DUCATI SINGLES

RESTORATION

MICK WALKER

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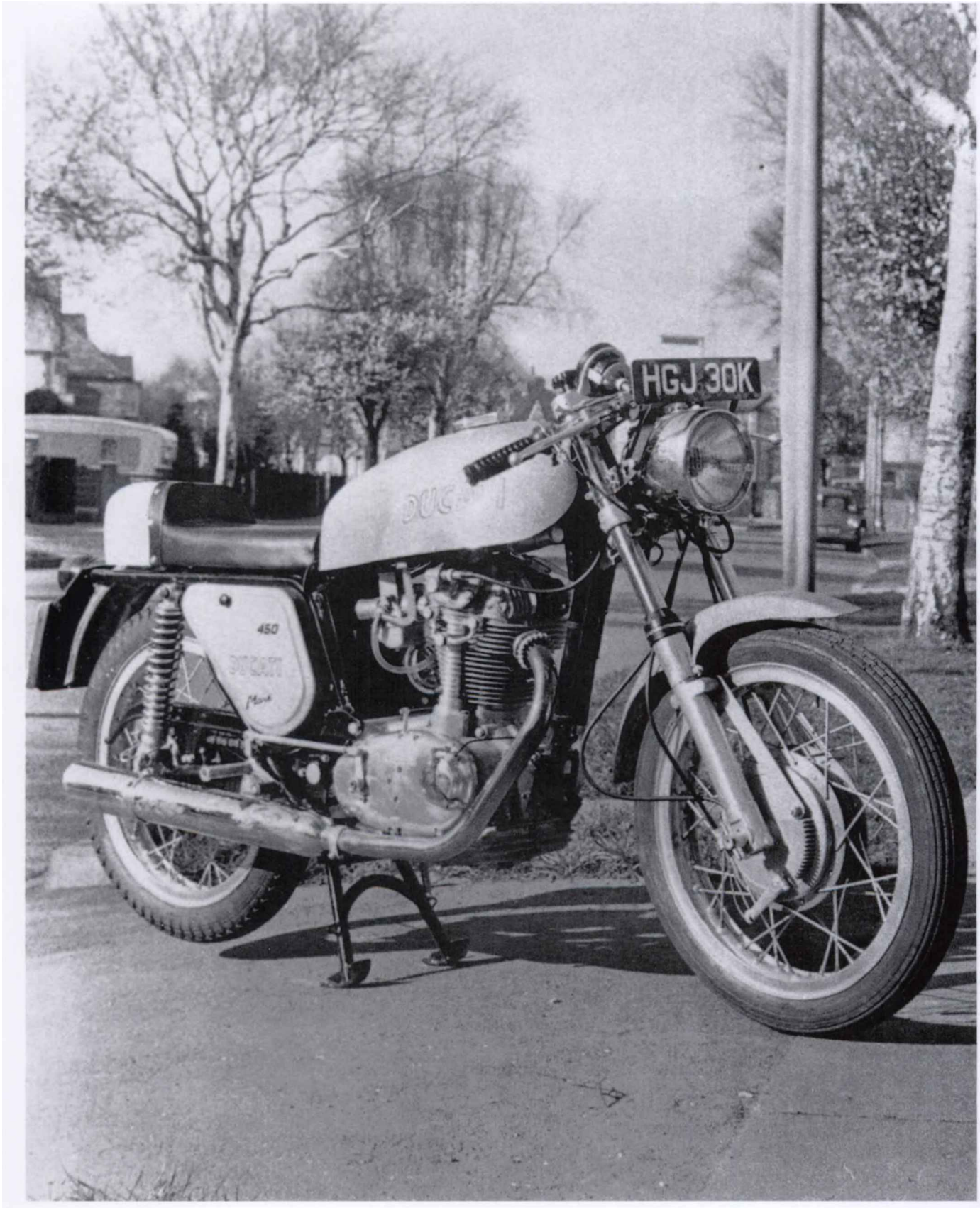
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All ohc bevel-driven four-strokes and piston-port two-strokes, 1957–77

MICK WALKER

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Contents


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Acknowledgements

My first book was *Ducati Singles* (Osprey Publishing), whilst *Ducati Singles Restoration* is number 18. Of the two, however, the latter was much more difficult to compile! Much of this was due to the truly vast array of single-cylinder machinery which the famous Bologna factory manufactured over many years. Trying to make some sense of this, from the restoration point of view, proved difficult to say the least.

Much of the material on which the text is based came from either my own collection of factory literature gathered over many years or personal experience. Most of the photographs and line drawings, too, came from my own files. Although it must be stated that the EMAP archives, which hold the old *Motor Cycle* and *Motor Cycling* files, also came to my assistance with a number of the illustrations.

A number of Ducati enthusiasts helped by providing encouragement and/or photographs, notably Marc Bruna, Barry Davis, Jim Porter, Don Upshaw, Simon Morris, Philip Tooth, Alan Moseley, Nigel Ball, Alan Hill and my Italian friend Gerolamo Bettoni. Doug Jackson and Alan Kirk also provided some key photographs and I gratefully acknowledge their excellent contribution.

Both my secretary Carol Green, who typed the manuscript, and my wife Susan, who provides such valuable support and encouragement, deserve a vote of special thanks.

Finally, my thanks also to the excellent Osprey editorial team headed by Nick Collins, supported by Ian Penberthy. Once more, they have managed their usual professional transformation of the original manuscript into the finished product that you have before you now.

Mick Walker
Wisbech, Cambridgeshire
April 1990

The author's involvement with Ducati single-cylinder motorcycles spans over 30 years. He is pictured here in 1972 with a 250 built from spare parts of several different models

1 Background

Like Innocenti and Piaggio, the makers of Lambretta and Vespa scooters, Ducati was one of the big Italian engineering companies which had to switch to new, peacetime products at the end of World War 2. A start was made with the Cucciolo (little pup), an auxiliary unit designed by Aldo Farinelli. The tiny 48 cc engine was a precision-built four-stroke with overhead valves—operated by *pullrods* instead of pushrods.

This 'clip-on' engine sold in vast quantities during the late 1940s and early 1950s, and its success was to be the spur which launched Ducati into the production of small motorcycles, of 65, 98 and 125 cc capacities. All were ohv four-strokes but, unlike the Cucciolo, they had perfectly orthodox valve operation.

It was not long before the Ducati management began to develop an interest in motorcycle sport. The factory at Borgo Panigale, on the northern outskirts of Bologna, was located in an area where there was quite exceptional enthusiasm for all forms of motor sport. At first, they participated in trials and long-distance races like the Milano-Taranto and Giro d'Italia, but success was only modest, since the machines used by Ducati were simply not sophisticated enough to compete effectively with their more advanced rivals.

Determined to redress this situation, the directors at the factory, headed by Dr Giuseppe Montano were fortunate enough to gain the services of Ing. Fabio Taglioni. There are other books already published including, for example, *Ducati Desmo* (Osprey Publishing), which cover this great designer's career with the Bologna marque, but suffice to say from the time he joined Ducati, on 1 May 1954, things changed drastically.

Taglioni's first design for his new employers was the 100 Gran Sport, an attractive bevel-driven, single-overhead-cam machine which was not only a success first time out on the race circuit, but was to act as the prototype for a whole range of machines from 98 to 436 cc capacity over the next two decades.

The engine had bore and stroke measurements of 49.4 × 52 mm, giving a capacity of just over 98 cc. Its light-alloy cylinder barrel, with cast-iron liner, was inclined slightly forward. Driven by a bevel shaft on the right-hand side of the engine, its single-overhead-cam valve gear had exposed rockers and hairpin valve springs. The gear primary drive and multi-plate clutch were on the left, transmitting the power to a four-speed gearbox. The crankshaft, with full-circle flywheels, carried a small flywheel magneto on its drive-side extremity, supplying current for the battery of the coil ignition system. At the opposite end, outside the timing bevel, a gear with straight-cut teeth provided the drive for the oil pump (as with all the overhead-cam Ducati singles, the Gran Sport had full unit construction and wet-sump lubrication) and also for the contact breaker. Adjustment of the contact points was made through a spring-retained inspection cap at the front of the timing cover.

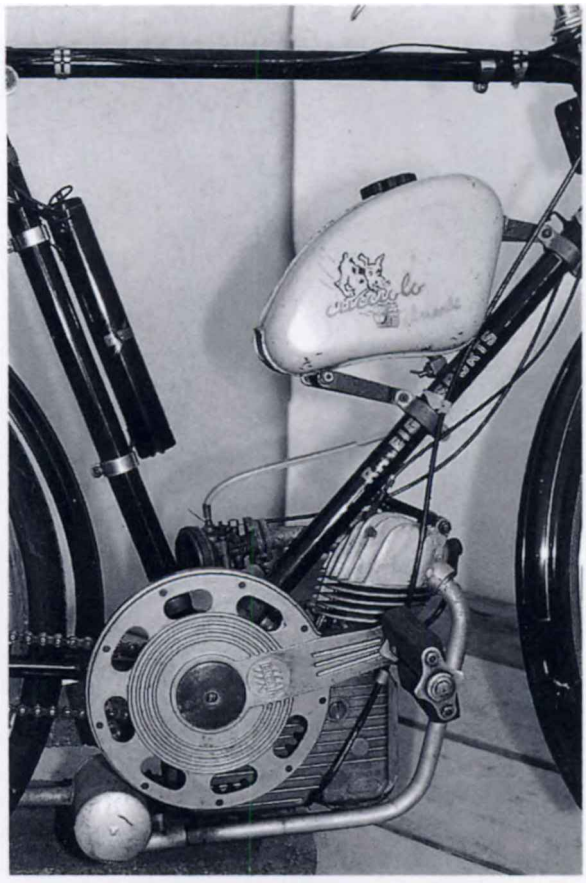
An initial power output of 9 bhp at 9000 rpm, with the engine running on an 8.5:1 compression ratio, was later boosted to 12 bhp at 10,500 rpm, the maximum speed rising from 80 to 87 mph as a result.

The 125 cc version (55.5 × 52 mm) produced 14 bhp at 10,000 rpm and had a maximum velocity of over 90 mph, whilst the 175 cc version (62 × 57.8 mm) gave 16 bhp at 9000 rpm and had a maximum speed in excess of the magic 100 mph. Weighing 86 kg (190 lb) and 91 kg (200 lb) respectively, as against the 82 kg (180 lb) of the 100 cc model, the 125 and 175 later appeared under the Formula 3 tag with enclosed rockers and valve springs, another modification being the use of 18 in. wheels instead of the original 17 in. components.

These Taglioni-designed Ducatis were extremely successful in long-distance races and also in circuit events for sports category racing.

ABOVE RIGHT *Ducati began their two-wheel involvement by producing the 50 cc Cucciolo (little pup) micromotor. Its valves were operated by* pullrods, *not pushrods*

RIGHT *The Bologna factory built its first complete motorcycle in 1950. This 98 cc pushrod-engined Sport made its début at the 1953 Milan Show. Note the oil cooler at the front of the crankcase*

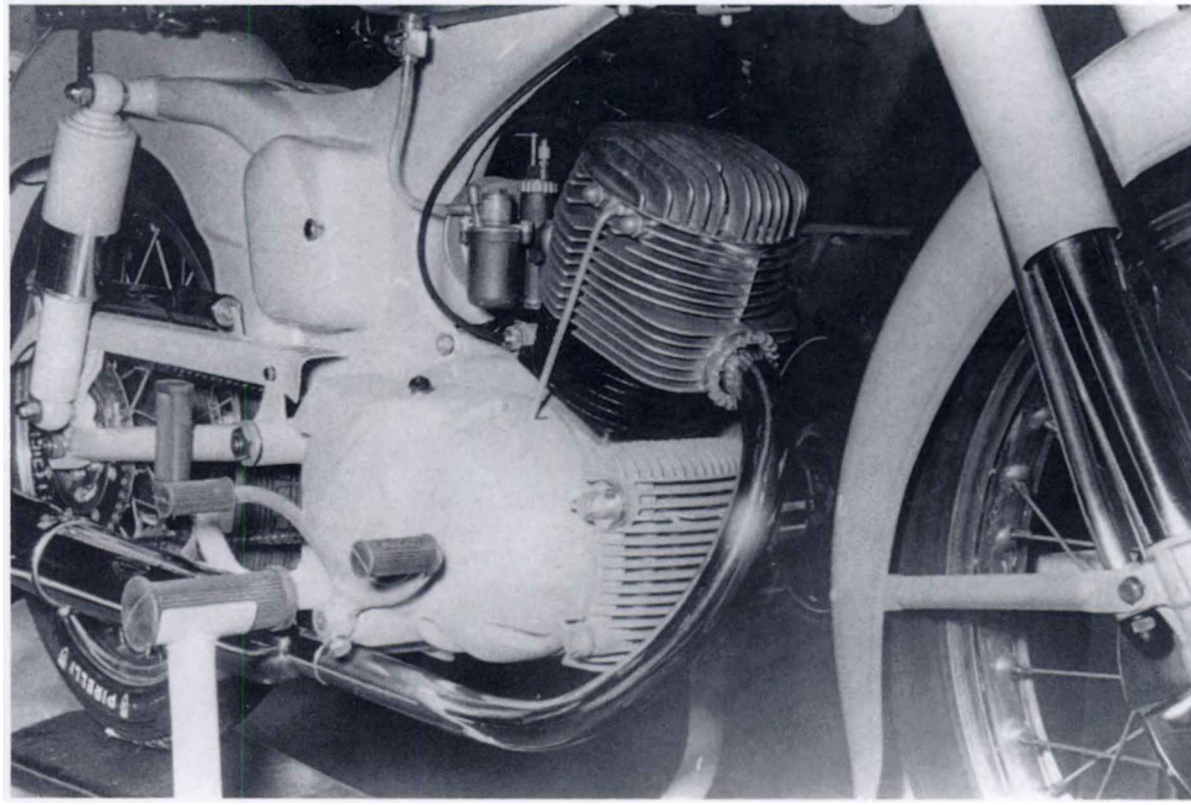


To mention every rider who cut his teeth on these fleet little Bologna singles would be an impossible task, but suffice to say the likes of Francesco Villa, Bruno Spaggiari, Alberto Pagani, Alberto Gandossi and Franco Farné all rode them during the early days of their careers.

Further proof of the basic soundness of the design came in November 1956, when a streamlined 100 Gran Sport, piloted by Mario Carini and Sandro Cireri, set 44 new speed records at Monza Autodrome. Over shorter distances, the machine averaged over 100 mph, whilst for the 1000 kilometre distance an impressive 96 mph speed was logged.

Not only were there to be more racing developments of the design in the shape of the dohc Grand Prix and Desmo models, but more importantly for the purposes of this particular book, a long line of roadsters. The first of these were the 125S (a sports model) and two 175s—the 175S and the 175T. These motorcycles were to be the cornerstone of all future Ducati four-stroke design for many years to come. The 125 was to give birth to 100 and 160 cc variants, while the 175 later went up to 200 cc, and later still 250, 350 and 450 cc. Altogether, the series was destined to have a production lifespan of 18 years in Italy and even longer if one counts the efforts of the Spanish Mototrans company which built the ohc singles until as late as 1982.

The 175 was first shown to the public at the Milan Show in late 1956. Strangely, in the light of its sales

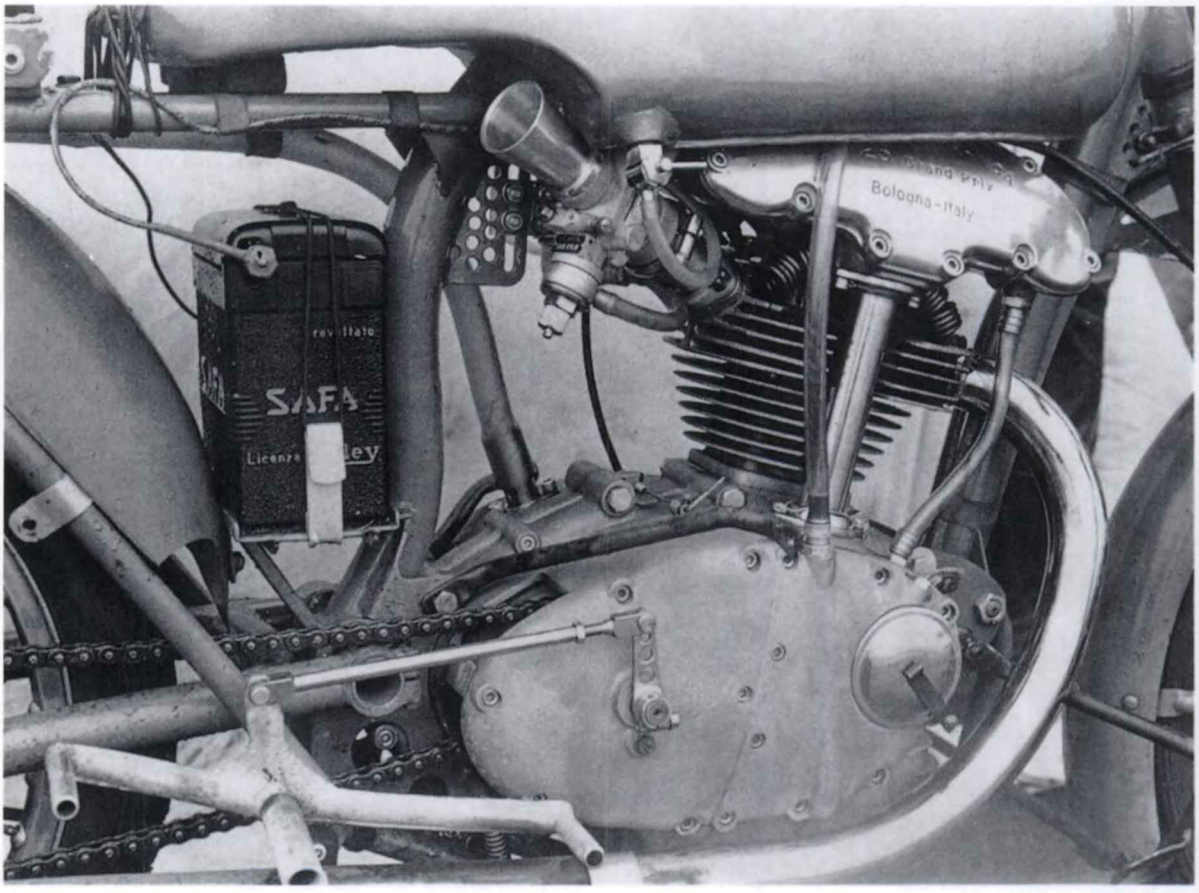


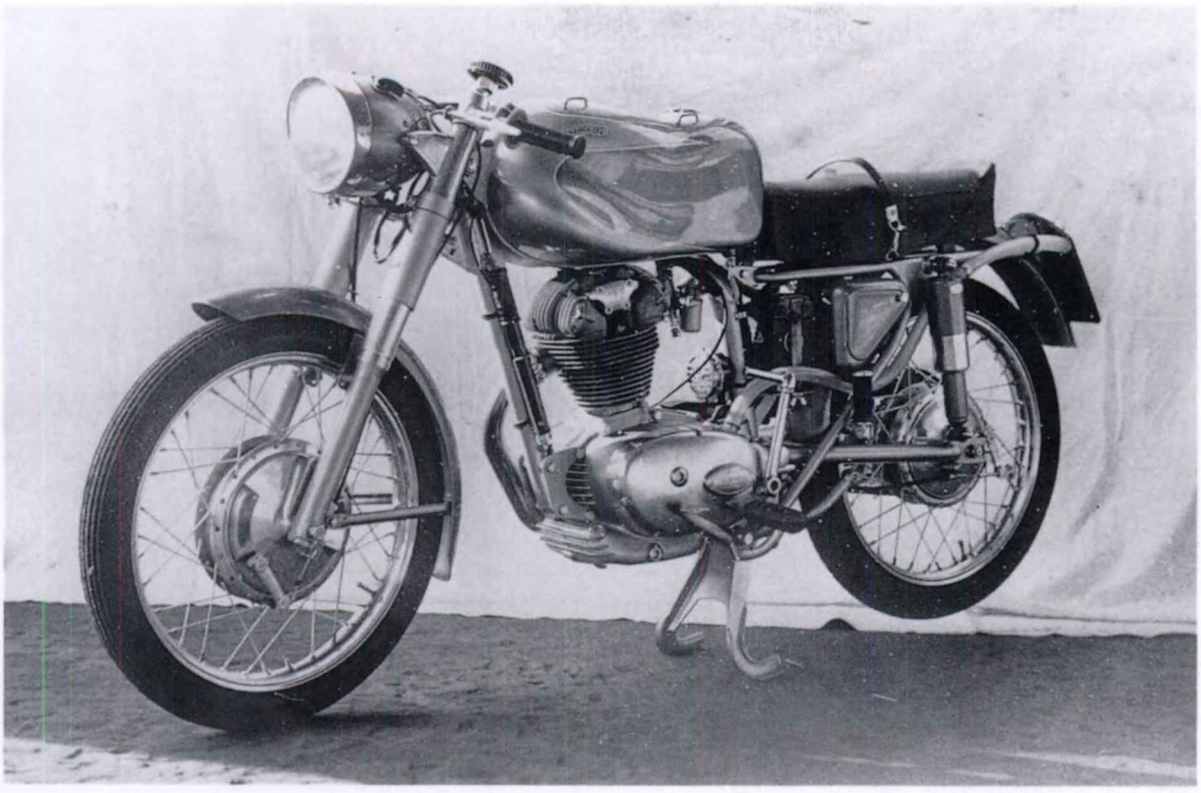
LEFT *By 1956 the 98 Sport wore a small handlebar-mounted fairing. This particular machine is under test with the British magazine* Motor Cycling

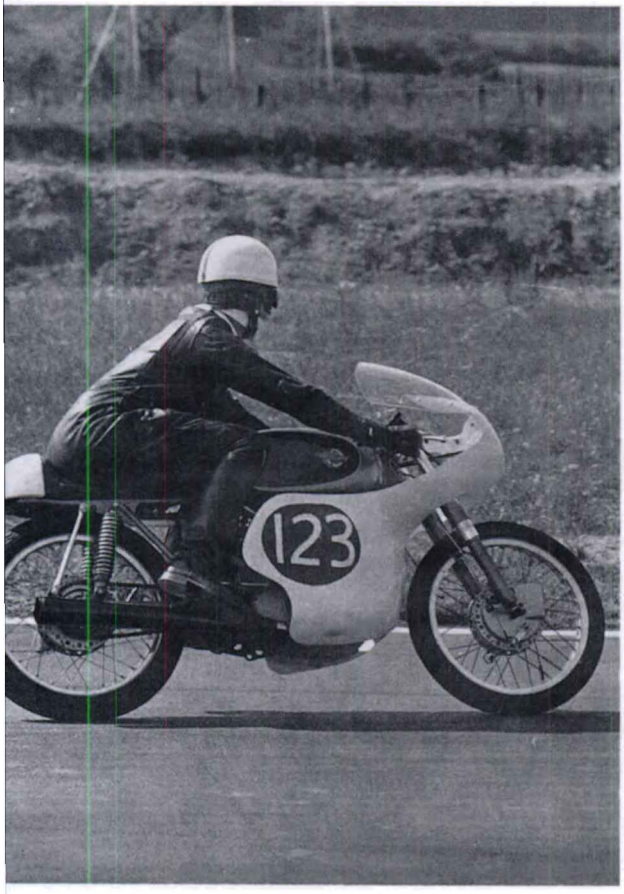
RIGHT *The first of Ducati's bevel-driven ohc roadsters, the 175S (Sport), made its début in early 1957 together with its strictly touring brother, the 175T*

BELOW RIGHT *The author in action at Snetterton during the mid 1960s, aboard a 1960 175 Formula 3. Built for Italian Formula events, when new it came with lights and a kickstarter*

BELOW *A number of specialized, over-the-counter racers were sold with a view to gaining additional publicity during the late 1950s. Typical was this double-knocker 125 Grand Prix model. Note the SAFA battery, a licence-built version of the British Varley component*







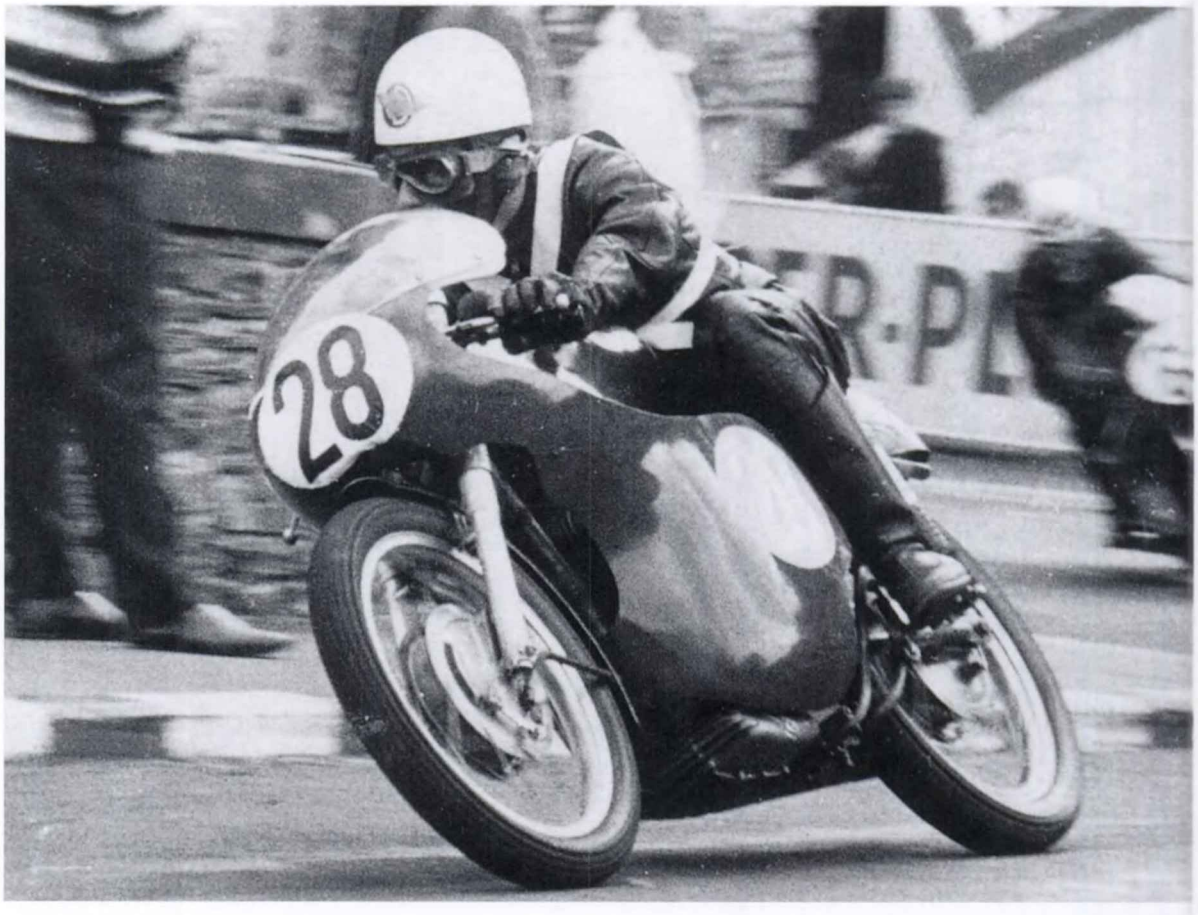
success and long production run, this first production ohc Ducati single did not create headlines at the *Padiglione della Meccanica*. That honour was shared by the Aermacchi 175 Chimera and IMN 200 Rocket, both of which were to prove sales flops!

By the end of 1958, Ducati had made considerable strides, helped in no small way by the success of its new ohc models. For the 1959 season, the factory were able to announce a new larger-capacity 200 (203 cc) version in four guises (Elite, Super Sport, Americano and Motocross). This, together with the appointment of new importers for both the United States and Britain, meant a considerable increase in production and sales expectations.

In 1960, the 200 engine was modified to test items for the new forthcoming 250 unit. These changes were to the crankshaft (one long shoulder in place of the previous equal crankpin type), clutch housing and cylinder head.

The quarter-litre single first appeared in the spring of 1961, both the American and British importers having had a considerable influence upon its introduction. The first versions were the Monza (tourer) and Diana (sports). The latter was sold in Britain under the Daytona name. Soon afterwards came the Scrambler, mainly aimed at the giant Stateside off-road market.

Another important model at the end of 1961 was the 48 cc Brisk, the company's first ever two-stroke. This was a simple piston-port-induction moped with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single speed and single seat. As with the range-topping overhead-cam 250, the cheap-and-cheerful 'stroker' was soon to be offered in a variety of versions, including the three-speed de luxe Piuma moped (which also boasted rear suspension and a dualseat) and the following year, 1962, the 48 Sport ultra-lightweight motorcycle. This latter machine employed a full double-cradle frame, clip-on handlebars and a 'bum stop' saddle. There was also an 80 cc version, but this failed to sell in significant numbers.

The next major development came in 1964 when all the 250 models received five-speed gearboxes. In addition, two new models were introduced—the 250 Mach 1 and 250GT. The Mach 1 was the star performer, having a highly-tuned engine featuring a high-lift camshaft, 10:1 piston, larger valves and 29 mm Dell'Orto SS1 carb. The tank was cut away underneath to enable the larger carburettor to be fitted. Its specification also included clip-ons, rearsets, and ball-ended control levers. In contrast, the 250GT was a soft tourer with even less performance than the Monza. It utilized much of the running gear from the 200GT of 1962 vintage. A distinctive feature was the fitting of swan-neck clip-on handlebars which provided a touring riding position.

The 160 Monza Junior also made its début in 1964. Its engine was developed from the ohc 125 and had a capacity of 156 cc, being fitted with a 22 mm carb. The machine had four-speeds and 16 in. wheel rims.

There were also a number of new two-strokes. The most significant of these were the 100 Cadet and 100 Mountaineer models, both of which employed a 94 cc engine with fan cooling and three-speeds. For their American launch, these were referred to as '90s' to compete with the recent Japanese imports from the likes of Suzuki and Yamaha.

The following year, 1965, the Diana Mark 3 was updated to Mach 1 specification, but still retained high bars and direct lighting from the crankshaft-mounted flywheel magneto. The first version of the new larger 340 cc Sebring also made its bow. Several long-running models, such as the 125 and 200 ohc models, were discontinued.

For the 1966 model year, the touring 250s, together with the 350 Sebring, were extensively restyled. These employed what was to become known as the 'square' styling, which contrasted vividly with Ducati's more normal, rounded, traditional sporting line. The 160 Monza Junior Series 2 (and Series 3) also appeared in this guise. Four-speed, foot-operated versions of the Cadet and Mountaineer two-stroke models replaced the earlier three-speed, twistgrip change.

In 1967 the 50SL, Cadet and Mountaineer were equipped with chrome-bore alloy cylinder barrels, which replaced the original cast-iron components. At the same time, the fan cooling was deleted.

The Mach 1 was discontinued, being replaced by a revised Diana Mark 3, which now had the battery/coil electrics from the Mach 1. A brand-new economy model appeared in the shape of the 125 Cadet/4—essentially a newly designed pushrod engine with 100 Cadet cycle parts.

At the biennial West German Cologne Show, staged in September 1967, Ducati showed the prototype of a replacement for their line of bevel-driven ohc singles. This featured a larger-capacity sump and much wider rear engine mounting points. The first model with the new type engine (and frame) was the 350 Scrambler, introduced in May 1968. This was soon followed by 250 and 350 Desmo (Mark 3D) and Mark 3, plus a 250 Scrambler.

In fact, the Desmo models were the very first *production* motorcycles to employ desmodromic (positive valve operation) cylinder heads. On these early Desmos, only the method of valve operation and more chrome fittings distinguished them from the standard valve-spring Mark 3.

Besides the wider rear engine mounts, the new 'widecase' frame was stronger at the rear, although the front and rear suspension was the same as on the earlier singles, using the 31.5 mm enclosed-spring forks and three-position chrome-spring Marzocchi rear suspension units. The brakes also remained unchanged.

It was in the engine department that the major changes (and improvements) occurred. The head design of the Mark 3 followed that of the ultra-sporting Mach 1 (as did the carburettor), whilst on the Desmo the actual design of the desmodromic system for mechanical valve opening and closing was very similar to the one that Ing. Taglioni, Ducati's chief designer, had devised for his early racing machines. The main difference was that the roadster's valve closing was assisted by springs (off the 125/160 models), unlike the racer's, which had none at all.

Other engine changes from the earlier models affected the bottom end, which had been a source of problems. An important alteration was to the kickstart gears—always a weak point on the 'narrowcase' models.

The big-end had also proved fragile, unless the machine was maintained and ridden by an experienced rider. It was vital to change the oil of the older models at regular intervals and not to allow the engine to plonk away at low revs, particularly in high gear.

ABOVE LEFT *The 200 Elite and SS first appeared during the 1959 model year. Many were raced with considerable success. Barry Davis is shown here aboard his race-kitted Elite in the 1964 Lightweight Manx GP*

LEFT *Ducati's first production 250 was the Diana (Daytona in Britain). It entered production in early 1961*

Ducati Deluxe Puma Moped

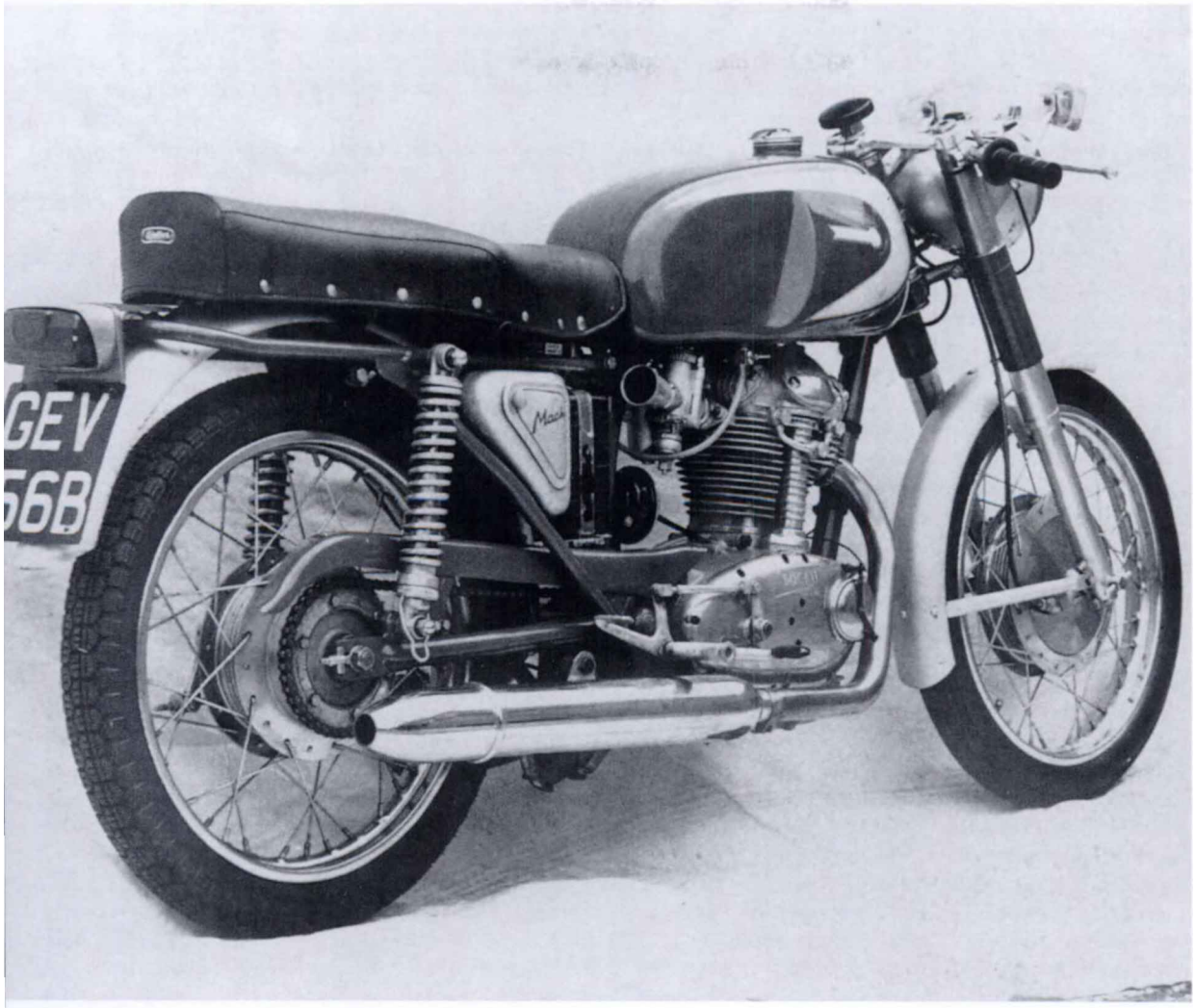
FOR RELIABILITY AND ECONOMY

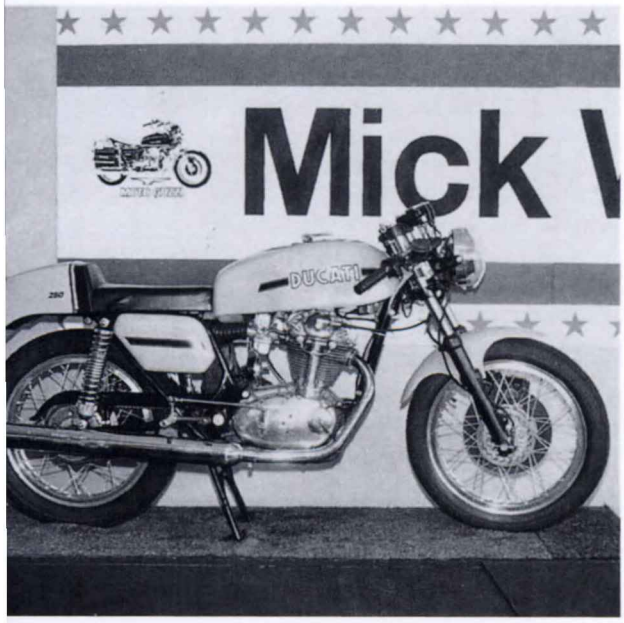
The Ducati Deluxe Puma 48 c.c. moped is an improved version of the standard Puma incorporating many extra refinements. Deeply-valanced all-weather mudguards and fully-enclosed chaincase, adjustable handlebars give increased riding comfort. Two-tone metallic blue and silver sheen finish is matched by two-tone dual seat. Complete with chromium rear carrier and streamlined enclosed headlamp with integral centrally mounted speedometer. Like the standard Puma, the Deluxe is easy and economical to ride and simple to maintain. It combines comfort with a reliable performance and provides the ideal low-cost transport for work or play. It is astonishingly light on fuel and on tyre wear and has fine road-holding qualities. The sturdy frame and precision-built engine keep maintenance costs to a minimum and each machine is extensively factory tested to ensure long, trouble-free riding.

PRICE INCLUDING PURCHASE TAX AND SPEEDOMETER

£79.10.0

Ducati concessionaires





ABOVE *When the five-speed 250 Mach 1 was launched in mid 1964, it created a sensation with its highly-tuned engine and 'ton-up' performance*

LEFT *The Italian company's final four-stroke singles were manufactured during 1974. Arguably the finest was the yellow café racer Desmo, a 450 version of which is shown here. Many enthusiasts mourned their passing*

FAR LEFT *Throughout the 1960s, the Bologna factory supplemented its range of four-stroke singles with myriad two-stroke models. Typical is this Puma (Piuma in countries except Britain) which sold in 1964 for £79 10s*

Even so, the big-end was often found wanting. With the new engine, the con-rod and big-end bearing were beefed up and the wet-sump lubrication capacity increased from 2.1 litres (3¾ pints) to 2.7 litres (5½ pints). There were also a host of more minor changes, including the gearbox and selector box. Electrics, although still 6 volt, were uprated from 60 to 80 watt, and a larger 13 amp/hour battery was installed.

In Ducati's search for even better big-end life, the diameter of this component was increased on three separate occasions, the last change to a 32 mm crankpin coming in 1974, also the final year of production.

Earlier, from 1969, an even bigger version of the ohc single theme had been introduced: the 450 (actually 434 cc).

Another update with several cosmetic changes appeared in 1971. This led to the more sporting Mark 3 Special and the externally-identical Desmo (nicknamed the 'Silver Shotgun' because of its metallic silver finish on the tank, seat and mudguards). These two machines continued until the end of 1972, as did another machine, the Mark 3 Tourer. The sportster had introduced the Grimeca-made, double-sided front brake and 35 mm Marzocchi front forks, later a feature of the final blue and gold Mark 3s, which entered production for the 1973 model year.

Hardly any of the 1971–2 bikes reached either the American or British markets, as both importers (Berliner and Vic Camp respectively) were in dispute with the Bologna factory over prices. Both countries imported Spanish Mototrans models during this period, except for small numbers of Italian-made 450s.

In 1973, the ultimate Ducati singles arrived, the previously-described blue and gold Mark 3s and what, in many people's eyes, were the finest—the striking yellow café racer Desmos. At first, the latter had the double Grimeca drums and 35 mm Marzocchis, but by the time the yellow Desmos were imported into Britain (April 1974), they had been equipped with a Brembo disc and Ceriani 35 mm forks.

Although production ceased in late 1974, the bevel-driven ohc Ducati singles were still available, new, up to early 1976 in Britain. This was due to the then importer, Coburn & Hughes, having bought up every single it could lay its hands on at the factory. This led to a real mish-mash of models, including French-market 239 cc tax dodgers, 350 Mark 3s with Spanish Mototrans engines, and even 250 Scramblers (SCRs) and 450 'Mark 4s'. The last were actually street scramblers, which were top sellers on the domestic market in Italy. Coburn & Hughes coined the 'Mark 4' tag to cash in on the popularity of the Mark 3 roadster. All very confusing then, and now!

It is also worth noting that the 239 was available both in Mark 3 and Desmo form. To compensate for its lower capacity, the state of engine tune was upped by using a slipper piston, coil valve springs (Mark 3 only), 30 mm PHF pumper carb and Lafranconi silencer. Also, the final Mark 3s (including the 239s) utilized chromed steel wheel rims (in place of the alloy originals), steel tool and air filter boxes and plastic tank badges (in place of transfers).

Many feared that with the demise of the long-running, classic, bevel-driven overhead-cam models, Ducati Meccanica had at last finally cut its ties with the single-cylinder concept. However, those pundits were to be proved wrong when, in 1975, the factory launched a brand-new model.

Sadly, this was neither a four-stroke nor a sports roadster. Instead, it was a six-speed, two-stroke dirt bike, the Regolarita enduro. This featured a radial-finned engine with left-hand gearchange, a chrome-bore alloy cylinder barrel, and a plastic tank, mudguards and panels. The specification was completed by a matt black exhaust and conical brake hubs. Unfortunately, the newcomer was to prove too heavy for serious off-road work, and its gearbox was suspect when employed to the full in events such as the ISDT.

Even though sales of the Regolarita were disappointing, to say the least, Ducati developed the theme. The result was to be the final Ducati single to enter series production, the Six Days. As its name implied, it was a serious long-distance trials machine—and it must be said, a much more capable contender than the original effort. Not only was its chassis redesigned and engine updated, but the styling was a great improvement, with a neatly sculptured, polished alloy tank and pukka motocross-type, high-level exhaust system, rather than the damage-prone low/high example with which the Regolarita was saddled.

The only thing missing was sales. Customers just could not reconcile themselves to an enduro bike with the Ducati motif on the tank.

Late 1977 saw the last few examples of the Six Days assembled, and with its phasing from production, passed the era of the Ducati single, a concept which had been listed ever since the factory built its first complete two-wheeler in 1950.

With Ducati now owned by the Cagiva organization, it seems unlikely that another single (at least one of the classic bevel-driven variety) with the much-loved name will appear in the foreseeable future. Consequently, this book may well stand as not only a restoration guide, but also as a record of the type of machine with which Ducati built a considerable portion of its reputation.

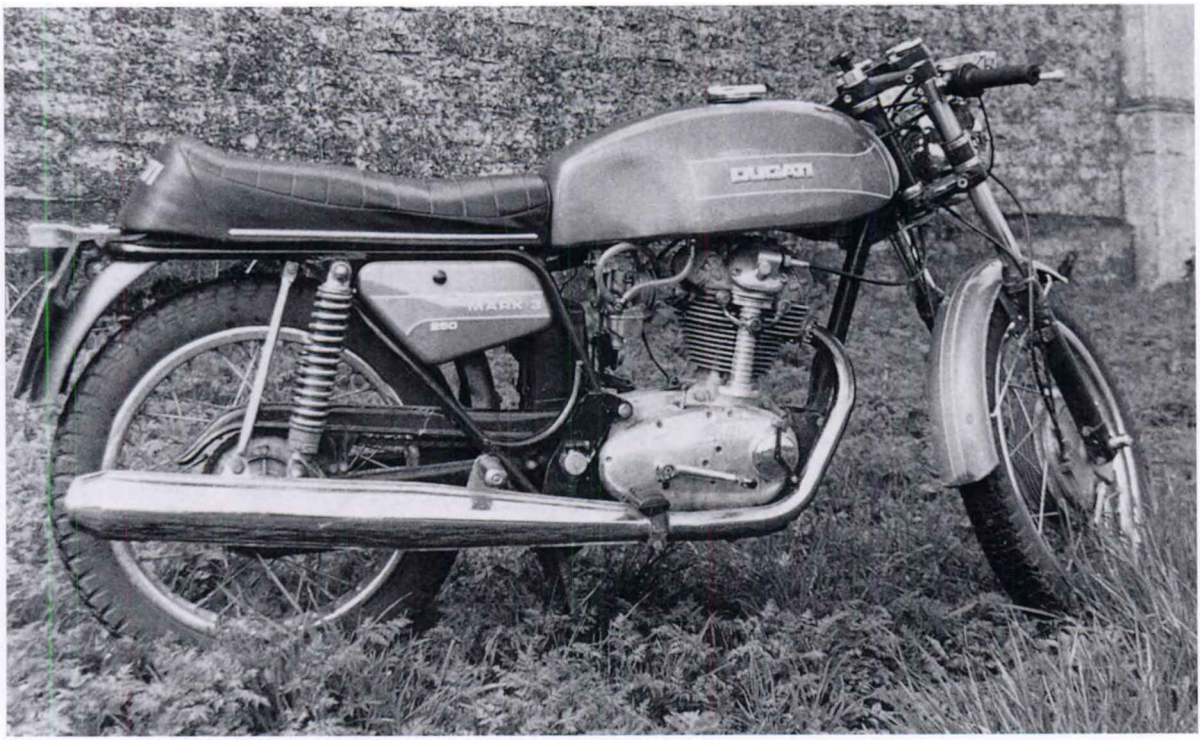
2 Where to start

This book sets out to cover the various Ducati single-cylinder motorcycles from 1957 onwards. However, its coverage is limited to the mainstream ohc bevel-driven four-strokes and piston-port two-strokes. This means that *none* of the push- or pullrod machines is covered. This is simply because to have included them would have meant a less than full coverage for the vast bulk of machines which have actually survived to the present day.

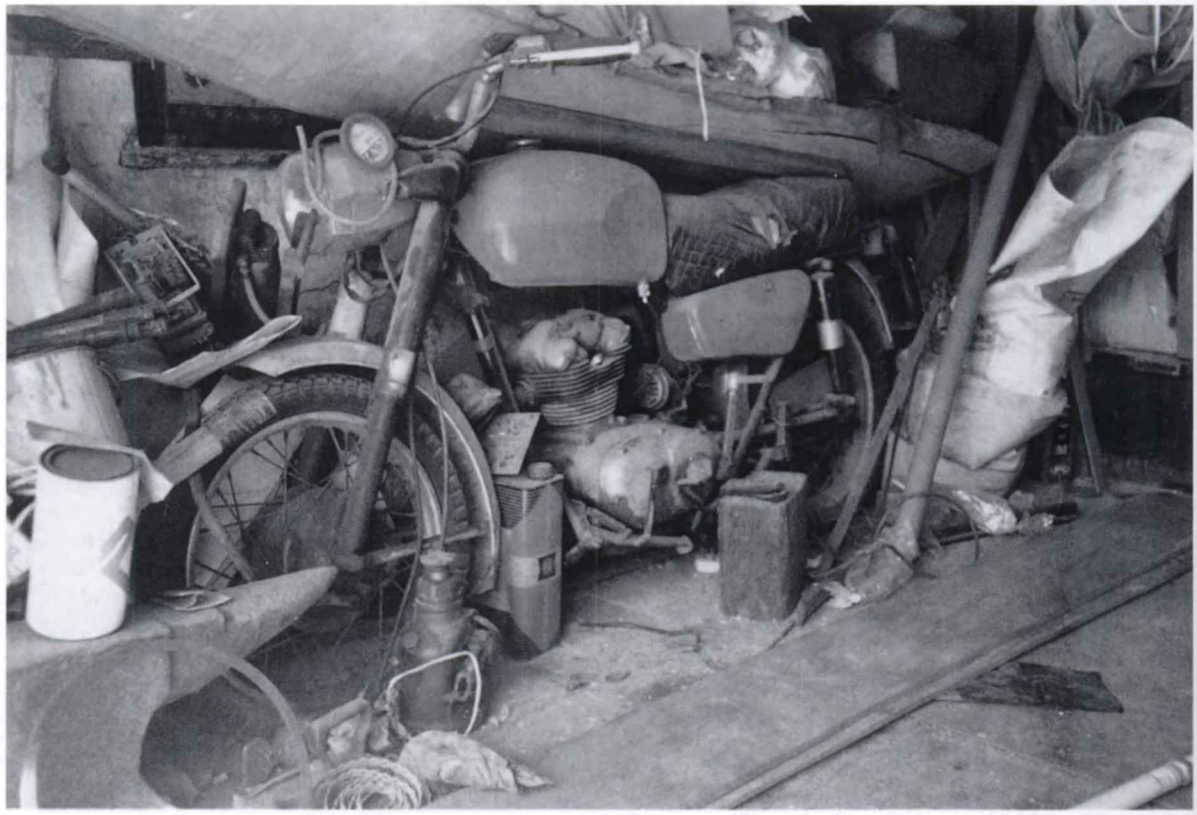
It should also be noted that, except where stated, the information supplied is for British market machines. Whilst it will normally be the same for machines sold in other countries, the reader is advised to consult the relevant handbook or workshop manual—particularly concerning electrical systems.

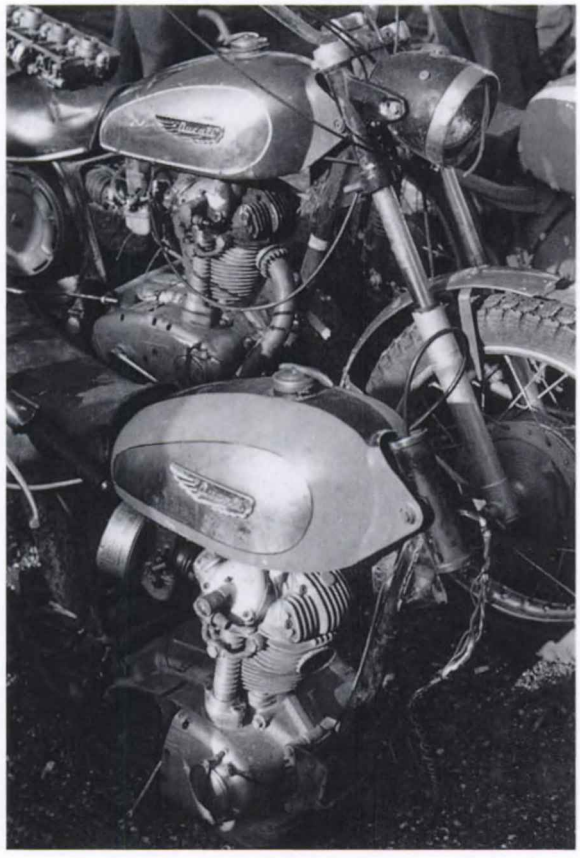
Generally speaking, the text covers only the standard production models and not prototypes or specials. However, by their very nature, Ducatis have always tended to prove awkward in this area, because like other Italian manufacturers, Ducati 'bought in' many components, leading to differences on the same basic model (for example, forks, brakes, electrical equipment and exhaust systems).

Engine and frame numbers are not listed, as in other volumes in this series. This is because Ducati have never maintained totally complete records in this area, as the various British manufacturers did. Indeed, the exact year of a machine is sometimes almost impossible to verify, although specification, colour and mechanical details can usually answer the question after careful study and research.



One of the last of the famous ohc single line, a 239 Mark 3, circa 1974. It differed from the 250 version by having a slipper piston, coil valve springs, PHF 30 carburettor and seamed Lafranconi silencer





ABOVE *Typical restoration project. For many years this 160 Monza Junior had lain unloved and uncared for, but it was rescued and restored in 1987*

ABOVE RIGHT *With the more sporting camshaft models becoming expensive, the less glamorous machines, such as this 160 Monza Junior are becoming more attractive to restorers on a tight budget*

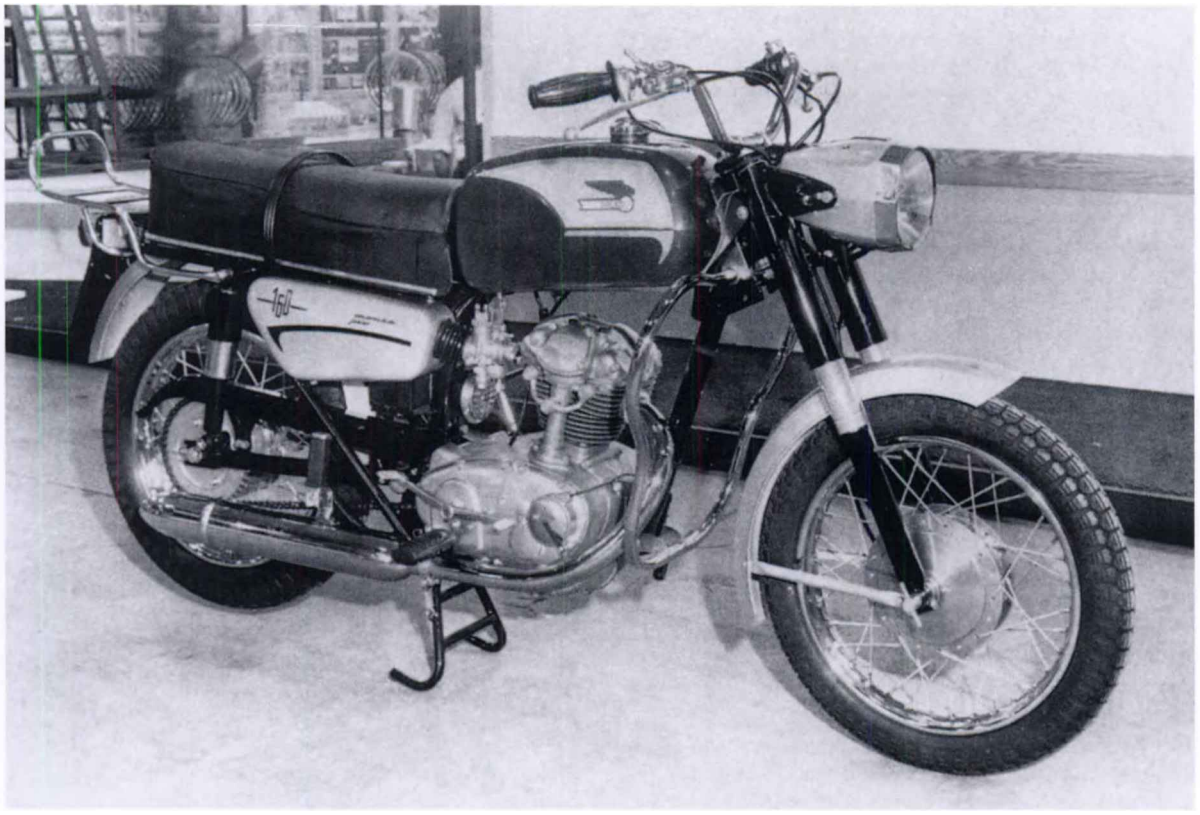
LEFT *A couple of 1970s Scrambler models at an autojumble in Italy. The machine nearest the camera is minus forks and front wheel*

Model Choice

With a total of 70 models covered in *Ducati Singles Restoration*, it is obvious that the potential owner has plenty of choice, with a variety of model types, engine sizes and years to make his selection from. In practice, however, the choice will be influenced by factors such as personal favourites, what is available at the time and, not least, what the purchaser can afford.

If you must have a certain model, you may face a long (and expensive) quest. Where you look first will be governed by the country in which you live and the model on which you have set your heart.

The best buys or, in other words, best value for



money are usually the bikes which do not ever reach being advertised. Conversely, these are the most difficult to find if you are set on an exact model and will not be satisfied with anything else.

The annoying thing is that for all you know, just the machine you want may well be sitting in someone's lock-up garage just around the block. Its owner may even want to sell, but not know how to go about it, or may be just too lazy to actually advertise it.

The following are the more usual ways of finding that elusive mount: local newspaper—the classified column, local dealer, specialist motorcycle press classifieds, specialist dealer, autojumbles and the like, word of mouth—including local or national club, auctions. The last category can include normal car/motorcycle auctions and auctions of the stock of dealers who have gone out of business. (The latter can also prove of use in obtaining spare parts and factory workshop tools.)

Another facet of choice is what the restorer wants to achieve. This can be anything from simply putting the bike back in working order right through to an 'as new' 100 per cent original finish. Problems can occur when refurbishing a crash-damaged machine. In this case, it is vitally important to ensure that the frame and fork geometry is checked by an expert and that the wheels are entrusted to a specialist of equal ability. Do *not* try to skimp to save money where safety is concerned.

Finances

This area is all-important, as without sufficient funds no one, however enthusiastic, will be able to see through the demands of a full restoration. In fact, before you do anything, you must put your financial position in order. This includes setting a limit on how much you intend spending and deciding how you are going to borrow or save the money if you have not got the amount sitting in your bank account. With credit, obviously shop around for the best deal.

Right from the start, it is best to realize that motorcycle restoration and repair require time, patience, equipment, knowledge and last, but not least, *money*. Obviously, having plenty of the first four ingredients will reduce the amount you will need to spend, but by the same token, those with none or only some of these assets will need extra cash.

Ability

Another early requirement in the project is to assess one's ability to carry out the task in hand. Obviously, everyone is different; some may have virtually no skills at all, except enthusiasm, while others may be qualified engineers in their own right.

Again, this may be your first restoration, or you may have successfully completed several before. In addition, a person's level of expertise will often vary

from task to task, and this must also be taken into consideration. An important decision, therefore, is judging which jobs you will be able to carry out yourself, and which will have to be entrusted to others.

One way of relying less on others (and, therefore, ultimately keeping costs to a minimum) is to accept a lower standard of restoration. So if you cannot do certain jobs and do not want (or are unable to afford) outside assistance, the only answer is to accept a less than concours finish.

To illustrate this, it is better all-round to complete an enjoyable, rideable bike which is reliable, but does not possess an immaculate factory-like finish, rather than put oneself into financial debt and suffer all the heartache which this can bring—even perhaps eventually losing the machine upon which the money has been lavished.

So make it a rule to know your abilities, both mechanical and financial, and keep within them.

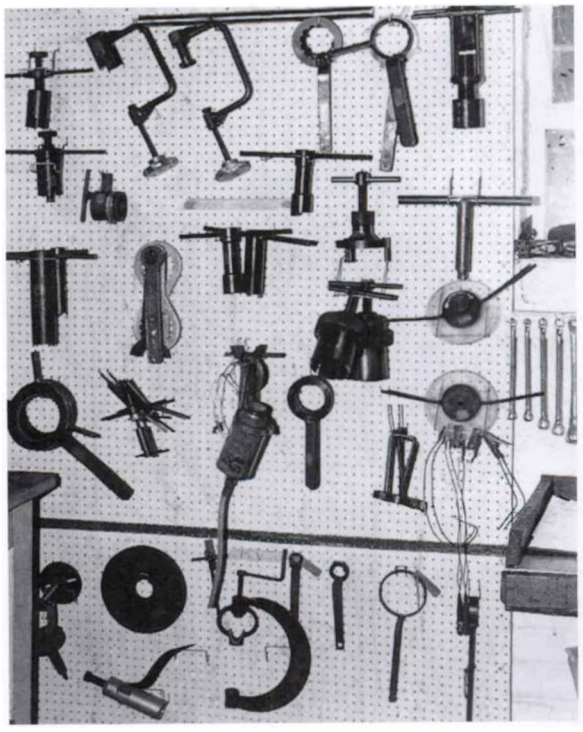
Tools and facilities

In an ideal world, one would like a full set of factory tools and a fully-equipped five-star workshop. For most, the reality is somewhat different. Consequently, throughout this book, I have endeavoured to show the budding Ducati singles restorer how to do the job *without* these facilities. This will not only keep costs down, but also enable you to carry out the work in the simplest manner. Without this help, you will probably waste considerable amounts of time puzzling over just how you are going to carry out a task. However, there are a number of essential basic requirements.

The first is a place to carry out the work. Although they have been used before, neither the kitchen nor sitting room is the best place. Not only will you find the job more difficult in these surroundings, but you will also run the risk of domestic problems—even divorce! It is much better, therefore, to organize a workshop area away from the confines of the house itself—either a lock-up garage or even a converted garden shed. In either case, it will need to be both heated and well lit. You will also need enough room to work without constantly having to move things. Attention to detail is important, if possible, light-coloured walls and a solid concrete or wooden floor. Needless to say, your workshop also needs to be secure, both from the weather and unwanted guests.

If you share a workshop, make absolutely certain that the other party is someone with whom you can work in harmony and that this person fully agrees to your rebuild project. The last thing you want to have to do is move out half-way through a restoration.

As for equipment, the first requirement is a bench to work on. This should be solidly constructed and firmly located in place. Just as important is a ramp upon which the machine can be mounted. This needs



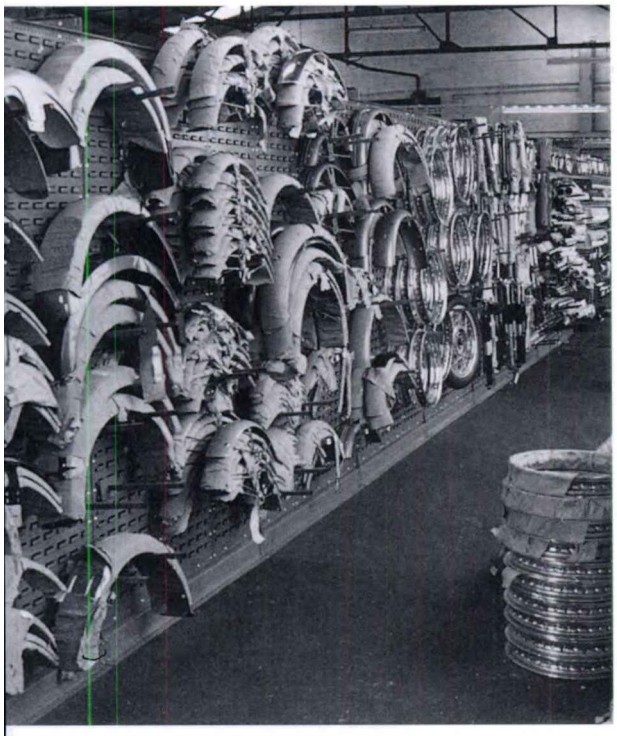
Factory workshop tools—the vast majority are not absolutely vital, since it is often possible to improvise less-expensive and less specialized alternatives

to be either of the type which the bike can be run up on to, or best of all one of the several metal hydraulic workbenches specially built for the motorcycle trade, as one would see in a dealer's workshop. This will make the job so much more pleasant, as you will be able to work at eye level, rather than having to bend down all the time.

Another basic requirement is a set of shelves on which to store items such as spare parts, tools, equipment and consumables (grease and oil, for example).

Other ideas, if you have the space, are a tool board and a means of safely storing your gaskets—either a shallow box or a purpose-built container. An engine stand is another useful addition to the restorer's list of equipment. This is best constructed from metal, its purpose being to hold the engine steady so that it can be worked on more easily and efficiently. To be really useful, an engine stand is best clamped to the workbench, where it will have the same effect as mounting the engine unit in a large vice. This leaves both hands free to carry out the work, otherwise you will need someone else to hold the engine. If you are concerned about how to design an engine stand, just use the same method as that employed by the frame—even an old frame (from a crash-damaged machine) can be cut up for this purpose.

You will also need a good quality vice for holding



The shelves of the British Ducati spares importers during the mid 1970s

other parts. This, too, needs to be securely located on the bench.

As already mentioned, hand tools are best hung on a board—this beats having to constantly go through a tool box. Files should be stored separately, both to avoid damage and make sure that any metal particles are kept within check.

The most widely used tools are spanners, and like any other tool, it is always a good policy to go for quality. My own favourites are the combination type—open at one end with a ring at the other, both ends being of the same size. All fixing sizes on Ducati singles are metric, so equip yourself with a full set of metric combination spanners, from 6 to 24 mm, plus the equivalent in sockets. In addition, you will need certain sizes up to 32 mm, depending upon the exact Ducati model you have. Do *not* be tempted to use an adjustable spanner; it might be the 'easy' option, but it will never fit as well as the proper size of a purpose-made spanner and is likely to slip, either 'rounding' the nut or injuring its user.

When working on a Ducati, you will frequently need a good set of metric allen keys. Not only are the various engine covers held on by allen screws, but also certain internal parts, including the top bevel drive housing.

In addition to the various hand tools, you will also need an electric drill and accessories, including a flexible shaft to permit port work and a polishing buff.

Next come the more expensive and specialized items, such as a lathe, welding equipment and a hydraulic press. All three will enable a much wider range of work to be carried out 'in house', but will also entail considerable expense and need specialized training. Ultimately, the deciding factors are again finances and skill.

Workplan

This single word is all-important in carrying out a *successful* restoration. Without a workplan, you will find the task a nerve-racking experience, which may eventually cause you to lose patience with the entire project and possibly even sell the incomplete machine.

Careful planning before you start tearing the machine apart is absolutely vital. So the first thing to do is *plan your work*. It might seem obvious, but first of all make absolutely sure that what you are setting out to do is not only within your capabilities, but also attainable. For example, if you do not have the time, the patience or the money, do not even start. This will save a lot of heartache later on. Not only must you want to do it, but you must be able to complete the project.

Next, you have to decide if you are going to tackle the complete machine as a whole, or break it down into separate major parts, attempting only one task at a time and making sure this is completed before starting on the next job.

Space also has to be taken into consideration. Where this is tight, it is best to tackle only one job at a time, as this will reduce the storage/workspace required.

The next step to take is to document details of the various parts as they are stripped—notes, sketches and photographs. For the last, if close-up detail is required, you will need a good quality SLR type camera—not your ancient Box Brownie. Do *not* rely on photographic records alone—what happens if the film does not develop properly? In addition, always tag items so that they can be identified to their respective positions on the machine. Another point of great importance with Ducatis is that a vast number of shims is used throughout the bike, particularly in the engine unit. These are not simply a standard size, but are of an exact thickness for your particular machine. Therefore, they must be kept in exactly the right order. Failure to do this will cause a lot of unnecessary extra work to be undertaken to rectify the matter. You have been warned!

Always make notes as you are carrying out the work. If you leave it until the next day, it is likely that something vital will be forgotten, let alone several months later when that particular component is being

reassembled. Plenty of labels and polythene bags are essential.

Okay, you ask, what happens if you inherit someone else's abandoned project as a basket case? Well, some useful help is given in Chapter 3, but it is important to realize that your task will be considerably more difficult than starting with a complete machine.

Obtaining spare parts

The obvious source would appear to be your local Ducati dealer, but in practice he is most likely only to carry parts for the later twins, and then only general service items.

Another point, from personal experience, is that a *minimum* of five years is required before someone can amass enough expertise in Ducatis to offer a really efficient parts service, however much that person or company may wish to please. Knowing what fits where on a particular model takes time, so experience really does count for something. This means that it is essential to deal with a specialist—someone who has been involved with Ducatis for several years, but even more importantly, someone who *knows* the singles.

To Ducati's credit, for many years, unlike several other Italian manufacturers who sold off their entire stocks of parts for their various single-cylinder models, the Bologna factory maintained a stockholding of spare parts right back to its original 175 ohc model of 1957. However, this happy state of affairs began to change when Cagiva took control in 1985 and the policy now appears to be that once a line item runs out, no more will be manufactured or purchased from an outside supplier.

This means that an increasing number of components will either not be available at all, or will be remanufactured courtesy of the few major parts specialists who cover the single-cylinder range around the world. Many parts are already being 'relaunched' in this way (such as transfers, pistons and rearsets, for example), but the real problem lies in the very slow moving, expensive items such as cylinder heads and crankcases.

Besides using new parts, there is the possibility of buying used components. Provided these are fully serviceable, often they can not only solve a problem when a new item is not available, but will also be cheaper. Obviously, the sensible thing is to know the cost of the new part to judge if you are paying the right price. My own company (Rick & Mick Walker) operates a scheme where all used parts are half the cost of new ones and carry a full 'money back' guarantee.

One problem concerning used parts is their availability. Obviously, some parts are likely to be very hard to find. Each machine that is broken for spares only provides the exact number of that particular part fitted to the motorcycle, but some items will always be more prone to damage than others—either through wear or accident damage. Another thing to remember is that, with the price of complete machines soaring, it will become much more difficult to locate machines that can be broken for spares in a profitable manner.

At the time of writing (mid 1990), most engine parts are available. As for cycle parts, again, most smaller components and service items are not a problem. However, some of the early, larger cycle parts, like tanks, seats, side panels and mudguards, are *difficult* to say the least.

Private advertisements and autojumbles are also a source of parts. These are fine, but remember that you will be on your own if an item proves unserviceable—you are not covered in the same way as if you purchased the identical component from an official trader.

Data

No restoration should be attempted until the relevant data is at hand. Make no mistake, this is as vital as the tools with which you are going to carry out the actual work.

The Ducati factory themselves produced two mainstream workshop manuals covering the singles. The first one, issued in 1960, covered the 100 Sport, 125 Sport (Monza in Britain), 125TS, 175T, 175TS, 175 Sport (Silverstone in Britain), 200 Elite, 200 Super Sport, 200 TS Americano and 200 Motocross. The second covered the 160 Monza Junior, 250GT, 250 Monza, 250 Scrambler, 250 Diana Mark 3, 250 Mach 1 and 350 Sebring. Finally, in 1970, came a supplement to the latter manual which dealt with the differences in the newly introduced widecase 250 and 350, plus the new larger-capacity 450.

No factory workshop manual was ever produced for the later widecase models, such as the 'Silver Shotgun' or 1973–4 blue and gold Mark 3s or the yellow Desmo café racers from the same period. However, both Clymer and Haynes have produced manuals to cover the later singles (the Clymer book also covers the five-speed 250/350 narrowcase models plus the 160 Monza Junior). However, at the time of writing, only the Clymer manual was still in print. The various parts books, with their exploded drawings, also make an excellent source of reference as to what fits where.

Two-stroke restorers are less fortunate for literature, since only the parts books and the owner's handbooks are their means of reference.

More background information can be gleaned from the following books: *Ducati Motorcyles, Ducati Singles*, and the *Illustrated Ducati and Cagiva Buyers Guide*.

Used together, a rider's handbook, the relevant workshop manual and parts book, combined with specialized books on the subject, will give the Ducati singles restorer the vast majority of answers needed.

You will also require the names and addresses of those offering specialized services, such as plating, painting, wheel rebuilds and even engine rebuilds, if you do not feel like doing the work yourself. To attempt to list here every firm which you might need in the course of your rebuild project is not necessary for two reasons; one is the sheer number of such companies, the other is that the scene is constantly changing, with old firms closing and new ones springing up. So any list would only be valid in the year it was compiled. However, the respected British monthly *Classic Bike* now publishes just such a list each autumn, usually in the October issue, and it is something well worth keeping for future reference.

Even this does not tell you how good or *bad* a certain specialist might be, so it is always worth consulting other owners to see what sort of service they have experienced from any company to which you plan to entrust any work. Usually, those established over a long period will be a pretty safe bet, otherwise it is likely that they would not have survived. However, this is not to say that a recently opened outfit will not give the same level of service, just that it may be harder to verify.

Owners clubs

Clubs are very much a personal choice, and I am not of the opinion that every Ducati owner should automatically join one. However, there is no doubt that membership does bring you into contact with owners of similar machines and can be of real benefit.

In Britain, the Ducati organization is the Ducati Owners Club (DOC), but there are also equivalents in Austria, West Germany, Denmark, Finland, France, Italy, Sweden, Switzerland, Australia, the USA and Japan.

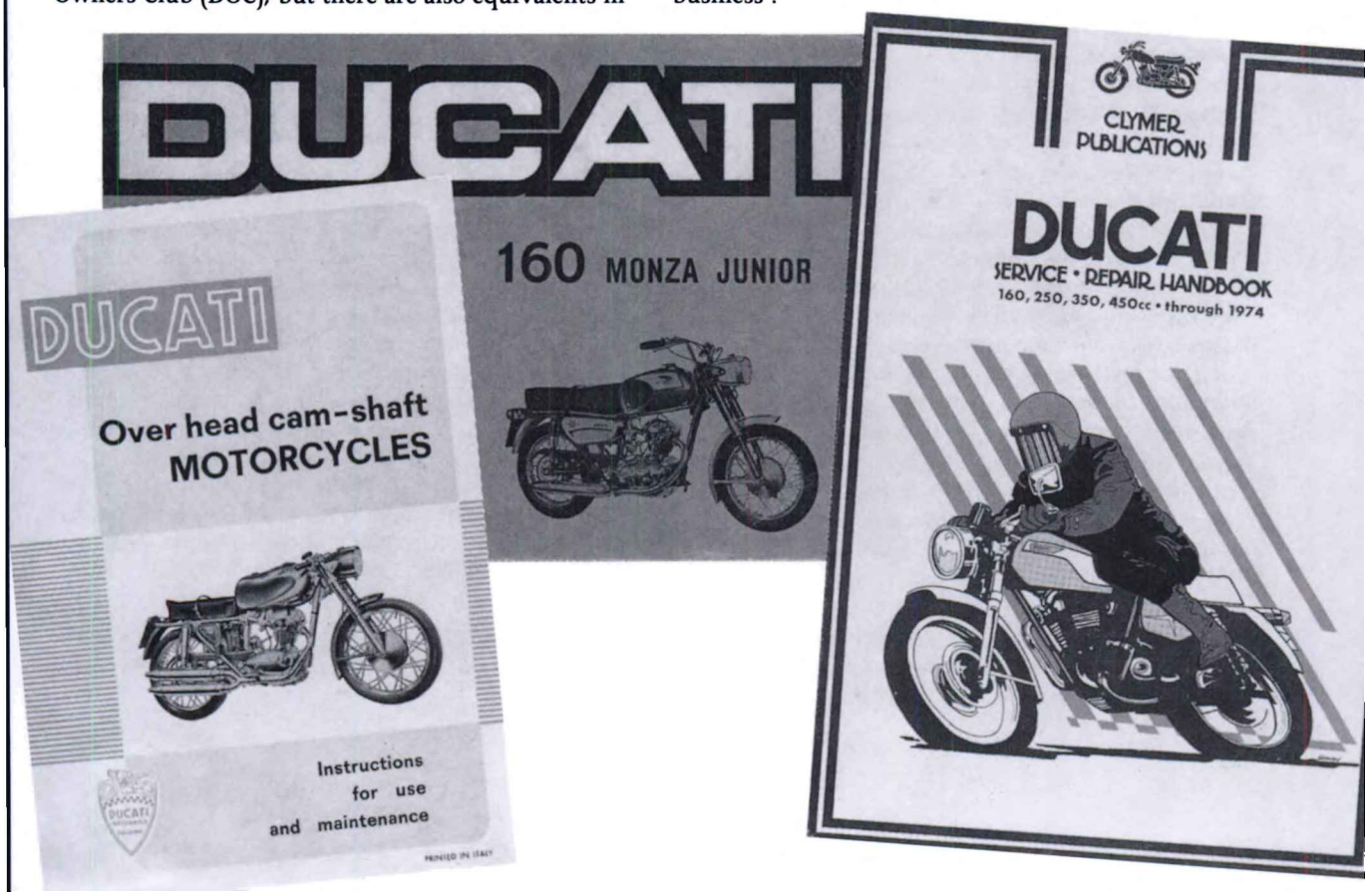
Of particular relevance are shows and rallies, where other machines can be studied in detail, and the club magazine in which correspondence can take place to help resolve problems—other owners may well have the answer to your particular difficulty.

Security

With the current high prices commanded by classic motorcycles and their component parts, the unpleasant spectrum of the light-fingered brigade has to be taken into consideration. Therefore, it is necessary to take the matter of security very seriously. This is especially true if you have to use a lock-up garage away from the boundaries of your home as your workshop, and it is vital that you undertake the necessary precautions to protect your property.

For a start, always avoid open publicity, as the word can quickly spread, sometimes to the wrong people. This can embrace anything from leaving a door open with the light switched on to an article on your machine in the local or national press. Also, if you are advertising a completed machine for sale, never quote your full address, only a telephone number, or use a box number.

Working at home reduces the problem, but does not resolve it entirely. Also, by keeping things quiet, you greatly lessen the risk of an unfriendly neighbour causing problems by reporting you to the local council because you are using your house as a 'repair business'.



3 Preparation

Inspection; to repair or replace?

After finally selecting and purchasing your restoration project (assuming, of course, that it is not already a member of the 'family'), the first task—after taking any photographs to illustrate the 'before-work-started' stage—is to give the machine a good clean to remove the assorted road filth and oil which may have collected upon its various surfaces. Having done this, it is important to make a record of exactly what went where, including the location of decals and badges. Like all other recorded details, this is vital, as after weeks or months, it will be impossible to remember everything.

Before attempting to strip any parts off the machine, I recommend that you go over the whole bike and apply penetrating oil to any components which look as if they will prove difficult to shift. Then leave it overnight for this to take effect. This will also get you into the habit of adopting a patient approach, because rushing will only cause unnecessary heartache and not help in achieving the ultimate dream of a concours-winning, sweet-running machine.

Another vitally important aspect is to determine exactly what parts will need to be repaired or renewed. However, much of this, including, of course, mechanical components, will often not be possible until the particular grouping has been broken down in the course of the dismantling process.

It is also necessary to take precautions so that fragile or easily damaged items are given proper protection. Make a note of the control cable routing, too. For example, are they to the left or right of the steering head and above or below the fork yokes? Even more important, make a full note of all the electrical wiring, connections and equipment. Compare this to a standard wiring diagram for your model—if different, check out just why. Nothing is worse than attempting to sort out the electrics after everything else has been fully restored.

Now put the bike up on to the work ramp, making sure it is fully secure. Use the centre stand, since neither prop (side) stand nor blocks under the crankcase is a good idea. Also take into consideration what will happen as you gradually dismantle the machine. Most machines with a centre stand will keep the front wheel on the ground, but if there is any doubt, it is a wise precaution to force a piece of wood under the rear tyre to ensure stability. This is particularly important when removing the engine unit, otherwise the whole machine can rock backwards and forwards, even to the point of coming off its stand. Work with caution at all times, certainly until you have removed the easily damaged and heavy components.

Items such as tank, seat and handlebars should all be relatively easy to remove, but the exhaust system can often prove the reverse. The real problem stems from the length of time it has been in place and the fact that the threaded exhaust ring, which holds the pipe into the head, will often be seized solid. The first step, therefore, is to make up a removal tool (from another exhaust ring nut). This, together with a good soaking in WD40 (or similar), will usually do the trick. Conversely, ignore these rules and you will not only find the job much more difficult, but could also strip the threads in the cylinder head.

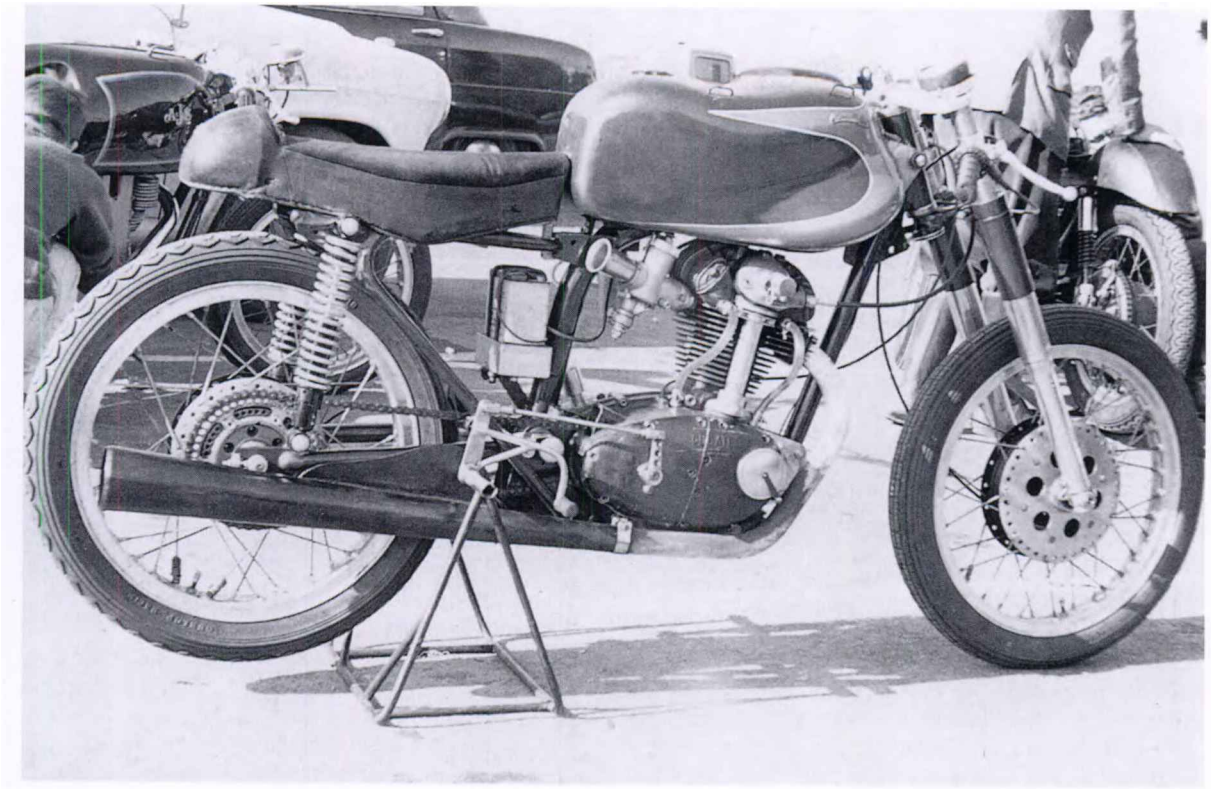
Another tight spot in the exhaust system is the joint between the exhaust pipe and silencer. Again, liberal amounts of penetrating oil and patience will usually do the trick.

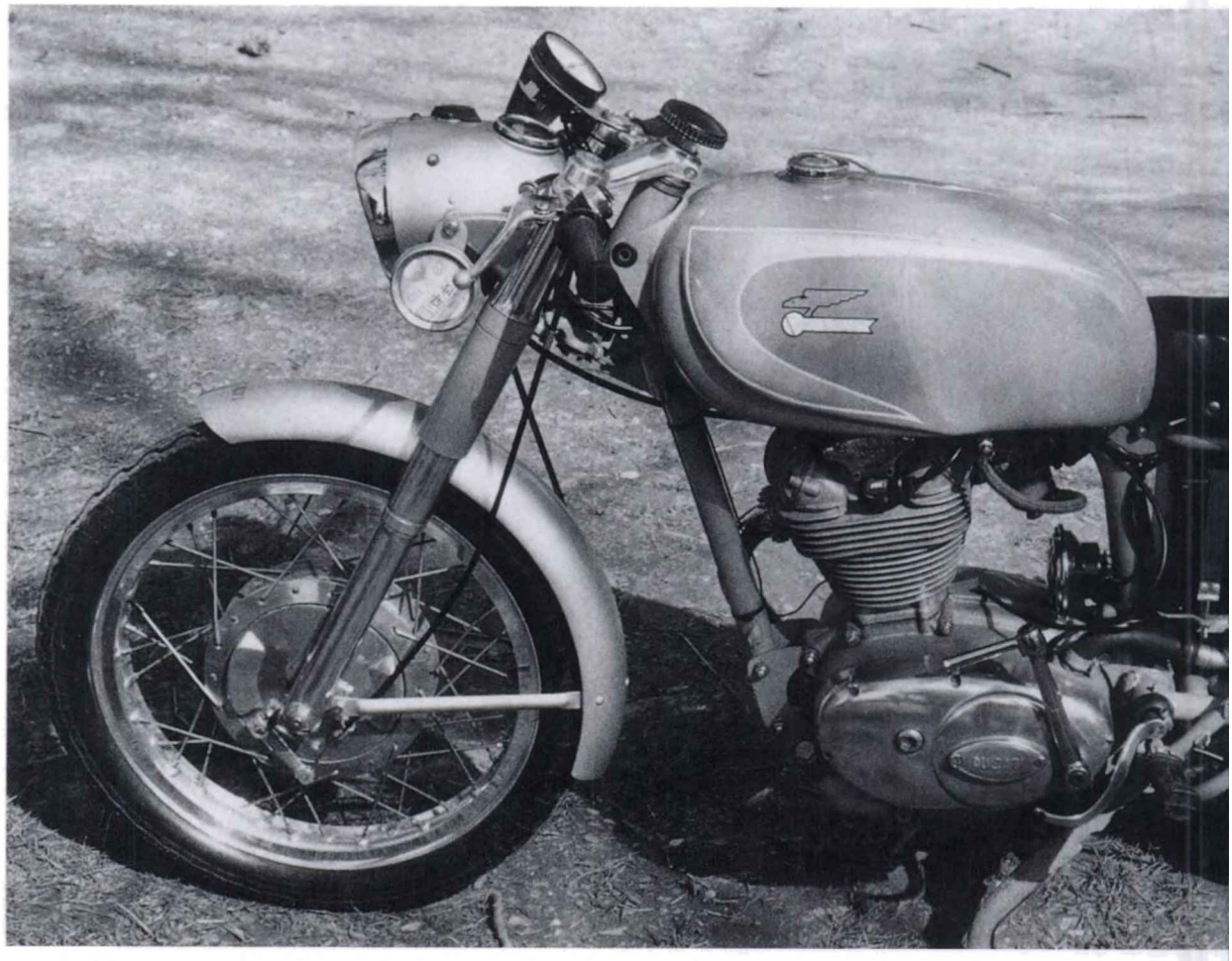
Next, attend to the fragile items, starting with the headlamp rim with its glass, reflector and bulb. Place something soft over the front mudguard so that the assembly can rest upon it whilst you disconnect the wires and their accessories. Store the front and rear lights separately in well protected boxes.

Next comes the speedometer, and tachometer if fit-

ABOVE RIGHT *Neatly-crafted 175 raced by Terry Grotefeld in the early 1960s. It employed several non-standard parts, including an NSU front brake, an Amal GP carburettor, a saddle of unknown origin and home-made rearsets*

RIGHT *A Mach 1 under test during 1965 by* The Motor Cycle. *Period photographs can often provide the restorer with vital information*





ABOVE *This modern restoration of a Mach 1 shows several differences from the original specification, including wheel rims, footrests, rear brake pedal, kickstart lever and rear shocks*

RIGHT *A factory studio shot of a 1971 125 Scrambler. The five-speed engine unit and Amal carburettor were assembled at the Spanish Mototrans factory and shipped to Bologna, where they were built into Italian cycle parts*

ted, noting on which side they were mounted. Take care not to damage the bulb holder at the back of the instrument and remove the bulb itself.

Remove the carburettor (and float chamber where it is not integral), remembering to drain off the petrol first. If a complete strip is to be undertaken, the slide is best removed from the cable and kept with the instrument until attention is turned to this component.

For more detailed advice on the stripdown, consult the appropriate workshop manual plus, of course, the appropriate sections of this book.

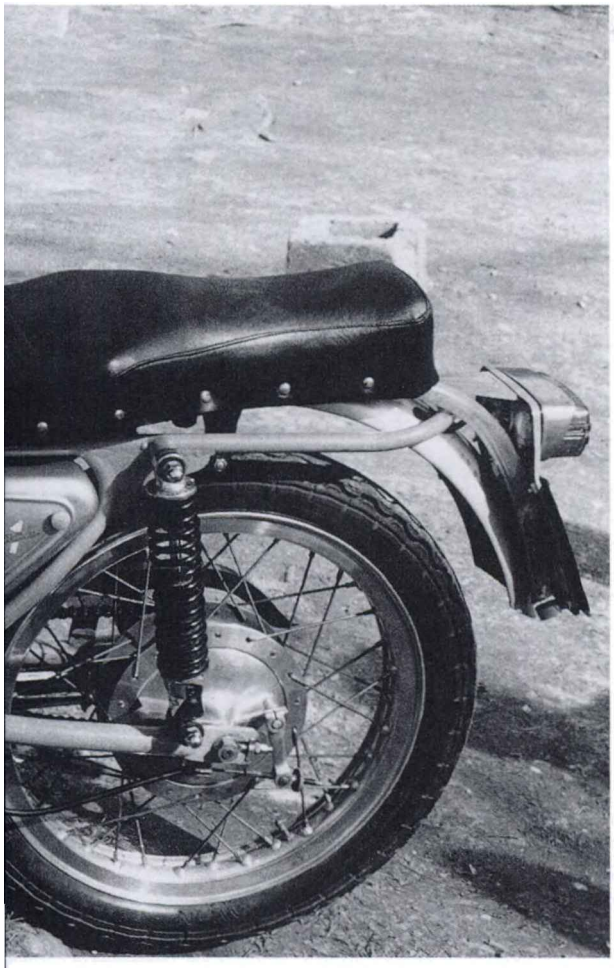
Finally, throughout this phase, you will need to decide exactly what should be refurbished, repaired or simply replaced.

Dismantling

Although putting things back together is usually more difficult than taking them to pieces, the latter is still a vitally important task, and the methods must be learnt if you want to make a successful restoration. As already mentioned, one of the very first tasks is to soak parts in penetrating oil, allowing enough time for it to take effect. Let the fluid soak in well, if necessary giving the part another soaking. Leave it for 36–48 hours—it is no use coming back in a couple of hours.

Patience is the answer. Keep at it until you win through. Going at things in a rash manner will only mean snapped bolts and skinned knuckles.

Really stubborn, well-rusted nuts and bolts holding cycle parts together sometimes call for another method. If they are too far gone for further use and the components are none too strong, do not try to undo them. You can easily do real damage to the bike or yourself, either with the spanners or the hacksaw



if you try that method. You will not be able to hold the fixing still to saw it and will inevitably damage the parts.

The answer is to tighten them up. Use a strong socket and bar, winding it up until the bolt goes bang. If it is on the large side, drill a hole up its centre first, but *never* attempt this on bolts fixed to tapped holes.

When attempting to shift items such as outer engine covers which are proving stubborn, use a hide hammer or, alternatively, a piece of wood to insulate the blow. To dislodge components such as this, a sharp single blow is much better than a series of taps.

A point worth remembering is that there may well be a hidden screw or nut, so before taking the above action, consult the appropriate page in the parts book to make sure you have not missed something.

Again, make notes as you proceed—do not leave things to memory.

Preserving

At this point, you really start to find out just how much work you have let yourself in for. You need to carefully examine every item to establish if it can still be used. The trick is to segregate (or mark) parts as necessary. For example: 'fully serviceable', 'repairable', 'scrap', 'needs painting', 'needs replating', etc.

Some parts may have to be repaired simply because no replacement is available, while in other cases it will be cheaper to buy a new item than have the old one repaired (instruments are often good examples of this).

If you plan to carry out the restoration over a number of months, or if the work is not carried out in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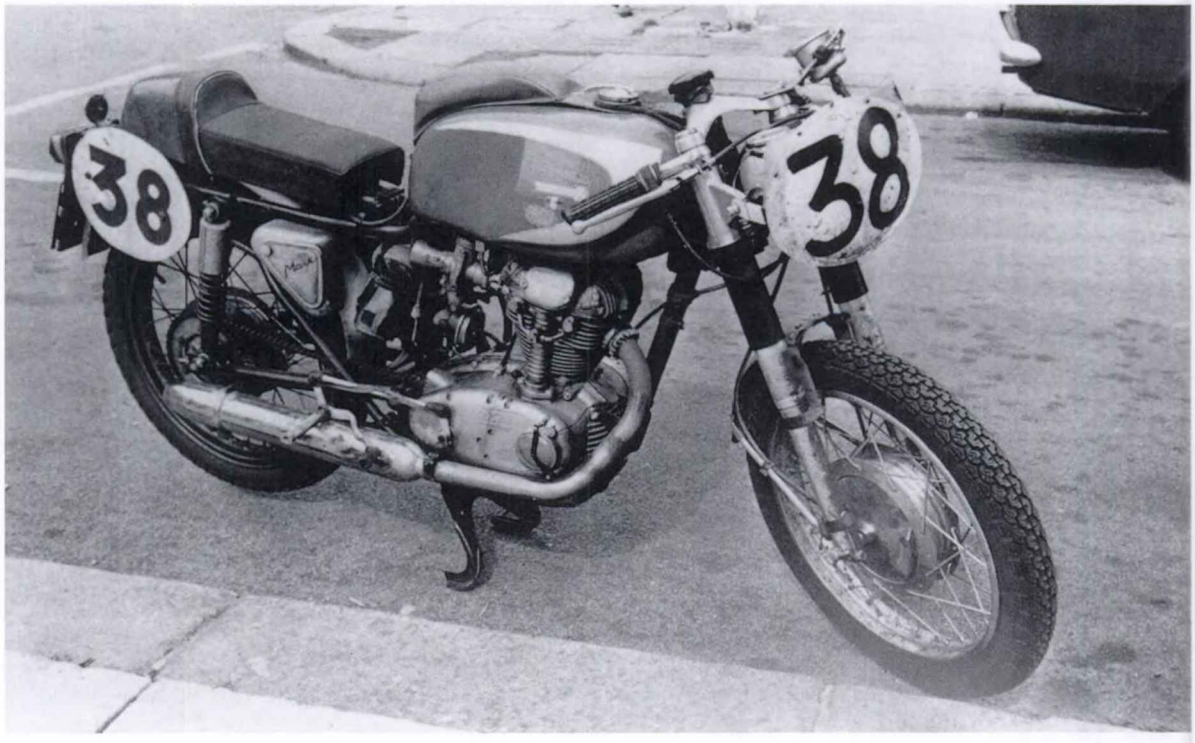
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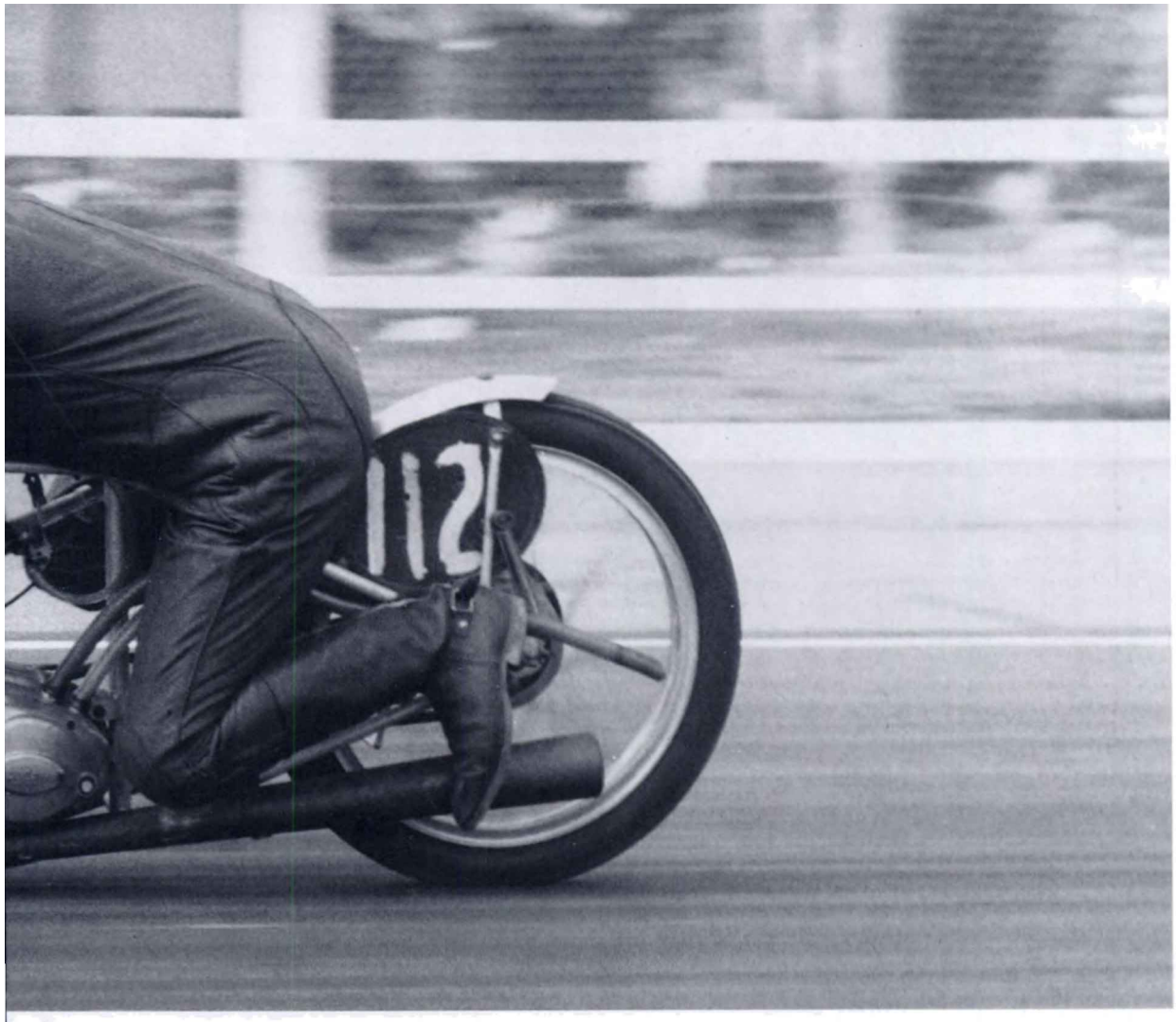


ABOVE *Ducati singles have even been used for sprinting. Here, Jim Wells screams his 175-engined device down the quarter-mile strip in 1968*

LEFT *This narrowcase 250 Mark 3 finished second overall in the 1968 Barcelona 24-hour race. Riders were Paul Smart and Reg Everett*

premises which are heated all the time, it will be necessary to coat many of the component parts in oil, grease or some other preservative. It is important, however, that rubber parts are kept well clear of these fluids, which will cause them to perish.

The biggest problem will arise if you are dealing with an accident-damaged machine. Here, it will be vital that welding/heating equipment is available, as the damaged cycle parts (unless they are to be replaced) will need to be warmed up before being straightened. Such equipment also allows the holes to be filled up and redrilled.

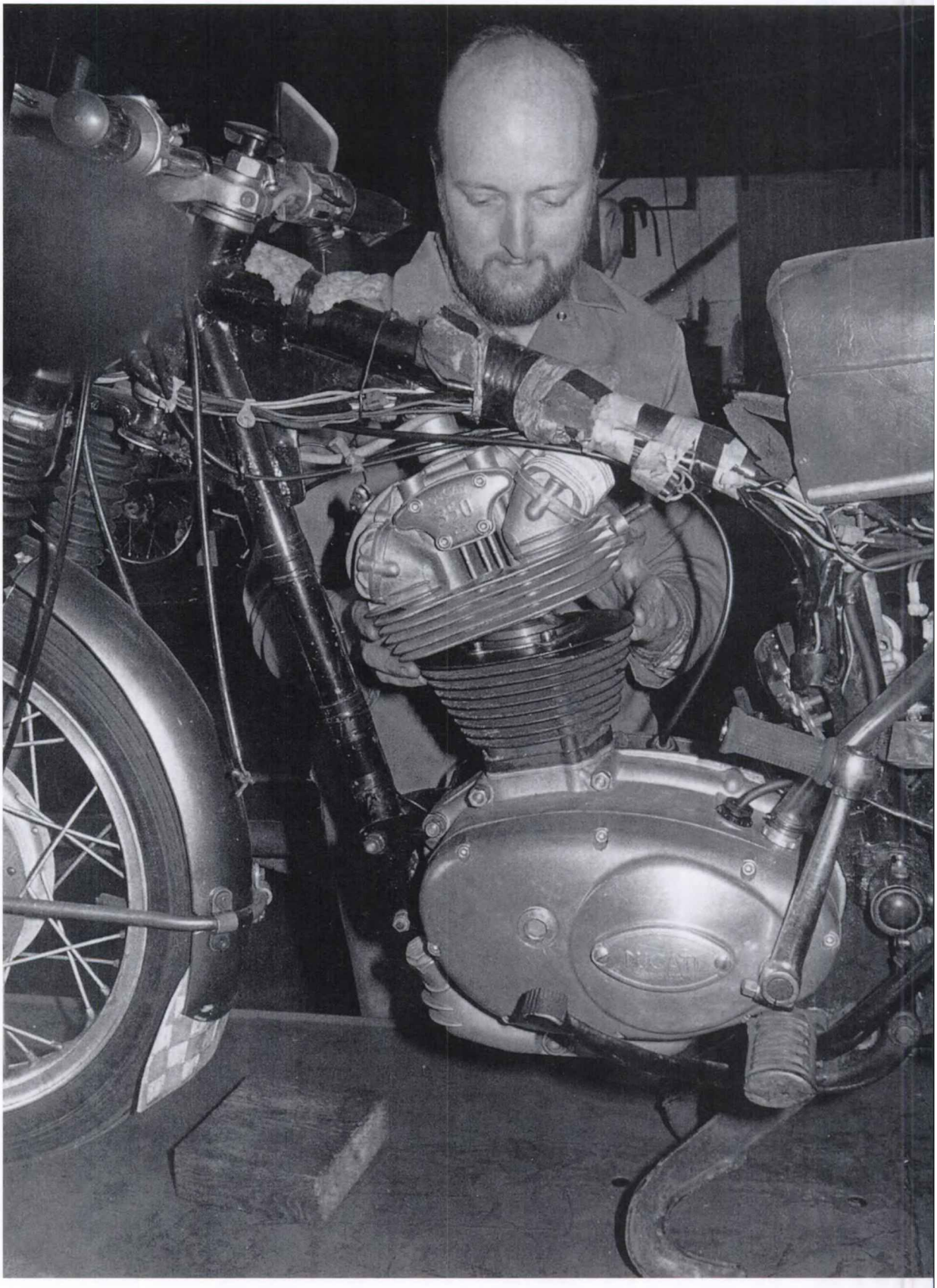
Of course, it is possible to take individual parts to a specialist for welding, but this may prove more difficult with larger items—for example, if the rear frame loop needs attention. In any case, getting everything straight really calls for all the parts to be in place, which makes it awkward for the job to be taken elsewhere, other than to a restoration specialist.

Basket case

This term is used to describe a motorcycle which has been stripped by a previous owner and the component parts left in a series of boxes. In effect, what you are doing is taking over the responsibility of carrying through the restoration project which someone else has abandoned. So you need to be fully aware of the extra problems that you are likely to encounter.

Not only are you likely to find lots of shabby bits and pieces, but also vital components may well be missing. (Which is probably the *real* reason the past owner gave up!) So it is well worth cleaning and examining the contents of each box, as only then will you be able to uncover exactly what you have purchased. It will also make the job more pleasant than constantly having to dig into a lot of dirty, unorganized oddments.

Once again, check which parts you have against the parts list. In this way, you will be in a position to know what will be needed from other sources.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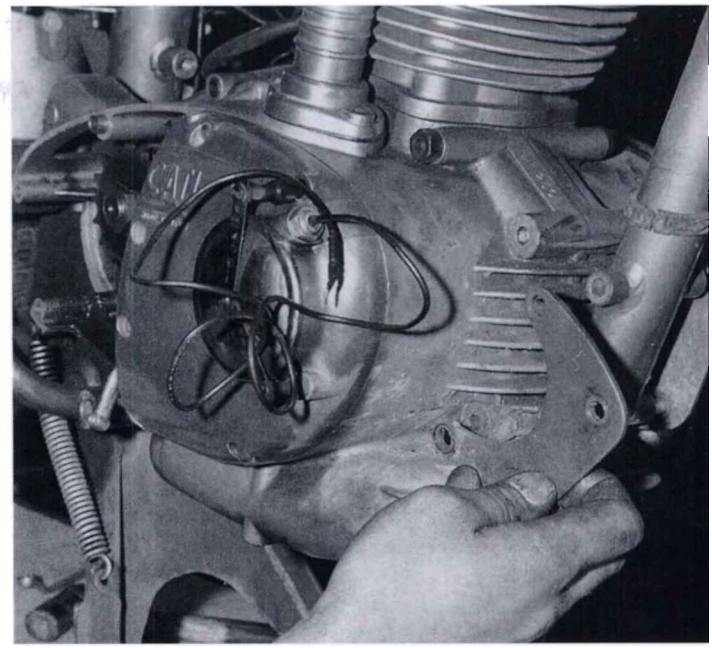
There are three main problems with basket cases. Firstly it is very likely that not everything will be there. This may not matter if the missing items are simply nuts, bolts, washers or the like, but specialized major components, or even things like metal badges, can pose a real headache. Secondly, some items may well be damaged, a poor fit or simply unserviceable. Finally, there are likely to be *wrong* parts that will catch you out unless you are familiar with the particular model you are restoring. Then, of course, as already mentioned earlier, there is the particular problem of the Ducati single's hand-built nature and the vast amount of shims within the engine and gearbox unit. So if this has been broken down, your task will be much more difficult and time consuming.

These are the main reasons why a basket case always takes so much longer to complete and tests the restorer's patience, as it takes ages before any real progress seems to be made.

From your checking and listing process, you should have gathered not only what is missing, but also what needs special attention. Once you are satisfied that it is all there and will fit together, you can continue with the project in the same way as someone fortunate enough to start with a complete machine.



Removing the front engine plates of a narrowcase overhead single prior to taking the engine out of the frame

Summing up

Whether you start with a complete bike or a basket case, you have now reached the stage when you can proceed to the restoration proper. In the following pages we will look at each area of the machine in detail. There are also numerous illustrations which will provide additional assistance. Good luck!

LEFT *The author's brother, Richard, removing the cylinder head of a 350 Sebring*

4 Engine

There is no doubt that the vast majority of restorations begin with the engine unit which, on any Ducati, also includes the gearbox and clutch. The exact procedure you adopt will depend on which model you have and your own particular working pattern.

The first task is to remove the engine unit from the frame and then dismantle it, but before removing it, a decision has to be taken regarding the major engine nuts (in the ohc and Desmo four-stroke Ducati singles there are five). It will definitely prove easier to undo these with the engine in the frame and connected to the rear wheel and brake. With the machine in gear, each nut can be attended to, starting at the crankshaft.

This method means that the timing cover, selector box and primary drive (clutch) cover all have to be removed. Do not forget to drain the engine oil from the wet sump before doing this. Obviously, disconnect all the various control and electrical cables which lead to the engine unit.

Another reason for starting with the engine is the simple fact that it is the largest single assembly of the whole motorcycle and therefore the piece which attracts the most attention.

The following information is meant to complement the various items of service literature already published (*not* replace it) and comprises many hints and tips which I have collected during my long association with the Bologna marque. It is aimed at the racer and roadgoing owner alike because hundreds of Ducati singles have been converted into track machines and currently rate as one of the most prolific types used in classic racing events.

The four-stroke engine

In many ways, the Ducati single is more suitable as a racer than a roadster, and I would like to make it quite clear that if you want a reliable, every-day, ride-to-work bike, then do not bother going any further. The small 'Dukes' are real rider's mounts, demanding enthusiastic owners who will lavish plenty of loving care and attention upon them.

Before you attempt any major mechanical work upon the engine, I would strongly recommend you not only obtain a suitable workshop manual, but also a copy of the relevant parts book. The latter will not only provide—and show—the correct location of components, but usually sizes of available parts, such as pistons, bushes and shims.

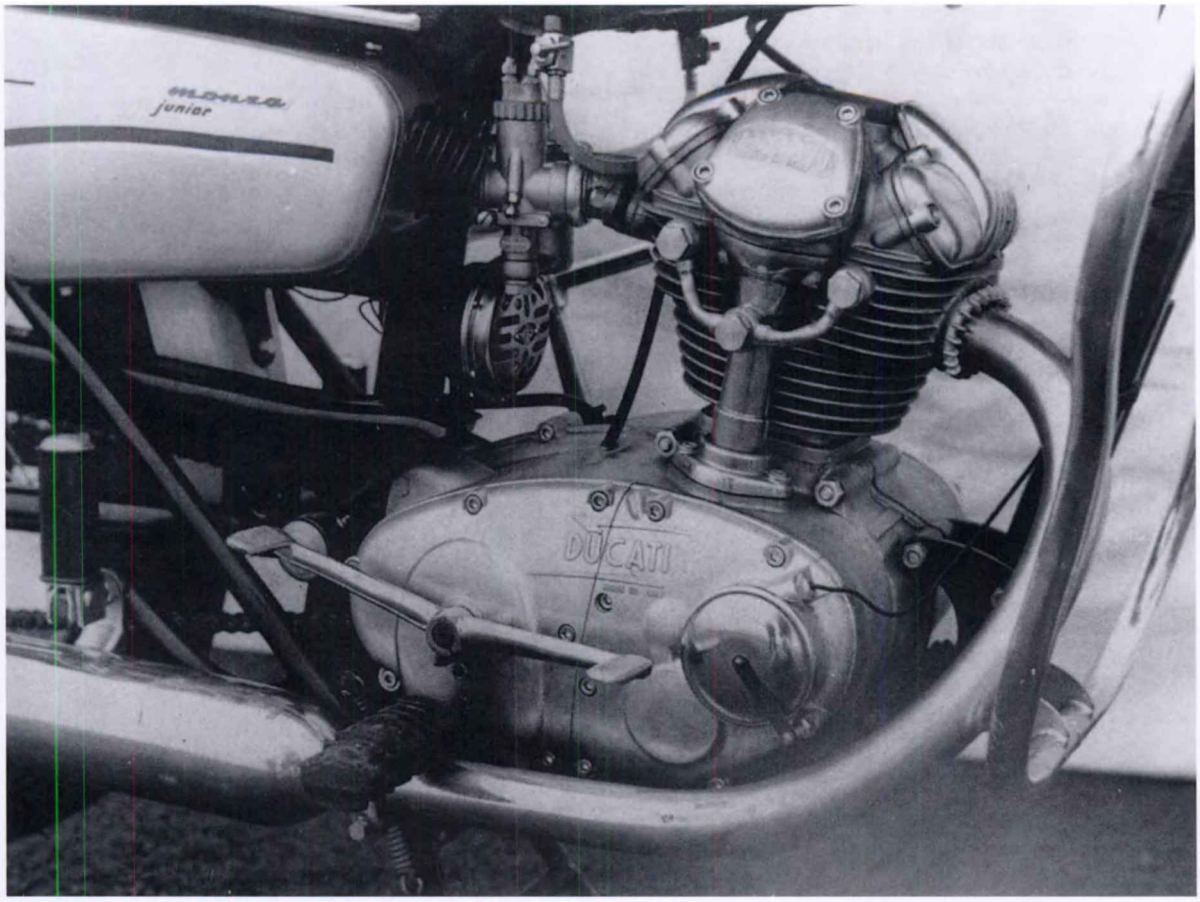
On the famous bevel-driven overhead-cam singles there are not only two types of valve operation, but also two distinct engine designs—narrowcase and widecase. The difference lies externally with the width of the rear engine mountings. On the earlier, narrowcase engines, this is identical to the front mountings. On the later widecase type, the rear mountings are some three times wider than the front.

The widecase engine was made in four sizes—239, 248, 340 and 436 cc—whereas Ducati offered the narrowcase in 98, 124, 152, 174, 248 and 340 cc capacities. Generally speaking, the widecase engine makes a far more reliable roadster, having important improvements to the kickstart gear design, increased oil capacity (from $3\frac{3}{4}$ to $5\frac{1}{2}$ pints) and more powerful and reliable electrics. Later still, the crankpin size was also beefed up. The first prototype widecase, a 350, appeared in the autumn of 1967, with production commencing the following spring. The 450 appeared in 1969. Production of the various ohc singles continued until the end of 1974, but because of existing stocks, it was still possible to buy one of the Bologna 'single-lung' machines until well into 1976.

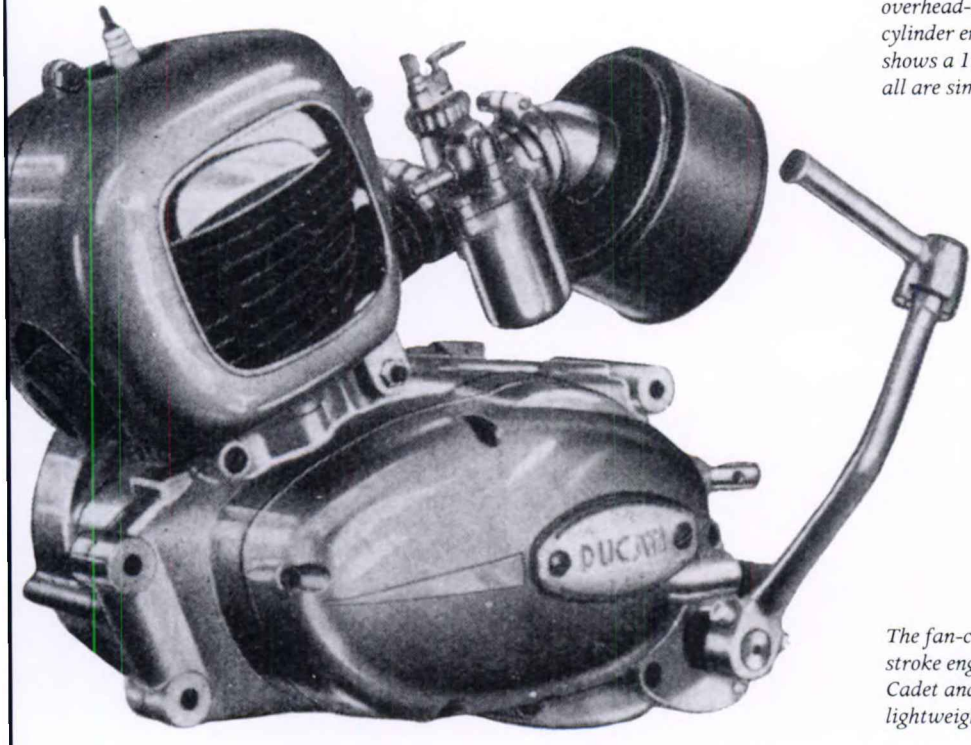
The two-stroke engine

Ducati's first two-stroke was the Brisk moped of 1961 vintage. Like all the others that were to follow over the next 16 years, this was a simple piston-port design, with full unit construction of the engine, gearbox and clutch.

The Brisk was a 48 cc single-speed automatic, then came the Piuma; this had the same capacity, but came with a three-speed, twistgrip-operated gearchange. The 80 Sport and 100 Cadet/Mountaineer ultra-lightweight motorcycles also used this type of gearbox until 1966, when a four-speed, foot-operated type became available. Development of these (including the sporty SLI) ran until the 1970 model year, when



ABOVE *The classic bevel-driven, overhead-camshaft Ducati single-cylinder engine. The photograph shows a 1966 160 Monza Junior, but all are similar*



The fan-cooled, piston-port, two-stroke engine which powered the 94 cc Cadet and Mountaineer ultra-lightweight motorcycles, circa 1964–6

Ducati temporarily shelved two-stroke production. It was resumed in 1975 with the all-new 125 Regolarita enduro bike. This employed a Sachs-type, radial-fin engine with chrome-plated alloy cylinder and six-speed box. Finally, in 1977, this was replaced by the Six Days, a full-blown off-road competition mount which pumped out 25 bhp at 10,250 rpm. After poor sales, production was halted at the end of that year.

