MOPED-SPESIALISTEN

Instructions for the application and use of Ducati's autocycle engine

cicciolo T50

DUCATI

DUCATI

SOCIETÀ SCIENTIFICA RADIO BREVETTI DUCATI
BORGO PANIGALE - BOLOGNA

EXPORT DIVISION - MILANO - Largo Augusto 7
Phone 702941 - 702942 - Cable Adresse DUCATITAL

TECHNICAL CHARACTERISTICS
OF DUCATI's T50 AUXILIARY CYCLE ENGINE
4 STROKE - OHV -

Foreword

Remember that a new engine always requires great care, as its service life depends from the manner in which it has been driven during the running-in period. It will repay you in long and loyal services the care you will have given to it right from the start.

DESCRIPTION

Capacity
Bore
Stroke
Maximum rpm.
HP approx.
Compression ratio
Ducati's fly-wheel magneto and lighting set.

The fixed head cylinder is detachable from crankcase, which constitutes one single block.

Ducati's engine unit has two speeds and a dead centre.

Adjustment of timing gears and fly-wheel magneto:
— Inlet: opening: 15" to 20" before top dead centre
closing: 35" to 40" after bottom dead centre
— Exhaust: opening: 45" to 40" before bottom dead centre
closing: 20" to 25" after top dead centre
— Ignition Timing: 25" to 29"

Gear ratios are as follow: high gear, reduction between main shaft and power main sprocket 7,4:1: low gear, 12,7:1. The ratio between high and low gear is 1:1,7.

The extraordinary smooth handling of Cucciolo engine

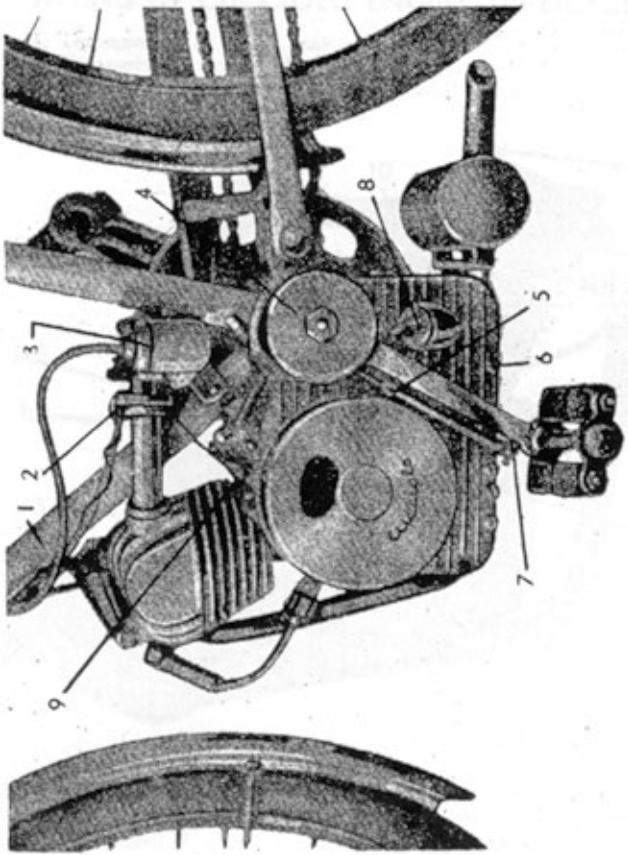

Fig. 1

affords a constant utilization of adequate ratio in spite of only two gears. While driving uphill in low gear and with engine « racing », high gear can be engaged and maintained.

The Carburetter is a 14mm Weber-Cucciolo type: needle jet 10mm; main jet 55mm; idling jet 45mm; throttle valve; single control.

With an adequate gear ratio and under normal load conditions (100 kilos between vehicle and passenger) on level roads at an approximate speed of 30 k. p. h. the carburetter will assure a run of 100 kilometers with a fuel consumption of one litre of petrol. Tank capacity is approximately 2 litres.