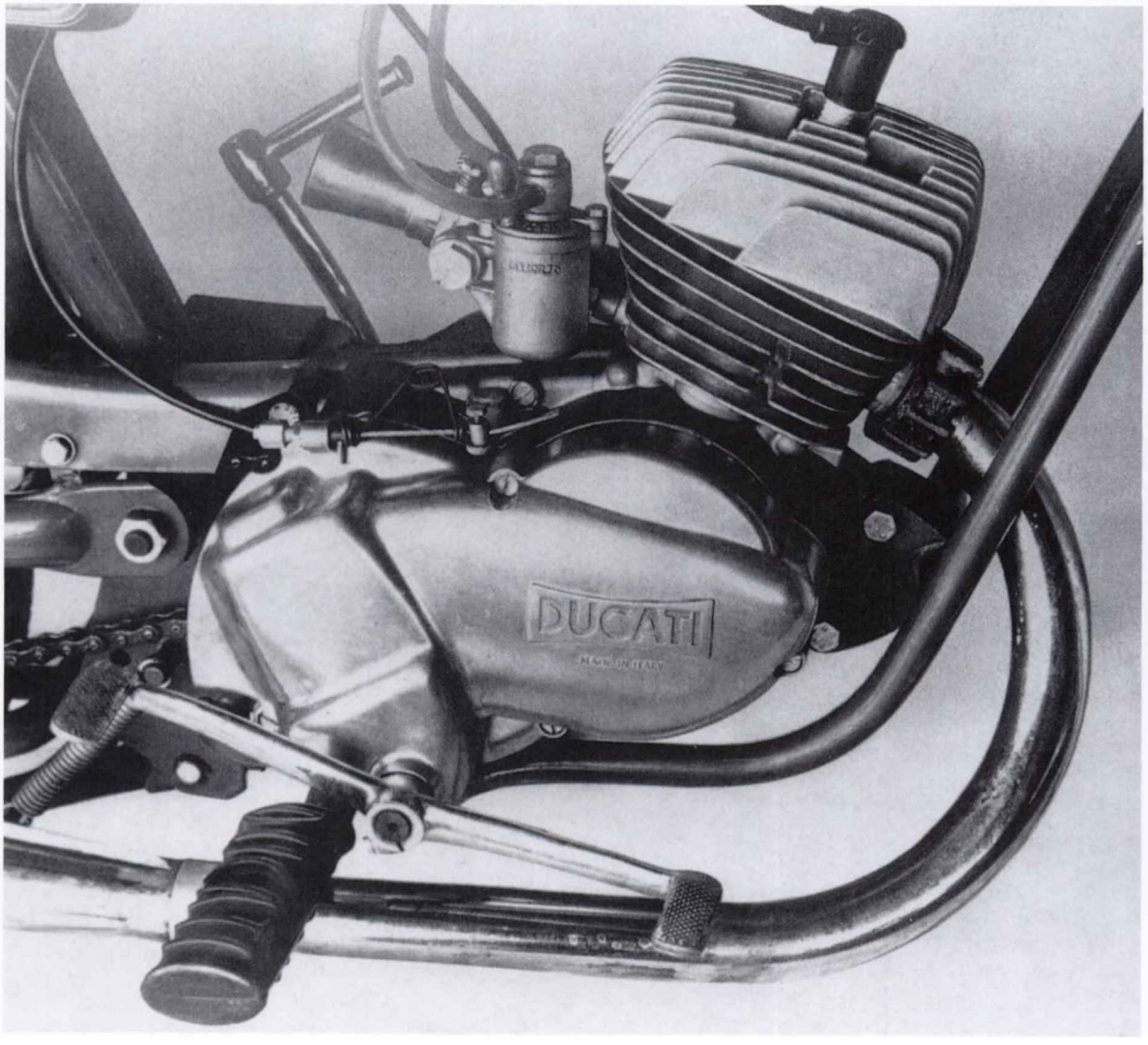
Removing and dismantling the engine

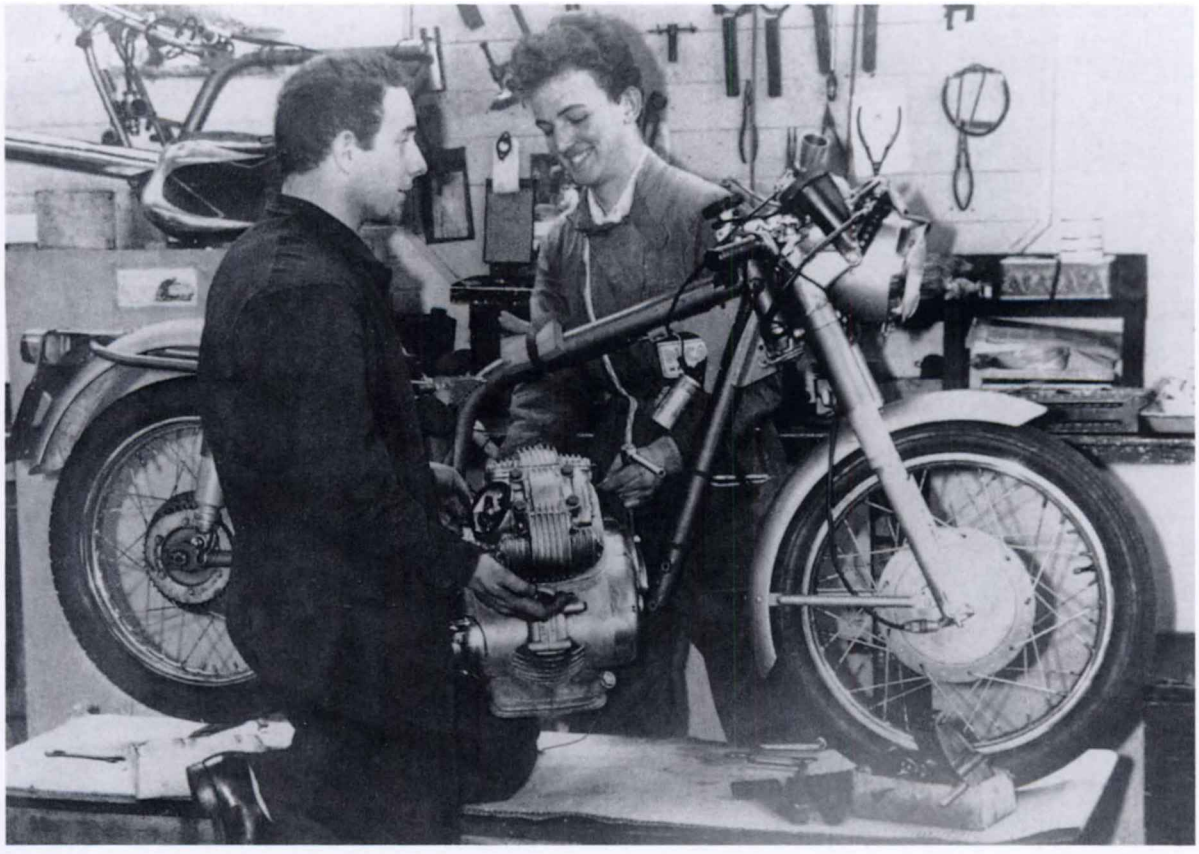
All Ducati single-cylinder engines are of the full unit-construction type and, therefore, can be removed in one piece without much trouble. As described earlier, it is a good policy to undo the main engine assembly nuts before removal. In addition, drain off any oil which is present in the engine. On the four-strokes this oil lubricates the entire engine unit; on the two-strokes, the gearbox and primary drive only. Besides being particularly careful with fragile parts and using special tools where applicable, you need to make a note of the locations of the various tab washers and woodruff keys.

Remember that patience is cheaper than damage, so proceed with caution, particularly if you have not worked on Ducatis before. At the end of the day, this extra care will be rewarded by a superior restoration.

Crankshaft

All Ducati singles, both four- and two-stroke, have a built-up crankshaft with a roller big-end incorporating a single row of caged rollers. The crankshaft will need splitting to check the big-end. In addition, it is necessary to make a careful inspection of the timing side end where it mates with a phosphor-bronze bush in the timing cover. This is vitally important because anything less than a perfect fit will cause a reduction in oil pressure at the big-end itself. Equally important is the task of removing the large centrifugal sludge





ABOVE *Before attempting to remove the engine from the frame, remember to drain the oil from the sump and disconnect the various control and electrical cables. Then seek the assistance of another person when actually lifting the unit out*

LEFT *From the 1967 model year, all Ducati two-stroke 50 and 100 cc motorcycles had a chrome-plated, alloy cylinder. The example shown is a 50 SL1*

trap screw housed in the right-hand (offside) crankshaft flywheel. In fact, this should be removed and cleaned out every time the engine is stripped and *always* following big-end failure. The reason for this is quite simple—once full, the trap will allow in the harmful particles it is designed to stop.

Other areas of the crankshaft flywheels and shafts which need checking are the woodruff key grooves and the taper for the alternator rotor. There is also a large shim between the left-hand crank flywheel and its respective main bearing. Various size shims are available, and the crank must be shimmed to spin freely (when cold), but with *nil* endfloat.

In the end of the left-hand crankshaft there is a small screw plug. This should not be removed, as it will also adversely affect the big-end oil pressure. Another good policy is to replace, as a matter of course, the main engine nuts, tab washers and woodruff keys at each end of the crankshaft.

Finally, the crankshaft assembly needs to be balanced with a V-block and dial gauge to within 0.04 mm (0.000157 in.) at each end.

Most of the above, except those notes concerning the lubrication aspect, apply equally to the various two-stroke crankshafts.

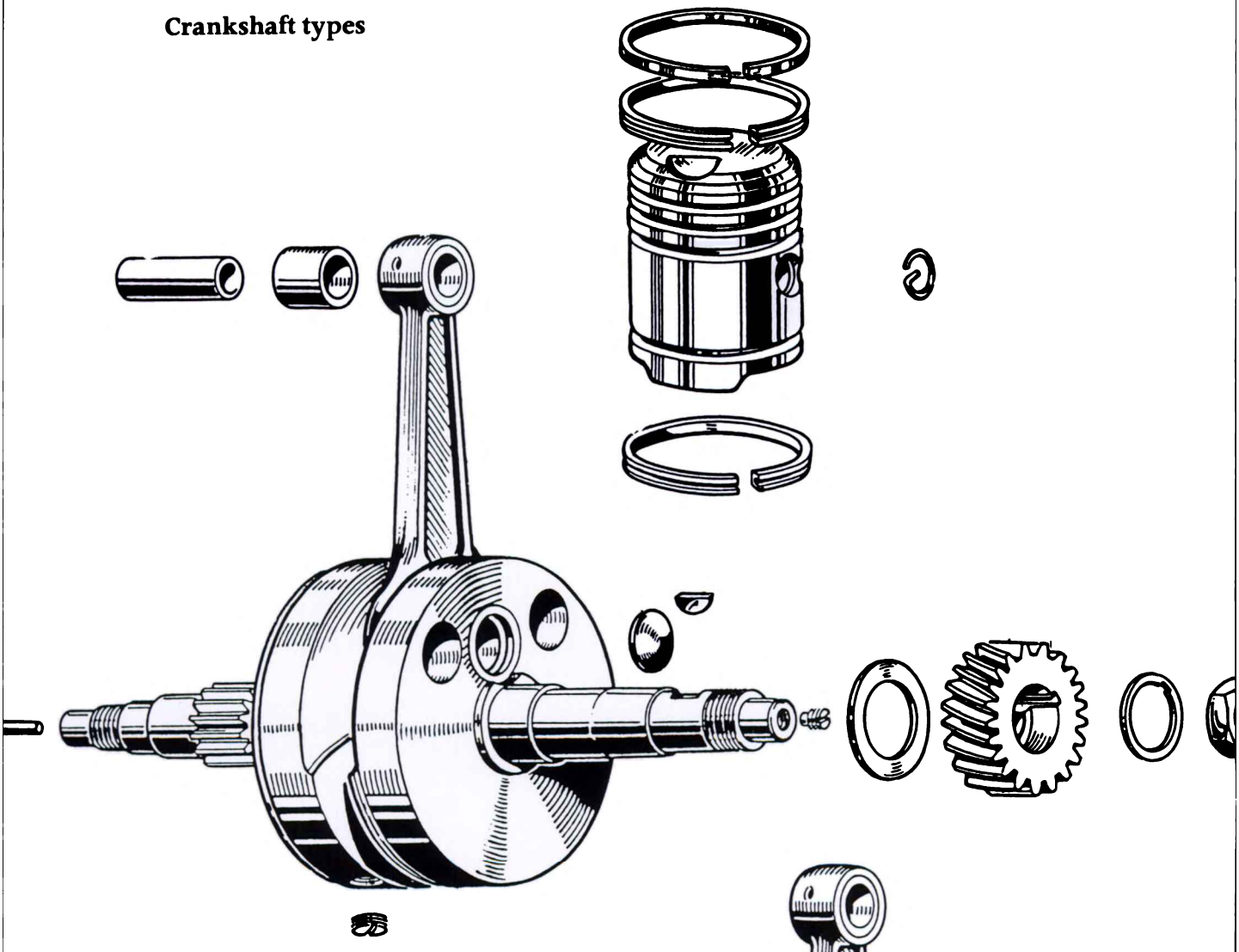
Crankshaft types

Essentially, all Ducati crankshafts are very similar. However, there are differences. On the 175 and early (A-type) 200, the crank flywheels are of equal width, whilst the late (B-type) 200 and narrowcase 250s have one long shoulder (nearside). The narrowcase 350 (the Sebring) is basically the 250 type, but instead of having full-circle flywheels, it has metal shaved off in pyramid fashion to compensate for the repositioned crankpin that gives it a longer stroke. Although of different design, the widecase model crankshafts follow this pattern, with the 239/250 being full-circle, whilst the 350 and the 450 have the pyramid type.

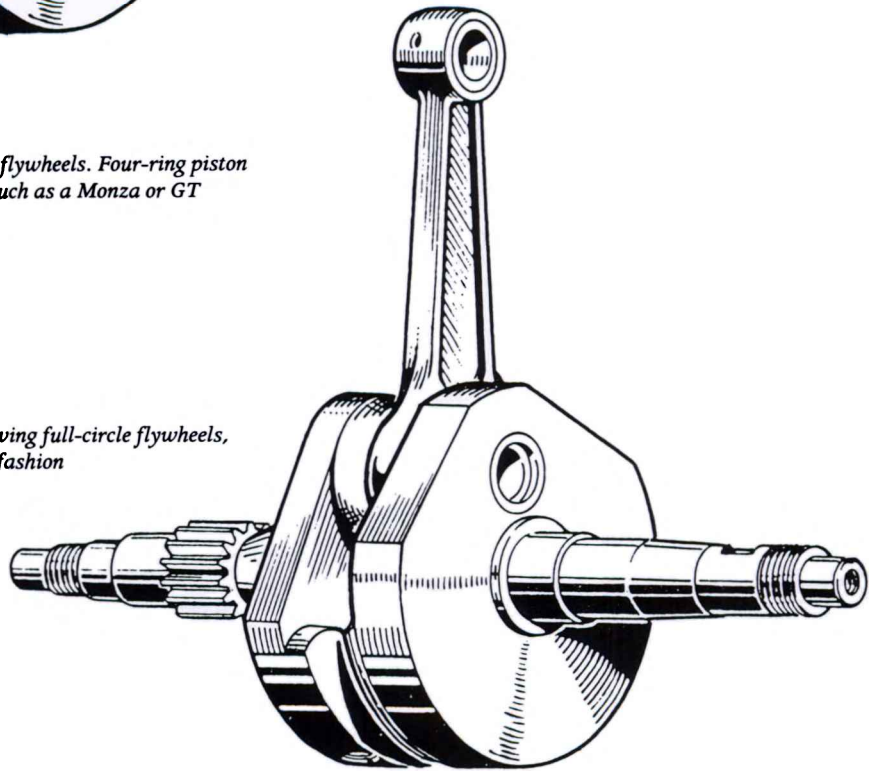
The 100, 125 and 125 ohc singles employ another type in which metal is scalloped away from the area on both sides of the crankpin.

Finally, the majority of the two-stroke models employ the full-circle type.

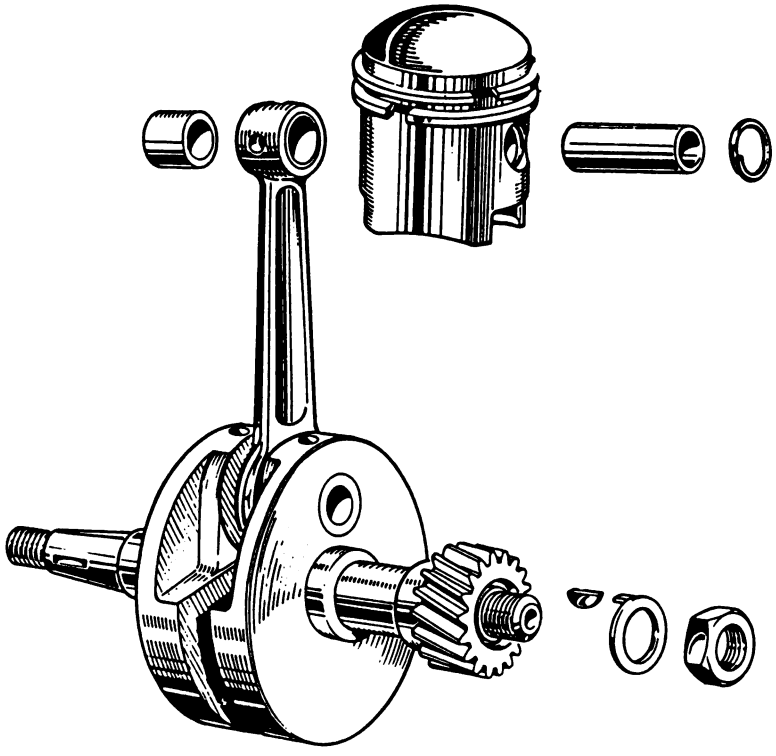
Crankshaft types



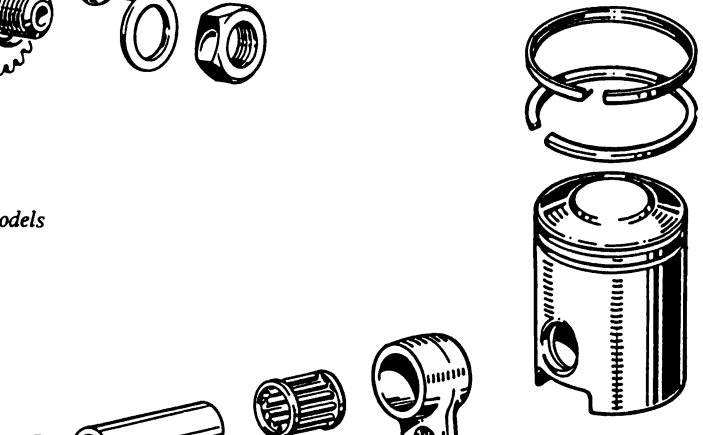
ABOVE *Narrowcase 250, full-circle flywheels. Four-ring piston denotes one of the touring models, such as a Monza or GT*

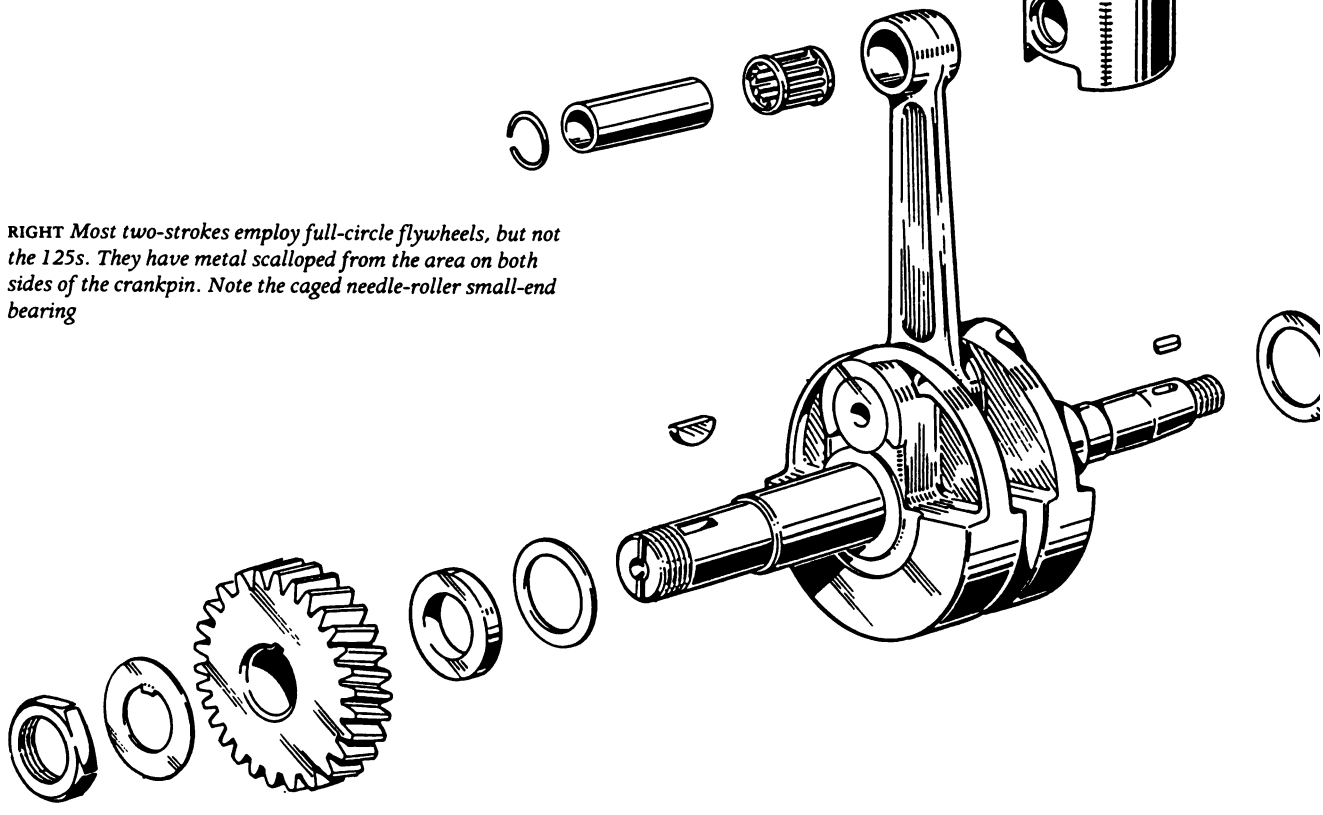


RIGHT *Widecase 350. Instead of having full-circle flywheels, it has metal shaved off in pyramid fashion*

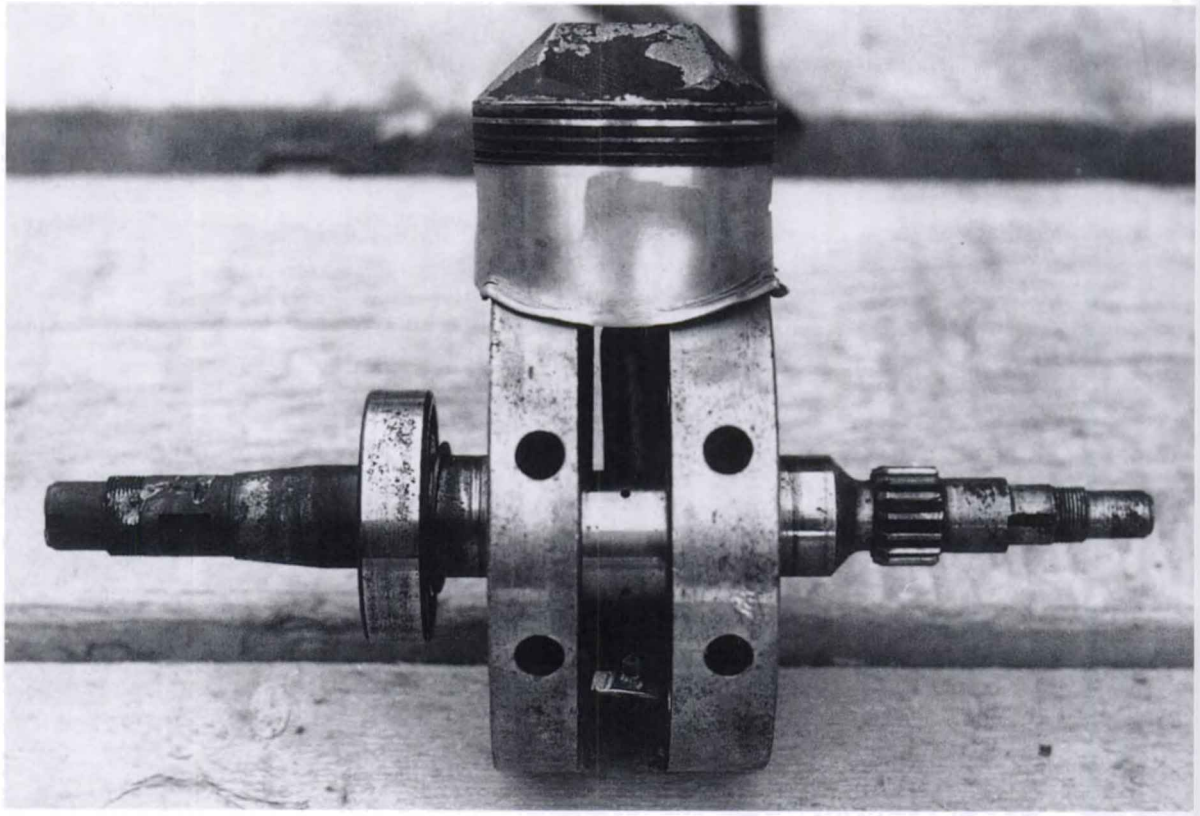


ABOVE *This type is fitted to 50 and 100 two-stroke models*





RIGHT *Most two-strokes employ full-circle flywheels, but not the 125s. They have metal scalloped from the area on both sides of the crankpin. Note the caged needle-roller small-end bearing*



ABOVE *For most single-cylinder Ducati models, the restorer has the choice of both original factory components or pattern con-rods. This is what can happen if you attempt to cut costs by using the latter for racing—you have been warned . . .*

RIGHT *Removing a gudgeon-pin circlip from a 350 Sebring piston. As standard, most of the four-stroke models came with forged pistons*

Big-ends

Often held as the weakest point of the classic bevel-driven ohc Ducati single engine, these feature caged roller assemblies and are all basically the same (including the two-strokes). All are pressed together.

The big-end bearing itself consists of a crankpin, alloy cage, needle rollers and side plates, with the one-piece con-rod and side plates (shims). The con-rod forms the outer eye of the bearing.

As described elsewhere, the *real* reason for Ducati's big-end problems centres around the lubrication distribution to this component and the need for regular oil changes and maintenance. In addition, riding habits can also play a major role in determining the life of the big-end assembly.

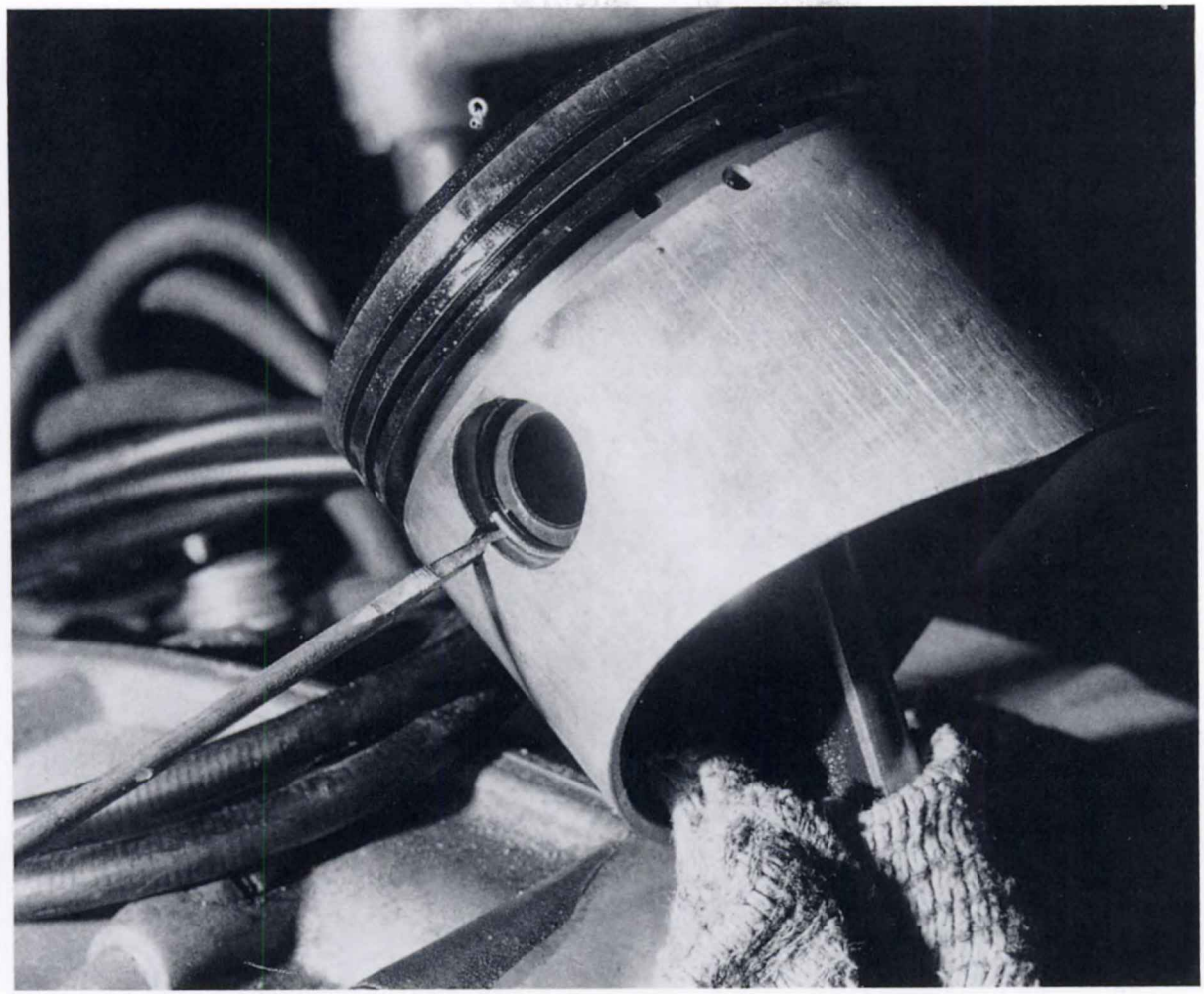
When checking the big-end for wear, do not bother testing for up and down movement of the con-rod in the time-honoured fashion, because on the Ducati single this is largely a waste of time. Instead, split the crankshaft and inspect each individual big-end bearing roller. Flaking of just *one* of these is the first sign of impending problems and can only be detected by actually inspecting as described. At the same time, also inspect and replace, if necessary, the con-rod side shim washers. These must be in a serviceable condition, otherwise excessive sideways movement of the con-rod will take place.

The crankpin itself has a pressed steel (sometimes alloy) disc at each end. It is important to check that this is a tight fit and will not come out.

Connecting rods

All the Ducati rods are steel forgings and, unlike many engines, these have to be replaced when fitting a new big-end because the inner ring of the con-rod is the outer race of the big-end bearing. However, new small-end bushes can be fitted when wear dictates and reamed to size.

For most single-cylinder Ducati models, the restorer has the choice of either original factory components or pattern con-rods. The key safety message for those intending to race a Ducati single is *do not* use a pattern con-rod assembly, only the genuine article. Fitting a pattern rod could not only damage your wealth



(blown-up engine), but even worse your health (accident).

Another thing to remember is to prevent the con-rod from knocking against the crankcase mouth as you fit it, for the resultant tiny nick will inevitably weaken it.

Small-end bush

With the sole exception of the 1975–7 six-speed enduro type two-stroke, which employs a caged needle-roller bearing, all Ducati singles use a straightforward phosphor-bronze bush small-end. If worn, this will need to be changed and may be pressed out using the new bush, provided the oil holes are lined up first. If the new bush has no pre-drilled holes, it will need drilling after fitting, but before reaming. This final operation should be carried out to give a nice sliding-fit on the gudgeon pin. Avoid hand reaming, if possible, as a guided machine reamer will do a much superior job. Check the oil holes again after reaming.

Piston

In the ohc and Desmo four-stroke Ducati singles the genuine piston is always forged—and mighty expensive. Normally, these will last a long time, the only real problem arising from high-mileage engines which have been used without an air filter.

To overcome excessive wear, it is often cheaper to fit a new cylinder liner and a set of rings, rather than carrying out a rebore and buying a new piston. Of course, this does not apply if you are opting to use a pattern piston, but these are usually cast and prone to breakage at high (racing) engine revolutions.

Oversize pistons are manufactured in 0.2, 0.4, 0.6, 0.8 and 1 mm sizes. Always fit new circlips every time the piston is removed, using the type without ears for racing.

Unless you are going to use your Ducati single in competition events, it is best to retain the standard compression ratio for your particular model. This will make life easier for what is becoming, in some cases (going as far back as the late 1950s), an old engine.

Two-stroke pistons are normally cast. It is always

a good policy, as a matter of course, to renew the piston rings on the 'strokers', as these lead a harder life than their four-stroke equivalents. They usually have two-rings (both compression). The sporting four-strokes, however, have three (two compression and one oil scraper), while the touring four-strokes have four (two compression and two oil scraper—one of the latter being at the base of the skirt, below the gudgeon pin).

The gudgeon pin should be examined for ridges and changed if not in really first class order.

All the four-stroke Ducati singles featured in this book employ an alloy cylinder with an austenitic liner. Two-strokes use both cast-iron and alloy (with hard-chrome bore) cylinder barrels.

If all else has failed in establishing exactly what model of machine you have, you will at least find some good pointers from both the bore size and whether the engine is valve-spring, desmo or two-stroke (push- and pullrod models are not covered here).

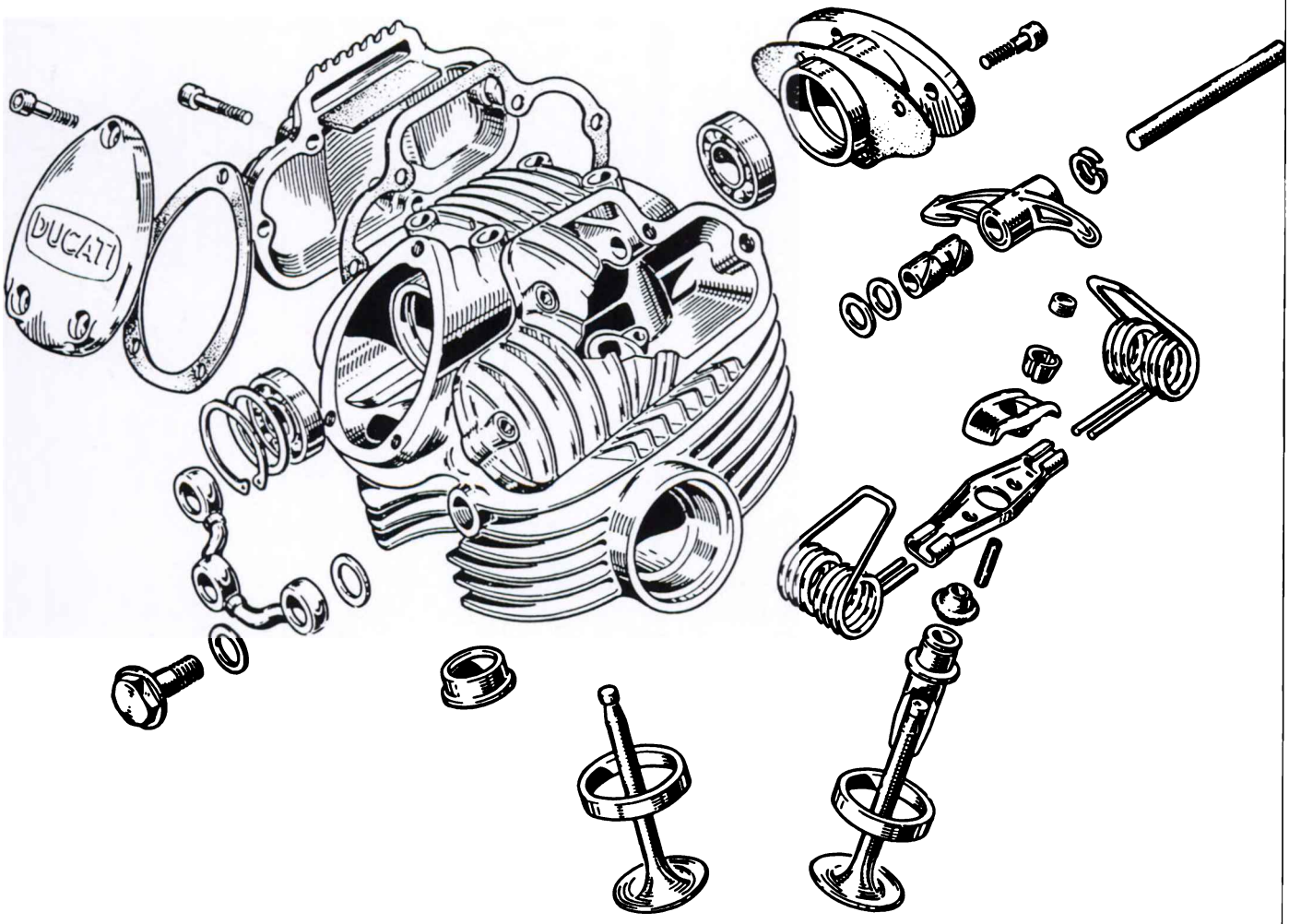
With the four-stroke valve-spring and Desmo models do not automatically assume that you must rebore a worn barrel and fit a new piston assembly—it will often be cheaper to fit a new liner and piston rings. With the cast-iron two-strokes, it will be necessary to rebore and fit a new piston. Alternatively, if yours is one of the chrome-bore alloy cylinders, either replace the entire cylinder and piston, or, and much cheaper, have the cylinder replated by a specialist and fit a new piston.

Owners of the 239 cc widecase ohc and Desmo models will find that it is possible to bore out the original 72.5 mm liner to accept the larger 248 cc 74 mm piston if required. This is of particular interest to those intending to go racing with their 239.

Never put any strain on the cylinder finning of either the alloy or cast-iron types—both will break readily. If you are sending one away to be reconditioned *always* make sure that it is packed in such a way as to survive the roughest handling.

All Ducati two-strokes are of the piston-port type, with the carburettor feeding into the cylinder and the gases expelled at the front via the exhaust pipe in the conventional manner.

Finally, ensure that the oilways in the four-stroke cylinder barrel are entirely clear.



Cylinder head

All Ducati cylinder heads are manufactured in light alloy, the four-stroke ones being almost works of art; the two-stroke components are much simpler castings with only spark plug and retaining holes.

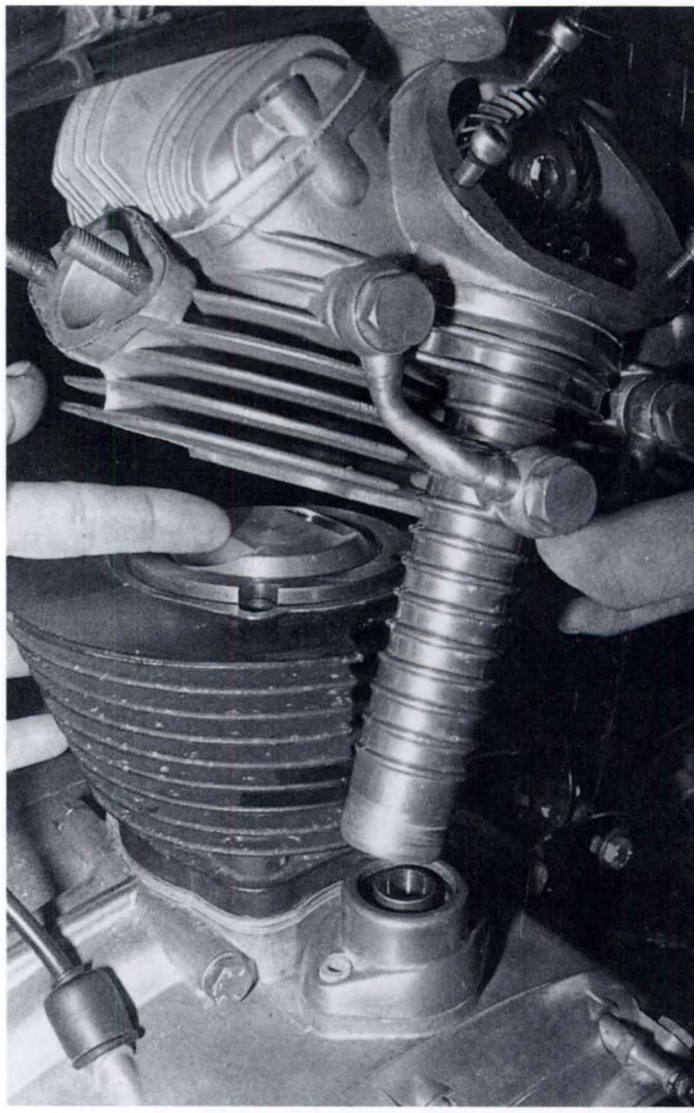
On the ohc singles there are two distinct types of valve operation—conventional single overhead cam, or desmo. The latter is only found on the later wide-case engine types. When the Desmo models were introduced in 1968, it was stated that a Desmo head could not be fitted on a valve-spring engine—this is utter nonsense. From the cylinder barrel downwards, the two types are identical. All the production Desmos use valve springs (identical to those fitted to the 125 Sport and 160 Monza Junior models), so the only real difference lies in the Desmo head having *four* rockers (two closing and two opening), each valve having two adjusting shims and four camshaft lobes. The valve diameters are the same as their respective valve-spring brothers. Performance is also similar, but there is no valve bounce if over-revved.

The term 'desmodromic' was coined from two Greek words, meaning controlled run. The idea, originally used in the Ducati works racers of the late 1950s, was to eliminate one of the chief bugbears of valve operation at high rpm—the phenomenon of valve float, or 'bounce'. This happens in a conventional engine when the valve springs are unable to respond fast enough to close the valves back on their seats to match the speed of the engine.

Although other manufacturers (notably Mercedes Benz) had known about and even used the system in racing, Ducati were the first manufacturers in the world to use the system in a series production engine. The Bologna company currently feature this arrangement in all their V-twin range.

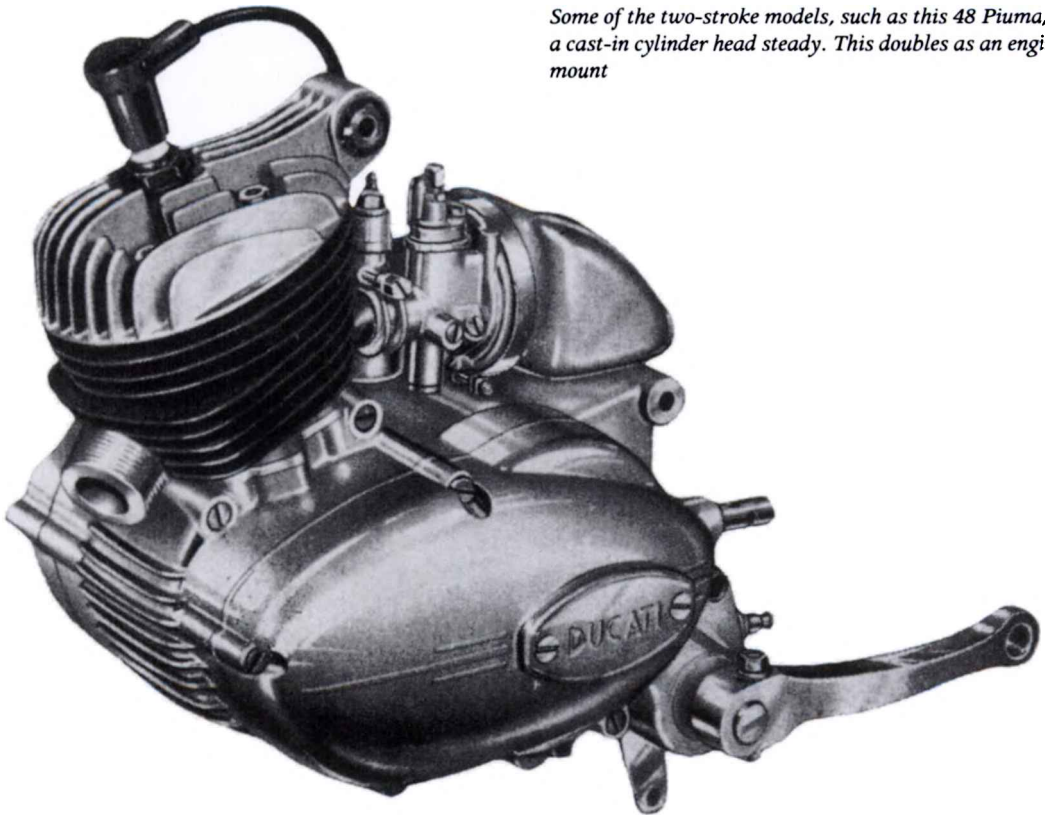
For production purposes, it has proved a sales tool, rather than providing additional performance. Most owners are rather overawed by the word 'Desmo'—certainly as far as maintenance is concerned. In reality, once set up, it does not need constant adjustment and an *experienced* mechanic will find it only slightly more difficult to work on than the normal valve-spring motor. As proof of this, study the relevant pages from the parts book to see what I mean. Another bonus, largely ignored, is that instead of around 80 psi valve spring pressure on the valve seat, the Desmo engine has only 8 psi, and that is with the valve springs mentioned above. This means that there is virtually no valve seat wear.

Essentially, the desmo heads fitted to the bevel-driven ohc singles were based on the conventional valve-spring type, but with four rocker pin locations instead of two. These stemmed from the 175 model exhibited at the Milan Show in November 1956, which had entered production early the following year. This head has a distinctive triangular-shaped bevel-drive inspection cover on the offside, below which is a pair of threaded oilway holes (the third is tapped into the finned alloy bevel shaft tube which runs up the offside of the engine). On the other side of the cylinder, above the spark plug hole, is the cam support bearing cover (usually inscribed with the capacity of the engine, or, in the case of the Desmo, the word 'Desmo'. To remove this cover, which is held in place by four allen screws, a long thin rod is inserted through the camshaft and tapped out from the other side. On no account attempt to prise the cover off the nearside.



ABOVE *Lifting cylinder head on bevel-driven ohc single*

LEFT *Component parts of a 250 Mach 1 cylinder head. Note shim-set rocker and hairpin valve springs*



Some of the two-stroke models, such as this 48 Piuma, feature a cast-in cylinder head steady. This doubles as an engine mount

Some valve seats are in bronze, some in steel, but in each case carefully inspect the cylinder head casting for any sign of cracks appearing between the valve seat and the exhaust port or spark plug hole.

With the 200 Elite or SS, it is important to realize that there are two distinct engine types: 'A' and 'B'. The 200 Elite engine started life as simply an overbored 175, but from the 1961 model year, it became an undersized 250. Restorers can easily identify which 200 they have, as these were clearly marked by the factory, being stamped 'A' (for 175-type) or 'B' (250) on the bottom fin of the cylinder head (and also on the top fin of the cylinder barrel). Another identification is that the 175-type casting has fins running front to rear across the top of the head between the four head bolt location holes, the 250 casting being bald in this area.

Do not attempt to use any gasket sealant on the barrel/head joint. Also there is no conventional gasket, only a single neoprene rubber O-ring (which must be replaced each time the head is lifted if oil leaks in this area are to be avoided).

Before leaving the cylinder head, I should mention that it is vital that the cooling ring, which secures the exhaust pipe, be wire-locked in place on reassembly. Otherwise, the ring can come loose and 'chatter' in the head, ruining the thread. Also, make sure you inspect both the thread in the exhaust port and also the much smaller spark plug hole for any signs of damage. The same applies to all the other threads in the cylinder head area, notably those for the oil drain tube bolts, which are easily damaged.

Gaskets and seals

The first point to be clearly made in this respect is that *no* Ducati single should leak oil—but there are three potential problem areas. The first is the sealed bearing behind the gearbox sprocket. On early bevel-driven ohc engines (narrowcase), this features a single-shield (Z) type bearing, which was replaced on the later (widecase) engines by a double-sided shield (ZZ).

Then there is the oil seal at the rear of the points backplate assembly located in the timing cover and, lastly, the rubber pushrod seal just forward of the gearbox sprocket shaft. When replacing the pushrod seal, it is also advisable to replace the flat metal washer which protects it.

The only other reasons why oil leaks may occur will be if gaskets or O-rings are re-used or left out, or where a mating surface has been damaged by misuse. *Never* attempt to save money be re-using gaskets or seals—particularly the small O-ring at the cylinder head/barrel joint (no Ducati single, with the exception of the mid 1970s 125 six-speed two-strokes, has a conventional head gasket); valve stem oil seals; the large O-ring at the base of the bevel shaft tube; any of the

oil drain or refill plugs, or the cylinder head oil feed pipe.

Generally speaking, there is a considerable degree of interchangeability between the various bevel-driven ohc singles. Remember, however, that besides the narrow and widecase engines, there are also three other clearly defined groupings: 100/125/160, 175/200/239/250/350 and 450.

A similar situation exists with the two-strokes where the 50 and 100 engines manufactured during the 1960s form one family, whilst the mid 1970s 125s are totally different in virtually every facet of design—including the gaskets and seals used.

Whatever Ducati single you are restoring, do *not* use any form of silicone jointing compound. Instead, simply use the purpose-made gasket and, in the case of large gaskets such as the primary clutch cover or centre crankcase assembly, apply grease sparingly to their mating faces. This is for two reasons: the fear of blocked oilways and the fact that, in my experience, the surface joints in Ducati engines do not require any help in achieving an oil-tight seal (provided, of course, that they are in good condition and new gaskets are being used).

Particular attention is needed when fitting the exhaust gasket, which is usually a copper/asbestos affair. Before fitting, check that the old one has not been compressed into the recess for the exhaust pipe in the cylinder head. Otherwise, it is quite possible that you will not get a correct seal, and the result will be a backfire on the overrun as the throttle is closed. (This can also happen if either an old gasket is re-used or the gasket is omitted entirely.

On most models, there is also a large neoprene rubber spacer between the cylinder head and carburettor inlet stub. This may not require replacing, but carefully check that it has not been distorted in any way, or is perished—either will allow air into the inlet port and, therefore, will affect the carburation.

The narrowcase 250 Monza and 350 Sebring employ a 1 mm thick alloy baseplate at the foot of the cylinder. To obtain an efficient seal, a pair of conventional paper base gaskets (one each side) are fitted.

All the ohc and Desmo singles employ rubber pads to deflect oil on to the tappets and rocker faces. These come in two sizes: 30 × 14 × 4 mm (100/125/160) and 50 × 17 × 4 mm (all others). On some models, the centre section is cut in a V-profile to allow clearance for screw-and-lock-nut tappet adjusters.

On the Desmo models, the rocker shafts are each fitted with an O-ring and rubber plug, unlike the conventional valve-spring models.

Finally, it is not advisable to attempt to manufacture your own gaskets, since a variety of materials and thicknesses are used throughout the engine unit.

Valves

Ducati used two basic valve material types for their ohc valve-spring and Desmo models. The first was the standard 'cooking' type used on what the company saw as the touring versions, and the other employed on the sports and racing machinery.

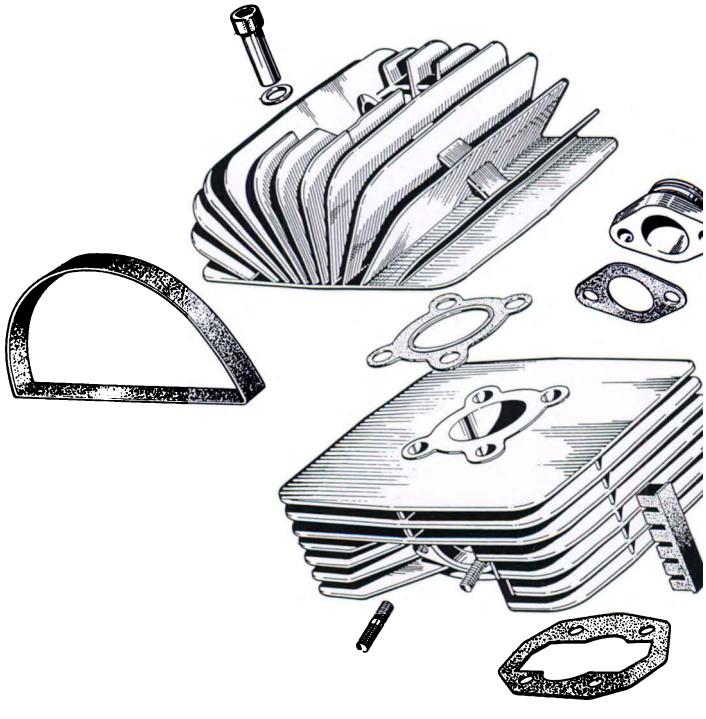
The first type can be identified by its bare metal finish, which is polished. The second is coated in a matt black/grey finish. In both cases, it is best to replace the valves, unless they are in very good condition.

Ducati also employed the same material for both exhaust and inlet—thus, the change in material was across the board. In other words, each model will have the same material for both its valves. (No Ducati single has more than two valves.)

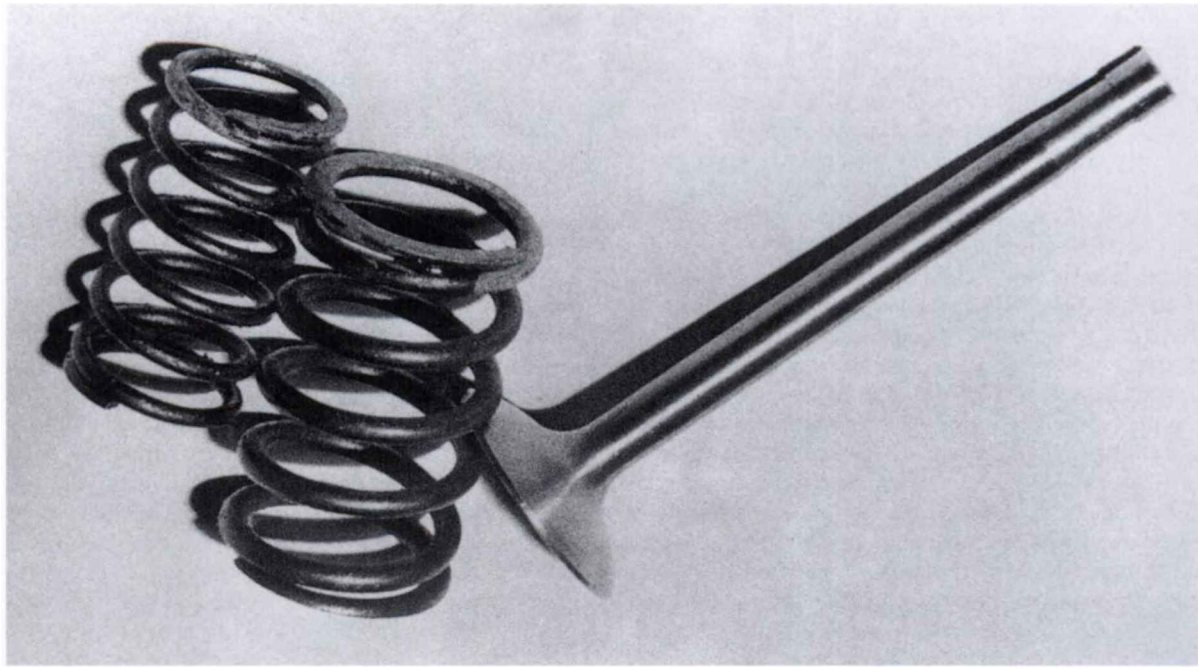
The models which use the high-performance, racing-quality valves are the 250 Mach 1, 250 Diana Mark 3 (narrowcase) and the various capacities of the widecase Mark 3 and Desmo models. In addition, some of the street scramblers use these, notably the ones from 1972 onwards.

As explained later under *Valve detail parts*, there are various types of valve adjustment (screws/lock-nut and shim).

When refitting the existing valves, or new replacements, it is necessary to grind them in to ensure a gas-



Radial-fin head of 125 Regolarita and Six Days models. Note rubber block to reduce 'fin-ring' noise



The exhaust valve, together with inner and outer coil springs, of a 1974 239 Mark 3. This model is the only Ducati single to have been fitted with coil valve springs by the factory

tight seal. This can be determined by pouring paraffin or similar down the port and watching for any leakage within the head combustion chamber area around the relevant seat. Make sure that you carry out the grinding carefully, removing no more of the seat than is absolutely necessary. Again, patience will pay dividends.

Except for the 175/200 narrowcase, 250 Diana (Daytona) and some street scramblers, all Ducati models only had one valve type during their production run. However, many models originally fitted with the standard steel valves will have been modified to accept the high-performance racing-type components. This will not only be confined to race-kitted bikes, but also those models modified for high-performance road use by their owners. In addition to their superior material, the racing-type valves have a larger diameter (36 mm exhaust, 40 mm inlet). All Desmo models had the performance valves as standard.

Valve guides

As all Ducati cylinder heads are of alloy, it should be necessary to remove or replace the valve guides with the head hot, but in fact they can be safely taken out cold. On all the conventional ohc valve-spring models, both valve guides are of identical design, it is only on the Desmo that the exhaust and inlet are different. In addition, all the models with which we are concerned here have guides made from a phosphor-bronze material. When replacing the guides, coat the stems with grease to make the task easier.

Except for the very early models, all Ducatis have a valve guide seal. This must be replaced, as it tends to harden with age, which will prevent it from being effective.

Unless you are automatically going to replace both guides, it will be necessary to check the existing ones for wear (and also the valve stems). Ducati now market guides which need reaming to match the valve stem—this innovation is intended to give owners the option of not having to buy both new valves and guides.

For racing (or road use, of course) it is not recommended that the guide area is cut back on the inlet side to increase gas flow. The gain in performance will be minimal and the modification will increase the likelihood of sideways movement of the valve stem. This, in turn, will lead to vastly increased wear and may also cause the valve seat to be less efficient.

Valve springs

All the four-stroke singles dealt with in *Ducati Singles Restoration* use the hairpin type valve springs (including the Desmos) except for the 239 Mark 3. This has coil springs, as fitted to the early V-twin models (750s and 860 GT/GTS).

Machines using hairpins should have their bottom spring holders checked for fatigue cracks. Another important point is that when fitting new hairpin springs, always make sure that the fresh ones are still

an easy fit. This is vital, as quite often batches of spring wire are not of an identical diameter. If the new spring is too tight a fit, it can cause valve spring breakage.

For some models, for example the 250s, 350 and 450s, it is possible to obtain both touring and racing hairpin springs. These are of different thicknesses and you should never attempt to fit the racing type in the touring holders, as this will cause the same problems described above, the new spring being too tight a fit. In the past, several riders with race-kitted Ducati singles have suffered valve spring breakages which can be traced to this practice.

Whilst on the subject of racing, use only the 3.8 mm hairpins for competition; the smaller-diameter ones are not suitable. It will be necessary to replace the hairpin springs after four or five short-circuit meetings, or one long race, such as the Manx Grand Prix, if using maximum safe rpm constantly, otherwise valve bounce will occur. Some non-factory coil valve spring conversions will cure this problem, but at the cost of greatly increased cam and rocker lobe wear.

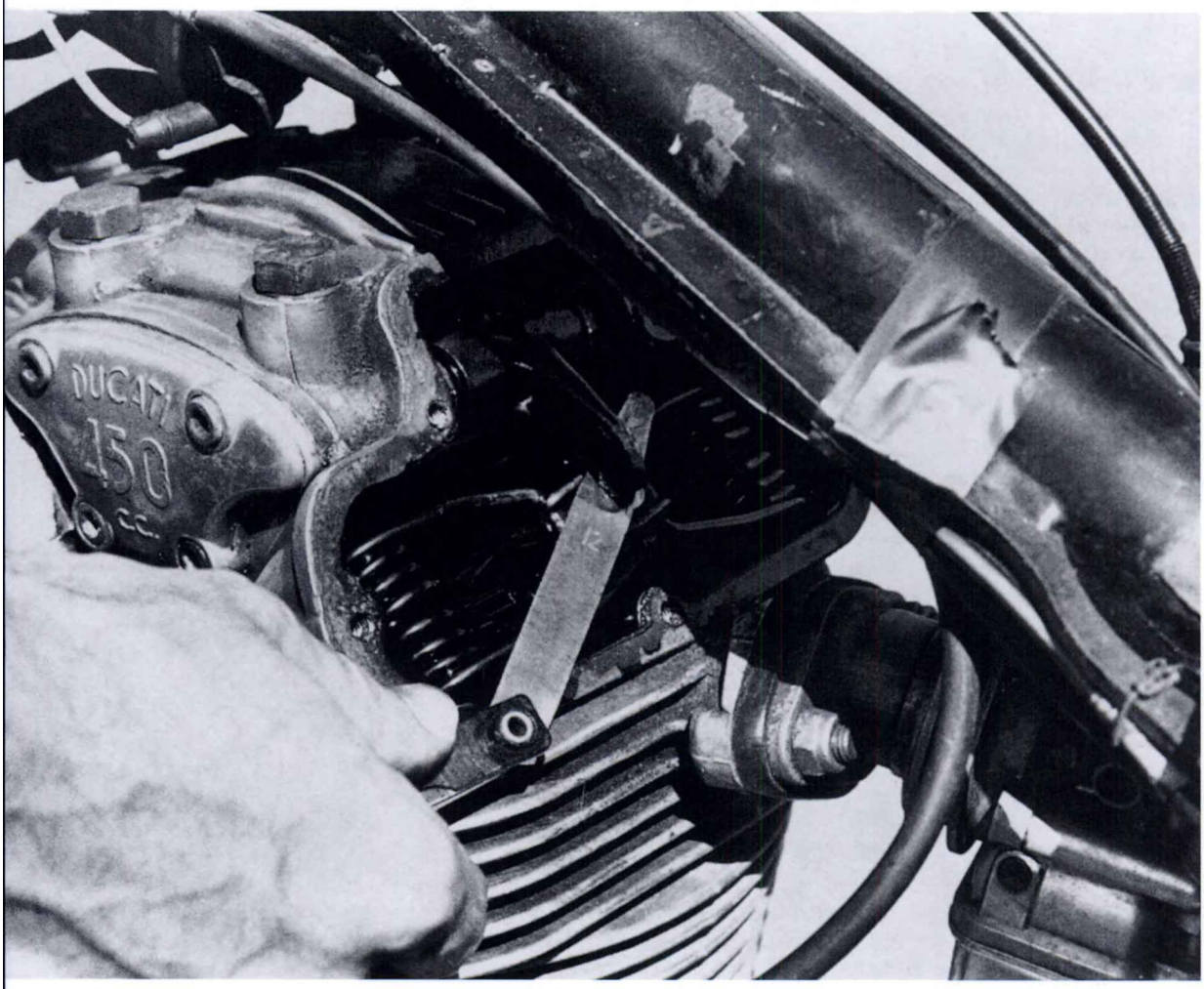
Finally, I would recommend fitting a new set of valve springs, as a matter of course, during a major rebuild such as a complete restoration.

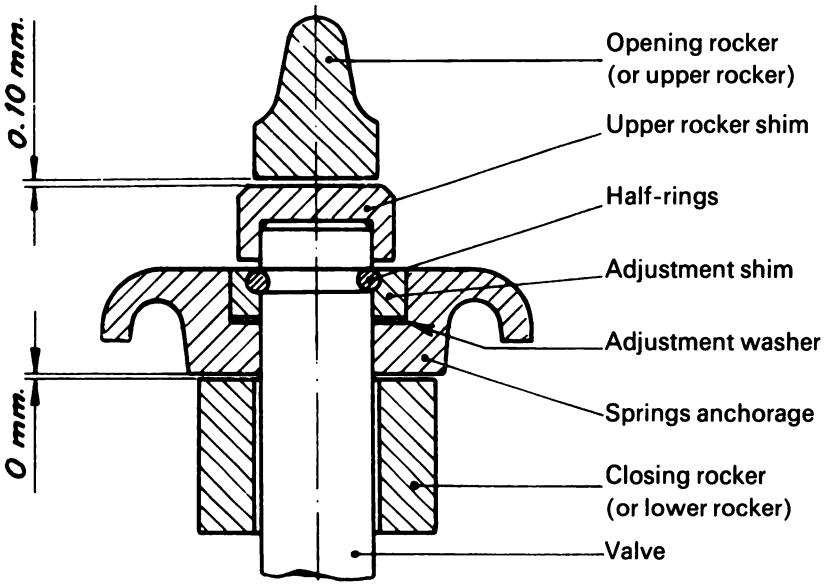
Valve detail parts

These items comprise the following: bottom valve spring anchorage plate (spring holder), anchorage plate drift (retainer), valve collets, valve collet holder, and the valve guide seal. On the Desmo models there are several additional pieces: valve adjusting caps and shims (these replace the screw-and-lock-nut tappets on a conventional engine), half rings (which replace the valve collets), and an O-ring (in place of the valve stem seal).

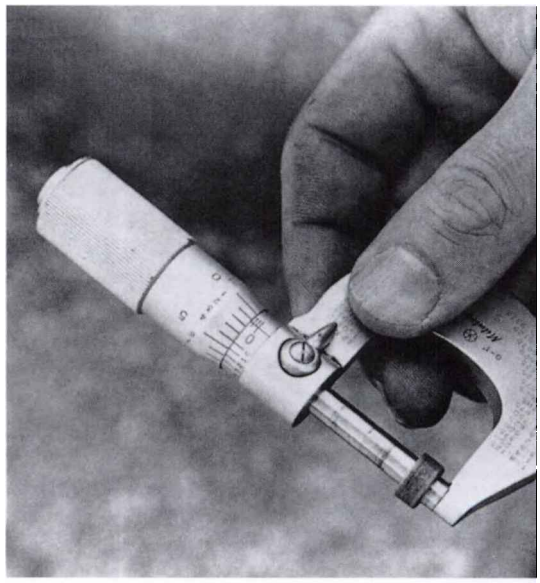
When stripping the cylinder head, make sure that you keep the components from each valve separate. The collets themselves should be carefully checked for their fit to the valve stems. This is particularly

Checking shim-set valve adjustments on a 450 Mark 3. Note the braced top frame tube, only found on 450 models





Technical drawing of shim-set valve system on Desmo models



Using a micrometer to measure the shim-set valve cap. These are available in a variety of thicknesses

important on the 175, early 200 and 160 Monza Junior models, as all have collets which have a very shallow recess on the valve stem. Also, for racing, it is probably best simply to replace the components. Either way, the last thing you want is to risk a dropped valve after your restoration has been completed.

Tappets

These can be found on all the bevel-driven ohc models, except the sports models (Mach 1 and all Mark 3s), the pure racing models (Gran Sport, Formula 3 and Grand Prix) and the Desmo models, all of which use shims.

The usual type of tappet fitted as standard by Ducati employs a ball with a flat on its surface. This ball is retained in the tappet adjuster itself. Unfortunately, this can become a problem, and it is not uncommon for the outside section of the adjuster to split and break up. This of course, will release the ball. Ducati also fitted a solid tappet to some engines for the adjuster-type rocker. I would recommend that you automatically replace both original ball adjusters with this solid version—for both racing and street use.

Some of the very early tappet adjusters—as fitted to the 100 and 125 models—had a smaller-diameter thread size for the adjuster and matching lock-nut.

For those models that use shims for setting the valve adjustment, a wide range of adjusting shims is available. The bottom ones on the Desmo models are simply flat shim washers; the top ones on the Desmos and those fitted to the more highly-tuned valve-spring models, such as the Mach 1 and Mark 3, are of the bucket type. The practice of cutting up feeler gauges to take up the adjustment, or grinding down the cap, should be avoided—it will work, but is not to be recommended.

Rockers

As stated earlier, there are two distinct rocker types in Ducati single-cylinder engines: those with conventional screw and lock-nut adjustment, and those with shim-type adjustment. All the Desmos, use the shim-set variety.

After removing the rocker shafts, it is simply a case of removing the respective rocker and its side adjustment spring washer (these should be removed for racing) and shims. Both rocker types have phosphor-bronze bushes which are a press fit. Quite often these become a floating fit after use, but this is alright *provided* there is no actual up-and-down movement between the bush and the rocker. In fact, it is usually a case of the rocker shafts themselves which need replacement rather than the bushes. Check very carefully for any sign of ridge marks, indicating wear on the shafts.

The most important areas of the rockers are the hard-chromed surfaces (pads). These should be inspected for any signs of wear or pitting. Any wear in the rocker pad curve will necessitate the item being replaced or repaired by a specialist. This also applies to pitting of the chrome surface. As Ducati rockers are *expensive*, it is usually preferable to have the sur-

face area which comes into contact with the camshaft replated. For racing, however, this is not always to be recommended, as any deep wear will have weakened the rocker. Just how much is dependent upon the actual wear, but it could lead to failure (breakage). In any case, if you are going to race your single, it is a good idea to have the rockers (together with other vulnerable components, such as connecting rods and pistons) crack tested.

A rocker pin extractor can easily be fabricated (using a suitable bolt, piece of tube and a washer) to save you the cost of buying the (expensive!) factory tool. Also, do not forget to replace the shaft with the threaded end showing.

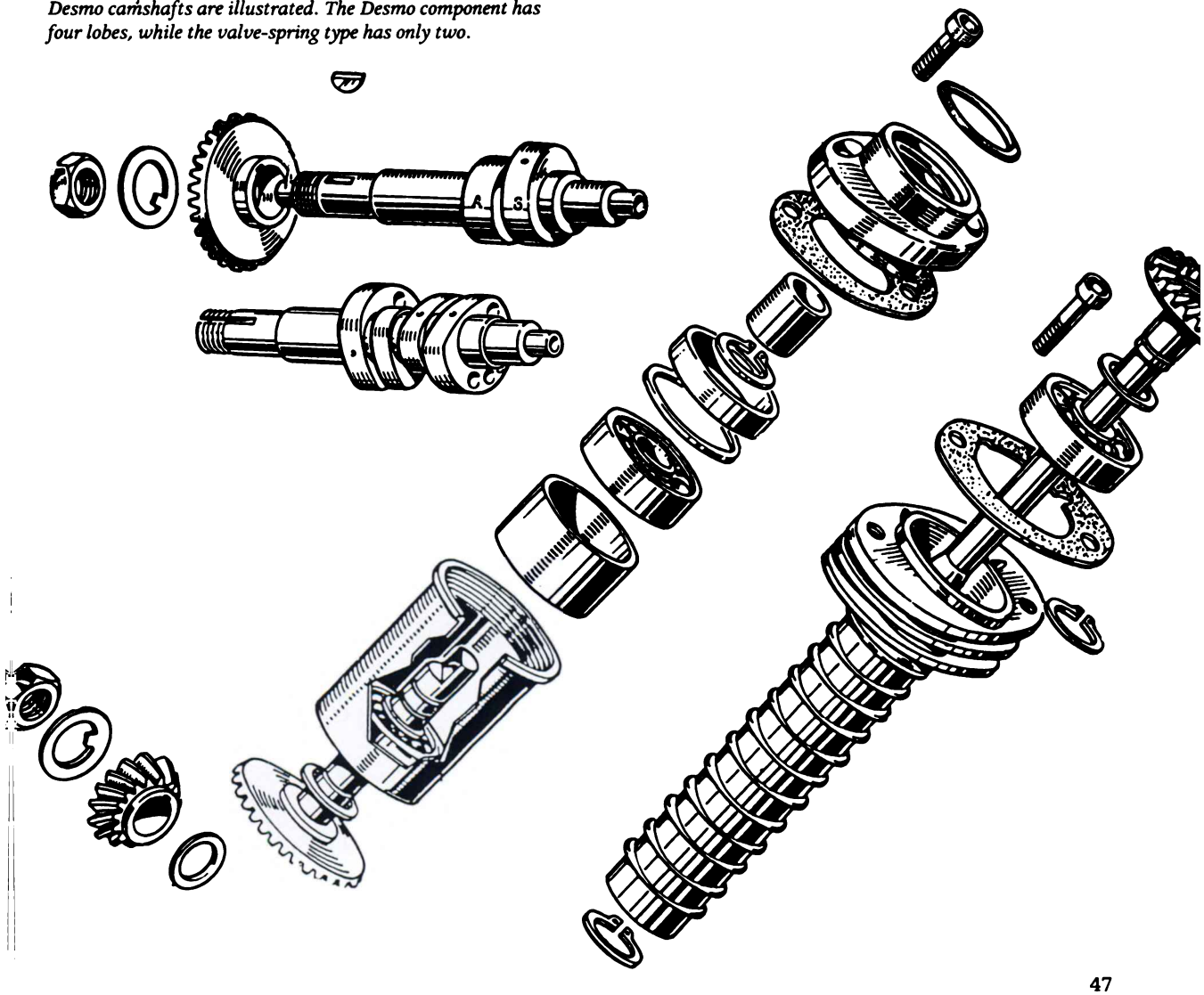
Camshaft

Several types of camshaft have been fitted to the various Ducati singles, in terms of both profile and length. In the latter, the camshafts can be broken down into three: 100/125/160, 175 and early 200 ('A' type), and the remainder (including the Desmos). Up to the 1960 model year, there are essentially three profile types: touring, sports and racing (Formula 3). With the introduction of the first 250 and the 'B'-type 200 for the 1961 season, Ducati employed a colour-code system (on the offside end of the cam). This is not entirely satisfactory, because once the paint has been removed, only an expert will be able to identify which camshaft you have! If you are fortunate enough to have some of the original paint remaining, refer to Appendix 5.

Having established exactly which camshaft is fitted to your particular engine (hopefully!), you can go on to check it for wear on the cam faces, in particular the lobes, and also the bearing surfaces. Check keyways and threads for damage and fitment with their mating parts.

If you intend to fit a camshaft giving higher lift, do not neglect other areas of the engine's breathing

Bevel gear and camshaft details. Both valve-spring and Desmo camshafts are illustrated. The Desmo component has four lobes, while the valve-spring type has only two.



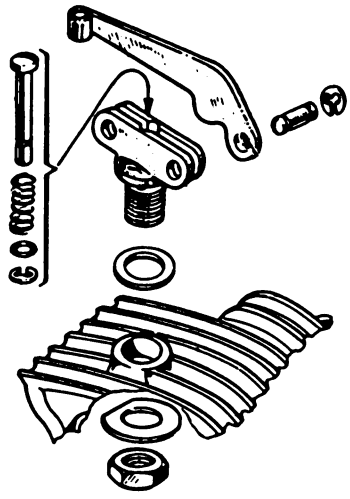
system, such as stronger valve springs, larger valves, and increased port and carburettor sizes—simply fitting a more sporting cam will not automatically bring an increase in performance. In addition, if needed, do not forget to reset the timing when the engine is finally reassembled.

Valve lifter

This is only to be found on 350 and 450 non-Desmo engines. It is needed to overcome the extra compression found with these particular power units. Although the construction is very simple, it still needs checking to make sure it is fully serviceable. The mechanism itself is housed in the centre of the front valve adjustment cover and is operated by a lever and cable. There is also a cable support which is mounted to the cylinder head casting by the front nearside cylinder head through-bolt.

Oil feed pipe

This really comes within the lubrication chapter, but it is worth repeating that the hollow bolts which support this item should not be given any more than light pressure, otherwise it is easy to strip either of the two cylinder head threads (or the single one in the alloy bevel-drive shaft tube). Also, there is a pair of soft alloy washers (gaskets) per bolt which should be replaced each time this section is disturbed. The pipe itself should be checked for any sign of cracking.



Working parts of valve lifter mechanism. This is only to be found on 350 and 450 non-Desmo models

Bevel gears

There are four ways of driving overhead camshafts from the crankshaft: by gears, a chain, an internally-toothed belt or a shaft. All the ohc Ducati singles use the last method, which features straight-cut gears on the original Gran Sport 98 cc production racer and the subsequent limited-production Formula 3 tarmac racers. For the mainstream series-production models, however, helical gears were chosen, mainly, it must be said, in the interest of quiet operation rather than outright efficiency.

Each engine has a set of top and bottom bevel gears with an Oldham coupling and sleeve connecting the shaft two thirds of the way down. There is a circlip at the base of the top bevel shaft to stop the Oldham coupling sleeve riding up. It is vitally important that this be renewed. Failure to do so will invariably mean that the sleeve *will* ride up, the usual result being a broken alloy bevel tube.

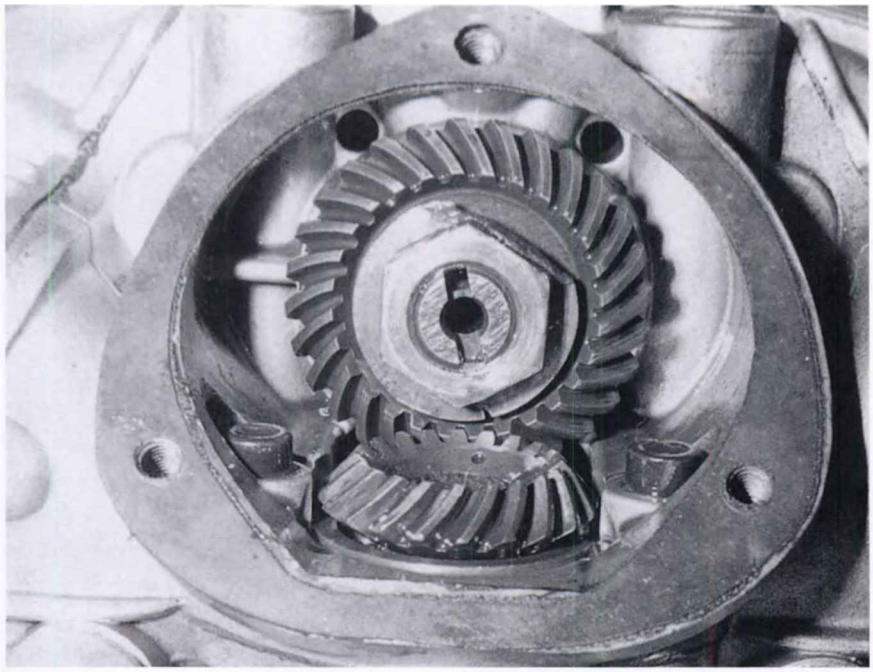
There is a series of special bearings in the bevel shaft train, one at the top and two at the bottom, together with a selection of shims. Again, make sure that the latter are carefully catalogued when removed. There is an O-ring in the bottom bevel drive housing holder. Obviously, this and the respective gaskets must be replaced as a matter of course.

The bevel shaft bearing holders, at both top and bottom, are made from steel. These should be secured with Loctite. The top one is particularly important. If allowed to come loose, its mounting location in the cylinder head can become elongated. The only cure for this is to fit an oversize bush (more correctly described as a collar). The factory only offer these in standard and 0.05 mm oversize, any larger and it will have to be made specially. Either way, the head will need to be machined for the new collar.

Timing gears

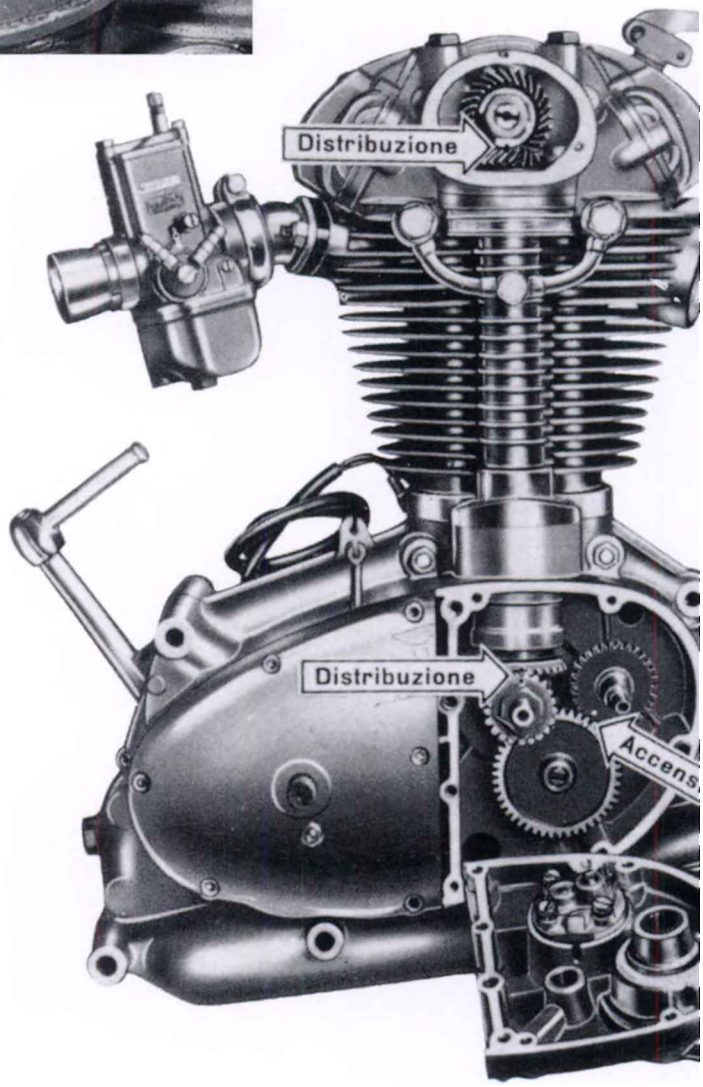
These were common throughout the overhead-cam singles, but it is worth noting that on Spanish-made engines (which include the very last of the widecase Mark 3 350s of the mid 1970s), the main timing gear, which also drives the oil pump and is itself driven from the crankshaft, is manufactured in fibre rather than steel, as in the Italian-made engines. The fibre gear is liable to shatter and should be replaced, as a matter of course, during the rebuild.

The steel gear can be re-used and should be inspected for wear or damage to its teeth, as should the matching teeth on the crankshaft. Whilst problems with the teeth of the timing gear can be rectified with a new gear, damaged teeth on the crank are more difficult and potentially expensive to rectify. These may well require repairing by a specialist, the teeth being built up, but at least this will save the potentially even higher cost of a new crankshaft assembly.



LEFT *Helical top bevel gears; note timing dots*

BELOW *Valve timing details of 450 Mark 3 engine*



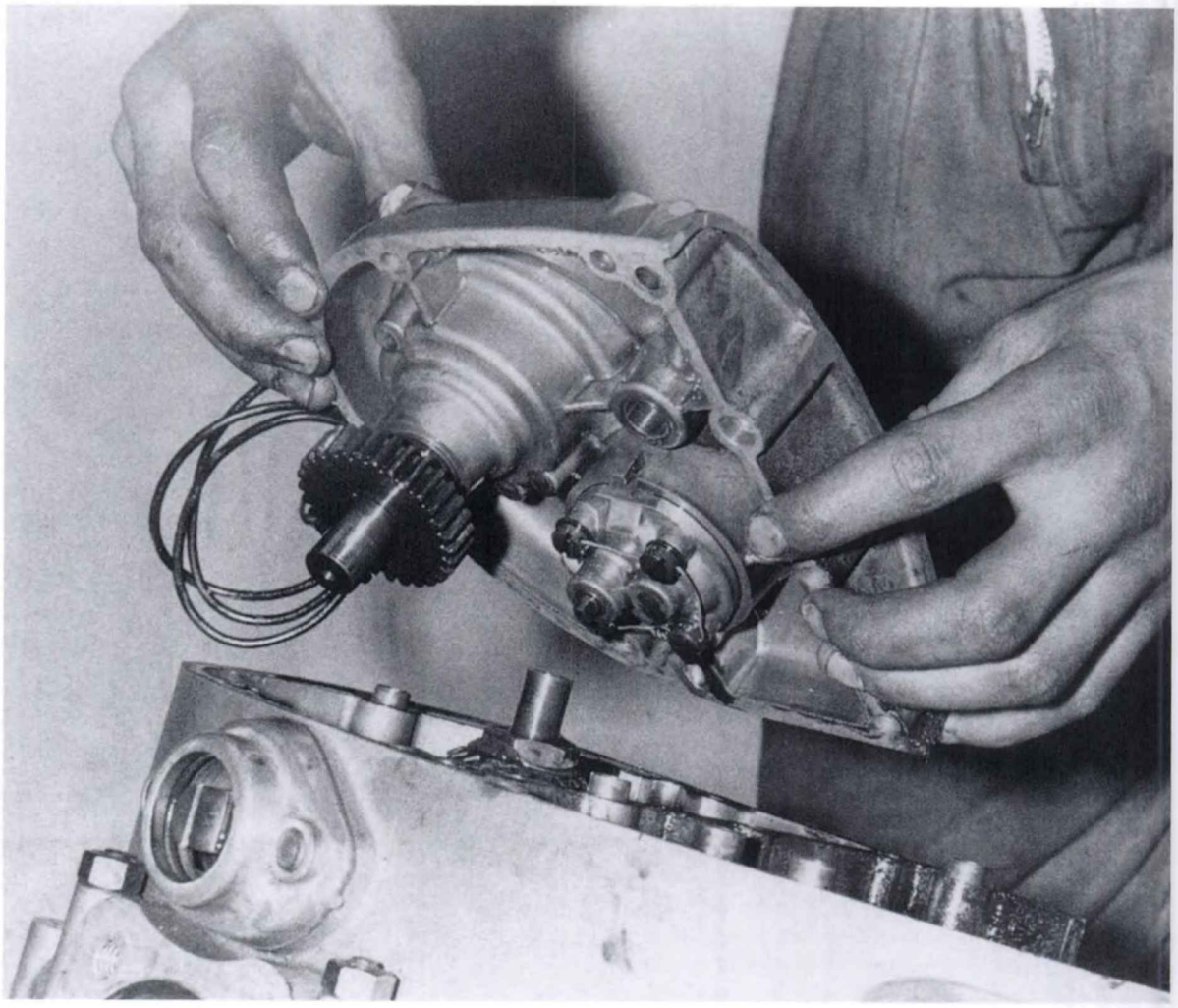
Timing cover

Of all the external covers on the Ducati ohc single-cylinder engine, this is the most important—and also the most expensive to replace. The reason is simple, it not only houses the ignition system (either contact points or electronic pick-up), but also the gear-type oil pump. The latter means that it also incorporates oilways. It is important, therefore, when reassembling the timing cover, that particular attention is paid to the placement of the gasket. Otherwise, a vital oilway to the pump could be blocked. Again, do *not* use any form of gasket compound.

There are two bushes in the timing cover. The most important is the one which forms an effective seal for oil passing through the offside end of the crankshaft to the big-end from the oil pump. The other supports the smaller timing gear where its shaft passes through into the ignition housing. There is also a rubber oil seal here to prevent oil reaching the ignition components from the engine.

Engine outer covers

If one discounts the timing cover, which is dealt with above, this leaves the large clutch/primary drive gear cover, the much smaller clutch inspection cover, the two valve adjustment covers, the cam end covers and, finally, the gear selector box cover. All are dealt with in the respective sections covering the major components which they protect, but it should be noted that Spanish-made engines can be identified externally by the rougher grain, matt (and unpolished) finish on the outer covers, or in the case



ABOVE *Removing the timing cover. This view clearly shows the points gear and oil pump*

ABOVE RIGHT *Primary cover together with hexagonal plug and clutch inspection cover*

RIGHT *Camshaft and bearing cover. On valve-spring engines, the capacity is shown ('125', '160', etc), but desmodromic models simply carry the word 'Desmo'*

of the 1971 125 Scrambler and late 1974 350 Mark 3 engine, which were made in Spain for Italian models, by the lack of the words 'Made in Italy' on the small clutch inspection cover on the nearside of the engine.

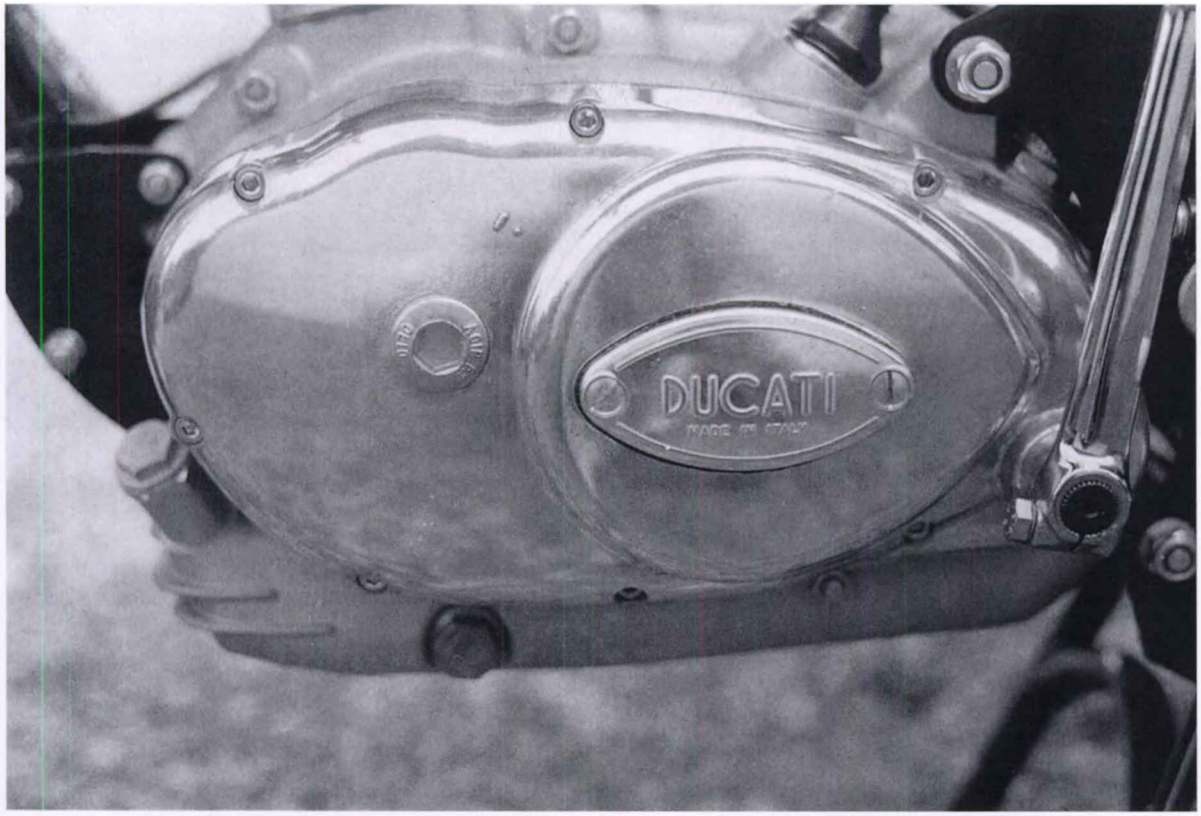
Those on the two-strokes are confined simply to the outer crankcase covers, which usually include the gear selector box of tricks in the usual Ducati fashion.

Two-stroke or four-stroke, check all covers for cracks, damage, gasket surface flatness and, as appropriate, thread condition.

Crankcases

All of the Bologna singles feature a vertically-split, two-piece crankcase set of full unit-construction. These are matched pairs, so do not attempt to use odd ones.

As related earlier, there are two distinct engine types: narrowcase and widecase. This difference not only refers to the basic engine, but also, and more importantly as regards this section, the actual crankcases.


DUCATI
MADE IN ITALY


DUCATI
DESMO

The original series of engines, dating from the 1957–60 model years inclusive, can be identified by the clutch housing which has an integral shaft at the rear. This runs in two bearings within the nearside crankcase. On the post-1960 engine (both narrow and widecase), the clutch housing was modified so that the bearings were self-contained in the clutch housing itself and the shaft deleted. This means that there are two fewer bearings within the crankcase.

The next major crankcase redesign came during 1964 with the introduction of the five-speed models, but the really big one was for the 1968 model year when the 250 cc and larger-capacity models became widecase versions. There were obvious external changes to these machines thanks to the redesigned rear frame assembly which required the much wider engine mountings at the rear, hence the name. In addition, there were several important internal changes, including main bearing sizes, a redesign of the kick-start mechanism, and a longer arm and built-in adjuster for the clutch.

Very late on, from around the 1971 model year, the offside main bearing was increased in diameter, while the nearside component was fitted with a circlip.

In addition, some crankcases on the post-1971 models were fitted with a cast-in shield to protect the clutch operating arm from damage in the event of a final drive chain breakage. This means that on these engines a maximum of 17 teeth (250 and 350) or 13 teeth (450) can be used.

The two-strokes also had their crankcases updated thanks to several changes already detailed. In the main, these centred around the changes in gear ratios. On the 1960s 'strokers' this meant either one, three or four ratios, while the entirely new mid-1970s two-stroke single had six gears.

Main bearings

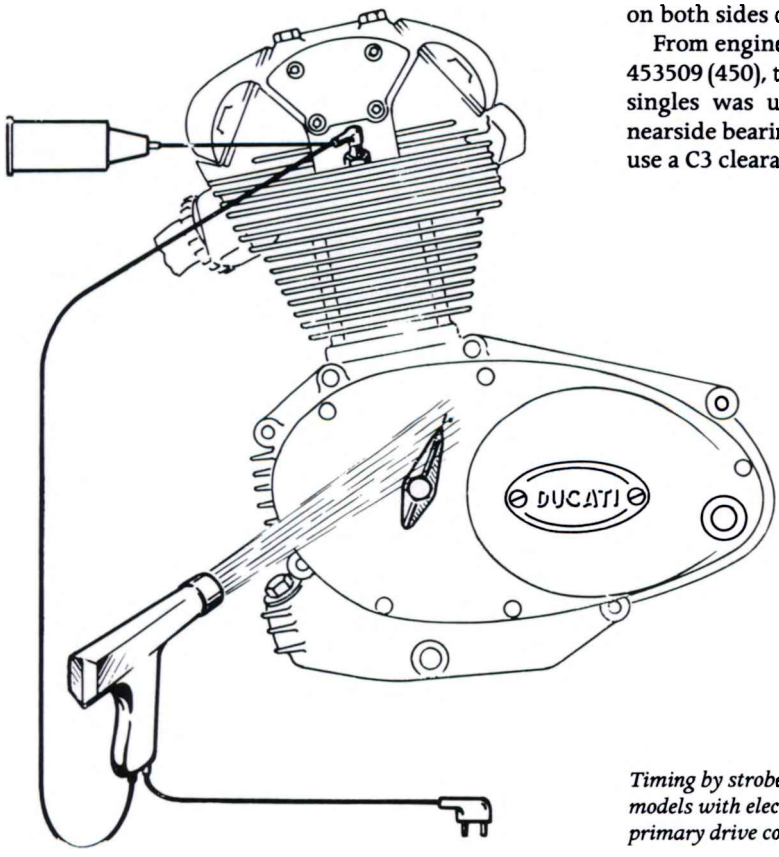
These are usually common to one model for many years, or used throughout its life. Thus, the same pair of bearings is to be found on the 1957 125S as on the 1971 125 Scrambler.

All main bearings used on Ducati singles are of the conventional ball-race type, and only two bearings were ever used.

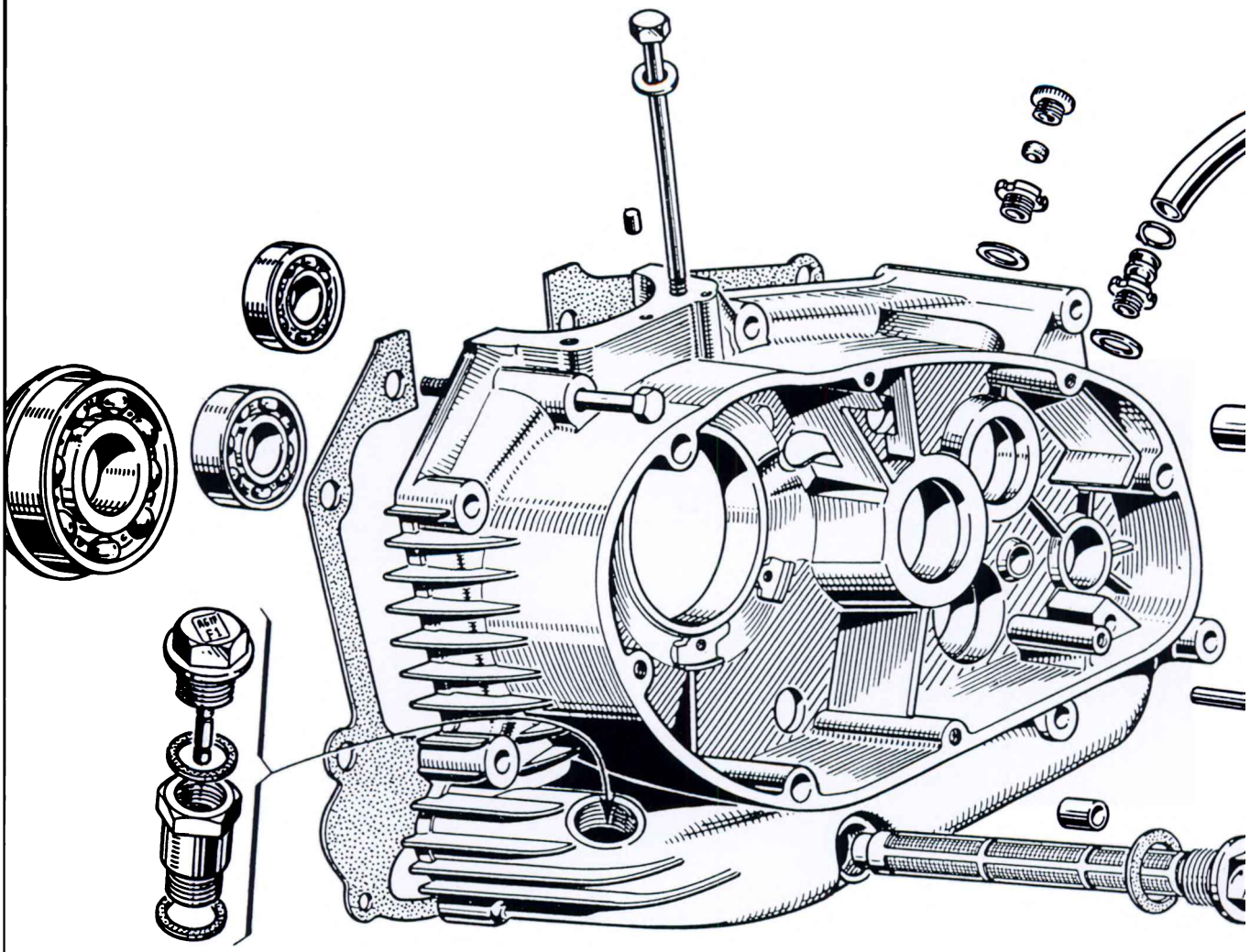
The 100/125/160 use only the one type on both the near and offside throughout their entire lifespan. These are of 25 × 52 × 15 mm dimensions. Then came the narrowcase 175, 200, 250 and 350 narrowcase models. Again, these only use one size: 30 × 62 × 16 mm.

With the introduction of the widecase family in 1968, the first engines used a 30 × 72 × 19 mm bearing on the nearside and a 30 × 62 × 16 mm size on the offside, the latter being the same component as employed on both sides on the narrowcase models.

From engine number 108621 (250), 11052 (350) and 453509 (450), the offside main bearing on the widecase singles was uprated to 30 × 72 × 19 mm, while the nearside bearing remained of the same dimensions. All use a C3 clearance.

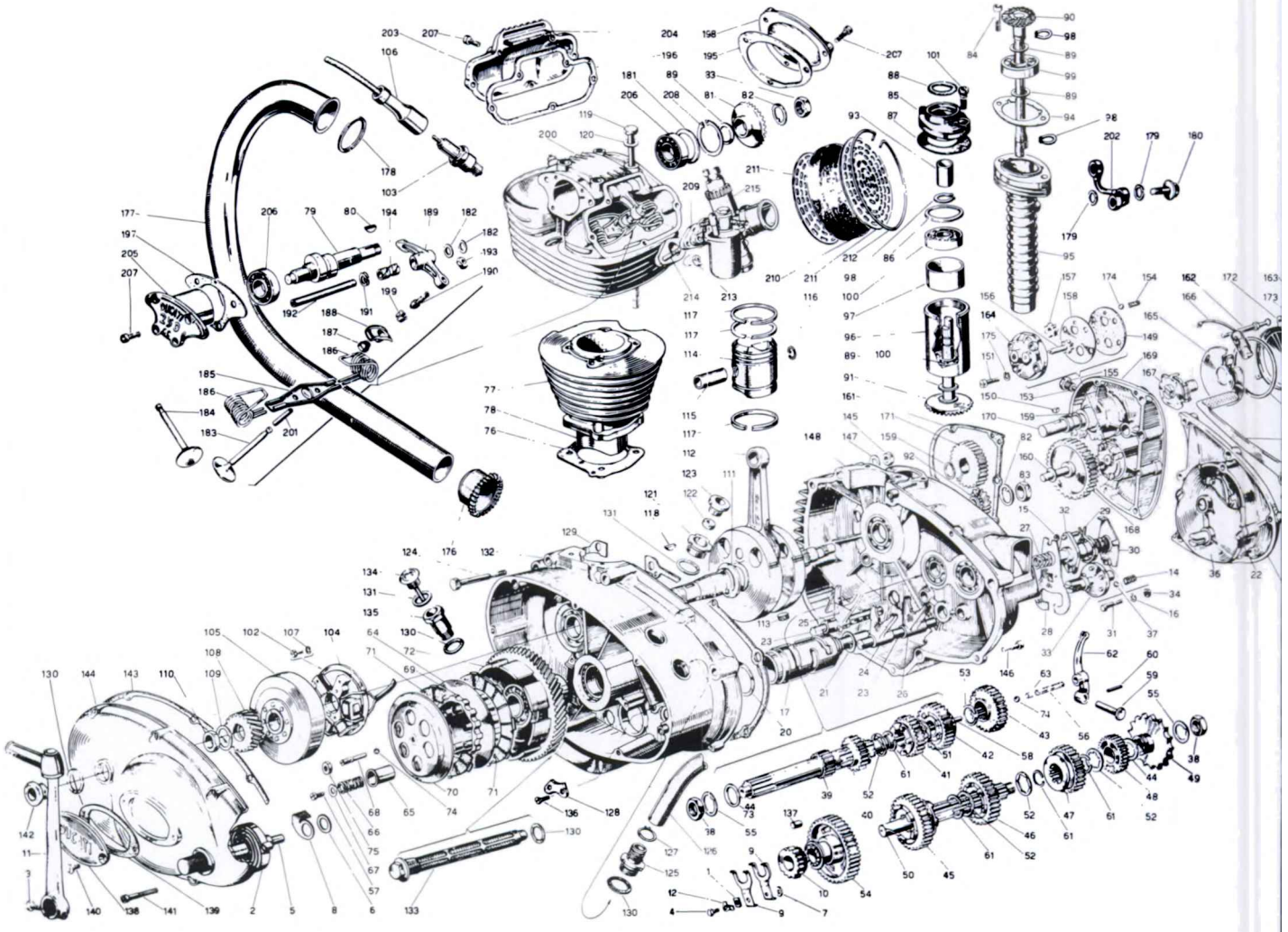


Timing by strobe light. This method can only be used on models with electronic ignition. There is a timing mark on the primary drive cover.



Widecase crankcase details, showing bearings, filler plug assembly and oil filter

Exploded diagram of 250 Monza narrowcase, five-speed engine



Starter assembly

1 Plate
2 Pedal return spring
3 Screw TE 8MB × 28 UNI 184
4 Screw TE 6MA × 12 UNI 187
5 Starter pin Z = 20
6 Thrust washer 15.5 × 23 × 0.5
7 Washer 6.5 × 13 × 2.5
8 Segment locking plate
9 Leaf spring
10 Starter gear Z = 22
11 Complete starter lever
12 Safety washer i = 64

Gearbox control assembly

13 Gear operating lever
14 Ball spring
15 Washer 7.4 × 13 × 0.5
16 Bent washer 6.4 × 11 × 0.5
17 Speed gear selector
18 Screw TE 6MA × 25
19 Screw TCEI 6MA × 30
19 Screw TCEI 6MA × 35
19 Screw TCEI 6MA × 45
20 Thrust washer 36.5 × 42 × 0.2
20 Thrust washer 36.5 × 42 × 0.5
21 Thrust washer 16.5 × 22 × 0.2
21 Thrust washer 16.5 × 22 × 0.5
22 Screw TSC 6MA × 30
23 Fork pin 12 × 106
24 1st and 3rd speed engaging fork
25 2nd and 4th speed engaging fork
26 Top speed engaging fork
27 Fork pressure spring
28 Selector operating fork
29 Pedal return spring
30 Adjustment plate
31 Eccentric 6MA
32 Fork operating spindle
33 5th speed selector
34 Hex. nut 6MA × 6
35 Cover chain side
36 Cover for speed selector
37 Ball 11/32 in.