The Carburetter is fitted with two adjustment screws. A & B. (see Fig. 3) screw A adjusts ratio of mixture of petrol to air for minimum and idling running; it has been set for average running conditions and it is advisable not to alter it, save under definite carburetting variations (quality and density of fuel, severe or tropical climate, new or very worn engine).

Screw B is merely a resistance stop of butterfly valve closing; it serves to adjust idling and minimum flow when Bowden cable is not pulling.

Maximum speed of Cucciolo T50 engine, if properly fitted and with adequate gear ratios, is of 50 k.p.h.

It is, however, advisable to limit speed to 30/35 k.p.h. when engine is fitted to normal unsprung frame cycles unless travelling on exceptionally good roads.

Transmission gearing has a 45 teeth insert and a slip sprocket with 12 roller pins. Transmission ratio between pedals and wheel is therefore similar to that of an ordinary cycle; the ratio between pedals and engine (starting) is 1:28 (top gear).

The large chain sprocket, carried by the lay shaft has a Whitworth standard thread and can be supplied with 14 teeth (for use with normal 26/27 teeth sprockets on back wheel) or with 19 teeth, for use with transport type 35/36 teeth sprockets, reducing chain traction effort.

Weight of engine unit: 8 kilos approx.

It is advisable to use fully first class lubricating oils for the lubrication of Cucciolo engine T50.

FITTING OF CUCCIOLO ENGINE TO BICYCLE

1. *Disassembly of crank axle support.*
Disassemble from bicycle the central pedal axle with the two pedal cranks. Only left pedal crank with pedal and right side pedal are used.

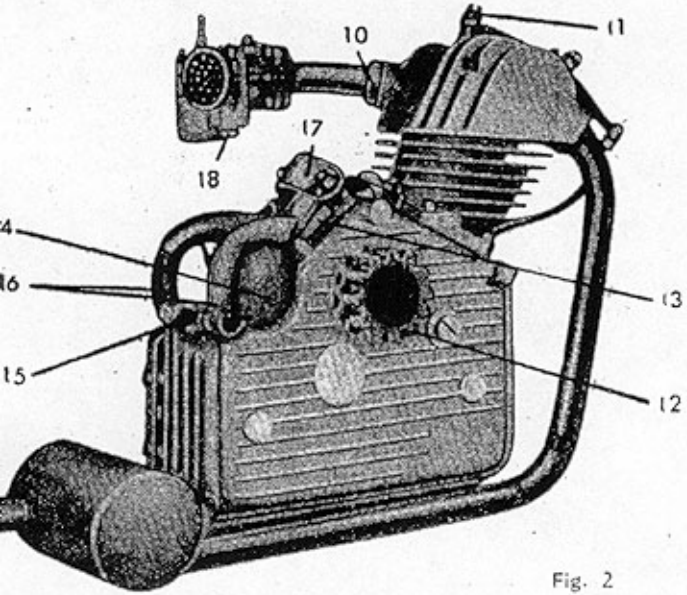

Fig. 2

2. *Optional fitting of brake control.*
If bicycle is fitted with external rod control brakes, the lever situated near the central movement will have to be

shifted slightly higher and rods eventually reduced, and a small bracket riveted on half-collar, shifted slightly above, so as to enable housing of half-collar for the blocking of the engine.

If a counter pedal brake is fitted in centre of bicycle, it will have to be replaced by a Bowden cable or rod brake, independent from pedal.

3. *Assembly of unit to frame.*

Place unit in position so that semi-cylindrical grooving (14) encircles lower part of pedal box (4) and cradle (13) may adhere to front lower part of frame's front diagonal tube. Grooved section (14) will be linked to pedal box by inserting the antivibration packing already supplied with it, as well as packing fitted to bracket for cradle (13) by means of the two clamps (16) which will fit around pedal box and are kept in position by the journal fixing unit. Strap (17) will be fixed on top against cradle (13) thus holding firmly Tube 1 (Fig. 1). Care must be taken when tightening clamps (the necessary spanners are supplied with unit) that top fins of cylinder do not touch or come too close to Tube 1 (a clearance of at least 2mm is indispensable). If necessary add some metal packing between cradle (14) and Tube 1. Tighten slightly first both clamps (16), then also slightly, strap (17), after which tighten hard both clamps and strap, driving in right and left nuts. With the tightening of these four stud bolts engine is definitely fitted.
See that grooving (14) snugly adheres to body of bottom bracket (4) and does not interfere with cups and lock nuts of movement caps, as otherwise the use of the pedals would be stiff and disagreable and axle base between roller bearings would be modified.