Gearbox & clutch assembly

38 Hex. nut (16 × 1M) × 6
39 Gear change main shaft Z = 17
40 2nd speed driving gear Z = 22
41 3rd speed driving gear Z = 26
42 4th speed driving gear Z = 29
43 5th speed driving gear Z = 31
44 Washer 20.2 × 28.2 × 2
45 2nd speed driven gear Z = 38
46 3rd speed driven gear Z = 35
47 4th speed driven gear Z = 32
48 5th speed driven gear Z = 30
49 Chain sprocket
50 Gearbox layshaft
51 Grooved thrust washer
52 Grooved thrust washer 18 × 26 × 0.5
53 Spring ring 18 × 22 × 2.5
54 1st speed driven gear Z = 43
55 Safety washer tab i = 16.3
56 Clutch peg
57 Screw TC 5MA × 12
58 Clutch operating rod
59 Clutch lever pin

60 Split drift pin 2.8 × 25
61 Spring ring i = 20
62 Clutch operating lever
63 Roller 5 × 5–RIV 91131051
64 Inner driven disc
65 Spring retainer
66 Clutch spring
67 Washer 5.2 × 14 × 1
68 Clutch adjustment screw 8MA
69 Clutch drum
70 Pressure disc
71 Driving disc
72 Clutch housing Z = 60 (see couple of gears)
73 Outer distance piece 20.3 × 25 × 5
74 Ball 3/16 in.
75 Hex. nut 8MA × 5

Cylinder assembly

76 Gasket between cylinder and head
77 Cylinder 74 mm
78 Cylinder liner

Timing assembly

79 Timing shaft
80 Special woodruff key 3 × 5
81 Bevel gear Z = 8
82 Safety washer with ∅i = 14.5 tab.
83 Hex. nut (14 × 1M sin.) × 6
84 Screw TCEI 6MA × 30
85 Flange
86 Thrust washer 29.2 × 35 × 0.1
86 Thrust washer 29.2 × 35 × 0.2
86 Thrust washer 29.2 × 35 × 0.5
87 Gasket between flange and crankcase
88 Gasket GACO OR 138
89 Normal thrust washer 15.5 × 22–thickn. 0.05–0.1–0.2–0.5–1
90 Transmission with bevel gear Z = 20
91 Bevel gear Z = 30
92 Bevel gear Z = 21
93 Normal sleeve 15 × 20 × 34
94 Gasket for head protection
95 Timing protection
96 Bush
97 Distance piece 31 × 35 × 19.6
98 Ring Seeger 15 E
99 Bearing RIV 02 AJ 15 × 35 × 11
100 Bearing RIV 3 AOn 15 × 35 × 11
101 Screw TCEI 6MA × 16 UNI 2383

Electrical system assembly

102 Screw TCC 5MA × 15
103 Sparking plug thermic degree 260 with gasket, Marelli CW 260 N.
104 Complete stator plate
105
106 Ignition cable
107 Spring washer A 5.3 UNI 1751

Crankshaft assembly

108 Crankshaft gear Z = 24
109 Safety washer with tab i = 20.2
110 Hex. nut (20 × 1M) × 7
111 Thrust washer 30.5 × 37 (thickness 1–1.1–1.2–1.3)
112 Crankshaft
113 Threaded dowel 18 × 1M
114 Complete normal Borgo piston 74 mm
115 Normal piston gudgeon pin
116 Spring ring i = 17.5
117 Piston rings set
118 Woodruff key 4 × 5 UNI 99

Crankcase assembly

119 Tie rod TE 10MA × 253
120 Bent washer 10.5 × 18 × 0.8
121 Cable gland nut
122 Rubber for flywheel cable
123 Ring plug
124 Screw TE 8MA × 85
124 Screw TE 8MA × 120
125 Breather air nozzle 22MB
126 Breather tube
127 Breather tube locking ring
128 Plate
129 Gasket
130 Gasket 22.5 × 28 × 1
131 Gasket 22 × 28 × 1.5
132 Crankcase clutch side
133 Filter
134 Oil plug with level stick
135 Oil filler
136 Screw TS 6MA × 15 UNI 262
137 Roller 7 × 7
138 Cover for clutch adjustment hole
139 Cover gasket
140 Screw TSC 6MA × 14
141 Screw TCEI 6MA × 40
141 Screw TCEI 6MA × 50
142 Plug 22 MB
143 Gasket for clutch side cover
144 Cover clutch side with bush
145 Hex. nut 8MA × 8 UNI 205
145 Hex. nut Elastic-Stop 8MA × 10.5
146 Screw TCEI 6MA × 25
146 Screw TCEI 6MA × 40
147 Bent washer 8.4 × 15 × 0.5
148 Crankcase chain side

Pump—electrical system assembly

149 Pump gasket
150 Special woodruff key 3 × 5
151 Screw with hole TC 6MA × 30
152 Gasket
153 Rubber tube
154 Pressure valve spring
155 Threaded bush 10 MB
156 Driving gear Z = 7
157 Driven gear Z = 7
158 Pump cover
159 Thrust washer 15.5 × 22 × 1
160 Thrust washer 10.5 × ∅18 × 1
161 Timing cover gasket
162 Column 6MA–L = 61.5
162 Column 6MA–L = 70.5
163 Screw TCC 4MA × 7
164 Pump body
165 Complete distributor
166 Condenser
167 Automatic advance
168 Pump operating gear with pin
169 Timing cover
170 Distributor operating spindle
171 Driving gear of the distributor Z = 30
172 Distributor cover with 2 springs
173 Spring washer A4.3 UNI 1751
174 Ball $\frac{1}{4}$ in.
175 Spring washer A6.4 UNI 1751

Exhaust assembly

176 Hold ring 48 × 1.5M
177 Exhaust pipe
178 Gasket 36 mm

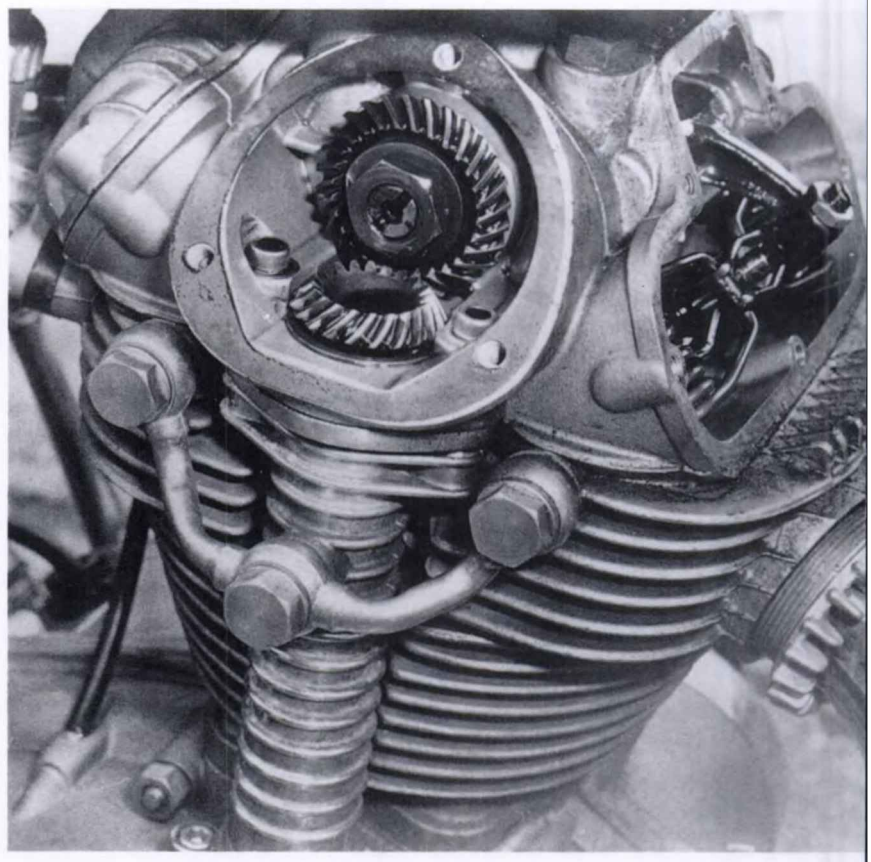
Head assembly

179 Gasket 12.2 × 20 × 1
180 Union screw (12 × 1.25M) × 24
181 Thrust washer 29.2 × 35 × 0.2
182 Thrust washer 10.5 × 18 × 1
183 Inlet valve
184 Exhaust valve
185 Spring attachment cross-bar
186 Valve spring
187 Valve rubber
188 Spring attachment, tie h = 12
189 Rocker with chromed shoe
190 Adjustment screw 8MB
191 Spring washer
192 Rocker pin
193 Hex. nut 8MB × 4
194 Rocker normal bush
195 Timing cover gasket
196 Valve cover gasket
197 Cap gasket
198 Timing cover
199 Cotters 11.9 × 8
200 Head
201 Split spring drift 5.4 × 12
202 Oil union
203 Valve cover
204 Rubber 50 × 17 × 4
205 Cap bearing holder
206 Bearing RIV 02 A or FAG 6202 15 × 35 × 11
207 Screw TCEI 6MA × 16–UNI 2383
208 Ring Seeger 35 I–UNI 3654

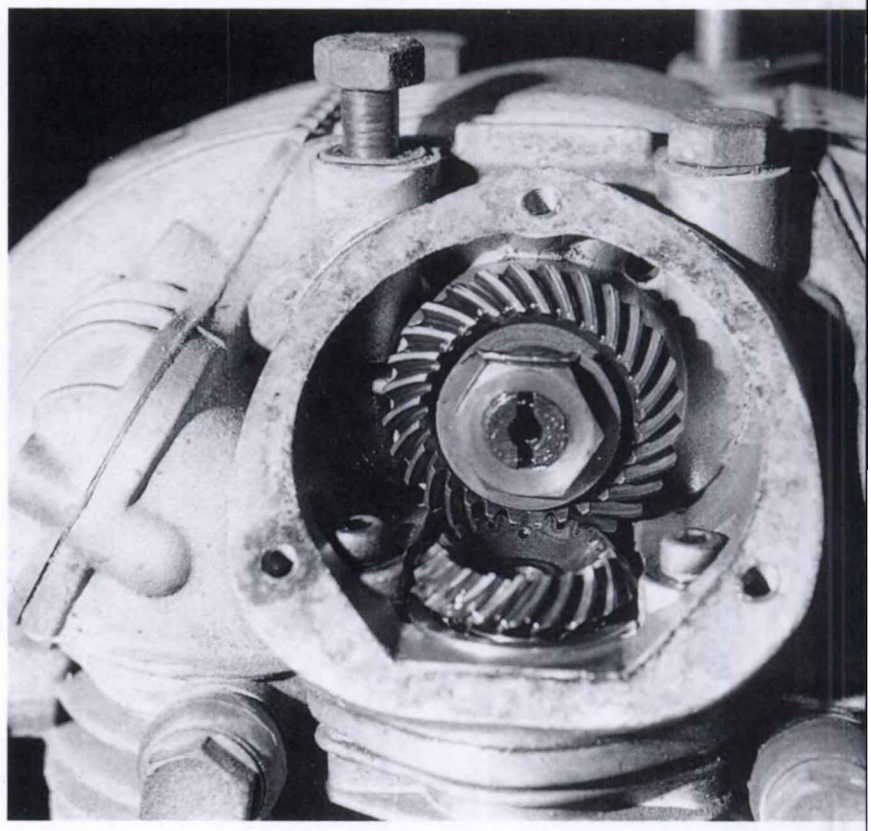
Carburettor

209 Rubber distance piece
210 Filtering body 2166
211 Drilled disc 2167
212 Filtering body retain ring 2168
213 Hex. nut Elastic-Stop 8MA × 9
214 Stud 8MA × 37
215 Carburettor Dell'Orto type UBF 24 BS

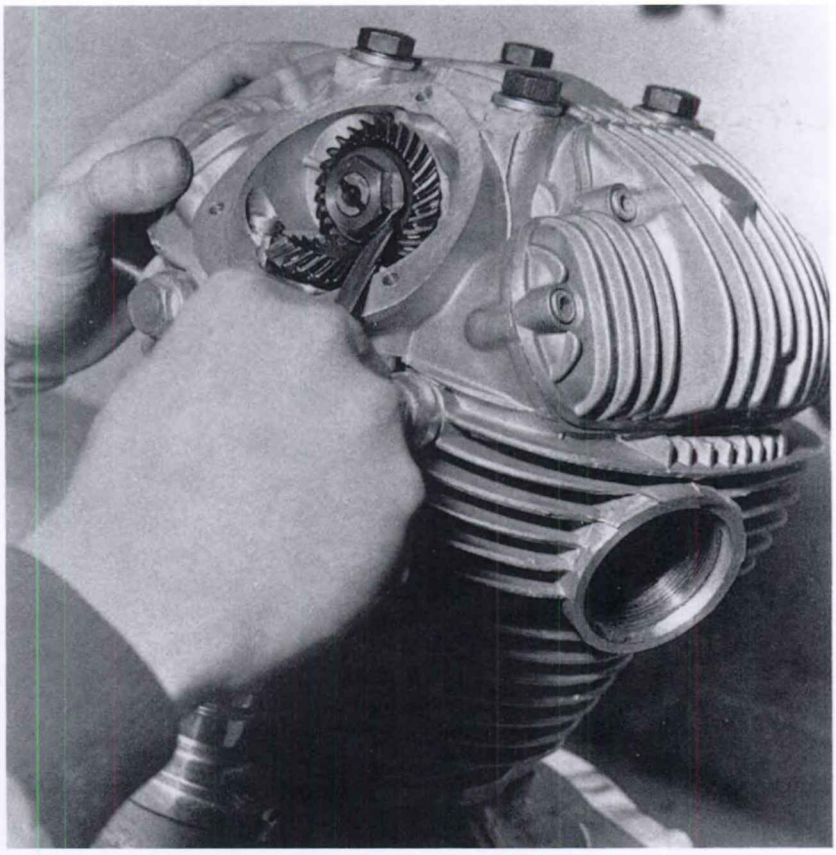
Engine strip-down



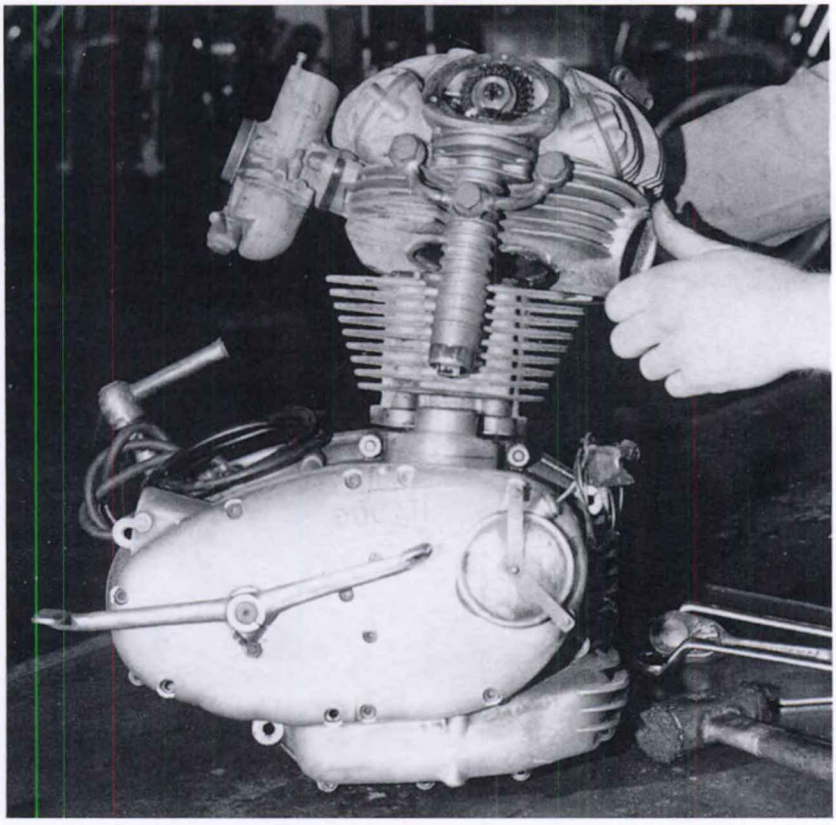
First remove the triangular bevel drive cover from the offside of the cylinder head



Rotate the bevel gears so that both dot marks line up with both valves closed



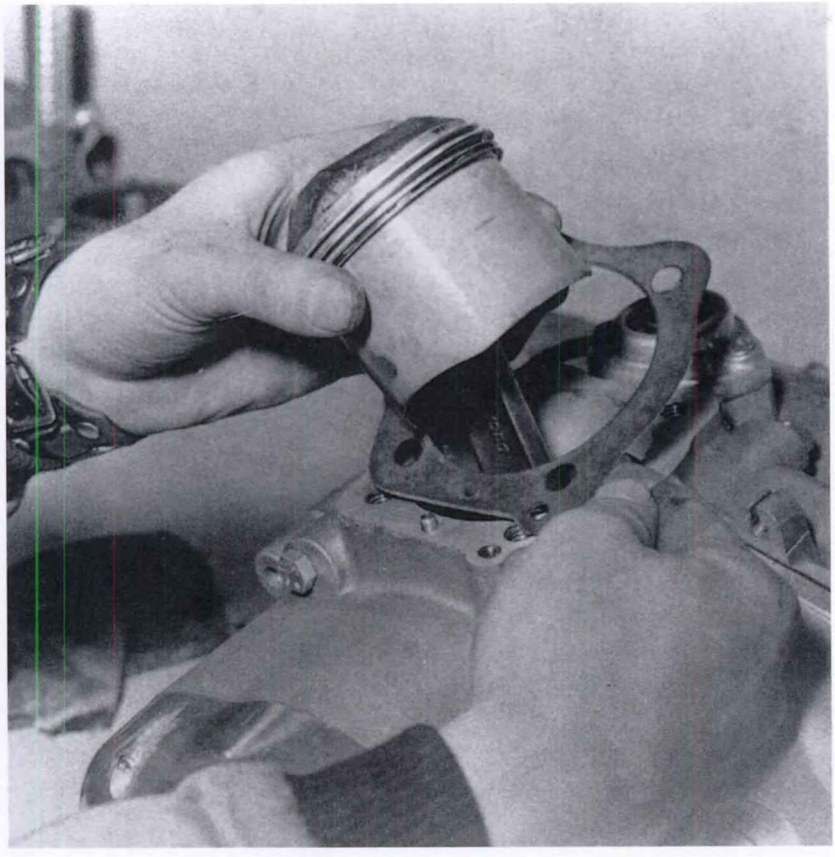
The camshaft nut has a tab washer



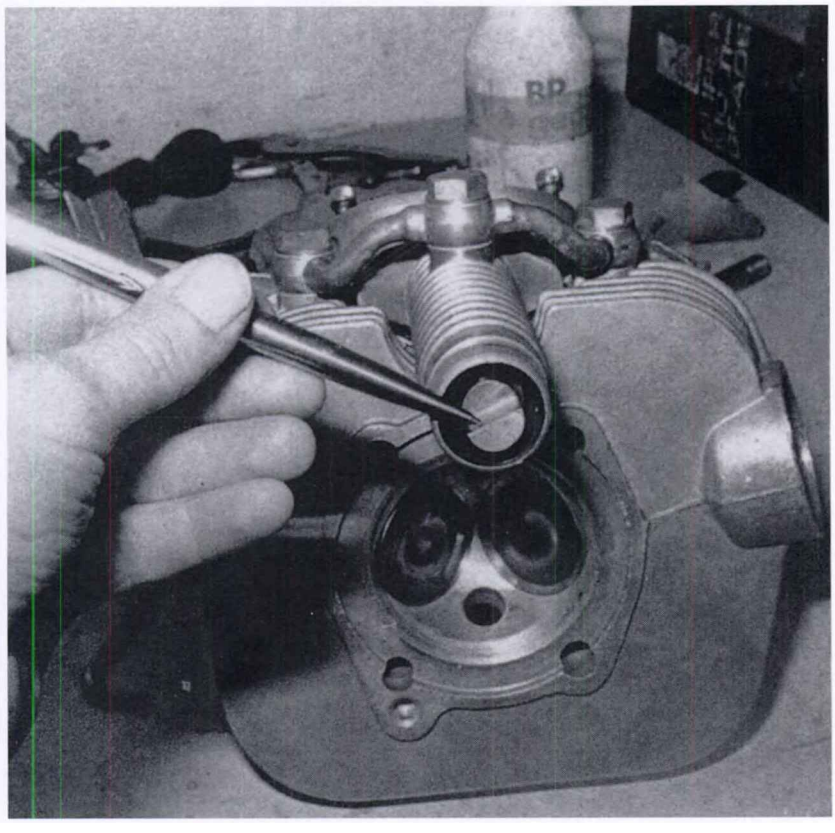
After removing the four long cylinder head/barrel bolts, the head can be taken off complete with the bevel tube and oilway pipe

There is no cylinder head gasket, only a rubber O-ring (shown)

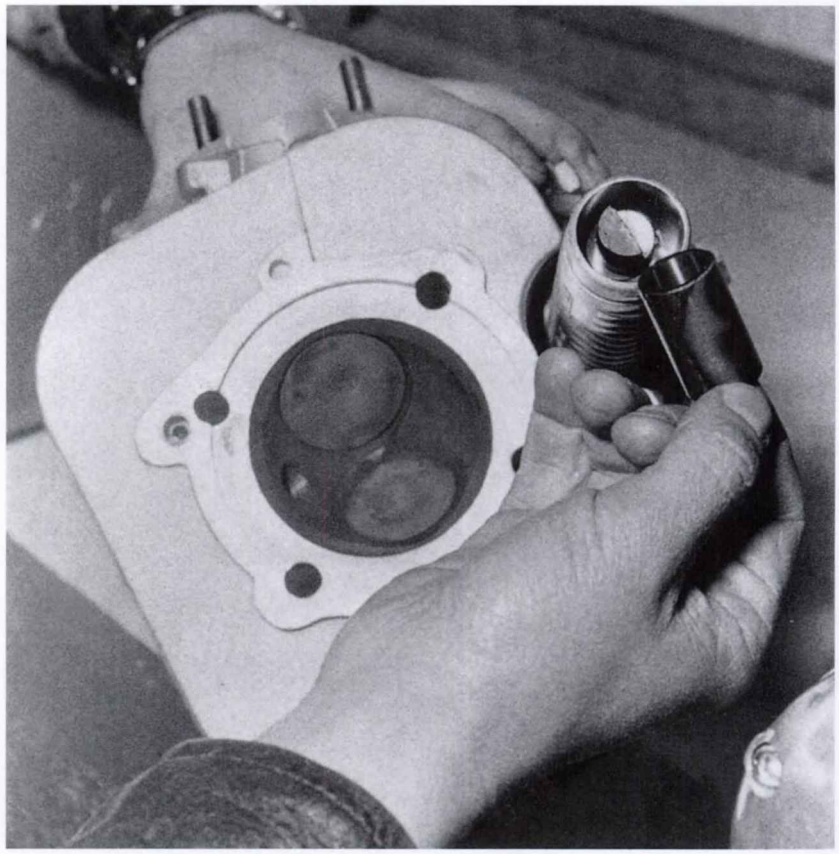
Always make sure that a new head O-ring is fitted each time the head/barrel joint is disturbed



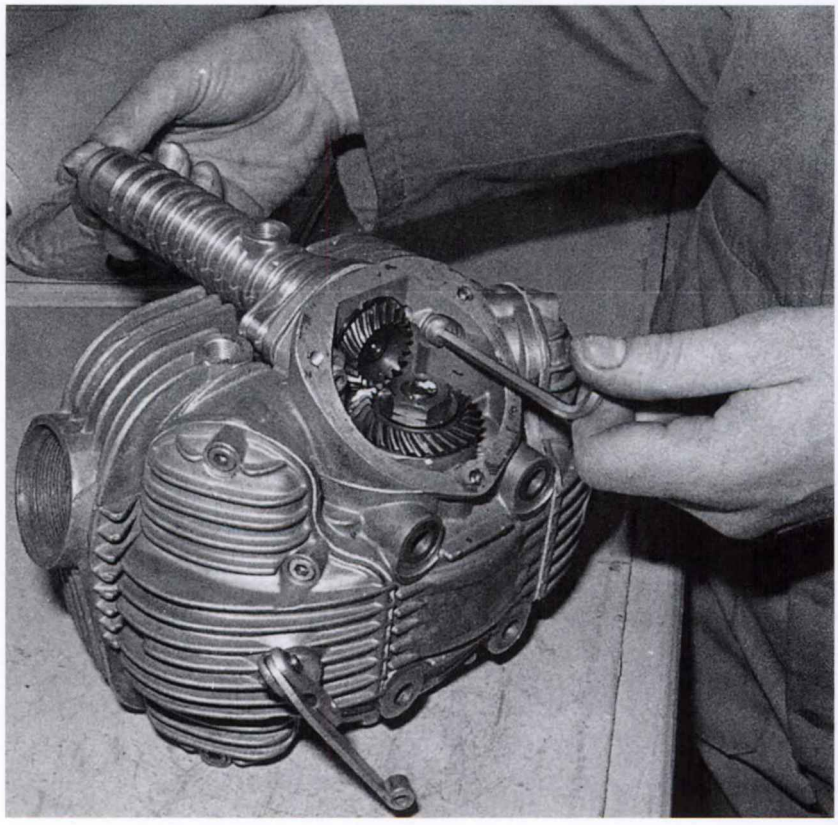
A replacement paper cylinder-base gasket will be required. Do not use any jointing compound. A ring compressor will not be needed; simply push the rings into the barrel, using your fingers



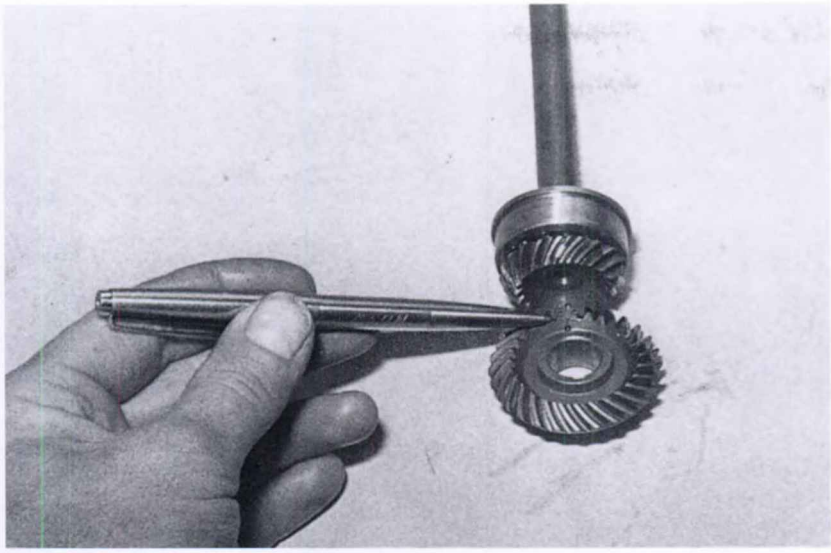
When the head has been assembled and the gear marks have been lined up, the drive shaft will be in this position to align with the crankshaft gears below



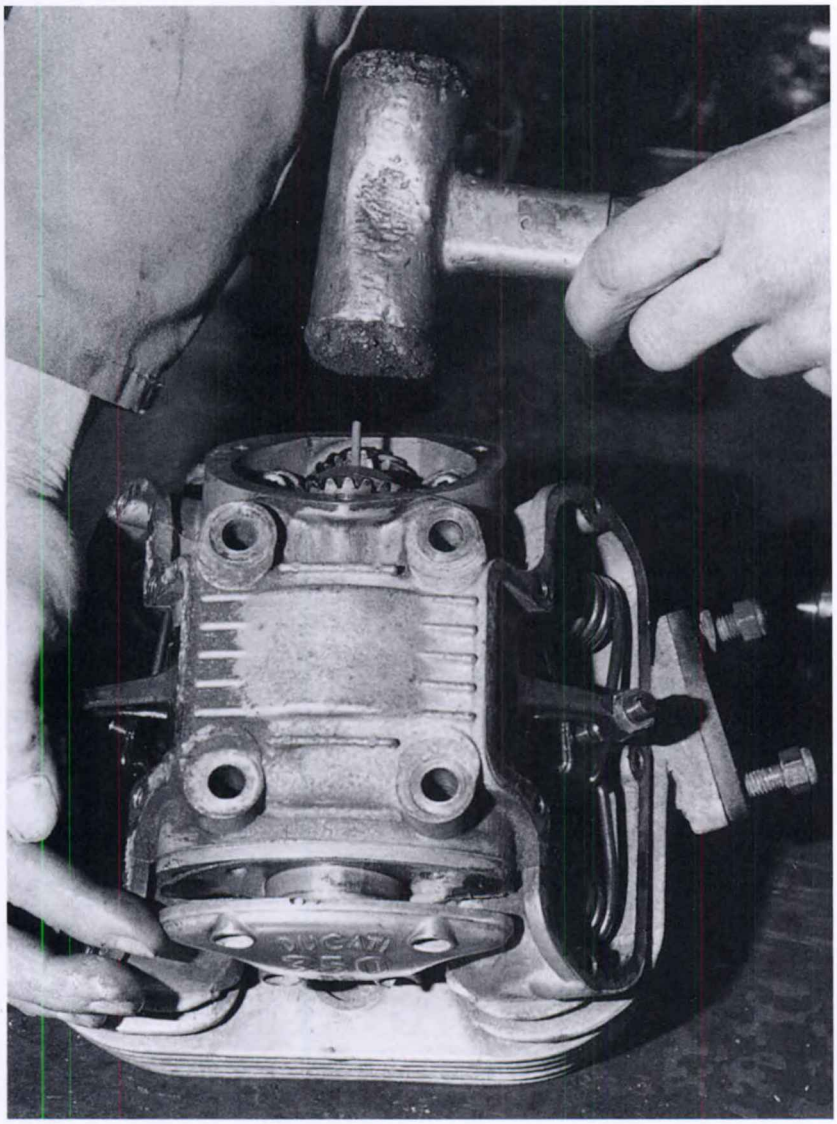
An Oldham coupling is used to join the top and bottom bevel shafts. Always renew the bevel shaft circlip during a rebuild



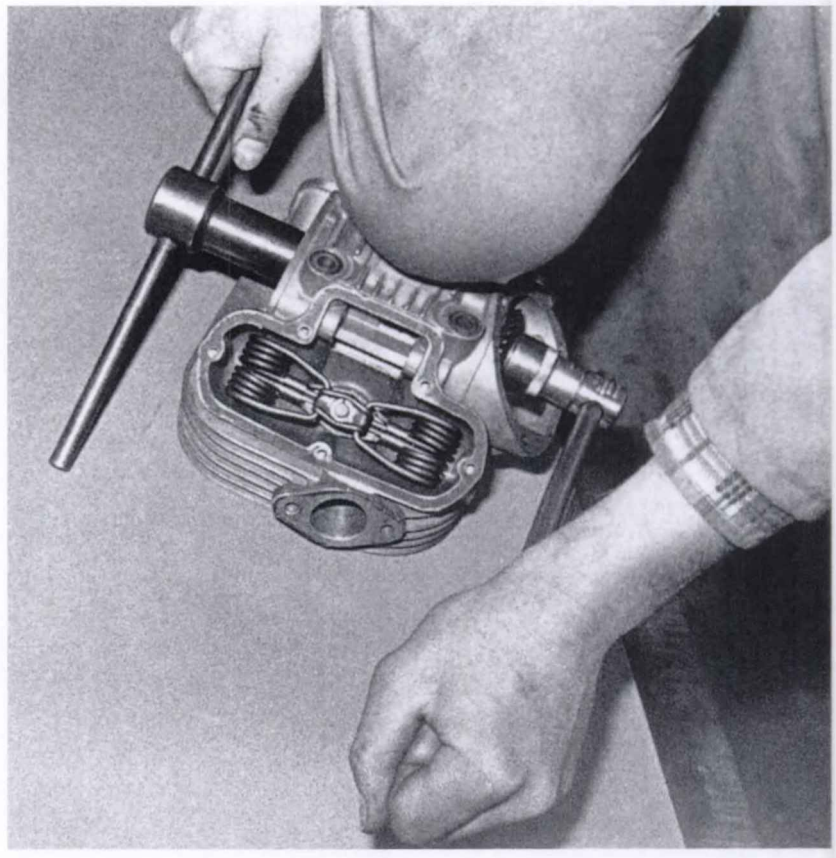
The alloy bevel drive tube can be removed by undoing two allen screws as shown



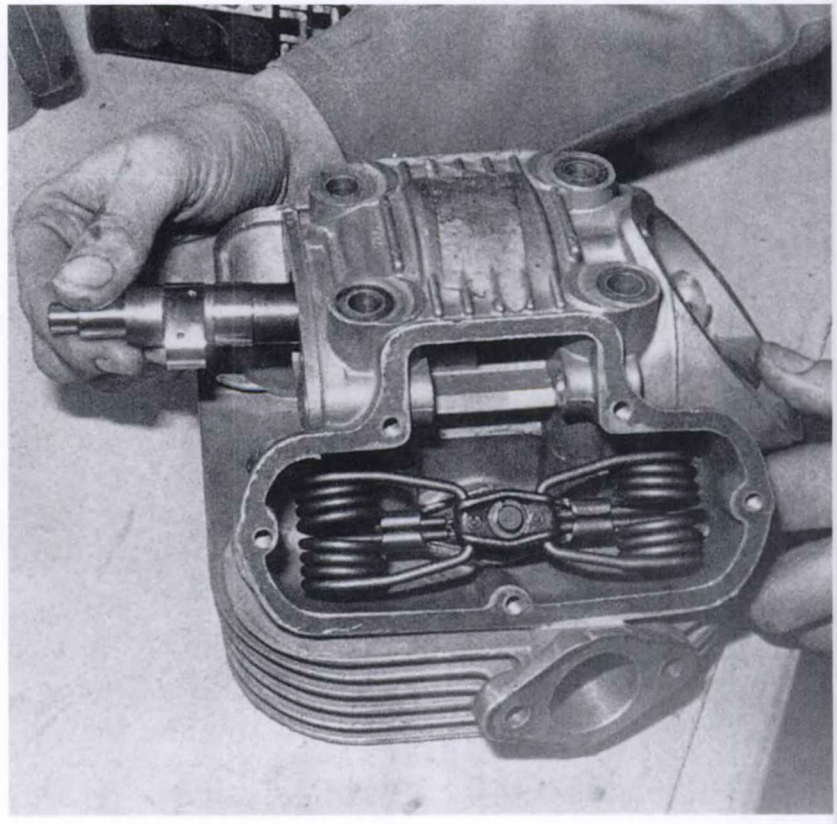
Bevel gears need to be checked for wear and correct shimming



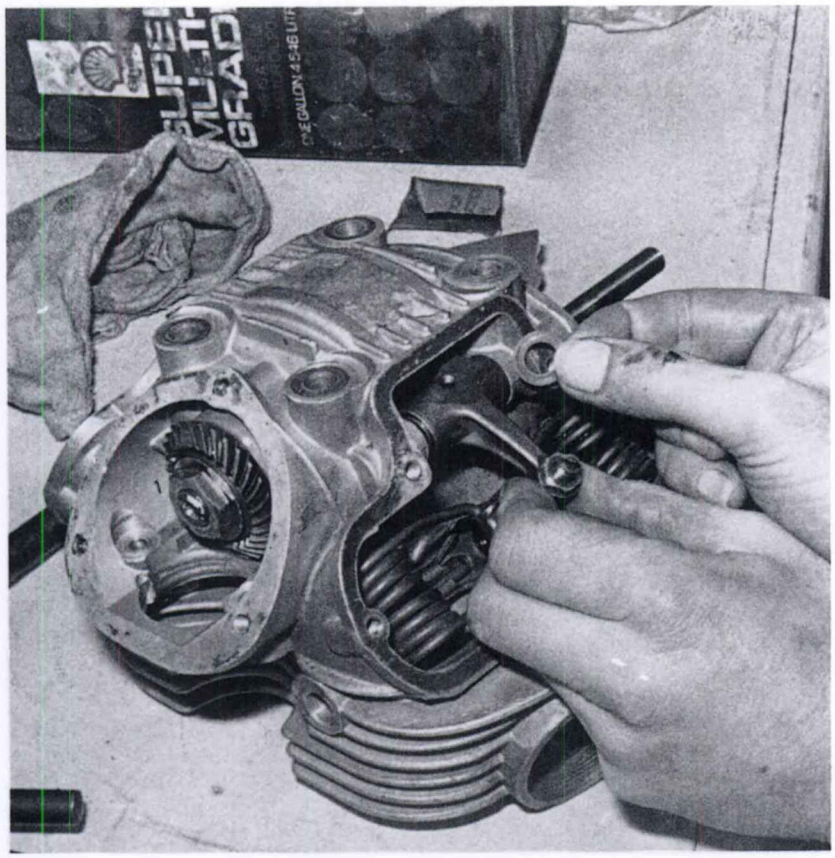
To remove the nearside cam bearing end cover, undo the four allen screws and tap out from the other end, as shown. Do not attempt to lever it off, otherwise damage will result



The camshaft should be removed by the method shown. Note that the thread is left-hand

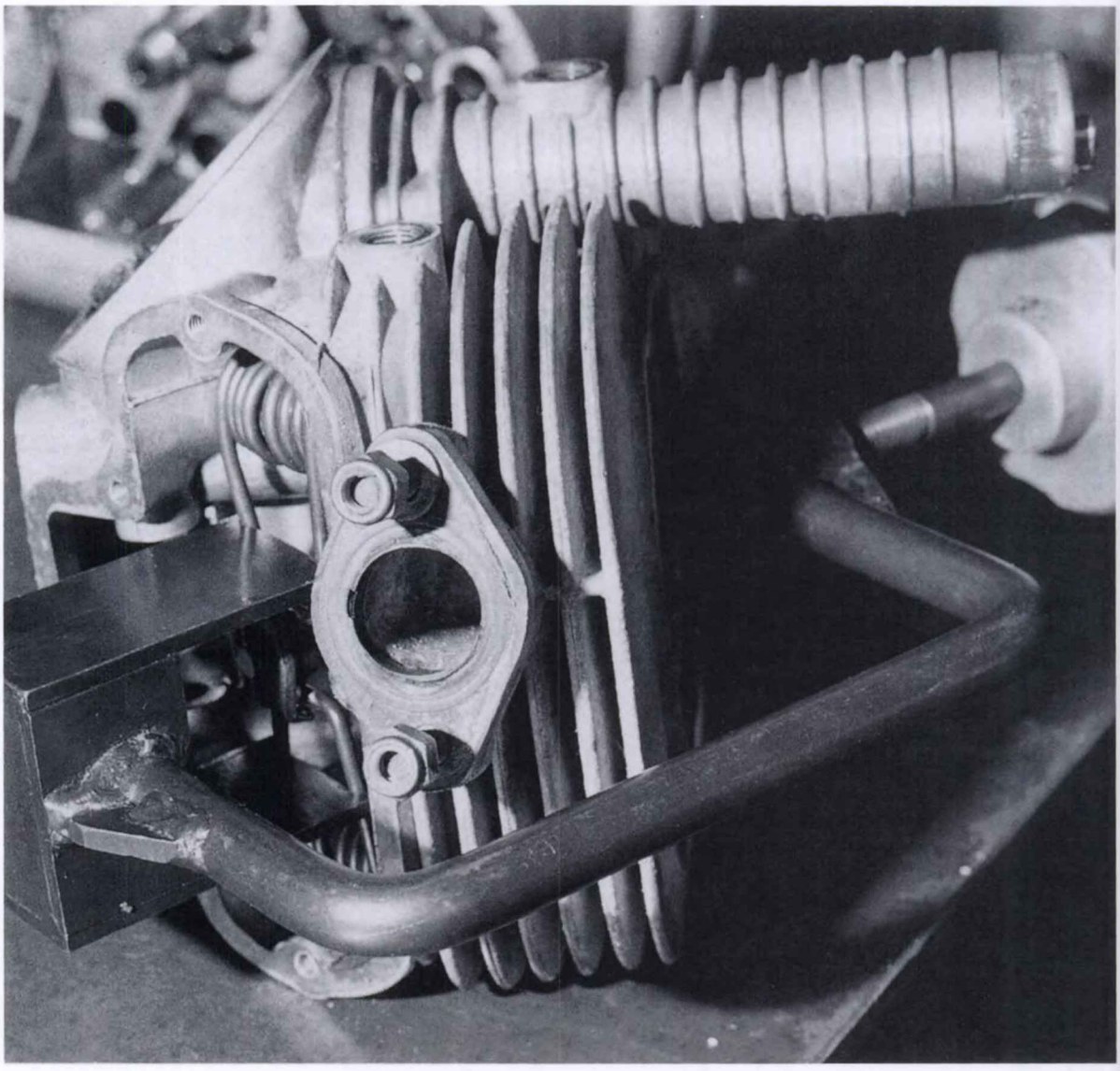


Remove the cam from the bearing

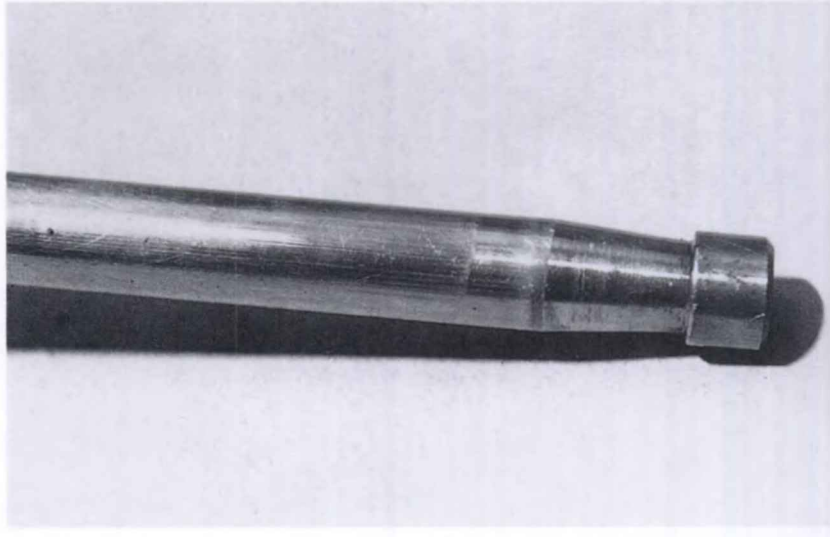


Rocker pins should be removed with a special extractor, or a home-made tool comprising a bolt, tube and washer. Note side shims and spring for rocker

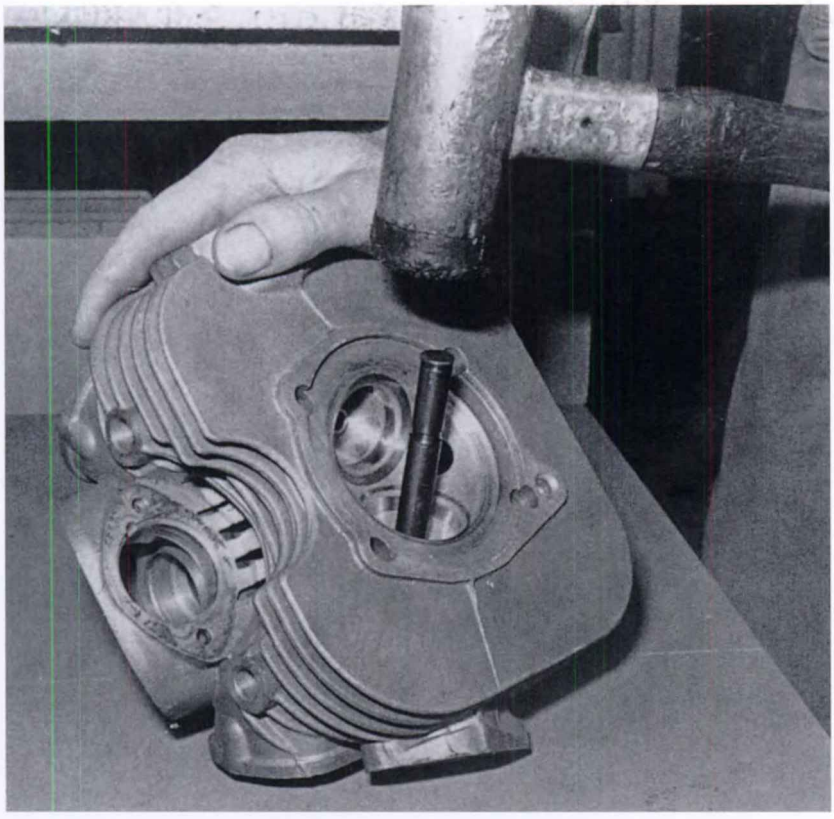
Two types of Ducati rocker: solid (shim type) on the left, conventional adjuster and lock-nut variety on the right



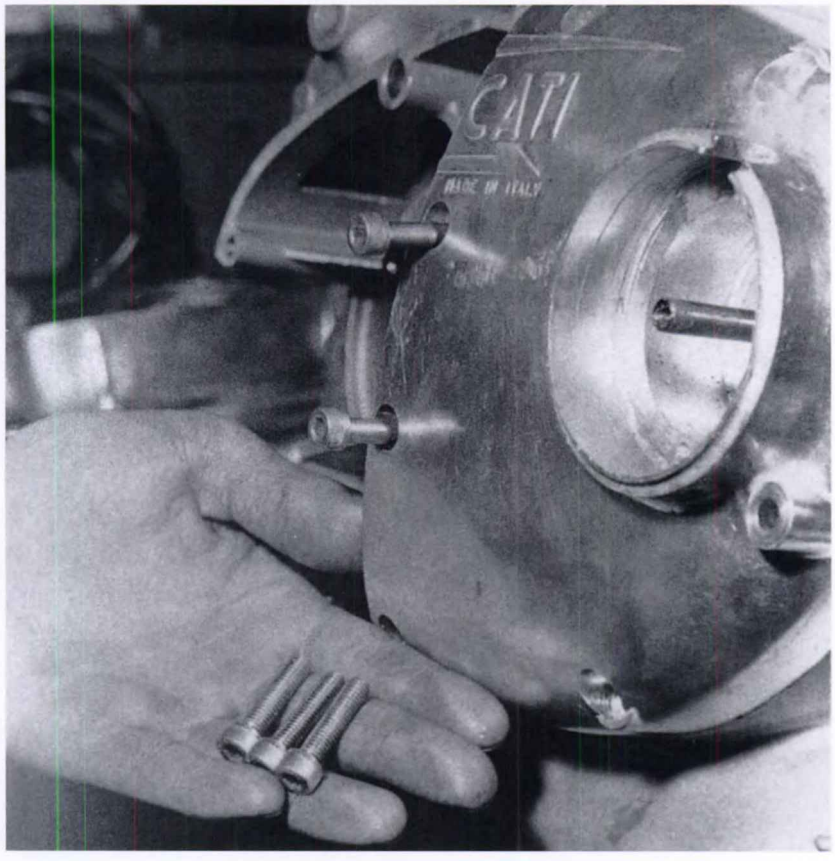
ABOVE Hairpin valve spring removal tool. Again, one can fabricate a suitable cheaper alternative



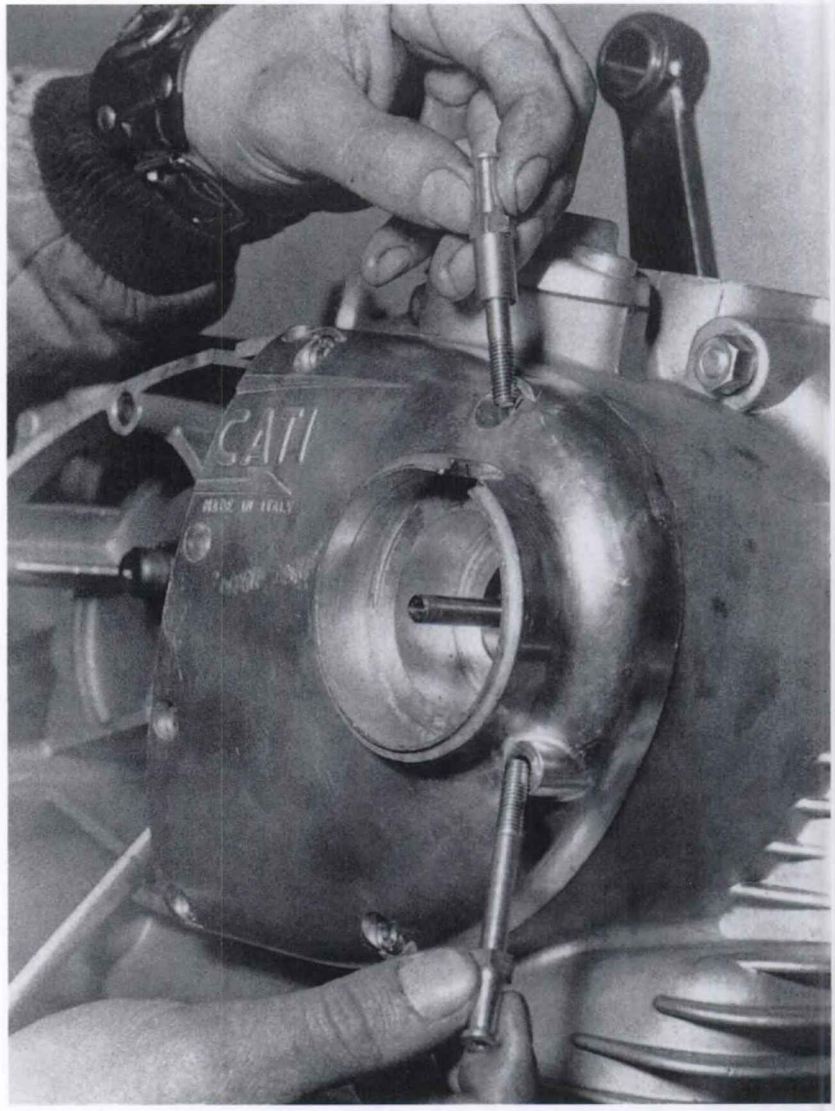
Check both valve guides and valve stems (shown) for wear



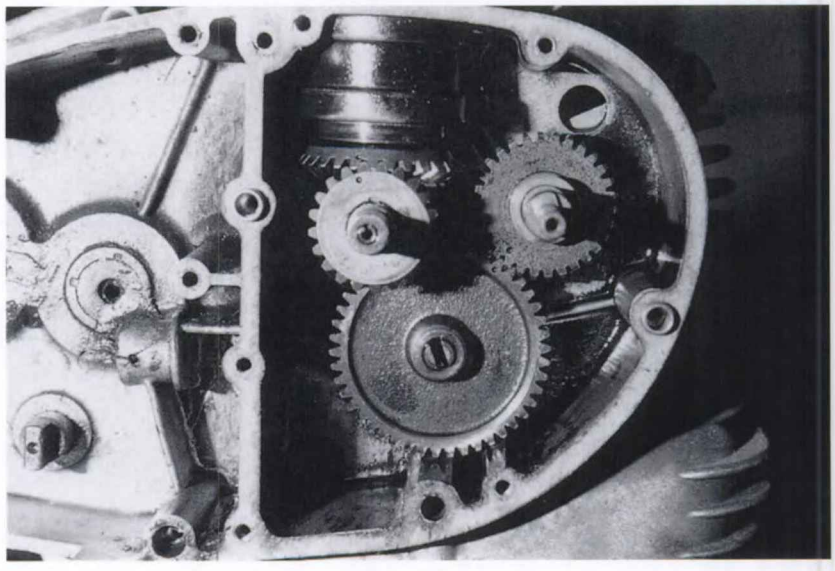
The guides are stepped and only knock out in this direction. They can be removed cold



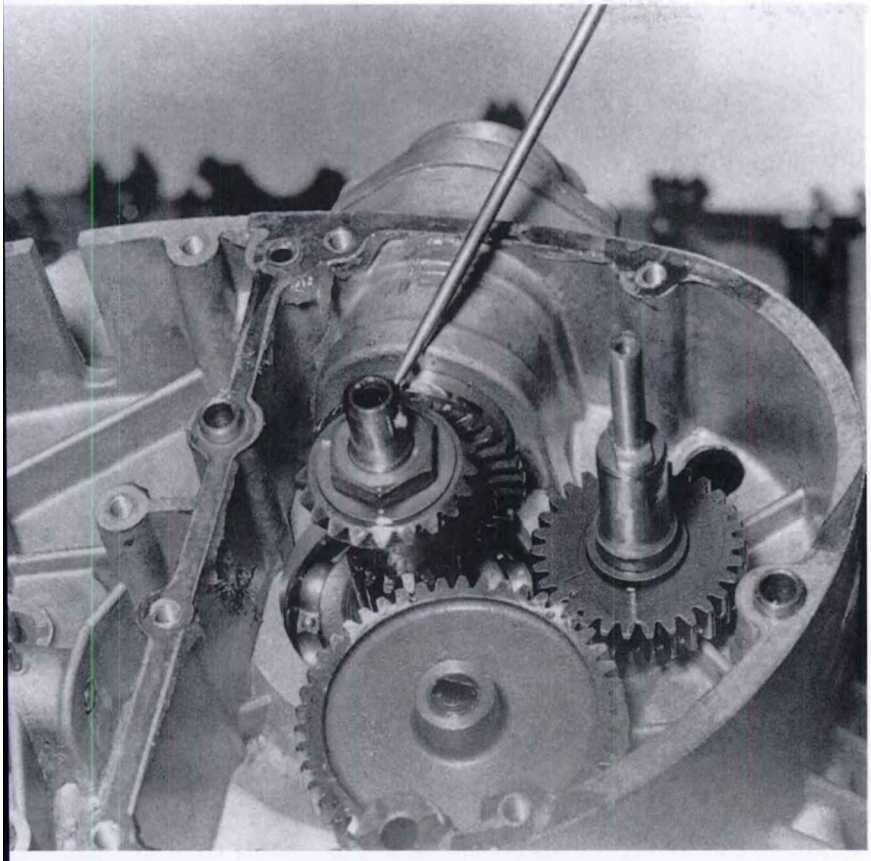
The timing cover has screws of varying length, as shown here. Note their positions as they are removed



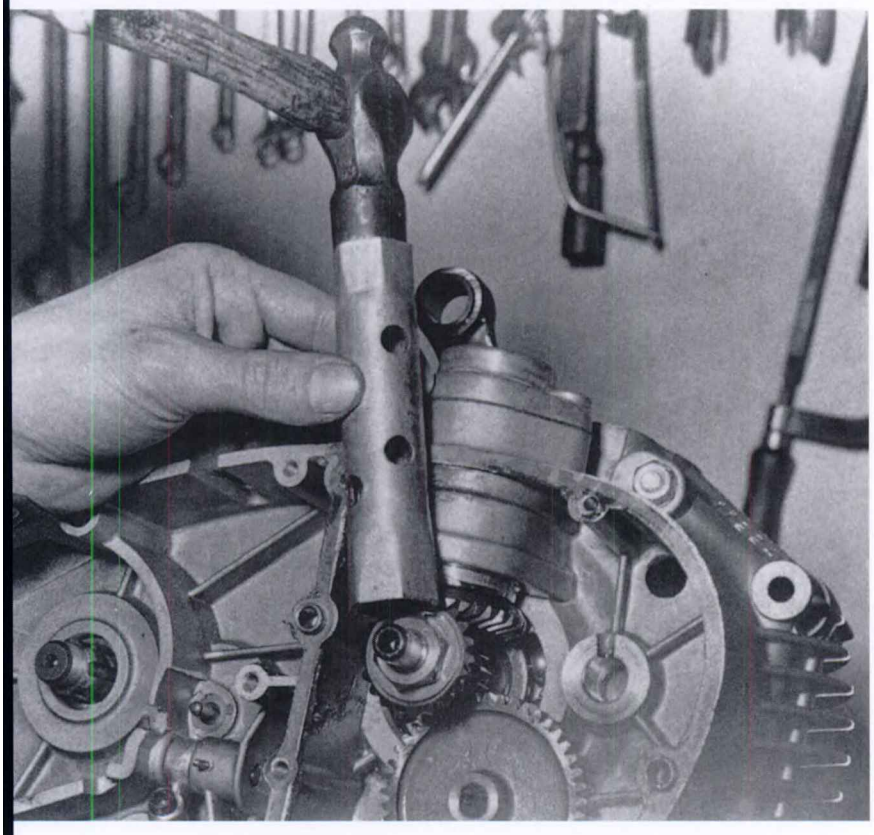
There are also two pillar bolts for mounting the points cover. The longer one goes to the bottom



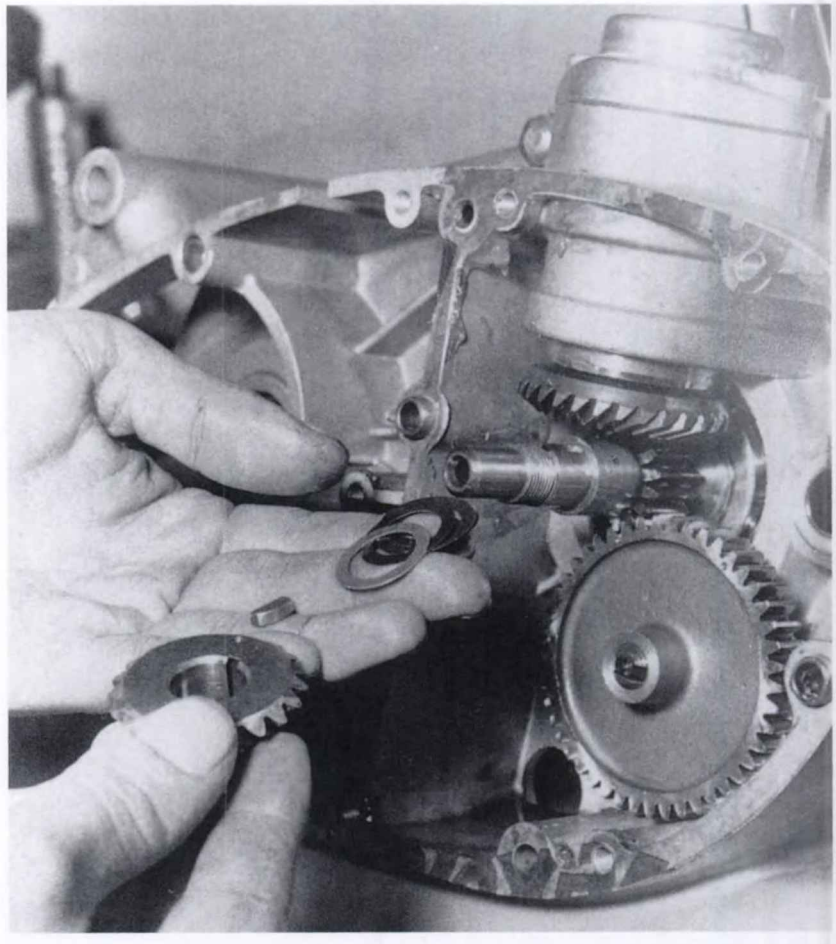
Removing the timing cover will expose the timing gears. All three need their timing dots aligning on reassembly. The larger gear at the bottom also drives the oil pump



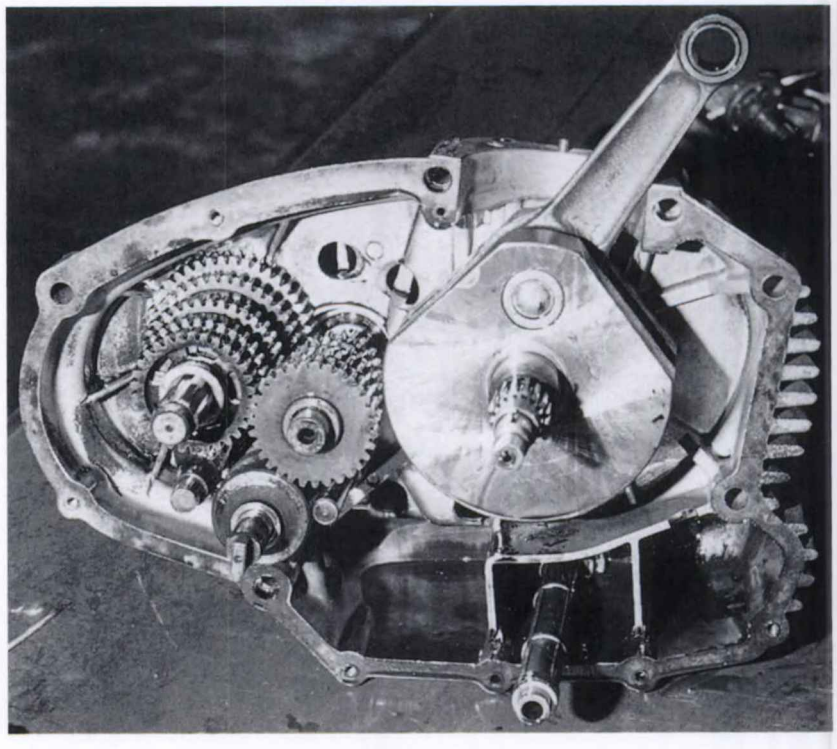
The offside end of the crankshaft must be in good condition, as should the matching phosphor-bronze bush in the timing cover, as big-end bearing oil pressure relies on this. If necessary, have the crank end turned down and fit a matching oversize bush



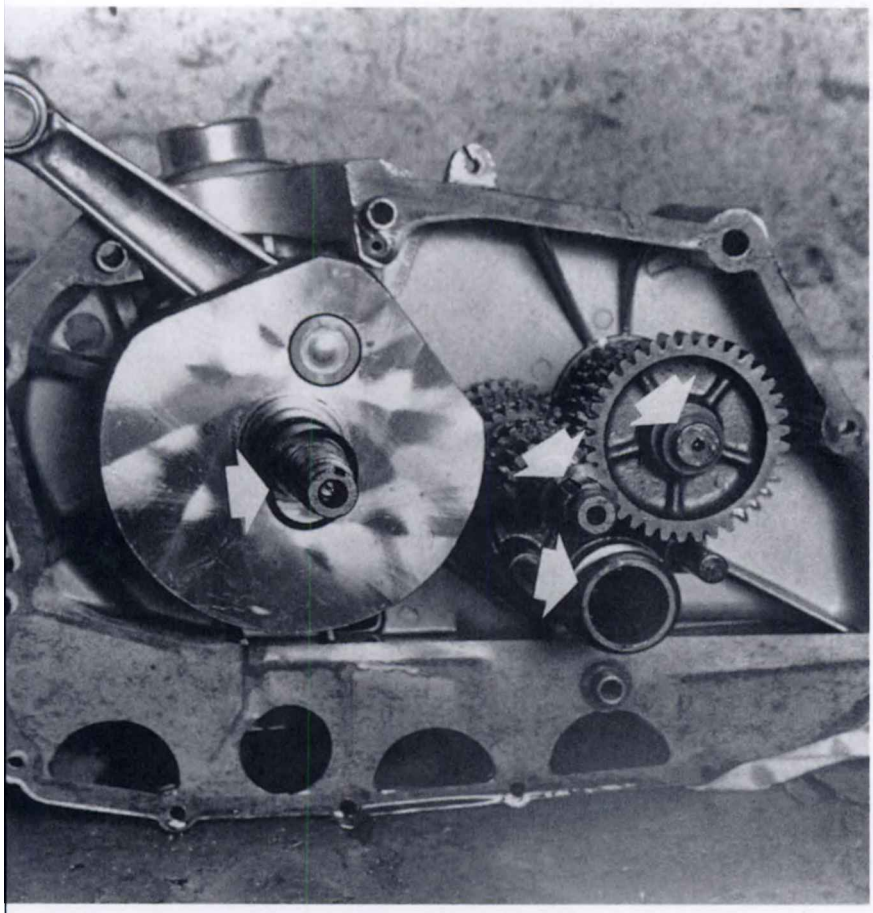
On reassembly, always ensure that new tab washers are fitted to the main engine nuts



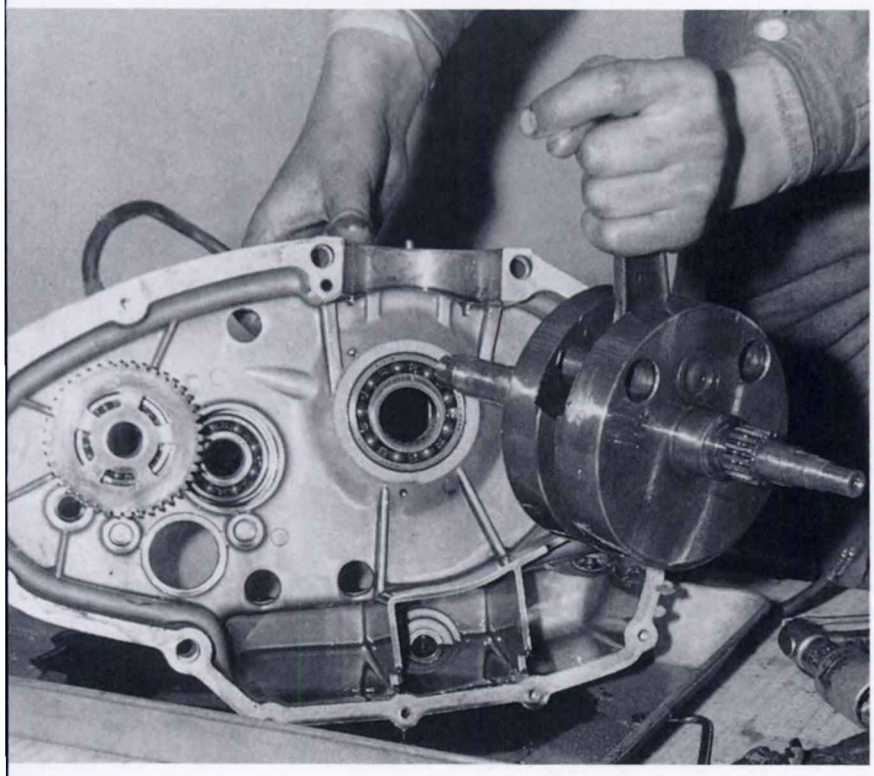
Every part of the cam drive assembly is shimmed. Make sure that shims and thrust washers are put back in the correct order



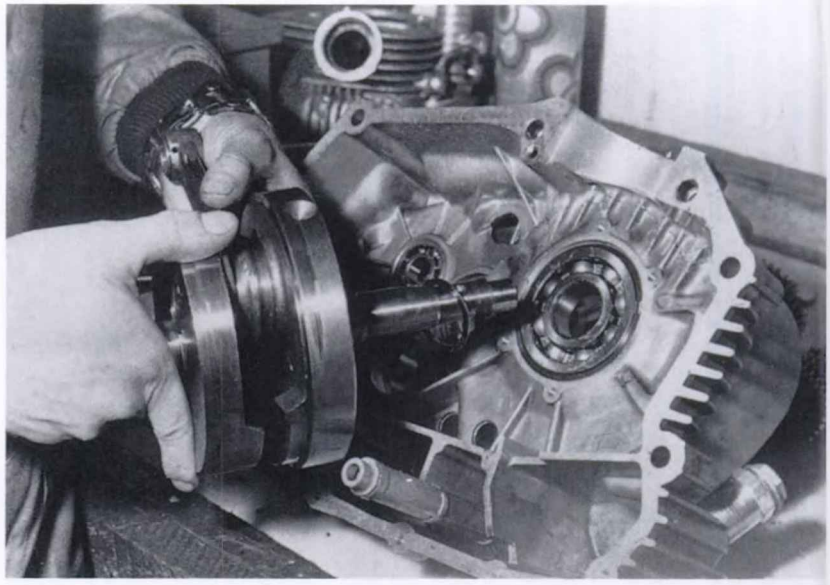
Crankcases come in matched pairs. Note the disposition of the gear cluster, crankshaft and oil filter. The example shown is from a narrowcase 350 Sebring



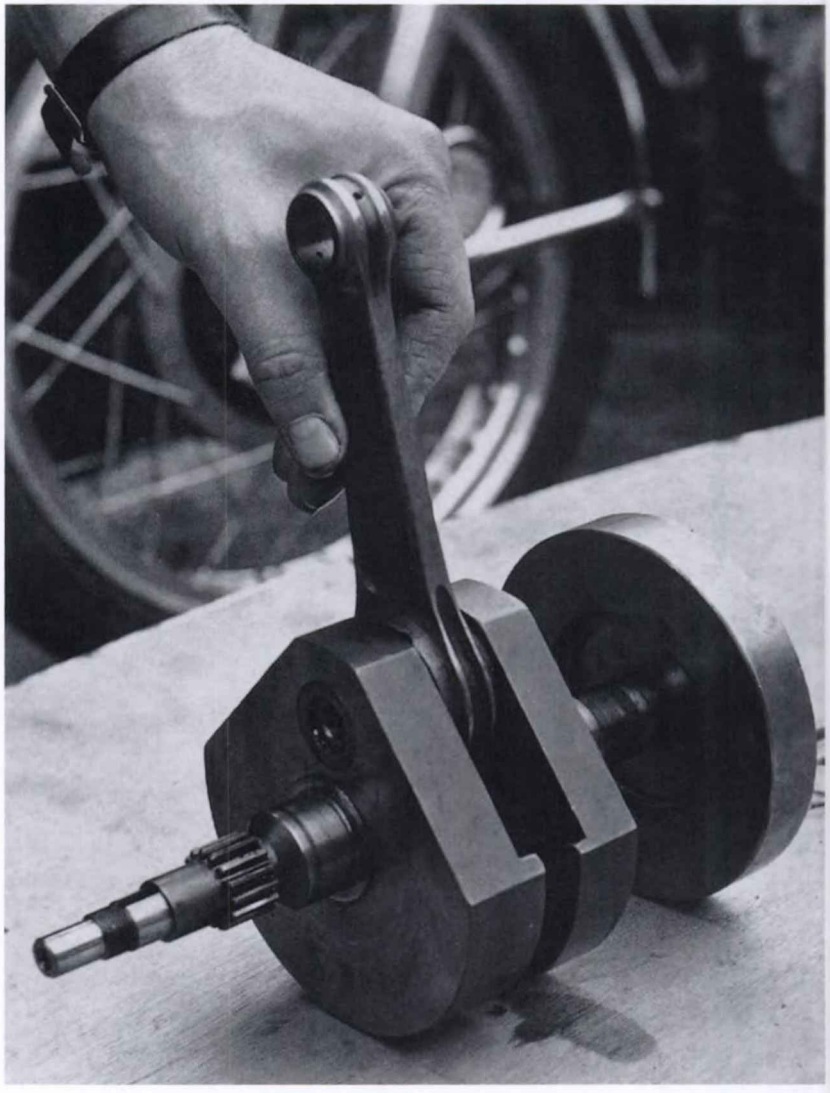
View of the crankcase internals from the opposite side. This is a widecase type (350 Desmo). Note the shims on the crankshaft, gear shafts and selector drum



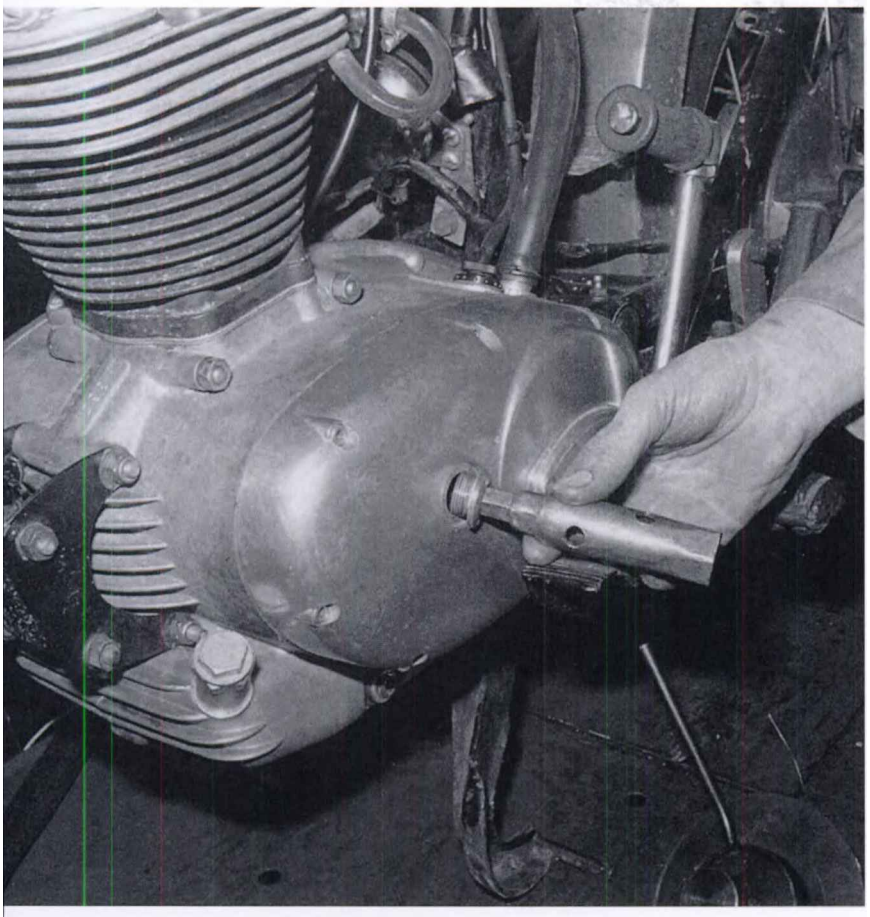
Crankshaft removal. Full-circle flywheels denote a narrowcase 250—in this case, a four-speed Diana, circa 1962



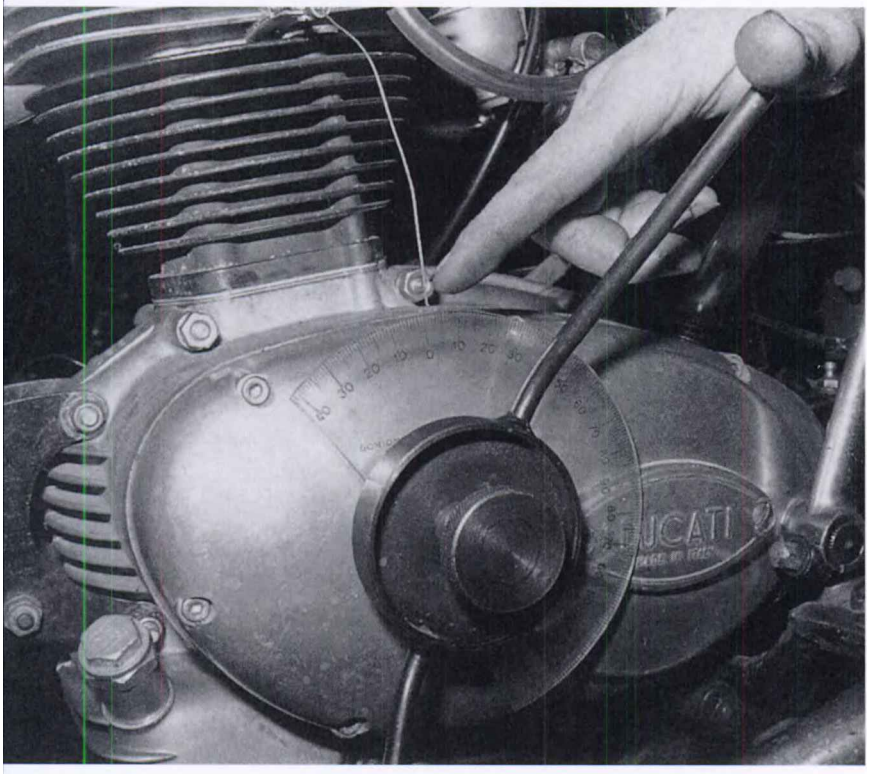
Crankshaft removal from a later widecase 250 (Desmo). The shim on the nearside needs to have zero endfloat, but with the crankshaft spinning freely



Big-end wear should not be 'felt' as shown. Rather the crankshaft needs splitting and each roller inspecting individually for signs of flaking



When the engine has been reassembled, it is essential that the ignition timing is spot on. The hexagonal plug on the primary cover can be removed to allow the fitting of a degree disc



Rig up a piece of wire on a suitable bolt, as shown. This will enable you to set the correct timing for your engine. Models with electronic ignition can be set with a timing strobe

5 Transmission

The transmission system conveys power from the engine to the rear wheel and also provides a means of adjusting the speed of the engine to suit the speed required by the road wheels.

This chapter covers all the mechanical components from the crankshaft to the rear wheel sprocket, so it takes in one chain, two sprockets, a pair of primary drive gears, a clutch and a set of gears. Included with the gears are the selector mechanism, kickstart and clutch operating parts. All Ducati singles have full unit-construction engine units. This means that the gearbox, clutch and primary drive assemblies are all contained within the same castings as the engine components—and lubricated by the same oil.

Primary drive

All the Ducati singles covered by this book feature geared primary drive, and unlike the specialized Bologna racers, such as the Gran Sport, Formula 3 and Grand Prix, the standard production roadster models feature helical rather than straight-cut gears. This is primarily in the interest of quietness. The straight-cut variety would provide around 5 per cent extra power, but would be much noisier in operation.

On all models the geared primary drive is long lasting—provided, of course, that any previous owner has observed a few vital rules and has not been ham-fisted. Of particular importance when removing the centre clutch nut, or locking the clutch housing when the plates are removed, is the need for some form of holding tool. (The simplest and cheapest comprises two old clutch plates bolted together with a handle attached.) Unfortunately, several owners in the past have vainly attempted to prevent rotation of the clutch housing (with its primary drive gear attached) by placing a large screwdriver or similar between the cast-iron lobes—with the result that one or more of them have been broken off, ruining an expensive and otherwise serviceable clutch housing/primary drive gear assembly.

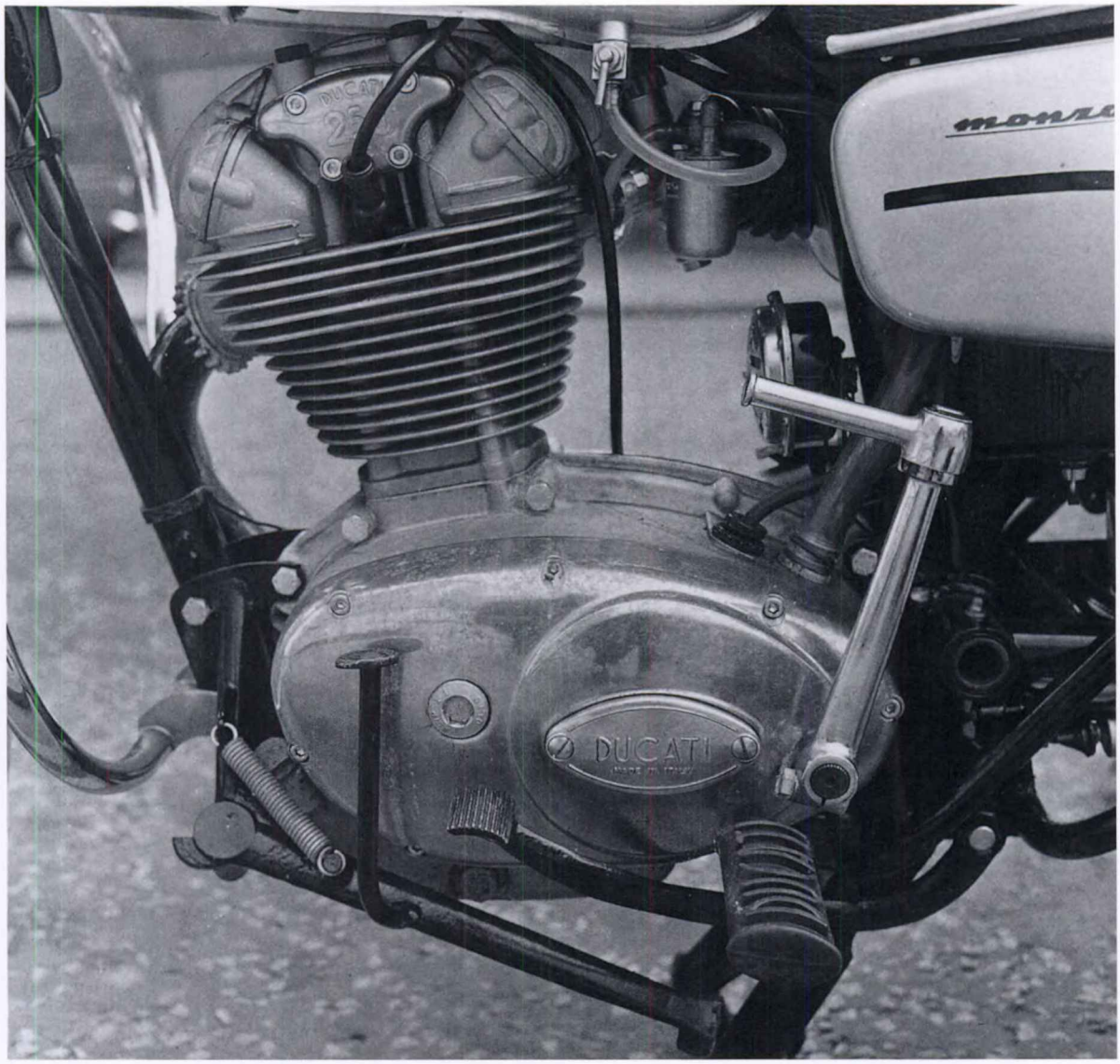
Another important piece of advice concerns the pre-1961 narrowcase ohc singles. These have a different type of clutch housing in which the support bearings are mounted in the crankcase and matched up with a shoulder which is cast integrally with the housing. This type of clutch housing has to be drawn off, making sure that it comes off centrally. Failure to do this, for example by attempting to lever it off, will ruin the housing by breaking it from the shoulder at the rear. The models which have this type of housing are the 100/125S, 175 (all models) and 200. Except for the 175, the others were modified for the 1961 production year with the much improved version which blessed all other four-stroke Ducati singles that followed. In this, the troublesome shoulder was deleted and the two support bearings transferred to the housing itself. This modification means that the clutch housing is much easier to remove in the event of a stripdown.

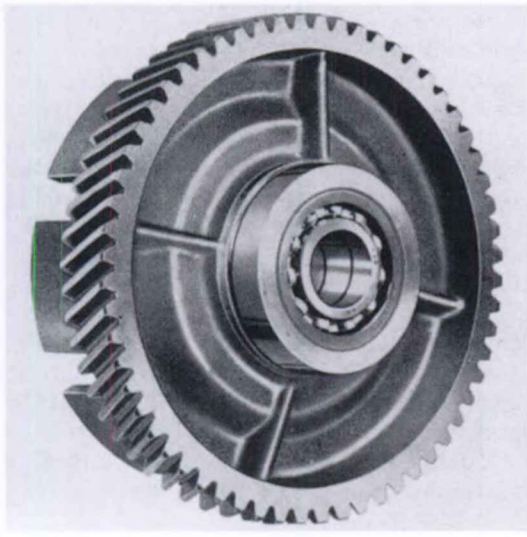
The pair of primary drive gears which comprise the clutch housing and the separate gear on the crankshaft are manufactured in different materials. Whereas the clutch gear is of cast-iron, brittle and potentially prone to wear at a faster rate, that on the crankshaft is manufactured in hardened steel and is certain to outlast the life of the machine.

Ducati offered a range of oversize front gears, in 0.02, 0.04, 0.06, 0.08 and 1 mm sizes so that an owner could purchase a gear to compensate for wear which had taken place on the large clutch gear. However, in practice, it is unlikely that you will find this necessary. Obviously, with some engines now having covered high mileages, this pattern is beginning to change and the option of oversize gears means that you do not automatically have to buy a new set of primary gears if your clutch housing teeth are showing signs of wear.

On the two-stroke models, the primary drive (and clutch) is basically the same as the post-1960 four-stroke machines, the only real difference being a phosphor-bronze bush in the place of the two bearings on the 50 and 100 models of the 1960s. The 125s of the mid-1970s reverted to the twin ball races as used on the four-strokes.

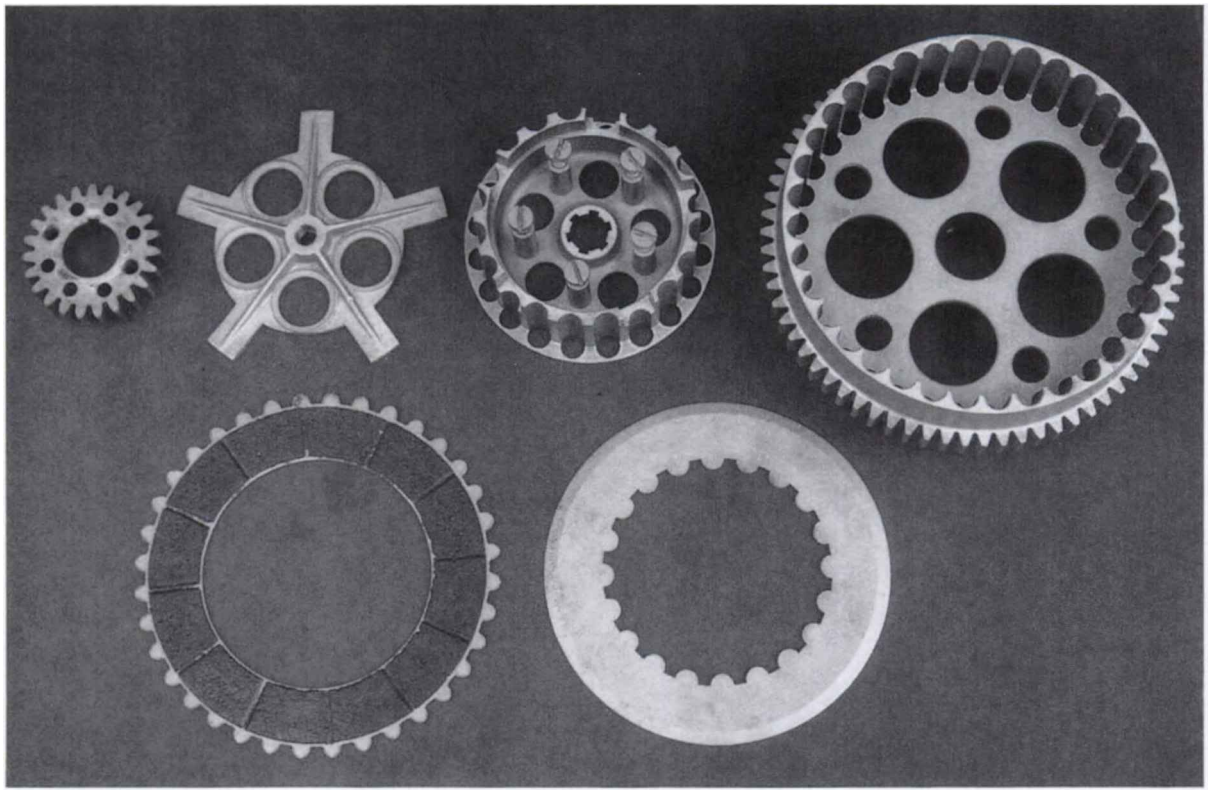
For the various ratios of the primary drive gears refer to Appendix 11.





ABOVE *Nearside view of narrowcase 250 Monza engine, showing primary drive cover to advantage. All Ducati singles have a gear-driven primary drive. The production roadsters feature helical-cut gears in the interest of quietness*

LEFT *Clutch housing of the type used on the post-1960 overhead-cam models. It is manufactured from cast-iron and is very brittle*



Clutch plates

The main plates are the plain and friction ones which take the vast majority of the drive, but there is also the pressure plate (plain) to clamp the clutch together. The numbers of the first two depend on the power to be transmitted, and some clutches (only in the two-stroke models) employ more than one type of friction plate. Therefore, this must be taken into consideration on assembly.

The ohc range began with six friction plates grooved to the clutch housing and five plain plates which moved on the clutch centre. This number of plates was continued throughout the production life of the following four-stroke models: 100, 125, 160, 175 and 200.

When the first of the 250 cc models was introduced in the spring of 1961, the Bologna factory engineers updated the clutch by incorporating one more of both the friction and plain plates, making totals of seven and six respectively. This set-up was to prove extremely reliable, being used on all subsequent 239, 250, 350 and 450 cc models.

If you are going to replace the friction plates, I would strongly recommend that the plain steel ones be replaced too, particularly if the machine is to be used for racing. In any case, beside inspecting the friction material, you need to carefully check that the plain plates are completely flat (laying them on plate glass is recommended) and have not suffered any blueing through overheating. Also examine the grooved tags; damaged or worn ones will affect clutch operation.

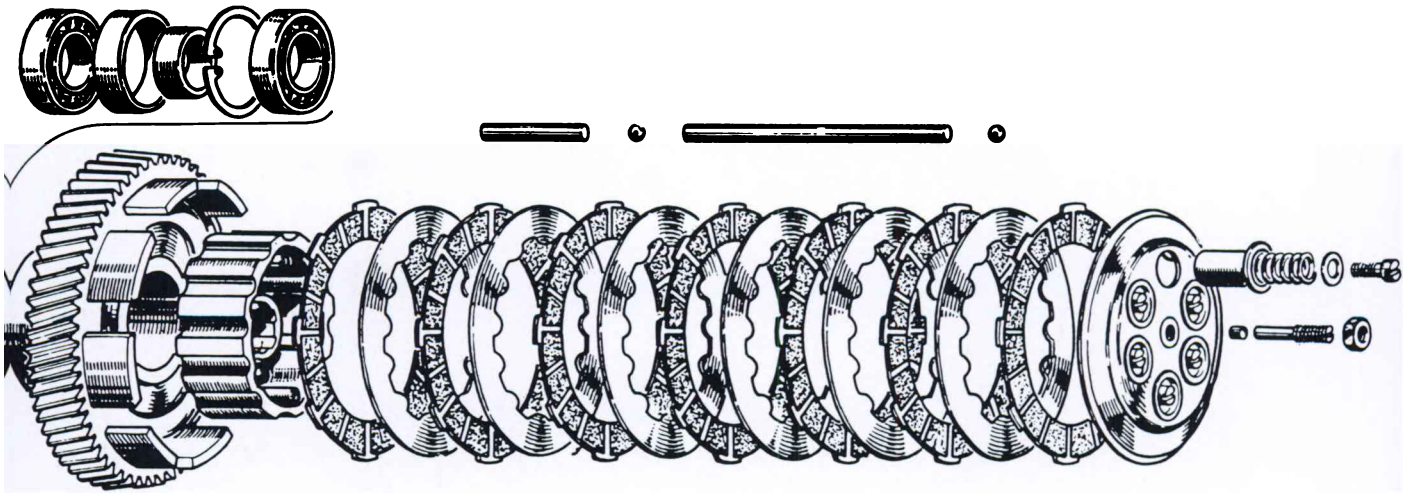
The same advice holds good for the plates of the various two-stroke models, in particular the plates of the 125 Regolarita and Six Days enduro mounts; they are likely to have been subjected to considerable abuse.

Clutch centre

The clutch centre of all Ducati models is prone to wear from the continual inward and outward movements of the grooved tag sections of the plain clutch plates. So look at this area very carefully. Light wear marks can be removed with emery paper, but deep marks will require a new clutch centre. Failure to take action will lead to an overstiff clutch action or uneven uptake of the clutch itself. Do *not* assume that by simply fitting new plates everything will be alright.

Check the fit of the centre to its spline on the clutch shaft. This must be true and square. Also, inspect the nut which holds it and, as a matter of course, fit a new lock washer.

Finally, the screw locating pegs (which hold the springs and cups) can come loose. These should be checked, and if any sign of looseness is detected, a repair can usually be carried out by dot-punching, together with a spot of weld.



ABOVE *The clutch from a 250. Essentially, all the four-strokes from 1960 onwards use this type, but those of 200 cc and below have one fewer of each plate*

LEFT *Only the pukka racing models, such as the Gran Sport, Formula 3 and Grand Prix, have special clutches like this together with straight-cut primary gears*

Clutch detail parts

These comprise the following: springs, screws, washers and cups (of which there are usually six of each), and the single adjuster and nut on the outer clutch pressure plate. Only the 50/100 two-strokes differ from this, having just six hooked springs. It is probably best simply to replace all these small components, which will not involve much expense.

Unlike many others, notably those found on British bikes of the classic era, the Ducati clutch is not adjusted by the six individual spring screws. All six should be done up tightly. Adjustment is only carried out at the pressure plate (for the pushrod assembly) or the control cable.

The springs, screws, washers and cups are the same across the four-stroke range, with the exception of the 450 which employs stronger tension springs. The 125 two-strokes (Regolarita and Six Days) use an identical set-up to the four-strokes, at least in design if not the exact components.

Clutch mechanism

This is the section which connects the clutch cable to the pressure plate and includes the clutch pushrod assembly.

All the four-stroke models have a single lever system to move the pushrod. On the narrowcase models the clutch cable enters the crankcase just inboard of the gear selector box and is retained at the base by a solderless nipple. This means that access is only possible by removing the selector box assembly (held in place by six allen screws). The widecase models have a longer clutch operating arm at the base of the cable, which means that it emerges *above* the crankcase. There is a built-in cable holder nearby, integral with the crankcase casting, and a clutch cable with a soldered-on nipple at its base, together with an adjuster which is screwed into the crankcase mount.

The 50/100 two-stroke models employ a swivel-arm and solderless nipple cable, while the later 125s use the four-stroke widecase set-up, albeit with the selector mechanism on the nearside, rather than the offside.

All, though, have some form of clutch pushrod assembly, usually comprising a series of rods, balls and rollers.

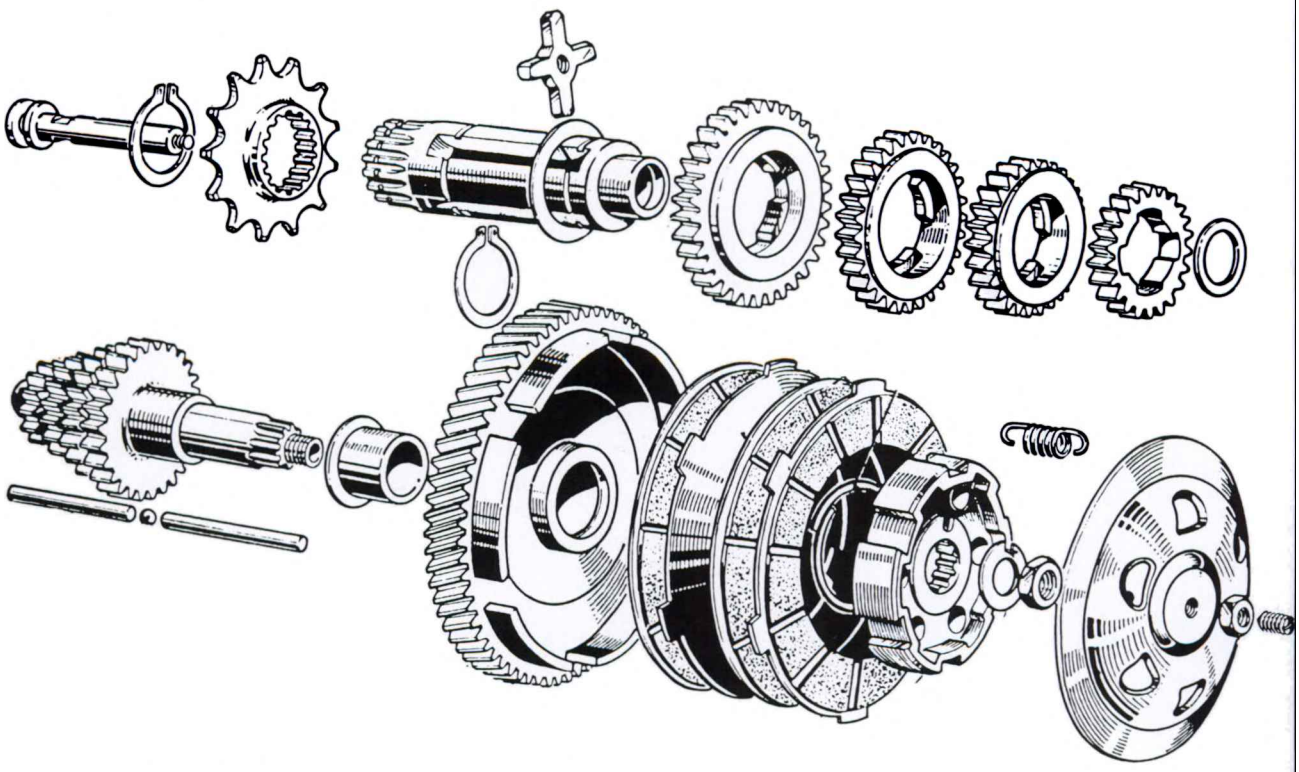
Gears, shafts and selector forks

Inside the gearbox there are two sets of toothed gear wheels of varying sizes, mounted along two parallel axes—the input (main) shaft and output (lay) shaft. Explained another way, the input shaft is the clutch shaft, while the output shaft comprises the gearbox sprocket shaft. Moving the gear lever operates selector forks inside the gearbox which choose the correct gear wheels for the desired gear.

The gear ratios, as they are called, are given in figures. These indicate how many turns of the engine are needed to give one turn of the gearbox output shaft.

Many gears, particularly those used in cars, feature helical-cut teeth for quietness of operation. However, the vast majority of motorcycles, Ducatis included, employ the straight-cut type.

On the ohc four-stroke models, the first gear on the input shaft is integral. There are three types: narrowcase, four-speed, 16 teeth; narrowcase, five-speed, 17



ABOVE *The gearbox and clutch of the four-speed 50 cc and 100 cc two-stroke models*

teeth; and widecase, all models, 15 teeth.

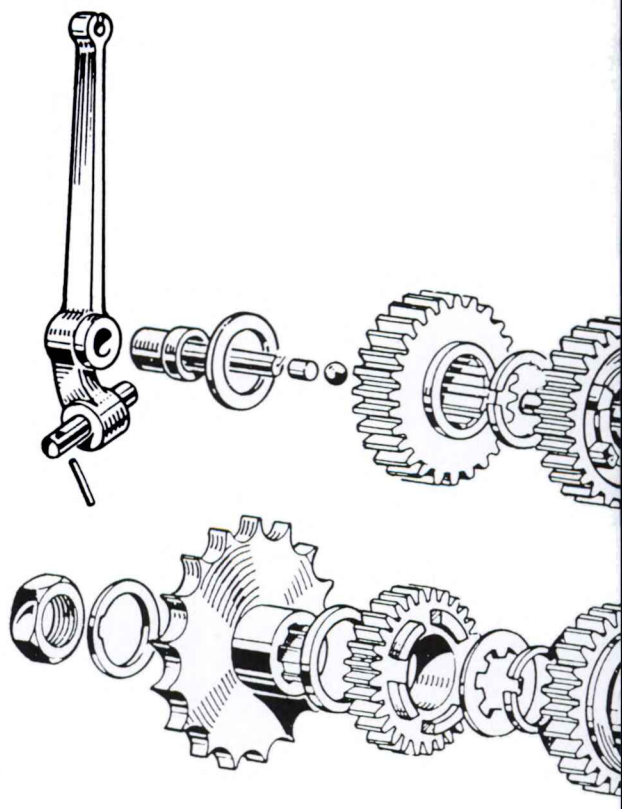
The 50 and 100 two-strokes with both three- and four-speed boxes have *all* of the gears on the input shaft as integral parts, while, like the four-strokes, the output shaft gears are all independent components.

With the six-speed 125 Regolarita and Six Days enduro bikes, Ducati chose a similar layout to its four-stroke models. This means that only the first gear of the input shaft is 'cast-in'. This, like the widecase thumpers, has 15 teeth, although it is not the same component.

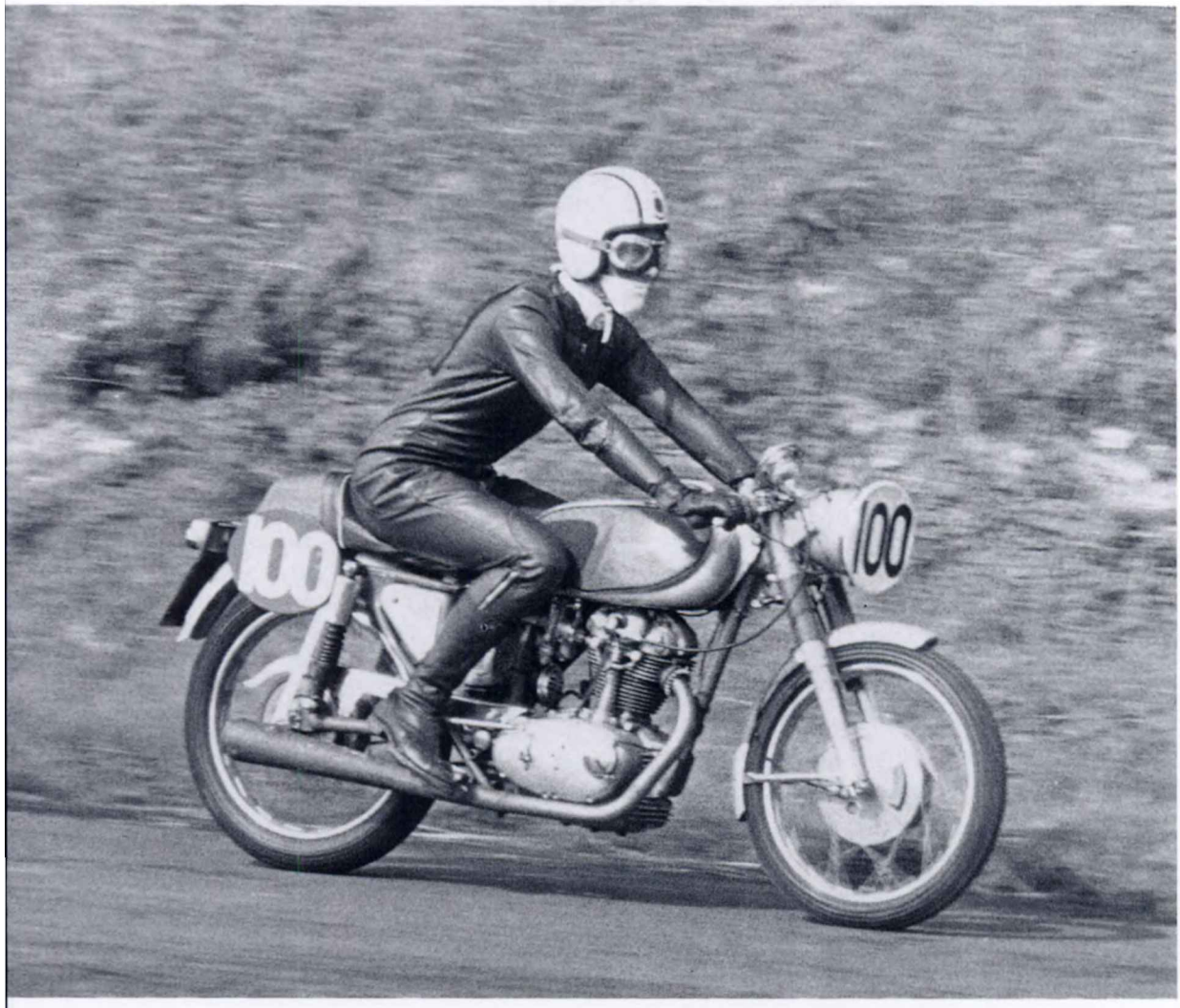
It is in the gear cluster that you will notice the largest concentration of shims, washers, bushes and bearings. However, Ducati were at least thoughtful enough, usually, to manufacture the shafts in different sizes, so provided you do not throw the shims around, you should not get into too much bother. Do not overlook the selector drum, either; there is a shim at each end.

Besides examining the actual gears for wear, also carefully inspect the working surfaces of the selector forks. If these are badly scored, they will need replacing. This could also mean that the engine has been held in gear and the continuous load may have caused damage through a heat build-up.

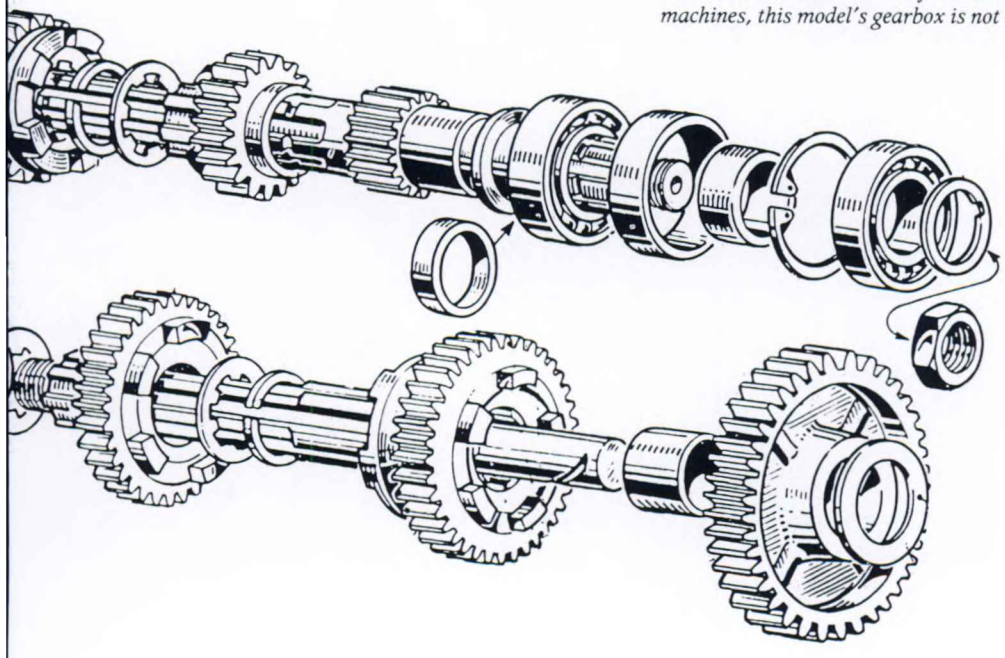
Particular gears which can cause problems are the second input and third inputs of the widecase models



With the introduction of the widecase ohc models in 1968, Ducati uprated the gearbox



ABOVE *Dave Arnold in action on his 250 Mach 1 at Cadwell Park in 1969. Like the rest of the narrowcase five-speed machines, this model's gearbox is not completely bulletproof*



(because the dogs on both mate up, they will both need replacement). Another weak point, but this time on the five-speed narrowcase box, is the fifth gear on the output shaft, which is prone to breakage. By contrast, the four-speed narrowcase gears are all virtually bulletproof.

As for the 'strokers', the only real problems are to be found on the 125 enduro bikes. The gears proved the Achilles' heel of the design when used in competition. One or more could simply explode, locking up the gearbox in the process.

On all models the circlips should be replaced as a matter of course, and when being reassembled, all the gearbox components should be liberally coated with fresh, clean oil.

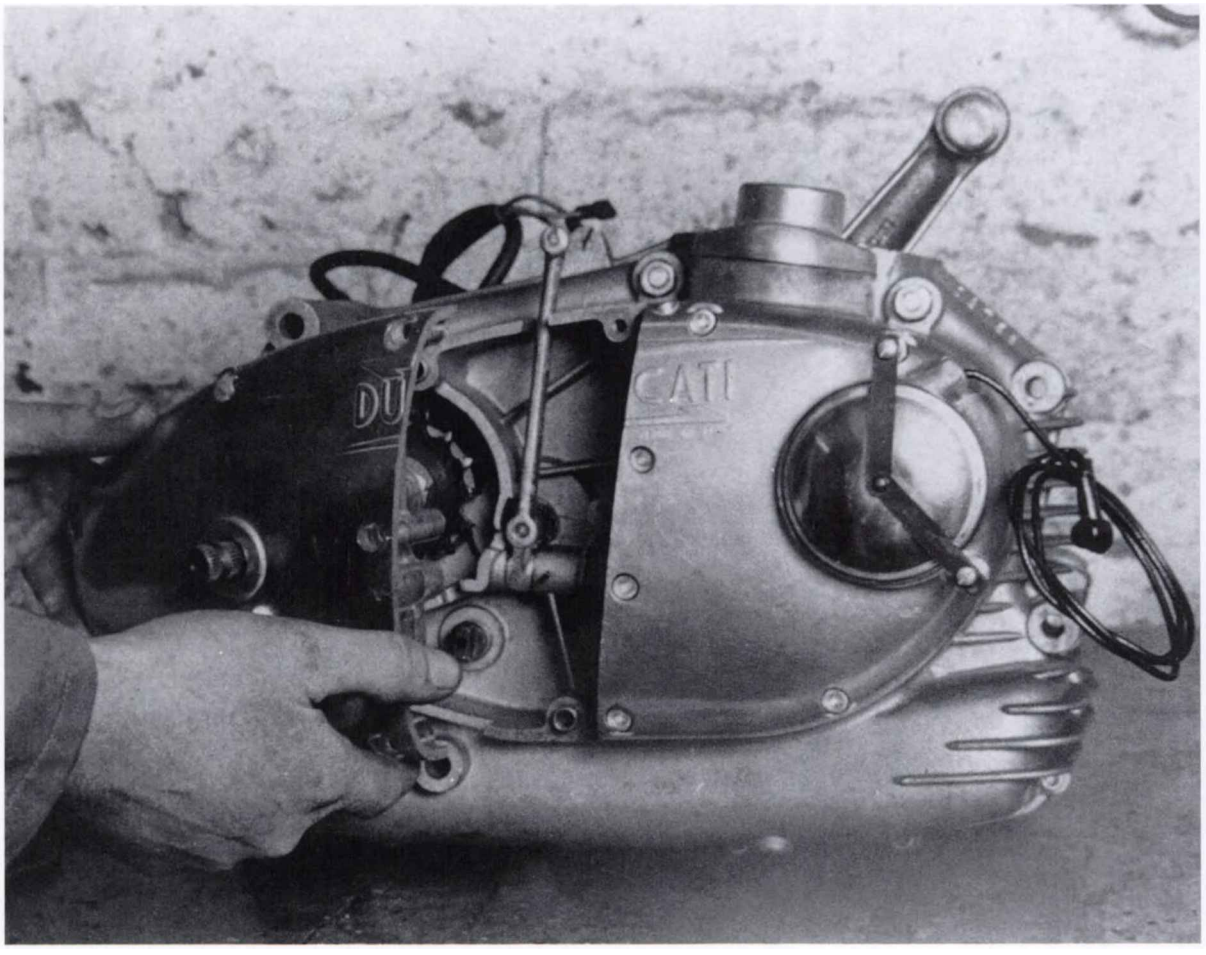
Finally, none of the gears should have any excessive back-lash, while the shaft assemblies need to be shimmed for zero endfloat, but at the same time they must spin freely.

Gearchange mechanism

On all the four-stroke 'camshaft' models (including the Desmos) and the 125 Regolarita and Six Days two-strokes there is a self-contained 'box of tricks' called the gear selector box. In theory, this is an excellent way of not only providing efficiency, but also of improving the appearance of something which through the years has tended to look like an added-on extra on many other marques.

All the parts relevant to the gear selection process are in this box, except the three selector forks and the main selector drum, which are housed in the gearbox portion of the main crankcase. The selector box is held to the rear offside of the outer crankcase by a total of six allen screws. Access to its working internals is gained by removing three slotted screws at the back and drawing off the triangular-shaped cover. There are two holes in this cover, the upper one of which contains a phosphor-bronze bush. The box itself is lubricated only by grease (no oil).

Within the selector box are two shafts, one of which is splined and mates up with the gearchange lever externally. The other shaft connects at the rear with the main selector drum in the gearbox. There are also



The rear section of the offside outer engine cover on the four-stroke models houses the gear selector box. Unless in perfect working order, this can prove a source of false neutrals—particularly when the full performance is being used

a number of plates and shims, together with two springs, the larger one of which needs to be replaced as a matter of course, as it tends to become weakened and then break.

For racing, and even fast road use, the gear selector box can sometimes prove a real problem on Ducati singles. The symptom is usually displayed by finding false neutrals rather than gears. This is nothing to do with the gears inside the main crankcase or the main selector drum in the same area. Instead, the answer is to be found in the selector box itself.

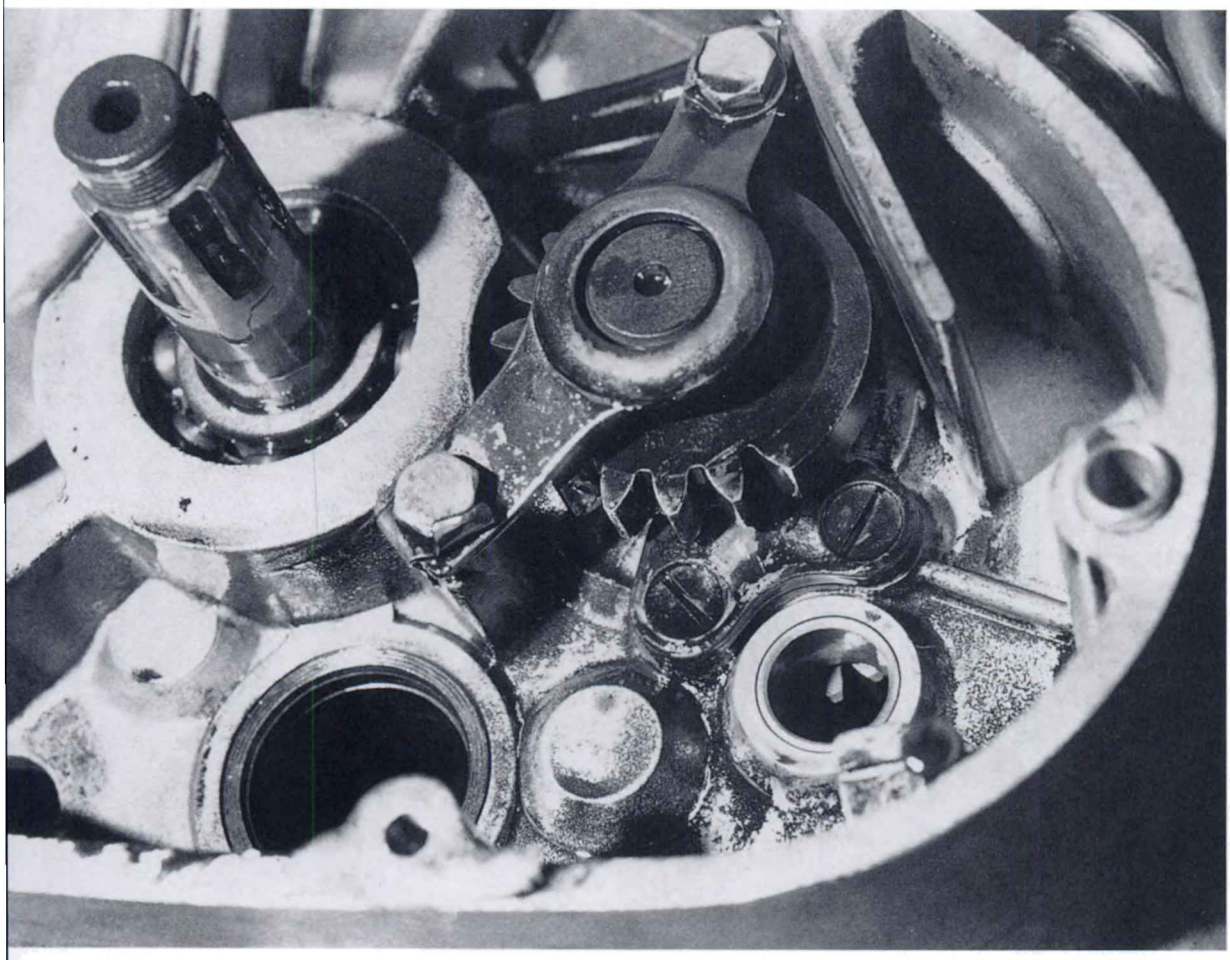
It is important, therefore, to overhaul the box as a separate unit (for example, much as you would treat the main engine components or clutch), paying special attention to all its working parts—particularly the main selector spring (already described) and the various phosphor-bronze bushes in both the outer and inner covers. There is a small cam within the selector box which can be adjusted externally by way of a lock-nut. Many owners think this will solve the problems of poor selection—it will not. All it does is to alter the angle of the gear lever!

Another source of gear selection trouble can be the various linkages in the rearset gear lever (a system of rods and clevis pins). These tend to wear, giving a sloppy action.

On narrowcase engines, several owners have modified their selector box covers by making a V-shaped cutout in the top section to provide instant access to the base of the clutch cable and the clutch operating arm. The opening is cut in such a way as to miss any of the working parts of the box itself. This modification is not recommended for street use, as the time saved to undo the six allen screws is minimal.

On the 50 and 100 two-stroke models (both with three-speed, twistgrip-operated and four-speed, foot-operated change), the selector mechanism is totally different. There is no separate self-contained unit, the parts instead being contained in the crankcase, as on many other designs. Cost was obviously the deciding factor in this rather untidy piece of work.

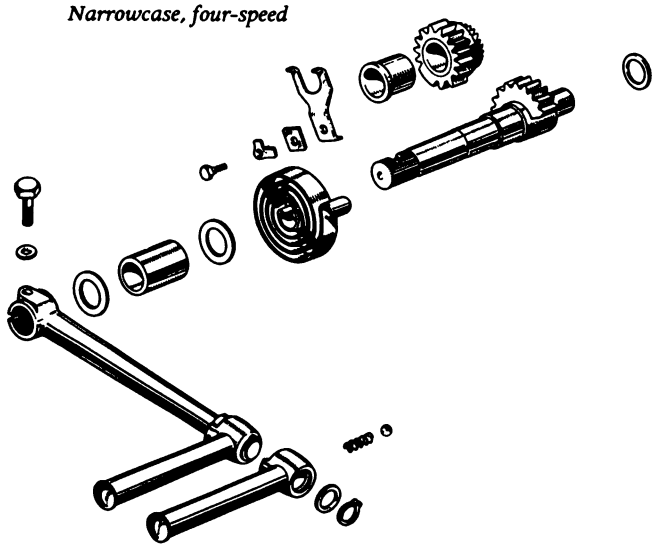
Another potential problem is the kickstart quadrant gear of the five-speed narrowcase models. It is retained by a plate and spring. Teeth can break off, making the kickstarter inoperative



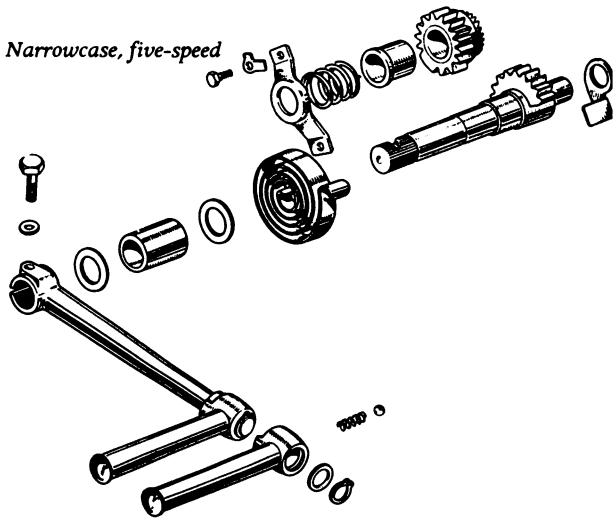
Kickstarter

For many years this was the Achilles' heel of the Ducati single in its aspiration to become a creditable street bike. All the narrowcase ohc singles manufactured up until the introduction of the widecase models in the spring of 1968 suffer, to a greater or lesser extent, from unreliability in this area. This centres around the quadrant gear that matches up to its sister gear, which is part of the kickstart shaft to which the operating lever is attached. Not only do the teeth tend to break on these gears (notably the separate quadrant), but the two leaf springs which hold the quadrant gear in place are simply not up to the task. The 350 Sebring, 250 Mach 1 and narrowcase Mark 3s are the most badly affected.

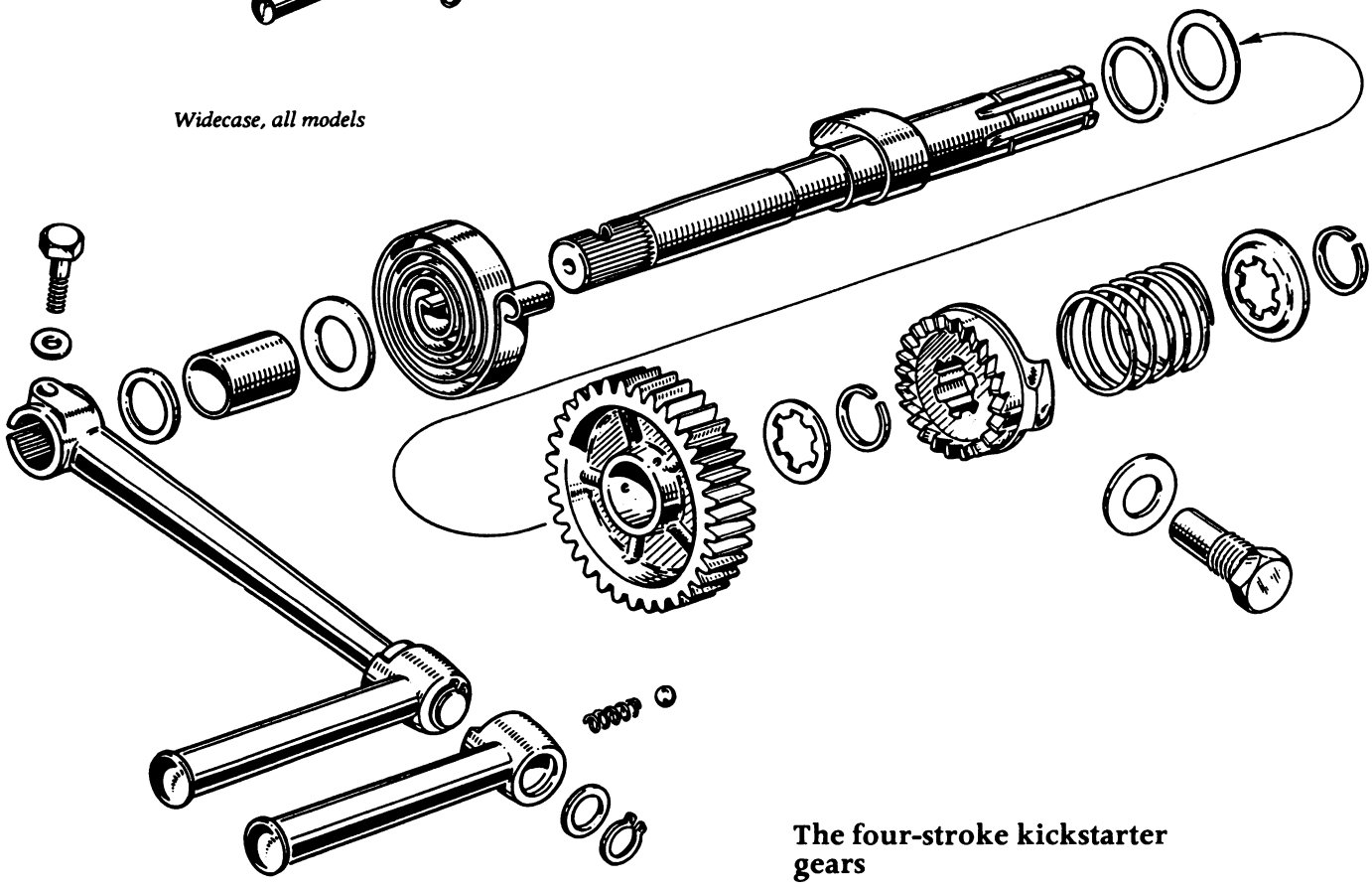
Narrowcase, four-speed



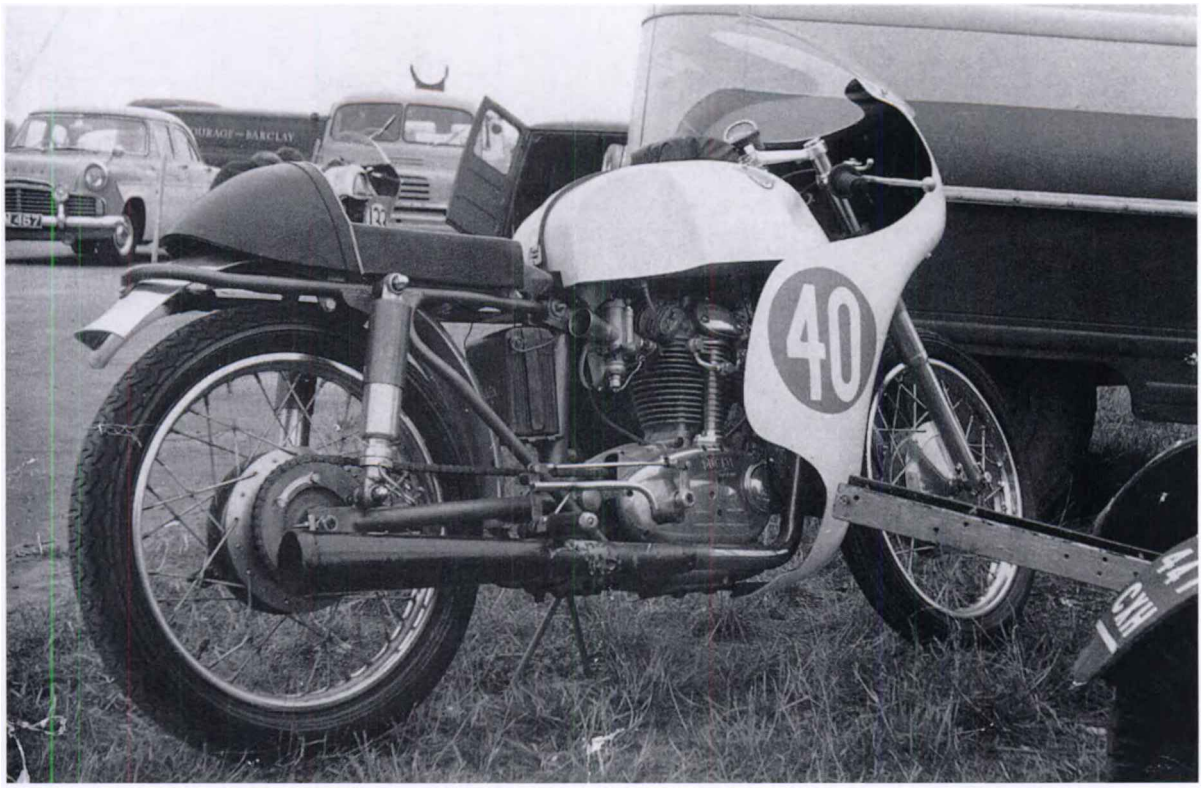
Narrowcase, five-speed



Widecase, all models



The four-stroke kickstarter gears



Ducati offered a wide range of sprockets for their camshaft models. For example, this 1963 race-kitted 250 Daytona had four alternate gearbox ratios and six for the rear wheel

Both four-speed and five-speed models suffer, but it must be said that the latter is by far the worst. By comparison, the totally redesigned system on the widecase model is the epitome of reliability. In fact, I have never known one to fail. A similar situation exists with the two-strokes. They, too, have proved trouble-free in this area.

As for the actual kickstart levers, all have a swivelling top section which folds away when not in use. The straight type, as used on all the 'cammy' singles except the Mach 1, is generally trouble-free, but check that it is not damaged where the stop is cast into the top of the shaft (where the foot section comes to a halt in the operating position). Also, the very fine thread of the securing bolt is prone to stripping.

No models, either four- or two-stroke, had rubbers fitted to the operating lever as standard equipment, but many owners have fitted one from a V-twin—it goes straight on and can help prevent injury to your leg muscle should you suffer a kick-back.

Gearbox sprocket and chain

On the four-stroke models three different sizes of final drive chain are specified. Details of these, together with lengths for the more popular models, are given in the Appendices.

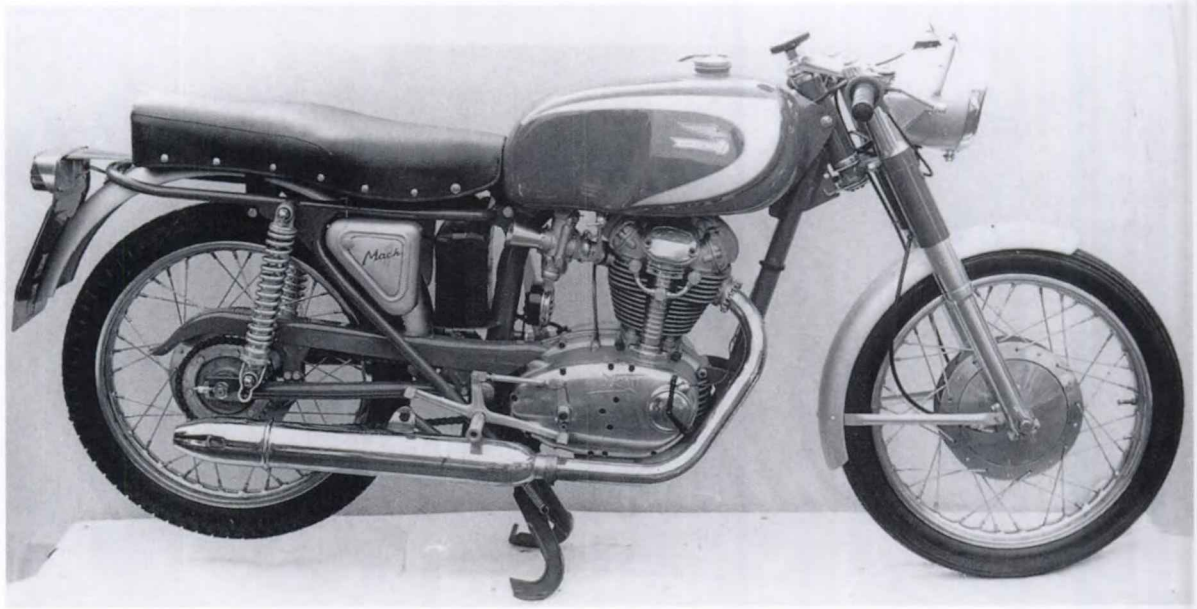
A truly vast range of alternative sprockets is listed by the factory for the majority of models, so selecting the correct ratios for your particular model and its usage is relatively easy. This also helps the racing rider who needs to change the gearing several times a season, depending upon which circuits he will use.

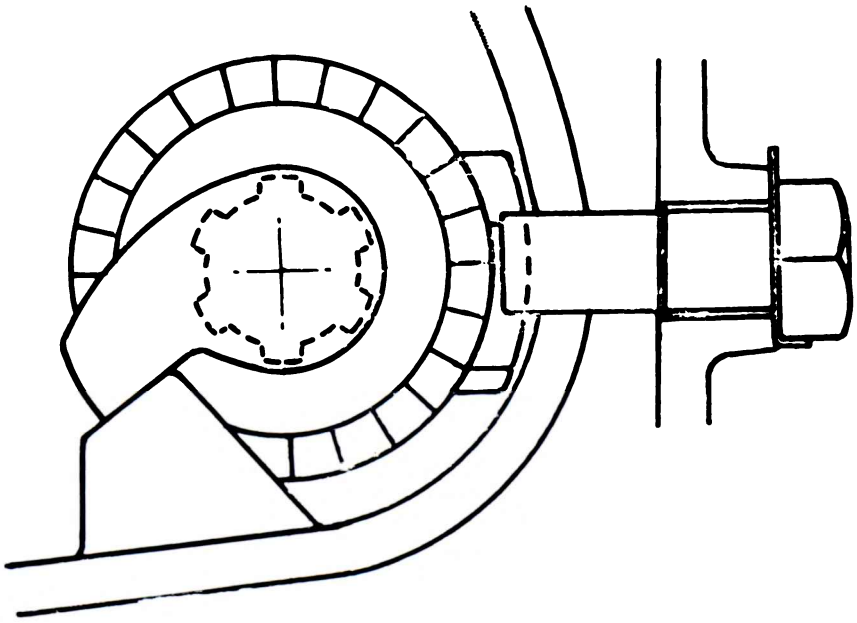
Only one gearbox sprocket nut and lockwasher are used over the entire four-stroke range, even though there are different chain sizes employed as detailed above. The two-stroke models follow a similar pattern.

In all cases, the rear chain should be replaced during any restoration and likewise the sprockets—unless they are in an unworn condition. It is not a good policy to fit either a new chain with old sprockets, or new sprockets with a less than perfect chain.

Rear wheel sprocket

The rear wheel sprocket is the third section in the final drive, after the gearbox sprocket and chain. Once again, the rule is to replace it unless its condition is 'as new'—anything less and it will be cheaper, in the long run, to buy a new one. Like the gearbox sprocket, that on the rear wheel usually comes in a number of optional sizes besides the standard fitment. For street use, at least, start with the standard ratios; experiments can come later.





LEFT *On widecase models, it is essential that the kickstart lock bolt is positioned into the crankcase, as shown, during reassembly*

FAR LEFT *As delivered, the Mach 1 featured an 18 × 40 gearbox/rear wheel sprocket ratio—the highest available—and it was usually unable to pull maximum rpm in top. For road use, 17 × 43 is much more practical*

BELOW LEFT *The 100 Cadet two-stroke, manufactured between 1964 and 1967, has a dual sprocket, which provides the option of a street or dirt ratio.*

Also, replace the three lock tabs and six bolts and nuts which hold the sprocket to the rear cush-drive holder.

The majority of Ducati rear wheel sprockets are of the simple flat type, but those on the 100, 125 and 160 ohc models are of a more complex design with four mounting shoulders at the rear which locate into the hub. These are not only more expensive, but difficult to find. Consequently, in this particular case, it may well be necessary to have the existing sprocket machined and a new toothed rim added by a specialist.

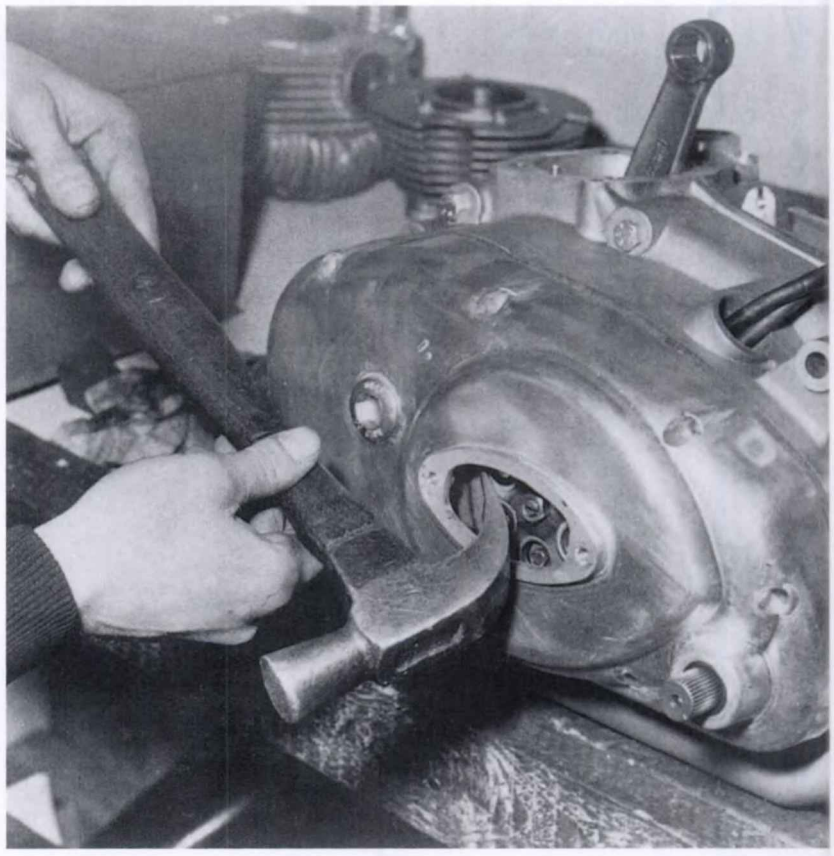
Assembly

Because of their unit-construction design, reassembly of the gearbox and clutch needs to be carried out with that of the engine as a whole.