Should it be difficult to tighten packing above pedal crankcase (an exceptional occurrence, due to defective construction of cycle frame) thus leaving grooving (16) slightly spaced, it will be necessary either to file slightly the edge of crankcase or remove with a file, or grind, projecting part of lock-nut or of bearing cup. If bottom

bracket (4) shows a 45mm. diam. instead of 42mm. it should be slightly filed, bevel coupling with tube 1, eventually filing or grinding slightly rim to a depth not exceeding one half millimetre of grooving, which should then fit properly without packing. Be sure that grooving (13) fits tightly to bracket.

4. *Reassembly of crank axle.*
Central crank axle pin is to be replaced by pin supplied with unit, which is a longer pin than the ordinary bicycle one. This pin it fitted normally.
Make sure now that pedal crank hub (21) projects from flush spring of slip sprocket (22) by at least 1,5 mm. If this is not so, bottom bracket cup should be adjusted bringing out pin to the required position.

5) *Assembly of Transmission Parts.*
Apply on pedal bearing hub, aluminium outer plate (20) bearing clutch sprocket assembly, with the six special screws and six notched washers. Before locking screws see that sprocket assembly does not press on drive sprocket teeth.
After the assembly, the transmission gear must run smoothly and silently. Apply external ornamental cover with six screws.
The clutch sprocket rod has a threaded hole in which the right pedal (dismantled from bicycle pedal crank) is to be screwed.

6) *Adjustment of automatic gear pre-selector.*
In order to synchronize gear change, loosen entirely clutch regulating screws (Fig. 1). Assemble gear change lever 24) on clutch lever, then fit washer and split pin. Place gear change into neutral position with left pedal down. Slip Bowden wire through special eyelet of clutch lever and pull until both gear change lever thrusts are at an approximate distance of 2mm from preselector cam (25).
With left pedal down, gear change will then be engaged into low gear (gear changing rod 23 right in). Lock Bow-