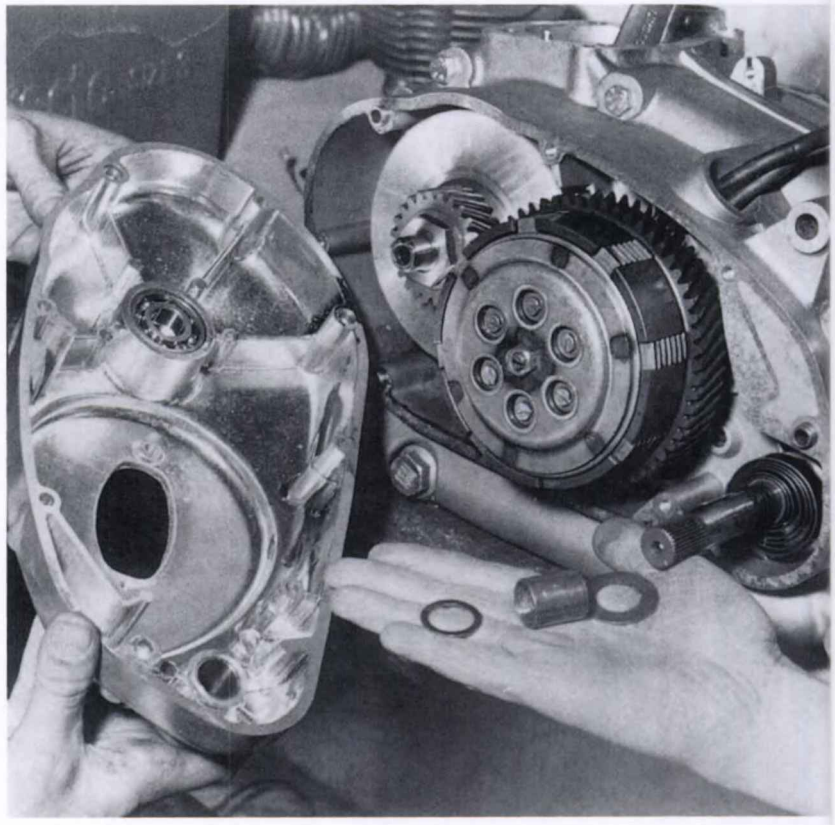
You are also advised to work to the relevant manual and check each stage for correct operation. Provided you follow this, assembly should not be too difficult. However, this assumes that you have the original shims in their correct location. As mentioned earlier, a basket case restoration will have made this impossible, and much more time and effort will be needed to achieve the desired result.

As the gearbox and clutch use the same lubricant as the engine, you will not have this additional task—as you would with a non-unit engine with separate gearbox and clutch assemblies.

Transmission strip-down

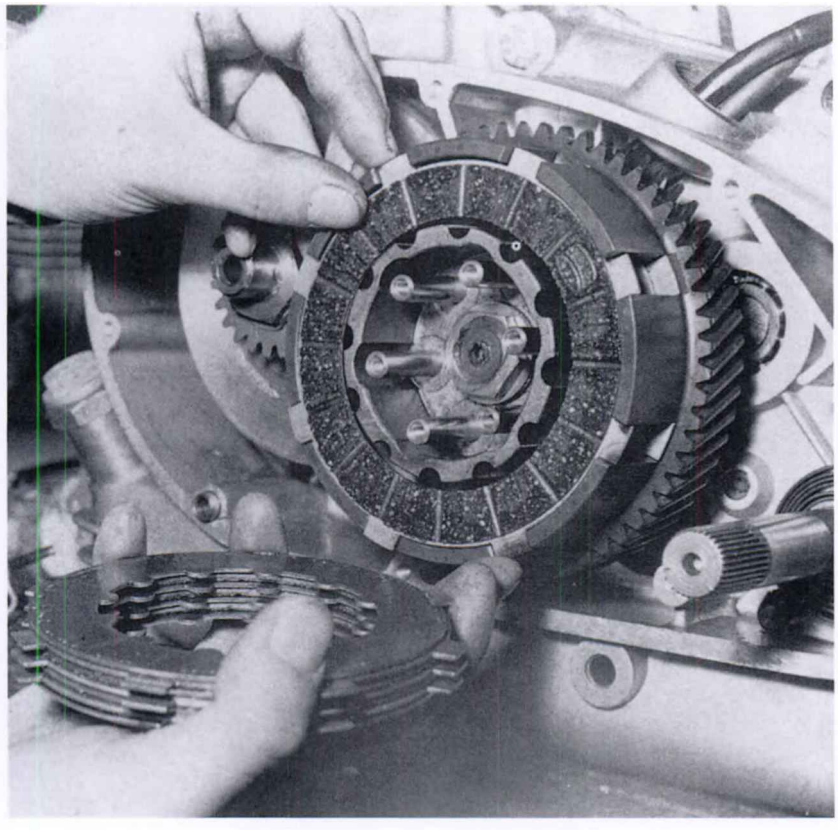


Crude, but effective. After removing the allen screws from the primary and clutch inspection covers (plus, of course, the kickstart lever), the easy way is to use a claw hammer—it actually *avoids* damage

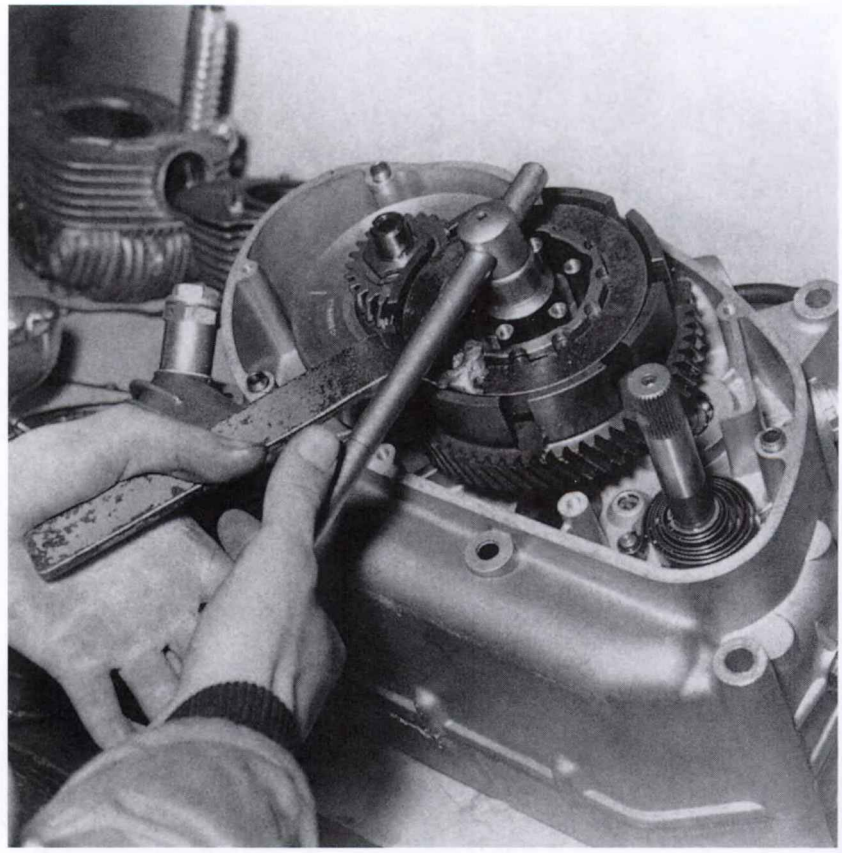


The cover will then come off, as shown, exposing the primary drive and clutch. Shims and spacers are from the kickstart shaft

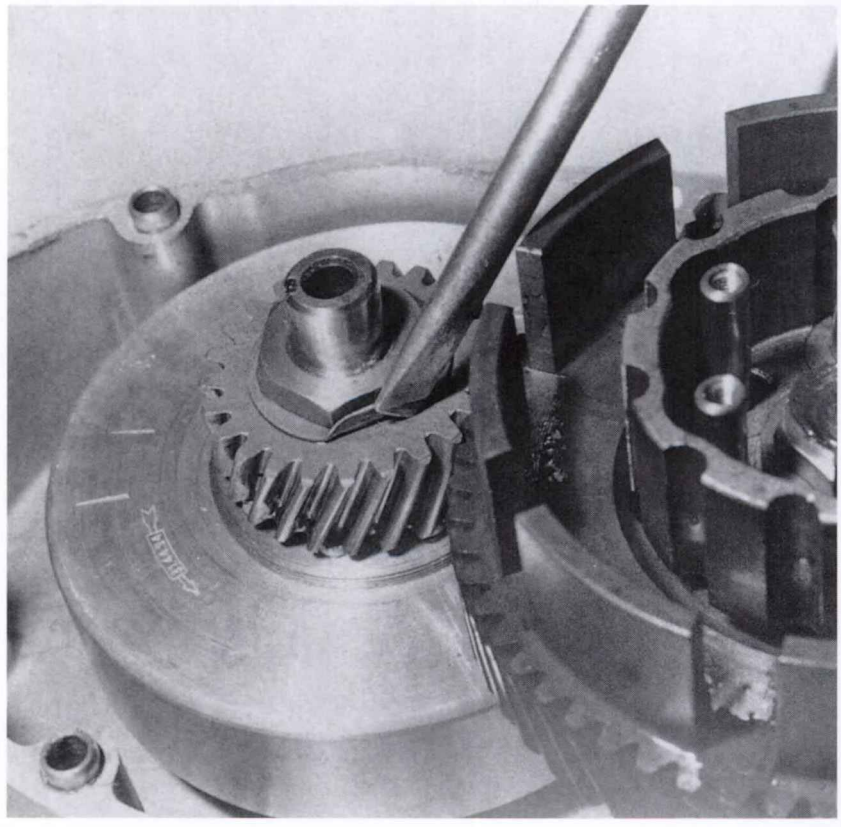
Next, undo the six clutch screws. When refitting them, make sure they are tight. Adjustment is carried out at the centre adjuster or at the handlebar



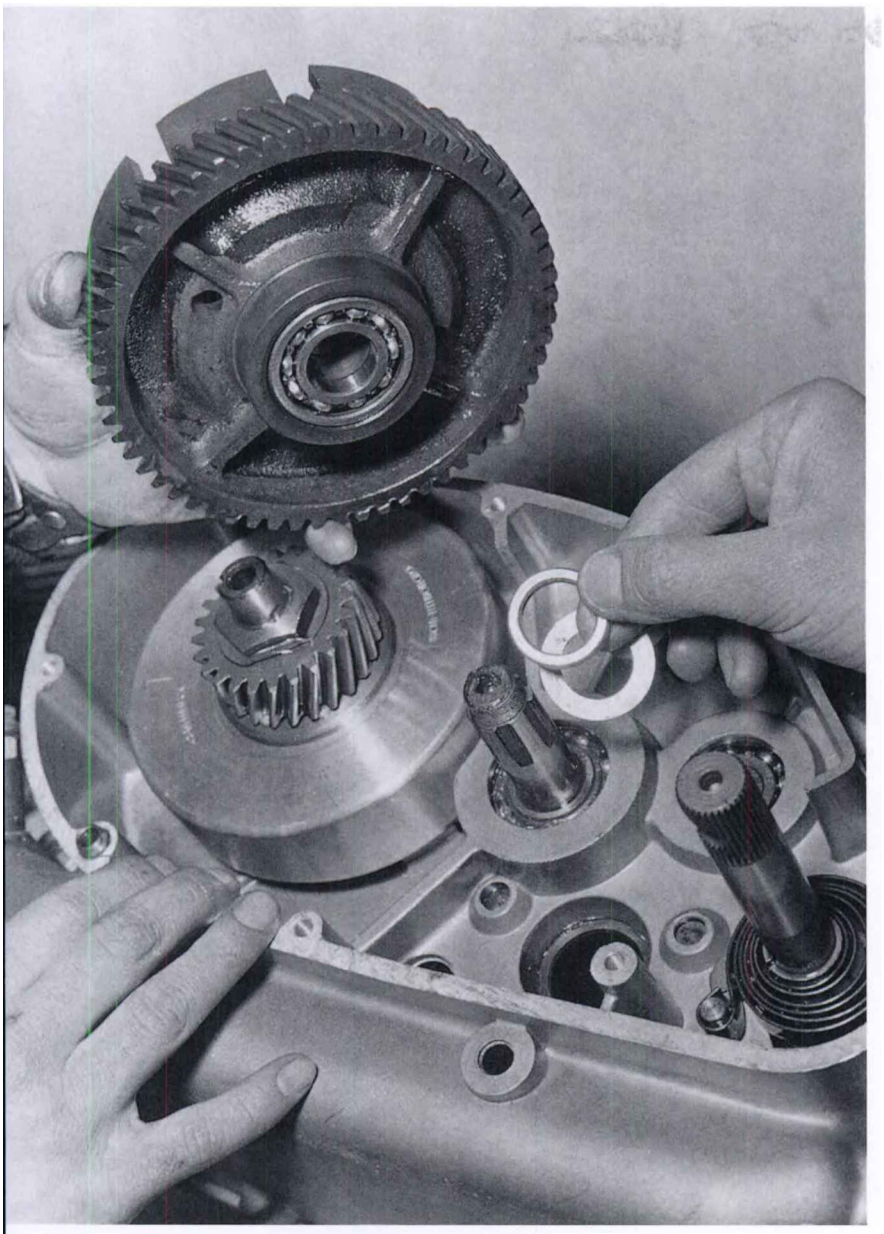
Make sure the clutch plates, both friction and plain, are in good condition and that they are in the correct sequence



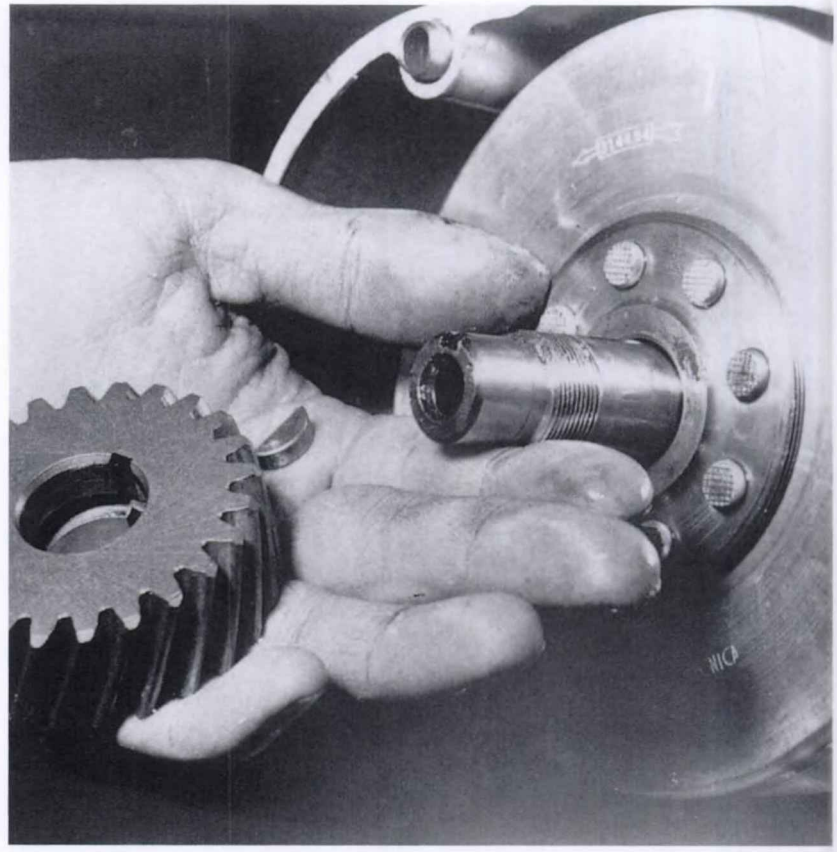
To remove the clutch centre nut, you will need a special tool—one can be fabricated from an old clutch plate if needed. Don't forget to fit a new lock-washer under the centre nut



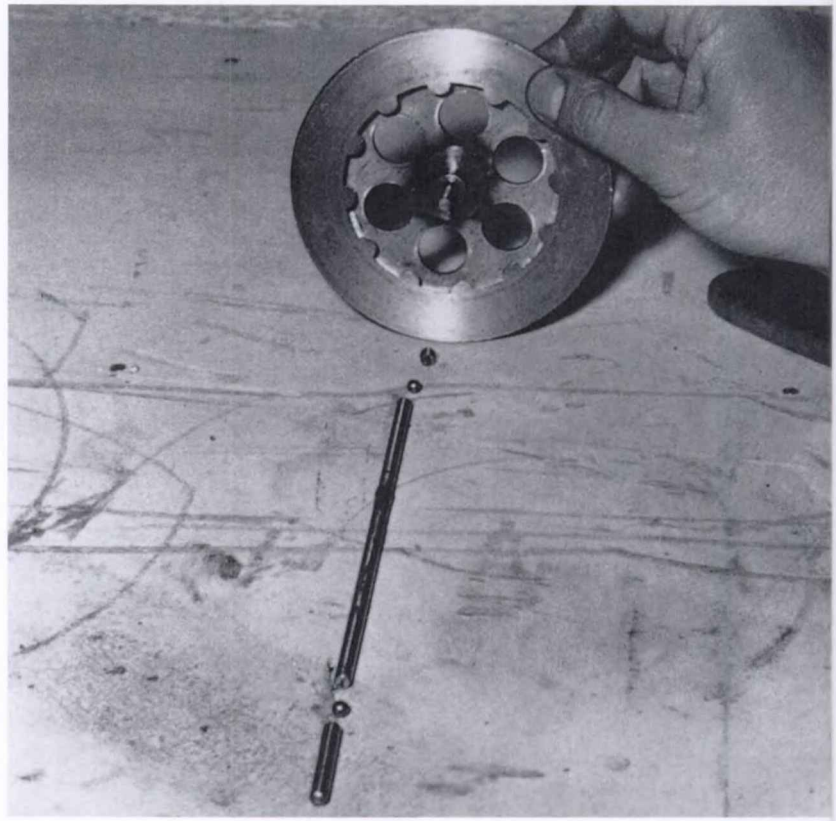
Equally important is the lock-tab on the crankshaft nut which holds the front primary drive pinion and the alternator rotor



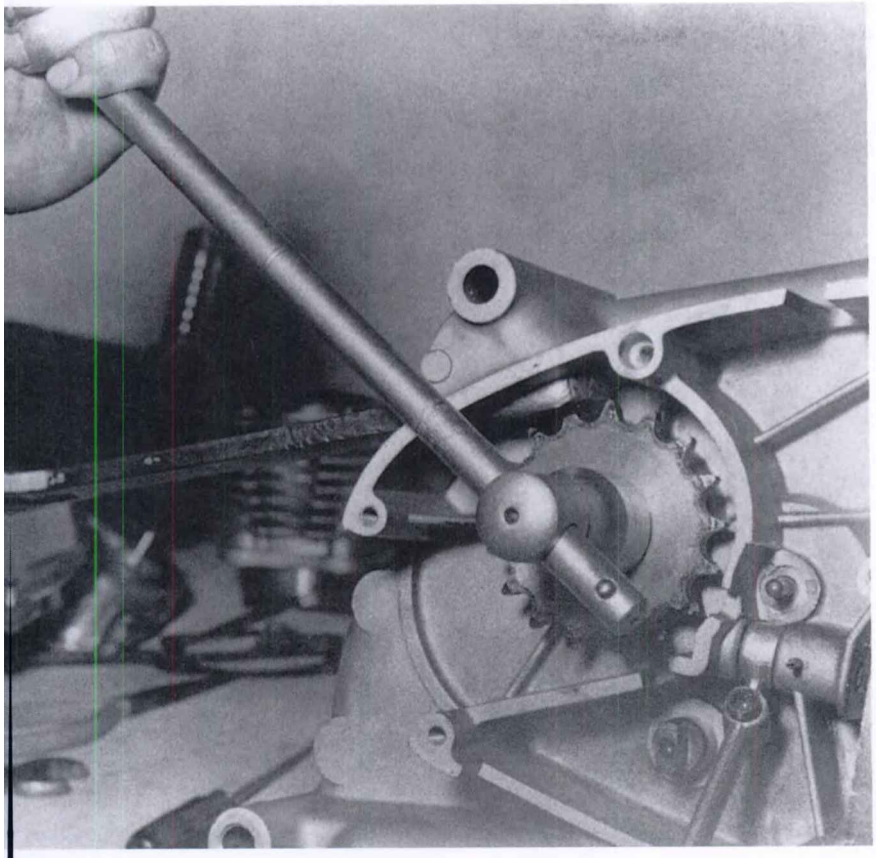
Note the position of the spacer and thrust washer at the rear of the clutch drum



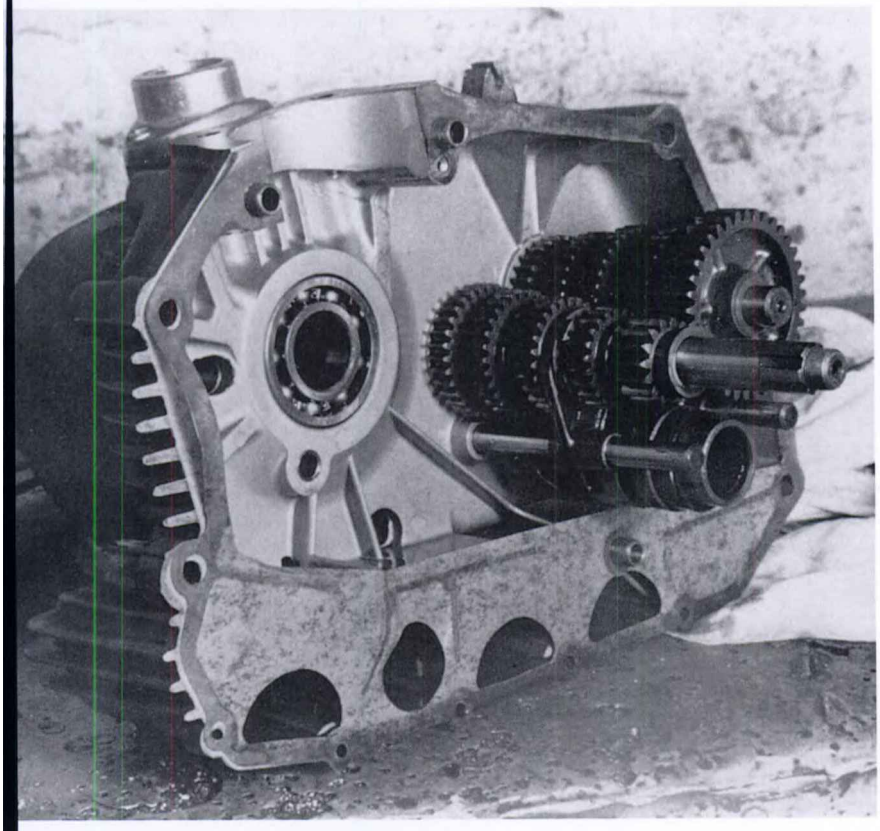
The primary drive pinion is held on the shaft by a woodruff key. Make sure that neither the key nor keyway is burred



It is vitally important to assemble the components of the clutch pushrod in the right sequence. Oil every part before reassembly



Gearbox sprocket must be locked, as shown, when removing or replacing the nut. Again, a new tab washer will be required. Alternate sprockets are available to change the gearing.



The best way, although not always the easiest, is to fit the gears as a complete assembly. Careful juggling will allow the shafts to be fitted. Make a special note of all shims and washers before removal

6 Carburettor and exhaust

These are both areas which can provide the restorer with considerable problems unless the parts are replaced. The difficulties arise because the carburettor wears and the exhaust corrodes all the time the machine is in use, so their conditions change continuously. Both affect the performance of the machine, especially the carburettor, and both are important to the final appearance of the model.

Full details of the standard carburettor types and settings are given in the Appendices.

Air filter

Surprisingly, for what many may see as largely a sporty range of motorcycles, a large variety of air filters was fitted to Ducati singles down through the years. Although some of the best known models, such as the legendary Mach 1, never had one as standard equipment. Three basic types are used: wire-mesh, paper and foam.

Of the original overhead-camshaft models, only the 175T, 175TS and 200TS (plus the 175 and 200 motocross) had air filters. These were of the small pancake type, clamped to the carburettor, with a wire-mesh element.

With the introduction, in 1961, of the new 250 range, the Monza and Diana (Daytona in Britain), saw the air filter element (still a wire-mesh pancake) transferred to a new home in the offside side panel (referred to as the air cleaner box). This was connected to the carburettor by a rubber hose. This system was to remain a feature of all the subsequent four-stroke touring models until production ceased in the mid 1970s. However, after the widecase models arrived for the 1968 season, a replaceable paper filter element was used instead of the original, and rather crude, wire-mesh type.

Meanwhile, in 1962, the on/off-road Motocross had become the Scrambler (more commonly marketed under the SCR label). Both employed a much larger filter. This remained bolted directly to the carburettor until the arrival of the widecase models, when it was transferred to a round air filter container in the same position as the touring models' air cleaner box. This housed a larger version of the tourers' paper element. The Desmo R/T of 1971–2 also used this set-up.

The two-strokes had a whole array of different filters, but whereas the wire-mesh type was replaced on the four-strokes by a paper element, the 'strokers' were given a foam component.

Luckily for restorers, the cut-off was precise. All the 50 and 100 two-strokes (1961–70) employed a wire-mesh filter, but the 125s of the mid 1970s exclusively used the foam version. Which was important given their usage as genuine off-road enduro irons.

The wire-mesh and foam filters are reusable after washing and cleaning, the former needing to be re-oiled. Paper elements have to be replaced, and it is recommended that you do this whilst carrying out the restoration.

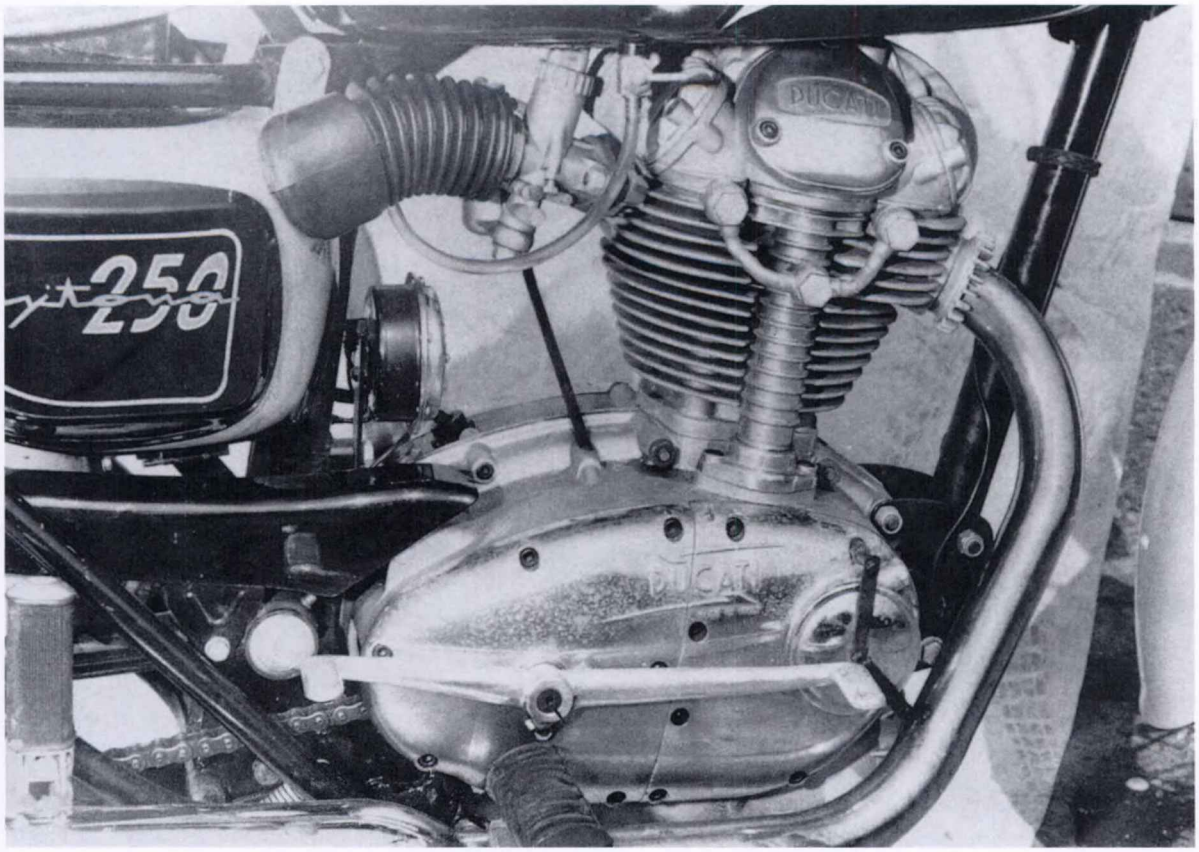
The other part which needs special mention is the rubber filter/carburettor hose. This becomes hard with age and will invariably need replacement.

Exhaust-pipe types

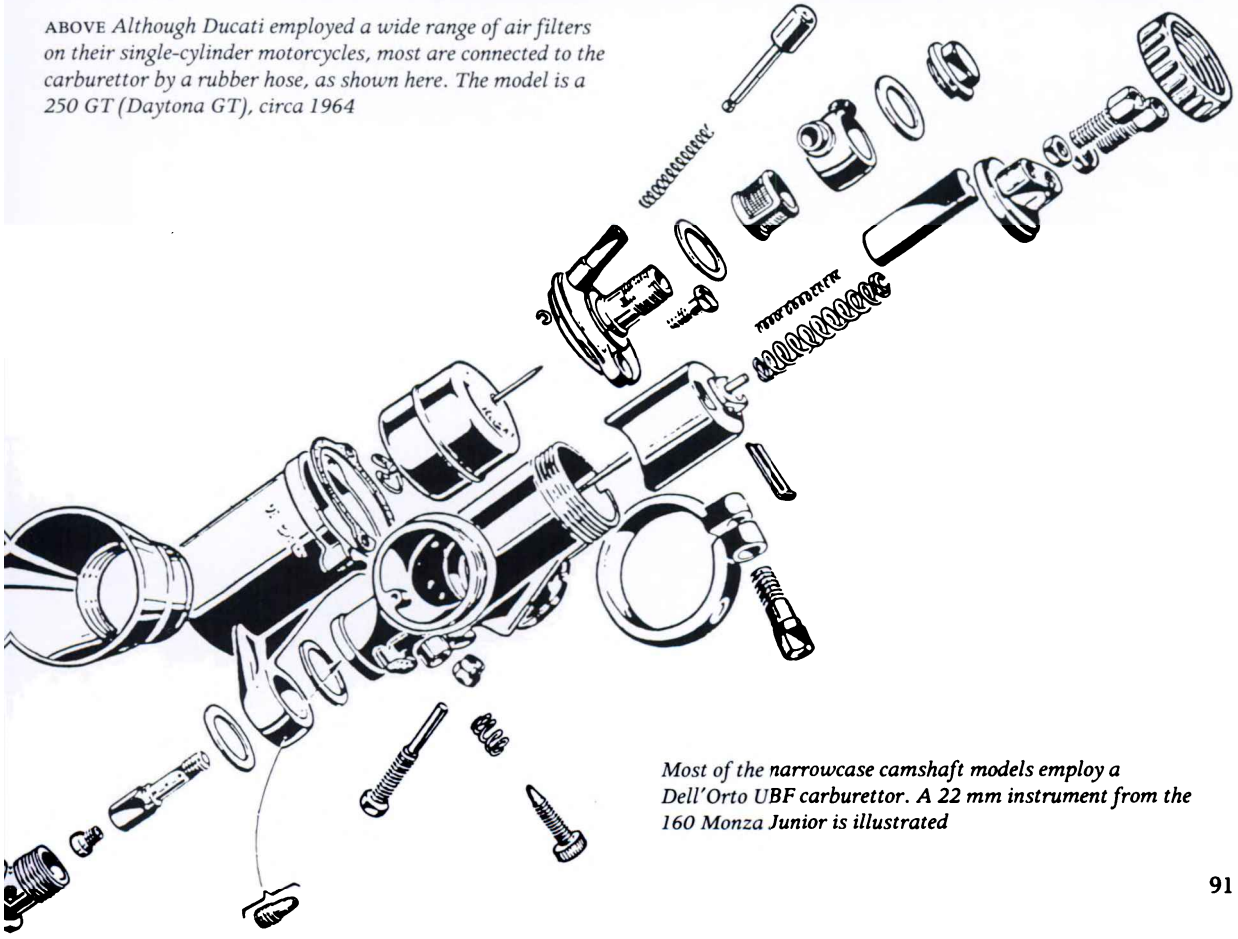
There are a good few variations of exhaust pipe, so it is important to get the correct 'factory' type, otherwise you may have problems with fit and alignment.

The majority of the ohc four-strokes—175, 200, 239 and 350 touring and sports models—use the same low-level pipe. There is also a very similar, but slightly deeper, version which is only fitted to the 450 (Mark 3, Desmo and SCR models). Another low-level type is fitted to the 100, 125 and 160. Additionally, the 175 Sport and 200 Elite employ a dual silencer assembly which uses a branched exhaust pipe. However, as this does not provide sufficient ground clearance, it has largely been replaced by the single silencer and pipe type. In any case, replacements of the branched exhaust have been unobtainable for many years.

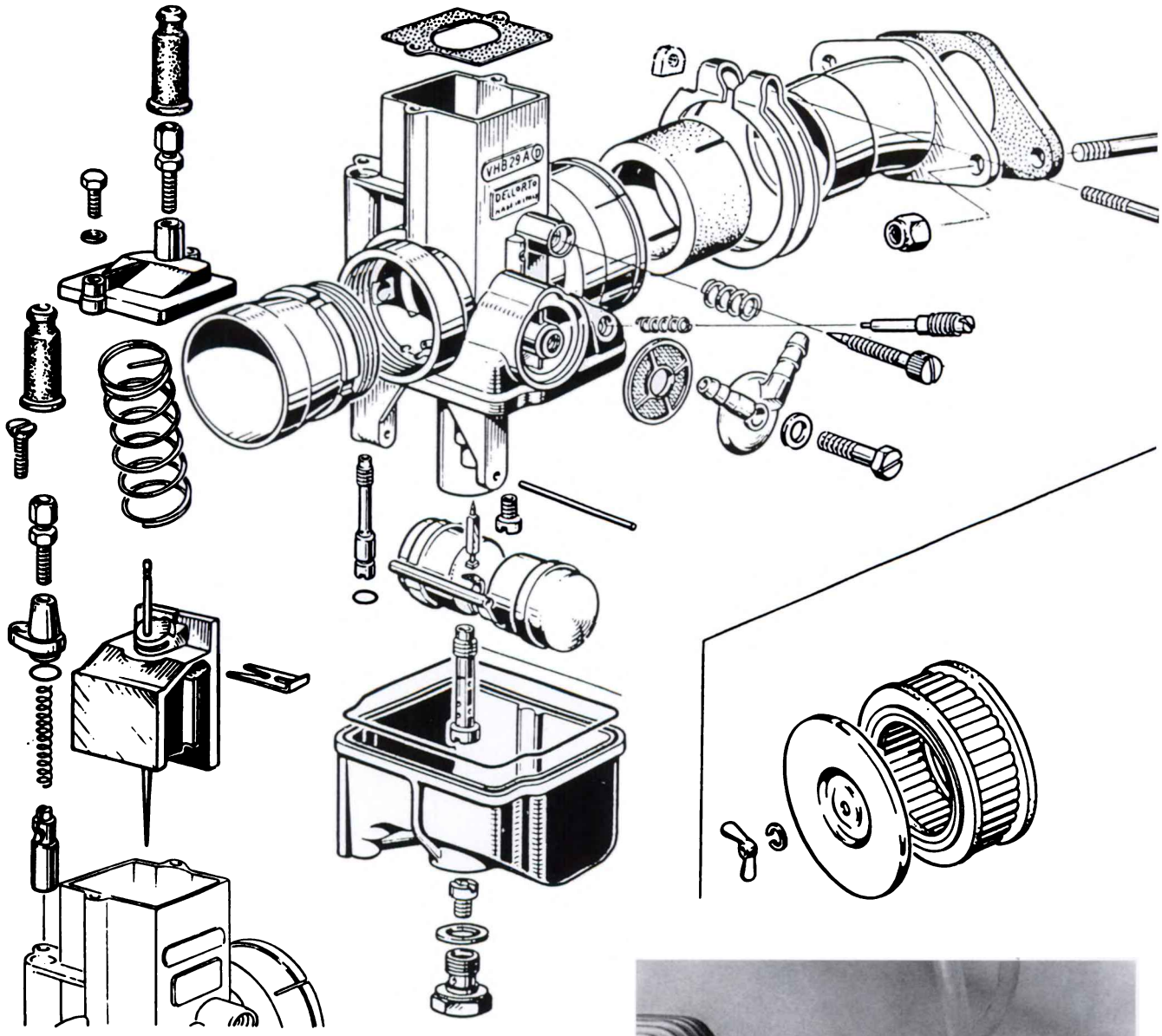
The main changes occurred in the various Motocross and Scrambler models. The first models which were marketed in 1959 and 1960 saw the standard low-level chrome pipe simply kinked up at the end. This was to allow the correct angle for the silencer.



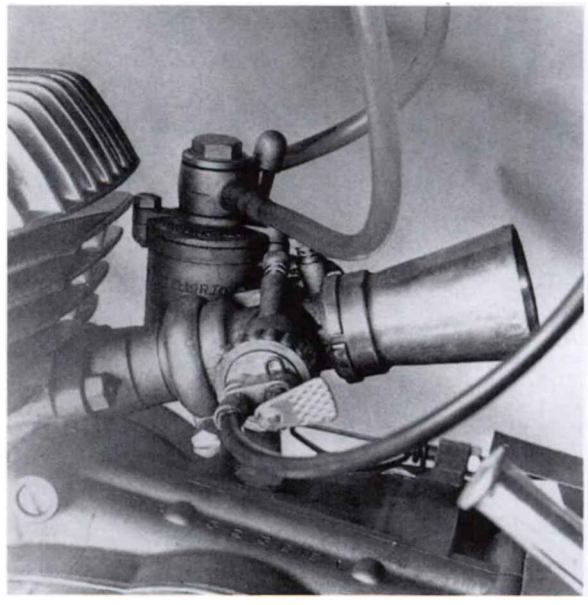
ABOVE *Although Ducati employed a wide range of air filters on their single-cylinder motorcycles, most are connected to the carburettor by a rubber hose, as shown here. The model is a 250 GT (Daytona GT), circa 1964*



Most of the narrowcase camshaft models employ a Dell'Orto UBF carburettor. A 22 mm instrument from the 160 Monza Junior is illustrated

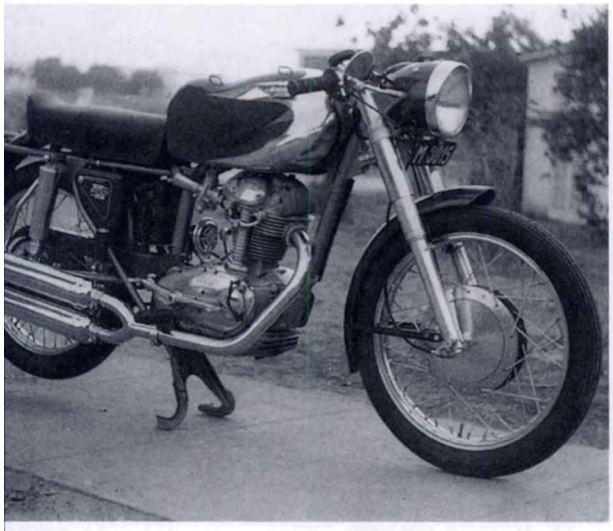


ABOVE *From the 1969 model year, the widecase ohc models are fitted with the square-slide VHB 29 carburettor, together with a disposable paper air filter element*

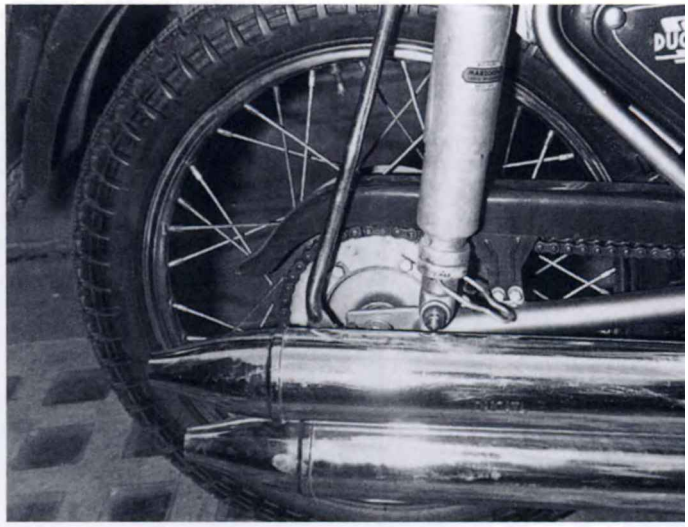


RIGHT *The two-stroke 1967 50SLI has its UAO 18S carburettor body mounted at this extreme angle*

When the 250 Scrambler was launched in 1962, mainly for Stateside off-road consumption, it had a lengthened straight-through pipe, which was hardly legal for road use (a task, none the less, which many of the bikes carried out in the early 1960s!). As governmental pressures world-wide for a cleaner and quieter environment began to take effect at the end of the 1960s, so the SCR models, with the introduction



Early models, such as the 175 Sport and 200 Elite (shown), originally had this branched exhaust pipe and double-barrel silencer. It provided poor cornering clearance, however, so most owners soon ditched the system in favour of a single Silentium



Close-up of the twin silencers. Note Marzocchi-made rear shock with polished alloy top and bottom spring covers

of the widecase versions in 1968, came to be fitted with silencers. This, in turn, meant that the dirt-styled bikes were equipped with the same exhaust pipes as their touring cousins.

Only the 450 R/T in the early 1970s bucked the trend. This employed a pukka, high-level, motocross-type straight-through pipe.

The two-strokes also used separate exhaust pipes, both low- and high-level types throughout the 1960s, but the 125 Regolarita dirt bike of 1975 changed all that. It employed a one-piece, low/high system in a matt black finish. It was also unusual in having a separate flange which was bolted on to the cylinder barrel. This, in turn, was held to the pipe assembly by two springs, so the exhaust system was flexibly mounted.

Exhaust-pipe ring

This is the large threaded ring nut which clamps the exhaust pipe on to the cylinder head (four-stroke) or cylinder barrel (two-stroke). On the four-stroke there are two types. The smaller (42 × 1.5 mm) is used on the 100, 125 and 160, whilst the larger 48 × 1.5 mm ring nut is found on all the other models from 175 to 450 inclusive. Manufactured from brass, the nut is finned and is best removed with a tool manufactured from another ring. The nut has a male thread which screws into the matching female thread in the cylinder head.

The type fitted to 50/100 two-strokes is quite different. It has a greatly reduced fin area, is manufactured in steel, and has a female thread which screws on to a male thread on the cylinder barrel. Sizes are 32 × 1.5 mm (50) and 40 × 1.5 mm (100).

It is recommended that all the exhaust ring nuts be wire-locked to prevent them working loose.

Silencer types

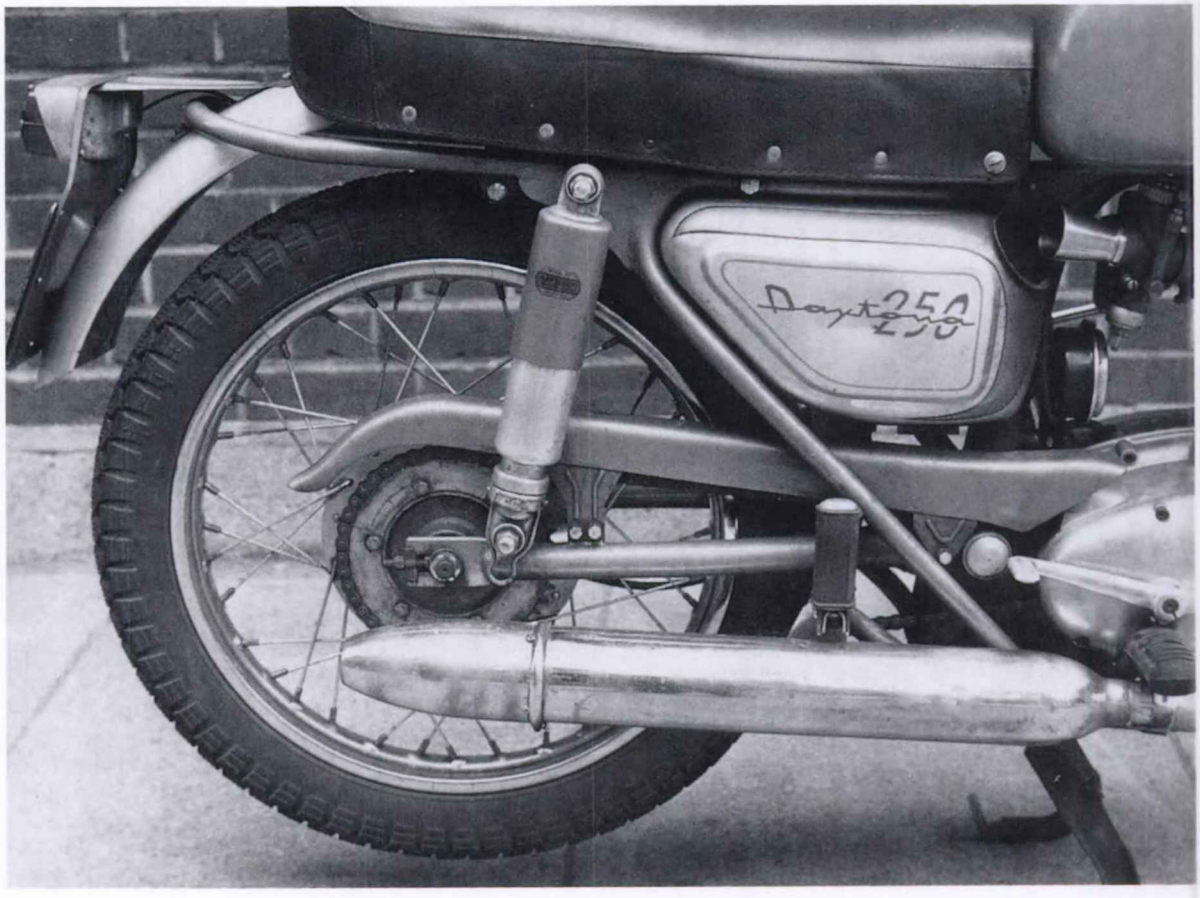
These were normally manufactured for Ducati by Silentium, but in some cases, notably the 239 Mark 3 and Desmo, the silencer was of Lafranconi origin.

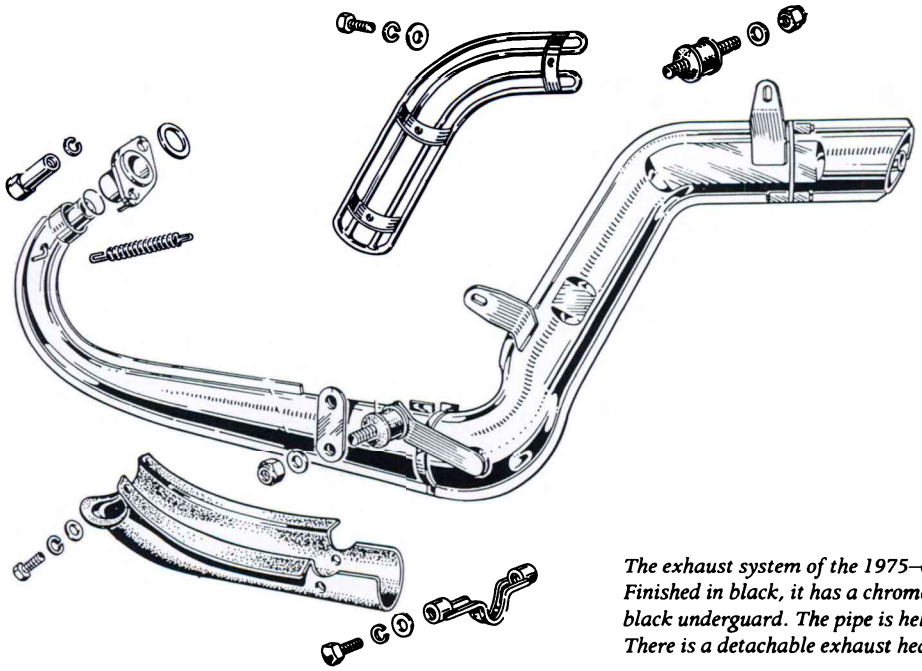
The early Silentium type—as fitted to the vast majority of narrowcase ohc models—has a detachable round end cone, which is held in position by a special circular clip. There are several different lengths and diameters of these silencers, depending on the exact model. The 1968 widecase models continued with this design, but for 1969 a new, slashed-end-cone type appeared which continued until the cessation of production in late 1974. Some of the Street Scramblers (SCRs) and all the 450 R/Ts do not have a silencer, only a straight-through pipe.

Strangely, the late 450 Mark 3 and Desmo singles, together with the majority of the 1969–74 SCRs, have a very short, stubby, slashed-end-cone Silentium.

Usually, the exhaust system (including the silencer) on Ducatis is chrome-plated. However, there are exceptions to the rule: the 125 Regolarita and Six Days two-strokes; the pure megaphone types offered on competition models such as the Gran Sport, Formula 3 and Grand Prix, the 1960 200 Motocross and US-specification Diana Mark 3 of the early to mid 1960s.


Ducati


Daytona 250



The exhaust system of the 1975–6 125 Regolarita enduro bike. Finished in black, it has a chrome-plated heat shield and a black underguard. The pipe is held into the head by springs. There is a detachable exhaust header pipe flange

Megaphone

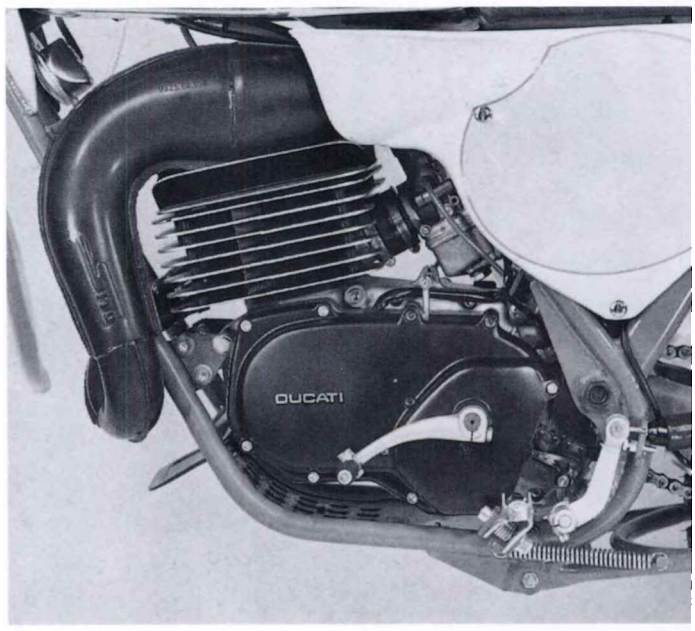
As mentioned above, these were standard equipment on the pure-bred racers, and available as optional equipment on the Diana Mark 3 for the USA. The latter, listed under the part number 0400.84.250, was for track use only. Although it is no longer available, replicas are offered by several Ducati single-cylinder parts specialists—those dealing in racing components. This works equally well on all the models from 175 to 450 inclusive. It is finished in a heat-resistant matt black finish. Recently introduced noise regulations at classic events may mean that some form of silencer will have to be fitted, however.

Heat shield

These are fitted to certain models with high-level exhaust systems to protect the rider and/or passenger from getting burnt. They comprise either wire grilles or perforated-steel sheeting attached to either the exhaust pipe or the silencer, sometimes both.

The first such shield was fitted to the 100 Mountaineer two-stroke in 1964. This one-piece affair covered sections of both the exhaust pipe and silencer. It was subsequently lengthened to provide more protection on later versions of the same model.

When overhauling an exhaust system with a shield fitted, make sure that any heat-dissipating washers are in place, otherwise the shield may lose much of its effectiveness.

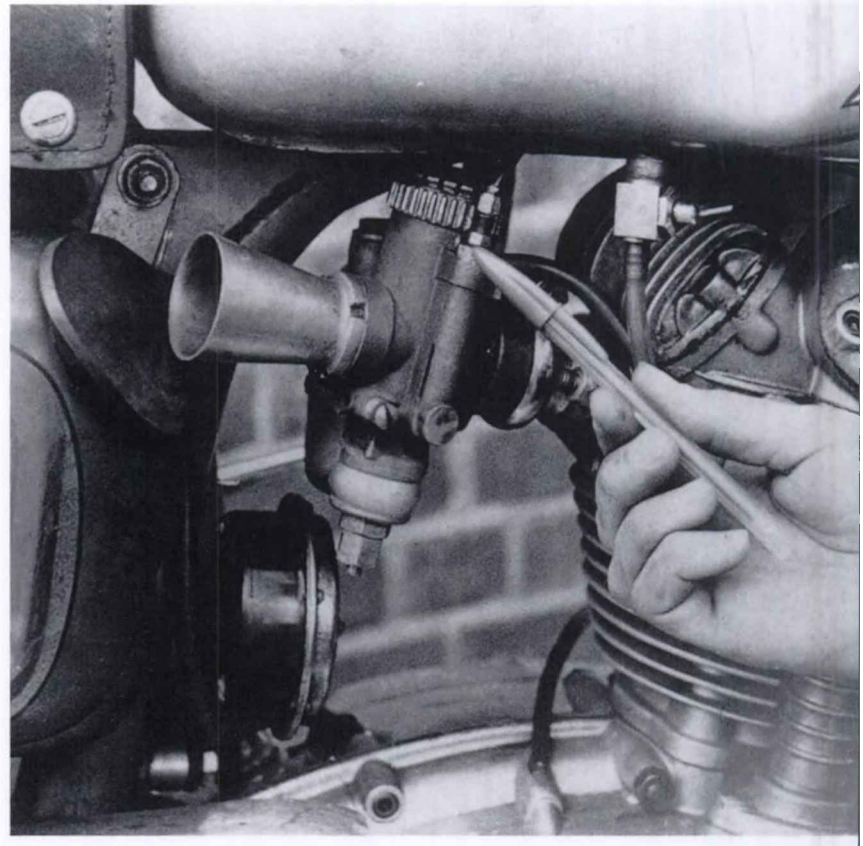


ABOVE LEFT *Besides the square-slide Dell'Orto carburettor, the widecase ohc singles received a slashed-end-cone Silentium silencer from the 1969 model year onwards. Some 450s have a shorter type of the same design*

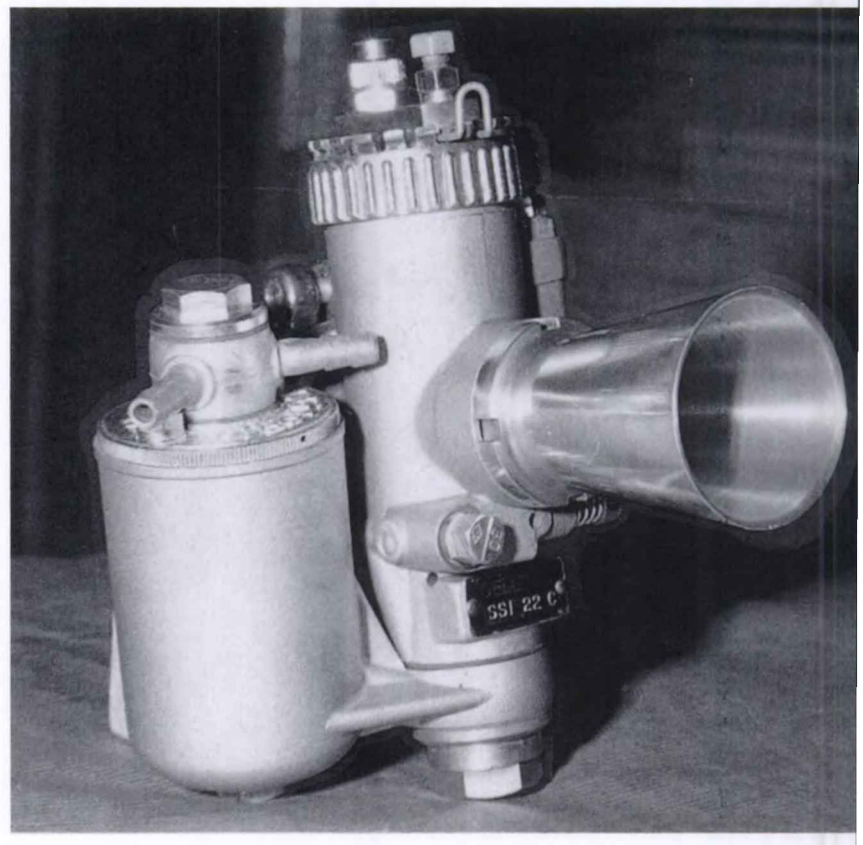
LEFT *Round-end-cone Silentium, as fitted to all the narrowcase singles from 175 cc upwards, except those equipped with the double-barrel type. The example shown is fitted to a 1962 250 Diana (Daytona in Britain)*

RIGHT *The final Ducati single to reach production status was the 125 Six Days. This was a serious enduro racer with a six-speed gearbox and up-and-over motocross-type exhaust pipe. It was only produced for one year, 1977*

Dell'Orto SS1 carburettor strip-down

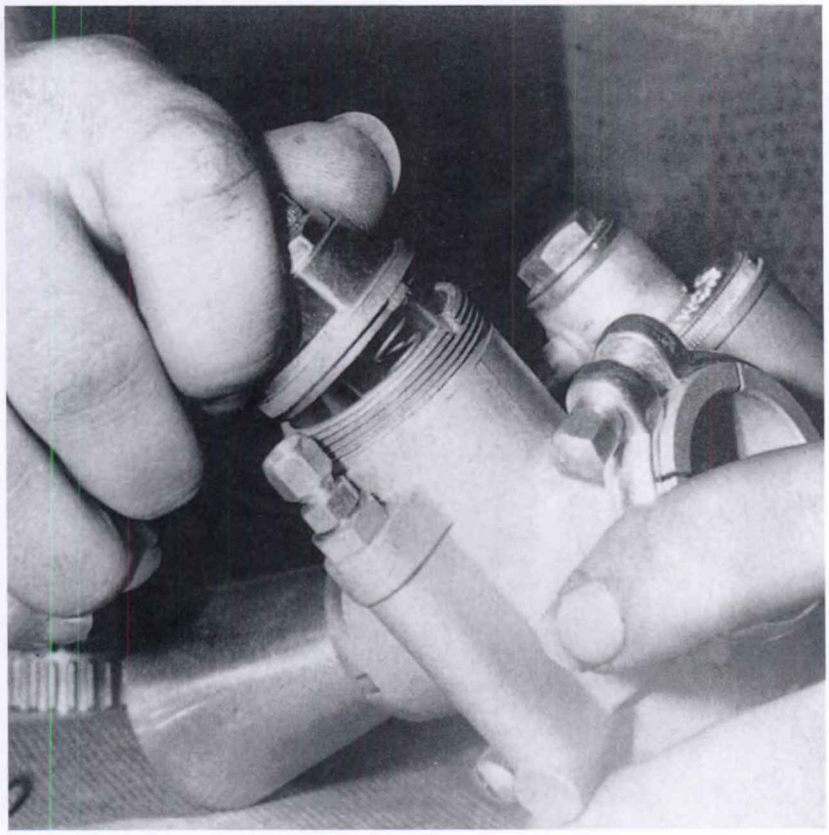


The sports/racing Dell'Orto SS1 carburettor is fitted to certain Ducati overhead-cam singles, notably the Mach 1 and Diana Mk 3. The choke assembly is in the offside, as shown, and is spring loaded.

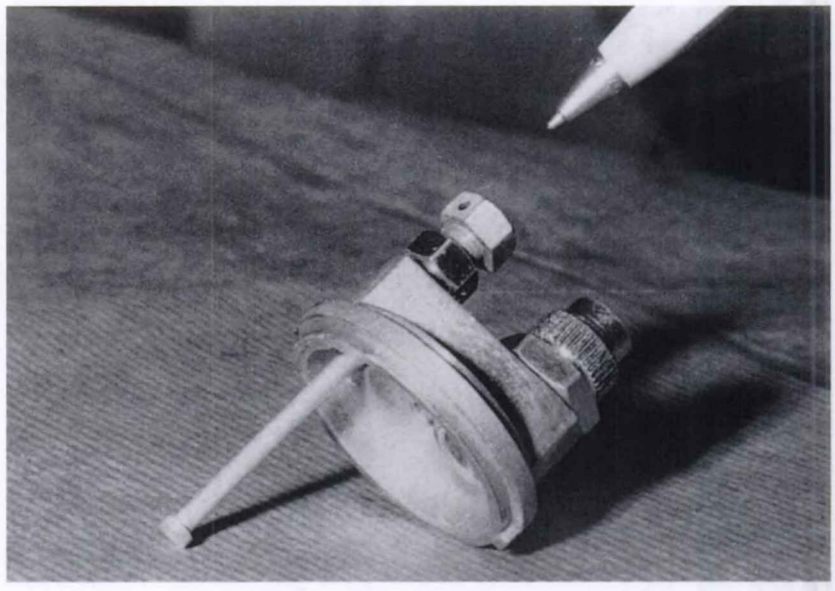


SS1 carburettor with float chamber

The slide/mixing chamber cover is held securely in position by this special spring. It must be removed before unscrewing the cover

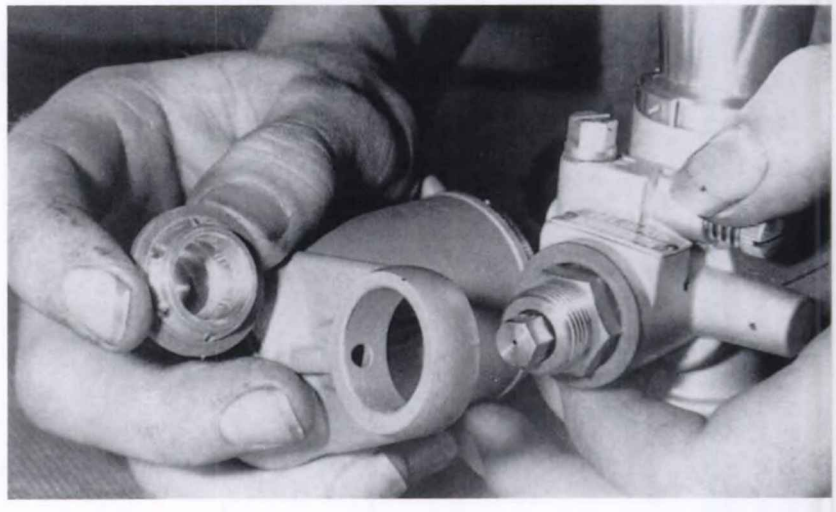


With screw cap undone, the slide can be lifted out. Note the position of the needle to ensure correct replacement on reassembly. Check for wear on the body of the slide

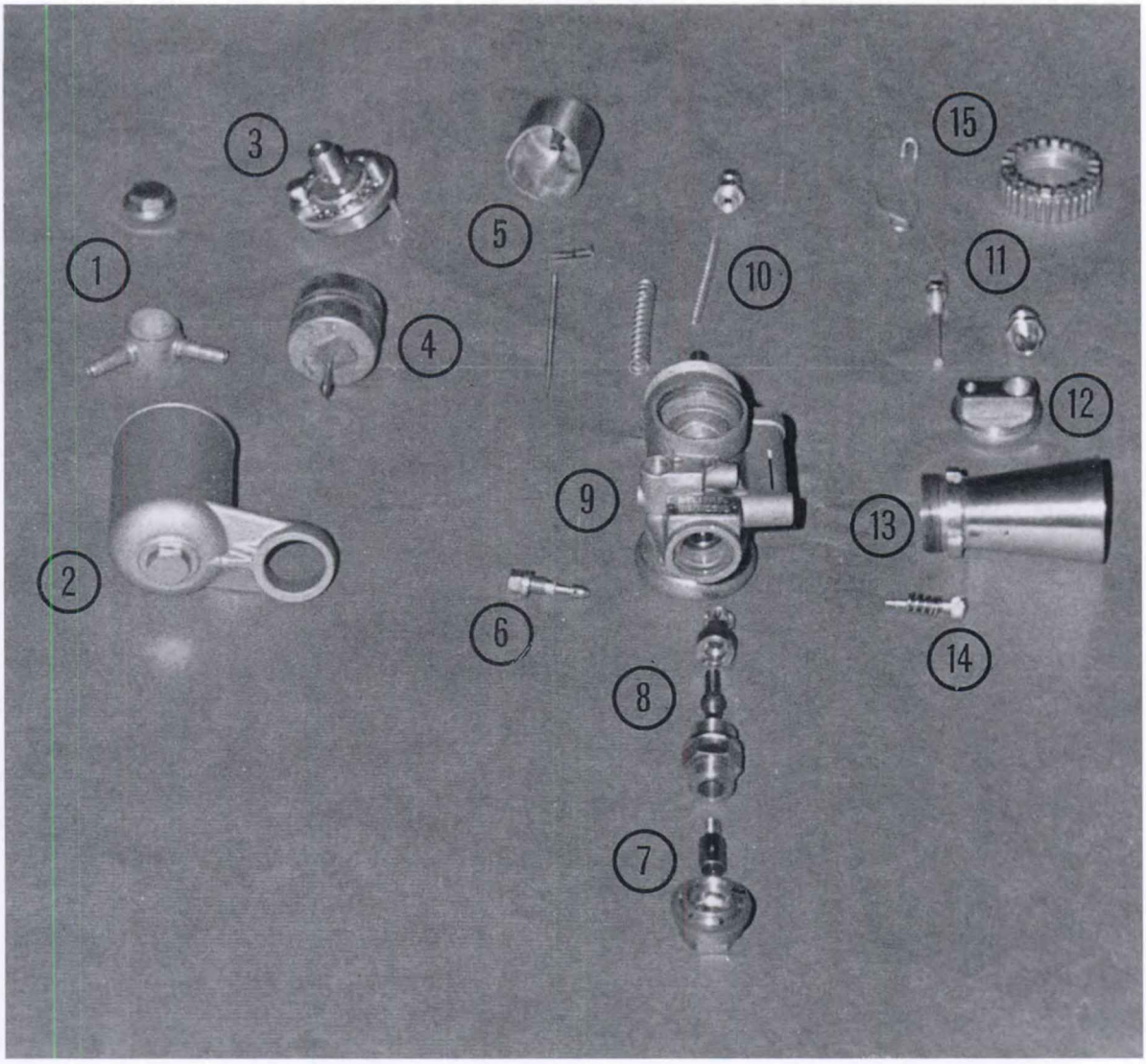


The throttle stop operates from the slide cover. Engine tick-over is set by this in conjunction with the pilot air screw

After the slide assembly has been dismantled, the carburettor bellmouth may be unscrewed. Secure it firmly on refitting



The main jet cover nut also holds the float chamber to the carburettor body. Be careful not to damage the fibre washer on the main jet cover



The components of the carburettor: **1 fuel banjo and nut**; 2 float chamber; 3 float chamber cover; 4 float; **5 throttle slide and** needle; 6 pilot jet; **7 main jet** cover and jet; 8 jet **holder** (atomizer), needle jet and **cover**; **9** carburettor **body**; **10 choke slide,** spring and adjuster; **11 throttle** stop screw and **adjuster**; **12** throttle slide cover; **13 bellmouth**; 14 pilot air screw; **15 throttle slide** cover screw and **retaining spring**

7 Lubrication

All four-stroke Ducati singles feature a wet-sump system in which the oil is contained in a finned sump, cast integrally with the crankcase. The four-strokes all have an oil pump of the type with two gears, and a ball-and-spring pressure release valve.

There are two filters: one, of the strainer type, attached to the oil drain plug in the sump; the other a centrifugal device in the crankshaft flywheels.

Engine breathing is by a simple hole with an extended clear plastic tube.

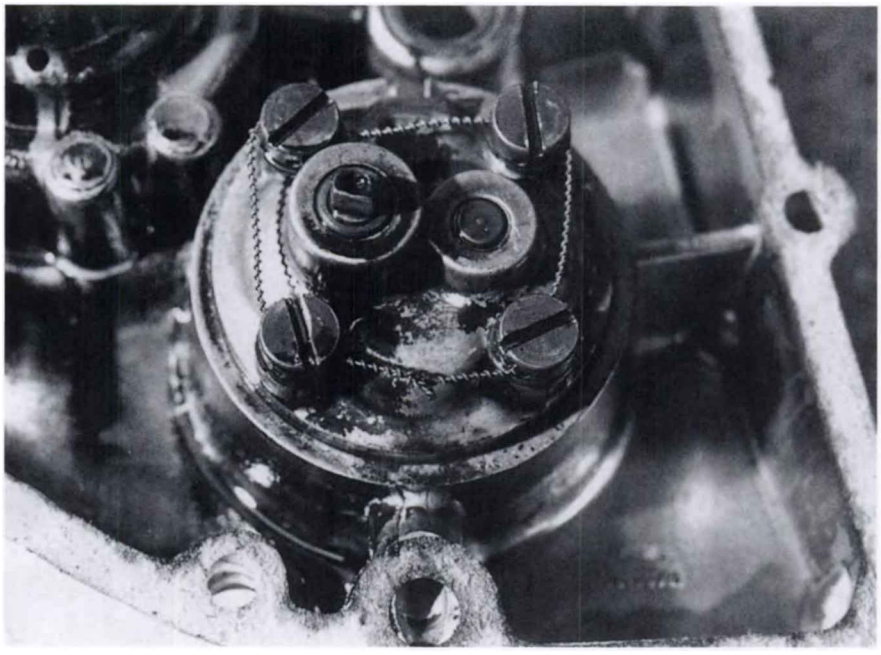
The two-stroke models all employ petroil mixture.

Oil pump

The type of oil pump to be found in all the four-stroke models featured in *Ducati Singles Restoration* is of the gear variety. Essentially, it consists of two meshing gears which rotate inside a close-fitting housing. As the gears rotate, they carry oil around against the housing. The meshing of the gear teeth forces the oil out, into the pump discharge tube.

This gear-type oil pump produces a flow of oil to various parts of the engine. However, if the flow is blocked, the oil pressure can increase sufficiently to damage the pump. Alternatively, if the oil is particularly thick (do *not*, for example, use a straight 50 SAE monograde in Britain!), the pressure required to force the cold oil through the small bearing clearances can cause a similar pressure build-up, damaging the pump. Partly to offset these possibilities, a very basic ball-and-spring pressure relief valve was fitted. This returns the oil to the sump when the pressure created exceeds a pre-determined level.

The pump is circular in construction and is mounted in a recess at the rear of the timing cover. This, in turn, is located on the offside of the crankcase. The pump body is held in place by four screws, which are wire-locked into position. Like the timing cover, the pump body is of alloy construction, having a steel backing plate and matching paper gasket. The body contains a pair of gears, one of which has an integral shaft which extends through the pump body and is



LEFT *The gear-driven oil pump is housed in the timing cover*

RIGHT *Early ohc singles, like this 1960 200 Elite, suffer big-end problems if denied regular oil changes and 'slogged' in a high gear by an uncaring owner*

driven by a large gear. This gear mates with a smaller gear which is part of the crankshaft.

The pump gears themselves were increased in width during 1964. The pre-1964 type features a pump body with a detachable hexagon nut which retains the oil pressure relief ball and spring, whilst the post-1964 uprated pump has an integral ball and spring. These were the only changes to the pump design throughout the Bologna ohc singles' production, which ran from early 1957 until late 1974.

It might be thought that since they are constantly immersed in lubricant, oil pumps would have an almost indefinite working life. However, the fact is that, like anything else of mechanical design, they will eventually wear. As a result, in time, the oil pump output will become insufficient for the requirements of the engine. Because of this, your restoration will not be complete without a thorough overhaul of the oiling system, the pump included.

Oilways and pipes

Unlike the vast majority of British bikes, the Ducati singles are of wet-sump design, rather than dry-sump. This greatly reduces the need for external oil pipes. In fact, there is only one—the oil drain banjo tube on the offside of the cylinder head.

Great care should be exercised with this because it is easily damaged. On early engines, the three hollow bolts which secure it to the engine have built-in washers which are more effective than the later bolt-only type. With the latter, particular care is needed if you are not to distort the matching flats on the banjo. Each bolt also has a pair of soft alloy washers which act as a gasket and, therefore, should be replaced every time the bolt/banjo union is disturbed.

Equal care must be taken when replacing the bolts, as too much pressure can cause stripped threads in either the cylinder head or alloy bevel tube. If these bolts prove difficult to shift when stripping the engine down, try giving each bolt a sharp tap with a *hide* hammer. This will usually do the trick.

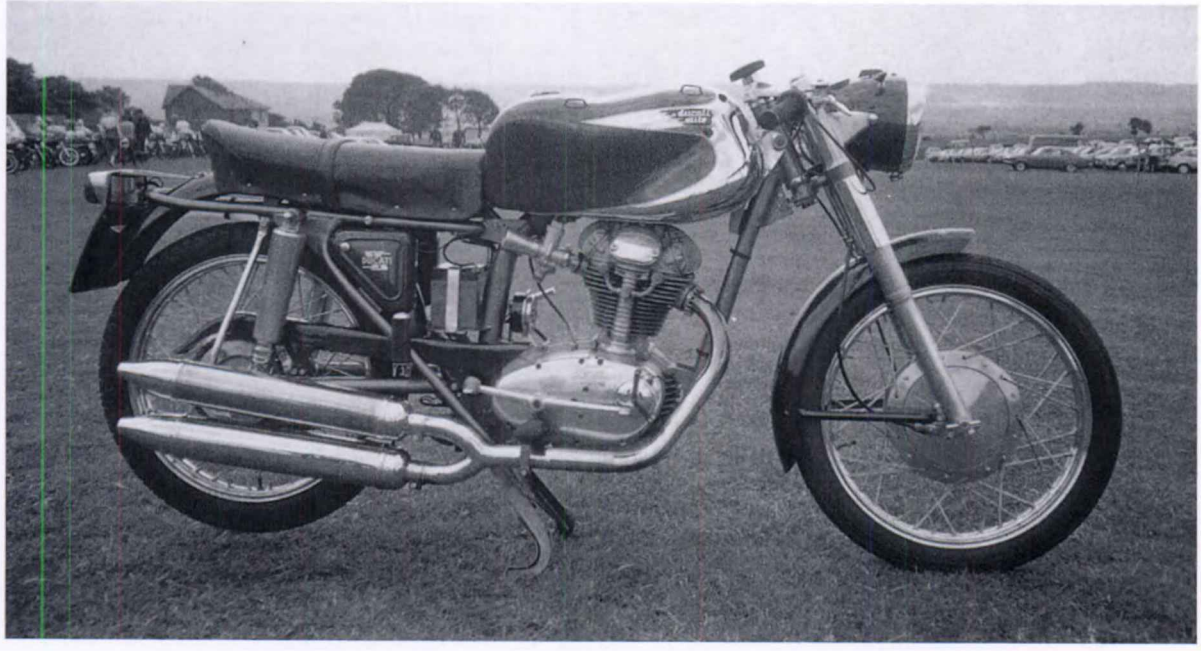
The oilways throughout the engine unit (study the illustration of the system on page 104) are relatively straightforward, but it is very important to ensure that they are completely clear with no blockages. Do not assume that they are, but actually carry out a full check, including blowing through them, where possible, with a high-pressure air line.

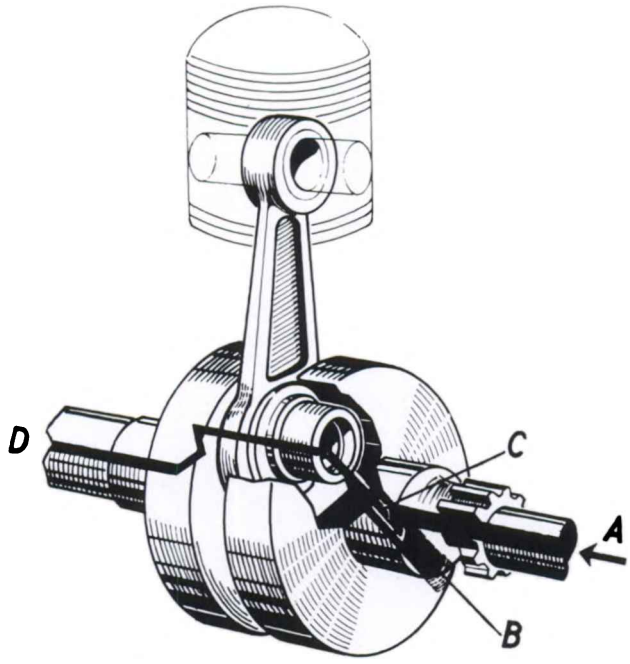
Breather system

The breather system is a simple hole (through a hollow brass plug) which is open to the atmosphere. There is a long piece of clear piping which carries the air out of the engine, while allowing any oil mist to condense in it and drain back. The pipe is retained by a single spring clip.

Sump

This is an integral part of the crankcase casting assembly and is shaped like a flat finned container. Situated at the very base of the engine, its purpose is to house (and cool) the lubricant. On the narrowcase design, the capacity is 2.1 litres (3¾ pints) and on the widecase, 2.7 litres (5½ pints).





ABOVE *Poor big-end lubrication is not helped by the design of the oilways in the crankshaft flywheels. The centrifugal filter (sludge trap screw) must be removed and cleaned out during a major engine overhaul*

The nylon gauze sump filter can easily become damaged if the end (nose) section is not located correctly into the opposite side of the crankcase. A new filter and alloy gasket are shown on the right

Sump filter

The sump's oil filter is primitive. It is simply a moulded nylon gauze tube attached to the drain plug—some very early engines use a detachable metal tube with a separate steel mesh.

Both types of filter should be washed in petrol or similar and then carefully inspected. Anything less than perfect should be replaced. When refitting, make absolutely sure that the nose of the tube is located properly. This can be determined by tightening it by hand. If there is any significant resistance, it is likely that it is not in properly. If tightened fully in this condition, the filter will be distorted and, therefore, totally useless.

Centrifugal filter

There is also a secondary filter in the offside crankshaft flywheel. The oil to be filtered is brought to the filter compartment (for cleaning purposes, a detachable threaded plug is fitted) by way of passages in the crankshaft. Centrifugal force then traps any impurities which are heavier than the oil in the chamber. The filtered oil then passes through a duct to lubricate the big-end and on to the crankshaft-mounted primary drive gear.

As already mentioned in the Engine chapter, this sludge trap screw should be removed and the compartment cleaned out during any major engine strip, and certainly following a big-end failure.

Oil filler plug

A combined oil filler plug and dipstick unit is incorporated at the nearside front of the sump. It usually has a separate neck extension to prevent oil escaping when the plug/dipstick assembly is removed. However, my advice is not to use this, either to refill the engine with oil or check (via the dipstick) if the level is correct.

Firstly, on several models, notably those fitted with side stands (which attach to the nearside front engine mounting plate), it is virtually impossible to gain enough access to successfully carry out the task of pouring the oil in. Secondly, unless completely vertical, the dipstick will provide a totally inaccurate reading—on a number of occasions, this has contributed directly to big-end failures and associated problems.

The only really safe (and accurate) method of adding oil is to measure the correct amount before pouring it in through the small clutch inspection cover.

Two-stroke lubrication

All the two-stroke models avoid the complication of

pumps and oil containers by running on a petroil mixture. Early models required a recommended ratio of 20:1, however with the development of much improved two-stroke lubricants over the last few years, this can safely be increased to at least 25:1. The later models (most notably the mid 1970s 125s) were built to run on a 32:1 mix.

Usually, the above figures can be a shade leaner if a competition-quality synthetic oil is selected. However, in this case, you are advised to follow the maker's recommendation.

The task of mixing the correct ratio has been made much simpler since the introduction, by the oil companies, of the plastic bottle with its graduated table showing how much oil to use to achieve the required ratio.

Rear chain lubrication

No automatic rear chain lubrication is provided, as on some other marques. Therefore, to ensure that the rear drive chain is lubricated, you are left with either the time-honoured 'boiling in grease' method, or the more modern aerosol can treatment.

Engine-oil grade

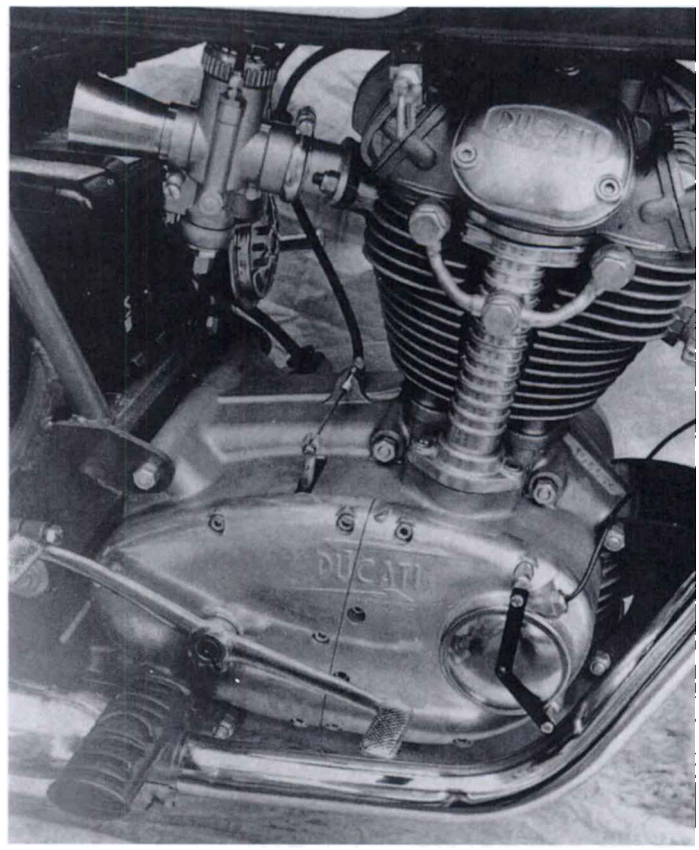
The standard-issue Ducati rider's handbook normally refers only to AGIP lubricants sold on the Italian domestic market, but in many export markets these are simply not available. In any case, many riders have their own personal preferences.

What is important is to ensure that the correct grades are used. Ducati recommended a straight SAE 40 monograde. This is perfectly suitable, but with the great advances made in oil technology over the last few years, a good quality SAE 20/50 is also in order.

Perhaps most important of all, however, is to carry out *regular* oil changes at intervals not exceeding 1500 miles. As already explained in the Engine chapter, failure to stick to this golden rule will usually lead to a much shortened big-end life.

Many of the race-kitted Ducati singles used a vegetable-based (castor) oil. Because of the machine's wet-clutch design, and the fact that this type of oil tends to stick when cold and build up gummy deposits, a 20 or 30 SAE grade is needed to prevent excessive clutch drag. Unfortunately, today, most oil companies only offer a 40 SAE castor-based type. I would *not* recommend the use of vegetable oil for anything other than racing. In a road machine, it has no advantage (except the delightful smell) and lots of disadvantages.

With the advent of the modern synthetic competition oil, vegetable types are largely obsolete. However, if you do intend using them, remember that mineral and vegetable oils will not mix. Therefore, if switching from one to another, the whole engine must be stripped and cleaned out, otherwise you risk serious problems.



Although the lubrication system remained largely unchanged, except for increased sump capacity, the widecase singles gained considerably improved reliability. This is a 1968 250 Mark 3D (Desmo)

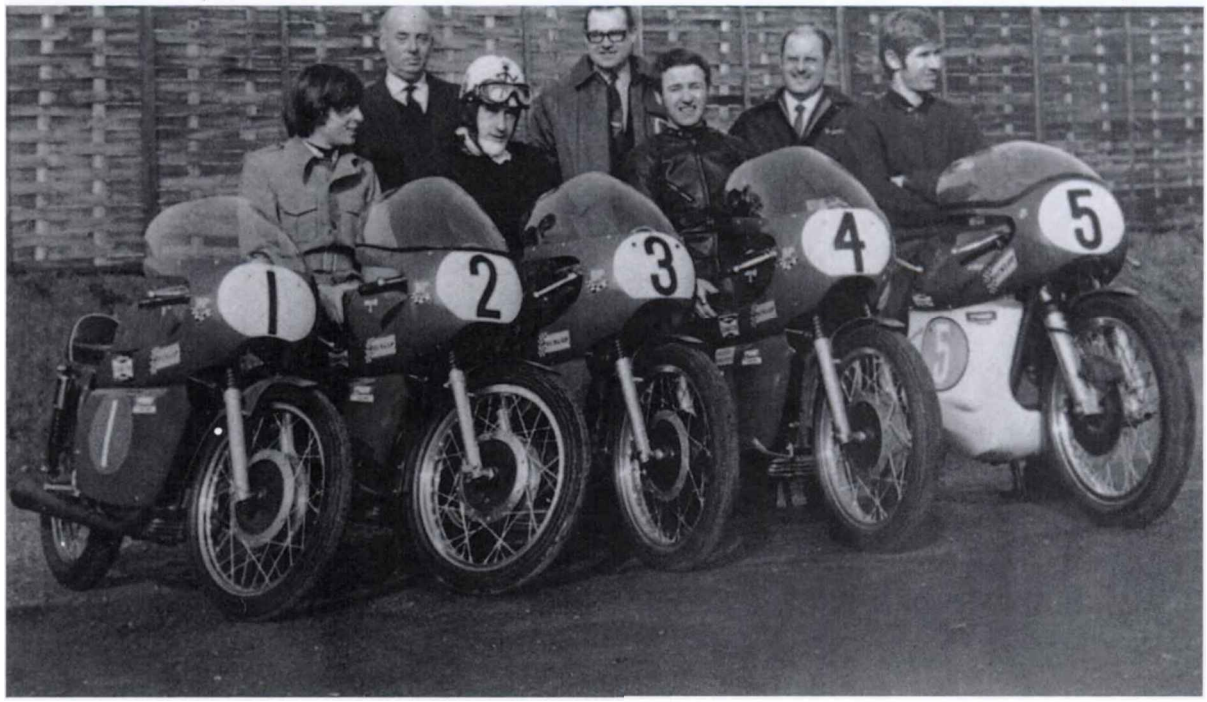
Summary

Perhaps the single biggest criticism levelled at the range of overhead Ducati singles, and in particular the narrowcase models, over the years has been big-end failure. Much of this is directly attributable to the lubrication system which, although quite suitable for racing use, was not always the best when it came to everyday street use.

Two aspects in particular definitely cause problems: lack of regular oil changes and 'plonking' the engine at low speed in high gear. Unfortunately, both situations would occur (often together) when riders were either new to the game or looked upon the machine purely as a cheap form of transport.

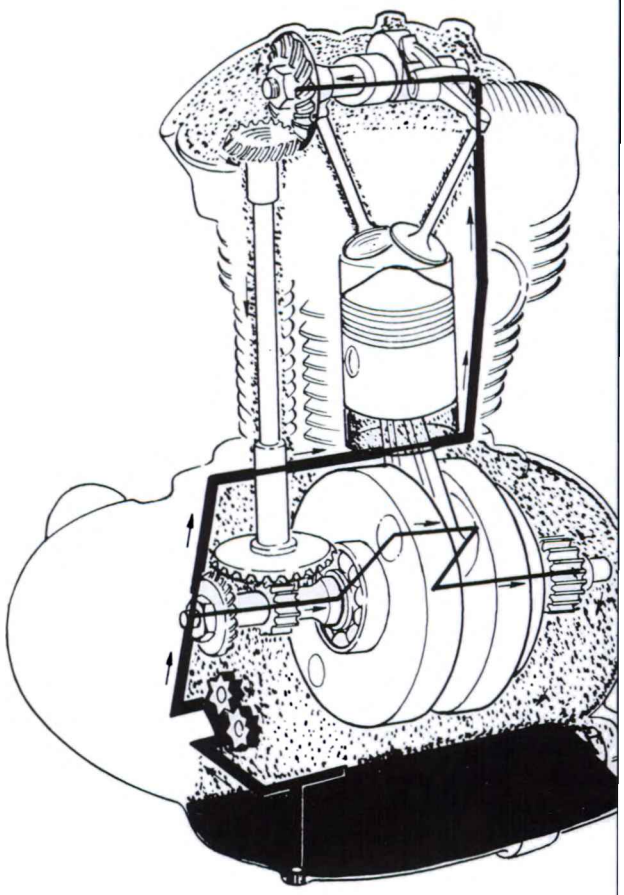
With *all* Ducati four-stroke singles, it is absolutely vital to change the oil regularly, and to use the most suitable grade, as described elsewhere in this chapter.

There is no doubt that the Bologna machines will



ABOVE *Narrowcase singles were generally more reliable as track bikes than roadsters. This Kirby/Camp Racing School shot shows some famous names. Left to right: Chas Mortimer Jnr, Chas Mortimer Snr, Alan Peck, Vic Camp, Jim Harvey, Tom Kirby and Alan Barnett*

RIGHT *Arrows show the lubrication circulatory system on bevel-driven camshaft singles*



stand up better to hard-riding enthusiasts than much slower, inexperienced novices. What you have to remember is that while you will most likely be the former, the machine which you are restoring could well have been owned for much of its life by the latter . . . so make sure that you spend sufficient time on the lubrication system to ensure that it will give a long period of reliable service.

Essentially, the system is straightforward, but it needs to be in perfect order to give of its best. Remember, riding habits and regular oil changes are all-important.

8 Frame

The purpose of the frame is primarily to act as the structure which supports the engine assembly (in Ducati's case, of course, this includes the gearbox, clutch and primary drive) and other working parts, together with the rider and passenger if carried, whilst holding the front forks and rear wheel in the designed positions. This can be achieved through the design of the frame alone, or complemented by the use of the engine assembly as a stressed member.

Ducati engineers employed both types of frame in their single-cylinder machines. There is also a surprisingly wide range of variations on both themes, particularly amongst the two-strokes.

At first glance, the restoration of the main frame, together with the pivoted rear fork (swinging arm), may appear to be one of the most straightforward tasks that the restorer has to tackle. However, there is more to it than may at first appear.

The first priority is to check both the frame and pivoted fork for alignment. *Never* assume that they are straight, *check*.

If at all possible, have these components tested for accuracy by a specialist (there are special jigs for checking the frame, and these can usually be found at dealers who carry out crash repair work). Although primarily intended for modern machines, they will usually accommodate a wide range of types.

If you intend carrying out the checks yourself, you need to ensure that the headstock is square to the rear wheel spindle or swinging-arm pivot. This can be achieved with a spirit level if the headstock is set up vertically.

Other checks to be carried out along the frame are for twist, and most are done by comparing one side of the frame to the other. For these tasks you will need a spirit level, straight edge, rule and a ball of string.

Correcting errors in the actual alignment, however, is usually outside the ability of the restorer and calls for specialized equipment. If you decide to opt for a replacement frame remember that, unless it is new and unused, you will still need to carry out the checking procedure all over again.

Whatever you ultimately decide, remember the motto: 'Safety is paramount'.

Four-stroke frames

All four-stroke models feature a fully welded frame, in which the engine unit forms an integral stressed member.

The first design for the new ohc model range appeared in 1957 and followed the layout that had been adopted for the 100 Gran Sport racer. This features a large-diameter 'backbone' tube which stretches all the way from the steering head to the rear fork pivot and is curved, almost akin to a boomerang in shape.

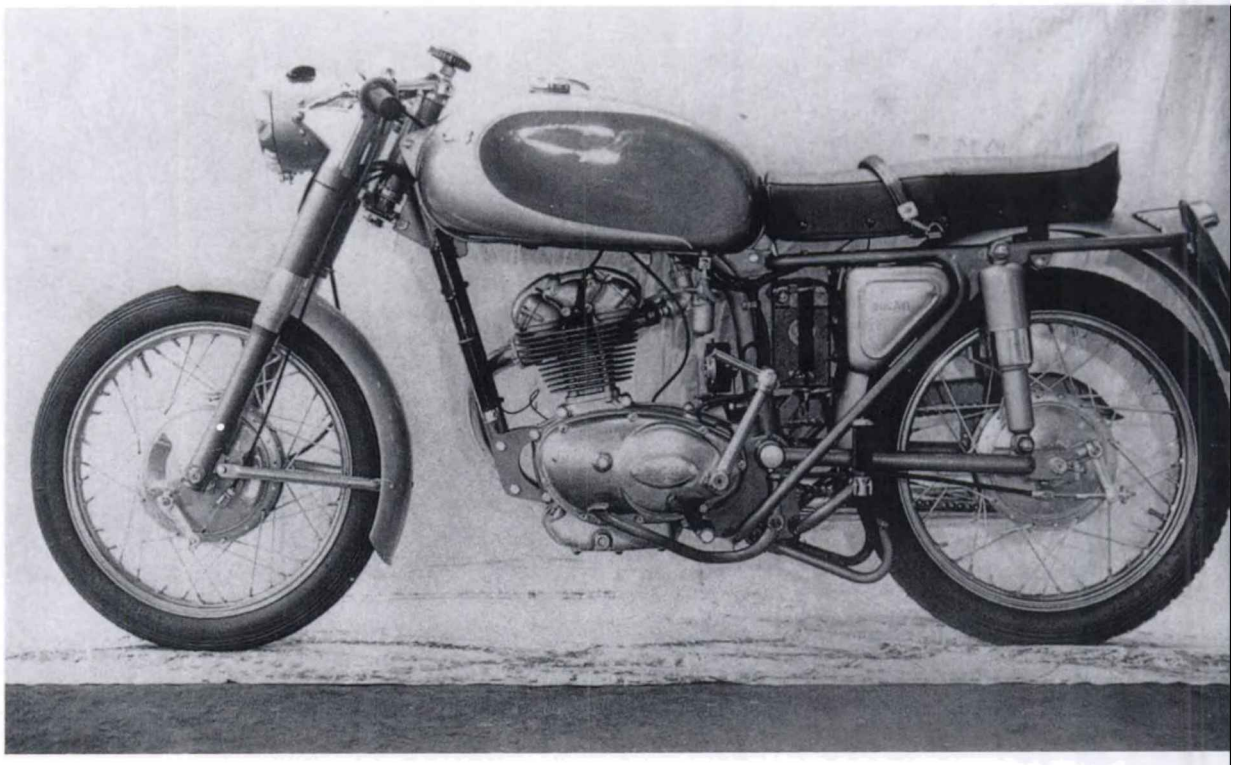
From the tank/seat joint, smaller support tubes splay rearwards to support, on each side, the top mounts for the rear suspension units and seat/rear mudguard supports. The pair of tubes, therefore, joins in a circular integral loop with a further support for the rear mudguard. There is another pair of support tubes which extend from the top rear suspension mounts to the base of the frame at the rear of the engine mounting on each side.

From the steering head directly downwards, a single tube mates with the pair of bolt-up front engine plates. Each plate has four holes.

The basic frame design was to remain unchanged throughout the life of the Bologna-built range of overhead-camshaft singles until their demise in the mid 1970s. However, there were modifications. The first came at the end of 1960, when the swinging-arm bushes were transferred from the frame to the pivoted fork.

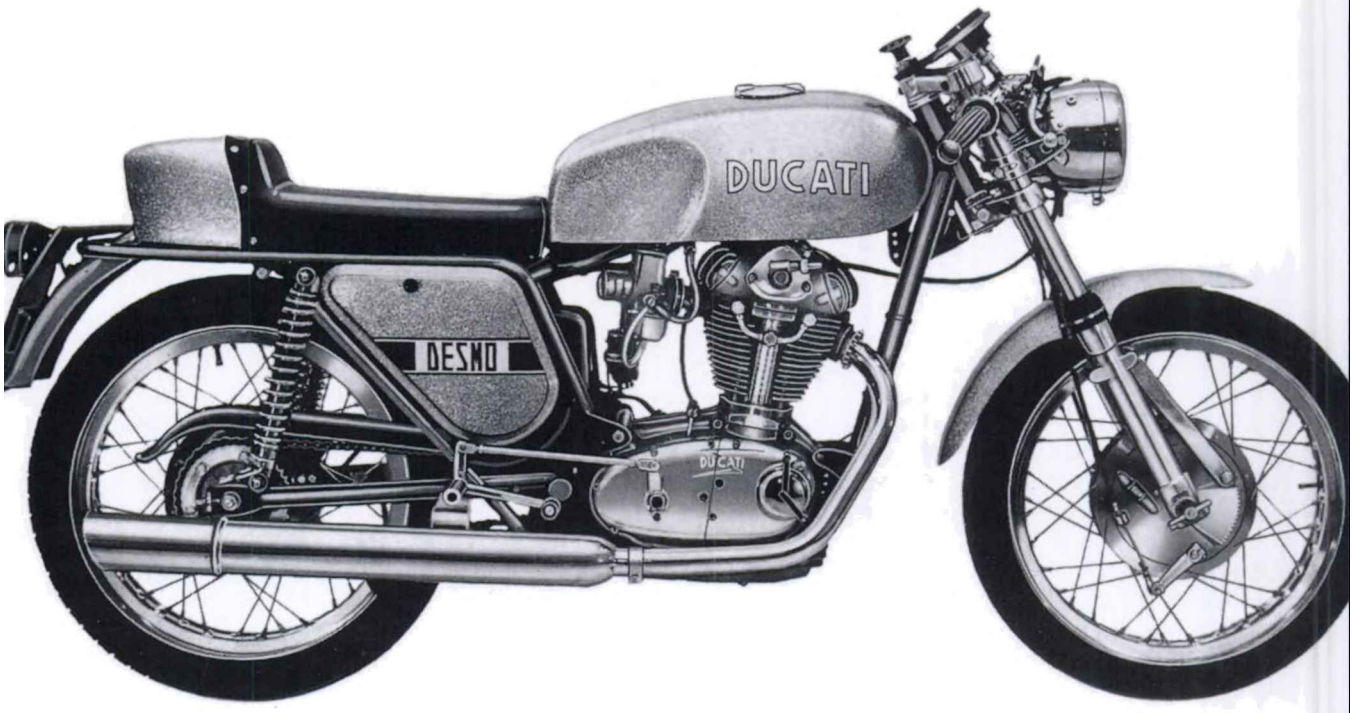
The 160 Monza Junior (1964–7) featured a revised (and slimmer) battery carrier which was relocated from its central mounting to a new nearside position. All the other four-strokes continued unchanged until the 1968 model year when the revised widecase machines made their bow. The main difference centred around the much increased width of the rear engine mounting—from 65 to 218 mm.

The mainstream models then continued with this revised frame until production came to an end. The only variation of the widecase frame appears on the 450s, introduced in 1969, which have the top tube gusseted for extra strength.



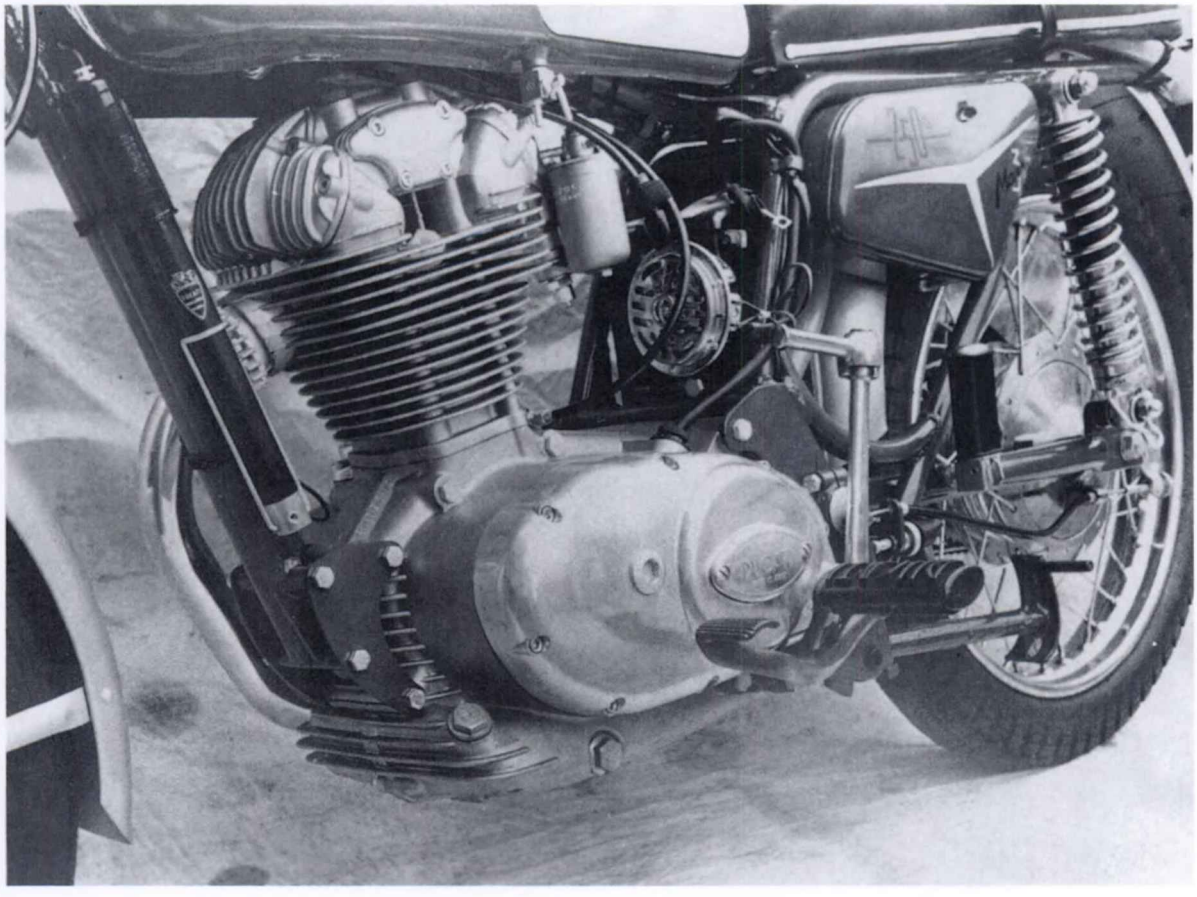
ABOVE *The narrowcase frame, used on all the ohc four-stroke singles from 1957 until the end of 1967, was based on the original 100 Gran Sport sports racing motorcycle of 1955. The example shown is a 1959 125 Sport*

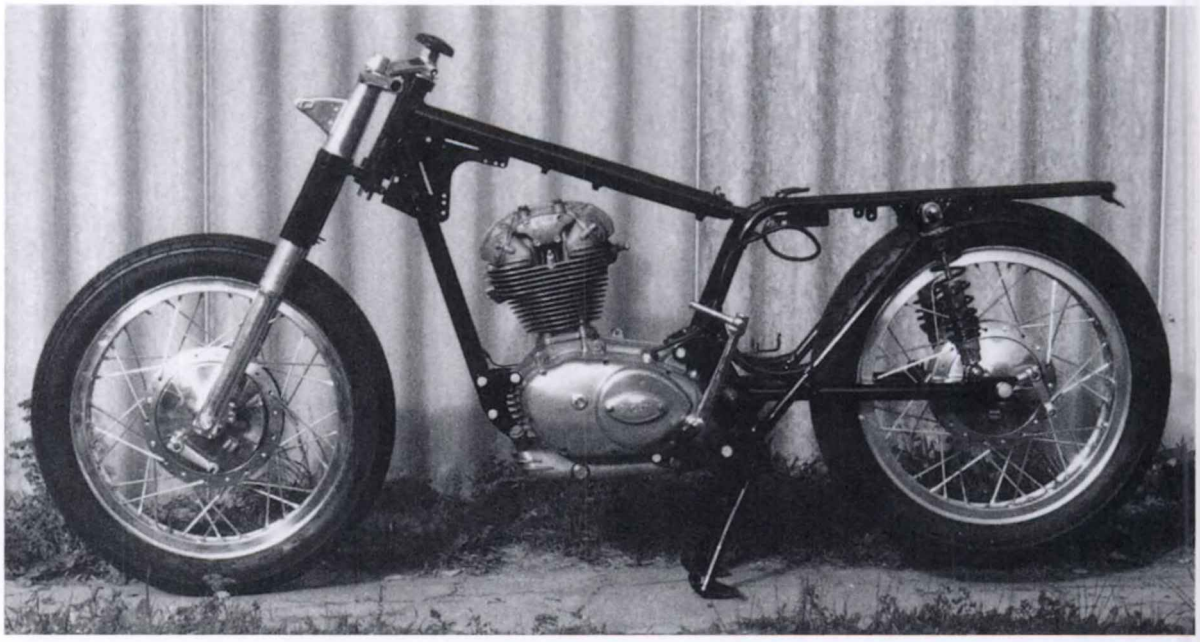
BELOW *The widecase frame (so called because the rear engine mountings were some 3 in. wider than the front ones) was introduced into production during early 1968. It ran through until the demise of the four-stroke single line in the mid 1970s. A 1972 350 Desmo 'Silver Shotgun' is shown*

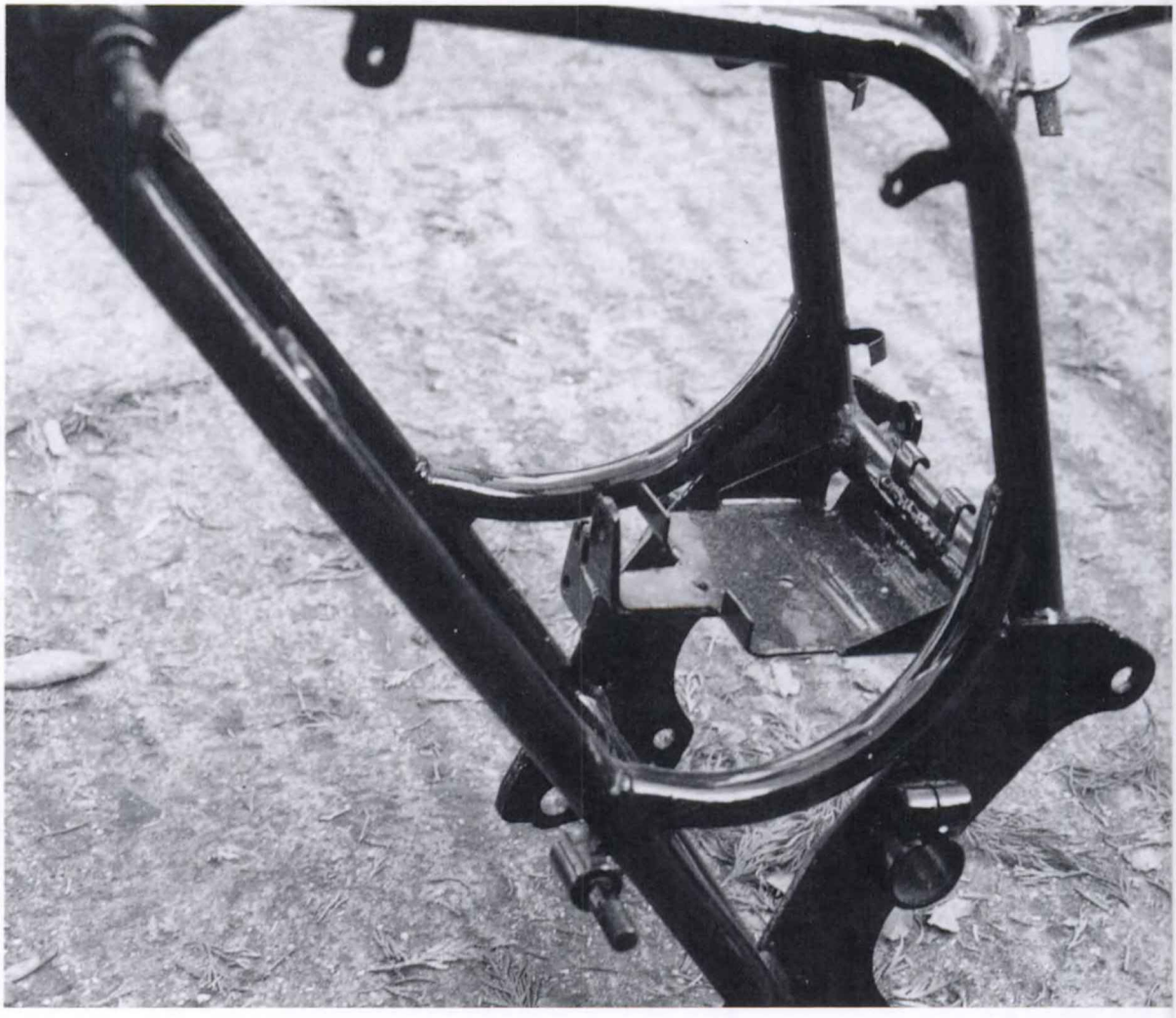


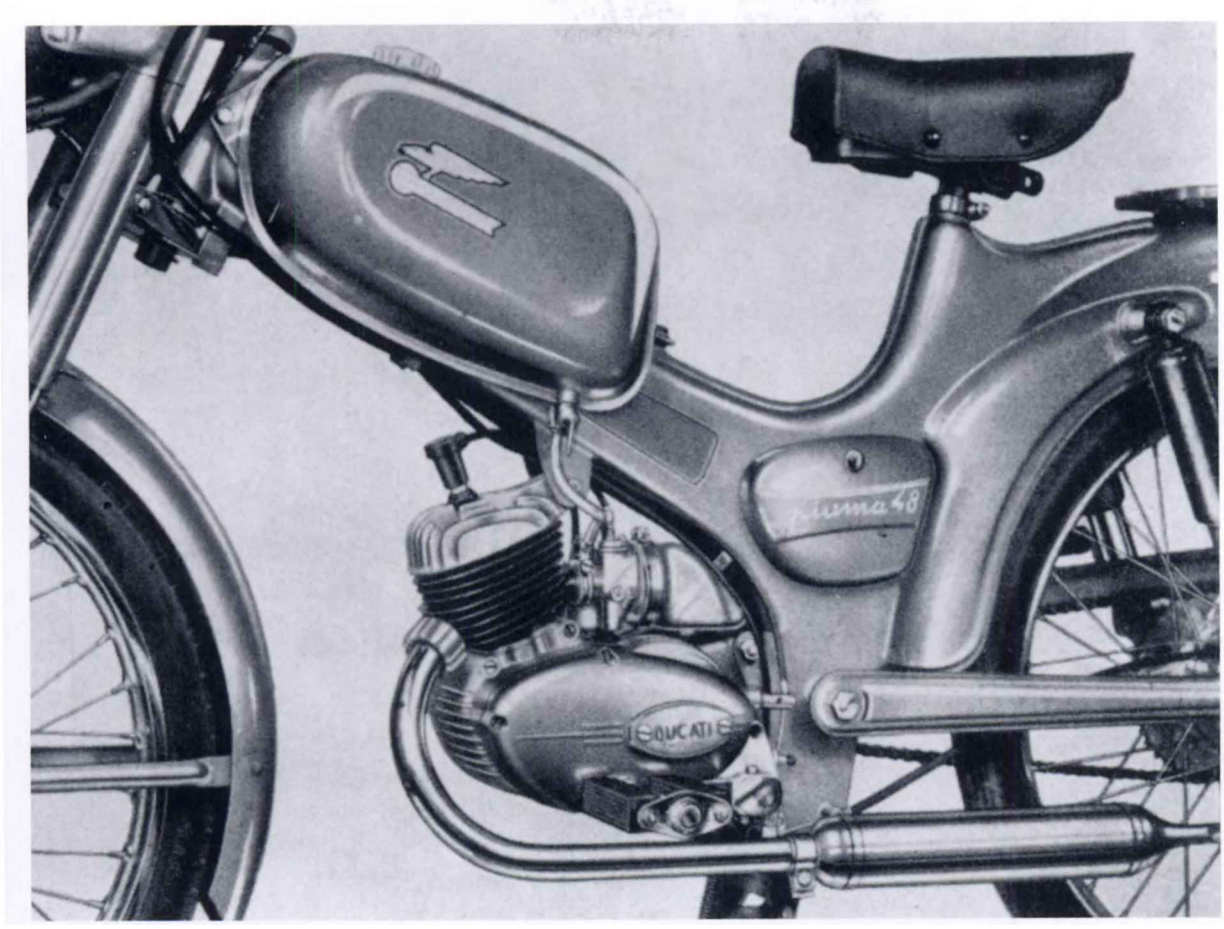
LEFT *The 450 R/T Desmo (1971–2) has a purpose-built frame which owes very little to the series-production roadster chassis. It was largely intended for Stateside off-road use*

BELOW *Close-up of a widecase frame. This photograph of a 1968 250 Mark 3 shows the engine mountings to advantage. Note the tyre pump on the front downtube*









ABOVE *The early Ducati two-stroke singles employ a pressed-steel frame and swinging arm, as shown here on a 1962 Piuma 48 moped*

ABOVE LEFT *Side view of a 1969 250 Mark 3 with tank, seat, side panels and mudguards removed*

LEFT *Integral battery carrier on a widecase frame. The battery sits in a moulded rubber tray and is retained by a rubber strap*

Only two models have 'one-off' frames. These are the 450 R/T (1971–2) and 125 Scrambler (1971).

The R/T had an almost totally new frame, with only the basic single front downtube layout and engine forming a stressed member remaining from the standard production type. In place of the large-diameter 'boomerang' main tube, twin rails run backwards from the base of the steering head to the rear of the seat. These are braced in five places, the final one being a welded-in loop underneath the seat. There is a detachable frame loop which is also the rear mudguard support. The second bracing point from the front has a straight tube running upwards to the top of the steering head. This gives the steering head area a similar appearance to that of the famous Featherbed Norton. On each side of the frame, there is a triangular set of bracing tubes which meet just above the swinging-arm pivot point. Below this, a pair of flat plates is connected at the base by another thinner plate. Like the conventional series-production Ducati ohc singles' frame, the R/T frame uses the engine assembly as a stressed member and is fully welded. There is a comprehensive bolted-up sump guard, and instead of the separate detachable pair of front engine mounting plates, these are integral with the lower front downtube. The top mountings for the 320 mm Marzocchi suspension units have four positions, giving the rider various options of angle.

The 125 Scrambler uses a variation of the R/T frame, but in smaller-gauge tubing and of a fully duplex type. This not only has twin front downtubes, but these extend rearwards, all the way under the engine unit.

On all the four-stroke models equipped with a battery, the carrier for this is integral with the frame—unlike many other machines. The battery will be retained in position in the carrier by either a metal or rubber strap.

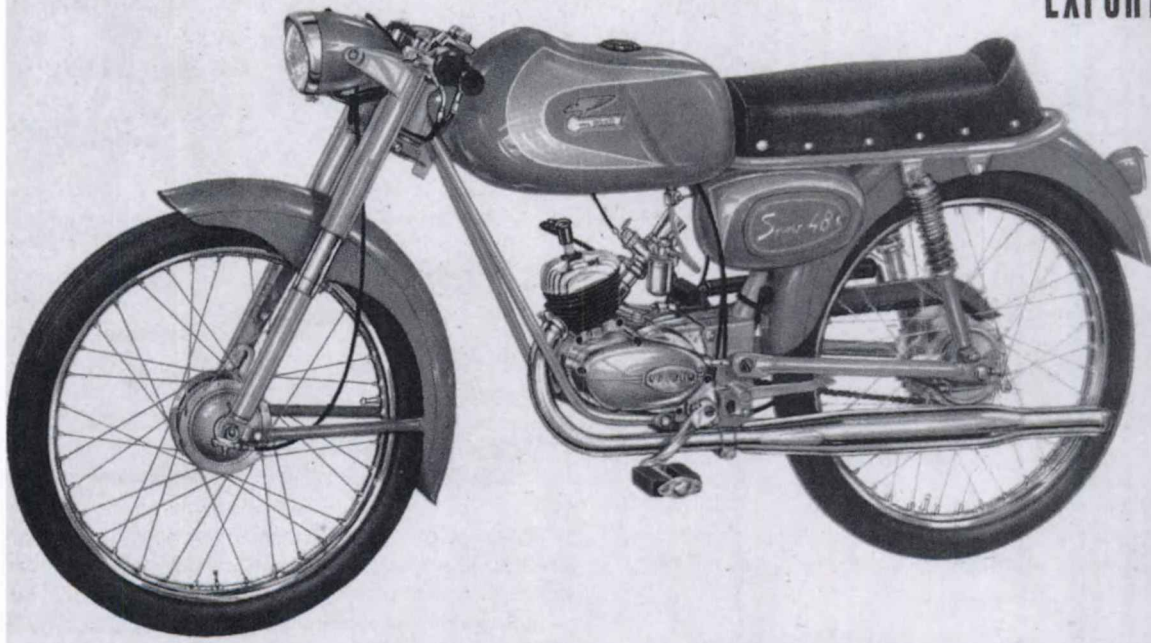
MOTO DUCATI

DUCATI

SPORT

48

EXPORT



ENGINE - Single-cylinder - Bore mm. 38 - Stroke mm. 42 - Displacement cc. 47.633 - Compression ratio 1 : 9.5 - Timing by crossed lights - Maximum Output: 4.2 HP at 8.600 r.p.m. - Carburetter Dell'Orto UA 15 S with air intake bell shaped - Air cooling - 5 % Mixture lubrication for the engine; in oil-bath for the gear-box and the clutch - Ignition by 6V - 18W H.T. outer coil - 2 light front headlamp, tail light, horn - Speedometer inserted in the headlamp - Transmission: from engine to gearbox, by helical gears; from gearbox to wheel, by chain - Gearbox in unit with the engine; 3 speeds, gear in constant mesh - Movable operating handgrip in unit with the clutch operating one - Pedal starter or lever starter - Clutch: multi-plate discs running in oil bath.

FRAME - Double cradle - in highly resistant steel tubing, built on very smart line - Front suspension: telescopic fork with springs in oil bath - Rear suspension: with swinging fork and uncovered spring shock absorbers - Spoke-wheels, chromium steel rims with normal profile 1.35" x 19" - Expanding brakes: front, hand operated; rear, by pedal - Drums diameter: 105 mm. - Tyres: front, 2¼" x 19" ribbed; 2¼" x 19" with block tread, the rear one.

Weight (unladen) . . . . Kg. 54 (lbs. 119.050)
Oil sump holds approx. . . Kg. 0.250 (lbs. 0.5512 = lts. 0.300 = 0.066 imp. gal. = 0.0792 US gal.)
5 % Mixture tank holds . . lt. 9.600 (imp. gal. 2.1118 = US gal. 2.5360)

MOPED

2 stroke

48 cc.

Timing by crossed lights.

Gearbox: 3 speeds.

Maximum speed about Km/h 80 (Ml/h 50).

Fuel consumption lt. 2 for 100 Kms (140 Ml/imp. gal. = 118 Ml/US gal.).

DUCATI MECCANICA S.p.A. - P.O.B. 313 - PHONE: 49.16.01 - BOLOGNA (ITALY)

STUDIO LUCY LITOGRAFIA SCARANI - BOLOGNA PRINTED IN ITALY

Two-stroke frames

The first Ducati two-stroke models, the Brisk and Piuma mopeds, had a pressed steel frame, but with the introduction of the 48 Sport, in late 1962, a neatly crafted duplex affair was used. This continued through to the end of the 1960s on machines such as the SL, SL1 and SL2 50s and the 100 Cadet and Mountaineer ultra-lightweight motorcycles. However, only the larger machines have a full cradle type, as the 48 Sport and the SL series employ the engine assembly as a stressed member.

Then there was the budget-priced, single-speed Rolly commuter moped of 1968. This uses a rigid chassis U-tube which doubles as a petroil container and frame.

For 1969 and 1970, the new 50 and 100 Scramblers reverted to the full duplex frame used on the 100 Cadet and Mountaineer.

Finally, the 125 Regolarita and Six Days employ a very similar type of frame to the 450 R/T and 125 Scrambler in the amount of tubing, even though the layout itself is different. In fact, the design is very similar to that used on the majority of other 1970s dirt racers, just prior to the advent of single-shock rear suspension. This means that not only is there a duplex cradle, but the steering head is gusseted for extra strength and the large-diameter top tube is supplemented by a smaller-diameter bracing tube under the tank.

Rear frame loop

This, at least in detachable form, was only fitted to the 450 R/T Desmo.

Frame numbers

On the majority of Ducati singles exported to the USA, difficulty may be experienced when trying to locate the frame number. The answer is simple, as these bikes had a peel-off frame number on an adhesive strip of tinfoil. Originally located on the steering head, this may well have become detached over the years, resulting in no numbers.

The above information also applies to American specification models imported into Britain by Bill Hannah of Liverpool during 1968, and sold from 1969 through to 1972. Essentially, this was a batch of 3500 machines, which comprised 100 Cadet, 160 Monza Junior, 250 Monza, 350 Sebring and the narrowcase 250 Mark 3.