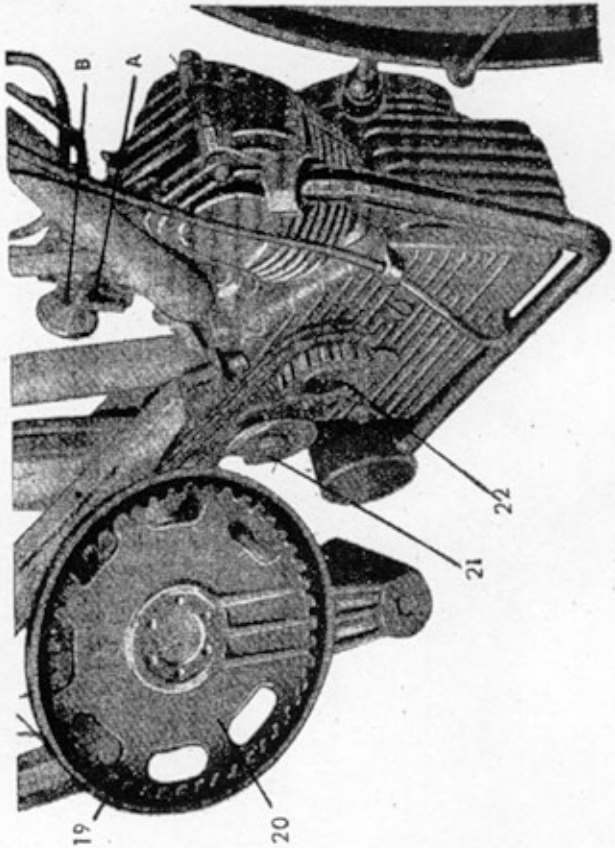

Fig. 3

den cable with appropriate screw and adjust clutch screw (7) by locking it with a locknut.
With pedal down, gear change is in neutral position. With left pedal backwards, engage top gear (small rod 23 entirely out).
When both gears are engaged, pedals must turn backwards freely, without preselector cam (25) touching gear change lever (24).
If adjustment of automatic gear should make it necessary to shift outward preselector cam, insert between cam and central movement pin, spring washers, so that internal part of bell shaped selector (25) is always well backed to pedal crank.

7. *Transmission.*

It is generally advisable to fit on back wheel a fixed sprocket which will not eliminate free wheel riding (a free wheel device is incorporated in slip sprocket) but will assure safer running and easier handling, allows inertia or pushing starting and permits using engine as a brake.
Ratios recommended for back wheel sprocket are:

	28" Wheel	26" Wheel
14 teeth driving shaft:	A - 18	A - 17
	B - 19	B - 18
19 teeth driving shaft	A - 24	A - 23
	B - 25	B - 24

From Engine serial number No. 273-346 the following are ratios recommended for back wheel sprocket:

	28" Wheel	26" Wheel	24" Wheel
14 teeth driving shaft:	A - 26	A - 24	A - 22
	B - 27	B - 25	B - 23
19 teeth driving shaft	A - 35	A - 32	A - 30
	B - 36	B - 33	B - 31

N.B. (A) For normal use with two-speed engine, with a normal weight rider and on normal roads.

(B) For normal use with two speed engine for heavy weight rider on normal roads with strong gradients.

As shown in above Tables, Cucciolo engine T50 can be supplied either with 14 teeth driving sprocket, which permits fitting on back wheel of ordinary "cycle" sprockets, found on the market, or with 19 teeth driving sprocket which necessitates fitting on back wheel of a transport sprocket (van type) and relative chain.

Both driving sprockets can always be interchanged and initial delivery with a 19 teeth driving sprocket can be asked from Cucciolo dealers, otherwise Cucciolo engines are normally delivered with 14 teeth driving sprockets.

8. *Complete fitting of Cucciolo engine with following operations.*

a) Connect tank tap to induction pipe by means of the flexible tube already supplied fixed to tank, by simply driving it in. No strapping or other connections are required.

b) Eventually adjust position of Carburetter which may appear out of shape following an abnormal tilt of engine deriving from an exceptional inclination of front diagonal frame tube. Correct this by slightly turning induction pipe (unlock and relock connecting ring to cylinder (10) Flat cup must be in an upright position in respect to ground.

c) Fit Bowden cables which are supplied already connected to levers; Fuel cable is connected to throttle lever pin and locked with relative screw. Valve lifting Bowden cable is connected to top part of cylinder head by a locking screw clamp already inserted. (Note that valve lifter control is working inversely, i. e. with fixed vire and pushing body, Avoid therefore taping too tightly body of cable to frame).

d) Connect lighting cables (9) using a small cable from plug in engine block near fly wheel magneto. Care should be taken that engine is grounded to frame as well as headlight; eventually ground in with special

separate wire. Lighting set supplies an average power of approx. 5/6 W. which can be utilized either with one or two lamps (head and tail lights).
Do not ground lighting cable when engine is running.

e) Lower saddle completely; check brakes thoroughly (particularly if transmission is on free wheel).

f) Chain guard (optional). A chainguard is unnecessary owing to the absence of external gear transmission, which on a normal bicycle would be a danger to garments.

This same transmission with inner teeth in Cucciolo engine represents the best and most attractive chainguard.
However if it is desired that top section of rear part of chain should be covered, crankcase can be used by cutting it at the right spot and connected to the same rear coupling.
Any cycle fitter will be able to perform this little job or eventually fit a new chainguard for the protection of upper part of chain only.