The first of the Bologna factory's 'strokers' to use a tubular frame was the 48 Sport of 1962. It features twin downtubes and was sold in both pedal (shown) and kickstart forms.

On all the other Ducati singles, including the two-strokes, the number is punched on to the frame in the traditional fashion, either on the steering head or main frame tube near the battery carrier.

Rear fork

The purpose of the pivoting rear fork (swinging arm) was not only to provide the bottom mounting for the rear shock absorbers, but also to ensure a good combination of comfort and handling. With one exception (the 1968 Rolly moped), all the Ducati singles covered in this book have some form of pivoting rear fork.

Expect to replace the fork bushes *and* quite often the pin. In fact, it is worth saying that not only do the bushes become worn, but the pin as well, so they really should be replaced as a complete package, not individually.

The bushes are made in various materials—most often phosphor-bronze, but in some cases they may be of cast-iron, nylon or a fibre material (the last is only to be found on Spanish Mototrans models).

In all cases, a specially hardened steel pin (or bolt on the two-strokes) of varying length is used. On the four-strokes, four lengths are used: pre-1960 narrowcase (bushes in frame), 182 mm; post-1960 narrowcase (bushes in pivoting fork), 201 mm; all widecase, except 450 R/T Desmo, 256 mm; 450 R/T Desmo only, 274 mm.

Wear on all these can prove a real problem. Not only will some previous owners have ignored the fact that the pivot needed lubricating, but also Ducati made the job virtually impossible anyway by providing less than adequate channels in the bushes for the grease to circulate and, worse still, fitting only *one* small press-in grease nipple on the majority of its models. This was on the chain side (offside) and would usually last only a short period of time before being dealt a terminal blow by the chain.

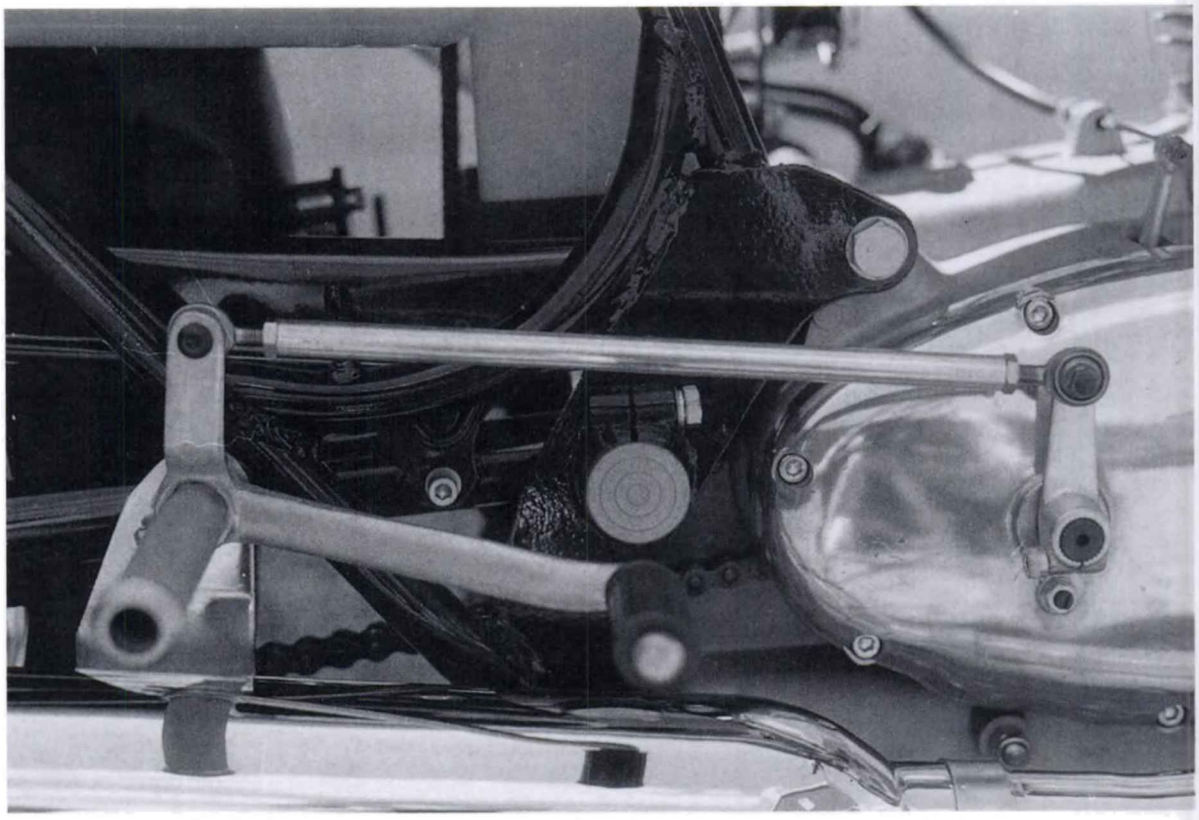
This means that it is quite likely that the pressed-in pin will prove extremely difficult to remove. In fact, you may have to cut it out.

To prevent a repeat performance, observe the following: make sure that the pivot is greased regularly; fit *two* nipples (one per bush) in such a way that they cannot be damaged; dismantle the pin, say, every 3000 miles, inspect it, turn it around and regrease. This will ensure a much longer life.

Various aftermarket kits have been produced over the years, but in the interests of originality, most bikes still retain the standard pin and bush system.

The two-stroke models differ only in having a bolt and nut, rather than a pressed-in pivot pin.

The rear forks themselves are even more diverse, both in length and bracing, but all are of the basic steel tubular design—except for the Brisk and Piuma mopeds (pressed steel) and the 125 Regolarita and Six Days enduro bikes (square-section tubing).



ABOVE *At each end of the swinging-arm pivot on the four-stroke models there is a silver-grey plastic cap, shown here on a 1974 350 Desmo. Note the rearset gearchange linkage*

Rear fork shimming

On the four-stroke models, a selection of shims in increments of 0.2, 0.5 and 1 mm are available. The rear fork should be adjusted with these to ensure a free movement, but with *no* endfloat. This should be done with the suspension unit detached.

Plastic end caps

Again, these are only a feature of the four-stroke models and comprise a pair of silver/grey plastic caps which locate into each end of the pivot pin. Their purpose is to prevent the ingress of dirt and water into the bushing area.

Head races

Expect to renew these as a matter of course. All the four-strokes, except the 450 R/T, use a set of chrome-plated cups and cones with a total of 48 steel balls of $\frac{3}{16}$ in. diameter, split between top and bottom. The pairs of cups and cones are interchangeable and are the same for all model years.

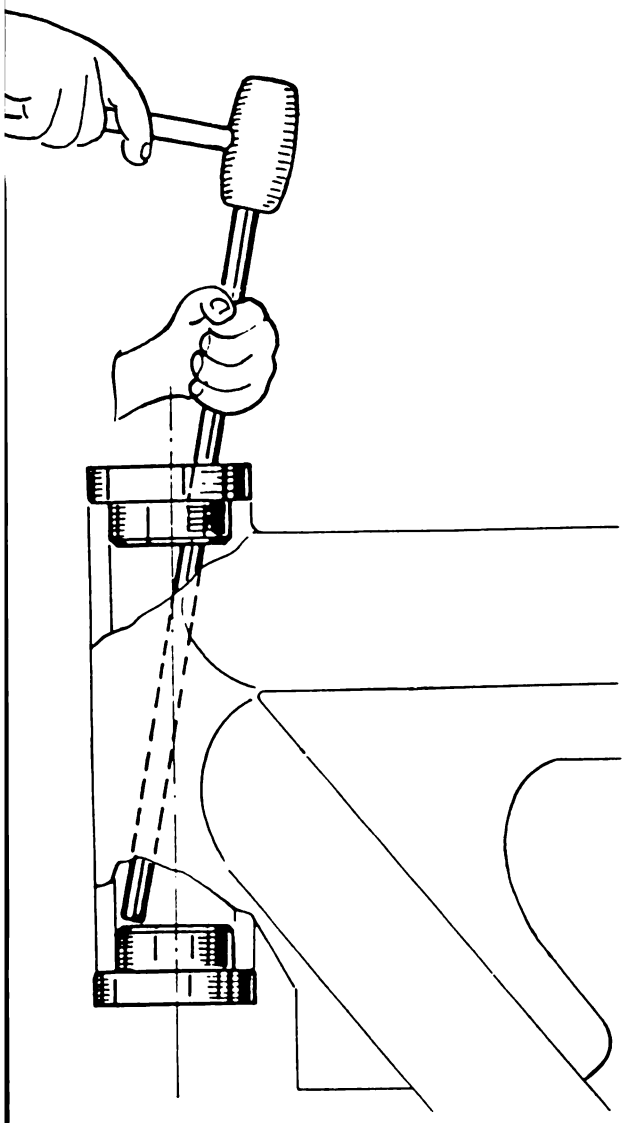
Besides wear and pitting of the bearing surfaces on both the cups and cones, the cups become loose in the frame. If you are lucky, fitting new cups with Loctite will solve the problem, if not, specialized engineering is the only course of action.

The 450 R/T is totally different. It features a pair of taper-roller steering head bearings, the size being 26 × 52 × 15 mm.

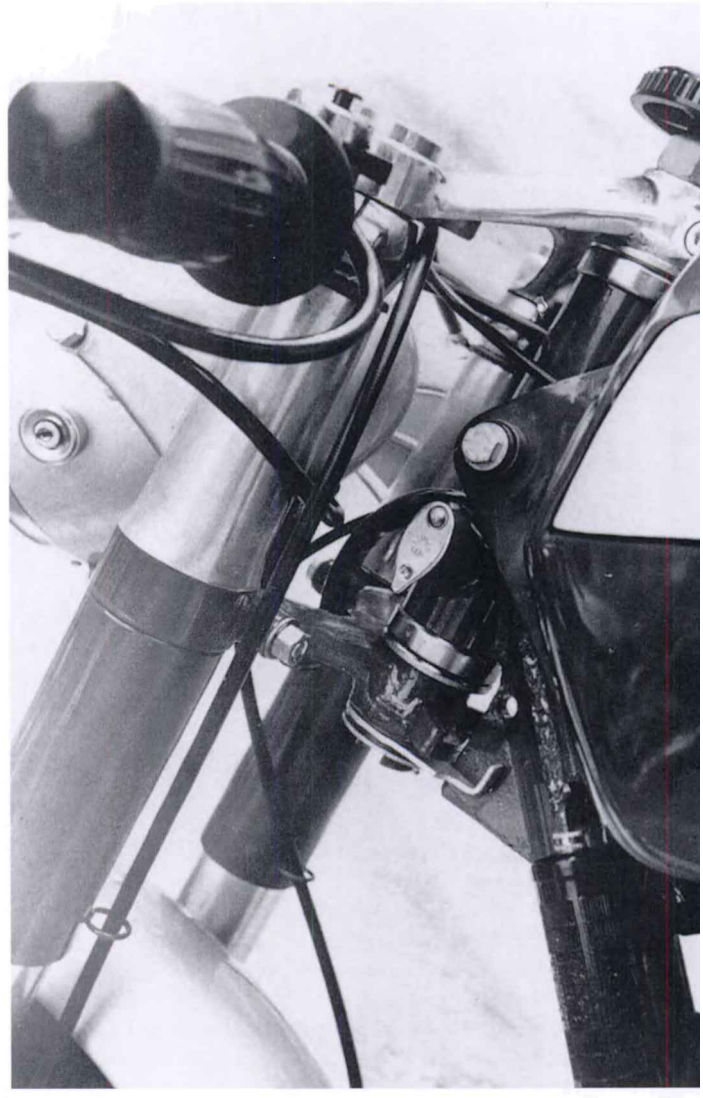
The majority of the two-strokes use cups and cones. However, these are totally different to the four-stroke types and there are several variations. Supplied only in kits, these are either of Agrati (seven-piece) or Griffanti (six-piece) manufacture. Again, unlike the four-strokes, the cups and cones are *not* interchangeable between the top and bottom races. However, the steel ball size is still $\frac{3}{16}$ in.

For the mid 1970s 125 cc models (Regolarita and Six Days), Ducati utilized an identical set-up to that of the 450 R/T, with taper steering head and bearings.

With both cups and cones or the much superior taper bearings, lubrication is all important. Do not assume that because your machine stays in the garage most of the time that it will not demand this attention. The truth is that grease will 'dry out' over a period of time, so the steering head bearings of both types will occasionally require repacking with fresh grease.



The method of steering cup removal



The steering head races (cups and cones) should be renewed as a matter of course during restoration. Neiman steering lock denotes that this is a widecase frame

9 Suspension

Together with the frame design, the suspension can take the credit for Ducati's almost legendary reputation for producing motorcycles blessed with leech-like road-holding and ultra-safe handling. These comments apply not only to the more recent twin-cylinder models, but also in equal measure to the range of motorcycles covered in *Ducati Singles Restoration*.

Much of this reputation is directly attributable to the success enjoyed by the Bologna marque in both sports and Grand Prix racing during the late 1950s and early 1960s.

Front forks

All front forks used on the Ducati single-cylinder range are of the telescopic type. On the four-strokes there are six individual basic types, all of which are of the oil-damped hydraulic variety.

The six types comprise: 100/125/160 cc, 30 mm with enclosed springs and covers; 175/200/250/350 narrowcase and some widecase models until 1972, 31.5 mm with enclosed springs and covers; 24 Horas (Hours) Spanish Mototrans, 35 mm exposed stanchions, painted sliders (bottom legs); Street Scrambler, 35 mm (1969–72 only) with enclosed springs and rubber gaiters; Mark 3 (1973 and 1974) and drum-brake Desmo (1972–4), 35 mm Marzocchi exposed stanchions; disc-brake Desmo (1973 and 1974), 35 mm Ceriani exposed stanchions.

Generally, all the above types are quite trouble-free and, with the exception of seal replacement, will normally require little attention. However, there are still a few points which need special care.

On the 31.5 mm fully-enclosed narrowcase type, the alloy sliders (bottom fork outer legs) act as a bush. If badly worn, these will not only affect the roadholding, but, in Britain, will also mean that the machine itself would fail an MoT (Ministry of Transport) test. There should be *no* sideways movement at any point between the slider and the stanchion.

A similar situation exists on the smaller-diameter 30 mm enclosed forks, as fitted to the 100/125/160 models. These have a separate screwed-in alloy bush at the top of the slider, just under the main stanchion seal. Again, if this is worn, it will need replacing.

Unfortunately, in some cases, parts for these early-type forks are either in short supply or, worse still, non-existent, which can prove a real problem.

On those models equipped with the later exposed-stanchion type, a further check must be carried out on the condition of the hard chrome plating of the stanchions themselves. Any pitting will cause rapid wear of the seals and subsequent leakage. On this type of fork there are two seals per leg, rather than only one, as on the earlier enclosed types.

Because of the many small components contained within the leg assemblies of a front fork, it is necessary to ensure that, like the engine unit, the positions of all shims, washers, etc are carefully logged during the stripdown. In addition, it is a good idea to have at hand an exploded diagram from the relevant parts book. This will greatly assist the process.

Much of the general information contained above applies equally to the two-stroke models. However, there are differences. The 1960s 50 and 100 cc ultra-lightweight motorcycles have a far more basic type of telescopic fork. This is undamped (often with no oil) and has far fewer working parts, and at 28 mm, the stanchion diameter is smaller.

The later, mid 1970s 125s have Marzocchi forks, which are very similar to those fitted to the late Mark 3s, but the stanchion diameter is smaller at 34 mm.

During restoration, some owners may wish to convert their machines from conventional handlebars to clip-ons (or vice versa, of course). For the job to be done properly, it is not just a case of fitting a different top yoke, but in the case of the post-1972 four-stroke,

ABOVE RIGHT *Brian Jefferies testing the prototype Vic Camp Mach 1 racer at Brands Hatch in late 1964. It used the standard production 31.5 mm front forks and Marzocchi rear shocks. The forks had their spring covers removed*

RIGHT *The components of the single-seal, enclosed, 31.5 mm forks. These are fitted to the majority of the Ducati four-stroke singles built between 1957 and 1971*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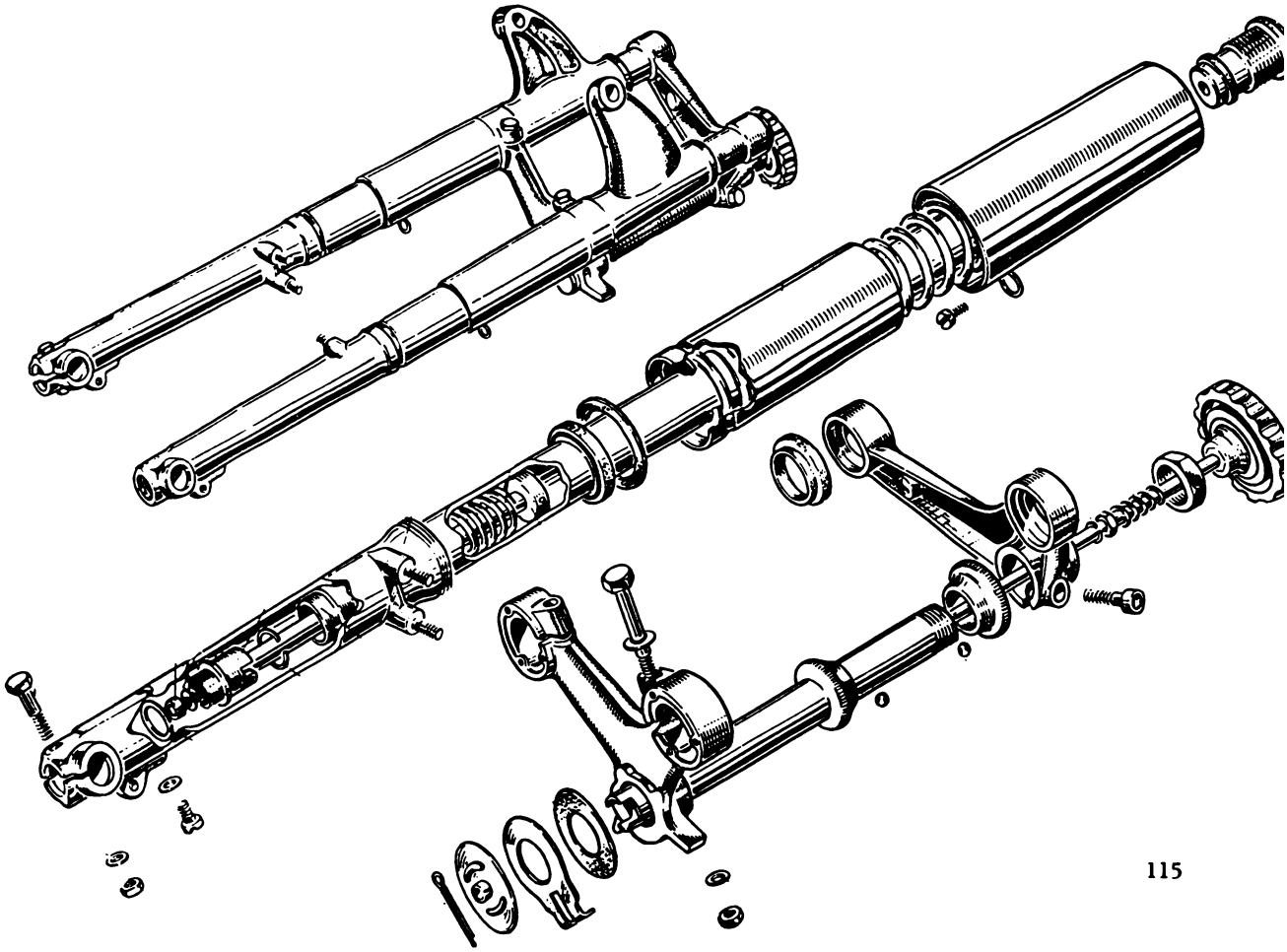
BP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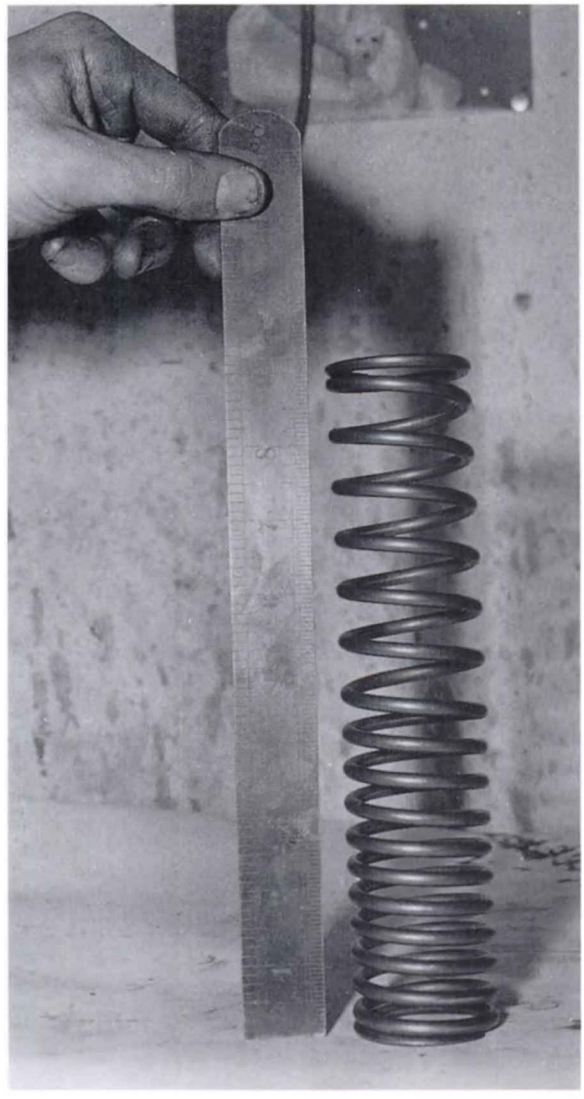


ABOVE *Some of the component parts from the 31.5 mm forks, including stanchion, slider, valve assembly, fork top alloy plug, oil seal and washers*

LEFT *Measuring the fork spring for correct length*

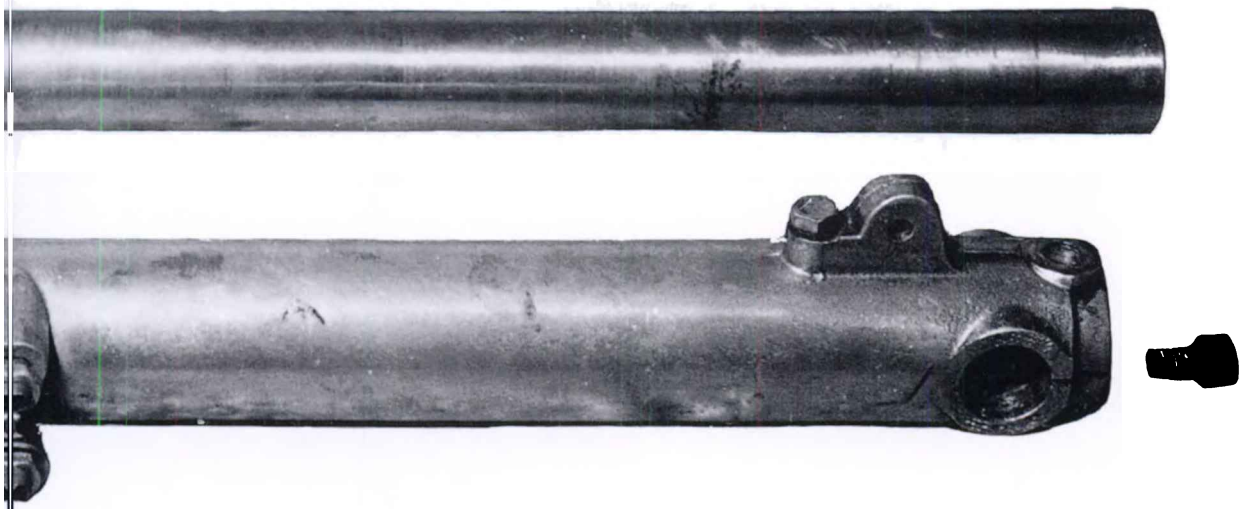
of also fitting different-length stanchions. These are approximately 50 mm (2 in) shorter when clip-ons are used.

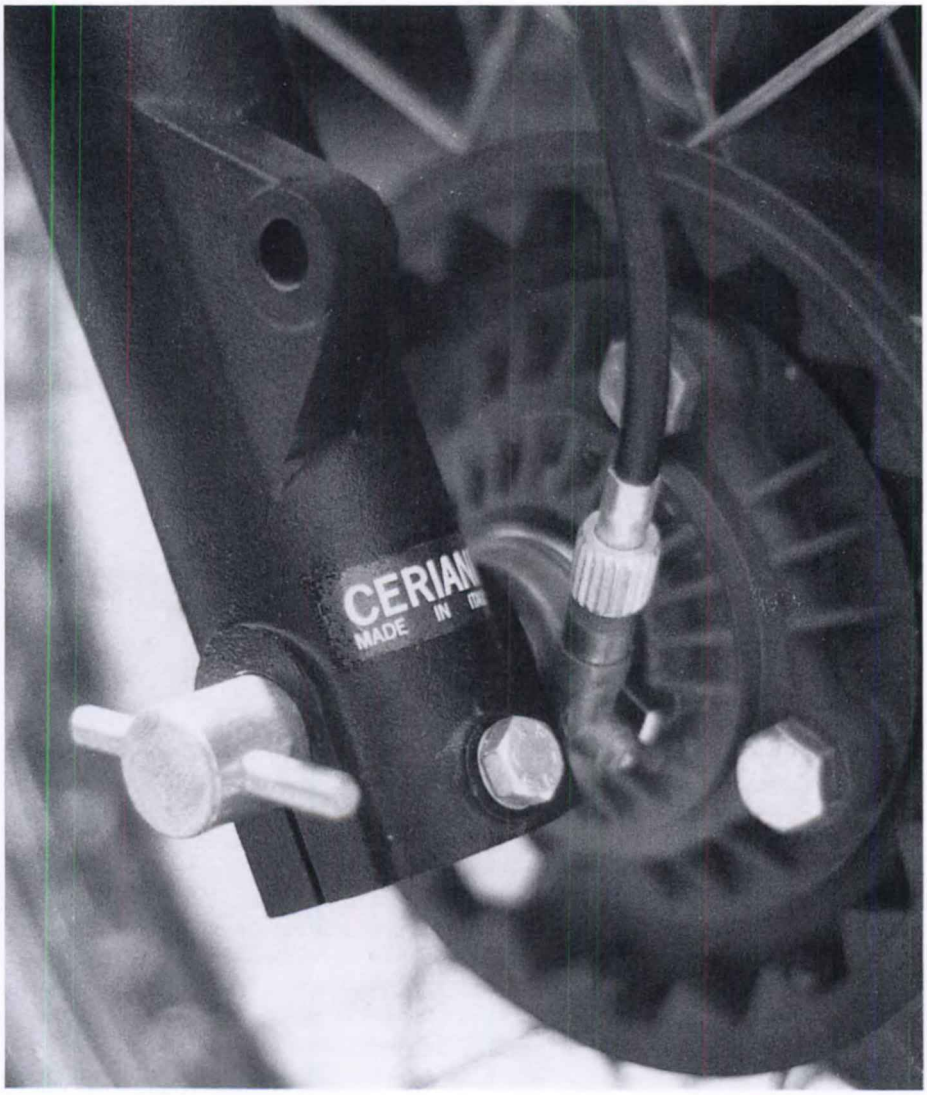
In my experience, it is very unusual for the fork springs to need replacing. Even so, I would advise the restorer to check the effective length against the figure given for the respective model in the workshop manual.

If the machine has been in a crash, or has suffered a heavy knock, there is a good chance that not only will one or both of the fork stanchions be bent, but also the yokes may be distorted. Some checks may be preferable with the yokes and stanchions assembled, but in all cases, any distorted components ***must*** be replaced. In the case of the stanchions, slight distortion may be put right by a specialist with a hydraulic press. For racing, however, or where there is a distinct 'crease' in the leg, it is not worth taking the risk of the metal failing.

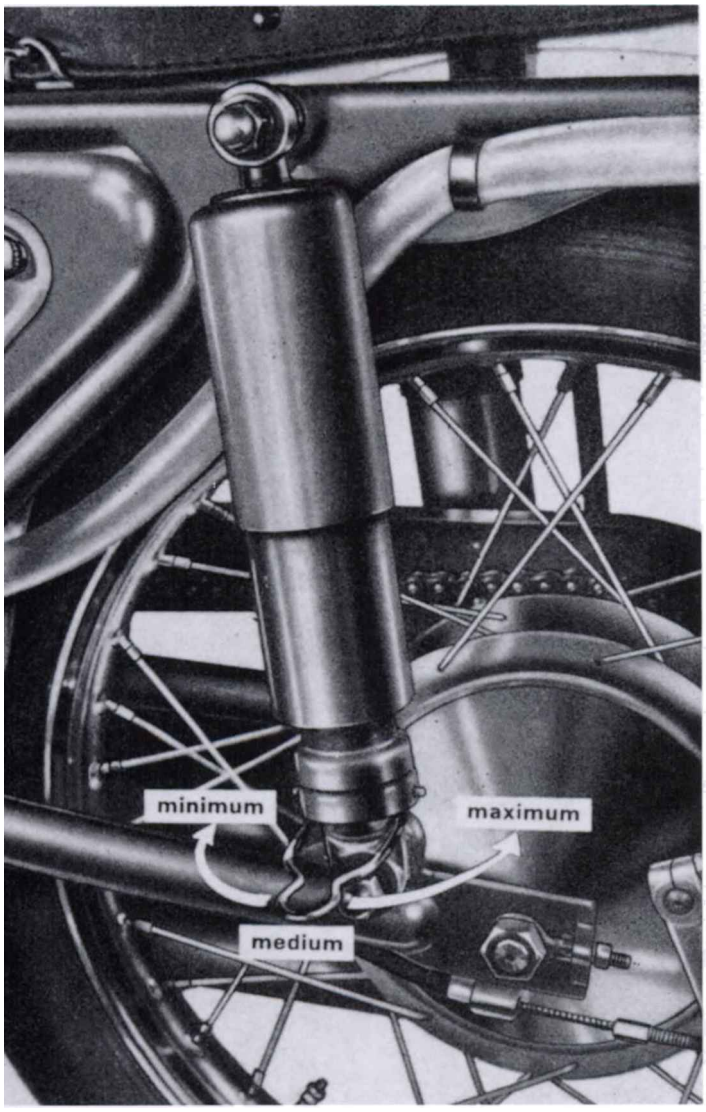
Wear on a stanchion can be dealt with by having it ground and replated, this is another job for a specialist.

When putting the machine back together, do *not* overtighten the front wheel spindle clamp at the base of the fork leg. With a cast-alloy clamp, this is easily done if you are not careful, and the result can prove expensive—a broken lug means that a replacement slider will be required.

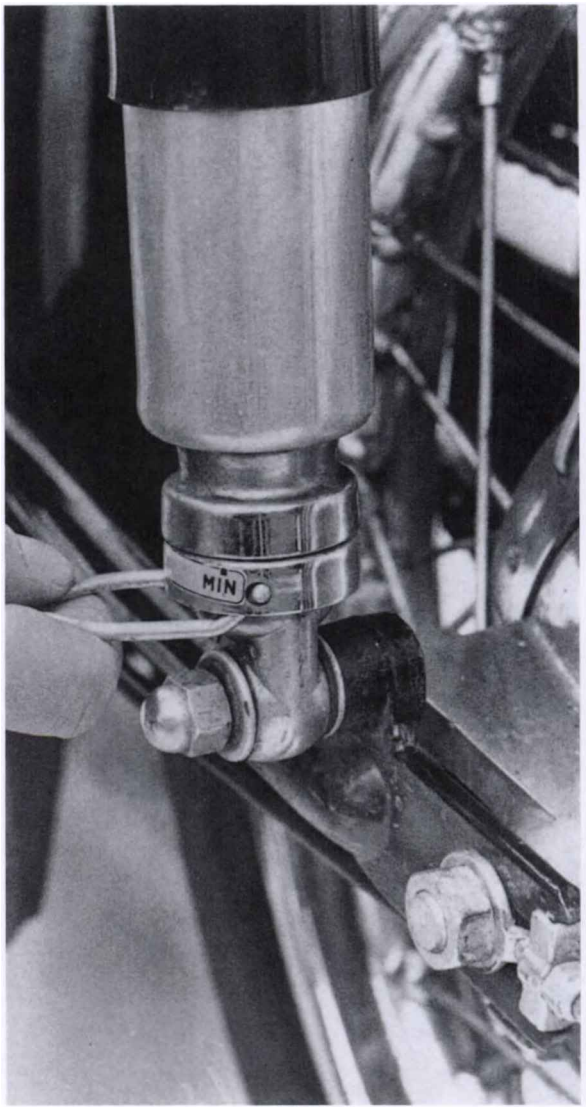




Ceriani forks had an extra lug on the offside slider for a second disc. Note the angled speedometer drive gearbox



Early camshaft models, such as the 175 Sport and 200 Elite, have polished alloy spring covers for the rear shock absorbers. There are three load positions



Using the hand adjuster lever

Handlebar fixing

There is a wide variety of these, but all serve the same purpose, that of clamping the handlebar to the top yoke. On the narrowcase and early widecase four-strokes (in other words, those machines fitted with the enclosed forks of either 30 or 31.5 mm diameter), these are simply U-bolts or, as in the case of the 350 cc Sebring, an alloy casting with four studs. On the later widecase bikes with 35 mm forks, there is a pair of alloy stampings, each with its own pair of allen bolts. The two-strokes follow similar lines.

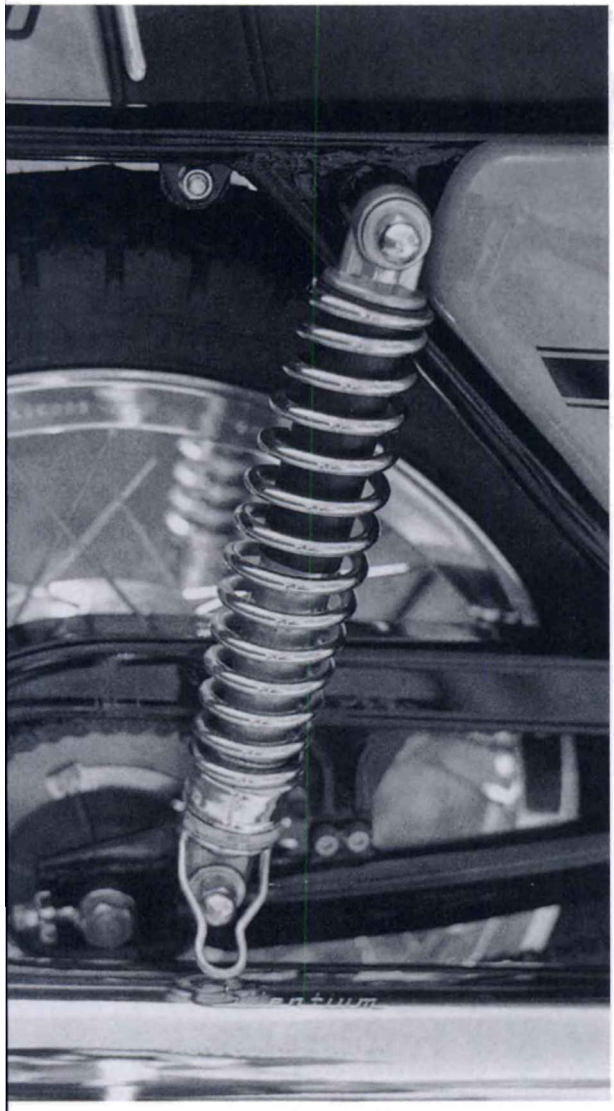
Models with clip-ons have a 'smooth' top yoke, each clip-on clamping directly to its stanchion.

Steering damper

Only the four-stroke models had a damper fitted as standard equipment, and then it was of the friction variety, not hydraulic.

During the restoration, all the various components which make up the damper assembly need to be renovated or replaced as necessary.

The design is virtually the same for all models, even though Ducati had more than one supplier (Ceriani, Marzocchi, etc). The damper knob is screwed into a long rod which passes through the steering column nut and down through both yokes. At the base of the bottom yoke are two plates (one threaded), two fibre



The sports models, such as the Mach 1, Mark 3 and Desmo, have chrome-plated, exposed springs

washers and a split pin. The latter is there to prevent the bottom threaded plate from becoming detached from the damper rod.

The only significant difference is that on the enclosed (30 and 31.5 mm) forks, there is a hollow nut/spring/circlip directly underneath the damper knob, whilst on the later exposed, hard-chromed-stanchion type, there is only a spring. Again, consult the parts book if in doubt.

Rear suspension units

Ducati fitted sealed rear suspension units to all its two-stroke singles. Consequently, these offer limited scope to the restorer. Furthermore, unlike the majority of British bikes, the outer covers *cannot* be removed, making life even more difficult. The result is that if there is anything other than defects to the external finish which need repainting, the units are so much scrap and are only good for the dustbin.

The four-strokes were entirely different. All the rear units (both covered and exposed-spring types) can be dismantled and, at least in theory, rebuilt. However, there is a snag—obtaining the correct seals to carry out this task. With some of the units being over 30 years old, the original overhaul kits have become obsolete long since. Even those for the final Mark 3s and Desmos of the mid 1970s are hardly any easier to locate.

However, all is not lost, and quite often it is possible to find suitable replacements from another machine (for example, the seals used in a Guzzi V35/50 can be utilized for the 1973 and 1974 Mark 3 and Desmo models).

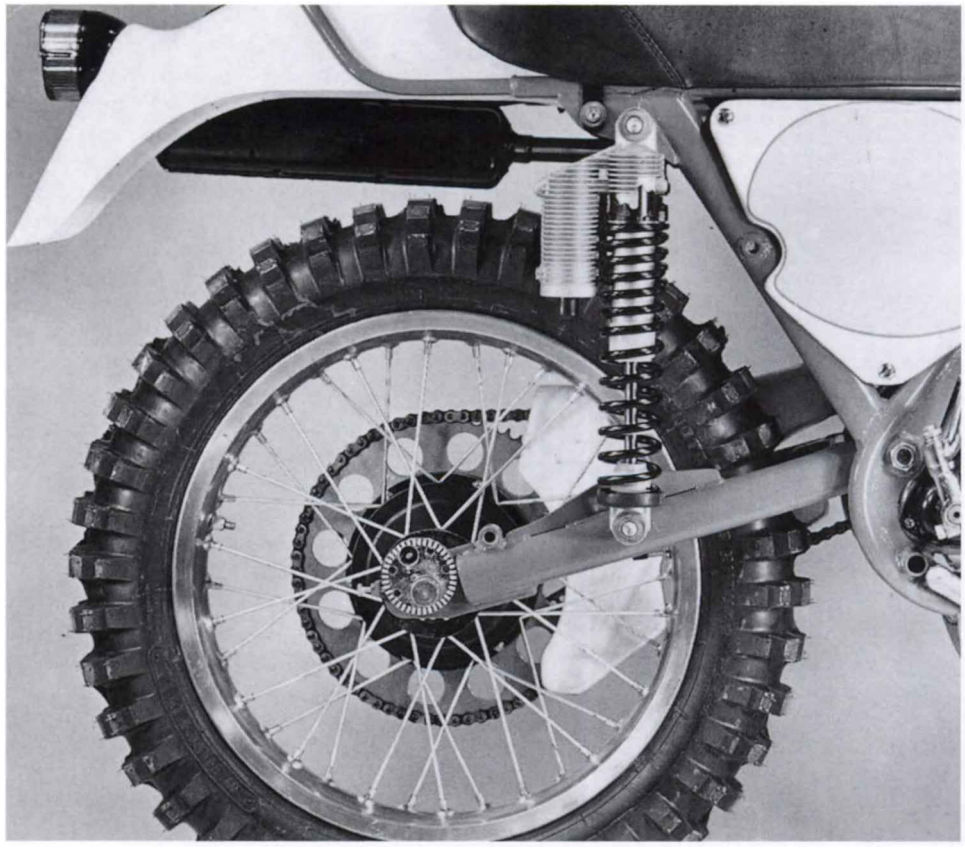
Other parts needed for a full overhaul to concours standard are available—if you know where to look. These include the eight cone-shaped rubbers (four per unit), the inner and outer curved washers which hold these rubber cones in place, the domed nuts and even the pukka decals (yellow Min-Medio-Max). The adjusting handle and its holding ring, and, where fitted, exposed springs can all be replated.

To dismantle each unit, it is necessary to compress it, which will allow the steel retaining ball to drop out of its groove (which has three positions to provide different loadings).

The only four-stroke models to employ another type of unit are the 100/125/160 models. These can still be dismantled, but are non-adjustable.

For anyone whose rear units are past the restoration stage, obtaining new *original* replacements is a most difficult, if not downright impossible, task. This is because both Ducati and Marzocchi (the manufacturers) no longer list any of the original rear units. The only alternative is to fit an aftermarket replacement.

From personal experience, I would recommend Sebac Zenith shocks. Not only are these reliable in service and offer good handling, but also are relatively inexpensive. There are, of course, several other options, including modern Marzocchis, Hagons (Girling type) and Konis, for example. The restorer may well have strong views about choosing a particular make, and ultimately it comes down to personal preference.



Unique to the 1977 125 Six Days enduro is this option of mounting the rear shocks vertically or at an angle. The finned cylinder is a gas reservoir

10 Wheels, brakes and tyres

This chapter concerns the components used to convey and stop the motorcycle. Once again, their condition is all important to the success of your restoration. It also deals with items which have to be tackled 'mid-stream'—without wheels, a machine becomes very difficult to move about before being reduced to parts, and the same applies in reverse when everything is being screwed back together again.

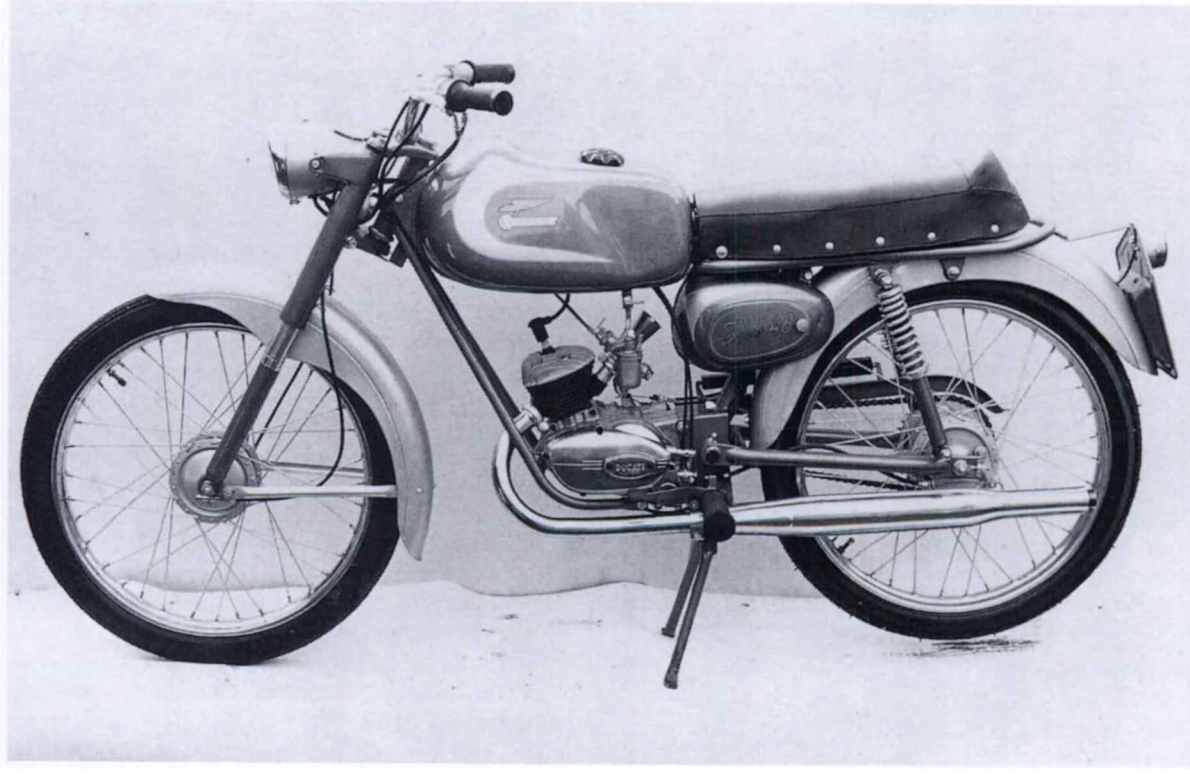
Spoking pattern and rim offset

First of all, take out your notepad, measure the rim offset and draw the spoke pattern. The former is an indispensable piece of information, while the latter will give you a real headache if you have to work it out from scratch.

The rim offset is found by placing a straight edge across the mouth of the brake drum and measuring from it to the edge of the rim. To be doubly sure, also measure from a firm point at the other end of the hub and take the rim width. Taking more than one measurement will ensure an increased level of accuracy.

To determine the spoking pattern, initially check whether the rim is handed to suit an offset hub. Then note where the valve hole is located, how the spoke to one side of it runs, whether its head points out from the wheel or into its centre, and finally any feature of the hub which will enable you to locate that spoke into the same hole.

Most Ducati singles have 36-spoke wheels like this 1964 48 Sport



The 180 mm single-leading-shoe front brake fitted to all ohc singles of 175 cc and above, from 1957 until the end of 1971. Pre-1965 hubs have seven fins between the spoke flanges, but thereafter this number was reduced to only three

The double-sided, single-leading-shoe Grimeca front hub first appeared on the Mark 3 and Desmo models in 1972. Its power and smoothness make it an attractive choice with classic racing enthusiasts

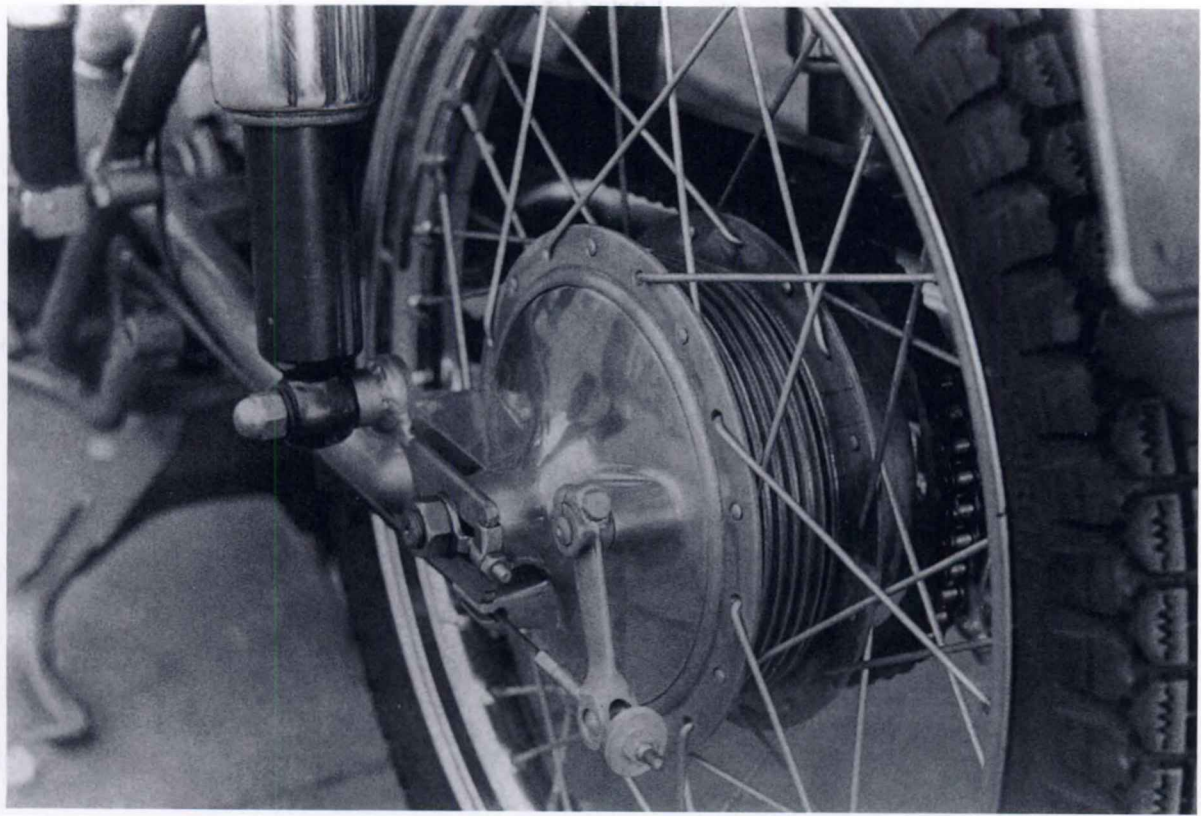
Relating the rim, spoke lay and hub to that initial spoke will provide the key to the wheel build. From it, the others will drop into a distinct pattern. Working round the rim, the spokes will alternate from one side of the hub to the other. Every third spoke will be laid the opposite way to the first, and its head will face in the reverse direction unless straight spokes are fitted. Every fifth will echo the first in angle and lay. Note the spoke cross-pattern.

It is worth pointing out that all spokes originally fitted to the range of Ducati singles, both four and two-stroke, were *painted*, not plated. These not only rust easily, but also are brittle and tend to break, on rear wheels in particular. My advice is to replace these with aftermarket plated components, as a matter of course, during the restoration. Opting for complete originality in this instance would be totally counter-productive.

Wheel dismantling

For the reasons outlined in the previous section relating to the infamous original painted spokes, you will have to dismantle both wheels. In any case, if you wish to either polish an alloy hub or repaint a steel one, this will also be necessary. Do *not* be tempted to chrome-plate the original spokes.

There will sometimes be up to four types (most Ducatis had only two) of spoke in each wheel, with a difference in length and head angle as well as diameter. So keep the spokes in batches and make a note of which goes where on your spoke diagram. Note that on some wheels, certain spokes cannot come away until others have been removed, and the rebuild will have to be done in the reverse order. For those not wishing to undertake the wheel building themselves, there are specialists who will carry out the task for you. This, of course, will add to your total outlay on the restoration, but at least it will allow more time to concentrate upon other jobs.



An early 160 mm rear hub. The machine is a 1958 175 Sport. Note the chain adjuster, alloy rear brake arm and cable

Hub, carrier and rear sprocket

The bearings, spindle, cush-drive rubber, sprocket carrier and sprocket teeth are the things most likely to need attention. Replacement is the easiest way to make good most damage or wear, but some items—such as the brake drum and sprocket—can be repaired. The former can be skimmed to remove scores or an oval circumference, while the latter can have the teeth area removed and a new toothed flange fitted. However, the latter repair will often prove *more* expensive than the cost of a new replacement sprocket, but it is the only solution when an 'off-the-shelf' replacement is not available.

Do not forget to fit a new set of rear sprocket lock-tabs.

Front hub types

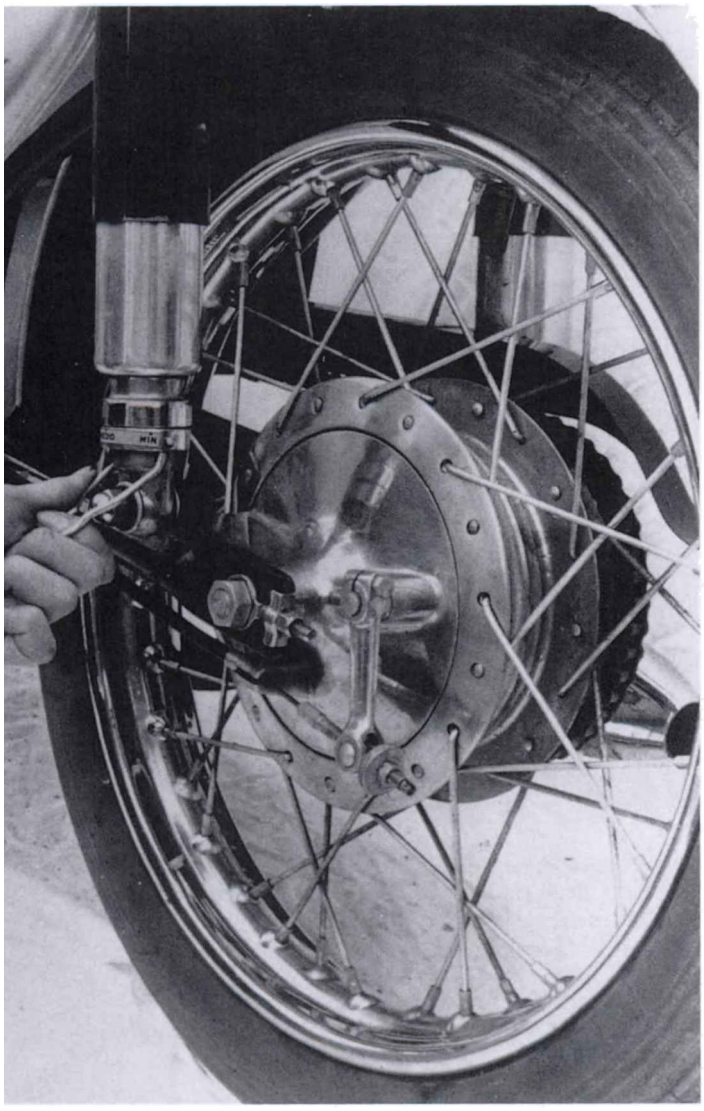
Considering the vast range of Ducati single-cylinder models, there are relatively few types of front wheel hub (or rear hub, for that matter). On the overhead-cam four-stroke range, which began in early 1957 with the introduction of the 175 Sport model, the front hub is a full-width alloy affair with a diameter of 180 mm. A very similar alloy full-width hub, but with a smaller 158 mm diameter, is fitted to the other 175 street bike, the Tourist.

These two hubs, which both have a separate external speedometer-drive gearbox were used up to and including the 1960 model year. The 180 mm unit was also specified for the 175 Americano, 200 Elite, Super Sport and TS Americano models, whilst the 150 mm hub was fitted to the 100 and 125 Sport models and the 125TS.

From 1961 onwards, the hubs were redesigned to incorporate an integral pair of speedometer drive gears (see Chapter 12). These comprise a large crown gear which is pressed on to the hub and a matching pinion worm fitted into a side plate.

These later hub types were used for many years afterwards (until the end of 1971, in fact). The modified 180 mm unit was also fitted to the later versions of the 200, all 250 and 350 narrowcase bikes, plus the widecase line (250, 350 and 450).

The only other modifications during this time came in 1966 when all the remaining four-strokes (except the 160 Monza Junior) were fitted with a dummy air scoop on the speedo drive mounting plate, and the hub was given fewer ribs in the area between the spoke flanges—three instead of the original seven.

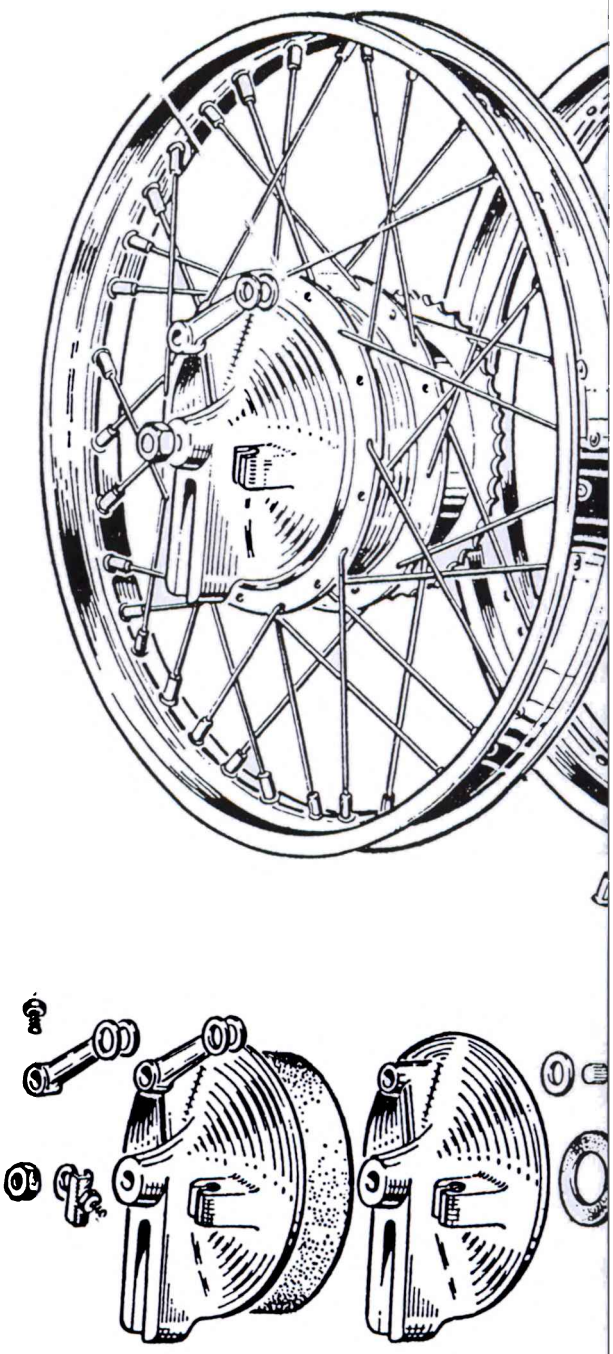


ABOVE *Later 160 mm rear brake fitted to a 1966 250 Monza. Note that it has wider bracing ribs between the spoke flanges than the 1958 machine*

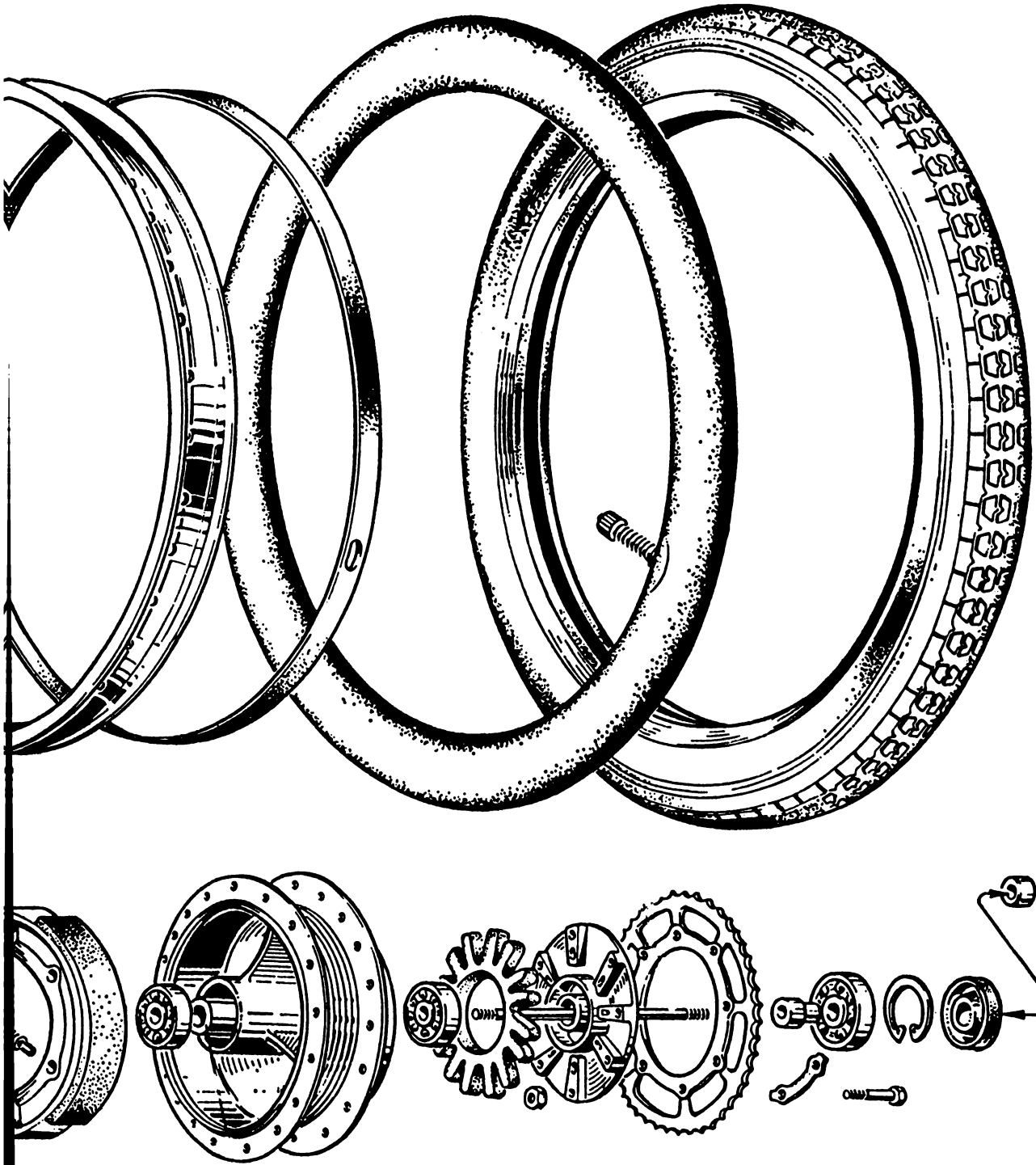
Then, in 1972, it was replaced, although not on the Street Scrambler (SCR).

The smaller 158 mm hub continued to appear on the 125 Sport (Monza in Britain) until it was taken out of production at the end of 1965. The 160 Monza Junior (1964–8), 125 Scrambler (1971) and 450 R/T (1971–2) also used it.

The only other front hubs to be used on the overhead-cam four-strokes are the 180 mm conical type fitted to the 175 and 200 Motocross models from 1958 to 1960; the 180 mm *double-sided* Grimeca, which became standard ware on the later Mark 3s, Street Scramblers and drum-braked Desmos (1972 onwards Mark 3 and Desmo, 1973 onwards Street Scrambler);



Typical Ducati rear wheel (from a 1963 250 Diana), showing the various components, including tyre, tube, rim tape, sprocket, cush-drive hub, shoe, brake plate, seals, shims and bearings



and finally the 280 mm Brembo hydraulically-operated disc for the yellow Desmo café racers.

The two-strokes use four types: full-width, steel, 90 mm (Brisk, Piuma and Rolly); full-width, steel, 105 mm (48 Sport); full-width, alloy, 118 mm (80 Cadet, Mountaineer, 48 Cacciatore, 50 SL/SL1/SL2, 50/100 Scrambler); and conical, alloy, 125 mm (125 Regolarita and Six Days).

None of the front hubs fitted to the various Ducati singles is particularly prone to problems, but the hub is still worth examining for any damage or metal fatigue, particularly as some of the machines are now over 30 years old.

Rear hub types

Like the front hub, the rear hub used in Ducati singles is usually of the full-width alloy type. The early ohc four-strokes have a hub diameter of either 160 mm (175 and 200) or 136 mm (100 and 125). Both were widely used throughout the career of the classic bevel-driven machines. The only real change to these hubs came in 1966 when they were cast with four ribs, instead of the previous seven, on the section of the hub between the spoke flanges.

The larger (160 mm) hub was standard ware for the 250 (and 239), 350 and 450, the last including the Desmo R/T dirt bike. As for the 136 mm assembly, this was fitted to the 160 and, later still, the 125 Scrambler.

The only other type of rear hub used on the series-production overhead-cam models is the conical, alloy, 180 mm assembly of the 1958–60 Motocross, in both 175 and 200 engine capacities.

As for the two-strokes, these all employ identical sizes to their respective front hubs: 90 mm (Brisk, Piuma and Rolly), 105 mm (48 Sport), 118 mm (all 80 and 100s, 48 Cacciatore, 50 SL/SL1/SL2 and 50/100 Scrambler), 125 mm (Regolarita and Six Days).

Again, none of these hubs is noted for particular weaknesses. However, as with the front assembly, carry out thorough checks to ensure yours is not damaged in any way. This is particularly important when the machine has been used off-road, especially for competition work.

Cush-drive

All Ducati singles have some form of cush-drive. This usually takes the form of a cast-alloy holder and a rubber vane with a number of integral segments. The holder will also have a bearing and oil seal, plus at least one spacer. For the exact sequence of assembly, you should consult the relevant illustration in the Ducati parts book for your particular machine. Do *not* assume that the assembly procedure is correct as you dismantle it—I have seen several bikes which have had incorrectly set-up cush-drive assemblies.

Besides the condition of the bearing, seal and spacer(s), the part most likely to wear is the cush-drive rubber itself. If there is *any* sign of imperfection, it should be replaced (as should one made soft by the ingress of oil or grease). Failure to do so will result in excessive chain snatch.

The two-stroke 125 Regolarita and Six Days dirt bikes have five separate cush rubber blocks, but, in essence, the principle and function are the same.

Wheel spindles and spacers

Most of these are of the simple pull-out variety. However, on the pre-1960 overhead-cam four-strokes, the rear spindle has shoulders which butt against the wheel bearings and so prevent its removal. All spindles need to be checked to ensure that they are completely straight.

Wheel spacers are there to carry out a precise job. To do this, they need to be fully serviceable and in the correct position. This last statement might sound obvious, but of all the things on a motorcycle which are likely to be in the wrong position, wheel spacers would probably head the list. Again, consult the illustrations in your parts book to determine the correct sequence of assembly.

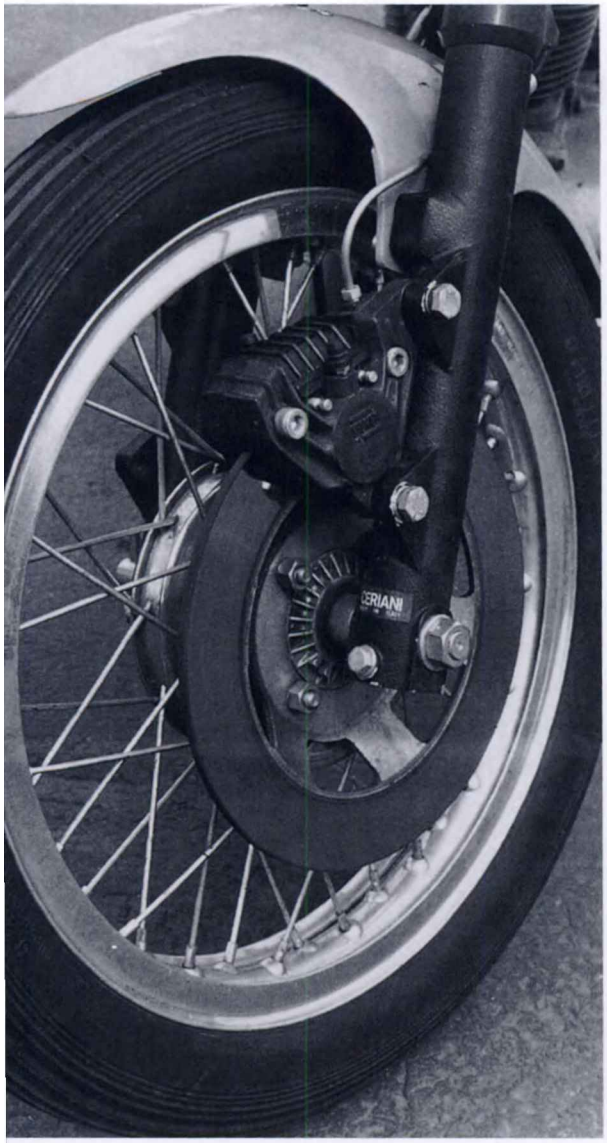
Wheel bearings

All Ducati singles use ball-race wheel bearings. Besides being free-running, with no noticeable movement, they need to be a good fit both in the hub and on the spindle. There are also normally both felt and steel protection discs. Obviously, these will need replacing if they are damaged in any way. The bearings are best removed by subjecting the hub to localized heating, while 'freezing' the new bearings will aid installation.

Brakes—drum

All drum brakes are of the single-leading-shoe type, even the double-sided Grimeca assembly fitted to the last of the drum-braked four-strokes. As such, these are straightforward to work on.

If you intend fitting new brake shoes (separate linings are not offered by Ducati as a spare part, and they are bonded, not riveted on), first ensure that the brake drum is of the standard diameter (as outlined earlier in this chapter). If it has been skimmed at some time in the past, you will need a specialist to supply and fit oversize linings. He will require the wheel *and* brake plate. Do not be tempted to go for the wrong grade of lining. For example, Ferodo AM4 'green' linings may be suitable for some machines, but not lightweights like the Ducati singles. They are simply too hard and not practical, even for racing. Furthermore, they can badly score the drum.



Brembo disc brake fitted to a 1974 350 Desmo. It features a square-pad caliper and a 280 mm cast-iron disc

The disc brake hub is the same component as that fitted to the wire-wheel 900SS and certain other early V-twin models. It has 40 spokes

Finally, do not forget to replace the brake shoe springs (these have been known to snap on Ducatis) and check and regrease the brake cams.

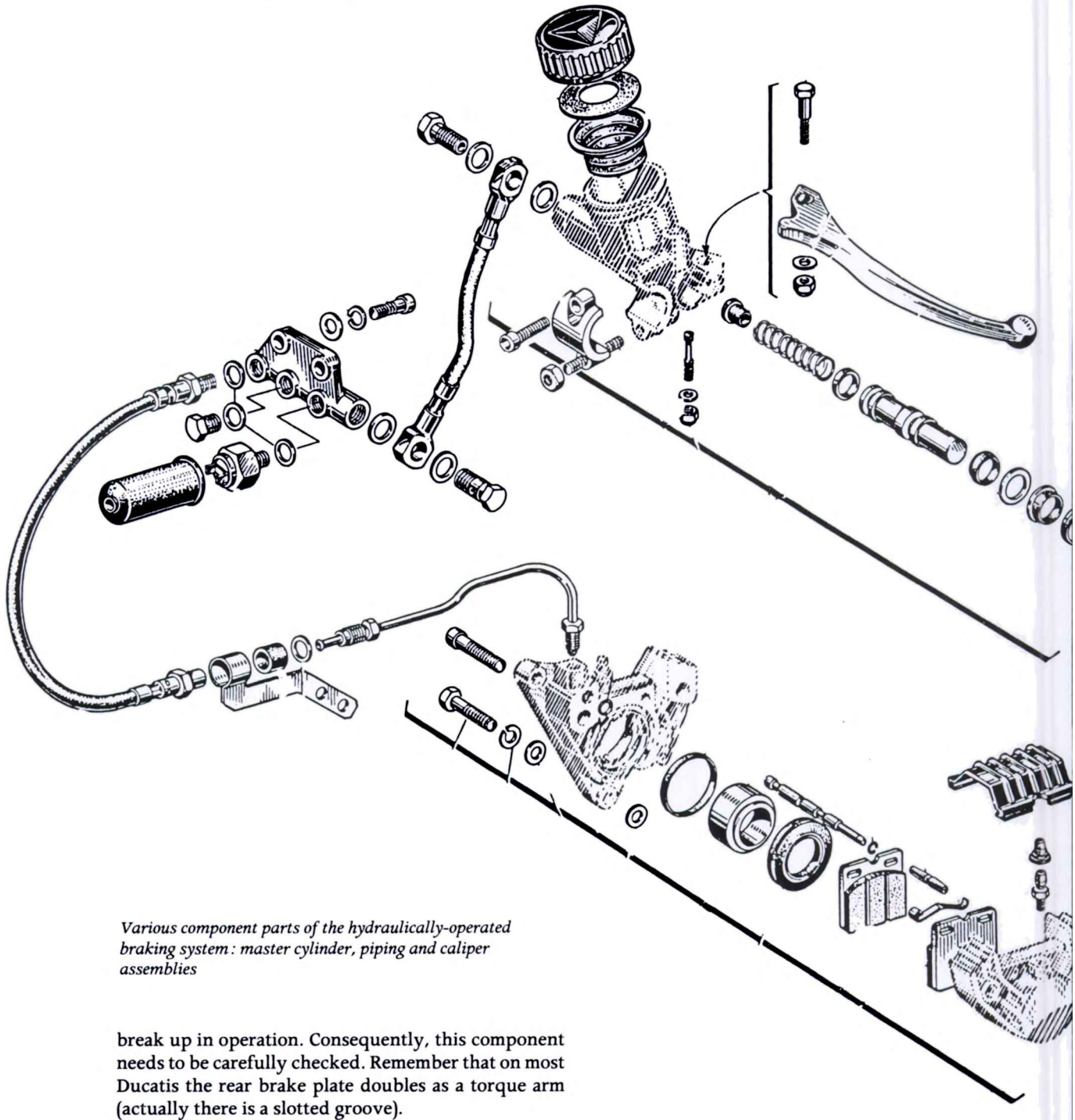
Brakes—disc

These were only fitted to the final batches of Desmo singles manufactured in 1973 and 1974. (Machines registered after this date were effectively old stock being sold after production had ceased.) The brake consisted of a single, undrilled, 280 mm, cast-iron Brembo disc, master cylinder and hydraulically-operated calipers.

When overhauling this assembly, it is possible to purchase both caliper and master cylinder seal kits (the latter will usually include a new piston), together with new pin and bleed nipple kits for the caliper. As for the pads themselves, experience has shown me that Surflex are just as good as the genuine Brembo articles and around half the cost.

Rear brake plate

On the 160 mm rear hub, employed on the 175, 200, 239, 250, 350 and the majority of 450s, the brake plate has been known to develop cracks and subsequently



Various component parts of the hydraulically-operated braking system: master cylinder, piping and caliper assemblies

break up in operation. Consequently, this component needs to be carefully checked. Remember that on most Ducatis the rear brake plate doubles as a torque arm (actually there is a slotted groove).

Wheel rims

Most Ducati singles have chromed steel rims of Radelli manufacture, with diameters of 16, 17, 18 or 19 in and width numbers of 0, 1, 2 or 3. Most have 36 spoke holes. The exception is the late, disc-braked Desmo model. This not only has 40 holes (front wheel only), but also Borrani alloy rims, the latter on both wheels.

Some late Mark 3s and drum-braked Desmos also have alloy rims (again, Borrani), but none of the narrowcase bikes came with the alloy type—except, of course, the pukka limited-production racers, such as the Gran Sport, Formula 3 and Grand Prix.

Wheel rebuilding

Wheel rebuilding is considered by many as best left to a specialist. However, with patience, it can be carried out by the restorer. You need to work in the correct order of assembly, ensuring that the rim is the right way round.

Fit the first spoke and start its nipple so that it cannot shift and scratch the rim. Then continue this process until you have all in place. It will be obvious if you have made a mistake.

Next attempt to true the wheel. To do this you need to set it vertically so that it can be spun and the rim marked by placing a marker pen just clear of the revolving rim/wheel. You can then adjust the spokes to give the radial position first. Next, go on to deal with the sideways error. By all means, let an expert give it a final adjustment to ensure that you have everything spot-on. Obviously, the spokes need their protruding threaded portions filed (or ground) back to the inside of the rim.

Tyres, tubes and rim tapes

As original equipment, the vast majority of Ducati singles came with either Pirelli or Ceat tyres. Except on the off-road models and the 160 Monza Junior, these were of a ribbed pattern at the front and a block thread at the rear.

No doubt, those restorers who demand absolute originality will go their own way and seek out old stock of these outdated and, most probably, totally unusable tyres. However, if you intend *riding* your restoration, you will be far better advised to go for a modern replacement type. Even then, it is still possible to find tyres in the 'old' sizes. One of these which I have found to offer good wear and grip and which suits the handling characteristics (mainstream overhead-cam 175–450 cc roadsters) is Pirelli's MT15 Mandrake. A word of warning, however. There are different compounds and profiles, so go for the S (Super Sport) type, which might cost slightly more, but is well worth it.

You should also replace both the tubes and rim tapes, as these may well have perished to a greater or lesser extent, and it is sensible to opt for safety.

Maybe this is a very basic and minor point, but check that you have a valve safety cap on each tube, and if you do not fit new tubes, at least fit new Schreider valves. Fitting new valves and ensuring that the safety caps are in place could prevent the risk of sudden tyre deflation.

Three final points: if you fit modern tyres of redefined sizes (i.e. 3–60, 4–10, etc) check for adequate clearances; take care when fitting the new tyres so as not to nip the tubes; and, lastly, *none* of the Ducati singles used security bolts as standard equipment.

11 Electrics

Electrics . . . this almost warrants a book to itself. Certainly, as regards using the Ducati single-cylinder range as everyday roadgoing motorcycles, the electrical system is the type's weakest point. I am sure that it was the one instance where the machine's racing heritage actually did it a disservice. This was because, in effect, all the electrical equipment was added on as an afterthought, rather than conceived as part of a complete package.

It is also true to say that the electrics worry more restorers of motorcycles than any other aspect of the machine. This is nothing new, stemming largely from the fact that problems in this area are not as instantly obvious as something like a broken clutch cable or a seized piston.

In practice, however, if one follows a sensible *planned* approach and has the basic information needed for the particular task, the vast majority of electrical problems can be solved—albeit occasionally after spending more than might have first appeared necessary.

It is also possible to *repair* the majority of components from older machines. However, with the advent of 'sealed-for-life' electronic devices in the early 1970s, replacement is often the only option for later models.

Besides the electrical components themselves, wiring is all-important, and it may be necessary to buy a new loom, or have one specially made. Trying to get the best out of an already less-than-perfect design with old, and often damaged, wiring components is simply asking for trouble.

Quite often, an electrical fault can have the simplest of causes. It may be something like a poor earth, an equally poor connection somewhere in the system or a faulty fuse.

You will also need the correct tools—a requirement that is often overlooked. The essentials are: a set of small (magneto) spanners, electrician's screwdrivers, pliers, wire strippers, cutters, an electrician's soldering iron, a hydrometer (to test the battery cells) and a small avometer. Finally, remember that these tools are best kept separate from the mainstream mechanical type.

Ducati electrical systems

There are three types of system: coil/battery/alternator; flywheel magneto (no battery); and electronic ignition/battery/alternator. All three were employed by Ducati and operate on 6 volts; compared to present-day motorcycle electrics they are antique in the extreme. (It should be noted that many owners have carried out their own 12 volt conversions.)

The early models (narrowcase) not only have weak outputs, but are also generally unreliable into the bargain. The systems fitted to the widecase (post-1967) machines, while still lacking any real output, are marginally better in the reliability stakes.

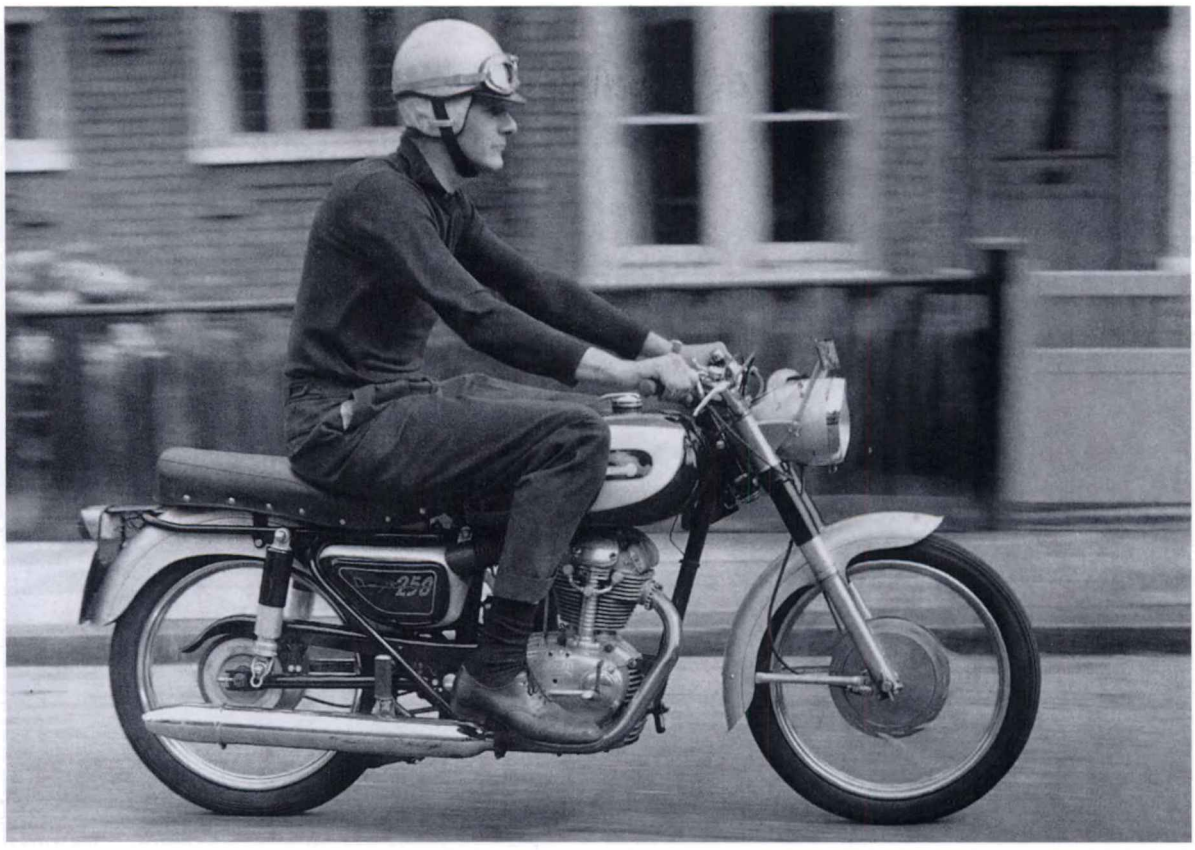
Ignition—coil

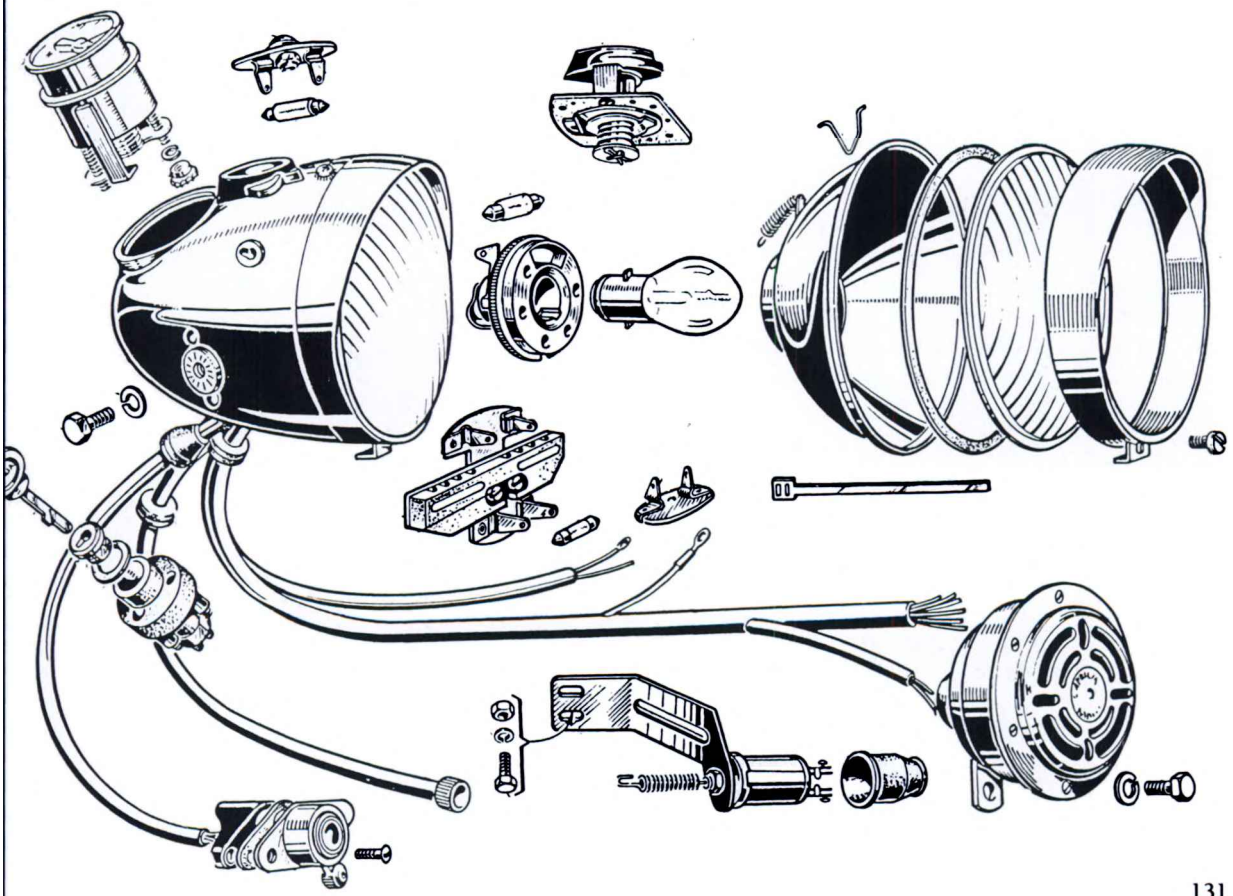
Early motorcycles invariably had magneto ignition, and many manufacturers carried on with this system until well into the 1960s. Ducati machines did not employ this almost vintage type of ignition—probably due to the fact that besides making motorcycles in the immediate post-war period, Ducati also made electrical components. Although the two sections of the company, Ducati Meccanica and Ducati Elettronica, split up in 1953, they lived next to each other for many years thereafter. Perhaps it was inevitable that 'Meccanica' should choose to fit 'Elettronica' components as standard equipment.

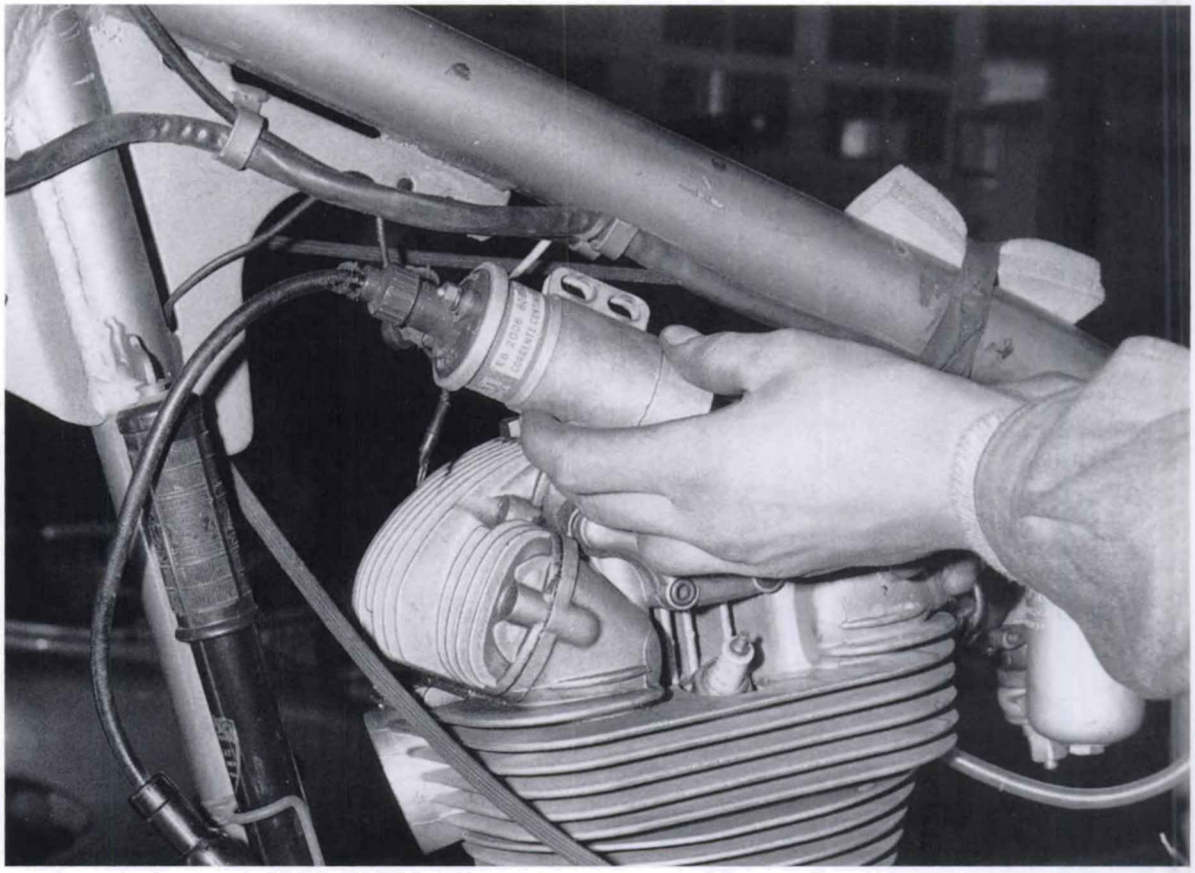
Even on the earlier four-stroke overhead-cam models (125, 175 and 200 cc), the usual ignition equipment is a coil set. This comprises a battery to supply electricity, a coil to transform tha. low-voltage supply

ABOVE RIGHT *John Houselander tests a 1964 model 250 GT (Daytona GT in Britain) during the summer of 1965. This machine typifies single-cylinder Ducati electrics of the era with its 6 volt, battery/coil ignition, 60 watt alternator and Aprilia lighting equipment and switchgear*

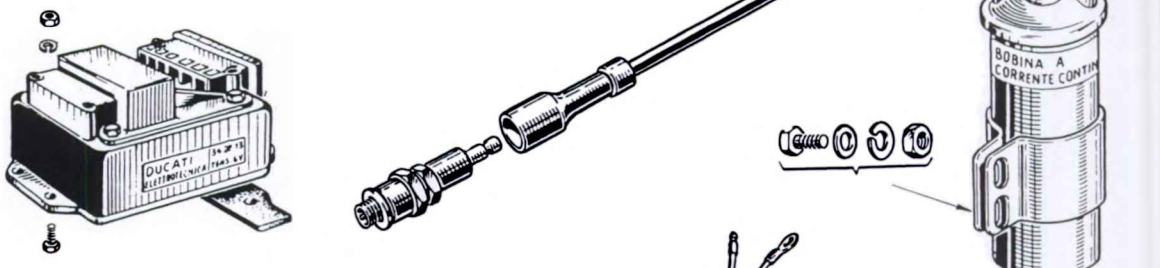
RIGHT *Typical electrical parts to be found on a single-cylinder Ducati. These components are from a 1964 250 Mach 1, but other models are similar*



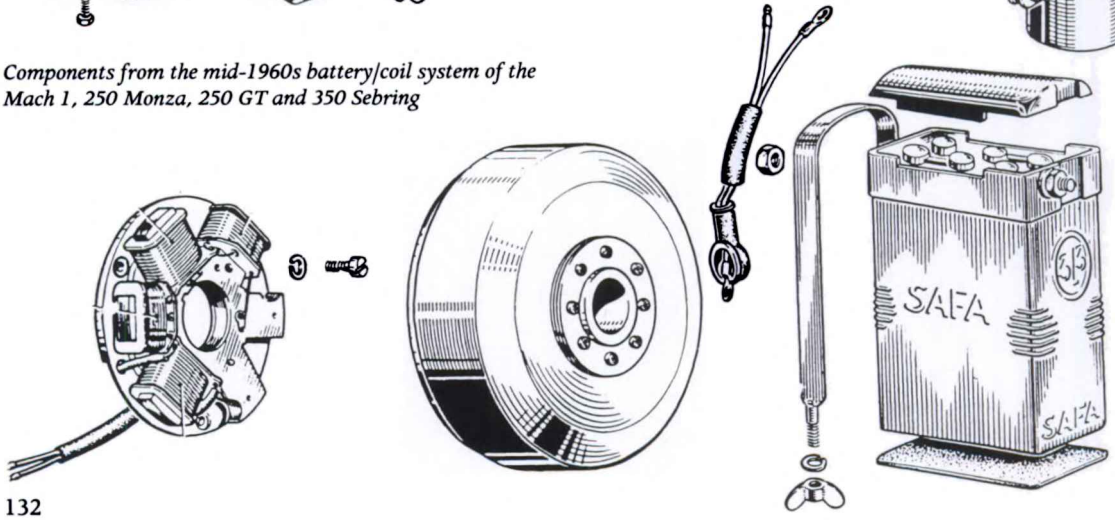


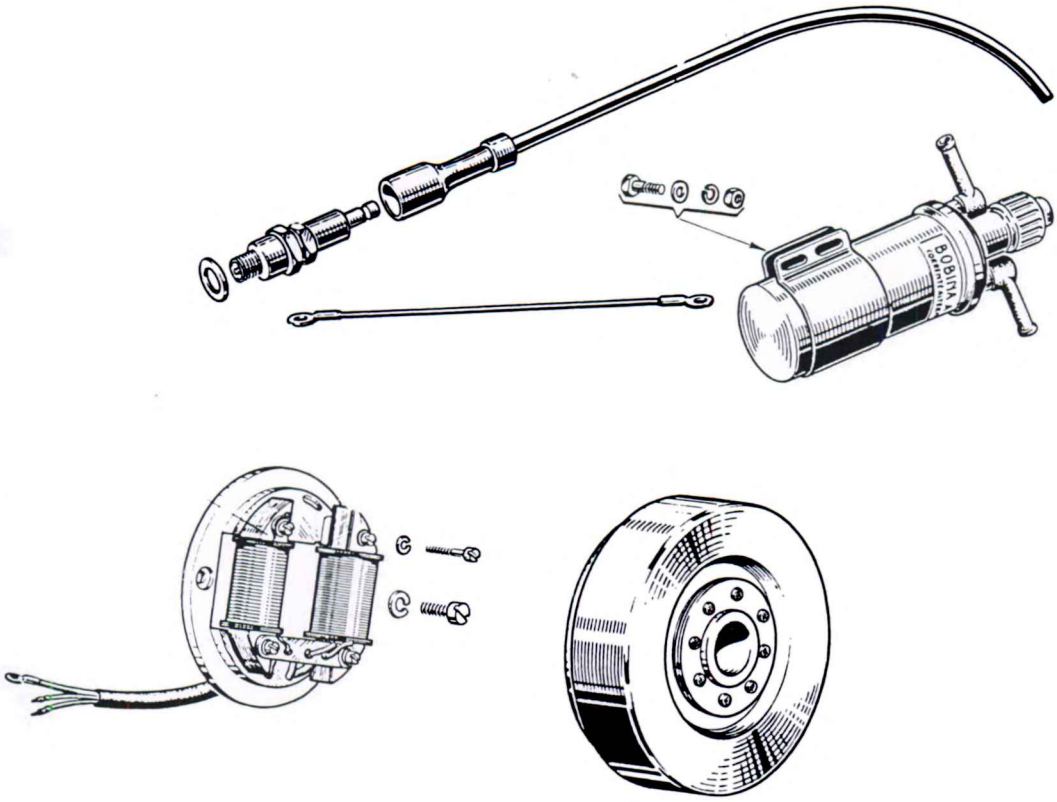


ABOVE *Ignition coils were manufactured by Ducati Elettronica who occupied a site next to Ducati Meccanica in Borgo Panigale, Bologna*



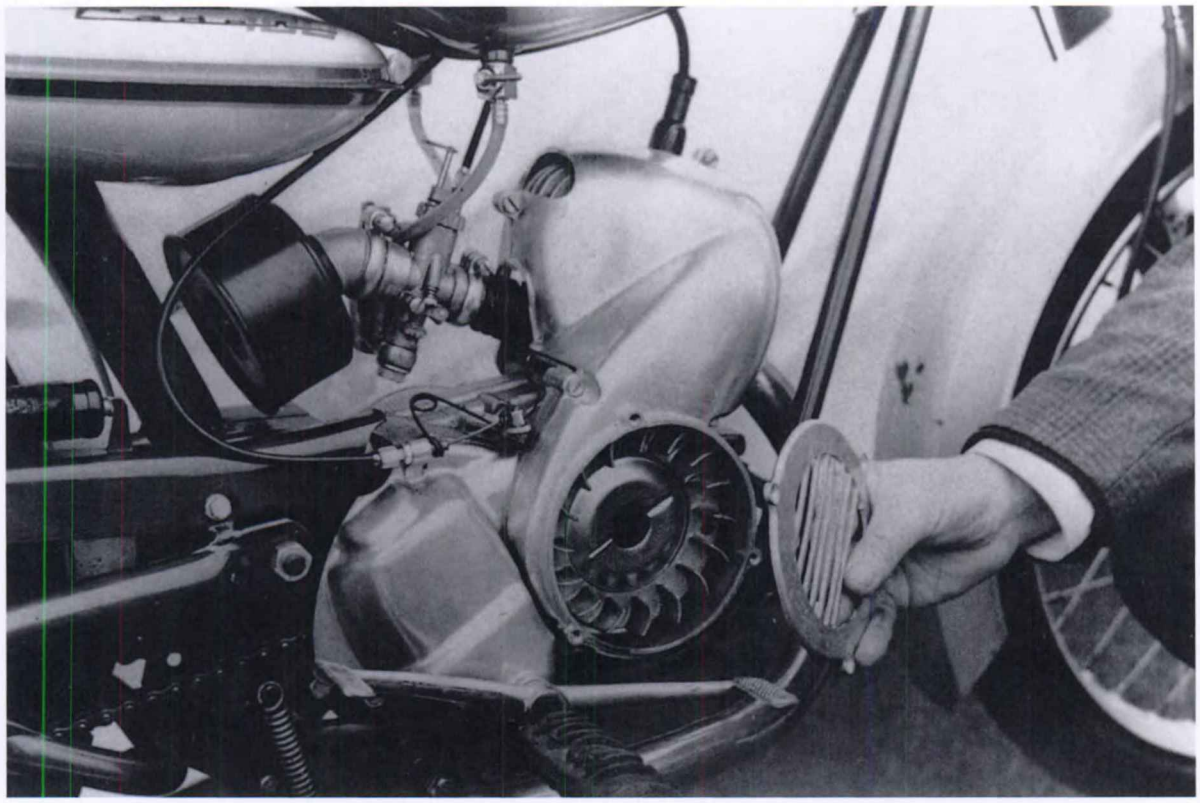
Components from the mid-1960s battery/coil system of the Mach 1, 250 Monza, 250 GT and 350 Sebring



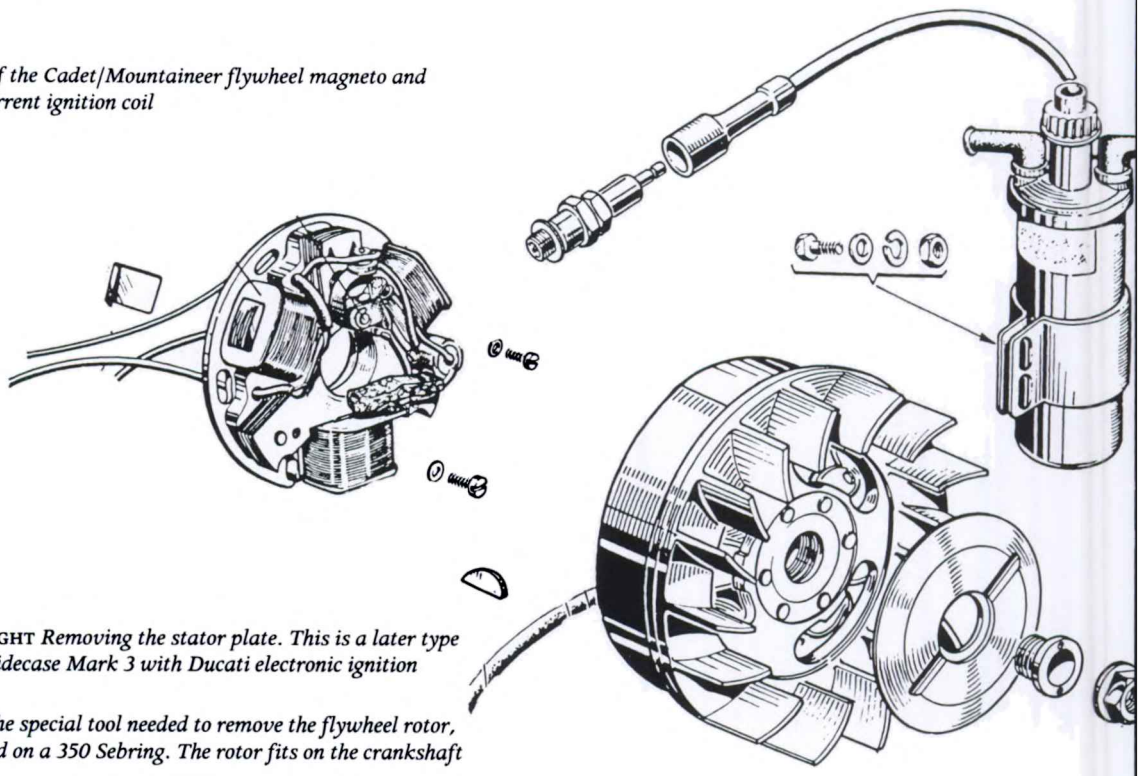


ABOVE *A flywheel-magneto system is standard equipment on narrowcase Scramblers, the 160 Monza Junior and the US-specification Diana Mark 3*

BELOW *On the 100 Cadet and Mountaineer two-stroke models, the engine's cooling fan is driven by the flywheel magneto rotor. The grille has been removed to expose the fan blades*

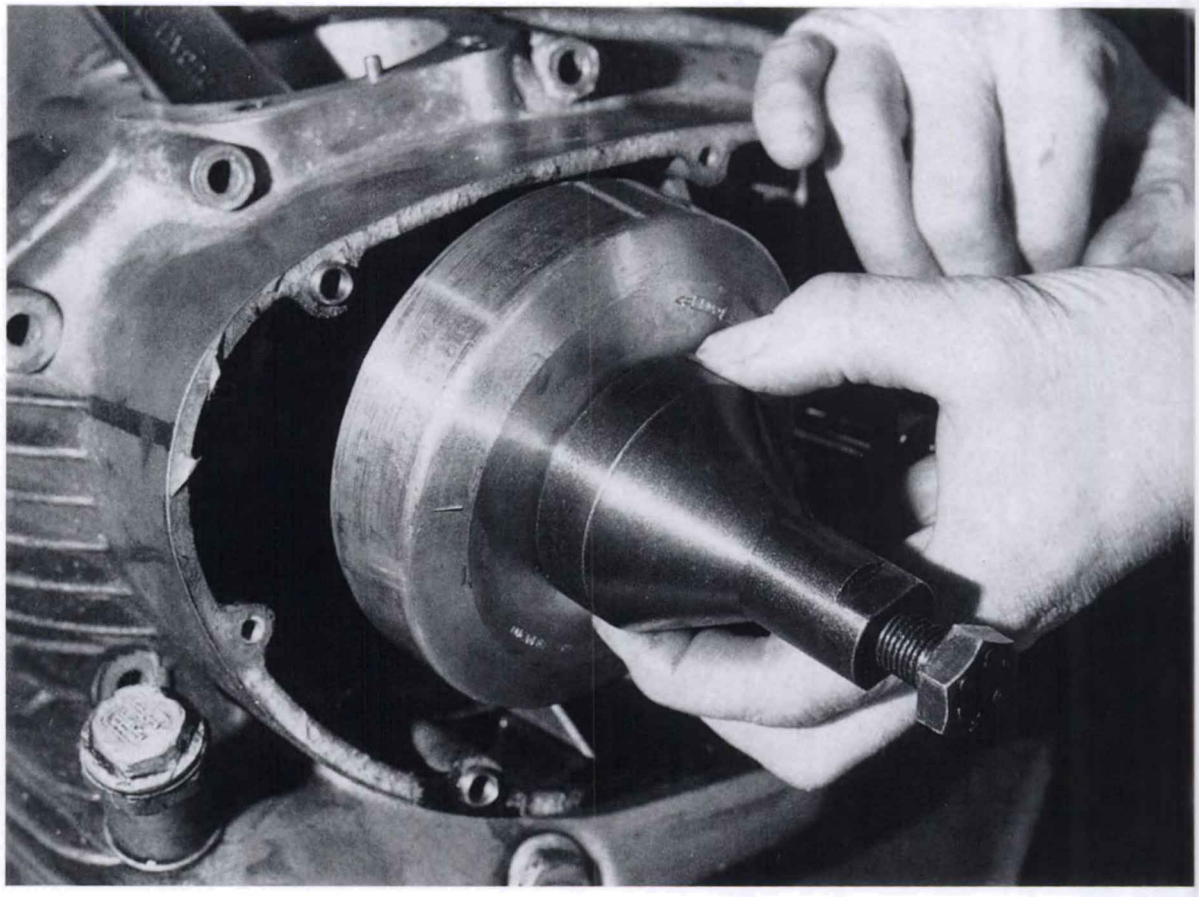


Details of the Cadet/Mountaineer flywheel magneto and direct-current ignition coil



BELOW RIGHT *Removing the stator plate. This is a later type from a widecase Mark 3 with Ducati electronic ignition*

BELOW *The special tool needed to remove the flywheel rotor, being used on a 350 Sebring. The rotor fits on the crankshaft taper*



to a much higher electrical pressure, and a contact breaker which triggers the coil to provide a very high-voltage pulse. This is then led, via a regulator, to the spark plug where the pulse jumps the gap between the electrodes, causing a spark and igniting the fuel charge in the process. The only other essential is a condenser, wired to the contact breaker to prevent excessive arcing or sparking across the points as they open to trigger the pulse from the coil.

It is a simple arrangement, cheap to make, and easy to maintain. However, by modern standards and, in particular, with regard to the ever-restrictive environmental legislation governing exhaust emissions and the like, the conventional coil-ignition system is not particularly efficient. Hence the rapid growth of electronics in this area.

Ignition—flywheel magneto

If the battery/coil arrangement is simple, then the even more basic flywheel magneto system can only be described as more so.

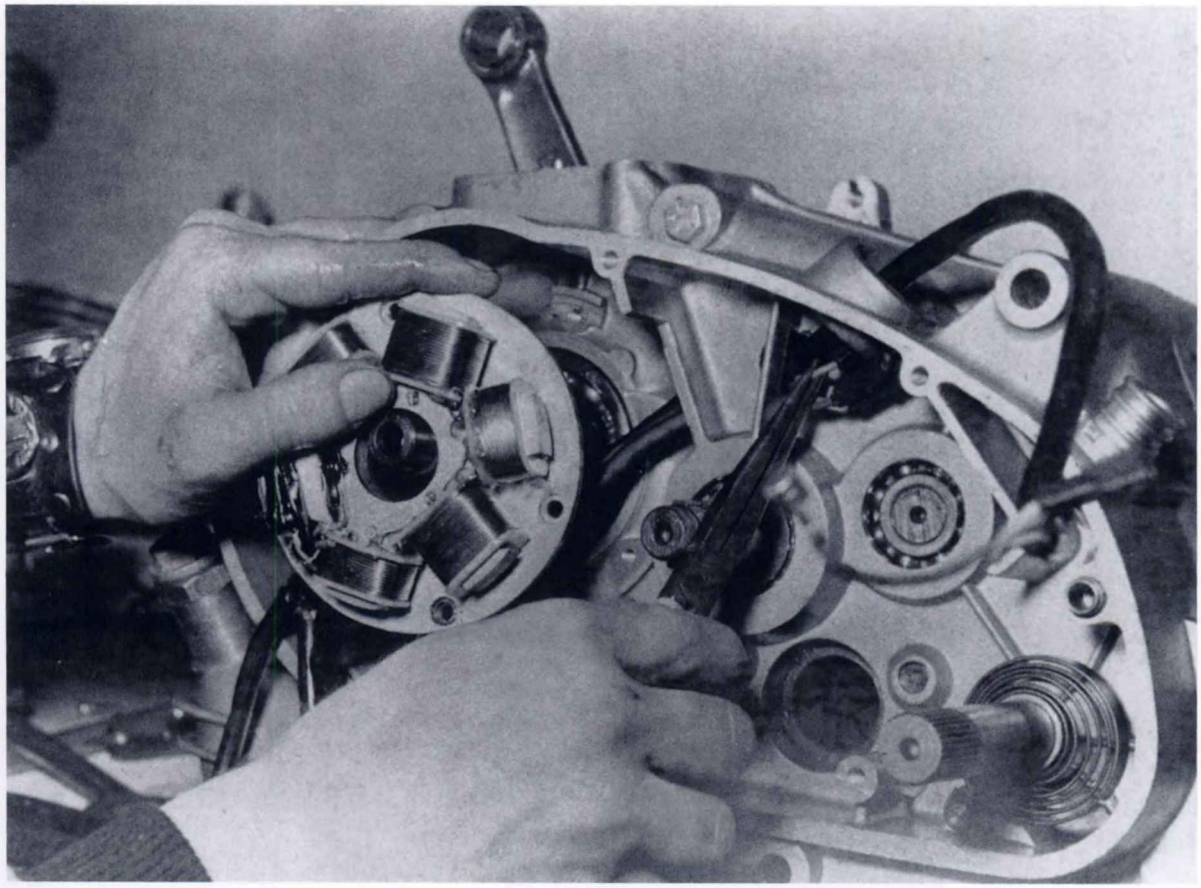
Designed for the moped and ultra-lightweight motorcycle, this system dispenses with the need for a battery (unless one is used for parking lights). Instead, the spark is generated by a crankshaft-mounted rotor and stator unit (very similar in appearance to an alternator) which, in conjunction with a coil and contact breaker/condenser, provides the spark.

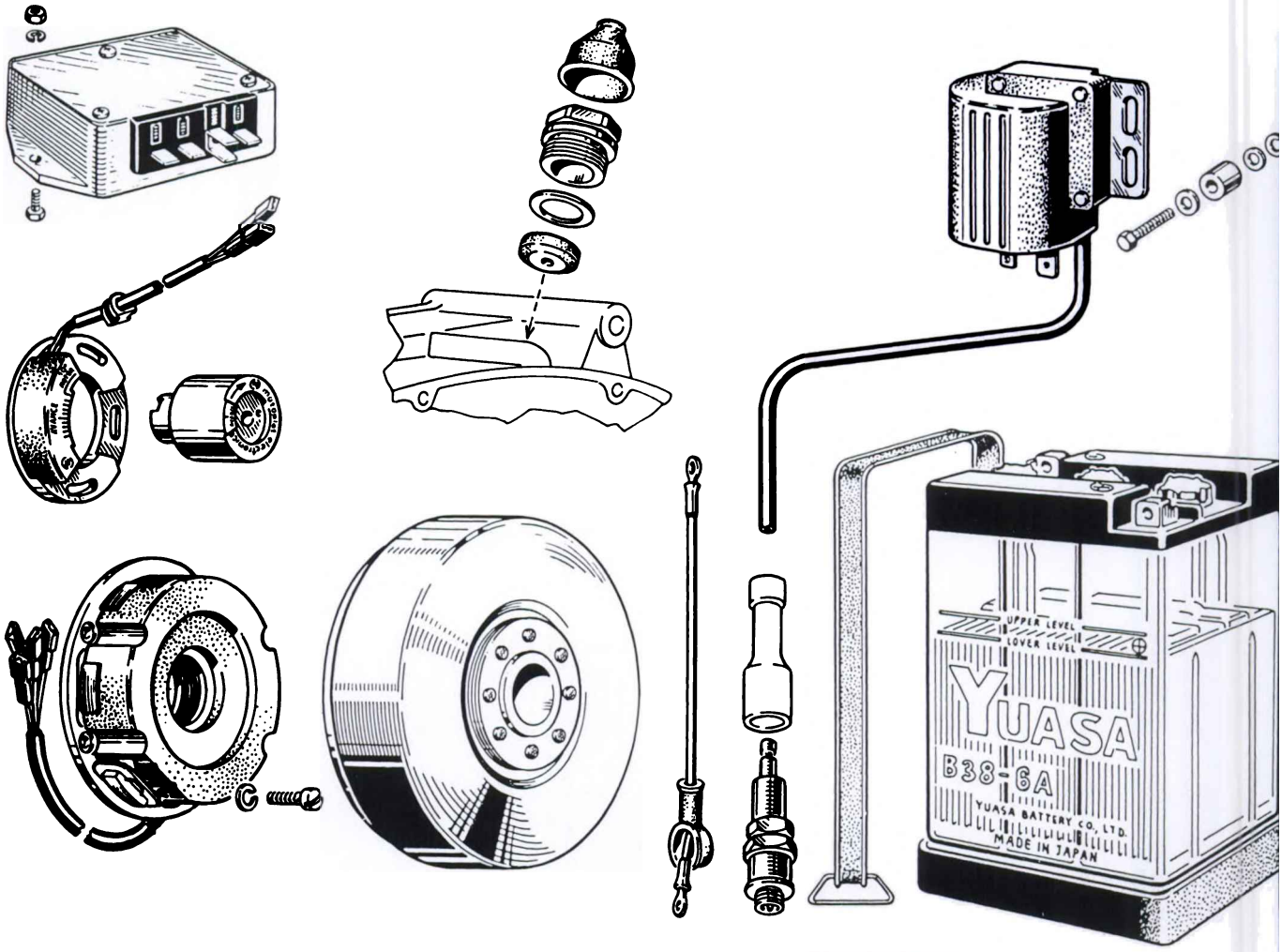
The flywheel magneto system was used extensively on the two-strokes, and also the 160 Monza Junior and US-market 250 Diana Mark 3.

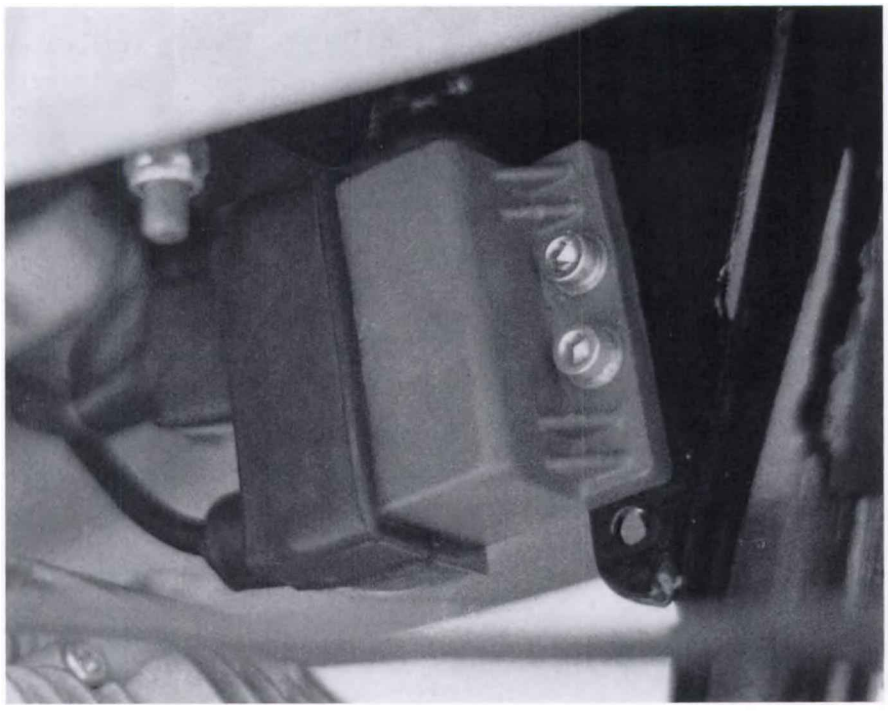
Ignition—electronic

Used only at the end of the single-cylinder range's life span in the mid 1970s, the electronic system features a pulse coil on the alternator stator plate, a transducer (under the tank), a pick-up (in what was formally the points compartment) and a regulator. In this instance, Ducati used components from either Ducati Elettronica or the Spanish Motoplat company. In service, the 'Elettronica' type proved not only more powerful, but also the most reliable.

The only models to be fitted with electronic ignition as standard equipment were the blue and gold 239, 250, 350, and 450 Mark 3 from 1973 onwards, together with the yellow/orange Desmo café racers of the same capacities and vintage. A few of the final 350 and 450 street scramblers SCRs also came with electronic ignition, but none of the 250s.



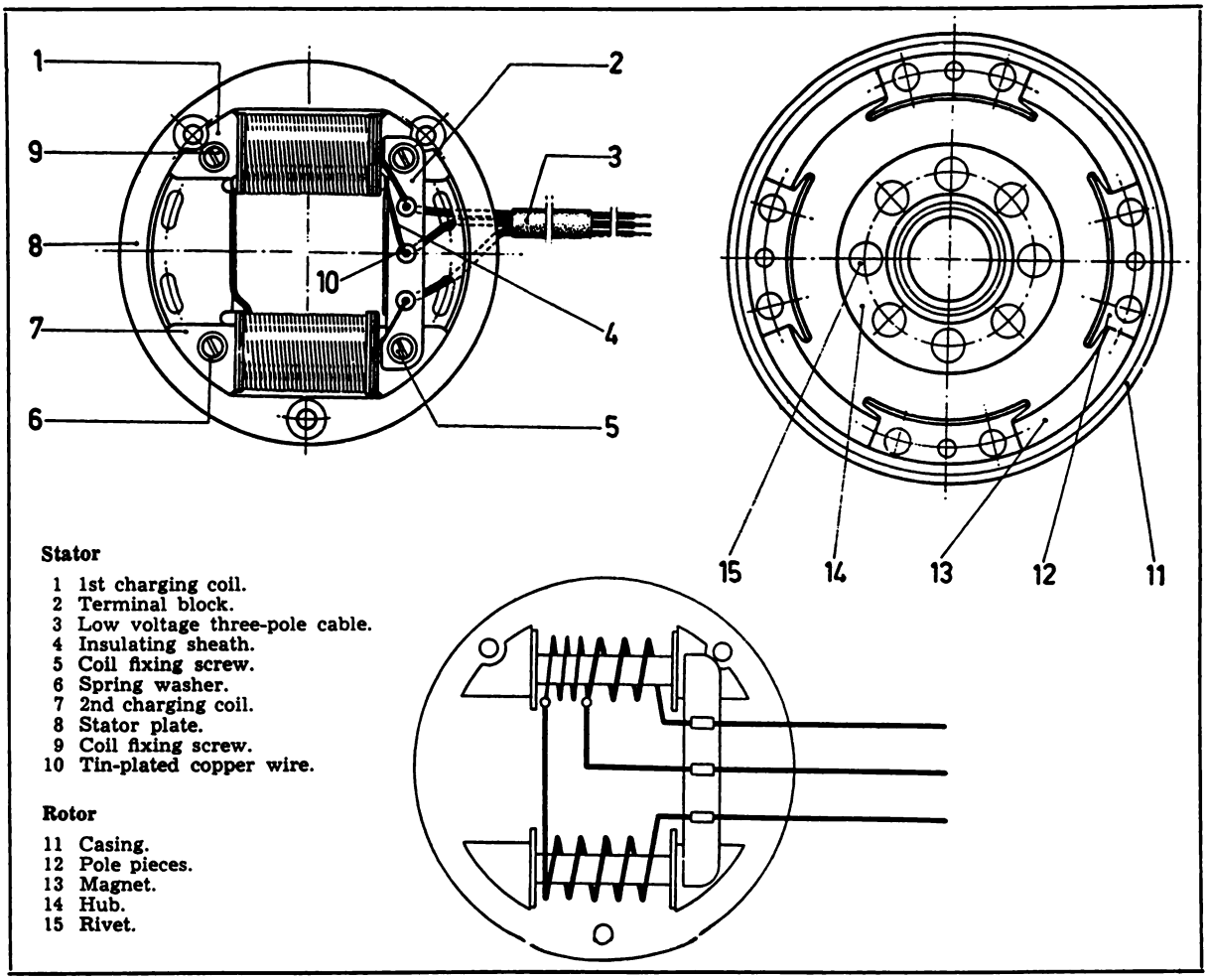




ABOVE ***Besides the Ducati system,*** *the Spanish Motoplat* ***electronic*** *ignition may also be* ***found on*** *the late Mark 3 and* ***Desmo models. Here*** *are the various components*

ABOVE RIGHT *Early 40 watt, three-wire alternator fitted to* ***the 175 Sport*** *and 200* ***Elite*** *among others*

LEFT ***A Ducati Elettronica transducer. This is*** *also fitted to the 860GT/GTS and 900SS* ***V-twins of 1975–7. It*** *is red in colour*



Stator

1 1st charging coil.
2 Terminal block.
3 Low voltage three-pole cable.
4 Insulating sheath.
5 Coil fixing screw.
6 Spring washer.
7 2nd charging coil.
8 Stator plate.
9 Coil fixing screw.
10 Tin-plated copper wire.

Rotor

11 Casing.
12 Pole pieces.
13 Magnet.
14 Hub.
15 Rivet.

Alternator

The alternator was widely used on both narrow- and widecase ohc singles, being uprated progressively as the years passed. Up to mid 1964, the output was 40 watt. Then, with the introduction of the new five-speed line, the alternator was increased in size and output (60 watt) and, finally, from the first widecase models, in 1968, there appeared an 80 watt assembly.

The rotor (of either brass or alloy with a riveted steel collar) is secured to the nearside crankshaft by a combination of taper, woodruff key and large engine nut.

Regulator

The regulator does exactly what its name suggests; it *regulates* the amount of current passing through the system. In addition, the type employed on the various Ducatis equipped with an alternator also ensures that the battery is kept charged. So not only does the regulator need to be regulating the current, but it also needs to be functioning in the recharging cycle.

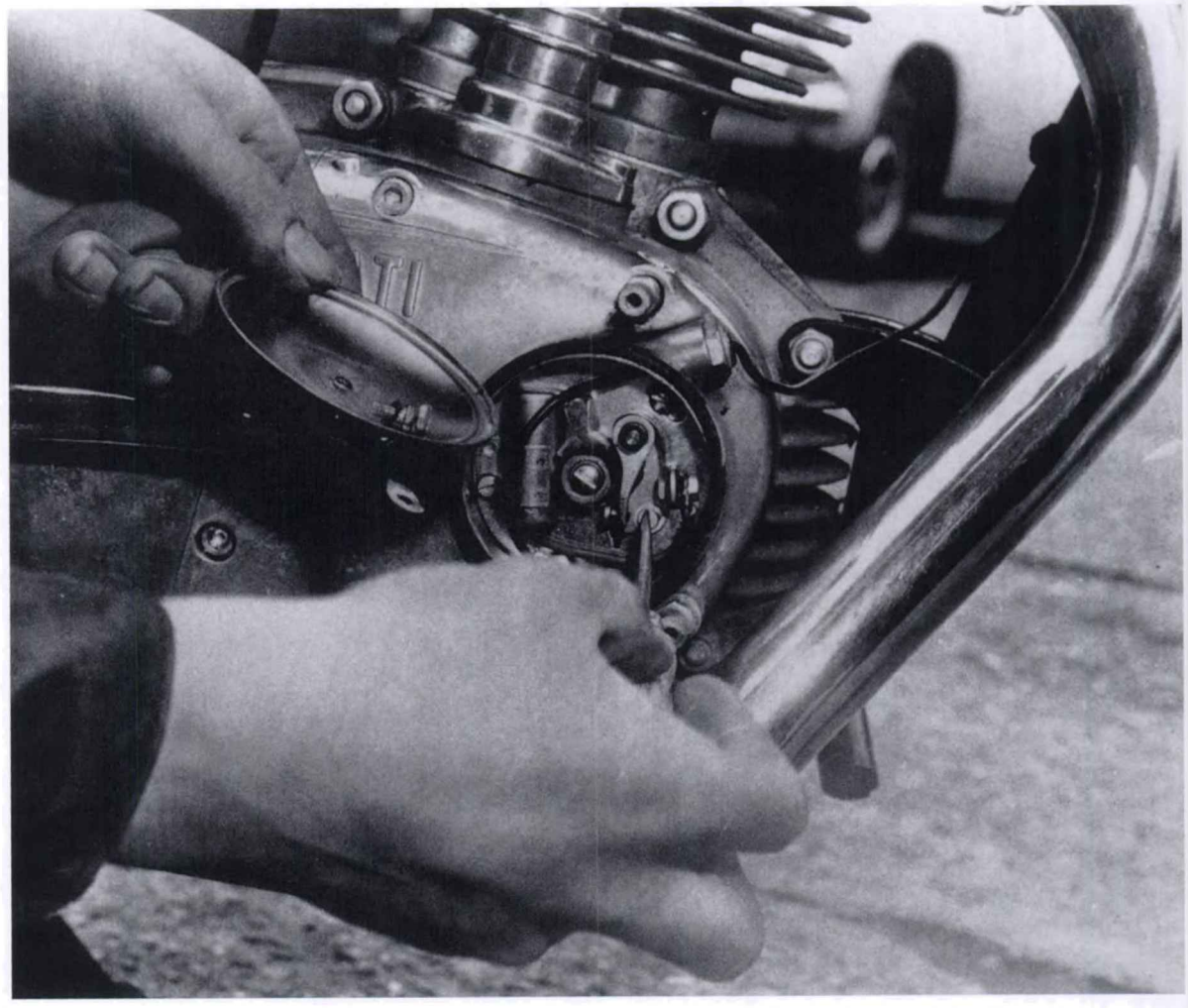
The type found on the narrowcase models will most likely feature six terminals—all at the same end. Some of the very early (pre-1960) models have a similar type of 'black box', but this features terminals at each end.

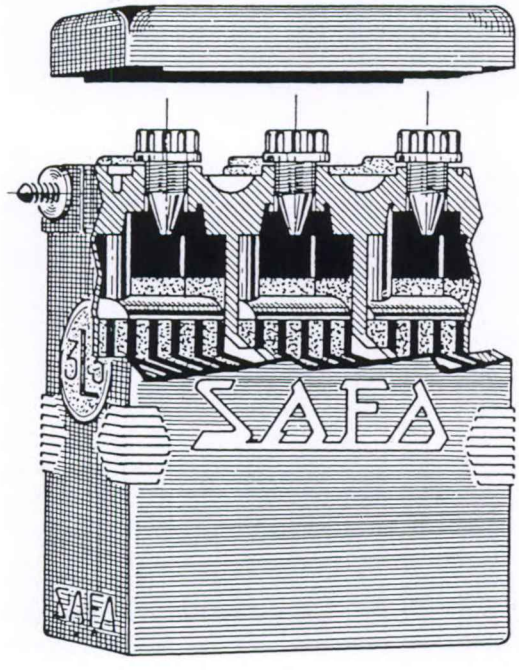
Both types can be dismantled and rebuilt. However, a completely revised regulator was introduced with the widecase models. Besides having only four terminals, the later type is not repairable in the event of a malfunction. The only solution to this is a replacement unit.

Ignition backplate assembly

This is the plate to which the points and condenser are attached on the four-stroke ohc models. It has elongated slots to allow adjustment of the timing. These slots are considerably longer on the battery/coil ignition models than on those equipped with the flywheel magneto system.

The only problems likely to be encountered are stripped threads and, when converting from flywheel magneto to battery/coil ignition, the need to lengthen the timing slots.





ABOVE *Adjusting the points. Many owners convert their machines back to points ignition when they strike a problem with the electronic type*

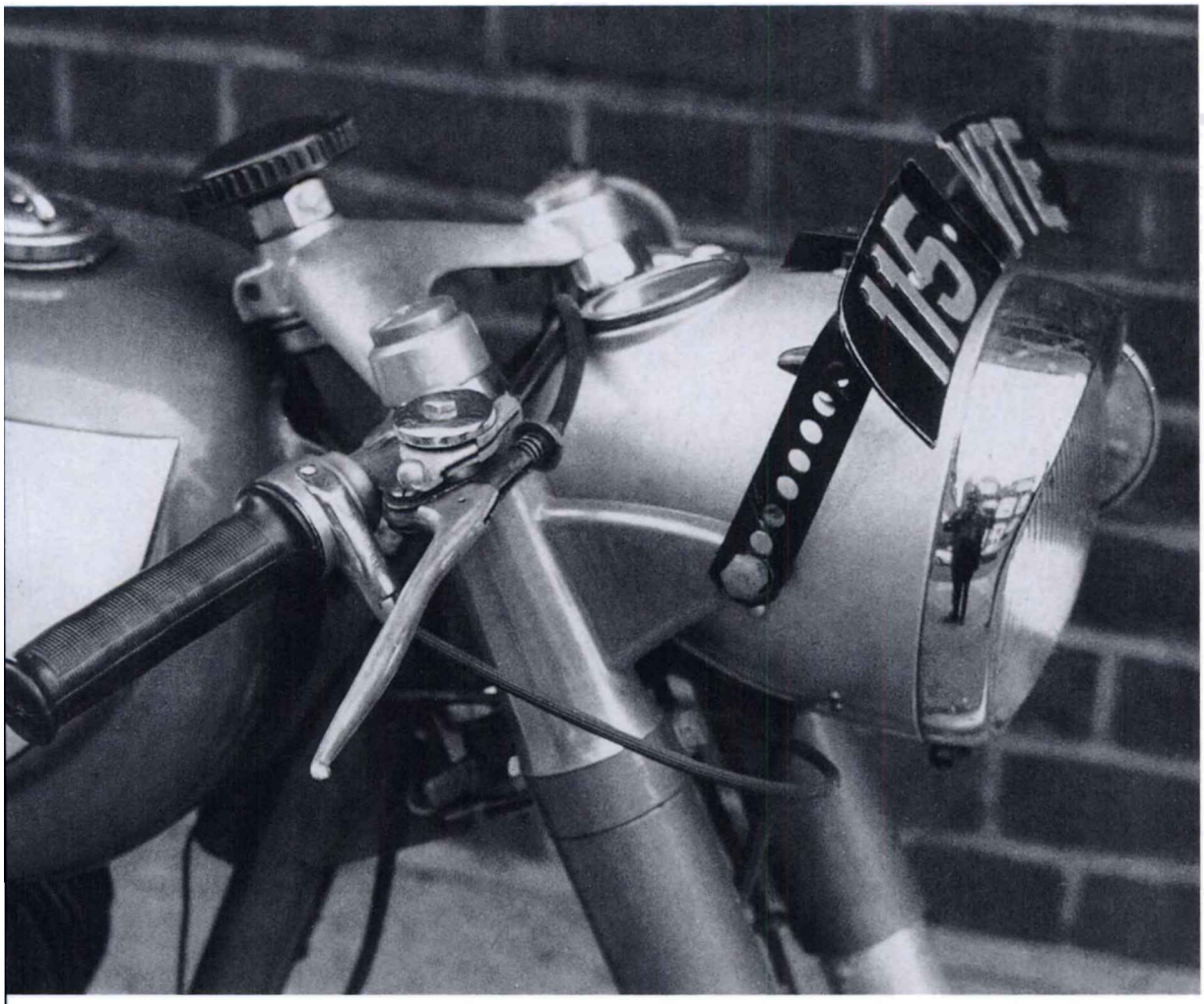
ABOVE RIGHT *The 150 mm Aprilia headlamp which adorned many of the narrowcase four-stroke models. Note the speedometer mounted in the shell and the 'peaked' rim*

LEFT *The Italian-made SAFA battery was, in fact, a licence-made version of the British Varley. It was fitted to most Ducatis from the late 1950s to the early 1970s*

On the two-stroke models (except those with electronic ignition), the points and condenser are mounted on the stator plate of the magneto.

Ignition advance and retard unit

Housed at the rear of the ignition backplate assembly, the advance and retard unit is a feature of all the ohc singles. The cam should be checked carefully for wear, and new springs should be fitted as a matter of course.



Battery

All the narrowcase Ducati singles which employ a battery in the electrical system were fitted at the factory with a SAFA component. In fact, this was an Italian licence-made version of the British Varley. Coded 3L3, it was rated at 6 volts, 13.5 amp/hour. External measurements were 120 × 90 × 165 mm.

The original SAFA unit is no longer in production, but on most Ducati models of that era, the battery is an obvious visible feature. Therefore, if a restorer wishes to retain the original look, one answer is to fit a current facsimile of the period black-bodied 6 volt battery. Another is to adapt an original battery by cutting out the interior and fitting a modern one inside it. Later models (post 1970) employ a modern Japanese Yuasa Type 1338-6A.

As for maintenance, a battery needs to be kept clean, dry and at room temperature. The terminals should be smeared with petroleum jelly to keep corrosion in check. Finally, whilst off the machine (or during winter storage), the battery should be discharged using a 3 watt bulb and then recharged at regular intervals. This will save it from a premature death.

Diode

Only fitted to the 160 Monza Junior. This regulates the current without the need for a conventional regulator. It should be noted that the 160 features a flywheel magneto plus a 6 volts, 7 amp/hour battery (for parking lights only). The diode is mounted on a fibre plate within the headlamp shell.

Spark plug, cap and lead

The plug should be replaced by a modern equivalent. On most Ducati models, the small screw-on cap at the top of the plug is omitted. However, if this is retained on your machine, ensure that it is tight, otherwise a misfire can result.

The cap which retains the ignition lead to the coil should be carefully inspected as, being manufactured in Bakelite, it is easily damaged and can fail in service.

A rubber seal/retainer is located between this cap and the coil. This needs to be in position to prevent water reaching the coil internals and to secure the plug lead.

Finally, the lead itself should be replaced and the spark plug cap checked for serviceability. The latter needs to be of the suppressor type, and it should also be waterproof.

Horn

The type of horn fitted to Ducati singles is known as the high-frequency type. This uses an electro-magnet and contact breaker to vibrate a diaphragm and resonator.

The round resonator plate is generally secured by a nut in the centre. The plate is joined to an armature, which is fixed where it passes through the centre of a metal diaphragm. Underneath the armature is an electro-magnet attached to the back of the horn body. A set of contact breakers, also inside the horn, is wired into the circuit.

The way in which it works is simple. When the rider completes the circuit by pressing the horn button, the armature is drawn on to the electro-magnet. This action opens the contract breaker points, the circuit is broken and the diaphragm attached to the armature reasserts itself; pulling the armature up with it. This allows the contact-breaker points to touch again. Current flows once more, and the whole process is repeated over and over again. The rapid flexing of the diaphragm sets up a high-frequency vibration in the resonator plate. This is where the sound comes from.

Trouble with the horn may occur in the component itself or be a fault in the button or wiring. The problem should be investigated by wiring the horn directly to the battery. If current is reaching the horn and nothing is happening, it could simply need adjustment (usually by means of a small screw on the outside of the shell). Proceed with caution, however, as adjustment should only be by a twelfth of a turn at a time. On no account attempt to move the central screw in the body, as this controls the basic points setting and requires specialized equipment to set. Provided these guidelines are followed, the horn may be stripped and the outer shell and grille renovated in the same way as any other item.

Headlamp

Various light units were fitted to the Ducati single-cylinder models through the years. Invariably of Aprilia manufacture, these are normally of either 130 or 150 mm diameter on the four-strokes, and 95, 105 or 130 mm on the two-strokes.

All suffer from rapid deterioration of the reflector. Unlike the vast majority of today's light units, they are not sealed-beam types, but a separate glass and reflector. The reflector is plated in a chrome-type finish which tarnishes easily, and poor sealing means that the finish is easily damaged by the ingress of water.

This can prove a real headache if originality must be retained at all costs—Aprilia went out of business in the late 1970s, and supplies of the fast-wearing original reflectors are now all but exhausted. However, a good replica is made by CEV. This incorporates a sealed reflector and glass assembly, which is much more water-resistant that the original Aprilia component. The CEV units are made in 130 and 150 mm sizes. Although the standard Bosch-type bulb is retained, a change of bulb holder is also required to complete this conversion.

Some models exported to the USA have sealed-beam units. In these, the whole unit, *including the bulb*, is a single assembly. Any damage (or failure of the bulb), calls for a replacement of the complete light.

Stop and tail lamp

On the very early four-stroke models (pre 1960), and certain two-strokes manufactured before 1964, there is no provision for a brake stop-switch and consequently only a single-filament bulb in the tail lamp. Except for these instances, the various Ducati singles always feature dual-filament bulbs.

Usefully, the much-used, oblong, alloy-bodied tail light features an *alloy* reflector. This does not suffer from the corrosion problems related in the previous section. Unfortunately, models with a round-bodied lamp do not enjoy this specification and employ plated steel reflectors. These should be inspected, as corrosion of both the reflector and main (steel!) body may have occurred.

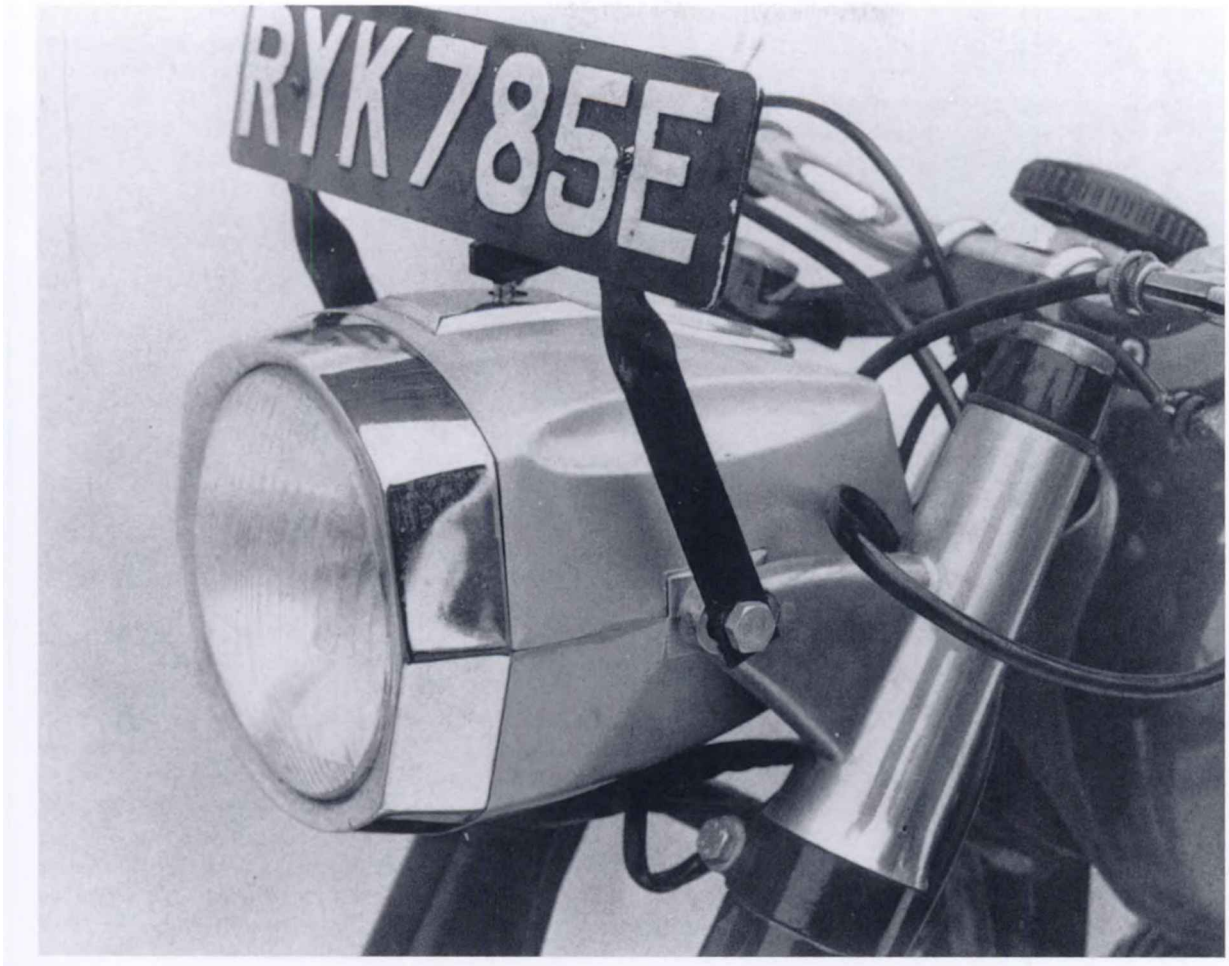
It is always a good idea to replace the rear red lens, which will probably have faded over the years, if not have become damaged in some way. Check also that the white number plate illumination glass is in position and is undamaged.

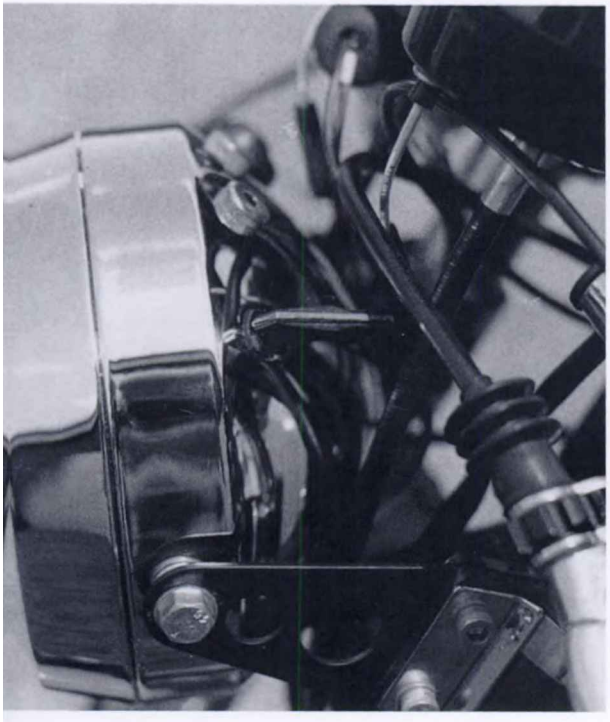
Switches

On the four-strokes there are five distinct types of ignition switch—three on the narrowcase models, and two on the widecase bikes.

The trio of narrowcase types are of the simple 'push-and-turn' variety. That fitted to the 100, 125, 175, 200, Mach 1, Diana Mark 3, and pre-1966 Monza and GT is a four-pole switch in the top, offside portion of the headlamp shell. A very similar, but smaller, switch appeared on the 160 Monza Junior.

The third narrowcase ignition switch can be found on the post-1966 250 GT and Monza plus the 350 Sebring of the same vintage. This is a contact type, located under a chrome bezel and mounted centrally on top of the headlamp shell.



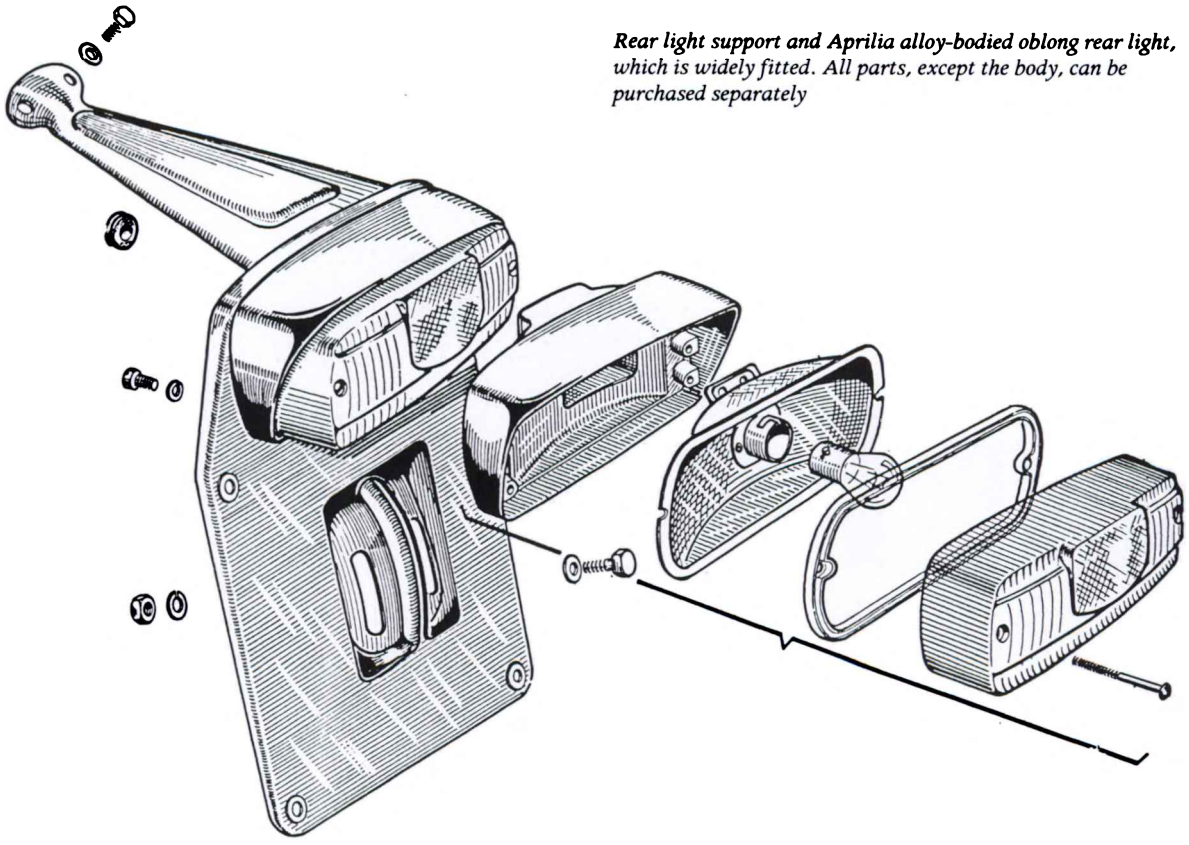


ABOVE *The ugly, six-sided rim and alloy shell which were distinctive features of the headlamp used on the 1966–7 versions of the 160 Monza Junior, 250 Monza, 250 GT and 350 Sebring*

LEFT *All-chrome headlamp found on the post-1972 Mark 3 and Desmo models plus some Scramblers. The majority have 150 mm light units, but some came through with 130 mm units and the rim's internal diameter amended accordingly*

With the introduction of the widecase models in 1968, a car-type switch with its own individual key was used. Mounted underneath the shell on the nearside, it has only three poles. Finally, when Ducati began to employ electronic ignition for the 1973 season, those models with the feature came with a four-pole version of the car-type switch, but relocated in the top, offside portion of the shell.

Generally, the two-strokes did not feature an ignition switch of any kind. The lighting switch, a three-position device, was fitted centrally at the top of the shell. On the post-1966 250 GT, Monza and 350 Sebring, the lighting switch doubles with the ignition switch and is attached to the main wiring terminal.



Rear light support and Aprilia alloy-bodied oblong rear light, which is widely fitted. All parts, except the body, can be purchased separately

All models, with the exception of some two-strokes and the flywheel magneto-ignition 250 Diana Mark 3, use the Aprilia horn/dip switch with its Bakelite/chrome cover construction. This is located on the left-hand (nearside) handlebar support. Other older models mentioned feature a combined dip/horn and lighting switch (still of Aprilia manufacture).

There are two types of rear stop light switch. Type A is fitted to the narrowcase models and the mainstream 50, 80 and 100. This has a spring and pull-action. Type B is only to be found on the widecase machines and employs a push-in plunger action. Like the other electrical switches, they are of Aprilia manufacture. Front brake switches were only fitted to the final four-stroke singles, the Mark 3 and Desmo, in the 1973 and 1974 model years.

Turn signals

Only offered on the final blue and gold Mark 3s, and then as an optional extra. Of poor quality and hardly worth fitting, as they are out of character with the rest of the machine.

Wiring

The condition of the wiring is often a prime contributor to electrical problems, poor earths and intermittent leaks to earth being the usual culprits. The original wiring on Ducatis could never be described as one of the marque's strong points. In addition, the outer plastic covering becomes hard and brittle with age. My advice is to either rewire the machine completely yourself or purchase a ready-made loom from a specialist. These are of a much superior quality than the originals. (R & M Walker have looms for both narrow- and widecase models available.)

Another extremely important item is a proper wiring diagram—do not attempt any wiring work without this vital piece of information.

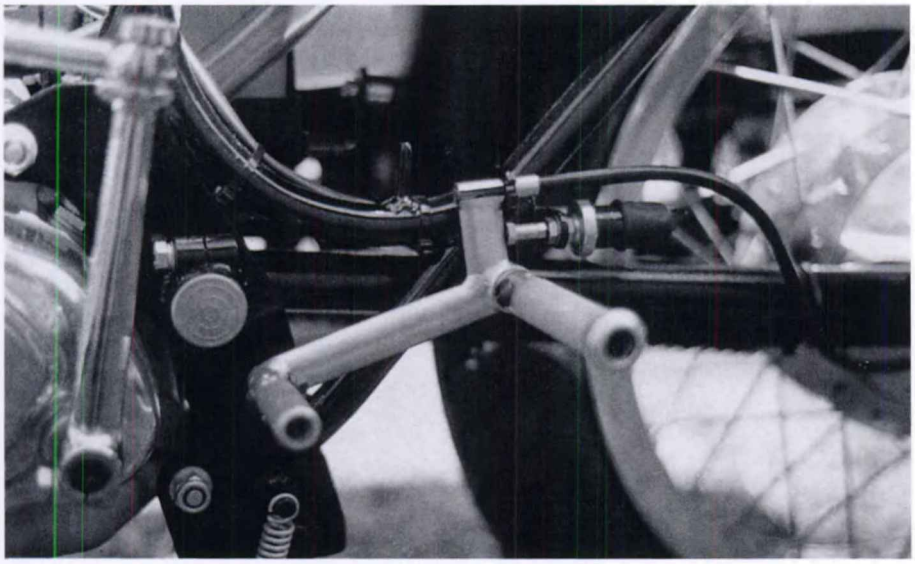
Warning lights

Otherwise referred to as 'Idiot lights', these are usually mounted within the headlamp shell. As for colours, green or white indicates dipped headlight; blue, headlight, main beam; red, ignition on. Unfortunately, as with many other features, Ducati didn't standardize and quite often used colours in a different order, or fewer lights (only one in some cases!).

Fuses

Of the Continental type, these are 15 amp (headlamp) or 8 amp (early type regulator box).

Aprilia horn and dipswitch–a familiar sight on most Ducati singles



Aprilia stop light switch. Employed on models with a battery, these come in two types. Narrowcase models have a spring operation, while widecase versions (as illustrated) have a plunger

Ammeter

Unlike the majority of British machines of the classic period, Ducatis do not have this component. So don't worry when you can't find it!

Summary

You are advised to consult the appropriate workshop manual or rider's handbook for more details concerning the electrical specification of your particular machine.

12 Cables, controls and instruments

Cables and controls are the direct link between the rider and his motorcycle. Without them, the mechanical components would not be able to answer his commands; conversely, the instruments relay information back to the rider concerning the various functions of his machine. Therefore, it is of vital importance to the success of the restoration that all these items are in the best possible condition.

As a matter of course, I recommend that you fit a new set of control cables, ensuring that they are of the correct gauge and length for your particular model. Usually, the Ducati parts book will give the length of each cable, thus helping when you do not have one of the old (correct) cables as a pattern.

Remember that a worn, badly-routed and probably frayed cable will not only look awful, but will be potentially dangerous, too. It may also lead to heavier-than-normal action (a particular problem for both the clutch and throttle). Badly lubricated cables also are more difficult to operate and can cause damage to instruments such as the speedometer and rev-counter.

Cables

Luckily for the Ducati singles restorer, it is still possible to buy the majority of the various four-stroke control cables: front brake, clutch, valve lifter (where fitted), choke, throttle, rear brake, speedometer and rev-counter (where fitted). For the two-stroke owner, the situation is more difficult and the cables will probably have to be made up.

The clutch and front brake both feature a detachable barrel nipple, which slides over the top brass nipple of the inner cable, and a solderless nipple at the bottom. It should be noted that these are not part of the cable and need to be ordered separately.

On models fitted with the chain-pull Super Practic B twistgrip, the respective cable will have a tiny, detachable, brass solderless nipple, rather than a soldered top nipple. Again, this does *not* come with the cable and needs to be ordered by itself.

The Ducati-type speedo cable employs a detachable alloy knurled bottom nut. This is retained by a brass circlip. However, cables now being manufactured often have a more conventional and simpler design where both the top and bottom nuts are 'sealed' to the outer cable.

The valve lifter cable (only fitted to non-Desmo 350 and 450 models) has an identical design to that used on the clutch and front brake types—a barrel nipple at the top and a solderless nipple at the bottom.

The rear brake cable not only comprises an inner and outer cable, but also a built-in adjuster with a large knurled nut and a barrel piece which fits into the alloy rear brake lever (sometimes a steel lever on the two-strokes). Only the mid-1970s 125 two-stroke Regolarita and Six Days enduro models feature a rod-operated rear brake; all the rest have cable operation.

When ordering either speedometer or rev-counter cables, it is necessary to quote not only the model and year, but also the make of the instrument (Smiths, Veglia, etc).

Cable making

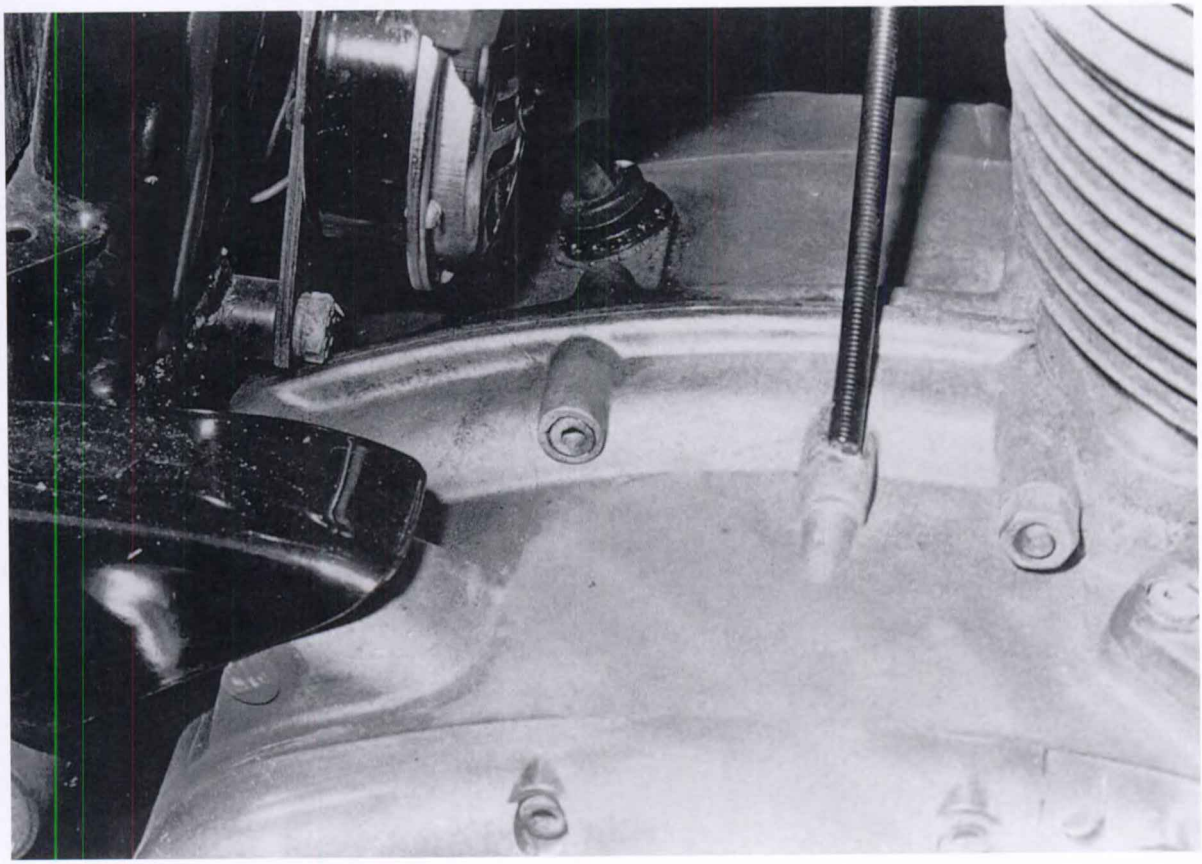
If you are unfortunate enough to own a model for which 'off-the-shelf' cables are no longer available, the only course is to make your own. To do this, you will need a soldering iron, solder and flux, plus a pair of good quality, heavy-duty cutters and, of course, lengths of inner and outer Bowden cable of the appropriate types.

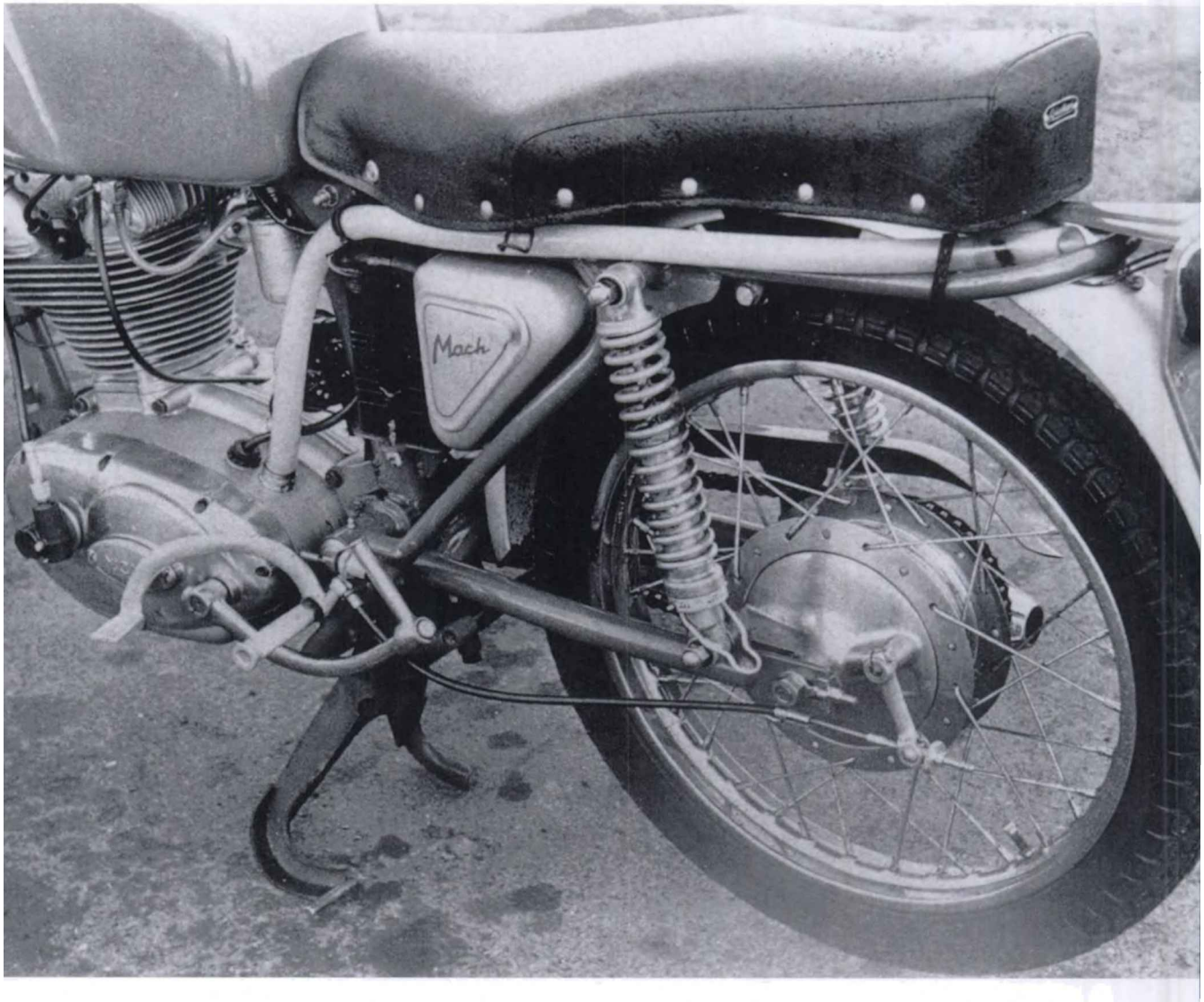
To achieve a successful result, you will need *clean* parts. Solder will not adhere to surfaces that are wet, dirty, tarnished or greasy. The solder comes in a

ABOVE RIGHT *Cables and controls are the direct link between the rider and his machine. Note how neatly both are tucked away on this factory-fresh 250 Diana on display at the Milan Show in 1961*

RIGHT *On the narrowcase models, the clutch cable passes through the outer crankcase to the clutch operating arm, which is situated behind the gear selector box. On the widecase models, the cable is routed externally to connect with the clutch arm that protrudes from the crankcase*


DUCATI 250

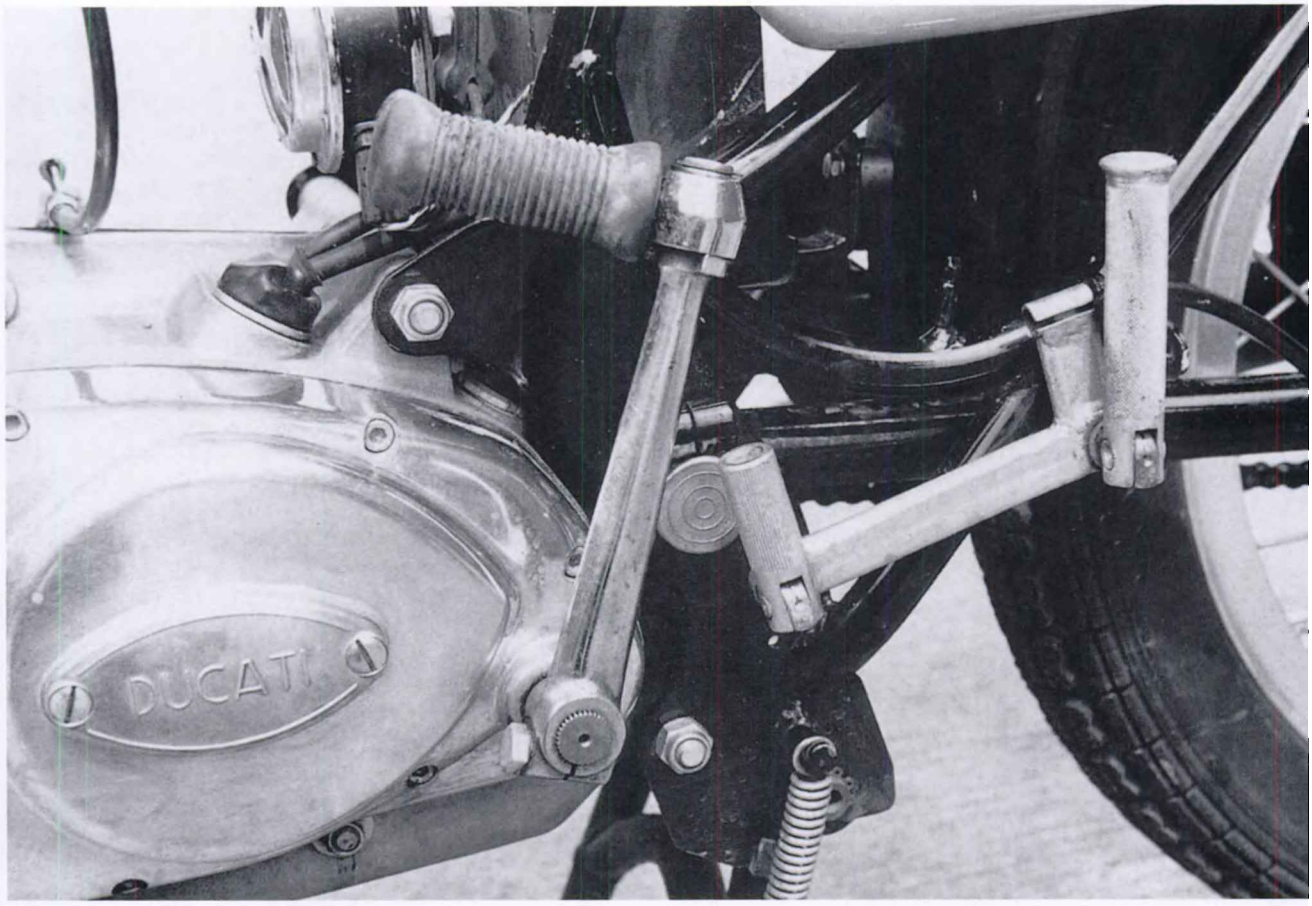




ABOVE *Routing of the rear brake cable on the Mach 1. Other models with rearset controls will be similar*

ABOVE RIGHT *The Desmo rear brake controls with folding footrest and folding brake pedal toe. Only machines from 1972 onwards have this feature. Prior to that, the Desmos had forward-placed footrests, as on the touring models*

RIGHT *Clutch (top) and valve lifter controls. The latter is only to be found on valve-spring 350 and 450 machines*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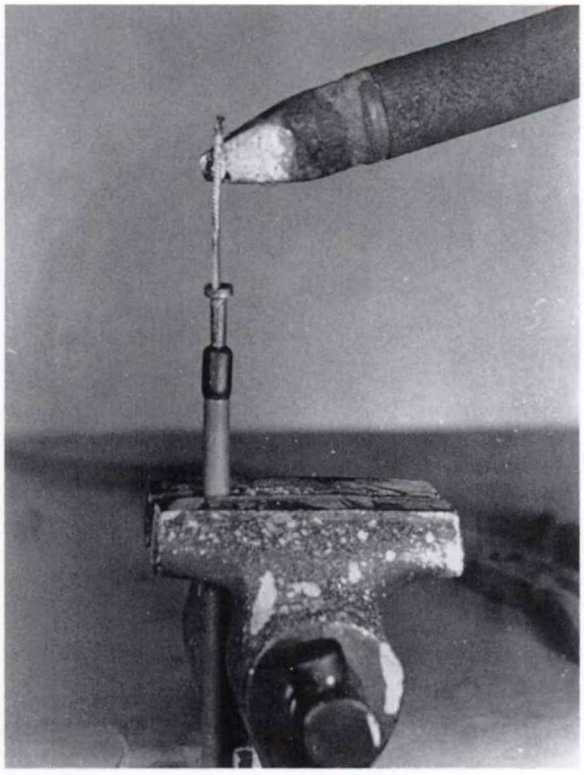
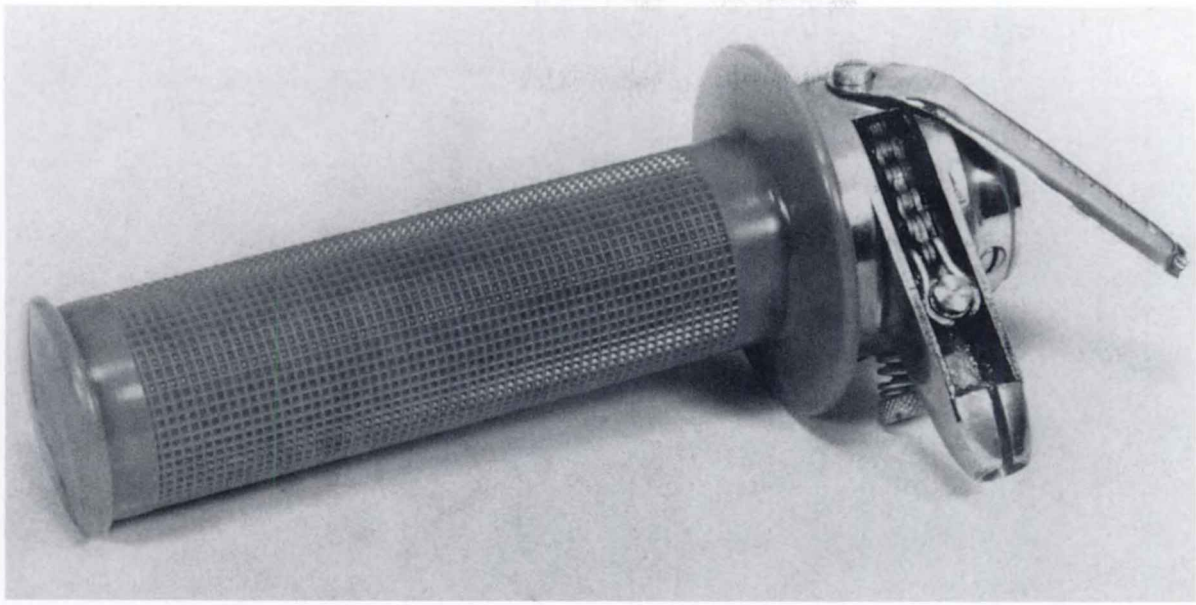


stick—do not use the flux-cored electrician's type, as it is not up to the task in hand. The flux can come in paste or liquid form. You will find the former the most convenient to use, as it is possible to open the container and dip the iron and cable in.

Before attempting to cut the inner cable, you must first tin the portion to be cut. This is to prevent the cut ends fraying. Once this has been done, you can cut the wire and solder a nipple on to the end. To achieve a successful result, you need to splay the wire ends out to sit in the countersink of the nipple and then apply the solder. Once it has cooled, check the strength of the joint by giving the cable a sharp tug—it is far better for the nipple to part company with the cable in the confines of the workshop, than on some deserted stretch of road out in the countryside. File the nipple to shape and make sure that it is an easy fit in the respective lever pivot.

As already mentioned, unlike many manufacturers, Ducati saw fit not to employ solid nipples at the ends of several of their cables. By making your own cables, you can enjoy the added advantage that soldered nipples give. In many cases, the only thing stopping you is that by doing so you will have strayed away from complete originality.

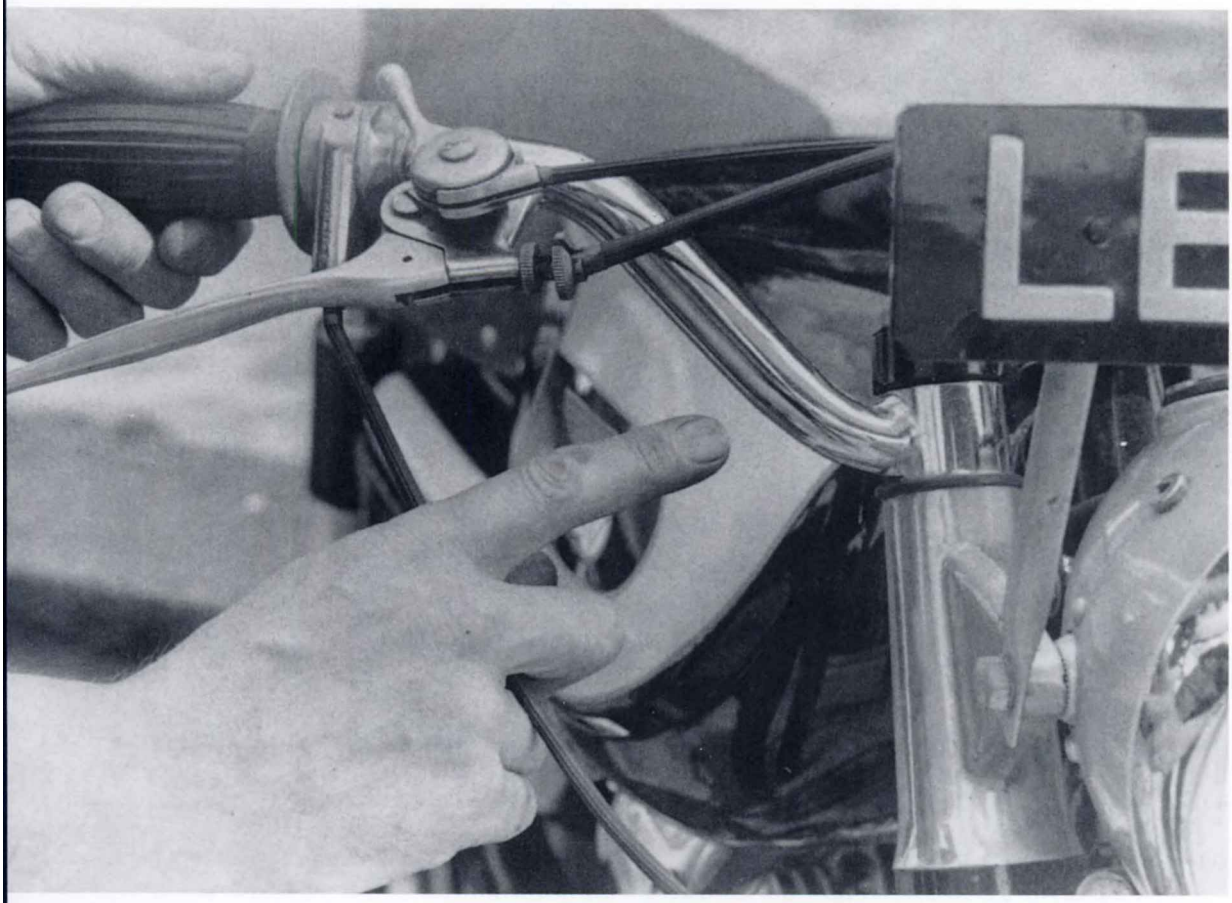


LEFT *Tinning the cable to prevent the ends from fraying*

BELOW LEFT *Some of the materials needed for cable construction*

ABOVE *Super Practic B chain-pull twistgrip, a standard fitment on many Ducati singles*

BELOW *Swan-neck clip-ons came as standard on the 1964 250 GT. These provide an almost ideal touring stance*



Controls: four-strokes

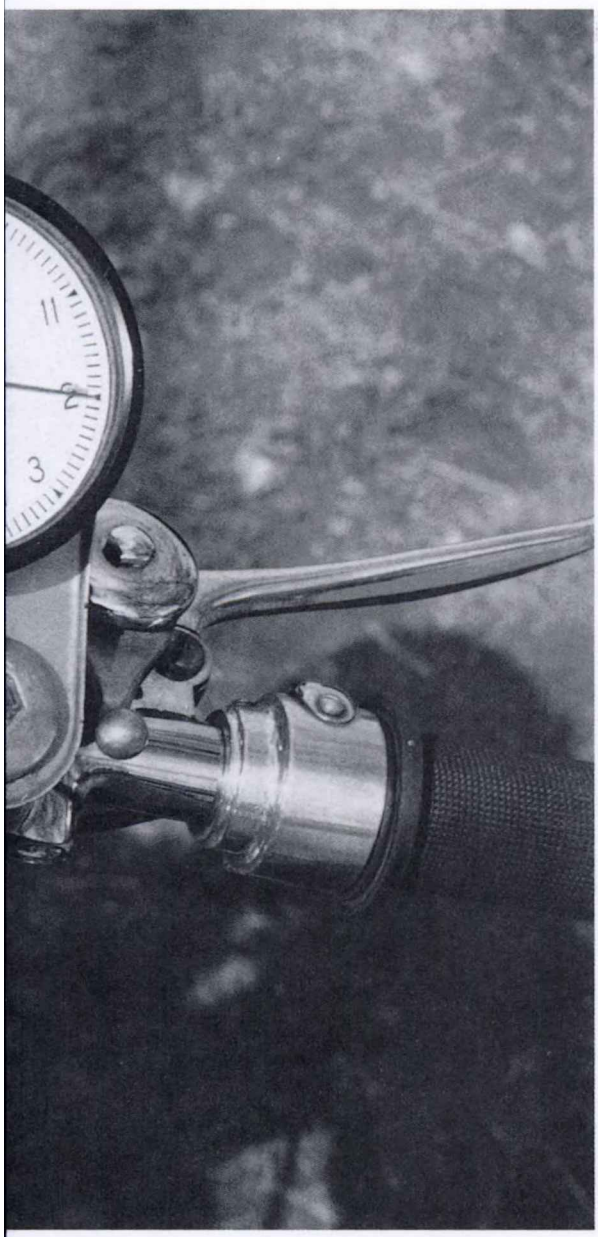
Four basic types of handlebar were fitted to the four-stroke Ducati singles: the conventional touring unbraced bar; the off-road-style braced motocross type; a pair of road-racing-style clip-ons; and, finally, a pair of swan-neck touring raised clip-ons. By far the most commonly used were the unbraced touring handlebar and the racing clip-ons. In fact, some models, most notably the Diana Mark 3 (narrowcase), Mach 1 and the final Mark 3s (widecase), had the choice of either as original equipment.

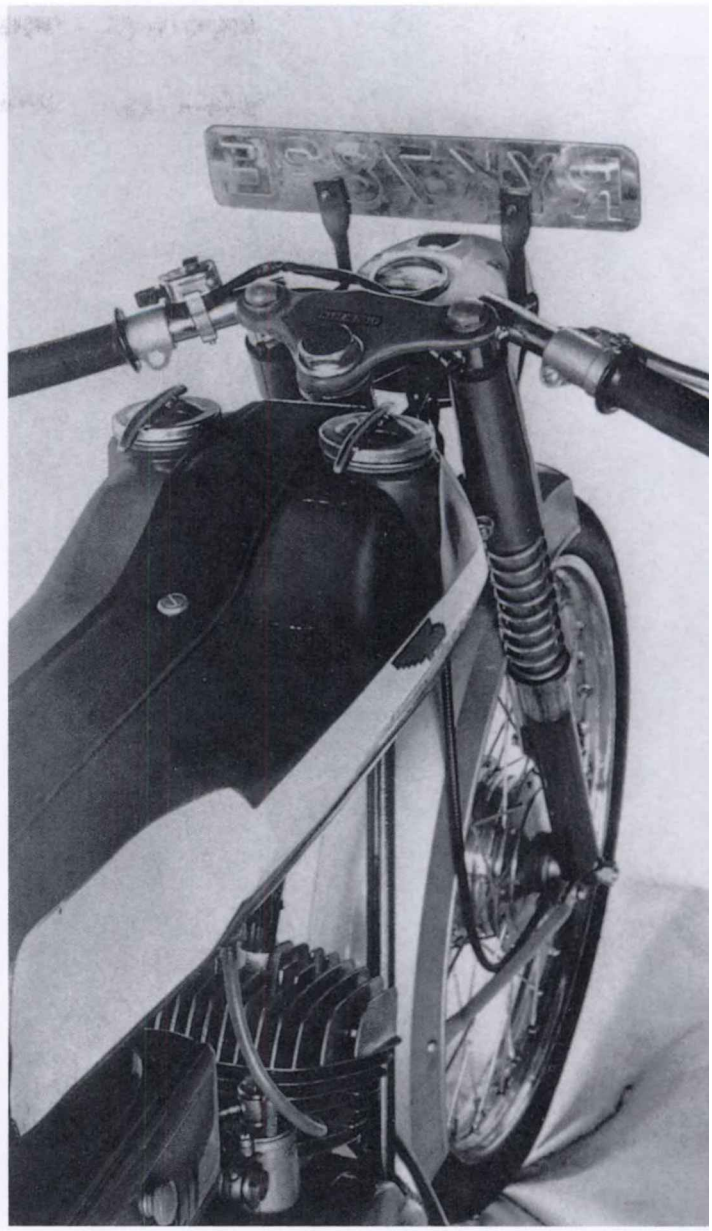
The braced off-road-type bars were only fitted to those machines which had an off-road capability, however limited. These were the 175 and 200 Motocross, 1961–7 250 Scrambler (narrowcase), 1971 125 Scrambler and 1971/72 450 R/T Desmo.

The fourth and final type, the touring raised swan-neck clip-ons, was only fitted to the 250GT—and this was restricted to 1964 bikes. (British readers should note that the importers of the time, Kings of Manchester, sold these during the following year, even though they were old stock.)

The control lever supports of those machines fitted with clip-ons had integral welded clamps (except the Desmo disc-brake models which featured separate and, therefore, adjustable lever clamps). Machines with conventional handlebars all had separate clamps.

Mark 3 and Desmo models from 1972 onwards, featuring the double-sided single-leading-shoe





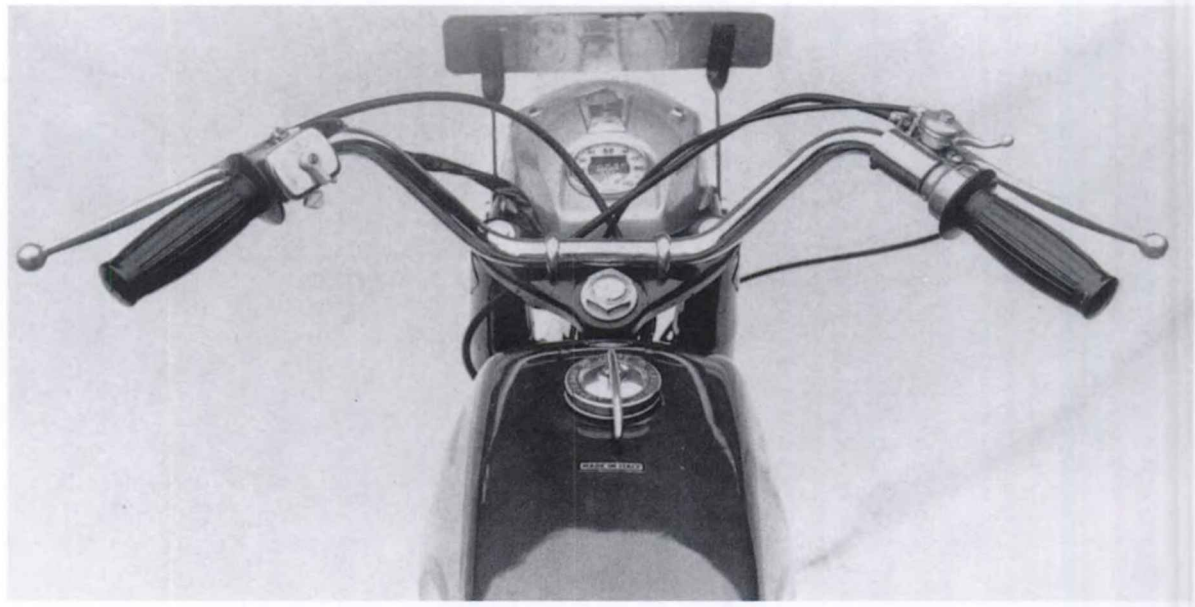
Grimeca drum brake, also had a compensator unit (a pin which passed through the brake lever and was retained by a circlip) and a special 'solid' adjuster for the twin front brake cables.

All machines with a drum front stopper were given a matching pair of clutch and front brake adjusters of the same style (this applied to the double-sided brake mentioned above). Up to the end of 1971, each was a simple two-piece affair, comprising a threaded adjuster and a knurled thumb nut. Thereafter, the adjuster assembly consisted of four pieces: the adjuster, a nut, a spring and a ball (obviously, the late Desmo models with a hydraulic disc front brake did not feature a cable adjuster).

All the clutch and front brake levers were of

ABOVE *More traditional Ducati singles riding position—the racing-style clip-ons with 'boy racer' pose. This bike is a 1967 50SL1. Note the styling gimmick of twin filler caps*

ABOVE LEFT *Mach 1 controls—welded-clamp clip-ons, large steering damper knob, headlight-mounted (150 mph!) speedometer and add-on, white-face Veglia racing tacho*




80 100 120
km/h

polished alloy, but it was not until the 1965 model year that ball-ended levers were specified.

All the four-strokes had a handlebar-mounted choke lever. This was usually on the right (offside), but the Desmo disc-brake models had this transferred to the opposite side.

On the 350 and 450 non-Desmos only, a valve lifter lever was situated under the left-hand (nearside) handlebar clamp or clip-on. This was quite often dispensed with, as many owners found it rarely needed.

LEFT *The far less glamorous controls of the budget-priced 160 Monza Junior tourer, circa 1967*

BELOW *Café racer—the pilot's eye view of the cockpit of a 1974 disc-braked 350 Desmo. Note the matching Smiths instruments and nearside-mounted choke lever. All the drum-braked models have the latter on the other side*

Controls: two-strokes

Essentially, these were similar in basic layout to those fitted to the four-strokes, but there were a couple of notable exceptions. For one thing, the majority of the control levers on the two-strokes were of chromed steel and there were no adjusters; the other significant difference was the location of the choke lever—this was on the carburettor itself, not the handlebar, as on the four-stroke models.

Instruments

Like electrics, instruments are not one of Ducati's strongest points! For several years, the Italian singles only had a speedometer, this Veglia-made instrument residing in the headlamp shell. The first model (except for pure racers such as the Gran Sport, Formula 3 and Grand Prix) to be fitted with a factory-specified rev-counter was the US Diana Mark 3 of 1962, and then it was very much an 'add-on' extra. This factory option was the now famous 85 mm white-faced Veglia racing instrument. Unlike the vast majority of clocks fitted to the Italian bikes, this one was totally accurate.

Except for the two-strokes and the 160 Monza Junior, which have a Rolle speedometer, all the narrowcase machines and the early (pre-1970) widecase ohc singles have the standard Veglia headlamp-mounted speedometer.

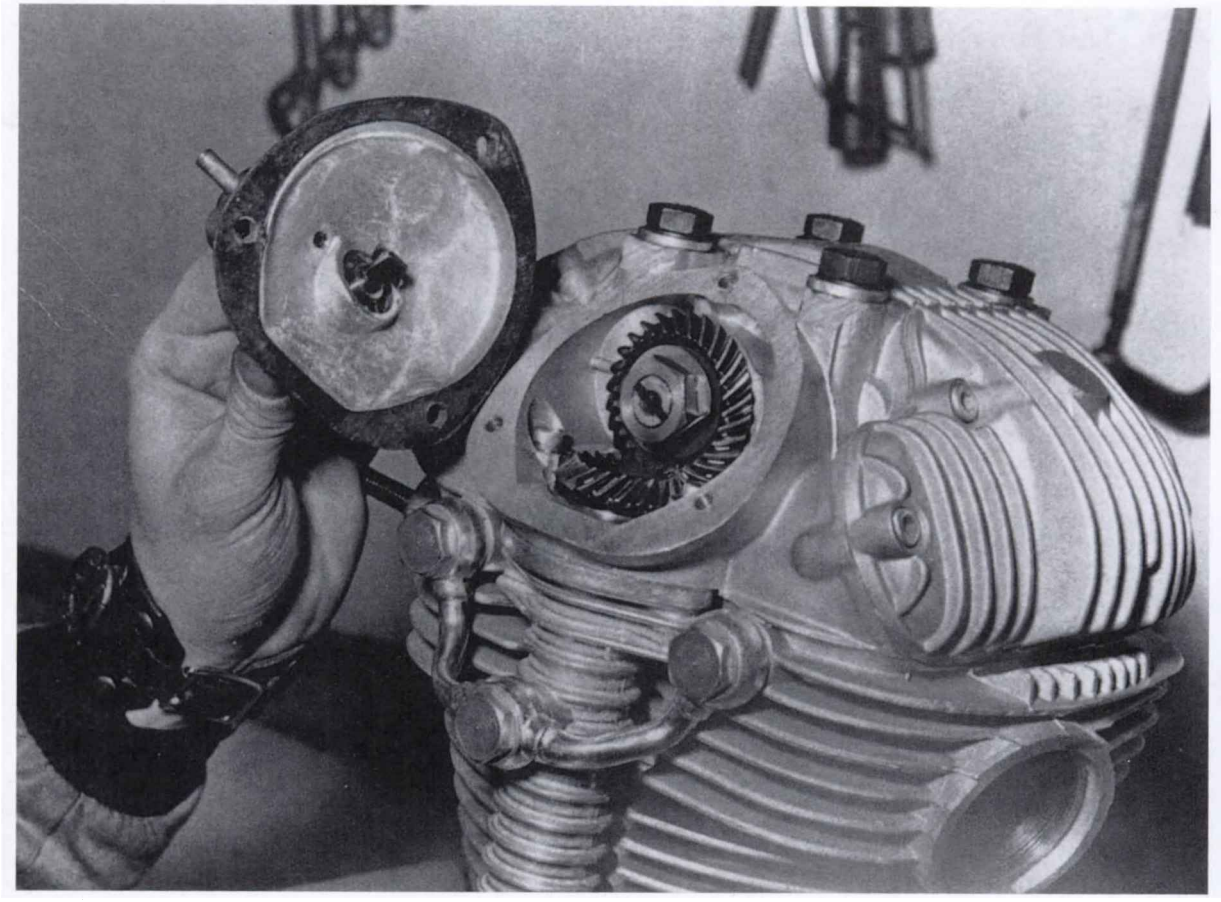
For 1970, Ducati decided that, at least as regards its sporting roadster Mark 3 and Desmo models, a matching speedometer and rev-counter would look more the part. For the first time, the speedo was transferred from its home in the headlamp shell to a position above the top yoke, together with the rev-counter. For this purpose, CEV provided a new design of instrument (but it was no more accurate!). At first, these were mounted in separate chromed steel binnacles, but from the 1972 model year, a one-piece, hard black rubber moulding was used to house both.

As for the two-strokes, these usually employ a different type of CEV speedo, and they were never fitted with a tacho as standard equipment.

All speedometers on the models covered in *Ducati Singles Restoration* are driven by the front wheel, either by a separate gearbox or by a pair of gears.

The first bikes, such as the 100/125S, 175S and T, and the initial production of the 200 Elite (up to the 1960 model year), had a Veglia drive gearbox of the type with a small tag which mated up with the wheel hub. The same idea, but *not* the same gearbox, was later used on the two-strokes and the Desmo disc-brake models.

Unfortunately, the weakness of this type is the tag which is prone to damage, but this can be built up with MIG weld and remachined to shape. However it will still probably be more practical for most



restorers to simply opt for a new gearbox assembly. The only other maintenance required is regular attention to the greasing point with a grease gun.

The other type of drive consists of a pair of gears; one is a large crown gear which is pressed on to a taper on the wheel hub itself. The other is a worm pinion and holder which is mounted in a detachable side plate (best described as looking like another brake plate, but without cams, levers and shoes).

Both types of drive are located on the right (offside), except on the 160 Monza Junior, which has its pair of gears and side plate on the left (nearside).

All instruments used on Ducati singles are of the magnetic type and (except for the racing Veglia rev-counter already referred to) are not to be relied upon for accuracy. In fact, in some instances, the speedometer acts more akin to a rev-counter, with the needle flying about all over the place!

The magnetic type of instrument is generally of cheaper construction than the much more accurate chronometric type. Another problem is that the types used by Ducati had a crimped-on rather than threaded chrome bezel (rim).

There were no additional instruments such as an ammeter, clock, etc, either as standard or as factory-listed options.

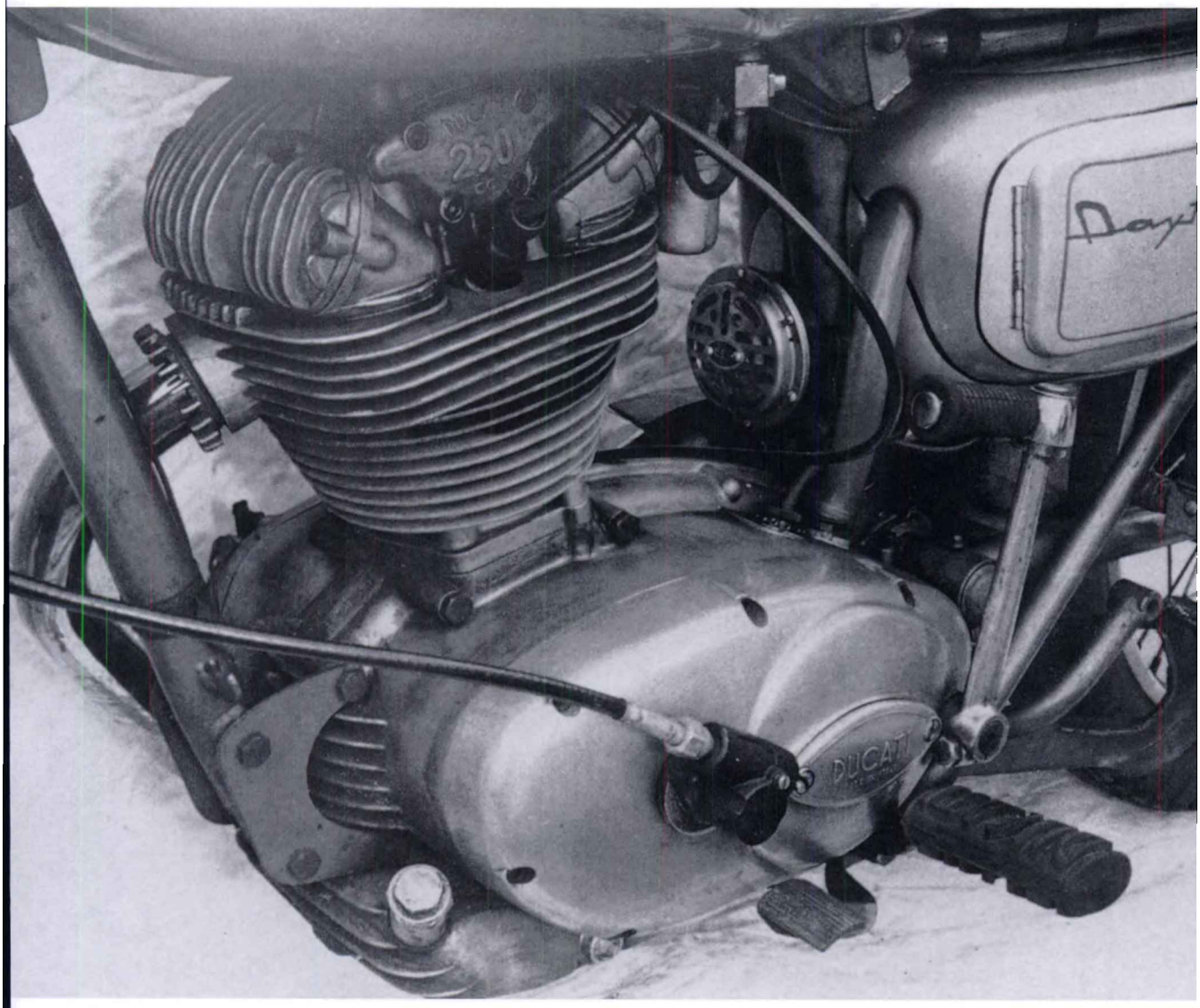
ABOVE *The factory rev-counter drive ran off the camshaft, as shown, with a detachable drive box and cover*

RIGHT *The crankshaft rev-counter drive shown is an aftermarket kit offered by British Ducati specialist Vic Camp during the late 1960s and early 1970s. It uses a Smiths drive gearbox*

It should also be noted that all the original factory-approved rev-counters take their drive from the triangular top bevel inspection cover—either with a detachable gearbox or integral gearbox/cover assembly. Either way, an Oldham coupling and sleeve connect these to the camshaft.

The integral gearbox/cover assembly replaced the separate unit in an attempt to cure oil leaks. This was partially successful, but the small oil seal on the later type is still prone to problems where it connects up to the drive cable.

If the bike you are restoring has a drive gearbox in another place, for example on the nearside primary drive cover (driving off the end of the crankshaft), it is an aftermarket kit produced locally. For example, the British Ducati importer, Vic Camp, produced just such a kit, using Smiths components, in the late 1960s and early 1970s.



As for instrument repairs, quite frankly, except for cosmetics, these are best left to a specialist. Alternatively, buy an entirely new instrument. Before proceeding on the former course, get a quotation, as repairs can often prove *more* expensive than a new speedo or rev-counter!

13 Seating

Early Ducati singles have the typical hard Italian dual or single seat with its sprung interior and plastic/leather covering. The first machines to employ the more modern (and comfortable!) foam-rubber cushion and metal base were the touring models, such as the 160 Monza Junior, 250 Monza and 350 Sebring in the mid 1960s. No Ducati singles were equipped with a grab rail as standard. Instead, there was usually a plastic (or similar) strap for the passenger between the rider and passenger portions of the dualseat.

Seat types: early

Like other Italian manufacturers, Ducati 'bought in' their seats. They were usually made by specialists such as Giuliari. Virtually every model has a different type, and sometimes, as in the case of the Mach 1, there could be several.

These early types, which feature a frame, springs and covering, may well prove impossible to restore if the frame and springs are badly rusted. This can prove a real problem, as a replacement seat will be difficult to find.

The overhead-cam four-stroke models with this type of seat are the 100 Sport, 125 Sport and TS, all 175s and 200s, all narrowcase 250s (except 1966 and onwards Monza and GT) and the pre-1966 350 Sebring. All two-stroke models made during the 1960s also have this seat.

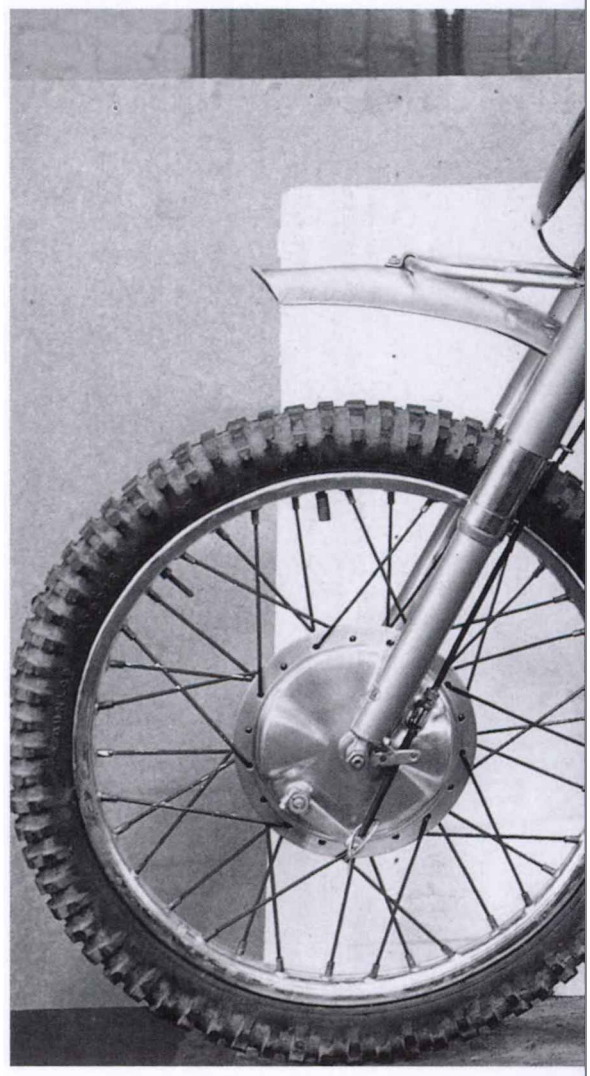
Seat types: late

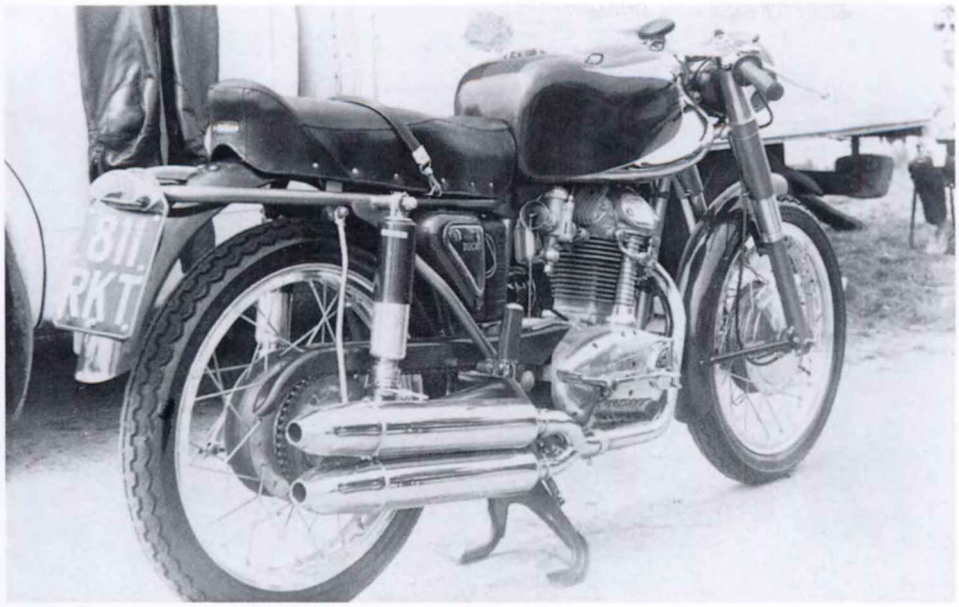
Beginning with some of the touring bikes, and later from 1968 onwards when the widecase models were introduced, Ducati replaced the original sprung dual seats with the more comfortable foam-rubber and steel pan type.

However, although better from a comfort point of view, this type can produce its own problems—the steel pan (base) can rust, the moulded interior can rot and, like all motorcycle seats, the cover can tear or split. For the restorer, only the latter can be successfully dealt with, by having it re-covered. Several specialists offer this service.

RIGHT *A 1959 175 Sport with a typical Italian sprung-interior seat of the period—narrow and racy, but uncomfortable on long journeys*

BELOW *Former road racer Alan Trow imported this one-off machine in late 1959. It used a standard production 200 Motocross chassis with an engine from a 175 Formula 3 racer*

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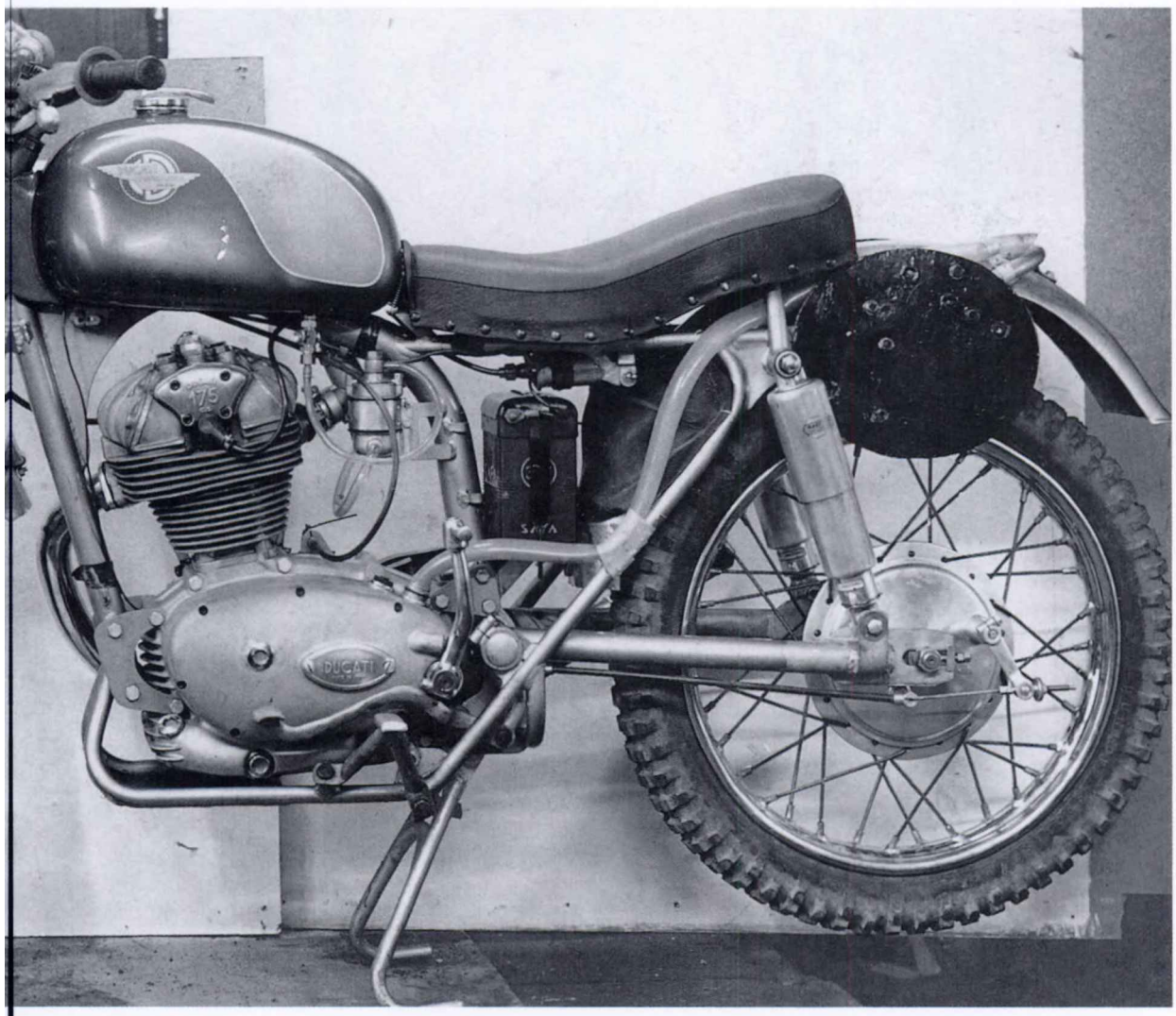
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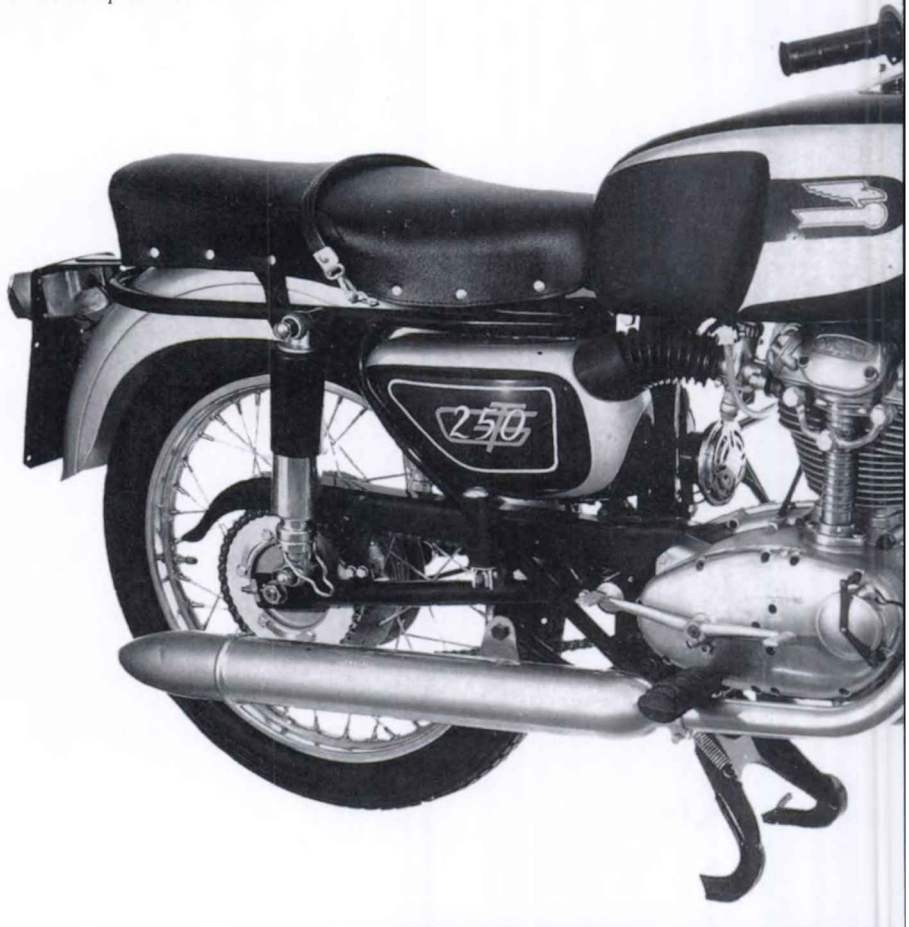
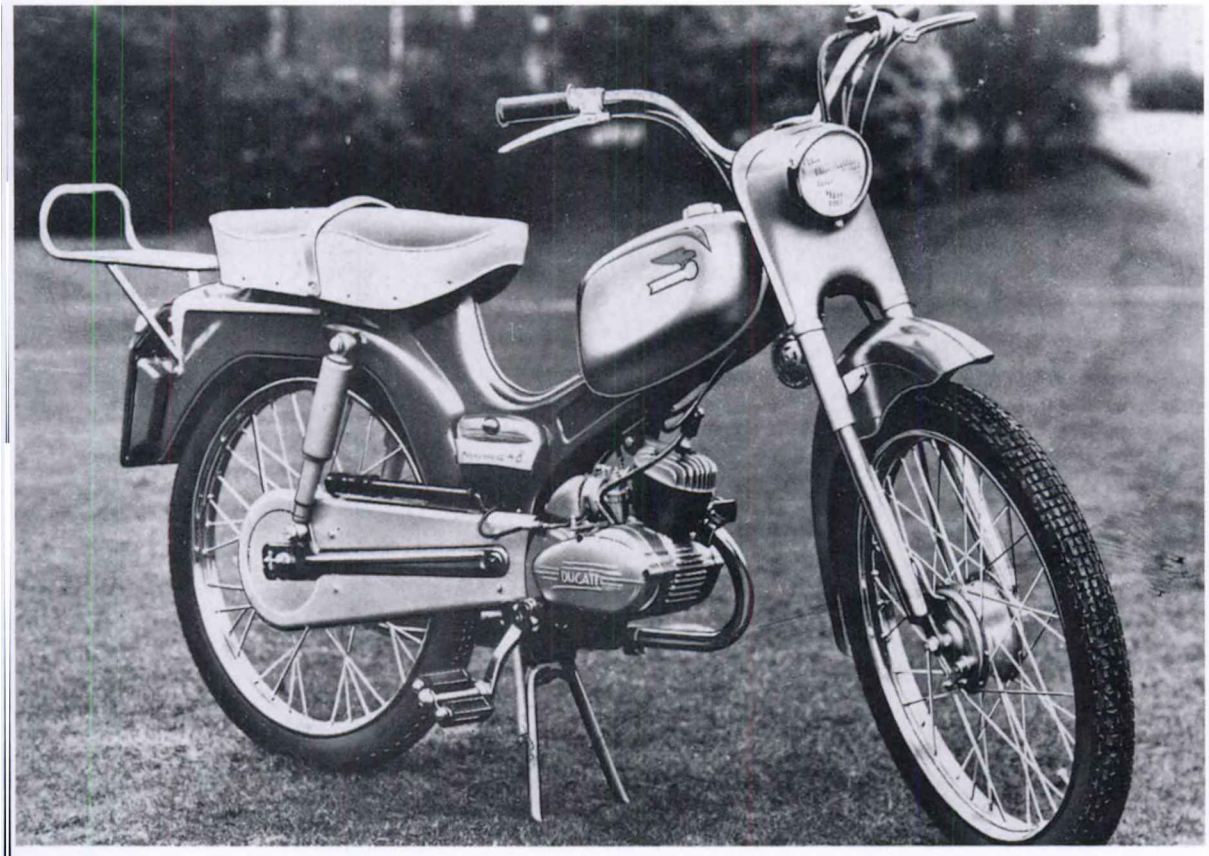
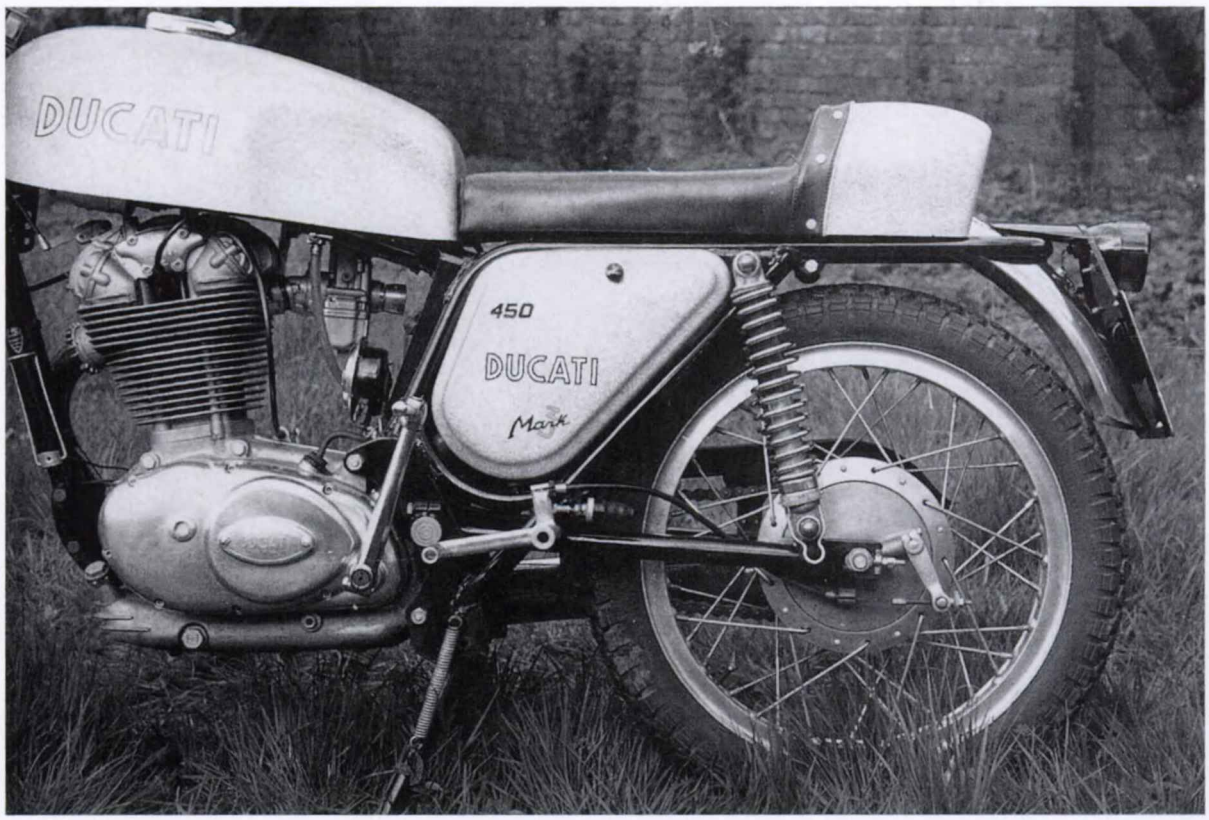
ABOVE *Slightly larger than the 175 Sport seat, and with a little more padding, is this seat fitted to the European 250 Diana (Daytona in Britain) of 1962*



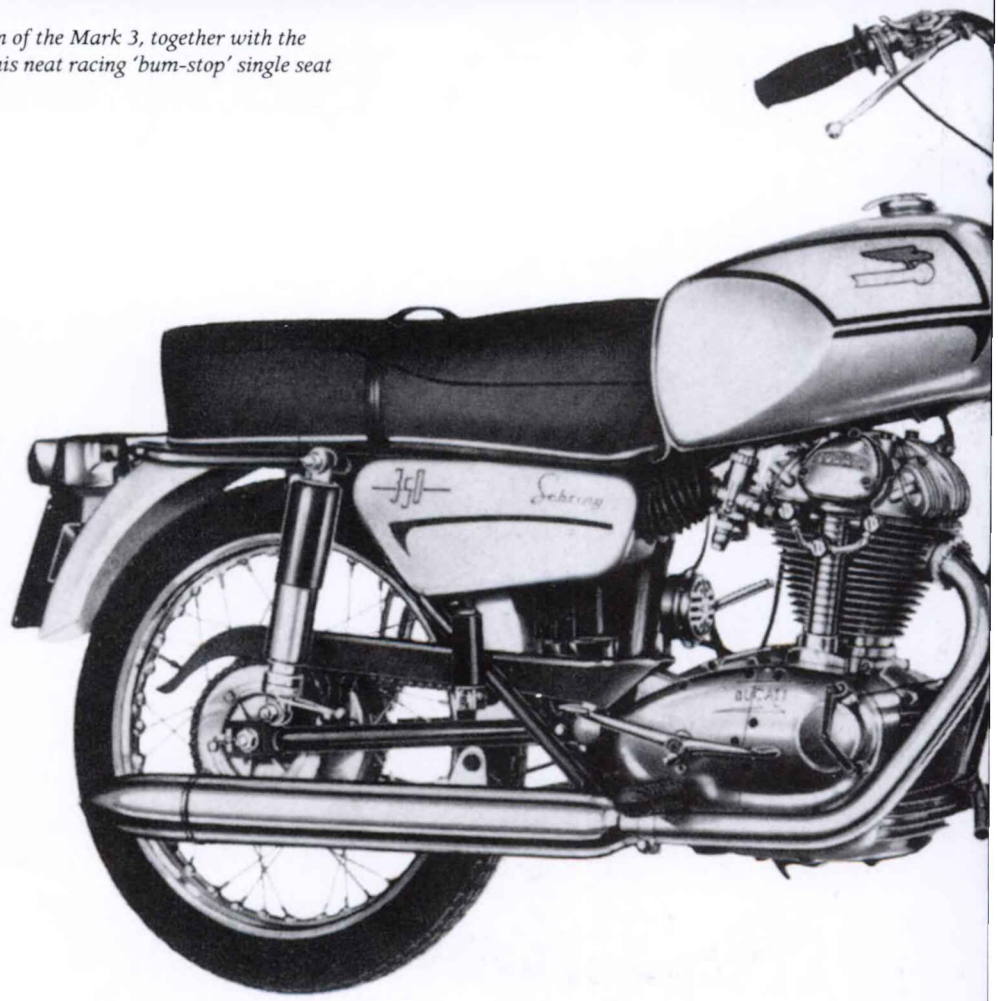


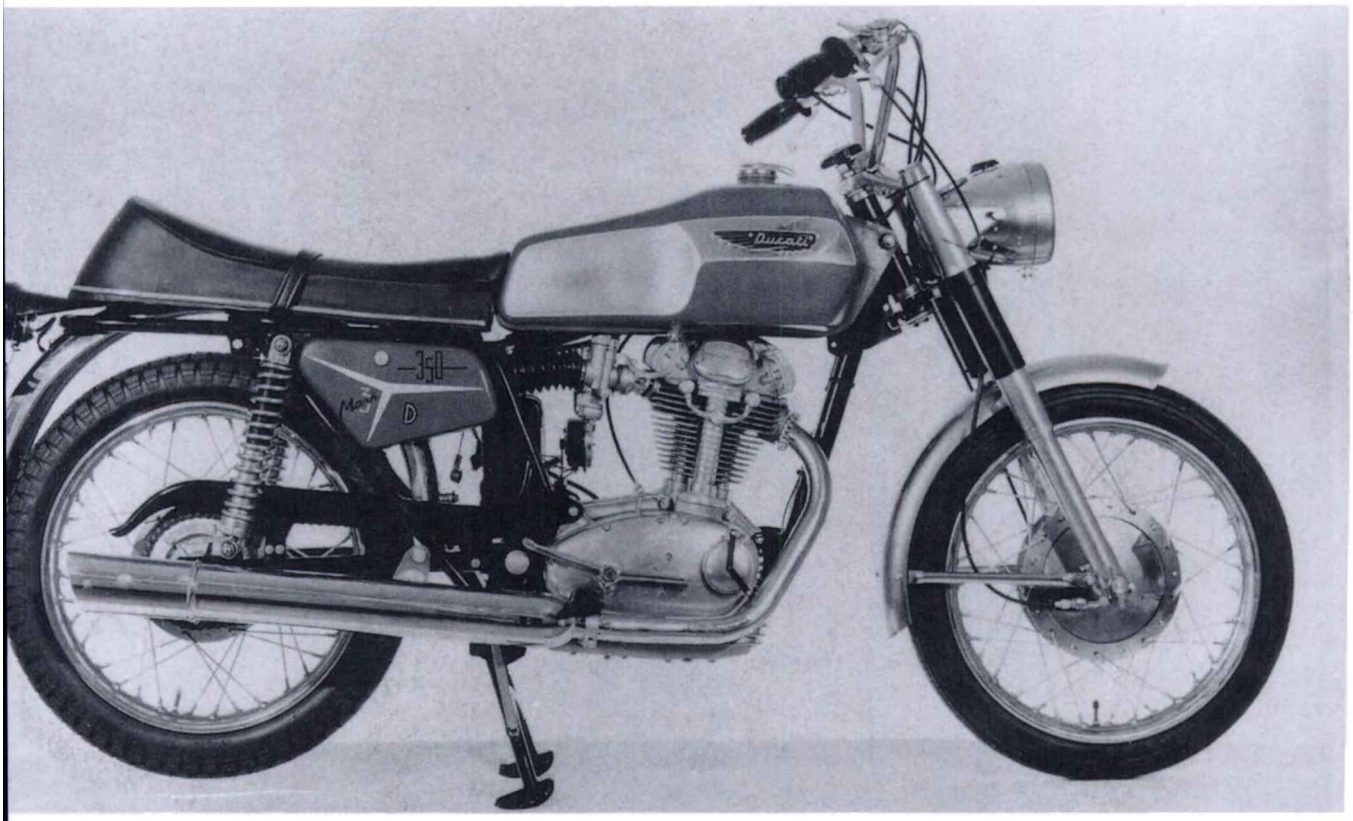
ABOVE *A Piuma De Luxe moped with two-tone (white and blue) dualseat, offered between 1962 and 1965*

LEFT *One of the first five-speed 250 GTs built in late 1964. Some Mach 1s also have this dualseat*



ABOVE *The sports version of the Mark 3, together with the Desmo, appeared with this neat racing 'bum-stop' single seat for the 1972 season*





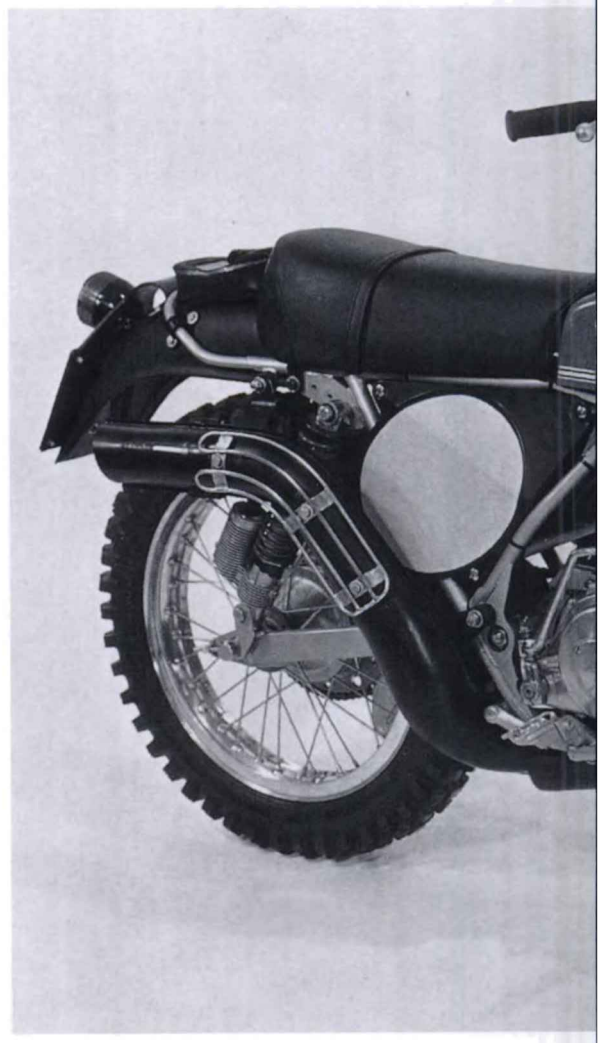
ABOVE *The 1968–71 Mark 3 and Mark 3D (Desmo) widecase models have this dualseat. The top is smooth, but the sides have a grainy texture*

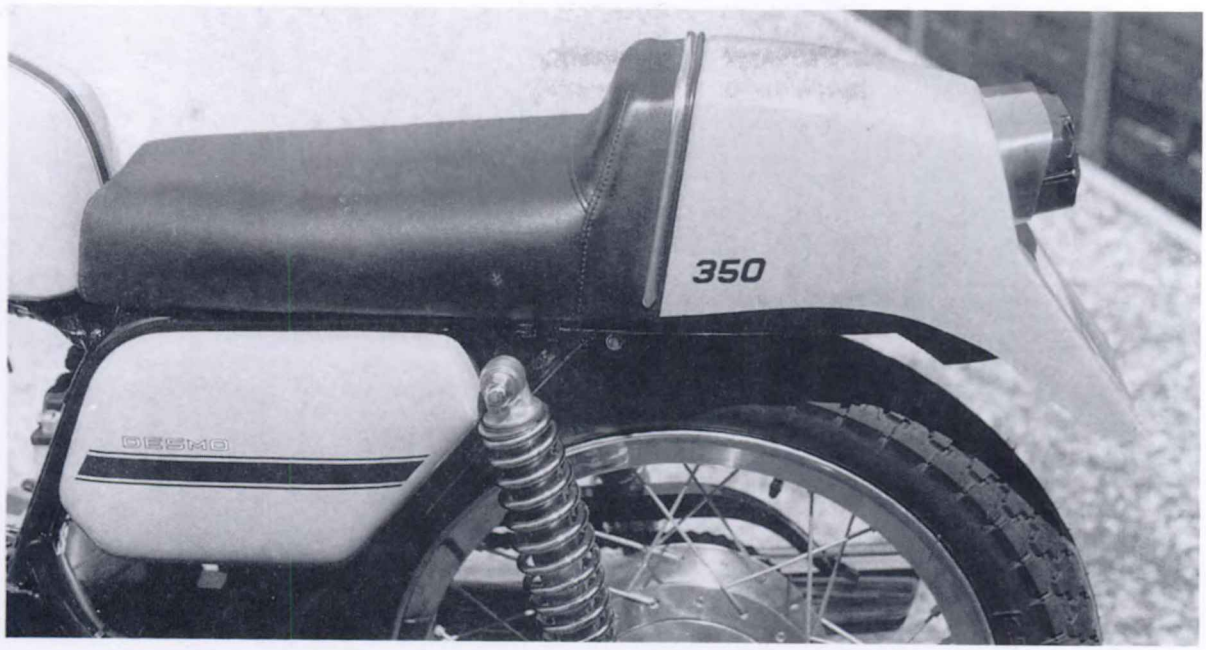
LEFT *The first Ducati to use a foam-rubber padded saddle, the 350 Sebring Series 3 of 1966; the 160 Monza Junior, 250 Monza and 250 GT also use the same type*

ABOVE *The final blue and gold Mark 3s, built in 1973 and 1974, have yet another design. It is commendably comfortable when compared to some of the early dualseats*

ABOVE RIGHT *The yellow/orange café racer Desmos have this fibreglass combined seat and tail-light support. These last of the four-stroke line command premium prices from today's buyers*

RIGHT *The thickly-padded seat which adorns the 1975–6 125 Regolarita enduro bike*




350
DESMO


CATI

In 1977 Ducati turned out this neatly-crafted enduro racing iron called the 125 Six Days. Once more, the seat was all new

On some models (the post-1972 Desmos in particular), a fibreglass seat base was used. Obviously, this cannot rust, but it may have been damaged. Repair may be possible but, if not, replicas of this seat are quite widely available.

Re-covering

There are lots of companies advertising a seat re-covering service for classic bikes, but be careful when choosing one, as while some do a truly excellent job, others are definitely not up to standard.

Remember also that the company you select to re-cover your seat will not have replacement trims or badges. If your seat has them still in place and they are still serviceable, make sure that they do not become lost, I have known restorers who have purchased another seat purely for the badge or trim.

On later models, such as the widecase Mark 3 and Street Scrambler (applies only to post-1971 models), the metal badge at the rear of the seat was replaced by a stencil-applied Ducati logo. This should be borne in mind when issuing instructions to the seat re-covering company.

The standard fitment on all Ducati singles was a black cover. If you find anything else, you can be sure that a past owner has already had it re-covered.

14 Painted parts and plated details

No less important to the success of any restoration are the myriad small, and not so small, components which give any machine its cosmetic appearance. These are not only the instantly visible parts, such as the petrol tank, side panels, mudguards and chainguard, but also the less noticeable bits and pieces, like footrest supports, engine plates and even the stop-switch bracket.

The components covered in this chapter are mainly steel pressings and nearly all are painted. However, some are forged or die-cast, and some are plated with chromium or cadmium.

First of all, you have to ensure that the components which have come with your machine are, in fact, those which it *should* have. This is because, unlike many of the other parts, original mudguards, toolboxes and petrol tanks have been in short supply, or non-existent, for a number of years. It may be that someone else has had this problem and substituted a part from another model.

As for a basket case project, this warning is even more relevant—cycle parts could not only be wrong, but also missing entirely. As I mentioned in Chapter 3, basket cases can prove a mixture of more than one machine and a nightmare of missing parts. Both problems are difficult to rectify when the very components needed to complete a successful restoration are virtually impossible to obtain.

The sections which follow are largely not so much concerned with the actual repair, painting or replating processes (which are covered in the following chapter), but of providing the reader with the relevant information to enable the parts you have, or are about to buy, to be correctly identified.

Petrol tank

With the exception of the engine unit, the petrol tank is, without doubt, the most visual focus of any motorcycle. On the vast majority of Italian bikes, Ducati included, this is doubly true, because Latin designers have always managed to give their products a special appeal by the curvaceous line of the tank. I said in *most* cases, as certain models are just the reverse, the tank giving every indication of being an afterthought with the result that its appearance can only be described as ugly—I am sure readers will not need me to tell them which of Ducati's single-cylinder models I am referring to . . .

Because of the tank's prominent position on the motorcycle, the quality of finish lavished on it can often make or break the complete restoration. This can work both ways. A concours job will need a finish to suit the rest of the machine, whilst another bike which has only been made serviceable will look positively silly with a pristine tank.

The petrol tank is also the one component in this chapter which requires a particularly careful check, followed by repairs as necessary, due to its inflammable contents.

If panel-beating or welding is required, these repairs are best left to a specialist. However, if it is simply a case of a rusty or dirty interior, this can be attended to by the home restorer with either a number of small (clean) pebbles or by steam cleaning.

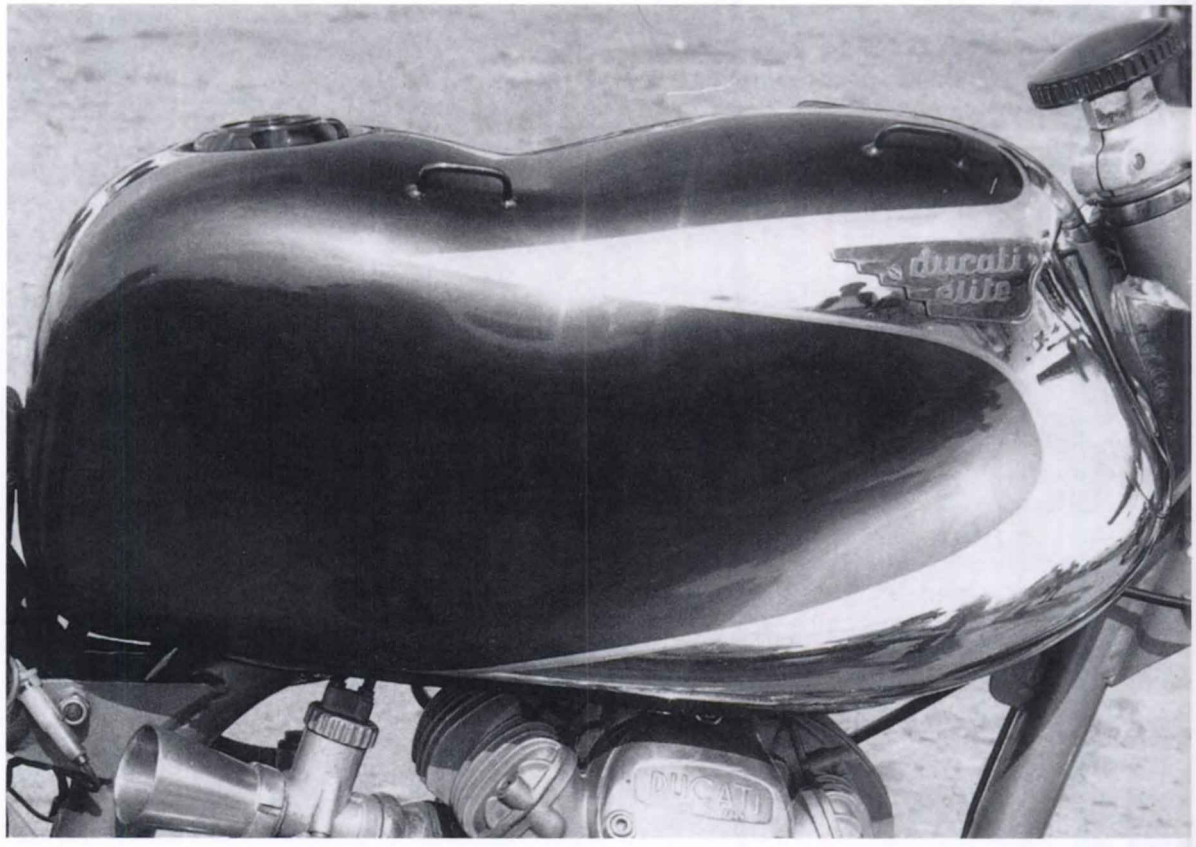
Minor external dents or imperfections in the tank surface can be rectified with a proprietary filler.

Tank types: four-strokes

The first of the production overhead-camshaft single-cylinder roadsters were the 175T (Touring) and 175S (Sport), which appeared in early 1957. The former has a rounded tank with virtually no identations for the rider's knees and a chrome-plated, lever-action filler cap. Like all the early Ducati tanks, it is bolted directly to the frame by means of 'ears' at the front on both sides.

The sports model features the famous 'jelly mould' design with its curvaceous lines, four tank-top mounting points for a bag or similar, and a black Bakelite screw-on filler cap. It has more sturdy front mounting points which use rubber cones.

In 1958, there was a whole crop of new models, in not only the original 175 engine sizes, but also 100 and 125. The new capacities employed tanks of the same shape and capacity as the factory's Formula 3 racers (produced in 125 and 175 cc versions only). The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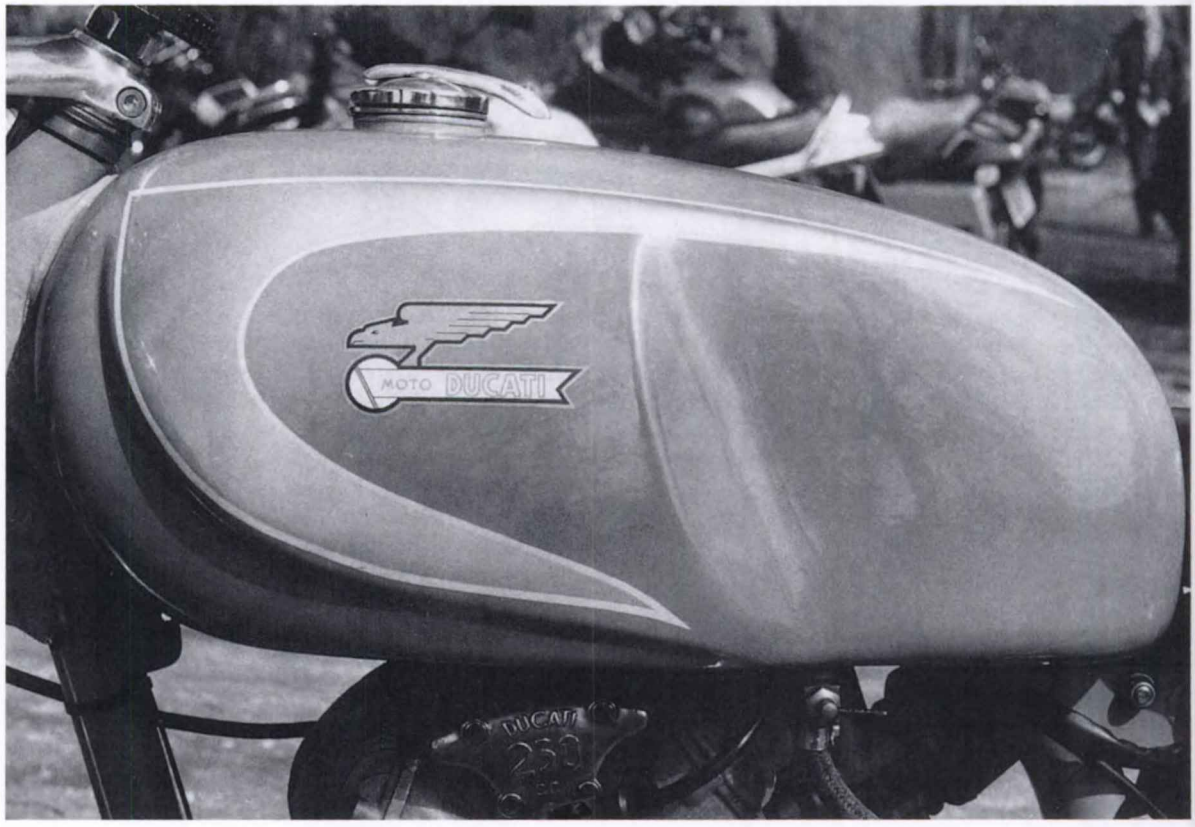
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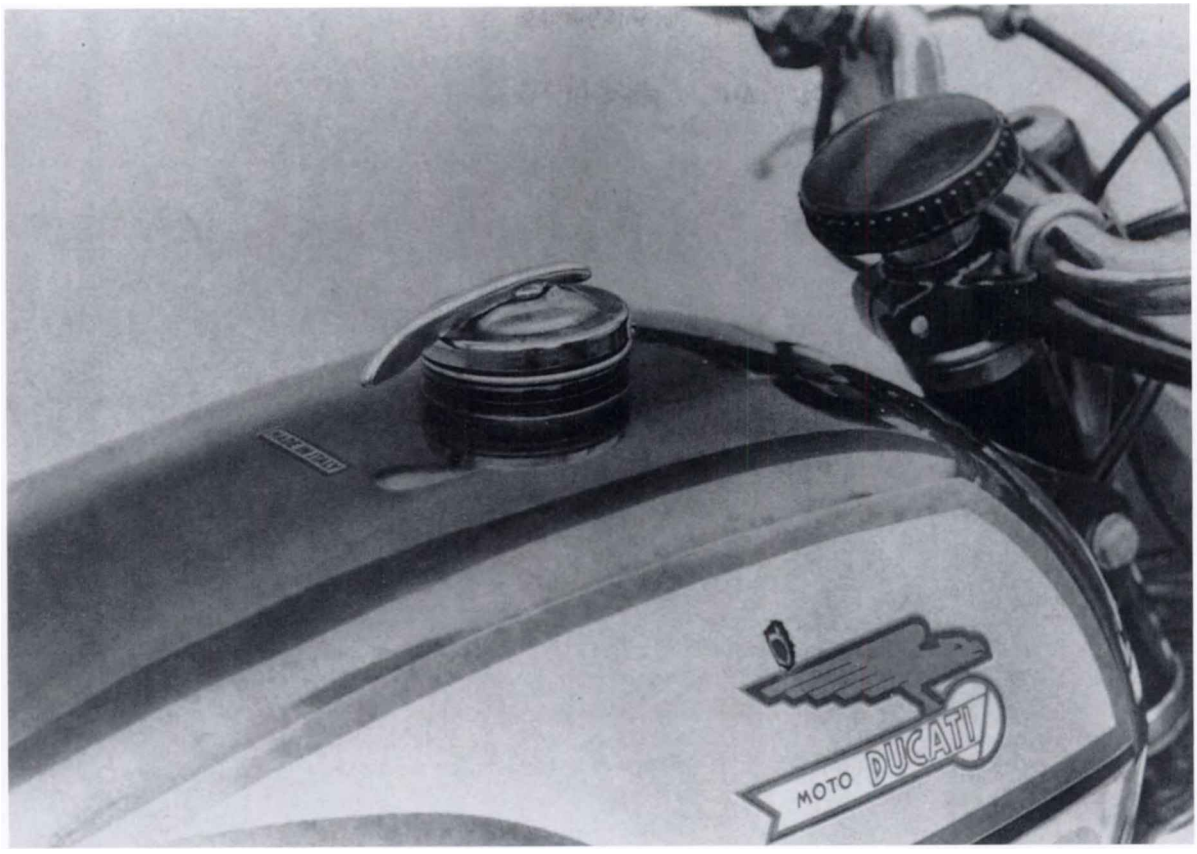


ABOVE LEFT *Petrol tank styling supreme—the curvaceous 'jelly mould' lines of the 200 Elite, manufactured between 1959 and 1965. Note the chrome flashes and tank-top parcel hooks*

LEFT *The Mach 1 tank had a chrome-plated hinged filler cap, smooth lines and an indentation in the offside base to clear the racing-type Dell'Orto SS1 29D carburettor*

ABOVE *A close-up of a 1966 350 Sebring, showing the hinged filler cap, tank lining and steering damper knob*

notable difference between the road and track tanks is the filler cap—the roadsters use the chrome lever type, whereas the racers employ the Bakelite screw-on variety.