OPERATING INSTRUCTIONS

Every Cucciolo unit is fully tested and tried, but not fully run in, before delivery. For the first 200-300 kilometers, the engine should not be overdriven and during this period the throttle should not be fully opened. The engine must not be allowed to race and run at a high speed and be over-heated.

Lubrication

The engine is delivered dry; before starting introduce through tap (8) Fig. 1. located on left side of crank case, approx. 400 grs. of thick oil if in summer and semi-dense oil in winter.

With this quantity of oil, if engine is in a horizontal position (normal mould of frame and bicycle on level) oil level should reach opening of filling plug. As this same plug acts as an overflow, control of successive fillings will be easy. Do not allow level to fall under 8/9 mm. of normal line; check position every 250 kilometers (provided engine is well dry and more frequently if there are oil leakages from connections or vent).

In any case after the first 200/250 kilometers and subsequently after approx. 1000 kil. the oil should be entirely changed.
Drainage is effected by unscrewing plug 6 (Fig. 1) while engine is still slightly warm.

Priming.

Make sure that fuel reaches float chamber cup by pressing two or three times Tickler button (small button projecting from float chamber cover) until fuel spurts from vent in Tickler cap. This operation which however must not be too excessive, is always advisable when engine is cold. On the other hand, this is unnecessary when engine is warm as it would unduly increase fuel mixture and make starting less easy.

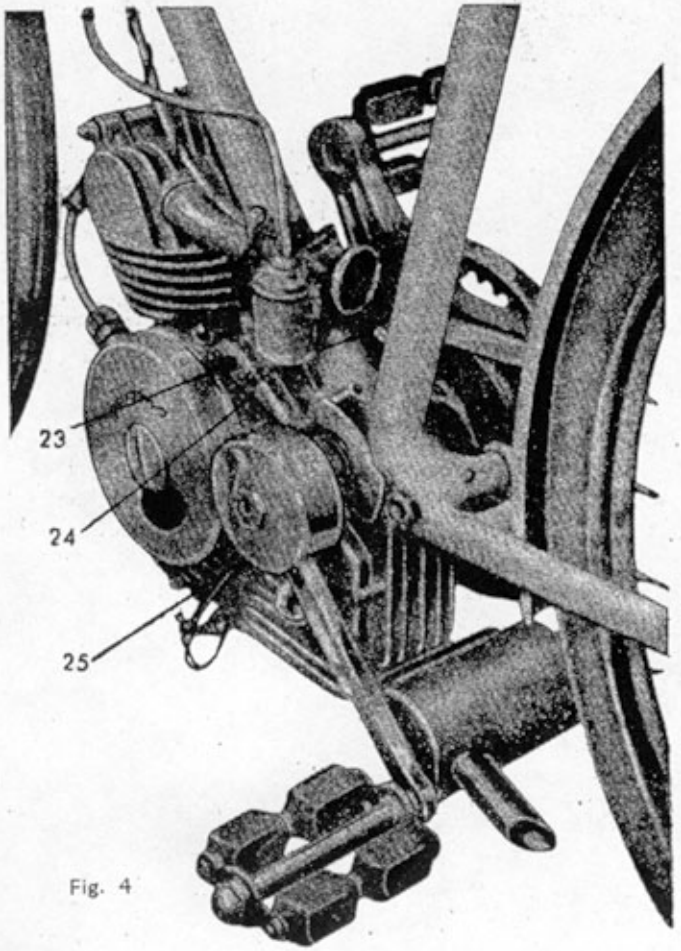

Fig. 4

Starting the engine.

Starting at moment of inertia. - This is the common way of starting engine when bicycle is fitted with a normal fixed back wheel sprocket. Start in neutral position, that is with bicycle out of gear and gather average speed by pedalling, not excessively; stop pedalling and keep right pedal in a forward position; open carburetter control lever, keeping small lever completely out; pull entirely for a moment clutch control lever and then release it; this will automatically engage top gear and inertia of cycle will start engine rotation.