There were also TS (Touring Sport) versions of both the 125 and 175 models. These have yet another tank shape; this time with deep knee cutaways and a raised Bakelite screw-on cap (the type on the 175 is recessed).

Also new for the 1958 season were the 175 Motocross and Americano models. The former has a smaller (11 litre) tank expressly conceived for off-road use, whilst the Americano has a US custom-style type.

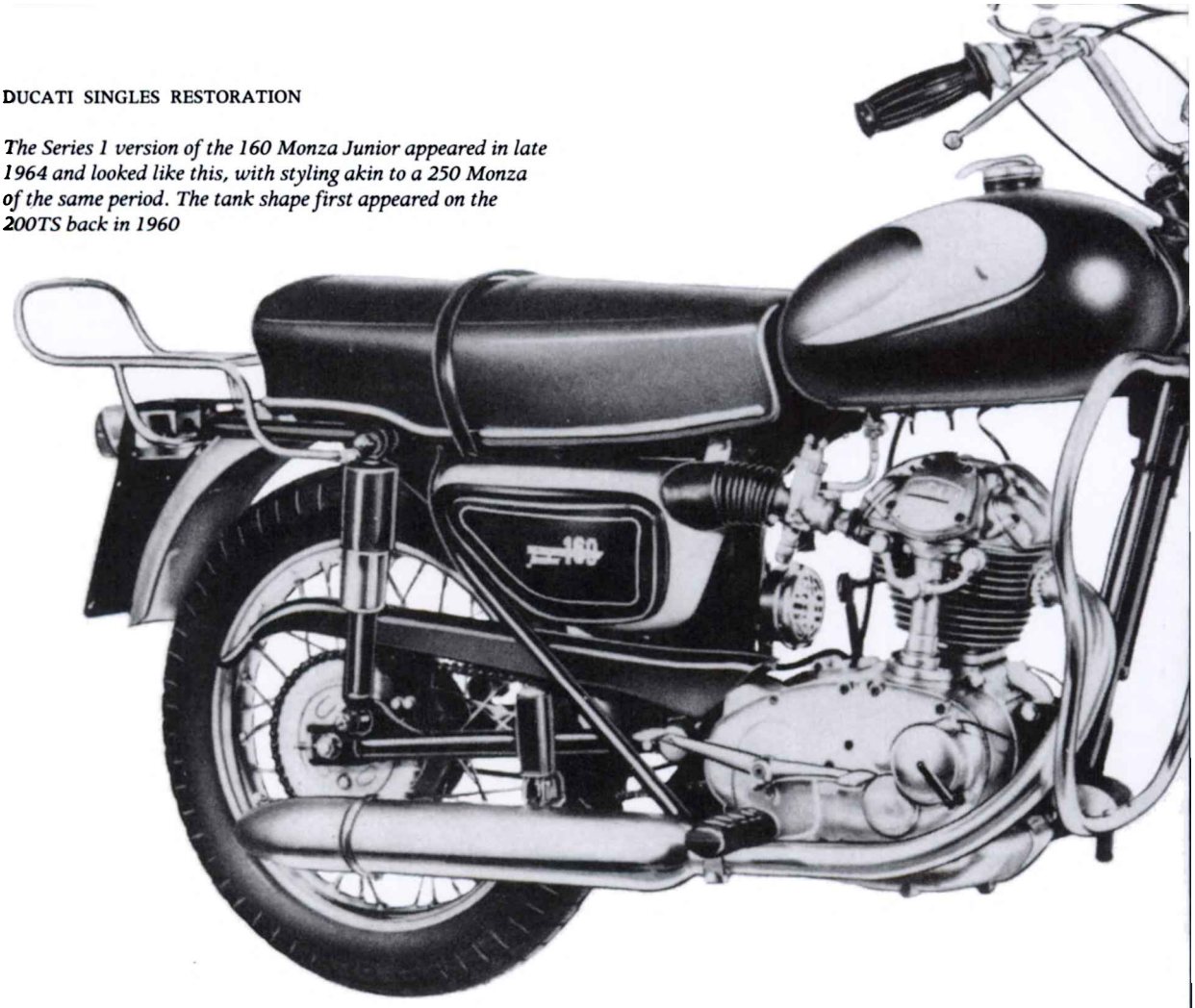
When Ducati introduced their new 200 line in 1959, both the Elite and SS (Super Sport) used the same tank as the 175S, but with a chrome-plated area at the front. From the 1959 model year, the 175S employed this as well.

In addition, the Motocross and Americano were uprated to the larger engine size that year, but continued with the same tanks. Although the Motocross was deleted from the model range at the end of 1960, the Americano (which became the TS that year) saw its tank design transferred to the 250 Monza (which effectively replaced the 200TS) in 1961.

Likewise, the 200 Motocross was superseded by the 250 Scrambler, but this uses a completely different tank design. Best described as a smaller-capacity version of the newly-introduced 250 street bike—the Diana (known in Britain as the Daytona)—it is much longer and narrower than that of the 175/200 Motocross. The Diana itself wears a much more sporty, but quite bulbous, tank, owing to its extra capacity.

The three types of tank used on the 250s remained unchanged until mid 1964, when the bikes were updated and fitted with a five-speed gear cluster.

The Series 1 version of the 160 Monza Junior appeared in late 1964 and looked like this, with styling akin to a 250 Monza of the same period. The tank shape first appeared on the 200TS back in 1960



Although Ducati continued with the same tank shape on the US-market Diana, Monza and Scrambler, the brand-new Mach 1 effectively replaced the European four-speed Diana.

The Mach 1 uses a *similar* tank to the original Diana, but with two real differences. Firstly, it is of slightly reduced capacity with a less bulbous appearance, and secondly, its base has an indentation to clear the larger 29 mm Dell'Orto SS1 29D carburettor.

Another 'new' model also made its appearance at the same time. This was the 250GT (known as the Daytona GT in Britain). The GT uses the tank from the four-speed Diana with its slightly larger capacity, as does the 350 Sebring which was launched in 1965.

For 1966, the Bologna factory released restyled versions of the GT, Monza and Sebring, plus the 160 Monza Junior (which had been launched in late 1964 with an identical tank to that used on the 250 Monza of that year). All four bikes have what is best described as 'square' styling. Not only are the mudguards of square section, but the tank is almost akin to a box with lightly rounded edges! Needless to say, the *Ducatisti* around the world did not find this particular styling exercise to their taste then, nor do they now.

The previous year, 1965, had seen the deletion of the long-running 200 Elite and with it the last of the models to employ the Bakelite screw-on filler cap, all four-stroke models now sporting the chrome-plated, lever-action type. The method of retaining the tank to the frame was changed to flat 'ears' and twin mounting bolts at the front with a spring/lock attachment (Mach 1, Diana and Scrambler), and a spring only on the touring models.

When the next update came with the introduction of the widecase models in the spring of 1968, only the 250 Monza and 350 Sebring tank shape survived (and this was only for a single year). The Scrambler sported a small 'peanut' type, but with a flat base. This has chrome-plated sides, but retains the lever-action filler cap.

The widecase version of the Mark 3, and the brand-new desmodromic Mark 3D came with a pure marketing fantasy, a twin-filler-cap creation which, on the Desmo, has chrome-plated sides. Otherwise, the Mark 3 and Desmo have identical tanks.

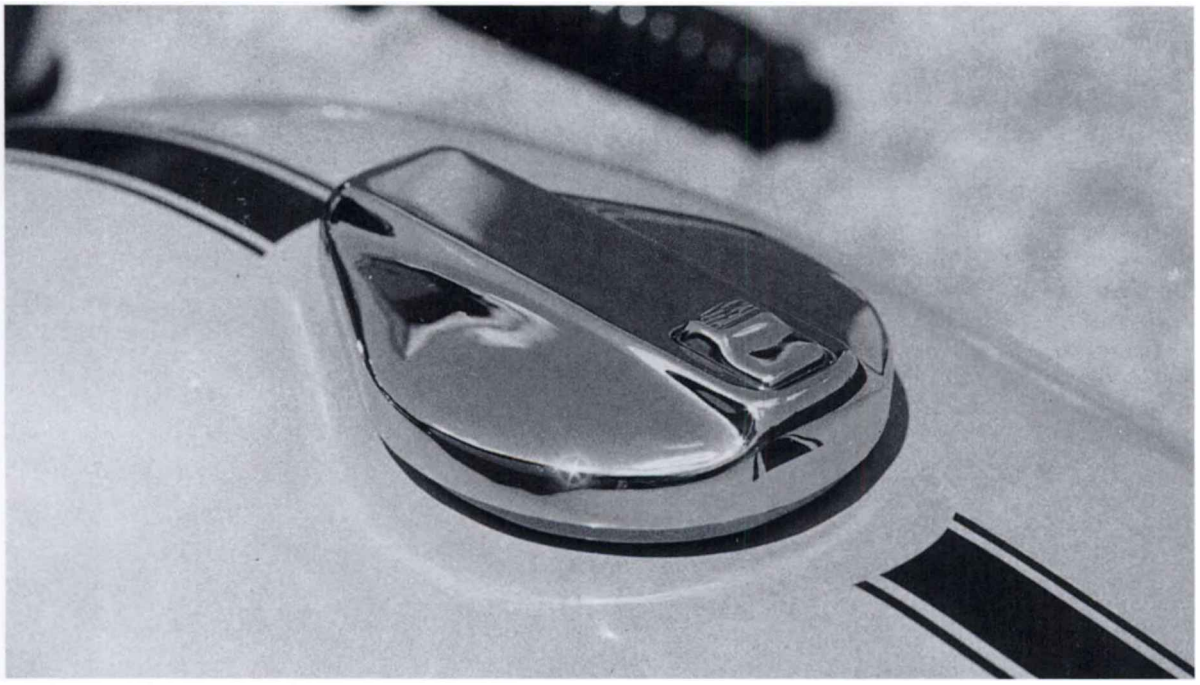
The Scrambler shape was to endure until the ohc

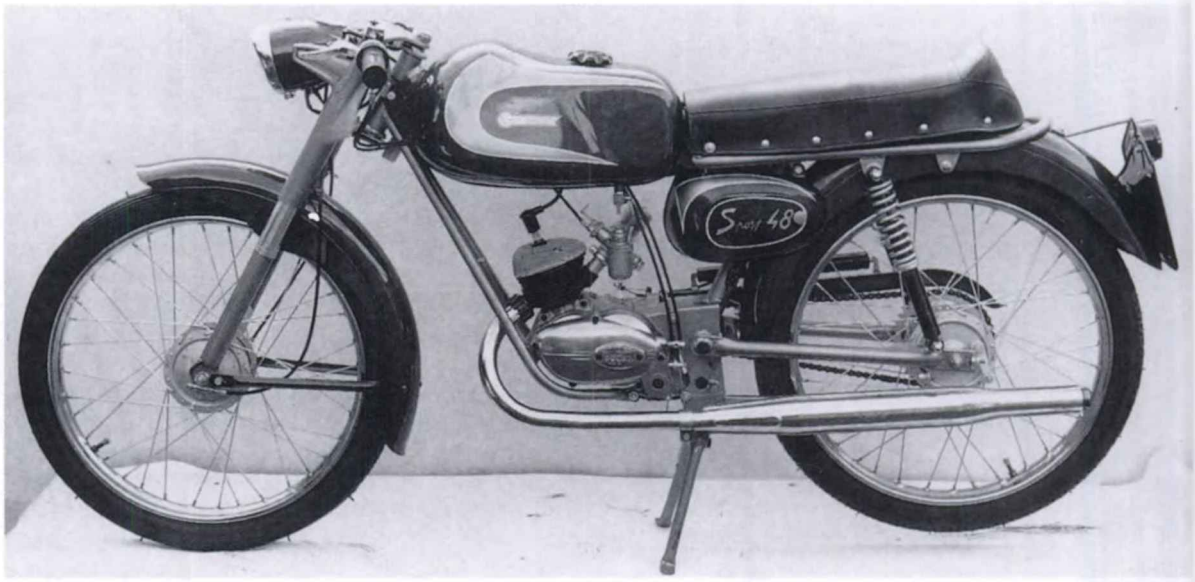
singles were finally phased out of production at the end of 1974. Whereas the Mark 3 and Desmo were to see several restyling exercises which included the tank. The first of these came with a small revision to the design for the 1969 model year with a return to a single filler cap—much more sensible, no doubt, but far less eye-catching!

Then at the end of 1971, at the Milan Show, the pre-production prototypes of new Mark 3s and Desmos were displayed. Finished in a silver Metal-flake finish, they soon earned the unofficial nickname 'Silver Shotgun'. From an identification aspect, their revised tank mounting method is more important. There are twin threaded buffers at the base towards the front, and a rubber-band fixing at the rear. Another departure from previous practice was a quick-action, chrome-plated, flip-up filler cap and larger-diameter outlets for the twin petrol taps. This shape and design was to continue, albeit in varying colour schemes, for both the Mark 3 and Desmo until they, too, were deleted from Ducati's marketing plans, together with all the other four-stroke singles in the mid 1970s.

Other tank shapes have been used on some of the lesser-known four-strokes. These were the 450 R/T Desmo—similar to the standard Scrambler, except for mountings as on the post-1971 Mark 3 and Desmo and a chrome-plated, round, press-and-turn filler cap (not threaded); the 125 Scrambler—basically similar shape to other Scramblers and with lever-action cap; and

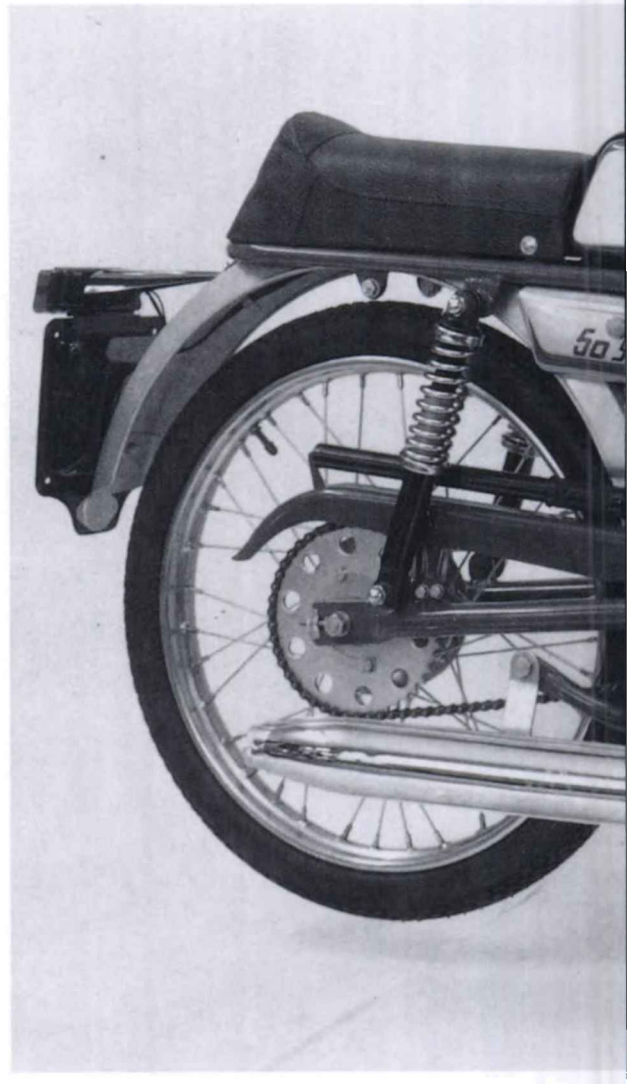
BELOW *The flip-up, quick-action chrome filler cap as fitted to the final Mark 3, Desmo and 350/450 Scramblers*





ABOVE *The 48 Sport, as imported into Britain during the mid 1960s, with clip-ons and kickstarter. Its tank uses the same Bakelite screw-on filler cap as the 175 and 200 four-stroke models*

RIGHT *This unique tank shape belongs to a 1967 50SL1. Besides its long, narrow line, the tank has twin filler caps*



the 450 Mark 3 Tourer, which has an identical tank to the Mach 1 (except for colour scheme and tank badges). Most Ducati four-stroke singles employ twin petrol taps.

Tank types: two-strokes

The first Ducati two-strokes, which made their bow in 1961, were the Brisk and Piuma. Both were basic ride-to-work commuter mopeds and, as such, the shape of their tanks was less important to sales success than that of a sports motorcycle. This showed in their design, which is best described as conventional moped practice of the era—provided they held fuel and fitted the U-frame they were sufficient. The shape is almost square, with a cream Bakelite filler cap and single tap. Each is bolted directly to the frame in three places (two at the front, one at the rear).

Next came the Piuma Sport. In design, it is very much a cross between a step-through moped and a motorcycle. This shows in the tank design which plugs the gap between the seat and tank found on the standard model.

The 48 Sport (sold in America as the Falcon) was first marketed in 1963. This has two distinct tank designs. One has a chrome-plated, lever-action filler cap, the other a black Bakelite screw-on type.

Next in the two-stroke line came the 48SL, 100

Cadet and 100 Mountaineer. All three first appeared in 1964. They employ identical tanks, again with a hinged lever-action cap and single tap.

The 50SL1 of 1967 ushered in the pure styling fantasy of the twin-filler-cap vogue (used the following year on the Mark 3 and Desmo four-strokes). This, together with a shape more akin to a 50 cc Grand Prix racer, endows this tiny machine with a simply beautiful style (at least to the writer's eye).

Ducati brought out a replacement for their Brisk and Piuma mopeds in the shape of the Rolly 50 in 1968. This is unique amongst the Bologna singles in having no conventional tank, the fuel being stored in the frame's U-tube instead.

The 50 and 100 Scramblers offered during 1969 and 1970 employ yet another tank design. Of rounded construction, this has one of the single hinged filler caps.

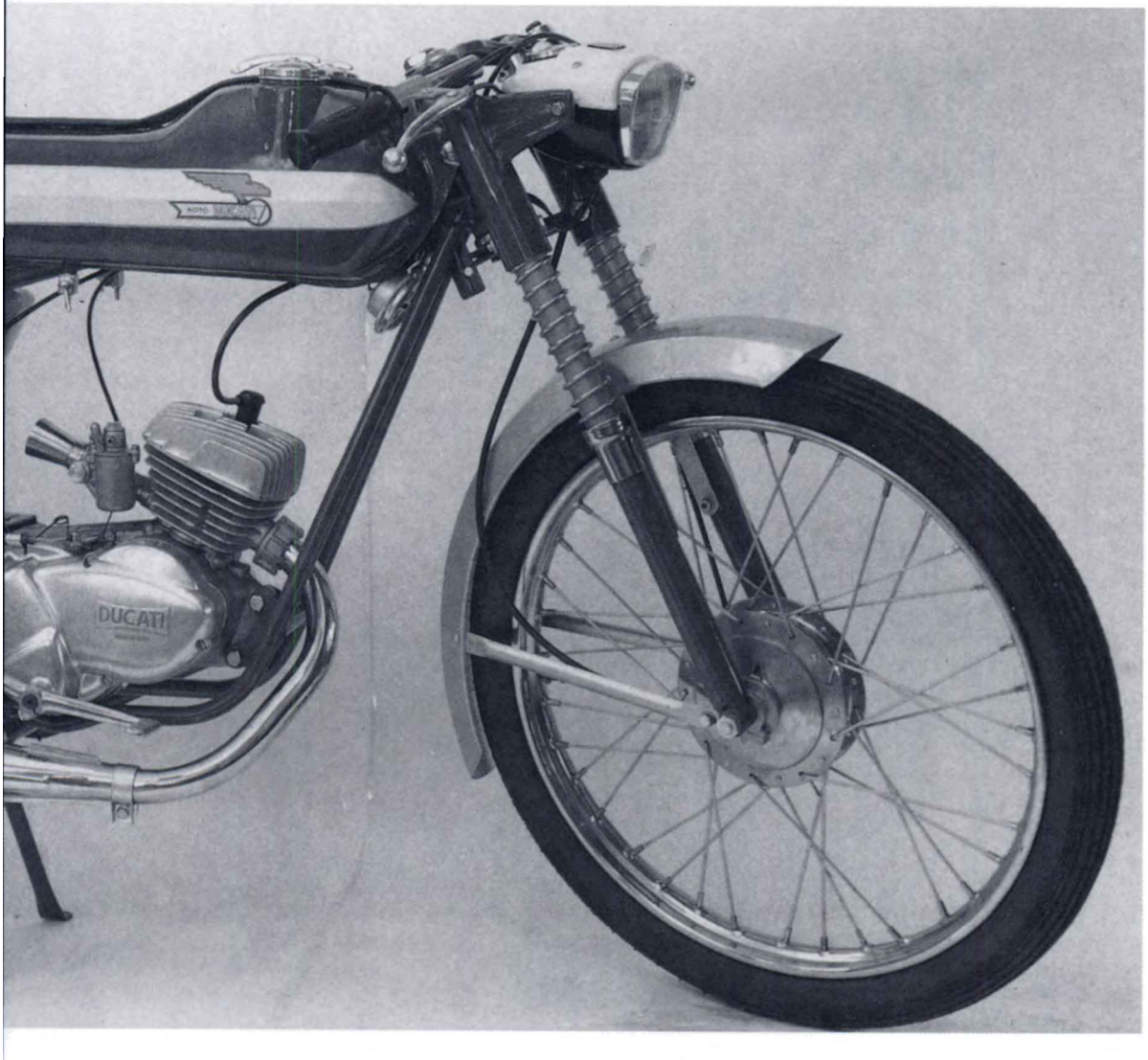
Finally, the 125 Regolarita and Six Days enduro mounts appeared in the mid 1970s. The Regolarita came first (1975 and 1976). This uses a plastic tank, whilst the Six Days (1977) has a much superior, superbly crafted tank in polished alloy.

The exact capacity for each tank is listed in Appendix 8.

Stands

These are in one of the very worst positions on the machine for collecting dirt and debris and can often be in a poor state of repair, which is not helped by wear to the feet and pivot points. As if all this is not enough, both centre and side stands often become bent over the years. Repairs can be made, and even strengthening sections added, but ultimately only a replacement may suffice.

On the ohc four-strokes there are essentially three centre stand types: narrowcase 100, 125 and 160; narrowcase 175, 200, 250 and 350; and another for all widecase models. All were finished in the same colour as the frame. Each is retained by a pivot pin with a



The centre stand fitted to widecase, four-stroke, camshaft models. Both spring and pivot rod are longer than those on other types

circlip at either end. A single spring is employed for retraction.

The two-strokes have their own series of centre stands, one type for the Brisk and Piuma, one for the remainder of the 50s, one for the 100s, and another for the 125 Six Days (the 125 Regolarita only had a side stand). As with the four-strokes, the stands were colour matched to the frame.

Very few models, both two-stroke and four-stroke, had factory-fitted side stands. These machines were the 160 Monza Junior, 100 Cadet and Mountaineer, plus examples of the 250 Monza, GT and 350 Sebring and, of course, the Regolarita referred to above. The normal fitment was to the nearside front engine mounting plate, but later, with the introduction of the widecase frame, a kit was offered which used the near-side rider's footrest mounting bracket instead. However, this latter type was not a standard fitment, only an optional extra.

Engine plates

These are to be found on the vast majority of Ducati singles, but only at the front, since the rear mountings are an integral part of the main frame assembly.

Except for models fitted with a factory side stand, the two plates are flat and have four mounting holes. Where a side stand is fitted which makes use of the nearside plate, there is a built-in lug with a bronze bush for the stand pivot.

Headlamp shell

All are basically similar, as their function is to carry a light unit, but there are variations in size between 95 and 150 mm, depending upon the model. There are also considerable differences in the piercing for the fitting of various switches, warning lights and speedometers (most Ducati singles up to the early 1970s carried the instrument in the shell).

Aprilia (no connection to the motorcycle marque of the same name) was the major supplier of headlamps to Ducati throughout the life of its single-cylinder line.

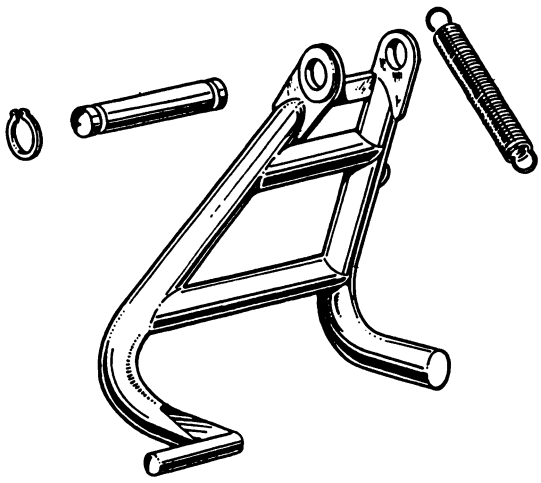
On the early four-strokes, these shells are all very similar and come in either 130 or 150 mm sizes. On the narrowcase models, the shells were usually colour matched to the main tank colour. The exact specification depended on exactly what Aprilia supplied at the time, but it is worth noting that the vast majority of four-stroke machines, up to the 1964 model year, had the larger 150 mm type headlamp.

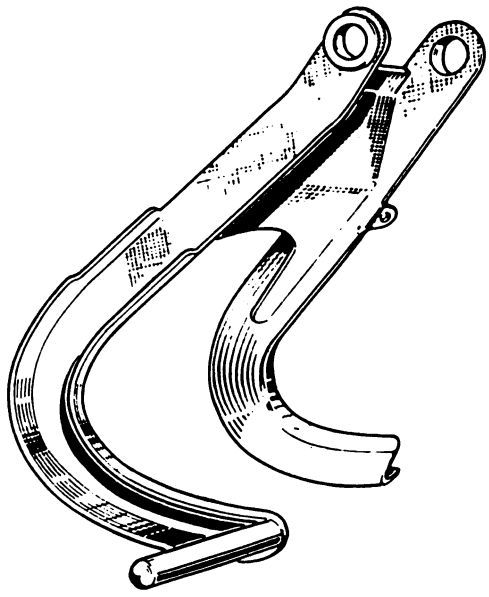
A major change came in the 1966 model year when Aprilia brought out a particularly ugly headlamp with a six-sided rim. The shell for this is in *cast alloy*. Fitted to the Monza Junior, 250 Monza, GT and 350 Sebring during the period 1966–8, all these shells were finished in silver. Although resistant to rust, they are easily damaged if involved in an accident and obviously cannot be straightened as a steel shell might be.

When the widecase models appeared in 1968, they normally had a 130 mm headlight with a conventional pressed steel shell. However, a major difference was that the ignition switch was relocated from the top to the nearside, underneath the headlamp bracket mounting. Also, after 1969, several models had the speedometer transferred to a mounting on the top yoke, which meant that a new shell appeared without a large hole for the instrument. On Desmo models, the shell was normally chrome-plated, but on the Mark 3 it was silver, while the Scrambler's (SCR) was black.

From the 1972 model year, a new Aprilia headlamp appeared on the Mark 3 and Desmo models. This had a chrome-plated shell and usually a 150 mm light unit (although just to confuse the issue, some Mark 3s and Desmos had the 130 mm size, as did all the later SCR models).

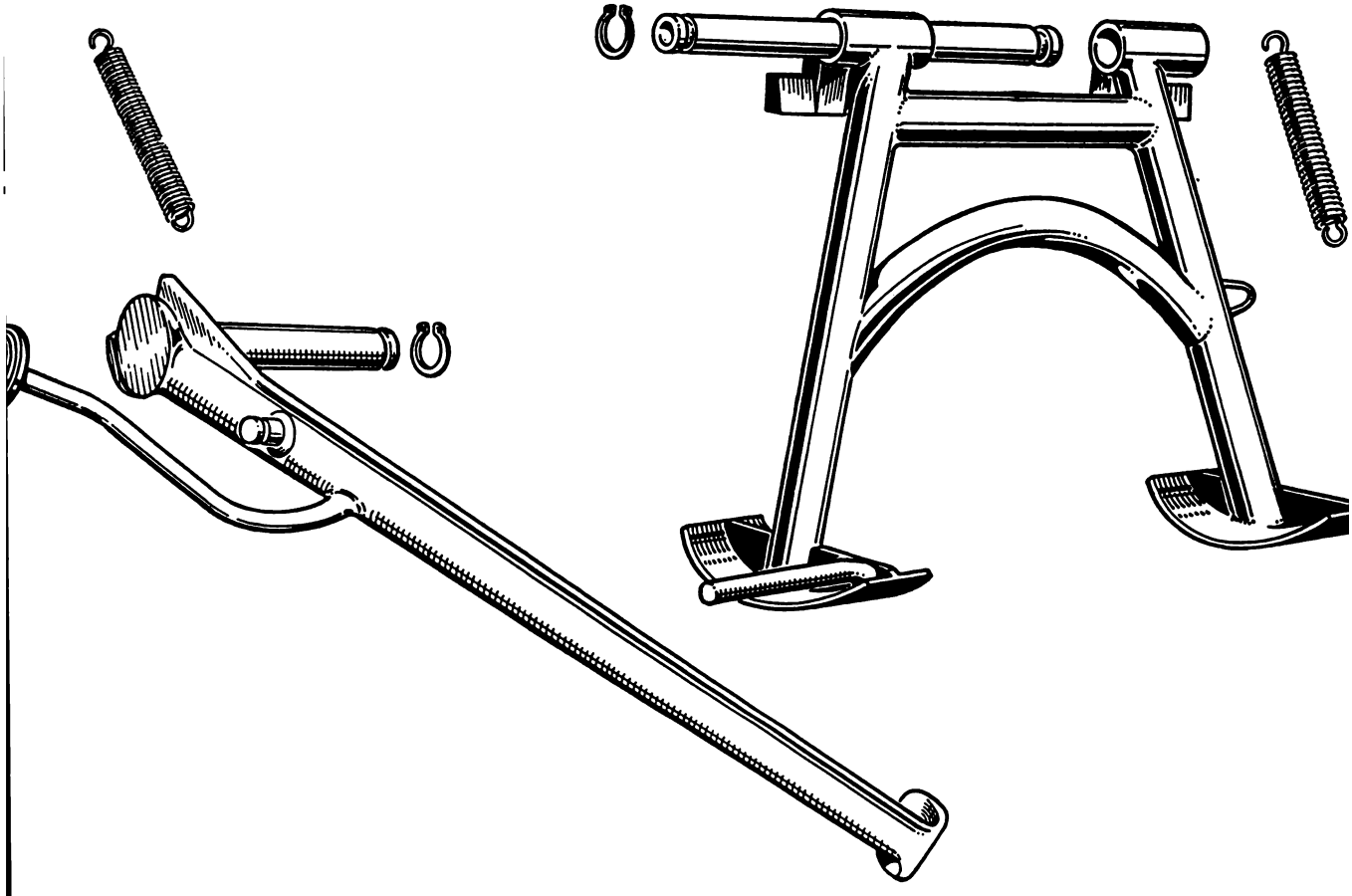
The two-strokes use many different designs, all of Aprilia manufacture. These range in size from the 95 mm type fitted to the Brisk and Piuma to the 130 mm ones which graced the 125 Regolarita.



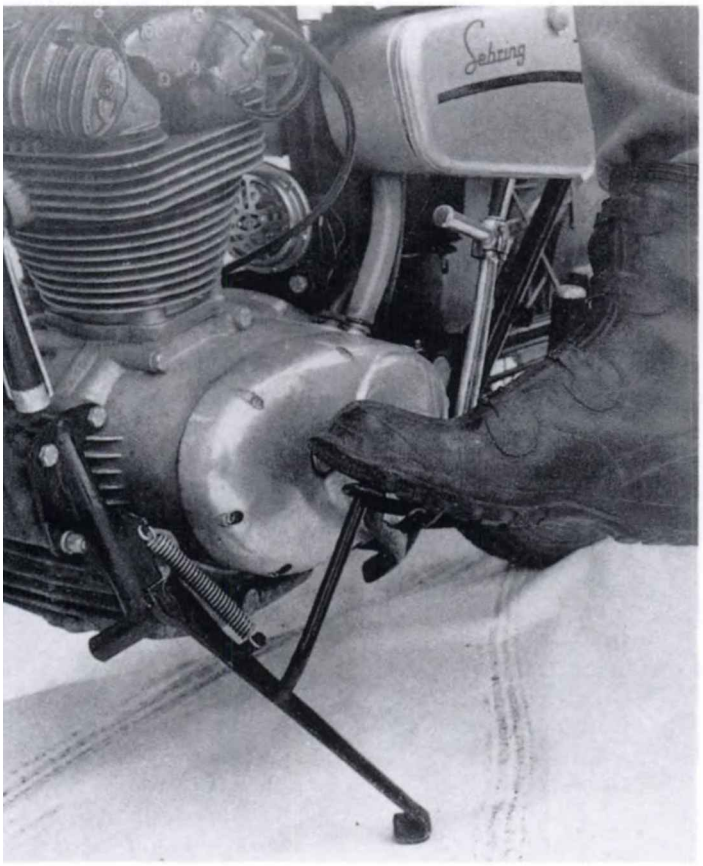


ABOVE *This centre stand appeared on the 100, 125 and 160 ohc four-strokes. It is of hollow tubular construction*

RIGHT *All narrowcase camshaft machines of 175 cc and above use this type*



On the left is the prop stand that pivots on the nearside front engine mounting plate, while on the right are the widecase centre stand and fittings



ABOVE *Operating the prop stand of a 350 Sebring. Note the engine plate mounting arrangement*

RIGHT *The standard front mudguard was retained by Vic Camp for his 1965 Mach 1 racer*

Headlamp brackets

On the mainstream narrowcase (100–350 cc) and widecase (250–450 cc) models which sport the enclosed 31.5 mm forks, the headlamp brackets were of polished cast alloy. Only the 'economy bikes' (125 TS and 160 Monza Junior), plus the 50 and 100 two-strokes, employed cheaper pressed-steel brackets which were painted in the colour of the frame.

Widecase models with either Ceriani or Marzocchi 35 mm exposed-stanchion forks had either Tommaselli (1972) or Verlicchi (1973 and 1974) clip-on type brackets, the latter type with rubber insulating pieces.

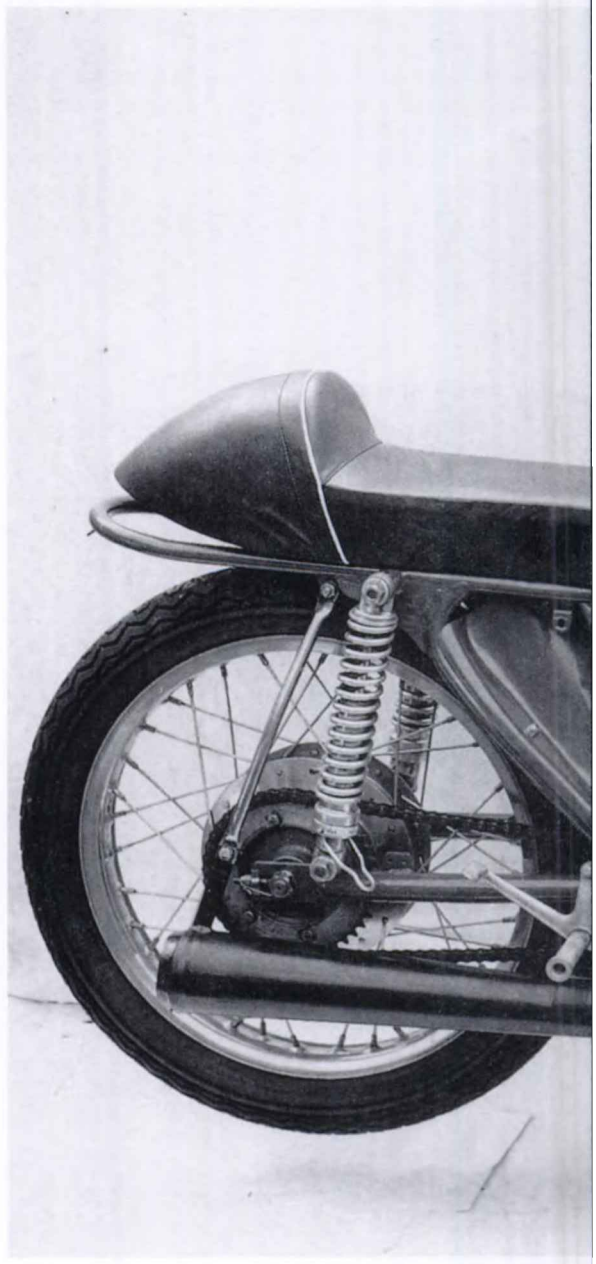
The 1975–6 125 Regolarita two-stroke enduro bike had small cast-alloy clip-on components, and the 1977 Six Days none at all—instead it had the modern enduro-type headlamp/number plate assembly moulded in plastic.

Flyscreen

This was only fitted to one model covered in *Ducati Singles Restoration*: the US-specification Diana Mark 3. It was in pressed steel, was painted white and had a tiny, flat, clear plastic screen.

Front mudguard

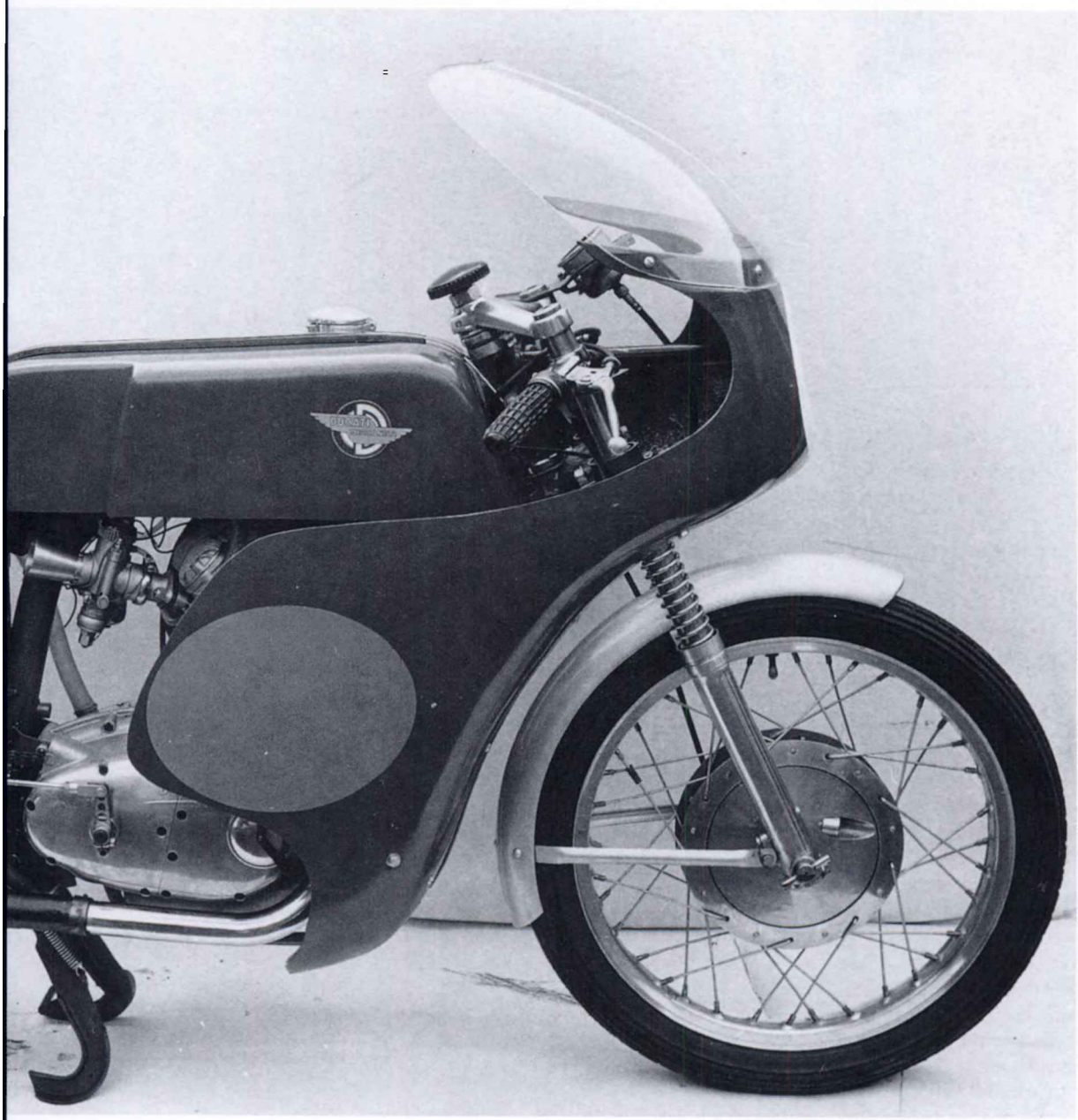
The vast majority of front mudguards used on Ducati singles are of pressed steel with either a round or square section in a narrow, sporting form. In addition, a small number have relatively comprehensive valencing. Although a few are in stainless, most are simply

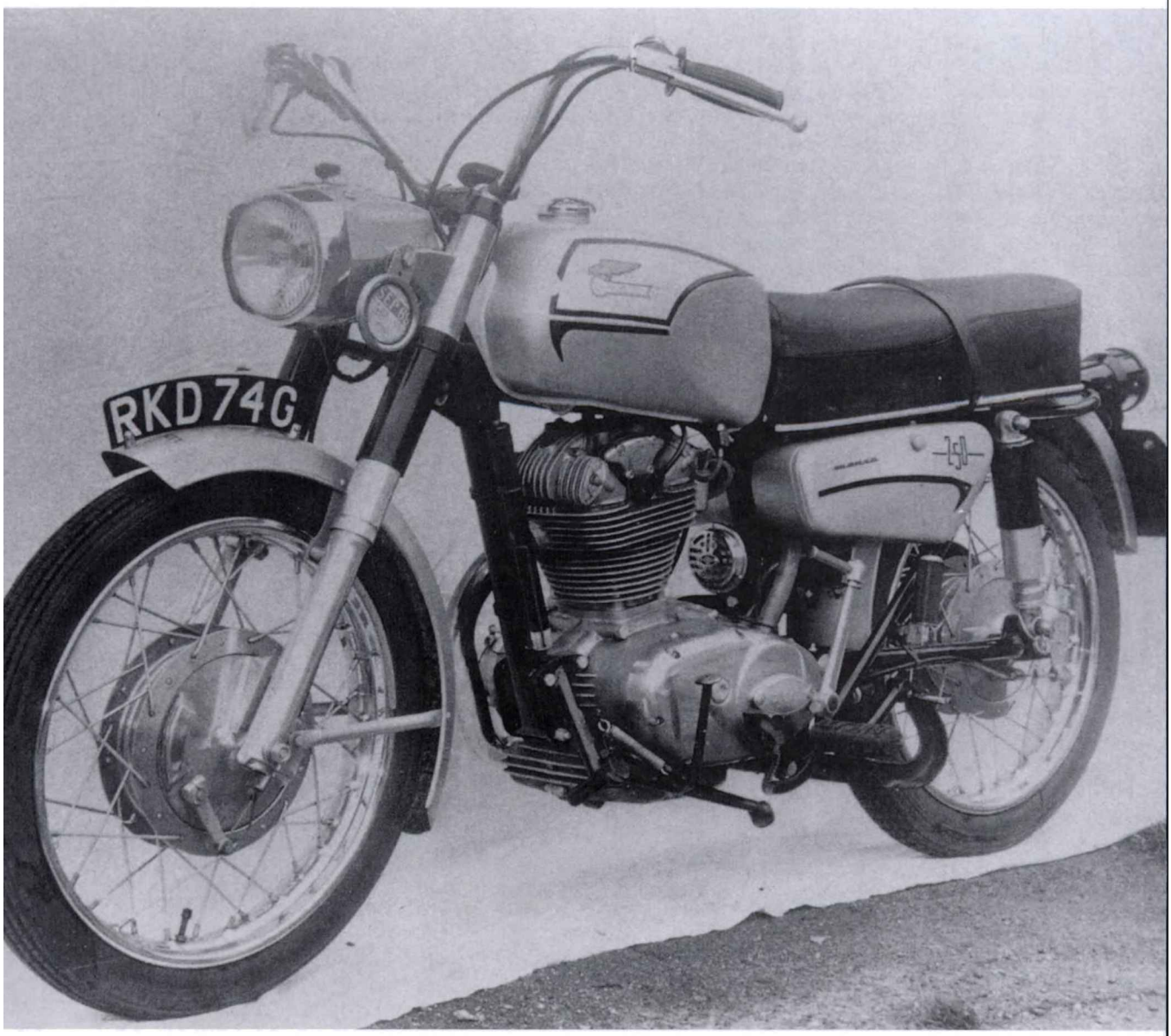


painted. These unplated types are prone to rusting from the inside, particularly underneath any bracketry. Some models, notably the early widecase Desmos have chrome-plated mudguards which, unfortunately, are equally prone to rust problems. The stainless ones only appeared on the 1969–71 Desmos, the 1972 450 Mark 3 Tourer and some Scramblers.

This leaves the fibreglass and plastic types. The former were fitted to the 450 R/T Desmo and the 1972–4 Desmo models. Unfortunately, the level of finish left much to be desired and hairline cracks would soon appear. On the Desmos, this is not so much of a problem because not only is the mudguard small and less likely to flex and, therefore, crack, but much superior aftermarket replacements are available at low cost.

The component on the R/T, however, is very much a different story. For someone wishing to restore one of these machines and yet retain originality, mudguard life is a real problem. Quite simply, the mudguard fitted to the machine will either be on its last legs or will have been thrown away years ago and a Preston Petty, or similar, plastic guard substituted. The original mudguard was just not suitable for its task. Off-road, it would rapidly suffer a terminal knock and, being solid, would simply snap. Even if the bike has been kept on-road, the chances are that the mudguard's bulk will have caused its poor fibreglass finish to look like crazy paving! Supplies





of factory replacements dried up years ago, so the only solution is to fit a modern plastic one which is as near the original shape as possible.

As for plastic guards which Ducati fitted themselves, only two models had these: the 125 Regolarita and Six Days two-stroke enduro irons.

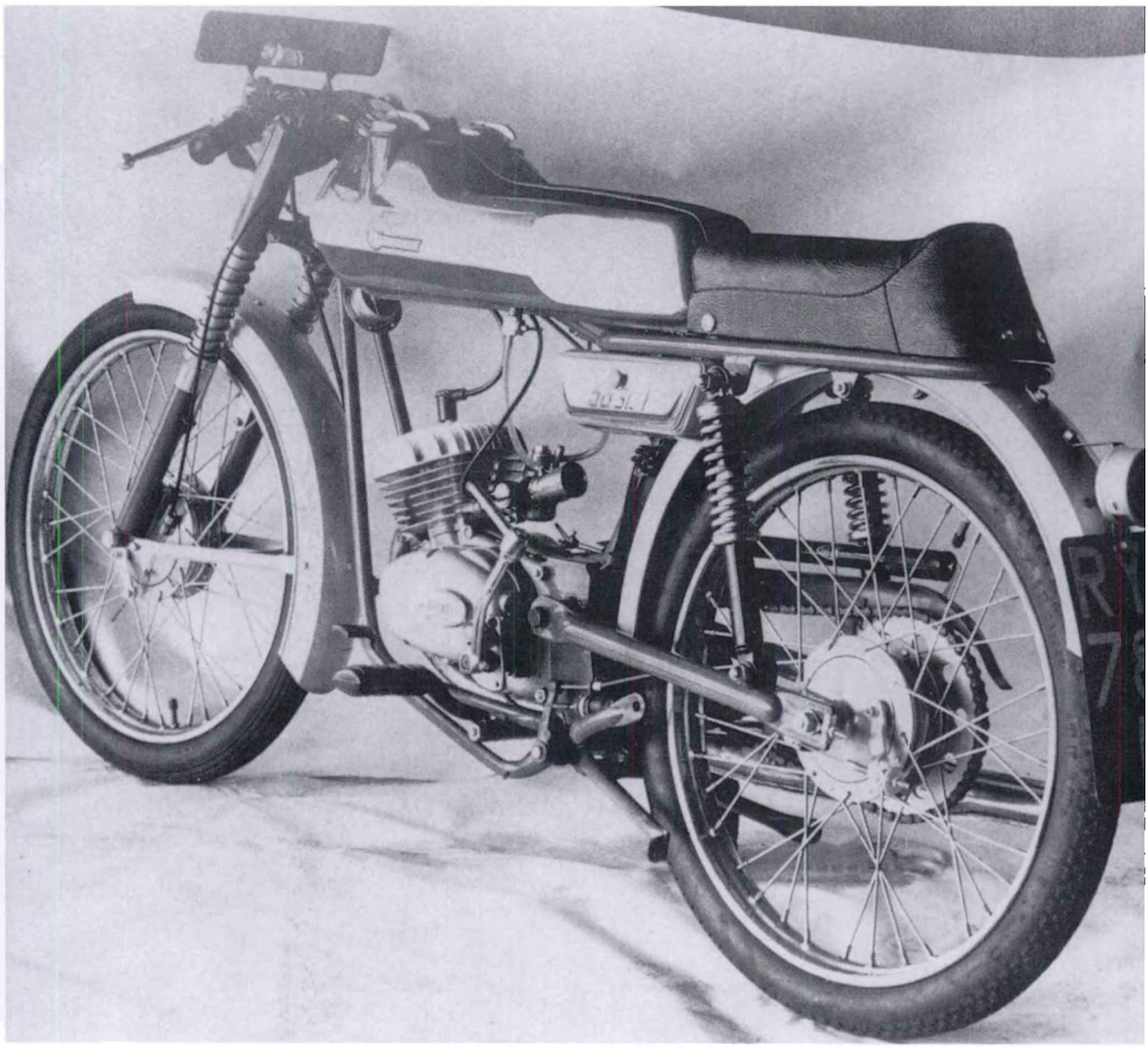
For the record, both fibreglass and plastic guards were colour impregnated.

Most Ducati front mudguards have built-in brackets. The only ones to have detachable brackets are those on the final blue and gold Mark 3s manufactured from 1973 onwards. They are chrome-plated 'wire', as also employed on the 750GT and Sport V-twins of the same era.

The mudguards are normally bolted to the forks but on the 1972 'Silver Shotgun' Mark 3 and Desmo

ABOVE *The 250 Monza (shown), together with the 160 Monza Junior, 250 GT and 350 Sebring, used these square-section mudguards during the 1966 and 1967 model years. The photograph is of a Bill Hannah-imported model, sold off later. Note the front number plate mounting which is potentially dangerous*

ABOVE RIGHT *A 1967 50SL1 two-stroke. This view shows many restoration pointers, including the number plate fitment, square-section mudguards, tyre inflator mounting, tank and seat details, and exposed-spring forks*



models, and the final drum-braked Desmos of 1973 and 1974, hose (Jubilee) clips are used to retain the mudguard to the forks.

Rear mudguard

Much of what has been said about the front mudguards applies equally to the rear. However, there are some important differences.

On some of the 50 cc two-strokes (Brisk, Piuma and Piuma Sport) which employ a pressed-steel frame, the rear mudguard is an integral part. Therefore, it can prove a real headache if it is badly rusted, as this will mean problems with the frame, too. Check before you buy.

The rear guard of some four-stroke models will not be of the same material as the front. A good example of this is the late Desmo which has a fibreglass front mudguard and steel rear one. If you are not sure which yours should have, check the relevant parts book for information.

Front number plate

No longer a legal requirement in Britain, but several owners like to retain it and apply either the registration or the model and year. However, in the writer's opinion it should be removed for the very reason the requirement was deleted—it can prove lethal in the event of an accident.

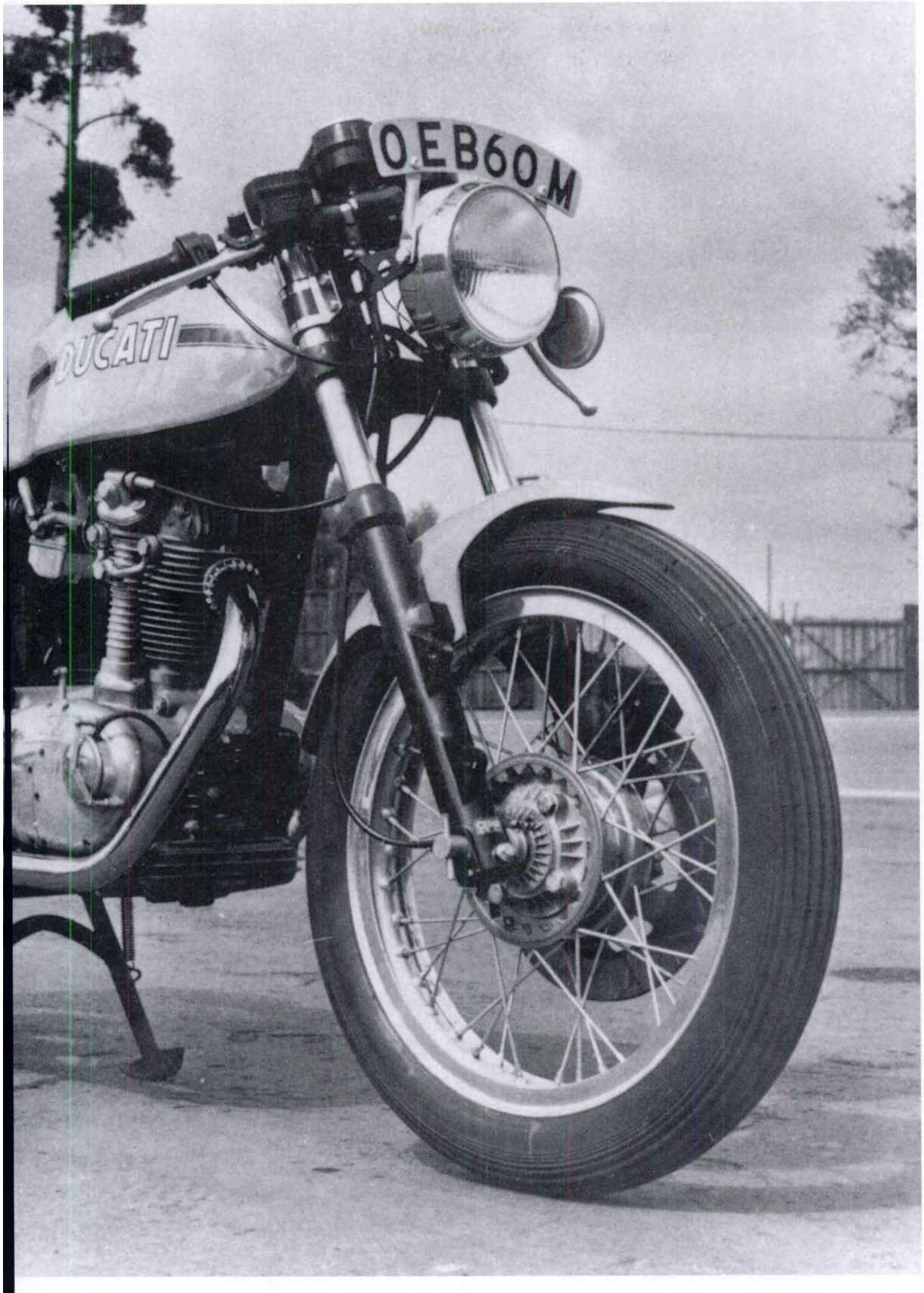
ABOVE *Rear number plate, plate holder and rear light. The machine is a 1964 five-speed 250 GT being put through its paces in June 1965*

RIGHT *A 1974 Desmo fitted with an aftermarket Mick Walker Conti replica silencer. The fibreglass front mudguard was a standard fitment*

Rear number plate

An internationally required method of recognition, the exact type of plate is governed by local requirement, depending upon the country in which the motorcycle is registered.

In Britain, during the immediate post-war period, it was the practice to paint the numbers directly on to the number plate holder. This was later followed by transfers, self-adhesive plastic numbers, pressed aluminium and finally the modern reflective version in yellow.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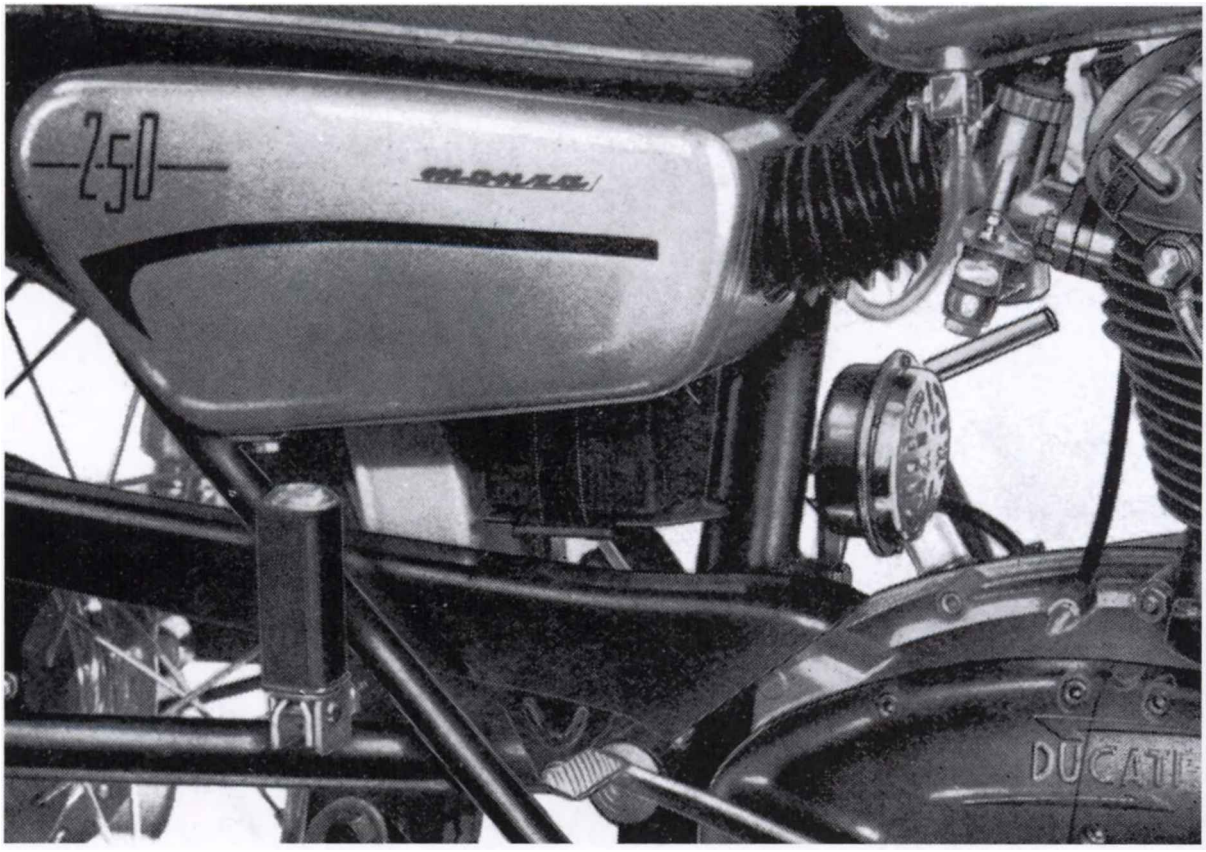


ABOVE *The air cleaner (filter) box of 1966 250 Monza*

RIGHT *Removing the toolbox from a British-market 250 Daytona (Diana). On this particular model, the engine breather pipe is routed through a section of the panel*

Unlike many manufacturers, Ducati themselves did not supply a rear number plate, only its support, which is described below.

Rear number plate support

A one-piece steel pressing, the number plate support is attached to the mudguard by bolts and comes in a variety of designs, depending upon which rear light is fitted.

All suffer from vibration which can lead to cracks appearing on the upper front support section, or the plate support body itself. This is a particular problem on the 450 models.

The only real variations to this metal bracket appear on the 125 Regolarita two-stroke enduro bike, which has a rubber tail light/rear number plate support, and the 125 Six Days and the 1973–4 Desmos, which have the light unit mounted in the rear mudguard seat moulding.

Side and centre panels

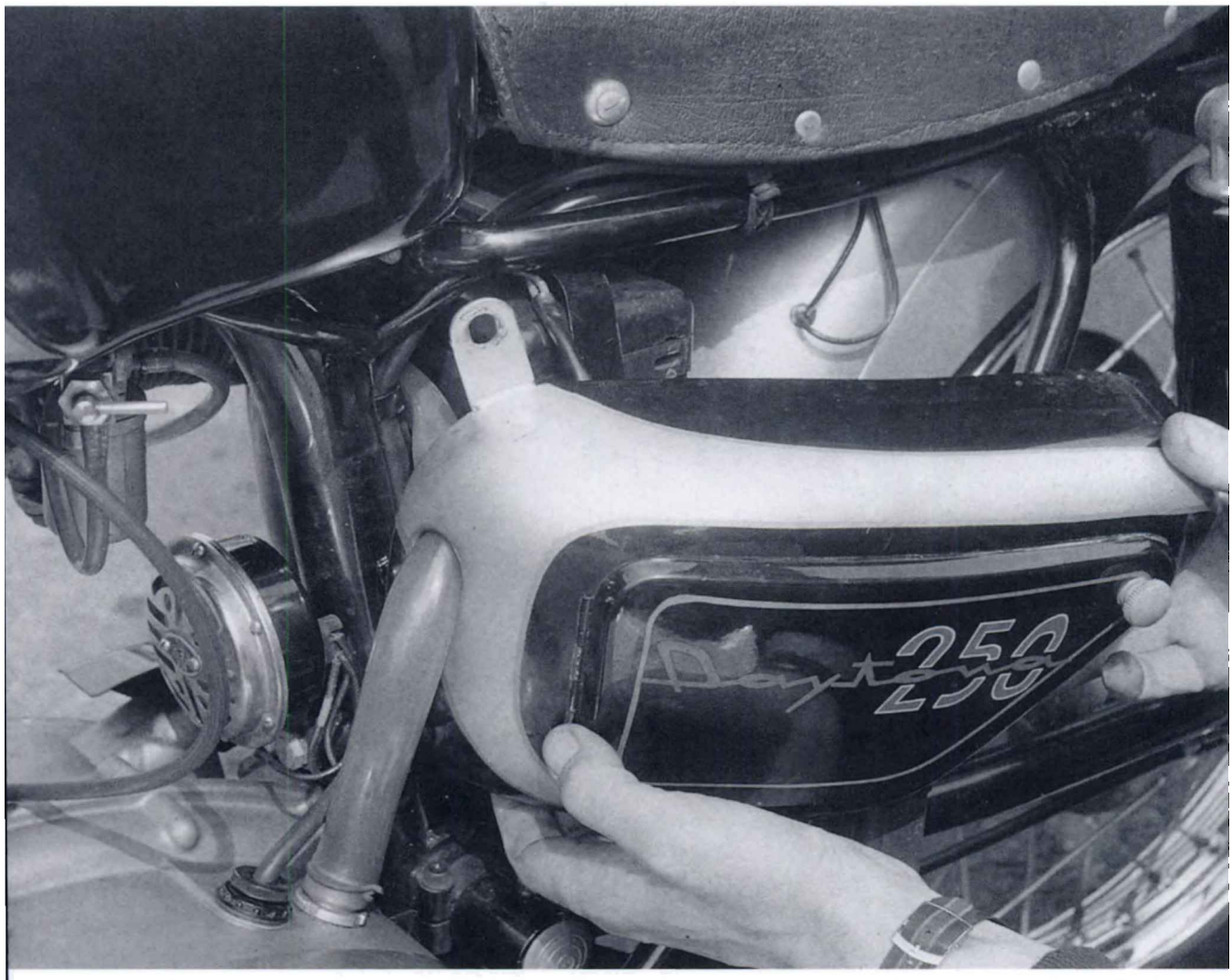
These are usually either toolboxes or air filter containers, the battery (where fitted) being supported separately by a carrier which is a part of the main frame structure.

The overhead-cam four-strokes up the 1960 model year employ a pair of triangular pressed-steel toolboxes with hinged lids which are retained by a pair of knurled thumb screws. The 100, 125, 175 and 200 Elite and SS models, the later Mach 1 and European 250 Mark 3 of 1967 also use these boxes.

With the advent of the new 250 series in 1961, a pair of larger side boxes was fitted. Additionally, the offside one houses an air cleaner with a wire-mesh type filter. This is connected to the carburettor by a rubber hose. The nearside assembly remains a hinged toolbox. These later boxes were fitted to the European Diana (Daytona in Britain) for 1961–4, Monza (1961–5), 200 TS (1961), 200GT (1962), 250GT (Daytona GT in Britain), 350 Sebring (1965) and the 160 Monza Junior (1964 and early 1965).

The narrowcase 250 Scrambler and US-specification Diana Mark 3, both with flywheel magneto, do not have any side boxes.

Next came a restyling exercise for the touring models for the 1966 season. This concerned the 160 Monza Junior, 250 Monza, GT and 350 Sebring. Not



only was the box shape changed, but the nearside toolbox was hinged along its base.

It was all change once more when the widecase range appeared in 1968. The Scrambler was given a large round air cleaner 'bowl' on the offside, but still nothing on the nearside. In place of the previous wire-mesh type filter element, a replaceable paper filter made its first appearance. The new Mark 3 and Mark 3D (Desmo) model had another design of tool/air cleaner box, both of which featured hinged covers.

These continued unchanged until the 1972 model year, when revised Mark 3 and Desmo models appeared. Whilst the metal inner section of the box was left the same, the outer lid was removed and replaced by a much larger fibreglass item (almost double the size of the component it replaced). This is retained by three prongs that mate with rubber grommets in the metal base.

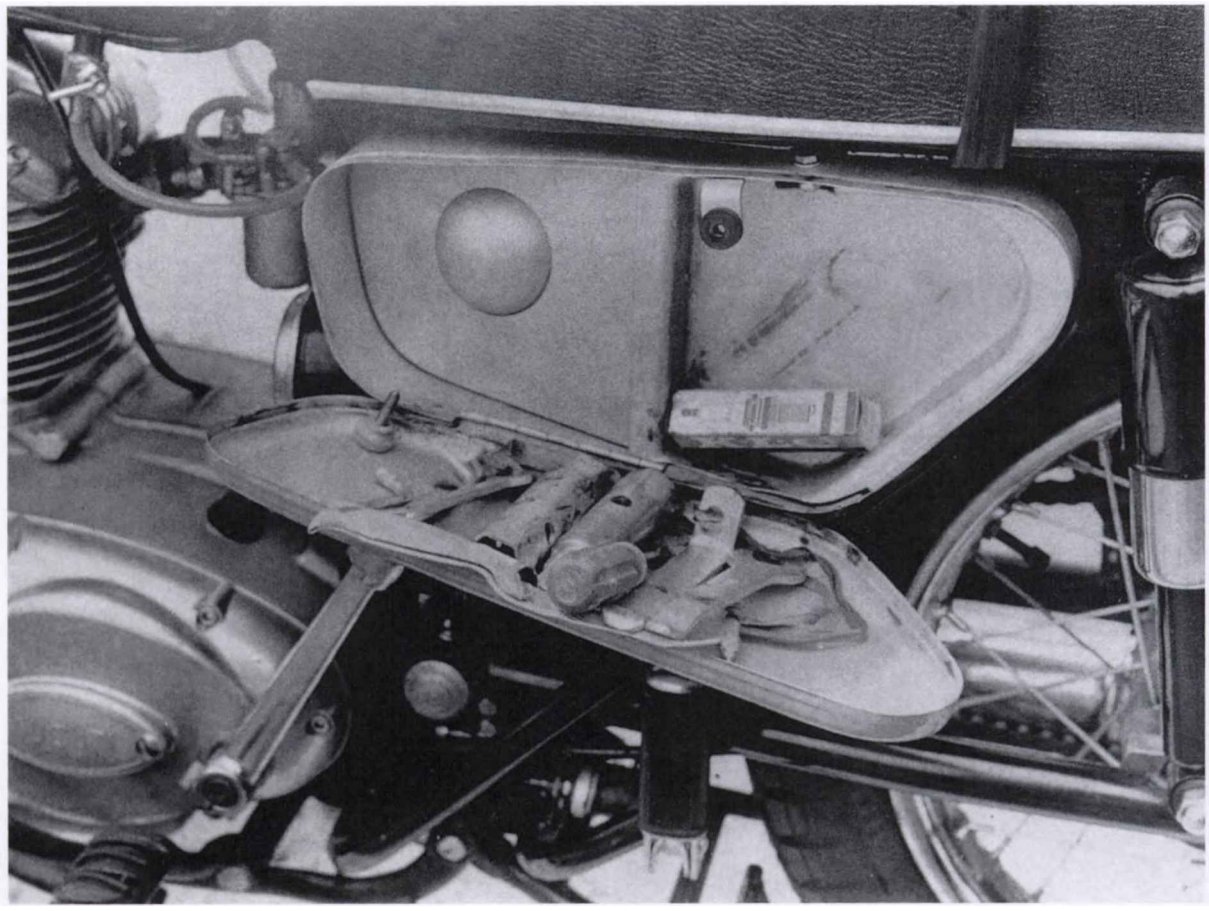
For 1973, the Mark 3 and Desmo models received yet another facelift. The outer side covers were redesigned, again in fibreglass, and were reduced in size almost to match the metal section at the rear, which remained unchanged. Prongs and rubber grommets are used to hold the outer cover in place.

When the 239 Mark 3 and Desmo models were introduced in 1974, Ducati reverted to the original all-metal boxes used between 1968 and 1971—probably to use up old stocks. In addition, the final batch of 350 Mark 3s use this set-up.

On the dirt bike scene, both the 1971 125 Scrambler and the 1971–2 450 R/T Desmo have competition-type number backgrounds instead of the conventional panels of the roadster.

The final batches of 350 and 450 Scramblers made in late 1973 and 1974, employ a similar type to the current roadsters, but with a revised outer cover.

The two-strokes follow a similar pattern. Models using a pressed-steel frame (Brisk and Piuma) have separate covers which are retained by thumb screws. The various 50 and 80 cc models (except the SL) have their own separate toolboxes, in a number of different designs, which bolt to the frame.



ABOVE *The hinged toolbox belonging to a 160 Monza Junior. A standard-issue Ducati toolkit is also evident*

ABOVE RIGHT *The one-piece centre panel of the 48 Sport. Rear mudguard and chainguard details are also evident*

RIGHT *The chainguard of a 1974 350 Desmo. All the four-stroke overhead-cam models have a similar design*

On the 50SL, 100 Cadet and 100 Mountaineer there is a much larger, single, central toolbox, which is distinctive in the way it 'wraps' around the centre main frame tube.

The 50 and 100 Scrambler models (1969–70) use the 'number plate' type of panel, similar in design to that of the four-stroke 125 Scrambler and 450 R/T.

By the mid 1970s, when first the 125 Regolarita, and then the Six Days, appeared, plastic had superseded steel as the material used in the manufacture of these side plates.

Horn

Although this is covered from an operating point of view in the chapter dealing with electrical components, its finish calls for separate comment.

Essentially, the main body and supporting bracket were painted—always in black—whilst the front cover (grille) was chrome-plated (occasionally the finish was cadmium).

Some covers are retained by screws but, unfortunately, some are riveted on. With the latter, if you wish to restore the paintwork and plating to its former glory, the only course of action is to drill out the rivets. When putting it back together, you will need to have the cover re-riveted (which may prove difficult) or revert to screws and nuts.

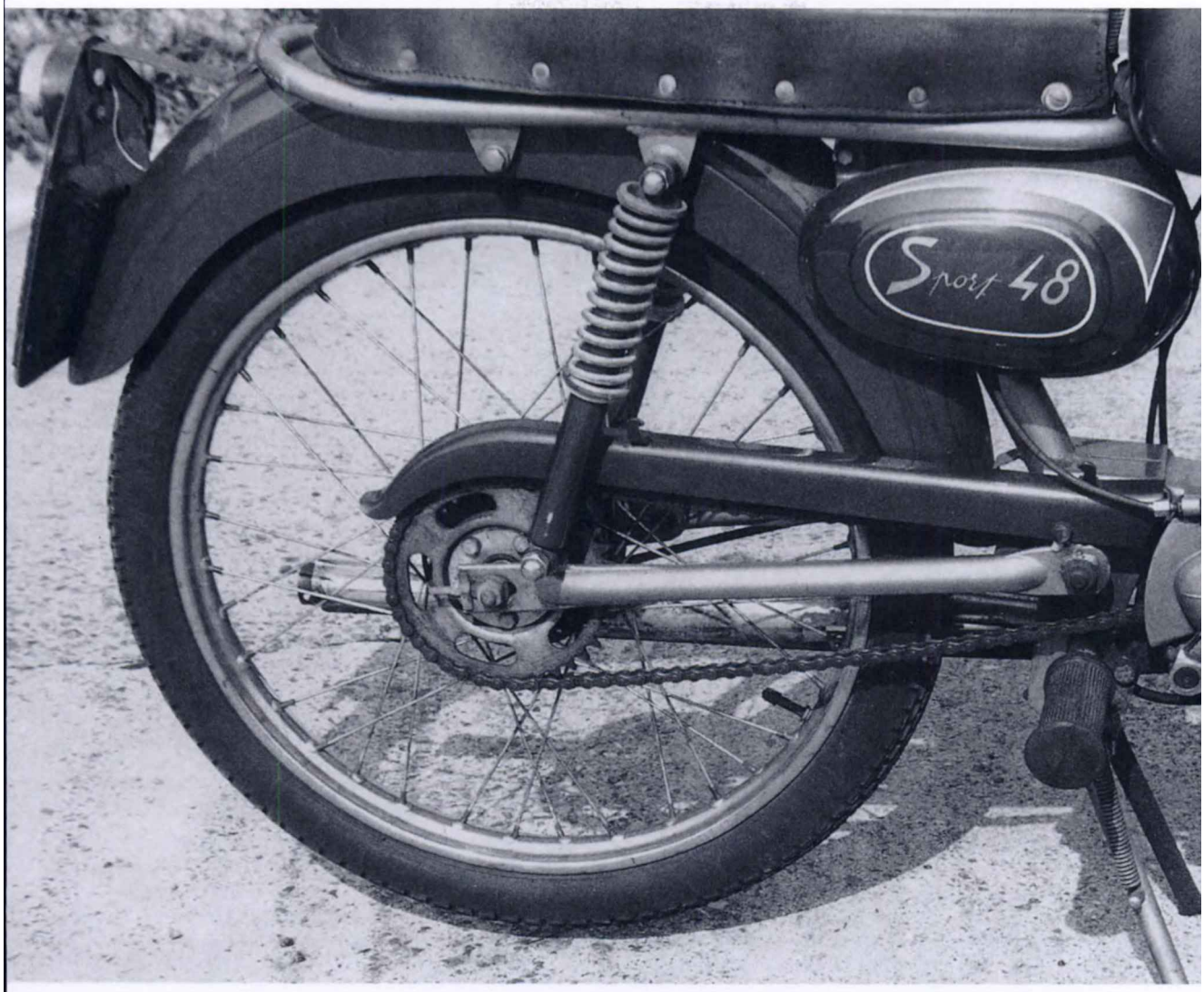
As with certain other components, it may well prove *cheaper* to buy a new horn—check costs first.

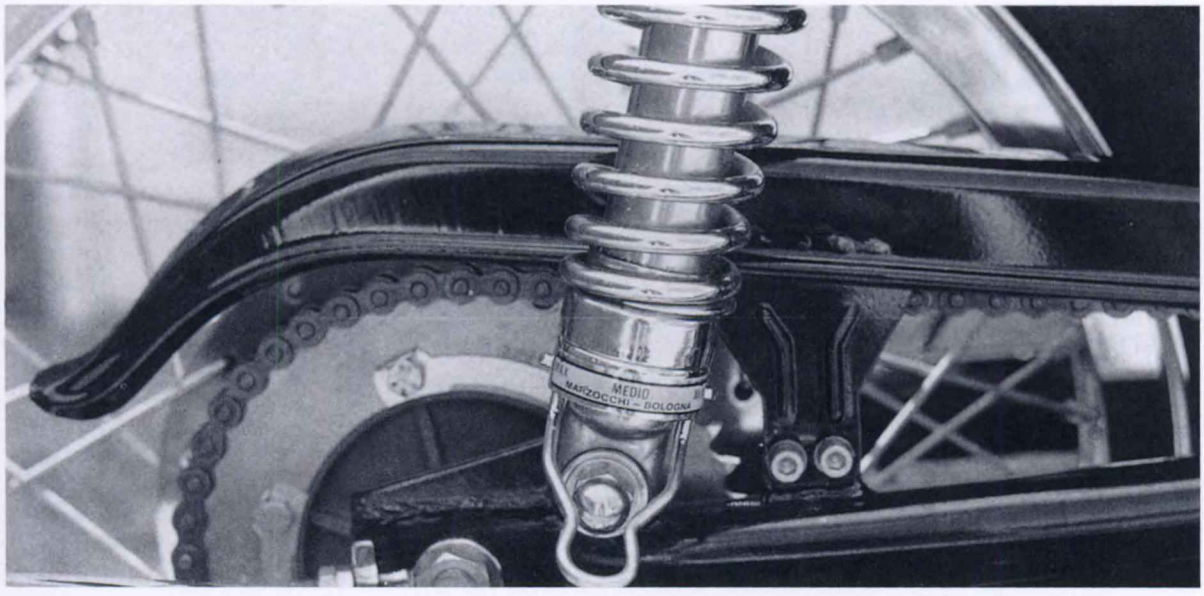
Stop switch bracket

This is a small steel pressing which bolts to the frame (below the swinging-arm pivot) on models equipped with a battery. It was finished in the same colour as the frame.

Chainguard

All the ohc four-stroke narrowcase models employ the same type of rear chain guard. This has two mounting


Sport 48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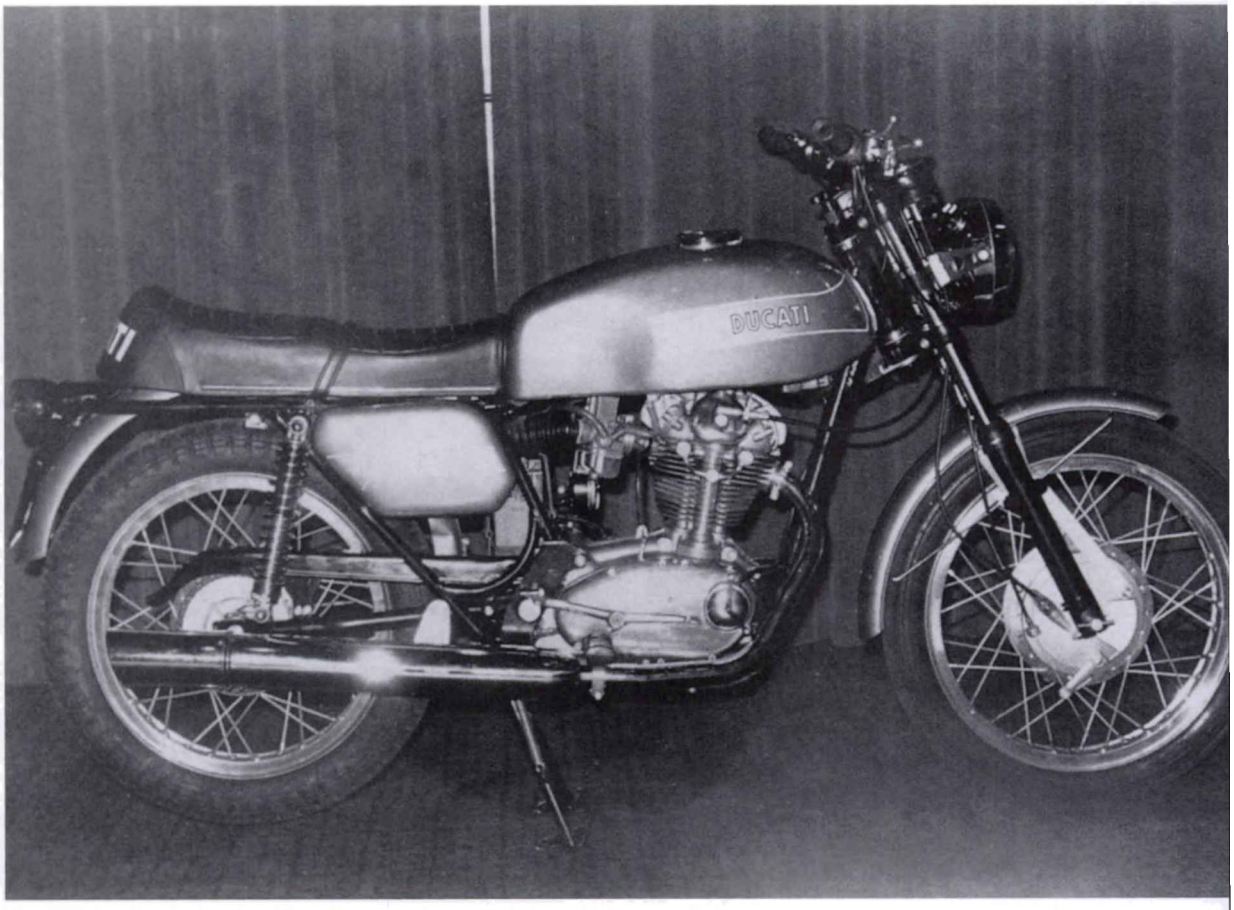


ABOVE *A widecase 250 Mark 3 on display at the official launch of the new British Ducati importers, Coburn and Hughes of Luton, November 1973. This model was available with either conventional handlebars, as shown, or clip-ons. All came with forward-mounted footrests*

RIGHT *A much more radical riding position is provided by the Desmo models of the mid 1970s with their rearset foot controls. The nearside rider's footrest and the toe of the brake pedal fold to provide clearance for the kickstart lever*

points, with three screws (two at the rear, and one at the front). The only difference came in 1964 when the rear section was changed from having a 'pointed' end to a 'flat' one.

The widecase bikes have basically the same guard, but the upper length at the front is *shorter*. Therefore, it is possible to modify a post-1964 narrowcase chainguard to fit a widecase bike—and it will look the part. I mention this because you may be able to obtain a narrowcase guard more easily than a widercase one, if your existing example is damaged, or perhaps even missing entirely.

The 50, 80 and 100 two-stroke models have a very similar design of chainguard to the four-stroke type but with only two mounting bolts and a couple of prongs on the upper side to hold the tyre inflator (pump).

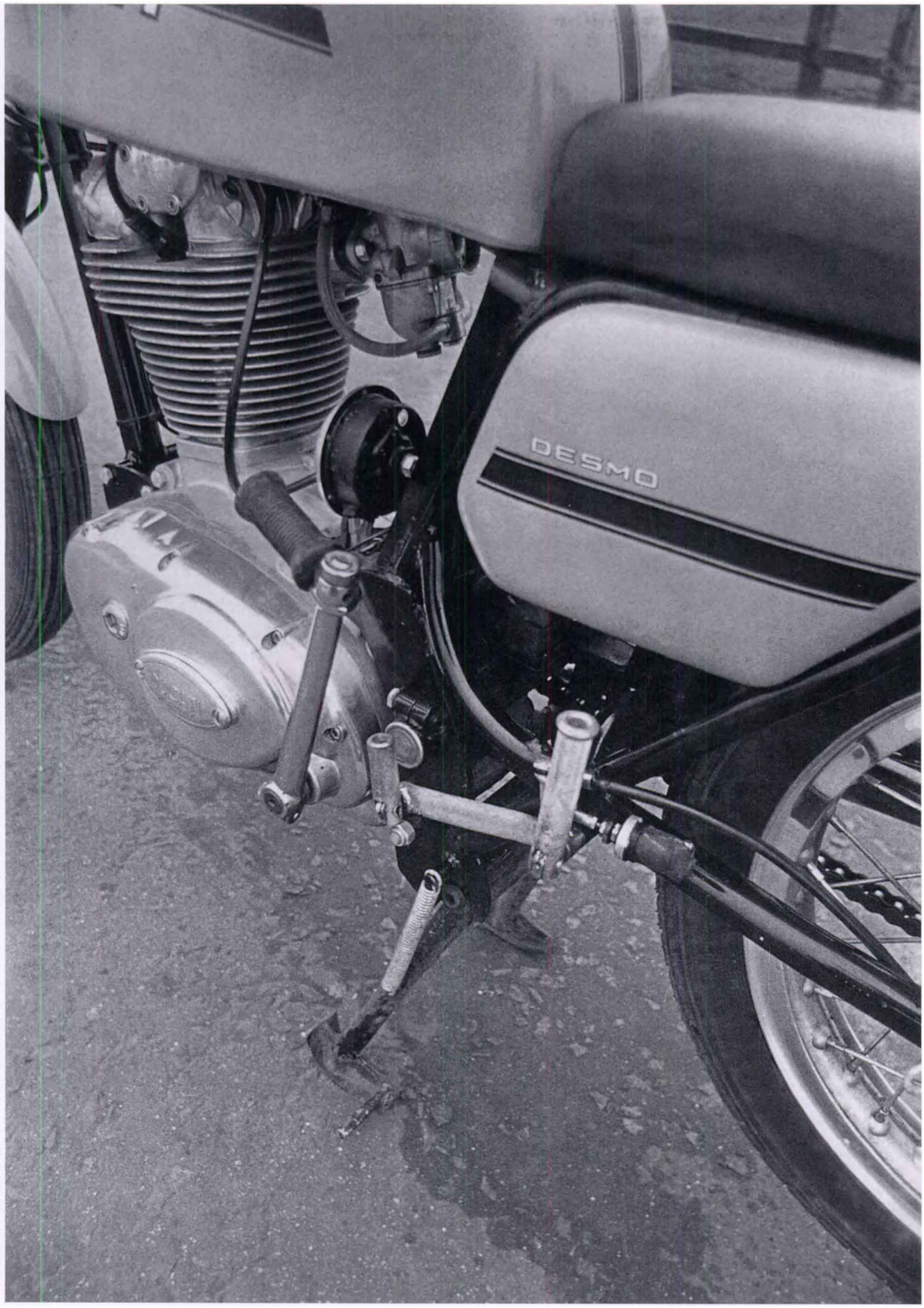
The two-strokes not to have this design are the 125s, which employ one far more suited to their off-road role. This is much shorter in length and considerably deeper (to protect both runs of the chain).

Chainguide

The chainguide is to be found on the following models: 450 R/T, 125 Regolarita and Six Days. Its purpose is to prevent the chain from jumping the sprocket whilst the suspension is taking a pasting off-road.

Footrests

These come in two basic categories: solid and folding. The former are usually steel castings, with a flat and a matching 'Ducati' footrest rubber. These are fitted to the majority of models, both four- and two-stroke. Only the super sports models (Mach 1 and post-1972 Desmos) and the widecase Scrambler have any variation to this.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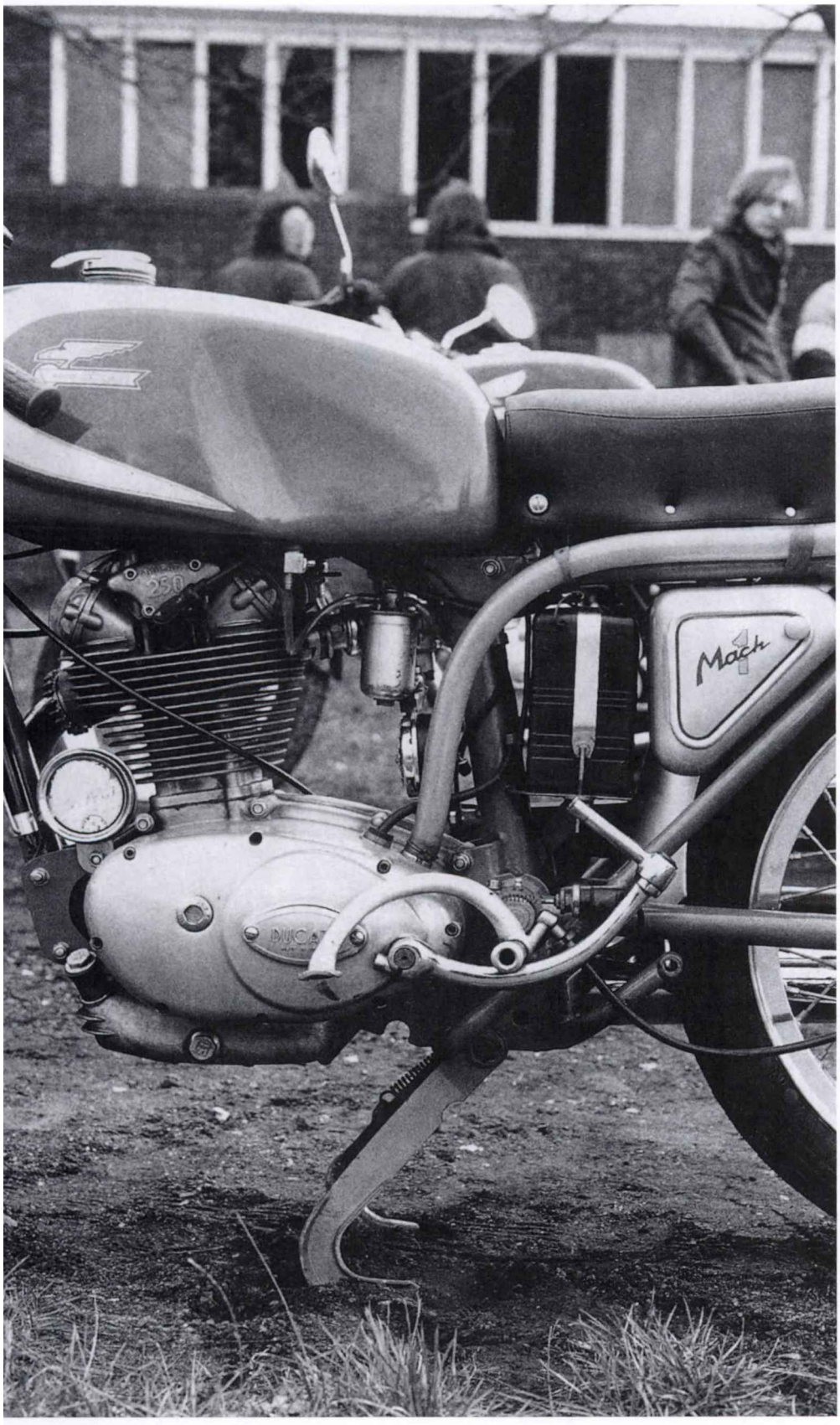
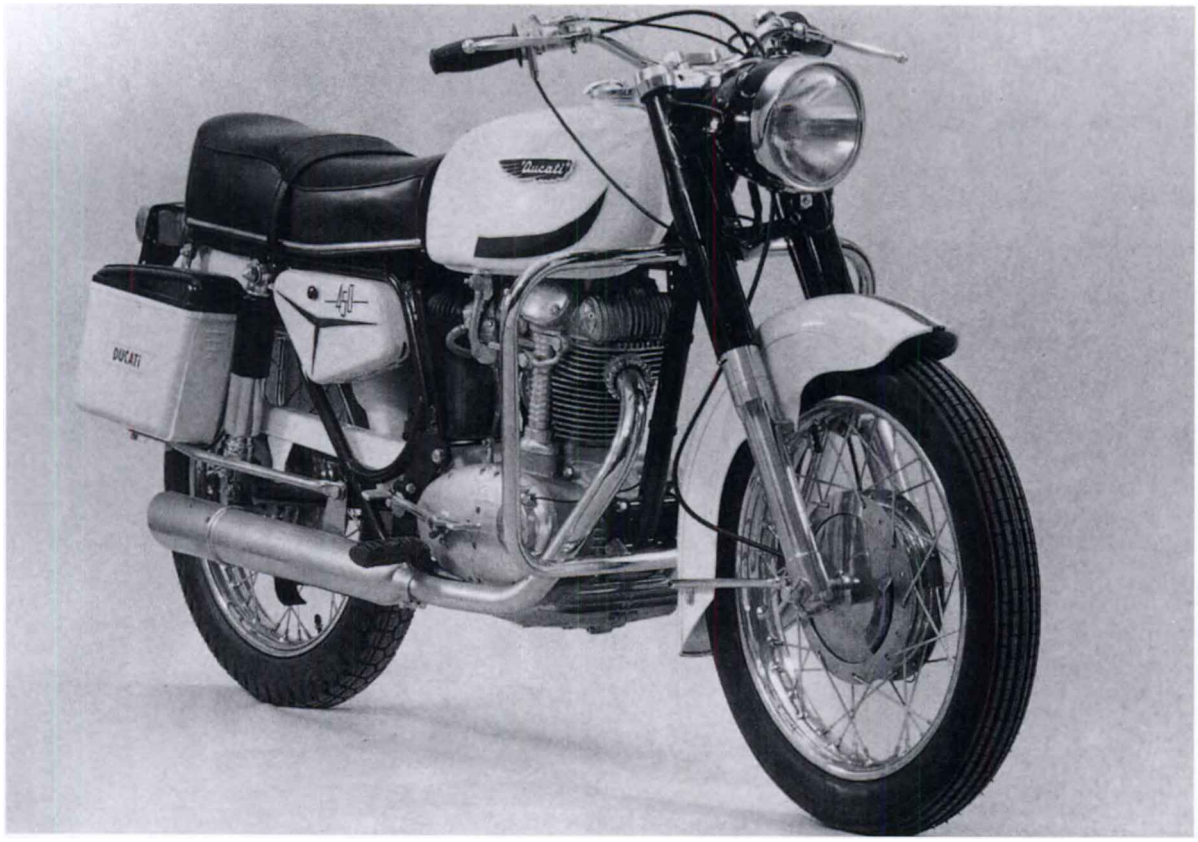


ABOVE RIGHT *Ducati introduced this 450 Mark 3 Tourer in late 1971. It ran through 1972 and was offered with optional crashbars and panniers to complement its touring specification. Note the special heavyweight forks and valanced mudguards*

LEFT *The extremely impractical rear brake pedal and kickstart lever arrangement of the narrowcase 250 Mach 1. The rider is usually left to start his bike by the 'run and bump' method*



The post-1968 (widecase) Scramblers use the same type of footrests as the 750GT V-twins. These are hinged, with a spring action, and comprise several separate component parts and a round footrest rubber.

Both the narrowcase cast-steel and hinged widecase Scrambler model footrests were painted.

The footrests for the Mach 1 and 1972-onwards Desmo are of a totally different concept. The same as used on the 750/900SS models, they are solid on the offside and folding (to clear the kickstart) on the nearside. Both are knurled and are threaded where they screw directly into the frame. The ends are of larger diameter to prevent the rider's feet from slipping off them. These footrests were cadmium plated.

The exceptions to this rule are the 125 two-stroke enduro bikes. These have a folding (with a spring) serated type which bolts to a support. This, in turn, is mounted to the frame.

The pillion footrests, where fitted, are all of the same design: folding with detachable rubbers, which are retained by plates. The metal components were cadmium-plated.

Brake pedal

On the mainstream production models, both four- and two-stroke, the brake pedal is simply a painted metal forging retained by a shaft and circlips. On the super sports (Mach 1 and later Desmo), however, it is a rear-set type finished in cadmium-plating, and on the Desmo the toe section folds to allow clearance for the kickstart lever.

Rear brake rod

Most Ducati singles have cable-operated rear brakes. The exceptions to this rule are the 125 Regolarita and Six Days two-strokes. Check that the rod is straight and the threaded section undamaged.

Crashbars

Crashbars were only factory fitments on the 160 Monza Junior, 1960/61 200TS, 175 and 200 Americano, 250 Monza (1960–7) and 350 Sebring. In addition, some examples of the 250GT (1966) and 450 Mark 3 Tourer (1972) had crashbars fitted as optional extras. In narrow-section tubing, these crashbars are largely ineffective for their designed purpose. All were chrome-plated.

Any other models fitted with crashbars will most likely have aftermarket accessories, not genuine factory parts.

15 Finishing techniques

On the subject of finish, my views are very precise—do not attempt to penny pinch. For *your* Ducati single, it is most definitely worth using the best paint finishers and chroming specialists your piggy bank will run to. Alternatively, if you intend doing at least some of this work yourself, the utmost care and patience, together with the right techniques, will pay dividends in the completed motorcyle, not to mention your own pride and satisfaction.

It is also worth stating that the original factory-fresh finish obtained by Ducati themselves left a lot to be desired. The standard of both the paintwork and chrome-plating on the vast majority of Ducati singles which left the Bologna works can only be called 'poor'. I once described the Mach 1 as 'a masterpiece dressed in tatters'. Ducati's only redeeming feature was the very high standard of their alloy work, which was truly superb.

With the ever-increasing costs of skilled labour, restorers are more likely to consider doing as much of the restoration as is possible themselves. However, the values of classic motorcycles are going up in real terms, so one must balance the two before making a decision. Then again, some may wish to do every possible job themselves because, to them, this is what the word 'restoration' means.

Obviously, there are some tasks—chrome-plating, for example—which have to be entrusted to a specialist, but much of the finishing process can be carried out by the restorer himself.

The following is intended to help achieve this. Unlike the car restorer, at least the motorcyclist does not have the pitfalls of hidden pockets of rust within the bodywork and chassis. Everything on a motorcycle is so much more accessible.

This superbly restored 1974 350 Desmo is a credit to its owner, Nigel Ball. His workmanship and patience have been rewarded to the full—will your restoration reach these standards?

Cleaning

The exact method will depend on which particular part is to be cleaned and the facilities that you have at your disposal, *and* just how far you wish to go.

If time is unimportant, but your budget tight, you will only be able to get so far along the road to perfection. However, a presentable finish can still be achieved. Someone with less time, but a bigger budget, will be able to 'buy-in' a number of services and/or equipment, and so speed up the process.

Mechanical

This is where the sense of the above statements begins to apply. At its most basic, mechanical cleaning involves removing the old finish, usually paint, with a scraper or similar instrument. However, it can prove a long and boring (not to say tiring!) task. You also have to take considerable care not to damage the surface. This is particularly true where paint is applied over alloy, for example.

Much more practical is some form of blasting process, where tiny particles are shot at the component to be cleaned and the finish literally blown off. It is

vitally important that the correct pressure, type of compound, etc, is employed, otherwise, you risk damaging the casting or surface.

For removing general corrosion, paint or rust, aluminous-oxide grit blasting is the most suitable. Another process is vapour blasting, which applies the abrasive material in water but, without doubt, the most popular method for motorcycle work is bead blasting. This employs minute glass beads, so does not actually remove any base material, only the surface finish, grime or rust. It is also used on castings that have been grit-blasted, as that method tends to open the metal pores. The glass beads close them up again, flatten the surface and provide a sheen which can range from matt to gloss.

Make sure all the parts you intend to have blasted are cleaned properly first, and do not forget to cover areas which would otherwise be damaged, or do not require blasting. This includes items such as oilways, bearings, cylinder bores, bushes, spigots, grease nipples and threads. This can best be achieved with masking tape.

Another method of removing paint, rust and, in this case, some metal, is using emery cloth. However, once again, it is a time-consuming task if attempted by hand. Much better, at least on larger or more difficult areas, is an electric drill with a range of suitable attachment for emery cloth. Do not be tempted to use a sanding disc, as this will invariably take off too much, and you will risk scoring the surface.

Obviously, begin with a coarser grade of abrasive and work through to the finer grades, so producing the very best finish. Polishing (alloy outer engine covers, fork legs and even alloy wheel rims), can be carried out by hand, but polishing mops on an electric drill will be much faster and will provide a superior finish.

Of course, the work can be entrusted to a specialist, but restoring alloy components is one of the basic jobs which any restorer will be able to tackle.

Manual polishing can be carried out in a variety of ways, but can be a long and tedious task if you use the old method of polishing with wet-or-dry emery in paraffin. For this, you will need both medium and fine cloth. In the last few years, however, the process has been speeded up by the introduction of Loyblox, which is a block of rubber impregnated with emery grit that can be used wet or dry.

Final polishing should still be carried out with a good quality alloy polish, such as Solvol Autosol, Belgom Alu or similar, applying it with a soft cloth.

Chemical

This can range from household detergents to specialized cleaning agents which will not generally be available to the private restorer.

The most easily accessible cleaner is household washing powder which can be used to clean alloy castings. Do not forget to remove all steel items before immersion. Use hot, but not boiling, water and remove the part immediately the scrubbing session is over. Rinse straight away in clean water to remove all traces of the detergent and then dry thoroughly.

There are also special chemical cleaning agents for light-alloy components. Most, however, need careful handling, so the instructions must be read carefully and followed exactly.

To most restorers, chemical cleaning means a paint remover (stripper). This is a messy medium to work with, but life is made easier if a few simple rules are applied. For a start, make sure that only the parts to be stripped go anywhere near the removing agent. Wear protective clothing (including gloves and eye protection) and, very importantly, avoid personal contact with the fluid. Spread out sheets of newspaper, place the items needing attention on the paper, brush on the removing fluid and wait for the old paint to start bubbling. Some form of scraper will be needed and a wire brush. As you must remove *all* the old paint, it will probably need a second application. Failure to remove all the old paint will lead to the new coat, when applied, lifting within a few days.

With the paint removed, you may well find other problems, such as hidden rust and even old patches of filler. These will need making good before any new finish is applied.

Again, remember to take your time, as preparation is all important to achieving a good finish.

Rust

With the removal of the old finish, you will be able to proceed to the next stage, but not without dealing with the potential rust problem.

Steel left in an unprotected, naked state will begin to oxidize straight away, and handling it with bare hands only speeds up the process due to the acids which are naturally produced by the skin. Therefore, it is important to move as quickly as possible. This entails giving each unprotected steel component a coat of primer. At least, this will keep the rust at bay until the proper finish can be applied.

Parts to be plated should be coated with grease and placed in a dry container—for example, a cardboard box, or similar.

Restoring the surface

Painted parts which have surface defects can be sanded down and filled with resin, but obviously this will not apply to those components which need to be plated. Instead, it will be necessary to braze or weld the parts, depending upon the material, to restore the correct surface. This technique will work well for castings and larger steel components, but is not

satisfactory for sheet-steel parts in general and the petrol tank in particular. These require sheet-metal working skills. You might, of course, have these, but if you do not, you will need to recruit the services of a specialist.

Filling

The first step in a repair of this nature is to prepare the surface to be treated, as there must be no residue of paint, primer, dirt or rust. Bare metal is required. Touching this area once it has been prepared should be avoided, as acids from the skin will prevent the filler compound from bonding to the prepared area and could well result in an unsatisfactory finish.

The next stage is to prepare the filler compound. A quantity of filler paste sufficient for the job in hand should be scooped out of its container and placed on a clean, smooth working surface which is free from pitting or ridging—a piece of plastic laminate or plate glass is ideal. The paste should be spread out and the catalytic agent (which converts the paste into a hard-setting, very tough and durable compound) is added to the paste.

Using the applicator, usually a piece of stiff plastic which is included in the filler kit, mix the paste and the catalyst with a smooth forwards and backwards action of the wrist. This should be carried out in such a manner as to ensure that not only are the two components of the compound mixed thoroughly, but also any air bubbles are not trapped in the filler.

Then, using the applicator, apply the filler to the damaged area, just a little at a time, spreading it in layers (depending on the depth to be filled). Push the filler down hard on to the damaged area and continue to apply layers until the filler stands a little proud of the remainder of the component under repair. Allow the filler to harden. The time taken for this varies, but a clean, dry and reasonably warm environment will help.

Once the filler has set, the high spots should be rubbed away. The first stage in this process is undertaken with a file—it is even possible to purchase quite inexpensive car body files which can be adjusted to con-

Preparing the paint is equally important for brushing or spraying

form to the curvature of the parts contour. These are particularly useful when repairing tanks, panels or mudguards.

Following this, a medium grade of rubbing-down paper, fitted to a rubbing block, should be used to smooth the filler and blend it into the surrounding areas so that an unblemished finish is achieved.

On larger areas, the repair should be left at least a week, and after this a final skim coat of filler applied to the area after sanding down once more with a fine grade of wet-or-dry paper, used wet, and then dried off thoroughly. This skim coat should be so thin as to allow the original filler to be seen through it—the purpose of this final coat is to fill in any small imperfections which might have appeared on the original surface.

After allowing this final skim coat to harden over the next few days (again, patience is the watchword), the repair is ready for painting.

Metal treatment

Sometimes a component might not be actually damaged, but may require some form of rust treatment. This is where rust has actually eaten into a hard surface, but not enough to call for really drastic action. For this, I have found Loctite Rust Remedy to be ideal.

Unlike other rust treatment products, which use a corrosive agent (basically acid) to eat into the rust and require washing off, Loctite's product is simply brushed on and left. It converts rust by forming an inert resin coating which can be painted over after 24 hours. I have found it to be an effective way of neutralizing rust and preventing it from reforming.

Painting

At the factory, all Ducati singles were painted by the spray-booth method. However, some motorcyclists still like the time-honoured brush application. With improved paint and brush technology, a much superior finish is now obtainable than in days gone by.

Most restorers choose synthetic enamel for brushing, and the most common make is Tekaloid—a product that is often selected by professionals. However, many simply shop at their local high-street paint specialist and opt for either an enamel or a two-part product.

You need to select a paint which is both suitable for brush application and has a quick drying time. For example, cellulose meets both requirements, but needs to be mixed with thinners, is volatile and flammable. It needs to be treated with extreme care because it can release dangerous vapours.

A short drying time is vital to the home restorer, because of airborne dust and insects. As a result, some may opt for cellulose, but my advice is do not. Instead, take the following steps. Choose a dry day when there is no wind, and preferably after rain, as this removes dust from the air. Do not be tempted to do any painting in cold weather, as you will not achieve a gloss finish. Instead, a 'bloom' will appear to give a matt effect. Select clothes which do not attract dust and work in an area free from draughts (but, of course, with some form of ventilation!).

Never attempt to paint with a brand-new brush (which needs to be of the best quality). A brush needs 'running-in' to remove dust, which will have collected since it was manufactured, loose bristles and the sharpness of the bristles. To do this, you should carry out some test painting on something unconnected with the restoration and, in the process, wash the brush a few times in paraffin to remove dust and debris. Finally, before painting your machine, wash the brush in warm soapy water and leave it to dry.

When applying the paint, do not dip the brush directly into the paint tin, but pour some paint into a separate, *clean* container. Select something as small as possible, relevant to the amount of painting to be done.

The size of the brush is important, too. Only use one in the $\frac{1}{2}$–1 in. size range. Selecting one which is too small will make the job take longer than needed, and one which is too large will cause the risk of putting too much paint on to the surface. Apply long, flowing strokes and avoid too much pressure. Do not overload the brush with paint, as this will cause 'runs'. In fact, the lighter the pressure, the greater the chance of achieving a nice, even glossy finish.

Provided you have carried out your preparation correctly and also applied the primer smoothly, two or three coats of gloss will suffice. Each needs rubbing down, using 500-grade wet-or-dry to give a smooth surface.

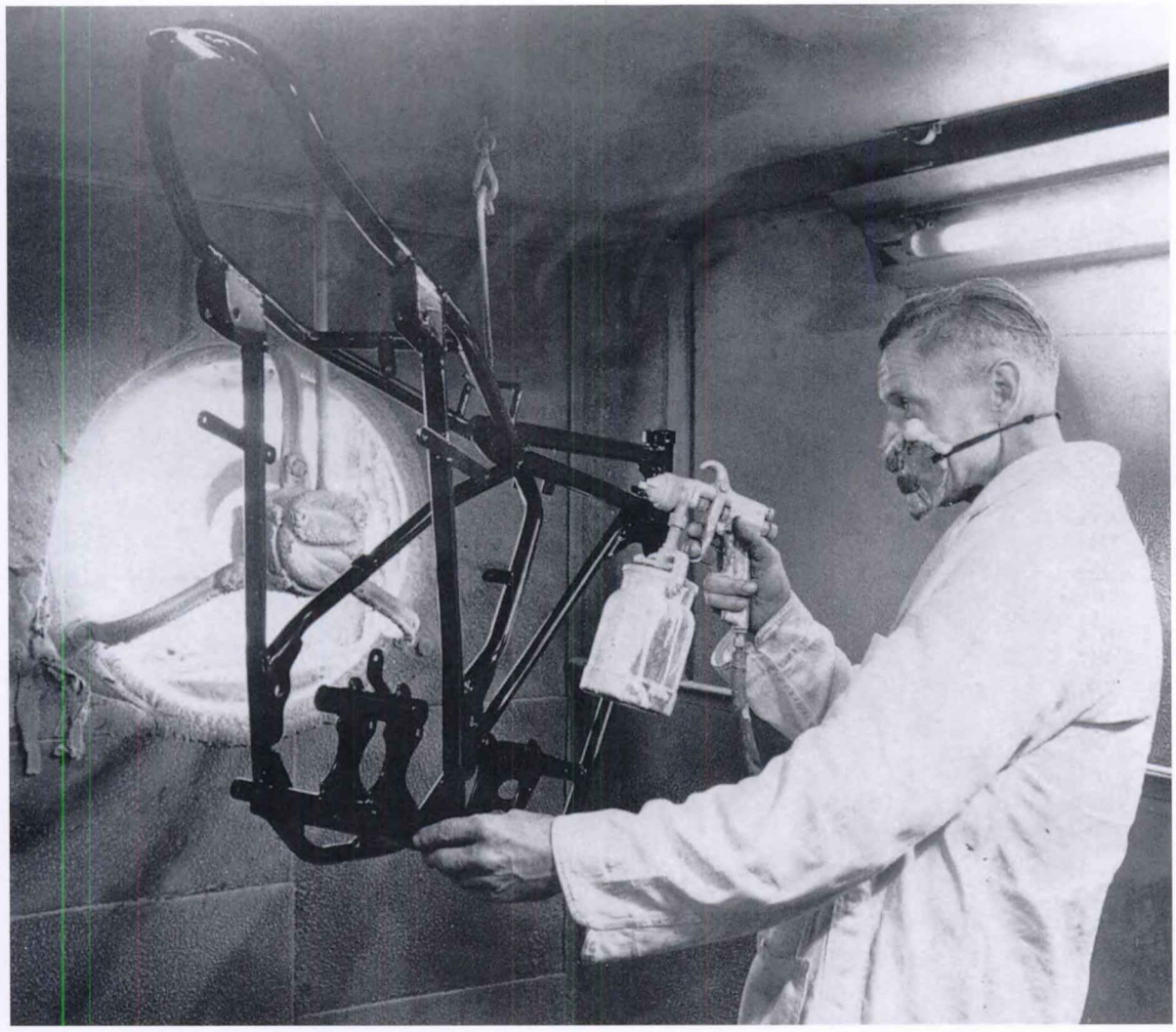
Some two-stroke models have cast-iron cylinder barrels and steel brake drums. Both will need to be stove-enamelled as, being subjected to heat, normal painting will not be suitable.

In addition, the fuel tank is also best left to an expert, otherwise it is liable to suffer from petrol deposits and staining.

Spraying

Under this category come both the simple aerosol can and the much more expensive and specialized spraying equipment. For a complete restoration, the former will be hard-pressed to cope (even if you can find the correct colours), whilst the latter not only requires expensive equipment, but also wastes a lot of paint.

Both types of application call for preparation on much the same lines as that described in the previous section for brushwork. The important elements are patience, preparation and a dust-free environment, together with practice.



Spraying—you not only need the correct equipment, but a dust-free, warm environment, adequate ventilation and a mask

You must also select the correct type of paint. Many give off potentially lethal vapours and are only intended for use by the professional sprayer. You must use one of the types suitable for a home restorer—in other words, an *amateur*.

Safety is important, as there are likely to be fumes given off which can not only damage your health (so wear a mask), but also constitute a fire hazard. Because of this, ensure adequate ventilation, preferably with an extractor fan. Do not use any naked flames while spraying, and this includes certain types of heaters. Even a spark from an electrical component could cause a fire.

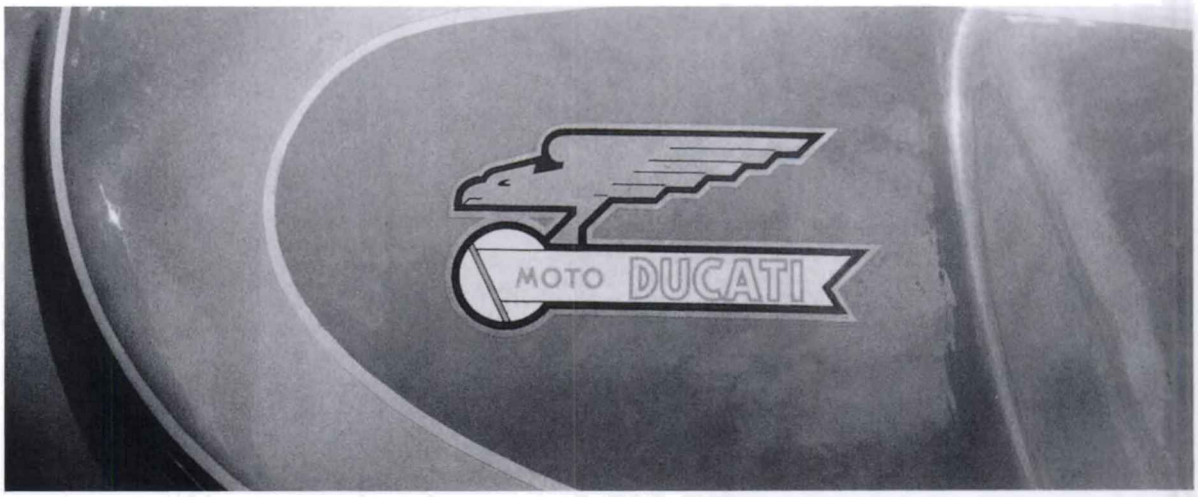
Always consider the worst that could happen; it is better to be safe than sorry.

As with the brush, always carry out a trial run first. This will ensure that you have a check of the colour and finish, and a feel of the equipment before risking your actual restoration.

Paint colours

Except for gloss black, the vast majority of colours used on Ducati singles are ones for which an exact match by an off-the-shelf car colour is not to be found. Some may opt for the *nearest* colour they can find, or alternatively go for another colour of their own choice.

However, for those wanting an original finish, the only course of action is to have the correct colour mixed by one of the specialists who normally operate in the car field. You will need a sample of the old colour, or a colour illustration, to be able to achieve this. Be warned, however, that the colour of your existing paintwork will most likely have become faded over the years, and colour illustrations are often inaccurate.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ABOVE *Mach 1 toolbox logo*

ABOVE LEFT *Moto Ducati 'eagle' used on Mach 1 and most other models until the end of 1967*

LEFT *Tank decals (transfers) as used on the tank of a 1975–6 125 Regolarita. These are for dry application, but most Ducati singles employ the water-slide variety*

Plating

Like painting, the quality of a plated finish is governed by preparation and the skill of the plater.

First, you must make sure that the components to be plated are in the best possible state, which will mean a lot of hard work. Another consideration is how very small items can be held to be plated without masking part of the surface. This can often prove really difficult.

You also have to sort out which parts need to be chromium-plated and which need cadmium-plating. Normally, the old plating will tell you, but do not be tempted to chrome items such as centre stands and chainguards. They will look completely out of place, since they should be painted.

As with any other services, try to get advice from other restorers as to companies that provide good plating. Expect to pay extra for a superior level of workmanship. Cheap plating will usually cost more in the long run, as it will have to be done all over again!

You should also note that there is more than one grade of chromium-plating, the best of which is the Diamond Hard variety.

Lining

Not many Ducatis have this, but some of the tanks and tool/air cleaner boxes do, particularly on the earlier narrowcase ohc four-strokes. At the factory, this was applied freehand by a skilled craftsman. For the home restorer, this will prove almost impossible to duplicate. Thus, it will be more practical to seek the services of a specialist who can cope with this particular work.

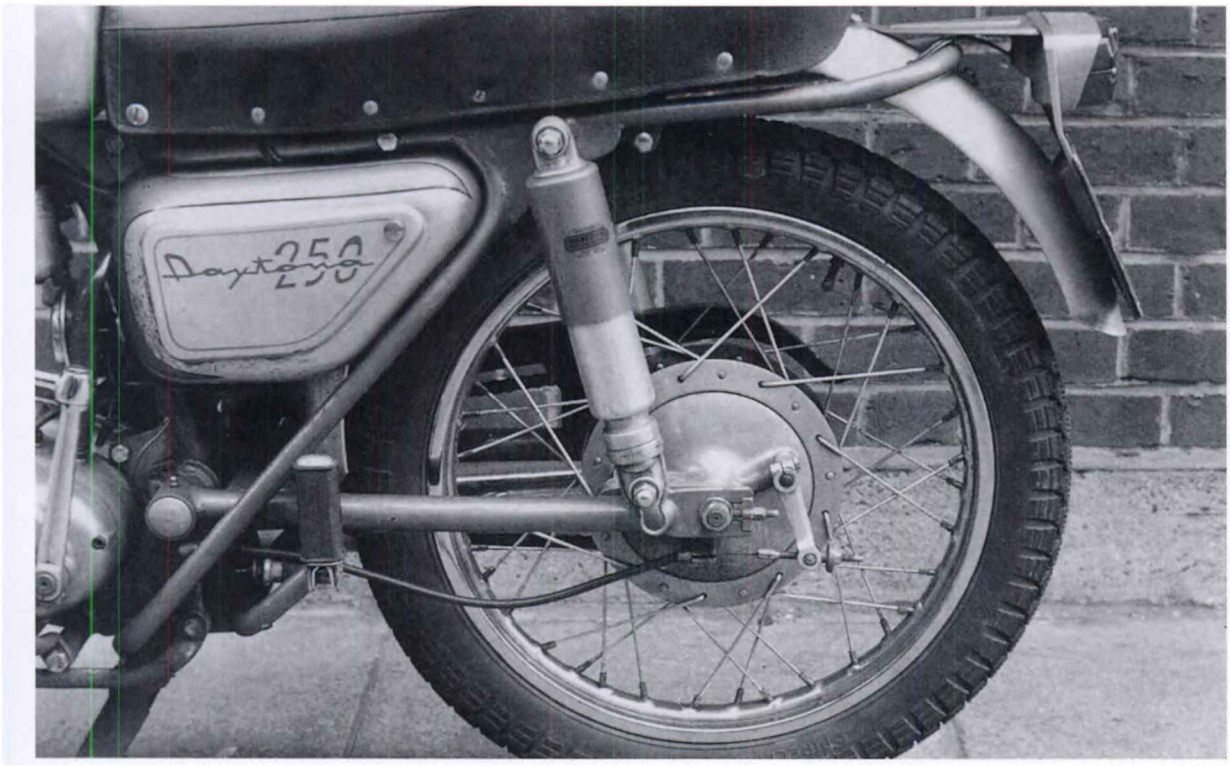
Fibreglass

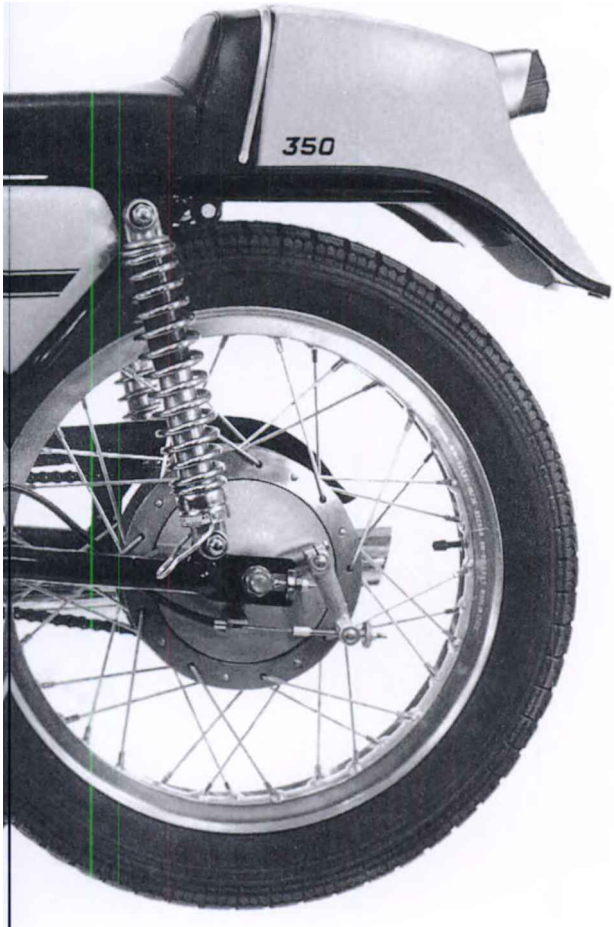
Again, very few machines covered in *Ducati Singles Restoration* use this material, and when they do, its use is restricted to mudguards, tanks, sidepanels and seat bases.