Pull immediately backward carburetter control small lever, slightly over central notch, that is to say not more than a quarter turn. Engine will then start off at once.

If owing to dirty spark plug or a dirty carburetter, or any other abnormal circumstance, engine should start off with jerks, and irregular firing, help it with some pedalling without touching clutch lever; eventually work for a few seconds throttle so as to gain without undue effort a smoother pedalling; revert small lever to normal position (open) and throttle away back and forth, while pedalling all the time, till engine has properly started.

If road is on a gradient, start by going in inverse direction (downhill) and as soon as engine has started, brake slightly, then turn back and proceed uphill.

When engine is warm, even in cold weather and always in warm weather, starting at moment of inertia can be obtained, simply by operating clutch lever, without acting on throttle.

Important notice. When engine is cold never start in low gear, but always and only in high gear so as to avoid putting pedals, chain and sprocket to excessive strain.

Gear change operation. The preceding considerations clearly illustrate the automatic operation of gear change; the same clutch lever 7 (fig. 1) and the same movement which disconnects engine from transmission, effects also simultaneously and automatically, gear change without requiring a special control lever.

For this purpose bell shaped cam 25 (fig. 4) fitted on left of pedal shaft, acts as preselector together with rela-

tive lever action. If clutch lever is operated when left pedal is in a forward position, low gear is engaged, (or will remain so if already in this position); with right pedal forward, operating clutch lever, high gear is engaged.

In engaging clutch with pedals in vertical position, (left pedal down) gear change is transferred to neutral, (close throttle before engaging clutch).

If clutch is not engaged, pedal stroke is entirely free, with engine engaged to either gear or in neutral position.

It follows that clutch must never be engaged while pedalling, in order to avoid engaging continually at every half turn, from one gear to another and avoid submitting preselector organs to inevitable reciprocal wear. It is therefore advisable to keep pedals in the right position before engaging clutch and change speed always with stopped pedals. The only exception is when free wheel back sprocket is in free tripping position, with engine stopped and chain not moving, gear change is effected by moving pedals slightly or move back bicycle a few inches, while clutch is kept moderately engaged in order to mesh gears.

To obtain a smooth gear change, close throttle slightly for a few seconds before clutching and reopen fully throttle before releasing clutch control if engaged in low gear; close throttle and reopen after releasing clutch control if top gear is engaged. All these operations will be easily mastered after some actual practice; beginners may use throttle and clutch as desired and can always change gear instantly and without any trouble.

A feature of Cucciolo gear change is an absolutely automatic and immediate functioning and the possibility of releasing clutch lever without special precautions.

While riding. No special precaution is required while riding. The engine may rotate at length at extremely slow speed downhill as uphill, in full operating conditions. However, it is advisable to follow a middle course. Change to low gear when engine is pulling and avoid pressing engine toc much at very high rotation speed. Do not rotate engine by hand or by pushing, with spark plug disconnected; excess voltage may burn coil. If it were necessary to rotate engine without plug (for test or other purposes) then place nipple of ignition cable to an earthed cylinder fin.

To use vehicle as an ordinary bicycle pass on to neutral gear. This reacts on all engine gears which remain detached and at rest, eliminating useless clutch. When riding downhill (with a fixed sprocket back wheel) engine will act as a brake but low gear should not be kept on too long and travel should not be too fast in order to avoid smearing spark plug Open throttle as soon as possible and let engine fire a little.

To clutch without changing speed, remember to keep forward pedal corresponding to gear engaged. Clutch is unaffected if it works detached (following obstacles, traffic signals, etc) even for a few minutes; however, avoid making it partially slip under strain as a substitute to gear change or a few pedal strokes.

When stopping while motor is on the point of coming to rest, actuate clutch or throttle (if engine is fitted on a fixed wheel) so as to avoid pulling and kicks on transmission.

When running out of fuel remember that you can still use the small quantity which travelling jerks will have saved for you by filling the small compartment on right side of tank. Tilting bicycle on left side, fuel will be made to flow over into outgoing tank.

FAULT FINDING CHART

a) *Engine will not start.*

Is fuel reaching carburetter? If it does not reach carburetter after depressing tickler, disconnect flexible tube at lower end and proceed by elimination in fixing cause of obstruction. If petrol with a dirty solvent is used, fuel needle may be sticking in seating; often only a few taps on tank remove trouble. Otherwise dismantle and clean.

Is fuel reaches carburetter flowing abundantly even without shaking (fuel needle sticking), close tap, start engine with fully open throttle and turn on tap after a few seconds.

If fuel reaches normally but compression in scarce (engine rotates too easily when pedal starting) see if exhaust valve is not " stuck " in its seating, remaining in open position, which may happen when unsuitable oils are used or in excessively large quantity, while engine is still new and working between valve stem and relative guide is minimum. Pour a few drops of petrol on stem and eventually pull it up with the hand or with a screwdriver inserted between turns of spring.

If valves are normal (see that they do not emerge if adjusted too tightly by your mechanic and that Bowden cable is too tight) check spark plug which may be moistened with petrol following first unsuccessful attempts to start with flooded carburetter (in the latter case burn plug) or plug points bridged by oil, carbon or deposit (in this case clean plug and adjust points gap).

b) *Engine knocks, lacks power or explodes in carburetter.*
Probably due to faulty spark plug. Clean plug thoroughly or change it. Failing an original plug as substitute, any good 14mm motor car spark plug of medium graduation (between 125-175 Marelli Bosch graduation) is suitable for a Cucciolo engine.

Check that upper end of ignition coil does not spark against valve mechanism Occasionally trouble can be traced to faulty fuel supply (dirty carburetter, too low level, water in petrol).

c) *Engine idles well but stops when opening throttle.*
Main carburetter jet is obstructed by some impurity in petrol. Unscrew (see Fig. 2) and clean by blowing energetically with your mouth or using bicycle pump, and refit.

d) *Engine rotates regularly but loses power.*

Excessive clearance or play of valve tappets. Normal clearance is 1 to 3/10 of millimeter and never over a half millimeter.

Cucciolo unit is fitted with a most economical valve timing, very sensitive to valve adjustment.

Check after first 250 kilometers and subsequently at intervals of 750 kilometers to 1000 kil. and if necessary adjust by reducing clearance to 1 or 2/10 with cold engine.

Appropriate nuts and lock nuts (11) at head of valve stem permit instant adjustment to be effected in a few minutes by anyone.

e) *Slipping or locked clutch.*
Bowden cable control is either too tight or too loose or clutch registration screw, fixed on lever (7) Fig. 1. is jammed or unscrewed. Remember that a normal clutch operates very smoothly and tends slipping slightly for a few yards after release of control, its working being largely facilitated by a flexible coupling. Inversely it is unnecessary to disengage clutch entirely in automatic gear change operation.

f) *When pedalling with high gear engaged, engine falls back into neutral.*

Wrong adjustment of gear change preselector group or too tight clutch control.

Check according to instructions in special « Assembly » paragraph.

If cycle is fitted with a fixed back wheel sprocket, the trouble is, however, negligible, as it is unnecessary to start

by pedalling with top gear engaged, whereas the eventual use of pedals in help of engine finds its purpose when travelling with low gear (which pedal stroke cannot suppress) and not when travelling with top gear engaged, with low gear as reserve.

g) *When riding uphill with full throttle open, engine misfires or even backfires (very exceptional).*

Spark plug points are set too close in relation to excess current supplied by magneto. Adjust distance between points, which is normally from 4-5/10 to 1 mm.

For all other defects or major breakdowns which are extremely rare, during the guarantee period, address yourself to the selling agent; and subsequently to any service station of Cucciolo Engines, all over the world.

As regards electric equipment address yourself directly to the nearest service station.

In all your correspondence with DUCATI or direct to Ducati's Works remember always to mention serial number of engine engraved on right lower side of crankcase.