Fuel tanks pose a problem, as they have been illegal for road use in Britain since 1973. Although, legally, it is possible to use a machine built before this date with a fibreglass tank, some police forces think the law applies retrospectively. In addition, current EEC regulations allow the use of non-metal tanks (meant to be plastic), but at the time of writing, this ruling does not apply in Britain.

Fibreglass repair kits are available from the vast majority of high-street car accessory shops, and these usually contain full instructions for their use. This is very similar to that related earlier under the *Filling* section. A difference is the use of glass matting which

Tank, side panel and seat transfer details of the 1973–4 350 Desmo





ABOVE *British-market only '250 Daytona'. Note also that applied to the rear shock*

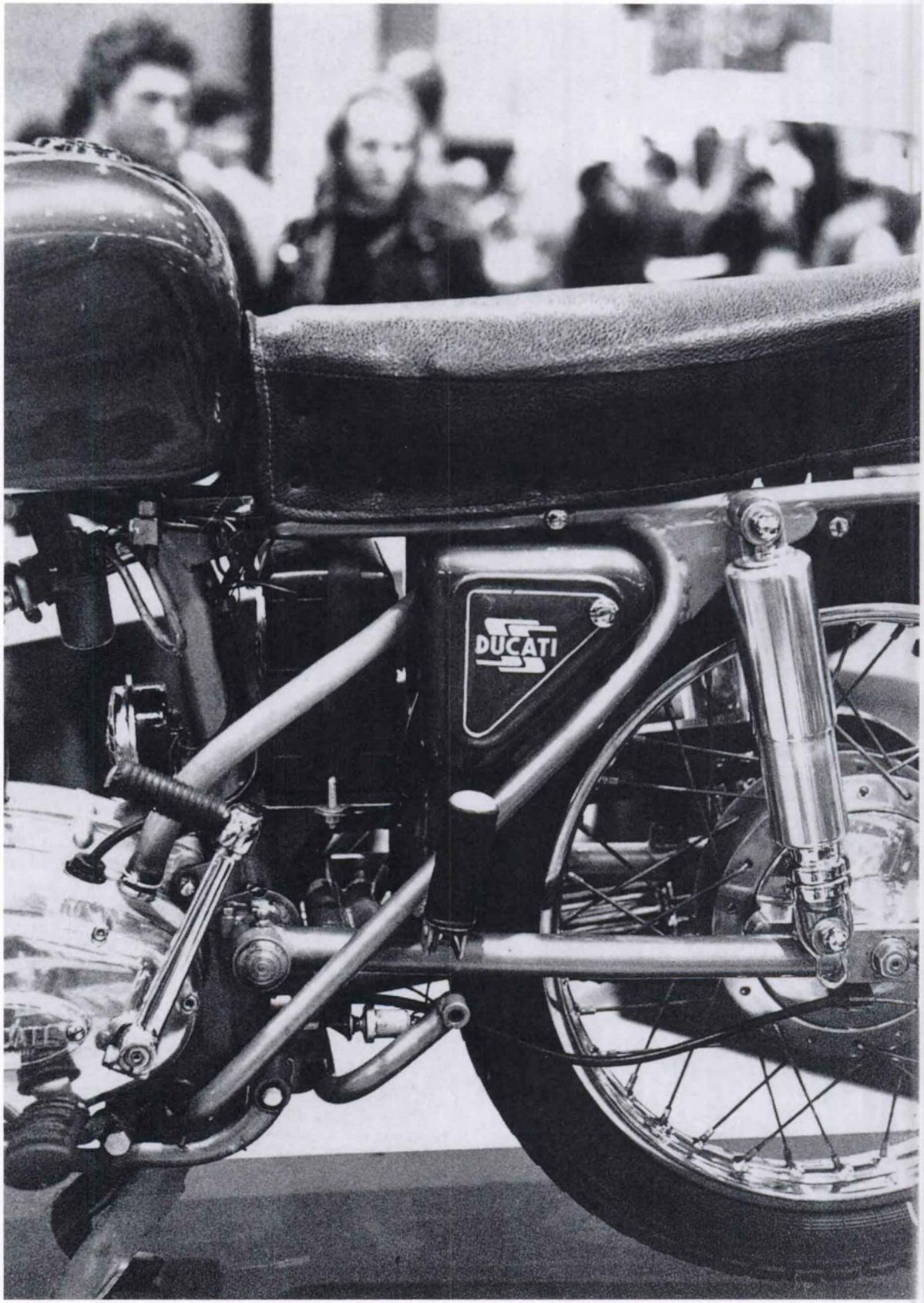
is intended to add strength to the repair. This should be applied to the rear face of the component so that it is out of sight. Obviously, on the fuel tank this cannot be done (except underneath).

Beside obtaining the correct kit and reading the instructions, it is also best to practice on some scrap components to get a feel of working with the materials, before actually commencing a repair for real.

Decals

Otherwise known as transfers, these were originally waterslide items, but during the early 1970s, Ducati switched to the dry-application type. Exactly what goes where is described in Appendix 4.

The following instructions apply to the waterslide variety. First clean the space on which the transfer is to be placed. Dip the transfer in cold or lukewarm water. Take it out and set it aside *before* the transfer starts to lift from the backing paper and leave it for about 30 seconds. Slide the design until about ½ in. projects from the backing paper. Place the projecting edge on to the position required. Hold the edge down with your fingers and gradually slide the paper from underneath. Replace the gummed paper (sticky side outwards) over the transfer and squeeze with card to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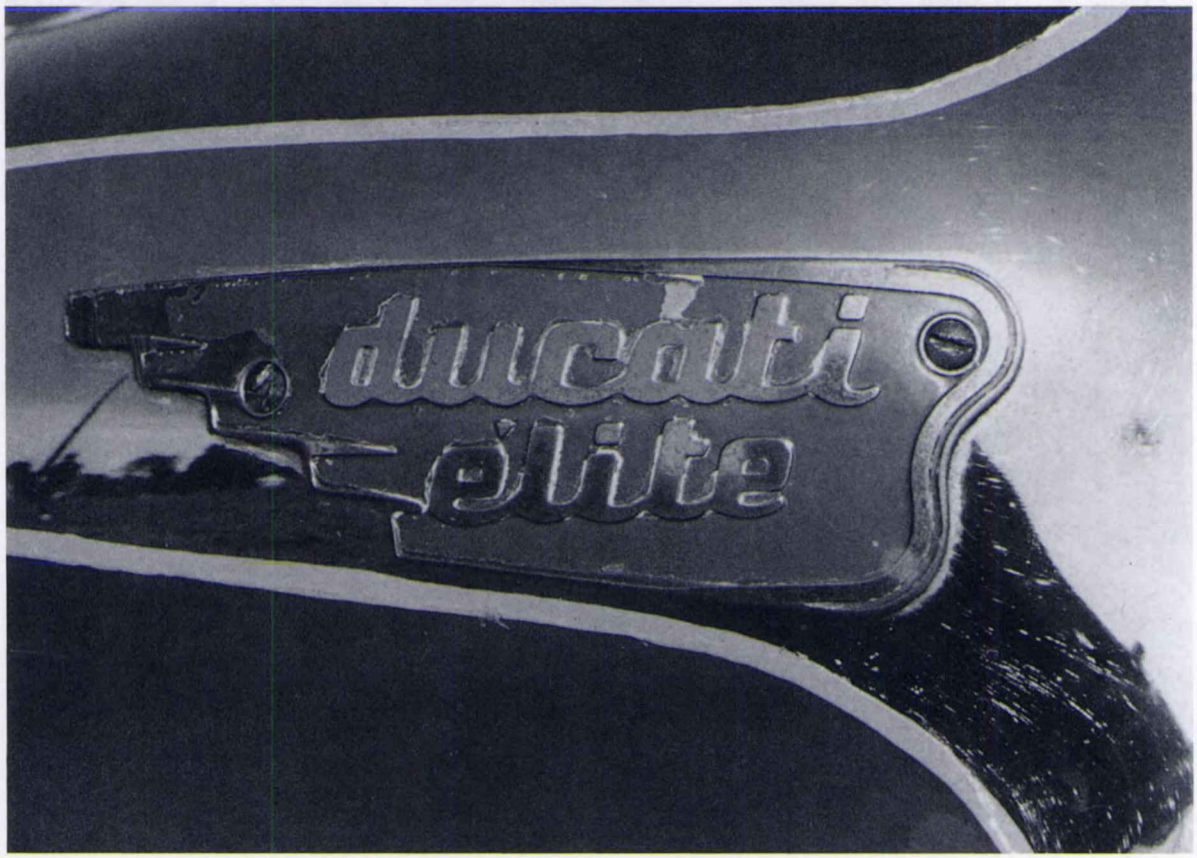
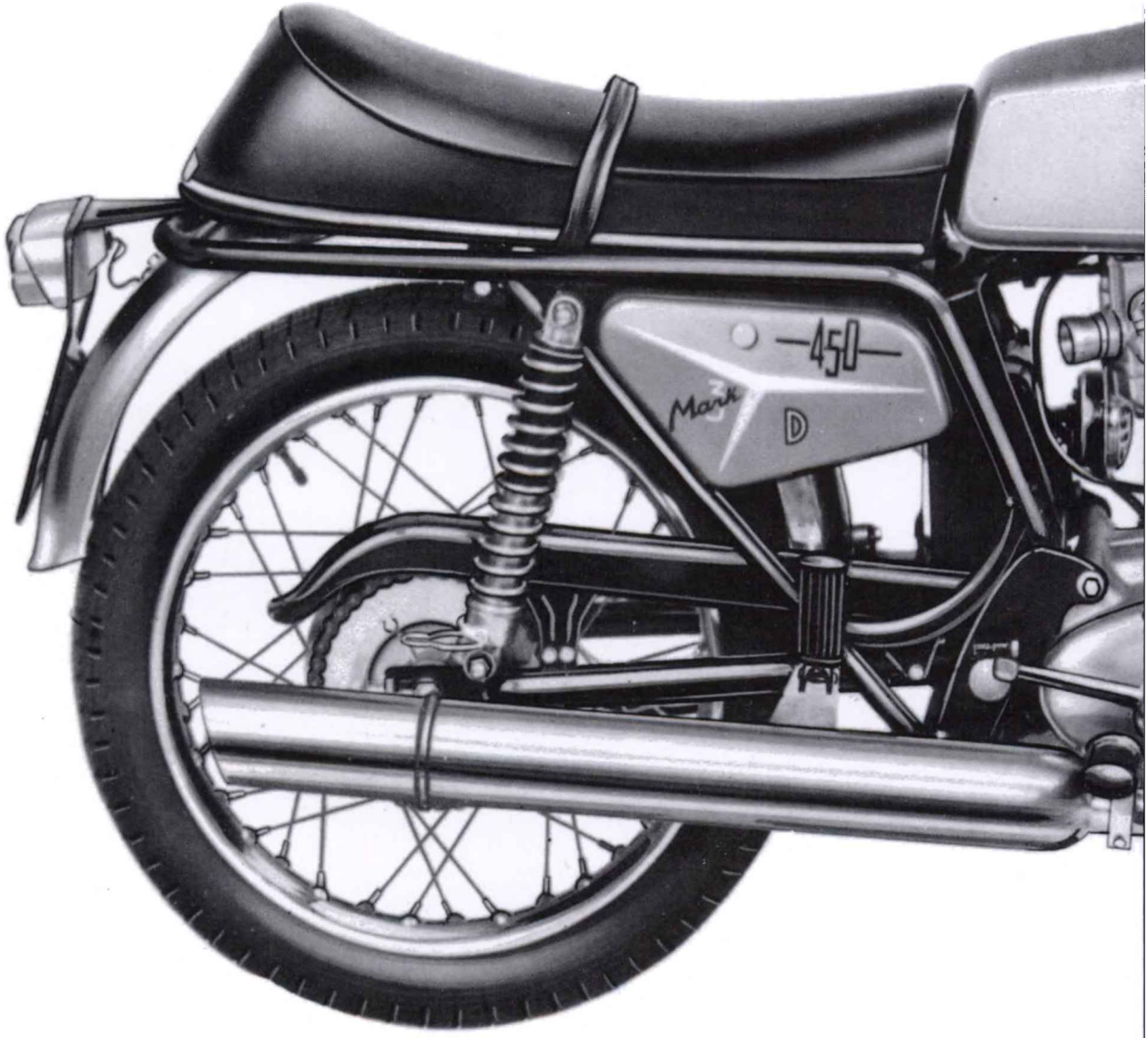


TOP *Badge designs: 'Ducati 175' from a 1958 175 Sport and . . .*

ABOVE *. . . 'Ducati Elite' from a 1959 200 Elite*

LEFT *The design used on the 200 Elite and SS toolboxes*



Some models have a combination of badges (tank) and decals (side panel). The machine is a 1969 450 Mark 3D

remove air bubbles and to ensure close contact with the surface. Wipe off surplus gum. Leave to dry for several hours before touching the surface of the transfer.

To ensure a lasting finish, some form of lacquer is required. My advice is to leave the transfer(s) to dry for a few days (a week, if possible) and then use yacht varnish. On no account use one of the acrylic-type lacquers (spray or brush-on), as the transfer will react against this type and leave a bubbly, uneven finish.

The dry-application type is much easier to apply

and work with. Peeling off the backing paper, place the decal in *exactly* the correct position, rub down with a coin or similar, and finally peel off the top paper. It is as simple as that.

Although the dry type is more resistant to various lacquer types, my advice is still to use an enamel-based varnish.

Badges

Used on some fuel tanks, these are either metal (usually brass), retained by screws, or plastic. The latter have two prongs at the rear which are retained by flat metal clips. These clips slot into recesses in the tank sides.

16 Getting back on the road

You are now on the final lap, with only assembly of the restored components and the completion of the various items of paperwork between you and getting your prized possession back on to the road.

Assembly

This is usually the highpoint of the restoration and certainly the most rewarding, culminating in that exciting moment when you kick the engine into life.

However, as I have mentioned throughout this book, make haste slowly, rather than rushing matters, as that carries the risk of damaging something. After spending so much time and patience, let alone money, that would be a waste indeed.

At this late stage, remember to follow the procedure laid out at the beginning, constantly referring to the literature you have collected and, in particular, the notes and illustrations that you have assembled during the restoration. These will now begin to pay handsome dividends as you find assembly so much easier and quicker because you have things in sequence.

The biggest problem will be protecting the finish you have lavished so much care and attention upon, so cover, pad and mask where necessary, and work slowly to avoid damage.

Consider the order in which you intend to assemble the components and arrange the parts of each stage so that they are together. This is good practice, as it is also a further check that you have not missed anything. It will also ensure that you are not caught out through the lack of a single vital component, which will stop the reassembly process in its tracks.

It is best to start the assembly with the main frame. Thereafter, fit the rear fork, the head race cups and cones (together with the top and bottom fork yokes) and the centre stand. Then you will be able to place the basic skeleton of your motorcycle on the workbench. At this stage, you may find it easier (depending upon which model you have) to fit the fork legs. Otherwise, the steering head will need additional support.

Next, fit the front wheel, not forgetting the speedo drive assembly; some models have this contained within the wheel hub, whilst others have a separate drive gear box. If you fit the front mudguard at this stage, it will need special protection, so it is best omitted for the time being. The rear one can usually be fitted at an early stage, and it may be necessary to add the wiring harness at this point, or at least fit the rear section, as it is often threaded through the rear guard, with several bend-over tabs holding it in place, to the rear light. If the bike is balanced on its centre stand, you will need either to fit the rear wheel or anchor the front fork to the bench.

Once you have a stable frame that is not liable to move, fit the engine unit while you have the most room to work in. Obviously, make sure you have all the relevant fitting plates, bolts, nuts and washers to hand before attempting this. Also, you will need at least two extra helpers at this stage. Trying to do it with fewer assistants will probably lead to not only heated exchanges, but also the risk of damaging something. Even though the Ducati engine is of full unit-construction design, it can still prove heavy and cumbersome.

In view of the likely cost of your rebuild, it is well worth considering the purchase of a car engine hoist or similar—something which will take the engine unit's weight easily. Arrange the lifting sling so that it is secure and holds the engine in the correct plane for its mounting points to line up. If you have to tilt the engine assembly to achieve this, you are much more likely to suffer an accident of some sort. Thus, it is far better to adjust the sling so that the engine just drops into place.

Then fit all fixings and tighten them. As with any assembly work, it is best to complete a sequence fully and not leave the final tightening until later, in case you forget. If this is not possible for some reason, make sure a marker is left to remind you.

Next, continue the assembly procedure as you wish and as the particular model dictates, but always leave

Your restored machine can be used for a variety of tasks. For example, exhibiting at shows like this 200 Elite . . .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fitting the tank and seat as late as possible. Check wheel alignment once both are in place, and adjust the final drive chain correctly.

Do not attempt to fire up the engine until *all* is ready. To avoid the possibility of fire, keep the battery away from the machine until assembly is virtually complete. Before connecting it, use an avometer to check that the wiring is not shorting to earth somewhere, and make sure you connect it the right way round. On all Ducati singles with a battery, *negative* is earth.

The battery should not be fitted whilst you fill the engine unit with oil.

If the machine is still on the bench, you will need assistance to lift it down safely. Take special care while this is being done, as it is easy to make a mistake at this stage, when completion is so close. Once the bike is at ground level, you can prepare to start up by opening the workshop doors to let the exhaust fumes out.

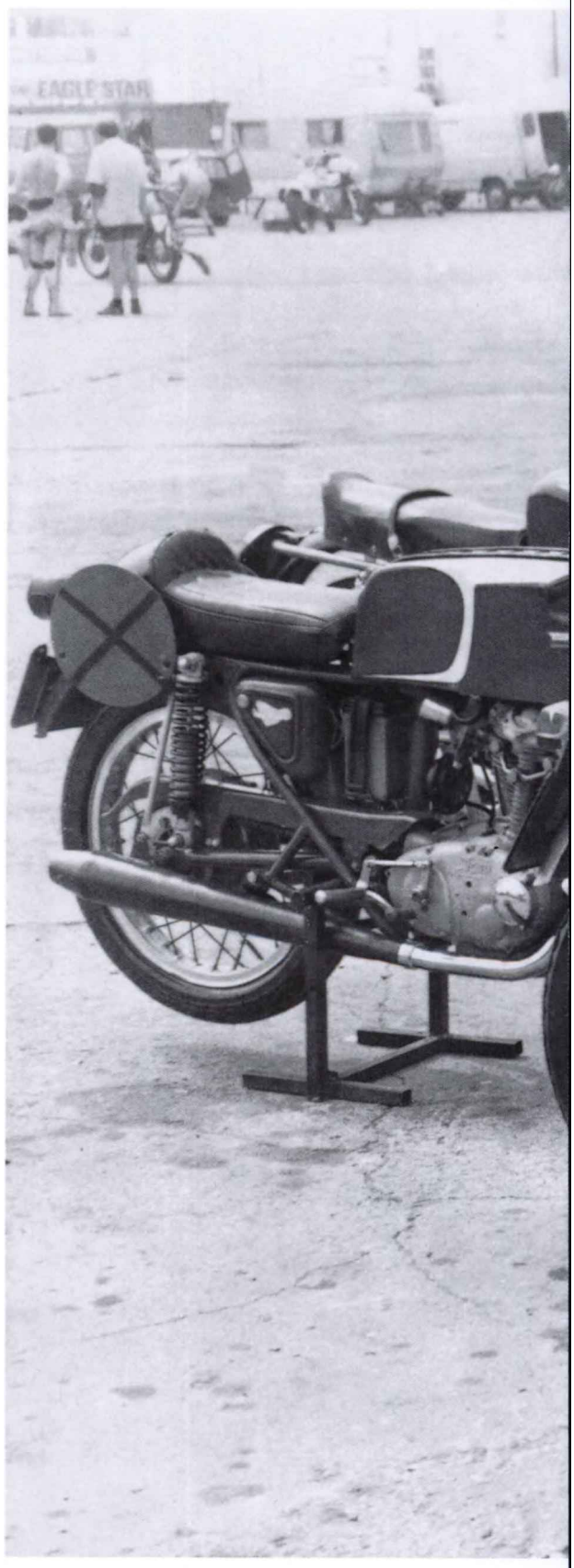
The petrol tank is best left off whilst you get the machine down to ground level, so fit it now, connect it up and pour in a small amount of fuel—$\frac{1}{2}$ gallon (2.25 litres) will be sufficient to begin with. Next, turn on the fuel tap and check for leaks. Once this has been accomplished without problems, you can proceed to the next stage, which is to connect the battery (where fitted) and start the engine.

Before putting any significant load on the engine, it is important to check that the oil pump is functioning. On some Ducatis this is made easy by a transparent bevel inspection cover, or where clear piping has been used for a section of the oil drain pipe. In most cases, however, the only way is the rather messy job of removing one of the tappet inspection covers. At the same time, make a check that the alternator is charging.

Next, put the machine on its centre stand and run it up through the gears to make sure all of them are functioning.

Now carry out a thorough inspection to ensure that there are no oil leaks from the engine unit and make an ignition-timing strobe check if this is called for.

Try the machine gently in your drive or on a *private* road to check the operation of items such as the clutch and brakes. This assumes that you have not yet put all your paperwork in order. Obviously, before venturing out on to the public highway, in the UK at least, you must have the necessary insurance, road fund tax and a valid MoT (Ministry of Transport) test certificate. All this may seem irksome after spending so much time on the restoration, but it is a fact of life, so just regard it as part of the process. This is such



. . . or parading at a classic event, like this 250 Mach 1, Spanish 24 Horas and 175 Sport. All three of these machines belong to London Ducati enthusiast Vic Pendrill


Mach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an important point that the final section of this chapter is devoted to it.

Paperwork

In this modern age, ownership and use of any road vehicle involves a variety of pieces of paper, and some of these are documents issued by the authorities. This last section concerns these in general, and those specific to the United Kingdom in particular. Details for other countries will vary and must be checked as necessary.

The first piece of paper was mentioned in Chapter 3 and is the receipt for the machine, or the bundle of receipts for parts, if that was the way you obtained your model. It is very desirable that they contain the engine and frame numbers so that you have proof of ownership. Make sure they agree with what is stamped on the machine and beware of anything that looks altered.

The other documents you will need in the UK are a registration form, a test certificate and an insurance certificate. The first is currently known as a V5, the second as a VT20 and the last is obtained privately. With them, you can tax the machine for road use.

You should consider insurance long before you get to the road, as the parts and the machine as a whole need to be covered against fire and theft as soon as you get them. Try to obtain an agreed value for the machine and make sure you adjust this in line with the market. The insurance will need to be extended to cover road risks before you ride in public, and it is worth shopping round for a company which specializes in older machines. Otherwise, for example, a relatively sedate Sebring will be lumped in with modern 350 cc models of far higher performance and spares prices.

The V5 and VT20 are linked to an extent and also involve the number plate of your machine. Where a machine had been in use on a fairly continuous basis, its original buff or green log book will have been replaced by a V5, which will record the correct engine and frame numbers along with the original registration number, as displayed on the number plate.

As nothing is ever perfect, there can be discrepancies even when the documentation is apparently all in order. For example, a Ducati is bought from a dealer; it suffers an engine problem and the complete unit is changed. This is not recorded at the time, the machine is eventually withdrawn from use and finally sold off. The new owner rebuilds it and, on attempting to register it, compares the paper numbers with the

Ducati singles wheel-to-wheel. The late Bernard Trout (250 Desmo) takes the inside line, duelling with Mach 1-mounted Jeff Miller, CRMC, Mallory Park, 5 May 1985

actual markings to find they do not tally—as they have not done for many years.

More difficult is a machine which has not been used for a period and has no V5. For the authorities to issue a form with a registration number appropriate to the machine's year, they need further proof, and the onus is on the owner to provide it. Only in cases of rare or historic machines, well-known past owners or some similar reason, is there much hope of retaining the original number, but it is always worth trying with an application.

As part of this exercise to keep the original number, it helps to be able to link it to the machine, and for this old MoT certificates or old licence discs are acceptable. Where not available, or to back them up, a letter from a recognized authority confirming the date of the quoted engine and frame numbers, and stating whether or not they were likely to have begun life together, should be obtained. Acceptable sources are the owners' club, the vintage MCC, service-page writers of the specialist magazines (I am one of these), or the holders of the original records of the firm.

It is not normally possible to trace the original registration number from scratch, as much of the official records no longer exists. The procedure needed would be to look at the selling company's records to match engine and frame numbers. If this is in order, the records will then give the name of the first owner to whom the machine was sold.

So much for the theory. In *practice*, few dealers from those days are still in business, and fewer still will have kept all their records for the last 20 or 30 years!

So you have to call on your Local Vehicle Licensing Office and take all your documents with you. There, you fill up an application form which will trigger off a series of events that will culminate in the issue of a V5 if all goes well.

The first thing likely to happen is a visit from the authorities, or their agent, to inspect your machine. This is done to check that all the numbers agree with those quoted on the form and that the machine is what you say it is and does exist.

This visit is not always carried out, but if it does take place, the machine is best assembled to some degree. It is often desirable to register the machine long before the restoration has been completed or there is any need to tax it for the road. At the very least, it allows you to get the number plate finished.

After the visit, and if all is in order, the vehicle documents can be issued. If the evidence is good, the original registration number, or mark as they call it, may, in rare cases, be retained and entered on the main computer at Swansea. Normally, this is not so, but where there is evidence as to the age of the machine, the authorities will try to issue it an appropriate number for its period. Should there be no way of linking the machine to any period, which may happen with a hybrid, a number with a letter 'Q' prefix will be issued.

Following this, the machine will have to go for its official test, as mentioned in the earlier section of this chapter. Book the test, make sure you have insured the machine for road use, and provided it passes the test (after all this, I would be most disappointed if it did not), you can tax the machine for the road.

Keep all the paperwork in case there are any queries at any time, and to go with the machine should you ever sell it.

Now you can get out and about on your 'new' mount and, if you have been bitten by the restoration bug, decide what to restore next!

1 General specifications

Model	175S	175T	175 Americano	175 Sport
Year	**1957**	**1957**	**1958**	**1958–61**
Bore (mm)	62	62	62	62
Stroke (mm)	57.8	57.8	57.8	57.8
Capacity (cc)	174.5	174.5	174.502	174.502
Compression ratio	8:1	7:1	7:1	8:1
Valve gear	ohv	ohv	ohc	ohc
bhp	14	11	11	14
@ rpm	8000	7500	7500	8000
Oil system	wet sump	wet sump	wet sump	wet sump
Inlet opens BTDC	44	35	35	44
Inlet closes ABDC	73	65	65	73
Exhaust opens BBDC	73	65	65	73
Exhaust closes ATDC	38	35	35	38
Tappets, inlet (mm)	0.06	0.05	0.05	0.06
Tappets, exhaust (mm)	0.08	0.07	0.07	0.08
Primary drive gearing	2.522:1	2.522:1	2.522:1	2.522:1
Final drive gearing	2.875:1	3.066:1	3.066:1	2.875:1
Box gearing				
4th	0.97:1	0.97:1	0.97:1	0.97:1
3rd	1.18:1	1.18:1	1.18:1	1.18:1
2nd	1.65:1	1.65:1	1.65:1	1.65:1
1st	2.75:1	2.75:1	2.75:1	2.75:1
No. gears	4	4	4	4
Front tyre	2.50 × 18	2.50 × 18	2.50 × 18	2.50 × 18
Rear tyre	2.75 × 18	2.75 × 18	2.75 × 18	2.75 × 18
Front brake (mm)	drum 180	drum 180	drum 180	drum 180
Rear brake (mm)	drum 160	drum 160	drum 160	drum 160
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	coil	coil	coil	coil
Wheelbase (mm)	1320	1320	1320	1320
Ground clear. (mm)	130	130	110	110
Seat height (mm)	790	790	800	790
Width (mm)	580	580	640	580
Length (mm)	1950	1980	1980	1990
Dry weight (kg)	103	104	118	103
Generator/output	6v/40w	6v/40w	6v/40w	6v/40w
Battery	6v 13.5ah	6v 13.5ah	6v 13.5ah	6v 13.5ah

Model	125S	100 Sport	125 Sport	125TS
Year	**1957**	**1958–60**	**1958–65**	**1958–65**
Bore (mm)	55.2	49	55.2	55.2
Stroke (mm)	52	52	52	52
Capacity (cc)	124.443	98.058	124.443	124.443
Compression ratio	8:1	9:1	8:1	7:1
Valve gear	ohc	ohc	ohc	ohc

Model	125S	100 Sport	125 Sport	125TS
Year	1957	1958–60	1958–65	1958–65
bhp	10	8	10	6.2
@ rpm	8500	8500	8500	6500
Oil system	wet sump	wet sump	wet sump	wet sump
Inlet opens BTDC	48	44	48	24
Inlet closes ABDC	65	68	65	56
Exhaust opens BBDC	67	72	67	40
Exhaust closes ATDC	45	41	45	22
Tappets, inlet (mm)	0.05	0.05	0.05	0.05
Tappets, exhaust (mm)	0.07	0.07	0.07	0.07
Primary drive gearing	2.533:1	3.000:1	3.000:1	3.000:1
Final drive gearing	2.875:1	3.066:1	2.750:1	2.875:1
Box gearing				
4th	0.96:1	0.97:1	0.97:1	0.97:1
3rd	1.18:1	1.18:1	1.18:1	1.18:1
2nd	1.54:1	1.65:1	1.65:1	1.65:1
1st	2.38:1	2.75:1	2.75:1	2.75:1
No. gears	4	4	4	4
Front tyre	2.50 × 17	2.50 × 17	2.50 × 17	2.50 × 17
Rear tyre	2.75 × 17	2.75 × 17	2.75 × 17	2.75 × 17
Front brake (mm)	drum 180	drum 180	drum 180 1	drum 158
Rear brake (mm)	drum 160	drum 160	drum 160 2	drum 136
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	coil	coil	coil	coil
Wheelbase (mm)	1320	1320	1320	1310
Ground clear. (mm)	140	140	140	120
Seat height (mm)	750	750	750	760
Width (mm)	580	580	580	680
Length (mm)	1910	1910	1910	1890
Dry weight (kg)	100.5	100	100.5	98.5
Generator/output	6v/40w	6v/40w	6v/40w	6v/40w
Battery	6v 13.5ah	6v 13.5ah	6v 13.5ah	6v 13.5ah

1 after 1960 — 158 2 after 1960 — 136

Model	175 Motocross	200 Elite	200 Supersport 1	200 Americano
Year	1958	1959–65	1959–60	1959
Bore (mm)	62	67	67	67
Stroke (mm)	57.8	57.8	57.8	57.8
Capacity (cc)	174.5	203.783	203.783	203.783
Compression ratio	8:1	8.5:1	8.5:1	7.5:1
Valve gear	ohc	ohc	ohc	ohc
bhp	14	17	18	16
@ rpm	8000	7500	7800	7500
Oil system	wet sump	wet sump	wet sump	wet sump
Inlet opens BTDC		34	44	34
Inlet closes ABDC		56	68	56
Exhaust opens BBDC		70	72	70
Exhaust closes ATDC		24	41	24
Tappets, inlet (mm)	0.07	0.06	0.07	0.05
Tappets, exhaust (mm)	0.10	0.08	0.10	0.07
Primary drive gearing		2.520:1	2.500:1	
Final drive gearing		2.812:1	2.647:1	
Box gearing				
4th	0.97:1	0.97:1	0.97:1	0.97:1
3rd	1.18:1	1.18:1	1.18:1	1.18:1
2nd	1.65:1	1.65:1	1.65:1	1.65:1
1st	2.75:1	2.75:1	2.75:1	2.75:1
No. gears	4	4	4	4
Front tyre	2.75 × 21	2.75 × 18	2.75 × 18	2.75 × 18
Rear tyre	3.00 × 19	3.00 × 18	3.00 × 18	3.00 × 18
Front brake (mm)	drum 180	drum 180	drum 180	drum 180

Model	175 Motocross	200 Elite	200 Supersport 1	200 Americano
Year	1958	1959–65	1959–60	1959
Rear brake (mm)	drum 180	drum 160	drum 160	drum 160
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	coil	coil	coil	coil
Wheelbase (mm)	1380	1320	1320	1320
Ground clear. (mm)		110	130	110
Seat height (mm)	830	800	800	800
Width (mm)	800	580	580	800
Length (mm)	2060	1990	1990	2000
Dry weight (kg)	122	111	109	118
Generator/output	6v/40w	6v/40w	6v/40w	6v/40w
Battery	6v 13.5ah	6v 13.5ah	6v 13.5ah	6v 13.5ah

1 With high-lift camshaft, and 27 mm SS1 carburettor

Model	200 Motocross	200TS	200GT	250 Monza (n/case)
Year	1959–60	1960–1	1962	1961–7
Bore (mm)	67	67	67	74
Stroke (mm)	57.8	57.8	57.8	57.8
Capacity (cc)	203.783	203.783	203.783	248.589
Compression ratio	8.5:1	7:1	7:1	8:1
Valve gear	ohc	ohc	ohc	ohc
bhp	1959|1960 19 | 18	17	14	16.4
@ rpm	7800	7500	7000	7200
Oil system	wet sump	wet sump	wet sump	wet sump
Inlet opens BTDC		34	34	20
Inlet closes ABDC		56	56	70
Exhaust opens BBDC		70	70	50
Exhaust closes ATDC		24	24	30
Tappets, inlet (mm)	0.07	0.05	0.05	0.05
Tappets, exhaust (mm)	0.10	0.07	0.07	0.07
Box gearing				
5th				1
4th	0.97:1	0.97:1	0.97:1	0.97:1 2
3rd	1.18:1	1.18:1	1.18:1	1.18:1 3
2nd	1.65:1	1.65:1	1.65:1	1.65:1 4
1st	2.75:1	2.75:1	2.75:1	2.75:1 5
No. gears	4	4	4	4 6
Front tyre	2.75 × 21	3.00 × 18	2.75 × 18	2.75 × 18
Rear tyre	3.00 × 19	3.00 × 18	3.00 × 18	3.00 × 18
Front brake (mm)	drum 180	drum 180	drum 180	drum 180
Rear brake (mm)	drum 180	drum 160	drum 160	drum 160
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	coil	coil	coil	coil
Wheelbase (mm)	1380	1320	1320	1320
Ground clear. (mm)		130	130	130
Seat height (mm)	830	800	750	800
Width (mm)	800	800	580	800
Length (mm)	2060	2000	2000	2000
Dry weight (kg)	124	118	116	125
Generator/output	6v/40w	6v/40w	6v/40w	1961–4|1964–7 6v/40w|6v/60w
Battery	6v 13.5ah	6v 13.5ah	6v 13.5ah	6v 13.5ah

1 Five-gear—0.97 2 Five-gear—1.10 3 Five-gear—1.35 4 Five-gear—1.73 5 Five-gear—2.53
6 mid 1964–7—five gears

Model	Diana (Europe)	Diana (USA)	250 Mark 3 (n/case)	250 Scrambler (n/case)
Year	1961–4	1961–6	1967	1962–7
Bore (mm)	74	74	74	74
Stroke (mm)	57.8	57.8	57.8	57.8
Capacity (cc)	248.589	248.589	248.589	248.589
Compression ratio	8:1	9:1	10:1	9.2:1
Valve gear	ohc	ohc	ohc	ohc
bhp	17.6			
@ rpm	7400			
Oil system	wet sump	wet sump	wet sump	wet sump
Inlet opens BTDC	20	62	62	32
Inlet closes ABDC	70	68	76	71
Exhaust opens BBDC	50	75	70	50
Exhaust closes ATDC	30	55	48	44
Tappets, inlet (mm)	0.05	0.15	0.15	0.15
Tappets, exhaust (mm)	0.07	0.20	0.25	0.20
Primary drive gearing	2.500:1	2.500:1	2.500:1	2.500:1
Final drive gearing	2.647:1	2.647:1	2.222:1	3.929:1
Box gearing				
5th		1	0.97:1	1
4th	0.97:1	0.97:1 2	1.10:1	0.97:1 2
3rd	1.18:1	1.18:1 3	1.35:1	1.18:1 3
2nd	1.65:1	1.65:1 4	1.73:1	1.65:1 4
1st	2.75:1	2.75:1 5	2.53:1	2.75:1 5
No. gears	4	4 6	5	4 7
Front tyre	2.75 × 18	2.75 × 18	2.50 × 18	3.00 × 19
Rear tyre	3.00 × 18	3.00 × 18	2.75 × 18	3.50 × 19
Front brake (mm)	drum 180	drum 180	drum 180	drum 180
Rear brake (mm)	drum 160	drum 160	drum 160	drum 160
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	coil	flywheel magneto	coil	flywheel magneto
Wheelbase (mm)	1320	1320	1350	1350
Ground clear. (mm)	130	130	130	130
Seat height (mm)	750	750 8	800	750
Width (mm)	580	800	590	820
Length (mm)	2000	2000	2000	2020
Dry weight (kg)	120	110	116	109 9
Generator/output	6v/40w	6v/40w	6v/40w	6v/40w
Battery	6v 13.5ah	None	6v 13.5ah	None

1 Five-gear—0.97 2 Five-gear—1.10 3 Five-gear—1.35 4 Five-gear—1.73 5 Five-gear—2.53
6 mid 1964–5—five gears 7 mid 1964–7—five gears 8 1965–6—800 9 1966–7—120

Model	Mach 1	250GT	250 Monza (w/case)	250 Mark 3 (w/case)
Year	1964–6	1964–6	1968	1968–74
Bore (mm)	74	74	74	74
Stroke (mm)	57.8	57.8	57.8	57.8
Capacity (cc)	248.589	248.589	248.589	248.589
Compression ratio	10:1	8:1	8:1	9.7:1
Valve gear	ohc	ohc	ohc	ohc
Oil system	wet sump	wet sump	wet sump	wet sump
Inlet opens BTDC	62	52	20	62
Inlet closes ABDC	76	52	70	76
Exhaust opens BBDC	70	75	50	70
Exhaust closes ATDC	48	27	30	48
Tappets, inlet (mm)	0.15	0.05	0.05	0.15
Tappets, exhaust (mm)	0.25	0.07	0.07	0.20
Primary drive gearing	2.500:1	2.500:1	2.500:1	2.500:1
Final drive gearing	2.222:1	2.647:1	3.008:1	2.812:1

Model	Mach 1	250GT	250 Monza (w/case)	250 Mark 3 (w/case)
Year	**1964–6**	**1964–6**	**1968**	**1968–74**
Box gearing				
5th	0.97:1	0.97:1	0.97:1	0.97:1
4th	1.10:1	1.10:1	1.10:1	1.10:1
3rd	1.35:1	1.35:1	1.35:1	1.35:1
2nd	1.73:1	1.73:1	1.73:1	1.73:1
1st	2.53:1	2.53:1	2.46:1	2.46:1
No. gears	5	5	5	5
Front tyre	2.50 × 18	2.75 × 18	2.75 × 18	2.75 × 18 **1**
Rear tyre	2.75 × 18	3.00 × 18	3.00 × 18	3.00 × 18 **2**
Front brake (mm)	drum 180	drum 180	drum 180	drum 180 **3**
Rear brake (mm)	drum 160	drum 160	drum 160	drum 160
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	coil	coil	coil	coil **4**
Wheelbase (mm)	1350	1320	1365	1360
Ground clear. (mm)	130	130	130	130
Seat height (mm)	1964–5|1966 760|800	800	800	735
Width (mm)	590	800	850	780
Length (mm)	2000	2000	2000	2000
Dry weight (kg)	116	125	127	128
Generator/output	6v/60w	6v/60w	6v/70w	6v/70w
Battery	6v 13.5ah	6v 13.5ah	6v 13.5ah	6v 13.5ah

1 1973–4 — 3.00 × 19 **2** 1973–4 — 3.50 × 18 **3** 1973–4 — dual drum 180 **4** 1973–4 — electronic

Model	250 Mark 3D	250 Scrambler (w/case)	250 Desmo	239 Desmo
Year	**1968–71**	**1968–74**	**1971–4**	**1974**
Bore (mm)	74	74	74	72.5
Stroke (mm)	57.8	57.8	57.8	57.8
Capacity (cc)	248.589	248.589	248.589	238.613
Compression ratio	9.7:1	9.2:1	9.7:1	10:1
Valve gear	ohc	ohc	ohc	ohc
Oil system	wet sump	wet sump	wet sump	wet sump
Inlet opens BTDC	70	27	70	70
Inlet closes ABDC	82	75	82	82
Exhaust opens BBDC	80	60	80	80
Exhaust closes ATDC	65	32	65	65
Tappets, inlet (mm)	upper rocker 0.15 lower rocker 0	0.10	upper rocker 0.15 lower rocker 0	upper rocker 0.15 lower rocker 0
Tappets, exhaust (mm)	upper rocker 0.15 lower rocker 0	0.15	upper rocker 0.15 lower rocker 0	upper rocker 0.15 lower rocker 0
Primary drive gearing	2.500:1	2.500:1	2.500:1	2.500:1
Final drive gearing	2.647:1	3.000:1	2.647:1	2.647:1
Box gearing				
5th	0.97:1	0.97:1	0.97:1	0.97:1
4th	1.10:1	1.10:1	1.10:1	1.10:1
3rd	1.35:1	1.35:1	1.35:1	1.35:1
2nd	1.73:1	1.73:1	1.73:1	1.73:1
1st	2.46:1	2.46:1	2.46:1	2.46:1
No. gears	5	5	5	5
Front tyre	2.75 × 18	3.50 × 19	2.75 × 18	2.75 × 18
Rear tyre	3.00 × 18	4.00 × 18	3.00 × 18 **1**	3.25 × 18
Front brake (mm)	drum 180	drum 180	dual drum 180 **2**	disc 280
Rear brake (mm)	drum 160	drum 160	drum 160	drum 160
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	coil	coil	electronic	electronic

Wheelbase (mm)	1360	1380	1360	1360
Ground clear. (mm)	130	130	130	130
Seat height (mm)	735	770	735	735
Width (mm)	600	940	600	600
Length (mm)	2000	2120	2000	2000
Dry weight (kg)	128	132	128	128
Generator/output	6v/70w	6v/70w	6v/70w	6v/70w
Battery	6v 13.5ah	6v 13.5ah	6v 13.5ah	6v 13.5ah

1 1971–2, 1973–4—3.25 × 18 **2** 1971–2, 1973–4—disc 280 mm

Model	**239 Mark 3**	**Monza Junior**	**Piuma Standard**	**Piuma Sport**
Year	**1974**	**1964–7**	**1961–8**	**1962–6**
Bore (mm)	72.5	61	38	38
Stroke (mm)	57.8	52	42	42
Capacity (cc)	238.613	151.968	47.663	47.663
Compression ratio	10:1	8.2:1	6.3:1	9:5:1
Valve gear	ohc	ohc	ts	ts
bhp		13	1.5	4.2
@ rpm		8000	5200	8600
Oil system	wet sump	wet sump	petrol/oil mix	petrol/oil mix
Inlet opens BTDC	62	24		
Inlet closes ABDC	76	40		
Exhaust opens BBDC	70	51		
Exhaust closes ATDC	48	30		
Tappets, inlet (mm)	0.05	0.05		
Tappets, exhaust (mm)	0.10	0.07		
Primary drive gearing	2.500:1	3.000:1	3.666:1	3.666:1
Final drive gearing	2.812:1	2.875:1	3.250:1	3.000:1
Box gearing				
5th	0.97:1			
4th	1.10:1	0.97:1		
3rd	1.35:1	1.18:1	1.14:1	1.14:1
2nd	1.73:1	1.65:1	1.61:1	1.61:1
1st	2.46:1	2.75:1	2.61:1	2.61:1
No. gears	5	4	3	3
Front tyre	3.00 × 19	2.75 × 16	2.25 × 18	2.25 × 18
Rear tyre	3.50 × 18	3.25 × 16	2.25 × 18	2.25 × 18
Front brake (mm)	dual drum 180	drum 158	drum 90	drum 105
Rear brake (mm)	drum 160	drum 136	drum 90	drum 105
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	electronic	flywheel mag	flywheel mag	flywheel mag
Wheelbase (mm)	1360	1330	1170	1170
Ground clear. (mm)	130			
Seat height (mm)	735	760	760	760
Width (mm)	780	735	720	570
Length (mm)	2000	1980	1910	1910
Dry weight (kg)	128	108	50	52
Generator/output	6v/70w	6v/40w	6v/18w	6v/18w
Battery	6v 12ah	6v 7ah	none	none

Model	Piuma De-Luxe	Brisk	Sport 48	80 Standard
Year	1962–7	1961–7	1962–5	1962–3
Bore (mm)	38	38	38	47
Stroke (mm)	42	42	42	46
Capacity (cc)	47.632	47.632	47.632	79.807
Compression ratio	6.3:1	6.3:1	9.5:1	7.1:1
Valve gear	ts	ts	ts	ts
bhp	2.2	1.5	4.2	4.25
@ rpm	5800	5200	8600	7200
Oil system	petrol/oil mix	petrol/oil mix	petrol/oil mix	petrol/oil mix
Primary drive gearing	3.666:1		3.666:1	
Final drive gearing	3.250:1		3.000:1	
Box gearing				
3rd	1.14:1		1.14:1	
2nd	1.61:1		1.61:1	
1st	2.61:1		2.61:1	
No. gears	3	1	3	3
Front tyre	2.25 × 19	2.00 × 18	2.25 × 19	2.00 × 18
Rear tyre	2.25 × 19	2.00 × 18	2.25 × 19	2.00 × 17
Front brake (mm)	drum	drum 90	drum 105	drum 118
Rear brake (mm)	drum	drum 90	drum 105	drum 118
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	flywheel mag	flywheel mag	flywheel mag	flywheel mag
Wheelbase (mm)	1170	1160	1180	1160
Seat height (mm)	770	760	780	760
Width (mm)	720	720	570	670
Length (mm)	1910	1900	1800	1780
Dry weight (kg)	52	45	54	62
Generator/output	6v/18w	6v/18w	6v/18w	6v/30w
Battery	none	none	none	none

Model	Sport 80	48SL	100 Cadet (51 mm bore)	100 Cadet (52 mm bore)
Year	1962–3	1964–5	1964–6	1967
Bore (mm)	47	38	51	52
Stroke (mm)	46	42	46	46
Capacity (cc)	79.807	47.633	93.969	97.691
Compression ratio	7.1:1	9.5:1	8.5:1	9:1
Valve gear	ts	ts	ts	ts
Oil system	petrol/oil mix	petrol/oil mix	petrol/oil mix	petrol/oil mix
Primary drive gearing		3.666:1	3.000:1	3.000:1
Final drive gearing		3.250:1	3.000:1 1	
Box gearing				
3rd		1.04:1	1.14:1	
2nd		1.61:1	1.76:1	
1st		2.83:1	3.18:1	
No. gears	3	3	3 2	4
Front tyre	2.00 × 18	2.25 × 18	2.25 × 18	2.25 × 18
Rear tyre	2.00 × 17	2.50 × 17	2.50 × 18	2.50 × 18
Front brake (mm)	drum 118	drum 118	drum 118	drum 118
Rear brake (mm)	drum 118	drum 118	drum 118	drum 118
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	flywheel mag	flywheel mag	flywheel mag	flywheel mag
Wheelbase (mm)	1160	1150	1160	1160
Seat height (mm)	760	730	750	750
Width (mm)	660	550	660	660
Length (mm)	1780	1770	1810	1810
Dry weight (kg)	62	59	66	66
Generator/output	6v/30w	6v/18w	6v/30w	6v/30w
Battery	none	none	none	none

1 1964–5—three speed 2 1964–5, 1966—four gears

Model	100 Mountaineer (51 mm bore)	100 Mountaineer (52 mm bore)	Brio 48 scooter	Brio 50 scooter
Year	**1964–6**	**1967**	**1963–6**	**1967–8**
Bore (mm)	51	52	38	38
Stroke (mm)	46	46	42	42
Capacity (cc)	93.969	97.691	47.633	47.633
Compression ratio	8.5:1	9:1	7:1	7:1
Valve gear	ts	ts	ts	ts
bhp			1.5	1.5
@ rpm			5200	5200
Oil system	petrol/oil mix	petrol/oil mix	petrol/oil mix	petrol/oil mix
Primary drive gearing	3.000:1	3.000:1	3.666:1	3.666:1
Box gearing				
3rd	1.14:1		1.04:1	1.04:1
2nd	1.76:1		1.61:1	1.61:1
1st	3.18:1		2.83:1	2.83:1
No. gears	3 1	4	3	3
Front tyre	2.50 × 16	2.50 × 16	1.75 × 9	1.75 × 9
Rear tyre	3.50 × 16	3.50 × 16	1.75 × 9	1.75 × 9
Front brake (mm)	drum 118	drum 118	drum 105	drum 105
Rear brake (mm)	drum 118	drum 118	drum 105	drum 105
Front suspension	teles	teles	leading link	leading link
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	flywheel mag	flywheel mag	flywheel mag	flywheel mag
Wheelbase (mm)	1170	1170		
Seat height (mm)	760	760		
Width (mm)	700	700		
Length (mm)	1830	1830		
Dry weight (kg)	68	68	63.5	63.5
Generator/output	6v/30w	6v/30w	6v/18w	6v/18w

1 1966—four gears

Model	Brio 100 scooter	Brio 100/25 scooter	48 Cacciatore	50SL
Year	**1964–7**	**1968**	**1964–7**	**1966**
Bore (mm)	51	51	38	38.8
Stroke (mm)	46	46	42	42
Capacity (cc)	93.969	93.969	47.633	49.659
Compression ratio	8.5:1	8.5:1	9.5:1	11:1
Valve gear				
bhp	6	6	4.2	
@ rpm	5200	5200	8600	
Oil system	petrol/oil mix	petrol/oil mix	petrol/oil mix	petrol/oil mix
Primary drive gearing	3.000:1	3.000:1	3.666:1	3.666:1
Final drive gearing			3.500:1	4.083:1
Box gearing				
4th				1.04:1
3rd	1.14:1	1.14:1	1.04:1	1.35:1
2nd	1.76:1	1.76:1	1.61:1	1.94:1
1st	3.18:1	3.18:1	2.83:1	3.27:1
No. gears	3	3	3	4
Front tyre	3.50 × 8	3.50 × 8	2.50 × 18	2.25 × 19
Rear tyre	3.50 × 8	3.50 × 8	3.25 × 16	2.25 × 19
Front brake (mm)	drum 105	drum 105	drum 118	drum 118
Rear brake (mm)	drum 105	drum 105	drum 118	drum 118
Front suspension	leading link	leading link	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	flywheel mag	flywheel mag	flywheel mag	flywheel mag
Wheelbase (mm)			1170	1150
Seat height (mm)			760	730
Width (mm)			700	550
Length (mm)			1830	1770
Dry weight (kg)	80	80	63	59

Model	Brio 100 scooter	Brio 100/25 scooter	48 Cacciatore	50SL
Year	1964–7	1968	1964–7	1966
Generator/output	6v/30w	6v/30w	6v/18w	6v/18w
Battery	none	none	none	none

1 With 42T rear wheel sprocket; 5.000 dirt, 60T

Model	50SL1	50SL2	Rolly 50	50 Scrambler
Year	1967–8	1968–9	1968	1969–70
Bore (mm)	38.8	38.8	38	38.78
Stroke (mm)	42	42	42	42
Capacity (cc)	49.660	49.660	47.663	49.660
Compression ratio	11:1	11:1	6.3:1	10.5:1
Valve gear	ts	ts	ts	ts
bhp			1.5	3.27
@ rpm			5200	6500
Oil system	petrol/oil mix	petrol/oil mix	petrol/oil mix	petrol/oil mix
Primary drive gearing	3.666:1	3.666:1		3.000:1
Final drive gearing	4.083:1	4.083:1		3.818:1
Box gearing				
4th	1.04:1	1.04:1		1.04:1
3rd	1.35:1	1.35:1		1.35:1
2nd	1.94:1	1.94:1		1.94:1
1st	3.27:1	3.27:1		3.27:1
No. gears	4	4	1	4
Front tyre	2.25 × 19	2.25 × 19		2.50 × 18
Rear tyre	2.25 × 19	2.25 × 19		2.50 × 17
Front brake (mm)	drum 118	drum 118	drum 90	drum 118
Rear brake (mm)	drum 118	drum 118	drum 90	drum 118
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	solid	s/a
Ignition system	flywheel mag	flywheel mag	flywheel mag	flywheel mag
Wheelbase (mm)	1150	1150		1180
Seat height (mm)	730	730		730
Width (mm)	550	650		800
Length (mm)	1770	1770		1840
Dry weight (kg)	59	60	43	64
Generator/output	6v/18w	6v/18w	6v/18w	6v/18w
Battery	none	none	none	none

Model	100 Scrambler	125 Cadet/4	Sebring	350 Scrambler
Year	1969–70	1967	1965–7	1968–74
Bore (mm)	52	53	76	76
Stroke (mm)	46	55	75	75
Capacity (cc)	97.690	121.340	340.235	340.235
Compression ratio	11.2:1	8.4:1	8.5:1	9.5:1
Valve gear	ts	ohv	ohc	ohc
bhp	6.27			
@ rpm	6000			
Oil system	petrol/oil mix	wet sump	wet sump	wet sump
				1968|1969–74
Inlet opens BTDC		30	20	65 | 70
Inlet closes ABDC		70	70	76 | 84
Exhaust opens BBDC		70	50	80 | 80
Exhaust closes ATDC		30	30	50 | 64
Tappets, inlet (mm)		0.05	0.07	0.10
Tappets, exhaust (mm)		0.05	0.10	0.15
Primary drive gearing	3.000:1	3.000:1	2.111:1	2.111:1
Final drive gearing	3.000:1	3.000:1	2.647:1	3.214:1
Box gearing				
5th			0.97:1	0.97:1
4th	1.04:1	1.043:1	1.10:1	1.10:1

Model	100 Scrambler	125 Cadet/4	Sebring	350 Scrambler
Year	**1969–70**	**1967**	**1965–7**	**1968–74**
3rd	1.35:1	1.35:1	1.35:1	1.35:1
2nd	1.94:1	1.937:1	1.73:1	1.73:1
1st	3.27:1	3.181:1	2.53:1	2.46:1
No. gears	4	4	5	5
Front tyre	2.50 × 18	2.50 × 18	2.75 × 18	3.50 × 19
Rear tyre	2.50 × 17	2.75 × 18	3.00 × 18	4.00 × 18
Front brake (mm)	drum 118	drum 118	drum 180	drum 180
Rear brake (mm)	drum 118	drum 118	drum 160	drum 160
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	flywheel mag	coil	coil	coil
Wheelbase (mm)	1180	1160	1330	1330
Ground clear. (mm)	150		130	130
Seat height (mm)	730	770	800	770
Width (mm)	800	670	850	940
Length (mm)	1840	1810	2000	2120
Dry weight (kg)	67	72	123	133
Generator/output	6v/30w	6v/28w	6v/60w	6v/70w
Battery	none	6v 13.5ah	6v 13.5ah	6v 13.5ah

Model	Sebring (w/case)
Year	**1968**
Bore (mm)	76
Stroke (mm)	75
Capacity (cc)	340.235
Compression ratio	9.5:1
Valve gear	ohc
Oil system	wet sump
Inlet opens BTDC	20
Inlet closes ABDC	70
Exhaust opens BBDC	50
Exhaust closes ATDC	30
Tappets, inlet (mm)	0.05
Tappets, exhaust (mm)	0.10
Primary drive gearing	2.111:1
Final drive gearing	3.214:1
Box gearing:	
5th	0.97
4th	1.10
3rd	1.35:1
2nd	1.73:1
1st	2.46:1
No. gears	5
Front tyre	2.75 × 18
Rear tyre	3.00 × 18
Front brake (mm)	drum 180
Rear brake (mm)	drum 160
Front suspension	teles
Rear suspension	s/a
Ignition system	coil
Wheelbase (mm)	1365
Ground clear. (mm)	130
Seat height (mm)	800
Width (mm)	850
Length (mm)	2000
Dry weight (kg)	127
Generator/output	6v/70w
Battery	6v 13.5ah

Model	350 Mark 3	350 Mark 3D	350 Desmo	450 Scrambler
Year	1968–74	1968–71	1971–4	1969–74 5
Bore (mm)	76	76	76	86
Stroke (mm)	75	75	75	75
Capacity (cc)	340.235	340.235	340.235	435.661
Compression ratio	9.5:1	9.5:1	9.5:1	9.3:1
Valve gear	ohc	ohc	ohc	ohc
Oil system	wet sump	wet sump	wet sump	wet sump
Inlet opens BTDC	70	70	70	27
Inlet closes ABDC	84	82	82	75
Exhaust opens BBDC	80	80	80	60
Exhaust closes ATDC	64	65	65	32
Tappets, inlet (mm)	0.10	upper rocker 0.15 lower rocker 0	upper rocker 0.15 lower rocker 0	0.10
Tappets, exhaust (mm)	0.15	upper rocker 0.15 lower rocker 0	upper rocker 0.15 lower rocker 0	0.15
Primary drive gearing	2.111:1	2.111:1	2.111:1	2.111:1
Final drive gearing	3.214:1	2.500:1	2.500:1	2.692:1
Box gearing:				
5th	0.97:1	0.97:1	0.97:1	0.97:1
4th	1.10:1	1.10:1	1.10:1	1.10:1
3rd	1.35:1	1.35:1	1.35:1	1.35:1
2nd	1.73:1	1.73:1	1.73:1	1.73:1
1st	2.46:1	2.46:1	2.46:1	2.46:1
No. gears	5	5	5	5
Front tyre	2.75 × 18 1	2.75 × 18	2.75 × 18	3.50 × 19
Rear tyre	3.00 × 18 2	3.00 × 18	3.25 × 18	4.00 × 18
Front brake (mm)	drum 180 3	drum 180	dual drum 180 4	drum 180 6
Rear brake (mm)	drum 160	drum 160	drum 160	drum 160
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	coil 7	coil	coil 8	coil
Wheelbase (mm)	1360	1360	1360	1380
Ground clear. (mm)	130	130	130	130
Seat height (mm)	735	735	735	770
Width (mm)	780	600	600	940
Length (mm)	2000	2000	2000	2120
Dry weight (kg)	128	128	128	140
Generator/output	6v/70w	6v/70w	6v/70w	6v/70w
Battery	6v 13.5ah	6v 13.5ah	6v 13.5ah	6v 13.5ah

1 1973–4—3.0 × 19 2 1971–4—3.50 × 18 3 1973–4—dual drum 180 4 1973–4 280 disc. Also available with a dual drum 180 5 450SCR, marketed as the Jupiter in the USA during 1970 season 6 1973–4 dual drum 180 7 1973–4—electronic 8 1973–4—electronic

Model	450 Mark 3	450 Mark 3D	450 Desmo	450R/T
Year	1969–74	1969–71	1971–4	1971–2
Bore (mm)	86	86	86	86
Stroke (mm)	75	75	75	75
Capacity (cc)	435.661	435.661	435.661	435.661
Compression ratio	9.3:1 1	9.3:1	9.3:1	9.3:1
Inlet opens BTDC	27	70	70	70
Inlet closes ABDC	75	82	82	82
Exhaust opens BBDC	60	80	80	80
Exhaust closes ATDC	32	65	65	65
Tappets, inlet (mm)	0.10	upper rocker 0.15 lower rocker 0	upper rocker 0.15 lower rocker 0	upper rocker 0.15 lower rocker 0
Tappets, exhaust (mm)	0.15	upper rocker 0.15 lower rocker 0	upper rocker 0.15 lower rocker 0	upper rocker 0.15 lower rocker 0
Primary drive gearing	2.111:1	2.111:1	2.111:1	2.111:1
Final drive gearing	2.666:1	2.666:1	2.666:1	2.692:1
Box gearing:				
5th	0.97:1	0.97:1	0.97:1	0.97:1
4th	1.10:1	1.10:1	1.10:1	1.10:1

Model	450 Mark 3	450 Mark 3D	450 Desmo	450R/T
Year	1969–74	1969–71	1971–4	1971–2
3rd	1.35:1	1.35:1	1.35:1	1.35:1
2nd	1.73:1	1.73:1	1.73:1	1.73:1
1st	2.46:1	2.46:1	2.46:1	2.46:1
No. gears	5	5	5	5
Front tyre				3.00 × 21
Rear tyre				4.00 × 18
Front brake (mm)	drum 180 2	drum 180	dual drum 180 3	drum 158
Rear brake (mm)	drum 160	drum 160	drum 160	drum 160
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	coil 4	coil	coil 5	flywheel mag
Wheelbase (mm)	1360	1360	1360	
Ground clear. (mm)	130	130	130	
Seat height (mm)	735	735	735	790
Width (mm)	780	600	600	930
Length (mm)	2000	2000	2000	2180
Dry weight (kg)	130	130	130	124
Generator/output	6v/70w	6v/70w	6v/70w	6v/40w
Battery	6v 13.5ah	6v 13.5ah	6v 13.5ah	none

1 Some 450 Mark 3s in touring trim had a concave 8:1 piston in 1972 2 1971–4 dual drum 180 3 1973–4—disc 280 4 1973–4—electronic 5 1973–4—electronic

Model	125 Scrambler
Year	1971
Bore (mm)	55.2
Stroke (mm)	52
Capacity (cc)	124.443
Compression ratio	8.5:1
Valve gear	ohc
bhp	10
@ rpm	8500
Oil system	wet sump
Inlet opens BTDC	24
Inlet closes ABDC	40
Exhaust opens BBDC	56
Exhaust closes ATDC	22
Tappets, inlet (mm)	0.20
Tappets, exhaust (mm)	0.20
Primary drive gearing	3.000:1
Final drive gearing	3.714:1
Box gearing:	
5th	0.97:1
4th	1.10:1
3rd	1.35:1
2nd	1.65:1
1st	2.39:1
No. gears	5
Front tyre	2.50 × 19
Rear type	3.50 × 18
Front brake (mm)	drum 158
Rear brake (mm)	drum 136
Front suspension	teles
Rear suspension	s/a
Ignition system	coil
Wheelbase (mm)	1340
Ground clear. (mm)	180
Seat height (mm)	850
Width (mm)	860
Length (mm)	2040
Dry weight (kg)	105
Battery	6v 11ah

Model	450T/S	450 Mark 3 Tourer	Regolarita	Six Days
Year	1971–2	1970–2	1975–6	1977
Bore (mm)	86	86	54	54
Stroke (mm)	75	75	54	54
Capacity (cc)	435.661	435.661	123.672	123.672
Compression ratio	9.3:1	8:1	12.4:1	14.6:1
Valve gear	ohc	ohc	ts	ts
bhp			21.8	25
@ rpm			9000	10250
Inlet opens BTDC	70	27		
Inlet closes ABDC	82	75		
Exhaust opens BBDC	80	60		
Exhaust closes ATDC	65	32		
Tappets, inlet (mm)	upper rocker 0.15 lower rocker 0	0.10		
Tappets, exhaust (mm)	upper rocker 0.15 lower rocker 0	0.15		
Primary drive gearing	2.111:1	2.111:1		
Final drive gearing	2.692:1	2.666:1		
Box gearing:				
6th			2.65:1	2.65:1
5th	0.97:1	0.97:1	3.05:1	3.05:1
4th	1.10:1	1.10:1	3.77:1	3.77:1
3rd	1.35:1	1.35:1	4.87:1	4.87:1
2nd	1.73:1	1.73:1	6.61:1	6.61:1
1st	2.46:1	2.46:1	9.5:1	9.5:1
No. gears	5	5	6	6
Front tyre	3.00 × 21	3.00 × 18	3.00 × 21	3.00 × 21
Rear tyre	4.00 × 18	3.25 × 18	3.75 × 18	4.00 × 18
Front brake (mm)	drum 158	drum 180	drum 125	drum 125
Rear brake (mm)	drum 160	drum 160	drum 125	drum 125
Front suspension	teles	teles	teles	teles
Rear suspension	s/a	s/a	s/a	s/a
Ignition system	flywheel mag	coil	Motoplat electronic	Motoplat electronic
Wheelbase (mm)		1360		
Ground clear. (mm)		130		
Seat height (mm)	790	735	851	856
Width (mm)	930	800		
Length (mm)	2180	2000		
Dry weight (kg)	128	133	108	101
Generator/output	6v/40w	6v/70w	6v/60w	6v/60w
Battery	none	6v 13.5ah	6v 7ah	6v 7ah

2 Model alterations

1957
First ohc models introduced. 174 cc in two versions S—Sport, T—Touring, and 124 cc in Sport form only. 175S had 22.5 mm carburettor, round Bakelite fuel cap, twin silencers, whilst 175T had 22 mm carburettor, chrome quick-action filler cap, single silencer and valanced mudguards. All existing models continued.

1958
The previous year's ohc S and T were thereafter known as Sport and Touring. The only changes to the 175 were the exhaust pipe shape and end cone to the Silentium silencers. Gear lever was modified. The 125 had its carburettor changed from an MB20B to a UB20BS, in addition an optional SS1 22C was offered. Other changes included the petrol tank paint style and front engine plates (four-hole, instead of three-hole for 1957). New introductions for the year were 85N and 85 Sport, both with 85 cc ohv engines. The 98TS ohv and several new ohc models. 100 Sport, 125TS, 175 Americano, 175TS and 175 Motocross. The 100 Sport was a 125 Sport with the bore reduced to 49 mm, in place of the metal tank badge was a 'Ducati Meccanica' transfer, and the headlamp rim did not have a peak like the 125. The 125TS had a tank of different shape with a black Bakelite filler cap. Conventional handlebars with the top fork yoke having clamps. The headlamp brackets and top spring covers were a combined black-painted steel pressing and the brake drum diameter was reduced to 158 and 136 mm front and rear respectively. Carburettor size was 18 mm, against 20 mm for the 125 Sport. The 175 Americano was a model with US styling including high-rise bars, larger dual saddle with a large number of metal studs, two horns, a crashbar and a smaller capacity tank taken from the 100/125 Sport. 175S, different tank (like the 125TS), deeply valanced mudguards and conventional, flat handlebars. The 175 Motocross had a black open megaphone, 21 in front wheel, braced bars and scrambler tyres.

1959
200 (203 cc) introduced in four versions: Elite, Super Sport, Americano and Motocross. The Elite and Super Sport were identical to 175 Sport except carburettor size increased to 24 mm, the Elite and Americano featured valanced mudguards and twin silencers, the SS a single silencer. The Motocross was a larger-bore version of 175 Motocross.

1960
200 engine modified as forerunner to test items for new 250 unit. These changes were crankshaft (one long shoulder, in place of previous equal-crankpin type), clutch housing and cylinder head. The 175 type had fins running across front to back in between four head bolts 250-type, 200 did not. Elite introduced with identical lightweight mudguards as 200SS. 200 Motocross now had lower front mudguard and chrome silencer fitted, restricting noise and power output. 200 Americano dropped. New model introduced to replace it called the 200TS; different saddle and tank design, to be used the following year on the 250 Monza. Also equipped with crashbar, valanced mudguards and high bars.

1961
248 cc engine introduced initially in two versions. Monza (touring), Diana (sport). The latter was marketed in Britain as the Daytona. Monza had prop stand, high bars, small tank with chrome fluting and valanced rear mudguard. Diana clip-ons, larger tank, mudguard similar to 175 Sport/200SS and later Elite, but longer at front. Both had larger toolbox/air cleaner, cover on front offside brake hub. These models also introduced alloy oblong rear light used on many later models. Both featured 24 mm UBF 24BS carburettor with air filter hose and four-ring piston. Some Dianas were sold in the USA with 27 mm SS1 carburettor, higher-compression three-ring piston and large Veglia tachometer. Others were kitted out in a like manner elsewhere after being sold. Brisk and Piuma two-stroke introduced. The following were discontinued: 100 Sport, 175TS, 200SS and 200 Motocross.

1962
250 Scrambler introduced, this like the USA models. Diana used a flywheel magneto without a battery. No toolboxes, horn or charging system. 27 mm SS1 carburettor, abbreviated mudguarding, 19 in wheels and special tank and saddle. Also available for American flat-track events with solid struts replacing conventional rear units. Also introduced was 200GT. This was essentially a 250 with 200 engine unit, main changes from Diana styling were the valanced mudguards and deep claret paint finish. More two-strokes were added, a De Luxe version of the three-speed Piuma with dual saddle and fully enclosed chaincase, Sport version with downdraught 15 mm carburettor, motorcycle-style tank, saddle and exhaust system. All Piumas, however, employed the same pressed-steel open frame.

Sport 48 introduced using Piuma Sport engine, but in a full double-cradle frame with racing styling, including clip-ons and bum-stop saddle. 175/200 Bakelite screw filler cap used. 80 cc version of Sport 48 was introduced in two forms, both with same single downtube frame and larger tank. Sport model had clip-ons, standard version conventional handlebars.

1963

48 Brio scooter, using fan-cooled version of Piuma engine, producing 1.5 bhp. Three-speed hand gearchange, 9 in tyres and single seat. 200GT discontinued.

1964

All 250 models received five-speed gearboxes, in addition two new models were introduced—250 Mach 1, 250GT. The Mach 1 was the star performer with its highly-tuned engine featuring high-lift camshaft, 10:1 piston, larger valves and 29 mm Dell'Orto SS1 carburettor. Tank had cut-away underneath to enable larger carburettor to be fitted. Specification also included clip-ons, rearsets and ball-ended control levers. 250GT was a soft tourer with even lower performance than the Monza and used tank, panels and mudguards from 200GT. A distinctive feature was the fitment of swan-neck clip-on handlebars which provided a touring riding position.

160 Monza Junior introduced, engine developed from ohc 125. Capacity 156 cc, 22 mm carburettor, four speeds. Original version used tank from early 250 Monza, with round 130 mm headlight and round-section mudguards. Touring guise complemented by parcel carrier, crashbars and prop stand. 16 in wheels as standard, many parts from 125TS model. New two-strokes were: 48SL, 100 Cadet, 100 Mountaineer, Brio 100 scooter and 48 Cacciatore. 48SL was restyled version of Sport 48, but with fan-cooling and new tank, saddle, toolbox and mudguards. Unlike the Sport 48, the SL had an air cleaner. Cadet and Mountaineer were brand-new designs, both used identical engine unit with three speeds and fan-cooling. The Brio 100 also used this 94 cc engine, but in a full-size scooter, with 8 in wheels and a dual saddle. For their American launch, the 100s were marketed as '90 cc' by the US importers. With the introduction of the five-speed ohc 250s, all the four-speed models in this size were discontinued, in addition both 80 cc two-strokes ceased production.

1965

Mark 3 updated to Mach 1 specification, but retained high bars and flywheel magneto ignition. All 250s now fitted ball-ended levers. GT fitted with Monza handlebars and Mark 3 saddle. Monza Junior produced with different square styling, but retaining original round headlamp, 340 cc version of five-speed 250 introduced. Two versions produced in 1965, USA edition had Monza styling, whereas Sebring sold in other markets was identical to the 1965 250GT. 125TS, 125 Sport, 200 Elite and Sport 48 all discontinued.

1966

Touring 250s and 350s extensively restyled. 250 Scrambler now fitted with battery, and tyre sizes altered to 3.50 × 19 in front/4.00 × 18 in rear. Mach 1 had Mark 3 saddle. Mark 3 given Monza footrests and pedals. GT and Monza had tank, saddle, side panels and mudguards introduced on Series 2 160 Monza Junior previous year, also Sebring produced in same guise. All three and the Monza given hexagonal Aprilia cast-alloy headlamp shell and matching chrome-plated rim to complete new styling package. All four-stroke models now with matching air scoop on speedo drive mounting plate and wheel hubs with fewer ribs across hub than previously, three front and four rear (against seven front and rear on all previous ohc models). Four-speed version of the two-strokes introduced in both capacity classes, also changed from hand- to foot-change. The only new model was the two-stroke 50SL. This was clearly based on the earlier 48SL, but the engine had its bore increased to 38.8 giving a capacity of 49.660 cc, in addition to a high-level exhaust system with heat shield run all the way along the offside, other changes were a plastic moped-type headlight, square-section mudguards and the saddle from a 100 Cadet. The other major change was the use of 19 in wheels. Piuma Sport discontinued.

1967

50SL discontinued in favour of the new SL1, this retained the SL four-speed engine, but introduced chromed-bore alloy cylinder barrel, which was also carried through into the Cadet and Mountaineer, at the same time their bore size increased by 1 mm to 52 mm, raising the capacity to 98 cc. The SL1 had a completely new tank, with twin filler caps, and clip-ons and small single saddle. Mach 1 discontinued, replaced by a revised Mark 3 which now had the battery/coil electrics from the Mach 1. For America this model was still offered with the high bars and 'race kit' comprising large Veglia tachometer, black megaphone, racing flyscreen and number plates and an assortment of jots. In other countries it simply replaced the Mach 1 and therefore had clip-ons and rearset footrests, but like the 1966 Mach 1 had the larger Mark 3 saddle. The 125 Cadet/4 pushrod was introduced, but by the end of the year had been taken out of production, essentially using the cycle parts of the 100 Cadet two-stroke, with a different tank, headlight and exhaust system. It also differed in having a battery. Brio scooter title change from '48' to '50'. 48 Cacciatore discontinued.

1968

All the existing four-stroke models were replaced by new machines featuring larger-capacity sumps and much wider rear engine mounting points. First model was the 350 Scrambler introduced in May followed by 250 and 350 Desmo (Mark 3D) and Mark 3, plus a 250 Scrambler. Scramblers had 19 in front wheels, enclosed rear suspension units and heavy-duty front forks. Mark 3s had painted mudguards. Mark 3Ds had chrome trim for tank, with chromed mudguards and Desmo emblem on nearside cam end cover. 1968 models of Mark 3 and Desmo had twin filler caps and SS1 carburettors. Besides the discontinued four-strokes, the following two-strokes were taken out of production: Piuma Standard, De Luxe, Brisk, Cadet, Mountaineer, Brio scooters and SL1. Rolly 50, a single-speed automatic moped with no rear suspension was introduced together with a Piuma with hexagonal headlamp and whitewall tyres. 50 SL2 introduced. 250 Monza, 350 Sebring, Rolly 50 and Piuma discontinued at end of year.

1969
436 cc ohc single introduced in Scrambler, Mark 3 and Desmo versions known as 450, 250, 350 and 450 singles standardized with single filler cap and square-slide VHB29 carburettors. 50 and 100 Scramblers introduced with four-speed two-stroke engines.

1970
Four-stroke models unchanged. All two-strokes discontinued. 450 Scrambler called Jupiter for US market.

1971
Scramblers discontinued, mid-season new version of Mark 3 and Mark 3D (now called Desmo). These had 35 mm Marzocchi forks, dual-sided front brakes, alloy rims and Metalflake silver finish. Fork legs and yoke polished alloy finish 450 R/T and T/S models introduced. Both had in common brand-new heavy-duty frames, braced swinging arms, plastic tanks, side panels and mudguards. R/T was an off-road scrambler, T/S enduro/six days bike with lights and silencer, initially high-level, later fitted with low-level Mark 3 system. 125 Scrambler introduced using Spanish-built five-speed engine and Amal carburettor.

1972
Touring versions of the 450 introduced, simply called Mark 3, one had old-style forks, tank and touring bars with concave low-compression piston, the other was a custom-built tourer with valanced mudguards, panniers, prop stand and crashbars. R/T and 125 Scrambler discontinued.

1973
New versions of Mark 3 and Desmo introduced. Mark 3 with 19 in. front wheel and choice of clip-ons or touring bars, the 35 mm Marzocchi forks now had black-painted yokes and fork bottoms. Mudguards were similar to those fitted to the 750GT with chrome front stays. Desmos in two versions: disc or drum front brakes. Disc version had Ceriani forks and the front mudguard bolted on to the forks. Drum, Marzocchi forks, with the mudguard retained by Jubilee clips. Both Mark 3 and Desmo featured fibreglass side panel covers, both instruments mounted in a black hard rubber moulded surround and fully enclosed rev-counter drive unit. The 350 and 450 Scramblers utilized parts from the 1973 Mark 3, but retained their own tank and saddle. They also used the side panels from the 1971/72 Mark 3/Desmos. The 250 Scrambler remained unchanged. At the end of the year the touring 450s and the T/S were discontinued.

1974
Mark 3, Desmo and Scramblers continued. 250 Scramblers now with Spanish-made engine and Amal carburettor. 239 version of Mark 3 and Desmo introduced for French market, some imported later into Britain. Identified by DM239 on crankcase, used coil valve springs (Mark 3), slipper piston, 30 mm PHF carburettor and Lafranconi silencer. Some 350 Mark 3s used Spanish-built engines towards the end of the year and last Mark 3s produced utilized steel wheel rims, earlier (1968–71) steel toolboxes and chromed plastic 'Ducati' tank badges. All production of the bevel-driven ohc singles stopped at the end of the year.

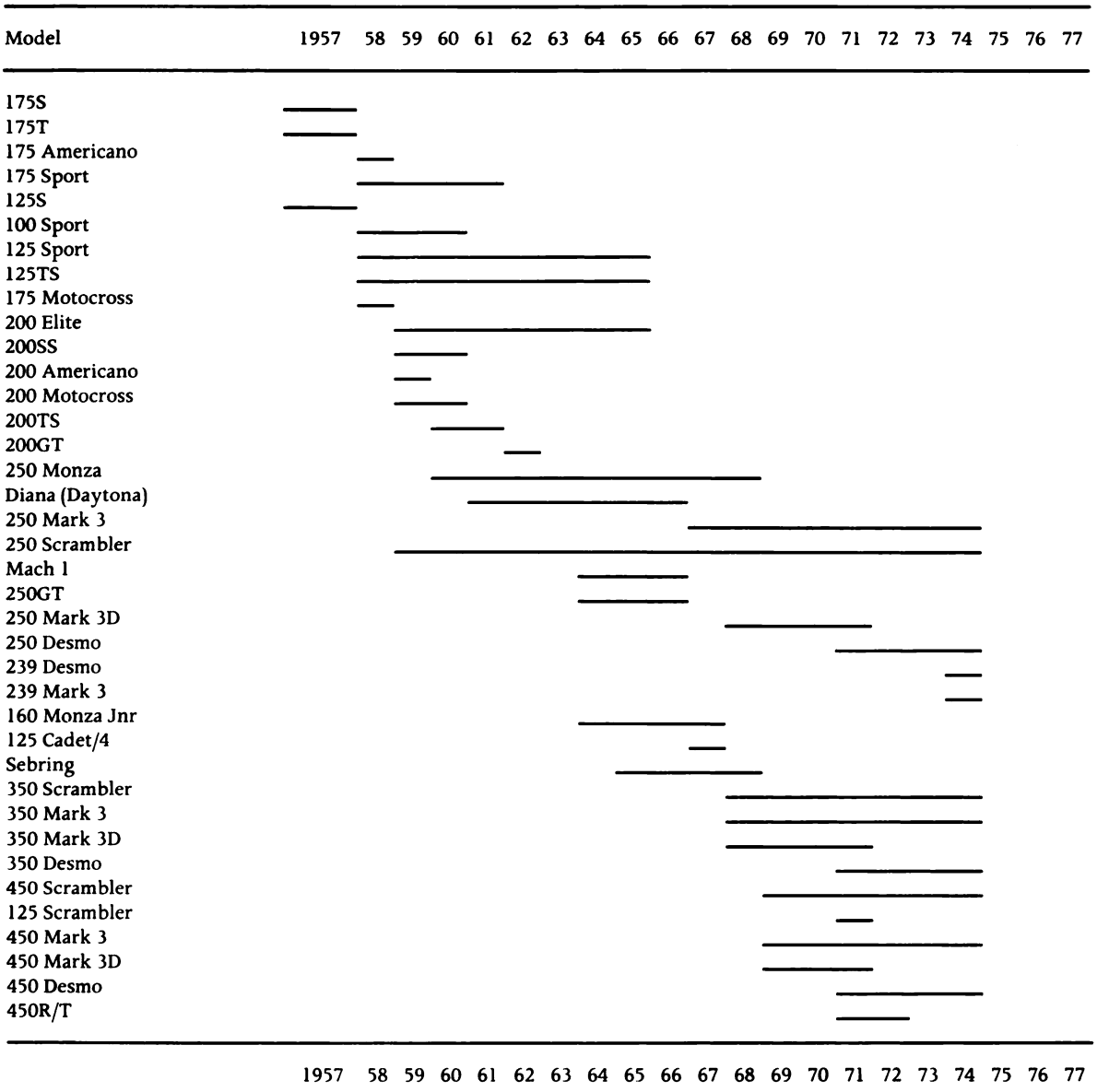
1975
New 125 six-speed two-stroke introduced. The Regolarita had left-hand gearchange, chrome-bore alloy barrel, plastic tank, mudguards and panels. 105 mm headlamp glass with chromed grille and conical brake hubs.

1976
Regolarita continued.

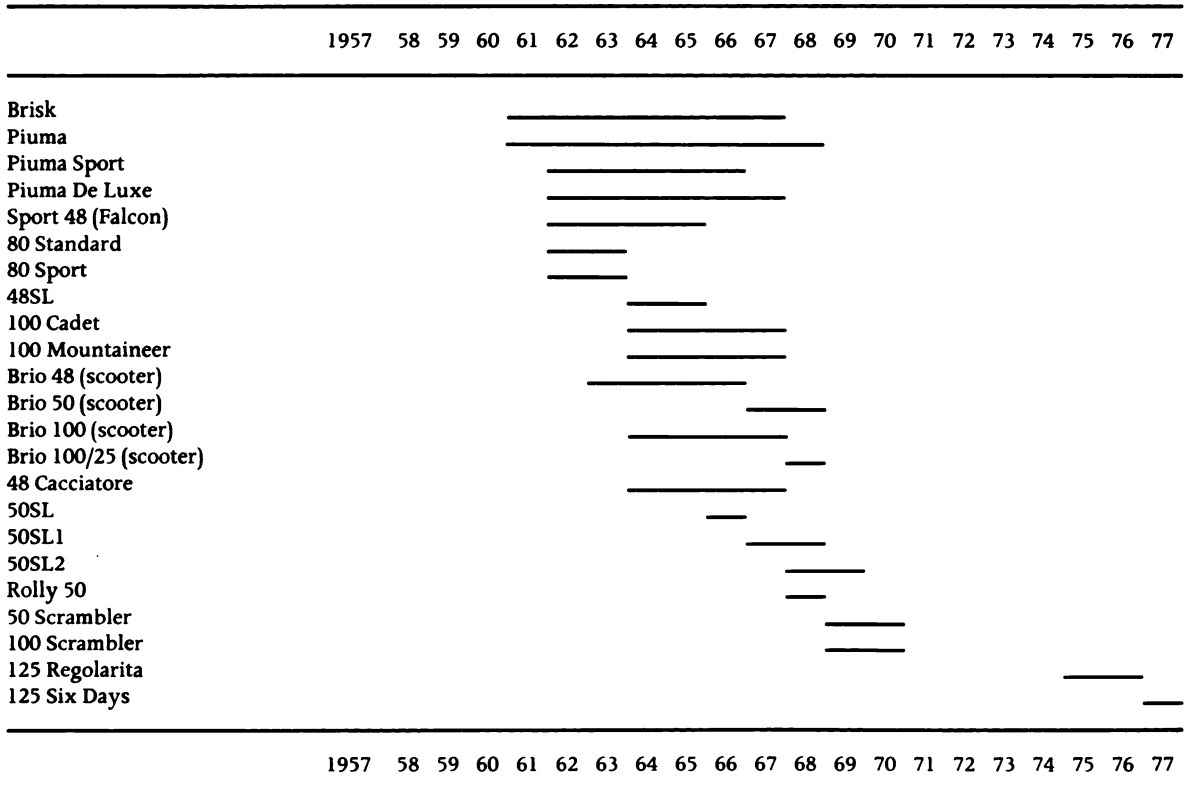
1977
Regolarita discontinued. New model introduced. Six Days, with polished alloy tank, redesigned chassis and more highly-tuned engine. Only a few manufactured before production ceased later that year.

3 Model chart

Four-strokes



Model chart (continued)
Two-strokes



4 Colour schemes

Only the well-known models have been listed here because of the vastness of the range.

125 Sport 1958–65
Metallic blue for all painted parts except mudguards, suspension units, headlamp shell and front section of fuel tank, which were finished in metallic gold. The exceptions were the horn, battery strap and seat brackets, in black.

Transfers: tank sides 'Ducati Meccanica' and 'Made in Italy' at rear of filler cap. 'Ducati' on front mudguard. Many earlier singles used this colour scheme, including 100 Sport, 125TV and several early two-strokes, plus the 125 Formula III racers.

175 Sport 1958–61
Metallic cherry red for mudguards, headlamp shell, suspension units, chainguard, toolboxes, rear light/number plate support and rear section of fuel tank. Metallic gold for frame, swinging arm, bottom yoke, spring covers and fork bottoms, engine mounting plates and centre stand.

The 1957 175S was identical except for gold-painted tank fluting not chrome, which was used in this area from 1958 onwards. The 200 Elite and SS models had an identical paint finish to the 175S.

Transfers: toolbox sides and front mudguards with steel tank badge.

175T 1957 and **Tourist** 1958–61
Overall dark crimson with the following in black: suspension units, rear light/number plate support, headlamp shell, horn and battery strap. White for tank flutes, outlined in yellow striping, as were toolboxes. Other colour options were tank finish in black overall with contrasting white or red.

Transfers: toolboxes and front mudguard, with 'Ducati 175' metal badges for tank in the same style as the Sport model.

250 Monza 1961–5
Overall metallic kingfisher blue with chrome areas on tank and side panels, and striping in red. Metallic gold was used on sections of the toolboxes, the headlamp shell, suspension unit top spring covers and mudguards.

Transfers: 'Moto Ducati' eagle on tank sides, 'Made in Italy' rear of filler cap and '250 Monza' on toolboxes. 'Ducati' on front mudguard. Later Monzas up to the end of 1965 were usually finished in black with silver relief for mudguards, and part of the tank and toolboxes. Some had metallic cherry red tanks, not black.

250 Diana, Diana Mark 3 1961–4
As 1961 250 Monza (kingfisher blue) except for silver, not gold, for parts of the toolboxes, both mudguards, headlamp shell and tank panels. Lining in red.

Transfers: Monza except '250 Diana' on toolboxes ('250 Daytona' for UK).

250 Scrambler 1962–7
All narrow-crankcase 250 Scramblers were black with silver mudguards, headlamp shell, tail-light and air cleaner box. Tank and side panels were in silver with yellow striping.

Transfers: 'Moto Ducati' eagle for tank sides, with 'Made in Italy' behind filler cap and 'Ducati' on front mudguard.

250 Mach 1 1964–6 and **Mark 3** 1965–7
Italian racing red except silver mudguards, headlamp shell, toolboxes and tank flutes, which were lined in yellow. Toolbox lids were lined in yellow (Mark 3) or red (Mach 1).

Transfers: both had 'Moto Ducati' eagle on tank, with 'Made in Italy' and 'Ducati' in traditional places. Toolbox had either 'Mach 1' or 'Mark 3'.

200GT 1962
Deep claret except black headlamp shell, rear light/number plate support, horn and rear suspension unit top spring covers. Silver for tank side flutes as Diana and Mach 1, lining in yellow.

Transfers: 'Ducati Meccanica' for tank, with '200GT' on toolboxes. 'Made in Italy' and 'Ducati' in traditional places.

250GT 1964–5
Black except silver mudguards, headlamp shell and fluting on tank and side panels, pinstriping in yellow.

Transfers: tank 'Moto Ducati', toolboxes '250GT' ('Daytona 250' for UK), 'Made in Italy' and 'Ducati' in usual areas.

Sport 48 1962–5
Metallic gold frame, swinging arm, forks, stand and tank/toolbox flutes, with white pinstriping. Metallic cherry red main area of tank/toolboxes, mudguards, headlamp shell, chainguard and rear light.

Transfers: 'Moto Ducati' tank, 'Sport 48' toolboxes, 'Made in Italy' and 'Ducati' in usual areas. Also in metallic kingfisher blue and silver.

Piuma Sport 1962–6, **De Luxe** 1962–7
Metallic kingfisher blue, with silver forks and headlamp shell, suspension units and tank flutes. Red pinstriping. On De Luxe chain enclosure in silver.

Transfers: 'Moto Ducati' tank, and either 'Piuma Sport 48' or 'Piuma 48' on toolboxes ('Puma' for UK).

48SL, Cacciatore, 50SL and **100 Moutaineer**
Italian racing red or metallic cherry with silver mudguards, toolboxes (red flutes) and headlamp shell. Tanks had silver flutes. Yellow pinstriping for tank and toolboxes. Air cleaner box in matt black.

100 Cadet (fan-cooled) 1964–6
Either—black overall with Italian red tank and silver flutes; silver for mudguards, headlamp shell and toolbox; pinstriping in yellow for tank, black for toolbox. Or—red overall (metallic cherry) replacing areas which were black in the first finish. Both versions had black rear light/number plate assembly, with matt black air cleaner box.

Transfers: 'Moto Ducati' eagle tank sides, 'Cadet 100' on toolbox, 'Made in Italy' and 'Ducati' in usual positions.

100 Cadet (not fan-cooled) 1967
Overall black, with silver for tank flutes, side panel and mudguards.

Brio scooter 1963–8
48 and 50 cream overall; 100 light green overall.

No transfers, but chromed badges: 'Ducati' and 'Brio' in 48, 50 or 100 version. The last batch of 100s had '100/25'. All were on the nearside front leg shield, near the top. Another 'Ducati' chromed badge was mounted above the rear light.

Monza Junior (160) 1964–7
This was produced in three versions. Version 1 used the same colour scheme as the 1964 Monza; versions 2 and 3 had black cycle parts, with silver mudguards, tank and side panels, with about 50 per cent of the bikes having a metallic cherry red tank. On the black/silver bikes all pinstriping was in black, while the red-tank models had their tank pinstriped in gold, with silver panels.

250 Monza and **350 Sebring** (square styling) 1966–8
These were finished as the second and third versions of the 160 Monza Junior, but both the Monza and Sebring were also in a metallic green for both the tank and side panels, with silver tank flutes and gold pinstriping.

250/350 Mark 3 1968–9
Italian racing red, but with silver for mudguards, headlamp shell and tank flutes.

Transfers: three-star effect for toolboxes with inscription '250' or '350' 'Mark 3' in silver. Pinstriping in gold on the tank. 'Made in Italy', rear of filler cap, 'Ducati' on front mudguard. Metal tank badges.

250/350 Mark 3D (Desmo) 1968–9
Overall black, but with metallic cherry red for tank and toolboxes. Chrome replaced the silver paint of the Mark 3s for mudguards, headlamp shell and fluting on the tank sides. Pinstriping was in gold, silver for three-star effect on toolboxes, with inscription '250' or '350'-'Mark 3' with 'D' in yellow with black edging. 'Mark' in black, '3' in yellow and '250' or '350' in black.

As the mudguards were in chrome, no 'Ducati' transfer was applied to front.

250/350/450 Mark 3 and **Mark 3D** 1970–1
With the arrival of the new 450, both Mark 3 and 3D were finished as the 1968–9 Mark 3Ds: in black with the exception of the chrome headlamp shell and tank flutes. However, whereas only metallic cherry had been available, colours were white, yellow or blue (all non-metallic), but as the red only for the tank and toolboxes. Stainless steel replaced chrome for the mudguards.

250/350 Scrambler 1968–74 and **450 Scrambler** 1969–74
Initially, colours were red, white or black for the tank (with chrome flute). Black was the main colour, with silver mudguards. In late 1969 yellow plus orange/red were added. The metal tank badge of the 1968–71 Mark 3 and Desmos was carried on the Scramblers until the end of production in late 1974. The 250 Scrambler remained unchanged for minor details; its last year of production saw it produced only in yellow for the tank (still with chrome flute) and mudguards which, with the tank, had black stripes running lengthways. From the beginning of 1973 the 350/450s had large plastic side panels and double-sided front brakes. These were in an overall black finish with gold pinstriping, or the metallic gold used on the 1973–4 750GT for the tank and mudguards, lined in a similar way to the late 250 Scrambler. The 1973–4 350/450 Scramblers had their side panels moulded in black and, therefore, were 'unpainted', but usually had '350' or '450' decals.

450 Jupiter 1970
USA market name for 450 Scrambler, only sold in yellow and black, see 450 Scrambler 1969–74 above.

125 Scrambler 1971–2
Black with white side number plate/panel covers. Tank and mudguards in orange/red with black lining from front to back. Tank same as other SCR models of the period, but without the chrome fluting or metal badges.

Transfers: 'Ducati' in same style as Desmo and 750S and SS models.

450R/T and **T/S** 1971–3
Silver frame and swinging arm assembly and stands/chainguard. All plastic parts such as side panels, tank, mudguards, headlamp cowling (T/S) moulded in yellow, except the R/T front number plate, which was white. Both models had competition number backgrounds on side panels in white. Rear number plate/light-support mounting (T/S) in moulded black rubber.

250/350/450 Desmo 1971–2
Referred to in some countries as the 'Silver Shotgun'; the reason—Metalflake silver fibreglass for the tank, side panels, seat and mudguards. The rest was finished in black. Chrome headlamp shell.

The bikes used exclusively transfers with a large 'Ducati' in the same style as the 750S and SS and the later yellow Desmos. 'Made in Italy', plus special 'Desmo' transfers for

the side panels, in a contrasting shade of silver were used.

450 Mark 3 (touring version) 1972
Colour scheme as 1968–9 Mark 3Ds (even though the fuel tank was based on the earlier Mach 1).

Mark 3 1973–4
Black with exception of tank, mudguards and side panels. Gold fluting on tank and side panels.

Transfers (not paint): early models had 'Ducati' transfer for tank and fibreglass lids for toolbox/air cleaner with black metal backs—later models, a chromed plastic tank badge and one-piece metal toolbox/air cleaner (one each side) all in blue, except gold flute transfer and either '250', '350' or '450' transfer in white. Other transfers were 'Made in Italy' behind the filler cap and matching gold stripes for the mudguards to go with those on the tank and panels.

Note: the Mark 3 was available with both clip-on and conventional handlebars and had black-painted top and bottom yokes and fork bottoms. None left the factory with polished components.

Desmo models 1973–4
Black but for yellow tank, side panels, seat base and front mudguard. Same colour scheme for disc and drum variants. Rear mudguards in matt black.

Transfers: black for striping on top and on the side of tank. 'Ducati' transfer used earlier on 1971–2 'Silver Shotgun', but side panel transfer design was new for 1973 with thick stripes and word 'Desmo'. Capacity ('239', '250', '350' or '450') was on seat base.

Regolarita 1975–6
Silver frame, swinging arm, front forks and cycle parts, except plastic or fibreglass items. Tank in non-metallic blue or red, with 'Ducati' decal and 860GT/Darmah-style lining (transfers) in white/black. Mudguards in moulded black plastic, matt black rubber number plate/light holder. Rear lamp body in black, also headlamp shell and control lever supports. Complete exhaust system in matt black, including sump/exhaust shield. Leg guard heat grille chrome. Side panels in black moulded plastic, with yellow competition number as was the front background number plate. Headlamp grille chrome plated. A small black, simulated-leather map/tool kit bag was located on top of the rear mudguard.

Six Days 1977
Red polished alloy tank with 'Six Days Ducati' decals, white moulded plastic mudguards and side panels, with yellow competition number backgrounds. Silver chain guard, with same colour used for front fork bottoms.

Transfers (Decals)
As a general rule, all Ducati single-cylinder models between 1957 and 1974 had 'Made in Italy' positioned at the rear of the filler cap, facing towards the rider. The gold 'Ducati' for the front mudguard (positioned facing so it could be read from the front) was only retained on machines up to the middle of 1971. None of the widecase Scramblers used this, however. Other transfers and badges were used, usually for only a short period of time, except for the 'Moto Ducati' winged eagle decal.

5 Camshaft colour codings

Colour	Model	Ducati Part No.
White	250 SCR – all years	0601.29.010
Grey	Mach 1, Mark 3 (narrowcase)	0603.29.010
Violet	Monza and GT from engine no. 87422	0600.29.013
White/green	250, 350, 450 non-Desmo racing	0747.29.010
White/blue	450 SCR, 450 Mark 3	0601.29.010
White/blue	Desmo all road models	0609.29.010
Red/white	Desmo racing	n/a
Red	1962–4 Diana Mark 3	0602.29.010
Violet	350 Sebring	0600.29.013
Black	250GT up to engine no. 87421	0605.29.010
n/a	125S and 160 Monza Junior sports	0251.29.013
n/a	160 Monza Junior touring	0296.29.010

6 Lubrication

Sump capacities—four-stroke models

100, 125, 160, 200, 250 and 350 narrowcase	2.1 litres ($3\frac{3}{4}$ pints)
239, 250, 350 and 450 widecase	2.7 litres ($5\frac{1}{2}$ pints)

It is recommended that the oil be changed every 1500 miles.

Petroil mixture—two-stroke models

All 50 and 100 models. Factory handbooks of the period state 20:1. However, with the development of much improved two-stroke lubricants over the last few years, this can be safely increased to at least 25:1.

125 Regolarita and Six Days enduro models, 32:1.

Front fork oil

Disregard type stated in handbook and use ATF (automatic transmission fluid). This was used by the factory for its racing motorcycles and became the recommended lubricant for the later V-twins—it works equally well in the singles, providing optimum fork damping and service operation.

For actual capacities of your own particular machine, consult the owner's handbook or a workshop manual.

7 Points and plugs

Contact-breaker points settings

All models, both four-stroke and two-stroke, with points ignition	0.30–0.40 mm (0.01181–0.1575 in.)

Spark plug settings

All models with points ignition	0.50 mm (0.01969 in.)
All models with electronic ignition	0.80 mm (0.03150 in.)

Spark plug types (Champion)

Model	Normal	Gold Platinum
All 50 and 100 two-stroke models	L82 or L86	L9G*
125 Regolarita and Six Days	L2	L2G or L3G
175 Sport, 200 Elite, 200SS	L86	L9G*
All 175 and 200 touring models	L85	L6G*
250 Diana (Daytona)	L78	L4G*
250 Monza, GT and 350 Sebring	L85	L6G*
125S and TS	L86	L9G*
160 Monza Junior	L78	L4G*
250 Diana and Mach 1 racing	L57R*	L2G
239, 250, 350 and 450 Mark 3, Desmo and Scrambler	L81* or L82	L6G*
125 Scrambler	L86	L9G*
450 R/T	L81* or L82	L6G*

Note

The original recommended spark plugs listed above are from 1966 and 1979 Champion Spark Plug Company catalogues. Those marked with an asterisk (*) have since been superseded as follows: L4G replaced by L77JC; L6G replaced by L82C; L9G replaced by L82C; L57R replaced by L87R; L81 replaced by L82.

8 Carburettor settings

Model	Year	Dell'Orto type	Size	Needle	Main	Pilot	Slide	Needle pos.	Needle jet
125 Gran Sport (racer)	1957	SS1 20 C	20	R4	80	45	70	3	260
175 Gran Sport (racer)	1957	SS1 22.5 C	22.5	R4	98	50	70	3	260
175S	1957	MB 22.5 B	22.5	E14	98	80	40	2	260B
175T	1957	MB 22 B	22	E12	92	45	80	2	260B
125S	1957	MB 20 B	20	E9	78	38	70	3	262A
100 Sport	1958–60	MA 18 B	18	D17	78	35	50	2	260A
125 Sport	1958–65	UB 20 BS	20	E10	85	35	50	2	260B
125 Sport (optional)	1958–61	SS1 22 C	22	R4	92	50	80	3	260
125TS up to 1500th engine	1958	UA 20 BS	20	E10	85	35	50	2	260B
175 Americano	1958	MB 22 B	22	E12	92	45	80	2	260B
175 Sport	1958–61	UB 22.5 BS2	22.5	E14	98	40	80	2	260B
175 Tourist	1958–61	MB 22 B	22	E12	92	45	80	2	260B
175TS	1958–60	MB 22 B	22	E12	92	45	80	2	260B
175 Motocross	1958	SS1 25 A	25	M14	118	50	100	2	265
200 Elite	1959–65	UBF 24 BS	24	E10	98	40	70	2	260B
200 Super Sport	1959–62	UBF 24 BS	24	E10	98	40	70	2	260B
200 Super Sport (optional)	1959–60	SS1 27 A	27	M13	108	50	80	3	265
200 Americano	1959	UBF 24 BS	24	E10	92	40	70	2	260B
200 Motocross	1959–60	SS1 27 A	27	M13	105	50	80	3	265
175 Sport (optional)	1959–61	SS1 25 A	25	M14	120	50	100	2	265
125TS	1959–65	ME 18 BS	18	G4	76	38	50	3	258B
175 Formula III	1959	SS1 27 A	27	M14	108	50	80	3	260
200TS	1960–1	UBF 24 BS	24	E10	92	40	70	2	260B
220 Grand Prix	1960	SS1 29 A	29	M14	115	50	80	3	260
250 Formula III (Manxman)	1961	SS1 29 A	29	M14	118	50	100	3	260
Piuma Standard	1961–8	T4 12 D1	12	A4	58			2	1–210
Brisk	1961–7	T4 12 D1	12	A4	58			2	1–210
250 Monza (n/case)	1961–7	UBF 24 BS	24	E11	108	40	70	2	260B
Diana Europe	1961–4	UBF 24 BS	24	E11	103	35	70	2	260A
Diana USA	1961	UBF 24 BS	24	E11	108	40	70	2	260B
Diana Mark 3 USA	1962–5	SS1 27 D	27	M14	120	50	100	2	265
200GT	1962	UBF 24 BS	24	E11	95	40	70	2	260A
250 Scrambler (n/case)	1962–7	SS1 27 D	27	M14	112	50	100	3	265
Sport 48	1962–5	UA 1SS	15	C1	68		45	3	260
180 Standard	1962–3	ME 1S BS	15	G1	63	40		3	258A
Sport 80	1962–3	UA 18 S	18	C1	92	35	55	3	260
Piuma Sport	1962–6	UAO 15 S	15	C1	68	45	65	3	260
Piuma De Luxe	1962–7	T4 12 D1	12	A4	58			2	1–210
Brio 48	1963–6	SHA 14 12	12		52	40	6493/01		
48SL	1964–5	UA 15 S	15	C1	68	45	65	3	260
100 Cadet (51 mm bore)	1964–6	UA 18 S	18	C2	82	38	50	2	260
100 Mountaineer (51 mm bore)	1964–6	UA 18 S	18	C2	82	38	50	2	260
Mach 1	1964–6	SS1 29 D	29	M14	122	50	60	2	265
250GT	1964–6	UBF 24 BS	24	E19	108	40	60	2	260B
Brio 100	1964–8	SHB 18 16	16		82	40	6493/01		
Monza Junior	1964–7	UB 22 BS	22	E16	98	42	60	2	260A
48 Cacciatore	1964–7	UA 15 S	15	C1	68	45	65	3	260

Model	Year	Dell'Orto type	Size	Needle	Main	Pilot	Slide	Needle pos.	Needle jet
250 Mach 1/s (racer)	1965	SS1 30 A	30	M14	132	50	60	2	260
Sebring (n/case)	1965–7	UBF 24 BS	24	E16	108	40	70	2	260A
50SL	1966	UA 18 S	18	D10	85	40	55	1	260F
Diana Mark 3 USA	1966–7	SS1 29 D	29	M14	125	50	60	2	265
250 Mark 3 (n/case)	1967	SS1 29 D	29	M14	125	50	60	2	265
100 Cadet (52 mm bore)	1967	UBF 24 BS	24	E2	102	40	70	2	260A
100 Mountaineer (52 mm bore)	1967	UBF 24 BS	24	E2	102	40	70	2	260A
125 Cadet/4	1967	ME 18 BS	18	G3	85	38	50	2	258A
125 Cadet/4 Motocross	1967	ME 18 BS	18	G3	85	38	50	2	258A
Brio 50	1967–8	SHA 14 12	12		56	40	6108/01		
50SL1	1967–8	UAO 18 S	18	D10	85	40	55	1	260F
50SL2	1968–9	UAO 18 S	18	D10	85	40	55	1	260F
Rolly 50	1968	SHA 14 12	12		52	40	6493/01	1	
350 Mark 3	1968–9	SS1 29 D	29	M14	112	45	60	2	260
Sebring (w/case)	1968	UBF 24 BS	24	E16	108	40	70	2	260A
350 Scrambler	1968–9	SS1 29 D	29	M14	125	50	100	2	265
250 Mark 3D	1968–9	SS1 29 D	29	M14	115	45	60	2	
Brio 100/25	1968	SHB 18 16	16		88	50	6493/02		
250 Scrambler (w/case)	1968–9	SS1 27 D	27	M14	112	50	80	3	265
350 Mark 3D	1968–9	SS1 29 D	29	M14	115	45	60	2	260
250 Monza (w/case)	1968	UBF 24 BS	24	E11	108	45	80	2	260H
250 Mark 3 (w/case)	1968–9	SS1 29 D	29	M14	112	45	60	2	260
50 Scrambler	1969–70	UA 18 S	18	C8	85	40	50	3	260F
100 Scrambler	1969–70	UBF 24 BS	24	E2	102	40	70	2	260A
450 Scrambler	1969–74	VHB 29 AD	29	V7	130	50	60	2	265T
450 Mark 3	1969–74	VHB 29 AD	29	V7	135	50	60	2	260T
450 Mark 3D	1969–71	VHB 29 AD	29	V8	135	50	60	2	260T
450 Mark 3 Tourer	1970–2	VHB 29 AD	29	V7	130	50	60	2	265T
250 Mark 3 (w/case)	1970–4	VHB 29 AD	29	V13	110	40	40	2	265M
250 Mark 3D	1970–1	VHB 20 AD	29	V13	110	40	40	2	265M
350 Mark 3	1970–4	VHB 29 AD	29	V13	115	40	40	2	265M
350 Mark 3D	1970–1	VHB 29 AD	29	V13	120	40	40	2	265M
350 Scrambler	1970–4	VHB 29 AD	29	V13	110	40	40	2	265M
250 Scrambler (w/case)	1970–3	VHB 26 BD	26	E17	95	45	40	2	260R
250 Desmo	1971–4	VHB 29 AD	29	V13	110	40	40	2	265M
125 Scrambler	1971	375/20*	20	A1	95	12	373/3	1	105/DA
350 Desmo	1971–4	VHB 29 AD	29	V13	118	40	40	2	265M
450 Desmo	1971–4	VHB 20 AD	29	V8	135	50	60	2	260T
450 R/T (open pipe)	1971–2	VHB 29 AD	20	V7	140	50	60	2	265T
450 T/S	1971–3	VHB 29 AD	20	V7	135	50	60	2	265T
239 Desmo	1974	PHF 30 AD	30	K3	125	65	503	2	265AB
239 Mark 3	1974	PHF 30 AD	30	K3	125	65	503	2	265AB
Regolarita	1975–6	PHB 30 BS	30	K3	125	65	50/3	2	265AB
Six Days	1977	PHBE 32 GS	32	K1	140	55	40	2	265AR

*Amal carburettor

9 Petrol tank capacities

Model	Year	Litres	Model	Year	Litres
Four-strokes					
175T	1957–61	18	239 Desmo	1974	13.5
175TS	1958–60	18	350 Scrambler	1968–74	10
175S	1957–61	17	350 Mark 3 (widecase, twin filler cap)	1968	13.2
125S	1957–65	13.5	350 Mark 3D (widecase, twin filler cap)	1968	13.2
100S	1958–60	13.6	350 Mark 3 (widecase, single filler cap)	1969–71	13.2
125TS	1958–65	17	350 Mark 3D (widecase, single filler cap)	1969–71	13.2
175 Americano	1958	13	350 Mark 3 (widecase, 'Silver Shotgun')	1972	13.5
175 Motocross	1958	11	350 Desmo (widecase, 'Silver Shotgun')	1972	13.5
200 Elite	1959–65	17	350 Mark 3 (widecase, blue and gold)	1973–4	13.5
200SS	1959–60	17	350 Desmo (widecase, yellow/orange)	1973–4	13.5
200 Americano	1959	13	450 Scrambler	1969–74	13.2
200 Motocross	1959–60	11	450 Mark 3	1969–71	13.2
200TS	1960–1	13	450 Mark 3D	1969–71	13.2
200GT	1962	16.5	450 Mark 3 (widecase, 'Silver Shotgun')	1972	13.5
250 Monza (narrowcase)	1961–5	13	450 Desmo (widecase, 'Silver Shotgun')	1972	13.5
250 Diana (Daytona, UK)	1961–6	16.5	450 Mark 3 (widecase, blue and gold)	1973–4	13.5
250 Scrambler (narrowcase)	1962–7	11	450 Desmo (widecase, yellow/orange)	1973–4	13.5
250 Mach 1	1964–6	16	450 Mark 3 Tourer	1971–2	16
250 Mark 3 (narrowcase)	1967	16	450 R/T	1971–2	10.5
250GT (round tank)	1964–5	13			
250 Monza (square tank)	1966–7	13	**Two-strokes**		
250GT (square tank)	1964–5	13	48 Brisk	1961–7	4.5
160 Monza Junior (round tank)	1964–5	13	48 Piuma	1961–8	5.6
160 Monza Junior (square tank)	1966–7	13	48 Piuma De Luxe	1962–7	5.6
350 Sebring (round tank)	?	13	48 Piuma Sport	1962–6	6
350 Sebring (square tank)	?	13	48 Sport	1962–5	12
250 Monza (widecase)	1968	13	48 Sport Extra	1963–5	9.6
350 Sebring (widecase)	1968	13	48SL	1964–5	11.6
250 Mark 3 (widecase, twin filler cap)	1968	13.2	50SL	1966	11.6
250 Mark 3D (widecase, twin filler cap)	1968	13.2	100 Cadet	1964–7	11.6
250 Scrambler (widecase)	1968–74	10	100 Mountaineer	1964–7	11.6
250 Mark 3 (widecase, single filler cap)	1969–71	13.2	48 Cacciatore (Falcon, USA)	1964–7	11.6
250 Mark 3D (widecase, single filler cap)	1969–71	13.2	50SL1	1967–8	10
250 Mark 3 (widecase, 'Silver Shotgun')	1972	13.5	50SL2	1968–9	10.5
250 Desmo (widecase, 'Silver Shotgun')	1972	13.5	50 Rolly	1968	4.5
250 Mark 3 (widecase, blue and gold)	1973–4	13.5	50 Scrambler	1969–70	11.5
250 Desmo (widecase, yellow/orange)	1973–4	13.5	100 Scrambler	1969–70	11.5
125 Scrambler (five-speed)	1971	12	125 Regolarita	1975–6	6
239 Mark 3	1974	13.5	125 Six Days	1977	6

10 Gearbox and rear wheel sprockets

Model	Gearbox sizes	Rear wheel sizes
Four-strokes		
100S/125S & TS	14/15/16/17	46
160 Monza Junior	14/15/16/17	46
175S & Tourist	14/15/16/17/18	40/41/42/43/44/45/46
200, all models	14/15/16/17/18	40/41/42/43/44/45/46
239, all models	14/15/16/17/18	40/41/42/43/44/45/46
250 Monza, Mach 1 GT, Mark 3 (narrowcase), Diana (Daytona, UK), Desmo 350 Mark 3, Sebring, Desmo	14/15/16/17/18	40/41/42/43/44/45/46
250/350 SCR	14/15/16/17	45/50/55/60
450 Mark 3 & Desmo	12/13	32/33/34/35/36/37/38
450 SCR	11/12/13/14	44/46/48/50/55
450 R/T	11/12/13/14	50
Two-strokes		
Brisk/Piuma	13/14	39
50SL	12/13/14	46/49
50SL1/SL2	13/14/15	46/49
48 Sport (Falcon, USA)	14	39
100 Cadet	13/14/15	37/39
100 Mountaineer	12/13	42–60*
125 Regolarita	11/12/13	55/57/59/61/63/64/65
125 Six Days	11/12/13	55/57/59/61/63/64/65

*Dual sprocket, on/off-road option.

11 Primary drive gear ratios

Four-strokes	
100, 125, 160—all models	21 × 63
175, 200, 239, 250, 350—all models	24 × 60
350, 450—all models	27 × 57

Two-strokes	
48 Brisk, Piuma, Sport	18 × 66
50SL, SL1, SL2	21 × 63
100 Cadet, Mountaineer	21 × 63
125 Regolarita, Six Days	28 × 70

12 Conversion tables

mm	in.	mm	in.	mm	in.	mm.	in.	mm	in.
0.001	0.0000394	0.37	0.01457	0.82	0.03228	27	1.0630	72	2.8346
0.002	0.000079	0.38	0.01496	0.83	0.03268	28	1.1024	73	2.8740
0.003	0.000118	0.39	0.01535	0.84	0.03307	29	1.1417	74	2.9134
0.004	0.000157	0.40	0.01575	0.85	0.03346	30	1.1811	75	2.9528
0.005	0.000197	0.41	0.01614	0.86	0.03386	31	1.2205	76	2.9921
0.006	0.000236	0.42	0.01654	0.87	0.03425	32	1.2598	77	3.0315
0.007	0.000276	0.43	0.01693	0.88	0.03465	33	1.2992	78	3.0709
0.008	0.000315	0.44	0.01732	0.89	0.03504	34	1.3386	79	3.1102
0.009	0.000354	0.45	0.01772	0.90	0.03543	35	1.3780	80	3.1496
0.01	0.00039	0.46	0.01811	0.91	0.03583	36	1.4173	81	3.1890
0.02	0.00079	0.47	0.01850	0.92	0.03622	37	1.4567	82	3.2283
0.03	0.00118	0.48	0.01890	0.93	0.03661	38	1.4961	83	3.2677
0.04	0.00157	0.49	0.01929	0.94	0.03701	39	1.5354	84	3.3071
0.05	0.00197	0.50	0.01969	0.95	0.03740	40	1.5748	85	3.3464
0.06	0.00236	0.51	0.02008	0.96	0.03780	41	1.6142	86	3.3858
0.07	0.00276	0.52	0.02047	0.97	0.03819	42	1.6535	87	3.4252
0.08	0.00315	0.53	0.02087	0.98	0.03858	43	1.6929	88	3.4646
0.09	0.00354	0.54	0.02126	0.99	0.03898	44	1.7323	89	3.5039
0.10	0.00394	0.55	0.02165	1.00	0.03937	45	1.7716	90	3.5433
0.11	0.00433	0.56	0.02205	1	0.0394	46	1.8110	91	3.5828
0.12	0.00472	0.57	0.02244	2	0.0787	47	1.8504	92	3.6220
0.13	0.00512	0.58	0.02283	3	0.1181	48	1.8898	93	3.6614
0.14	0.00551	0.59	0.02323	4	0.1575	49	1.9291	94	3.7008
0.15	0.00591	0.60	0.02362	5	0.1968	50	1.9685	95	3.7402
0.16	0.00630	0.61	0.02402	6	0.2362	51	2.0079	96	3.7795
0.17	0.00669	0.62	0.02441	7	0.2756	52	2.0472	97	3.8189
0.18	0.00709	0.63	0.02480	8	0.3150	53	2.0866	98	3.8583
0.19	0.00748	0.64	0.02520	9	0.3543	54	2.2160	99	3.8976
0.20	0.00787	0.65	0.02559	10	0.3937	55	2.1654	100	3.9370
0.21	0.00827	0.66	0.02598	11	0.4331	56	2.2047	110	4.3307
0.22	0.00866	0.67	0.02638	12	0.4724	57	2.2441	120	4.7244
0.23	0.00906	0.68	0.02677	13	0.5118	58	2.2835	130	5.1181
0.24	0.00945	0.69	0.02717	14	0.5512	59	2.3228	140	5.5118
0.25	0.00984	0.70	0.02756	15	0.5906	60	2.3622	150	5.9055
0.26	0.01024	0.71	0.02795	16	0.6299	61	2.4016	160	6.2992
0.27	0.01063	0.72	0.02835	17	0.6693	62	2.4409	170	6.6929
0.28	0.01102	0.73	0.02874	18	0.7087	63	2.4803	180	7.0866
0.29	0.01142	0.74	0.02913	19	0.7480	64	2.5197	190	7.4803
0.30	0.01181	0.75	0.02953	20	0.7874	65	2.5590	200	7.8740
0.31	0.01220	0.76	0.02992	21	0.8268	66	2.5984	210	8.2677
0.32	0.01260	0.77	0.03032	22	0.8661	67	2.6378	220	8.6614
0.33	0.01299	0.78	0.03071	23	0.9055	68	2.6772	230	9.0551
0.34	0.01339	0.79	0.03110	24	0.9449	69	2.7165	240	9.4488
0.35	0.01378	0.80	0.03150	25	0.9842	70	2.7559	250	9.8425
0.36	0.01417	0.81	0.03189	26	1.0236	71	2.7953	260	10.2362

mm	in.	mm	in.	mm	in.	mm.	in.	mm	in.
270	10.6299	340	13.3858	410	16.142	480	18.898	550	21.654
280	11.0236	350	13.7795	420	16.535	490	19.291	560	22.047
290	11.4173	360	14.1732	430	16.929	500	19.685	570	22.441
300	11.8110	370	14.5669	440	17.323	510	20.079	580	22.835
310	12.2047	380	14.9606	450	17.717	520	20.472	590	23.228
320	12.5984	390	15.3543	460	18.110	530	20.866	600	23.622
330	12.9921	400	15.7480	470	18.504	540	21.260		

1 mm = 0.03937 in.
1 in. = 25.4005 mm

Index

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