Variation of the intermitent spark (bike runs dies and restarts shortly thereafter) is symptomatic of impending failure of the high tension coil, low tension coil or condensor. In the case of electrical parts what is happening is that as the component heats up, the insulation can break down causing the coil to short out. As soon as it cools off it is possible that it will again have continuity (to be able to pass current). Testing such components is complicated by this intermitent breakdown and unless a continuity test can be performed while system is overheated and not functioning the only recourse is replacement by trail and error.

NOTE: An engine may also exhibit the behavior of running, stopping and restarting, quite independent of an electrical problem. Most likely this is indicative of piston seizure or carburetion problems. See carburetion trouble shooting chart.

IV. LIGHTING SYSTEM

Problems within the headlight, taillight, (not including brakelight) and horn will not affect the ignition system but nonetheless component failure may require trouble shooting. Obviously if a particular component fails then replacement is in order.

Should the entire system ever fail to operate begin by checking the lighting coil output. Loosen the yellow wire at terminal block and hold to outside edge of mag. Turning the engine over as if to start should yield a healthy spark. Starting the engine and checking the output with a VOM meter (hooking lead to yellow and lead to ground, set meter on 10 VOM AC scale) the coil should put out from four volts at idle speeds to six volts at high rpm's. If you do have output, but no lights, a faulty switch can exhibit this symptom.

Suppose however, headlight and taillight are both out. Before checking bulbs start the bike and check the horn with the light switch off. If horn works with light switch off and will not work with the switch on then the red wire from switch to headlight is grounding or the grey wire from switch to taillight is grounding. The short should be located along these wires and repaired.

REVIEWING STEPS

1) If horn, headlight, or taillight fail separately try individual component replacement.

2) If taillight and headlight fail check horn with headlight switch off and with switch on to test for break in red or grey wire.

3) If headlight, taillight, and horn all fail begin by checking output of yellow wire at terminal block, proceed to switch.

and the outside edge of the mag. This indicates the points are opening and the low tension ignition coil, condensor, and mag are putting out current (it does not guarantee the points are gapped correctly or in time).

So by following this procedure you are left with only the magneto components to trouble shoot by symptoms. The following list should assist.

POSSIBLE PROBLEMS IN MAGNETO
(Arranged in approximate frequency of occurrence)

1) Points not opening (adjust)
2) Point backing plate corroded (replace)
3) Condensor defective (replace)
4) Yellow wire from points to condensor worn thru (replace yellow wire)
5) Primary ignition coil wires, black wire (+), blue wire (-) worn thru by rubbing crank shaft behind stator plate. (replace wires)
6) Mag backing plate cracked allowing points to flutter (replace backing plate)
7) Woodruff key sheared (replace woodruff key)
8) Failure of primary ignition coil (using VOM set on OHM, check for continuity, besides visual inspection for damaged wires.
9) Defective rotor (substitute; if necessary replace)

Make appropriate repairs to mag and recheck the brakelight system (blue wire) and high tension coil system (black wire) if such repairs do not create spark at plug.

This entire diagnostic procedure, excluding magneto repairs, if you get in the habit of performing it should take from five to ten minutes. Because of its quickness and because it requires no experience in diagnosing symptoms, I recommend you perform it before work begins on any bike that comes in with no spark.

II. ERRATIC SPARK

The erratic spark (a spark which when you check is sometimes there and sometimes absent) is most difficult to diagnose by procedure and all I can recommend is to follow the testing method to eliminate brakelight system and kill system and begin substitution of magneto components. This advice only applies to bikes that pass a visual inspection. If kill switch is broken or near broken, if either taillight ground wire, or ground wire under footrest are not making good contact (paint should be scraped off to reveal metal) then these repairs should precede magneto work.

III. INTERMITENT SPARK

An intermitent spark (bike starts runs well. dies then immediately restarts), usually means brakelight system fault (spark stops when brakes applied). It is easy to check switches and blue wire leading to taillight. Simply go to terminal block, notice two blue wires, join blue wire from mag. One of these goes to brake switches and the other travels under fender to brakelight. By disconnecting one and checking for spark then substituting the other you can determine which is at fault.

HOW TO TROUBLE SHOOT

Always take time to diagnose the problem before attempting a repair. Given lots of experience a symptom will automatically suggest a specific problem and cure. However, most of us are just as likely to start repairing a healthy component as we are to luck onto the faulty one. Therefore, I recommend following this diagnostic procedure systematically on every bike suffering electrical problems. Best of all it is quick and requires no tools or meters and will locate where the problem is without any guessing.

WHERE TO BEGIN

Start work at the terminal block, most easily accessable by removing the four screws that retain the right engine cover (as you sit on the bike). Gently tug the wiring harness from under the foot rest cover to reveal the terminal block.

The black wire (originating at the low tension ignition coil within mag) goes via the kill switch to the high tension coil from which the spark plug wire emerges.

The blue wire (originating at the low tension ignition coil within mag) goes via the brakelight switches to the brakelight bulb.

The yellow wire (originating at the lighting coil within the mag) goes via the horn to the left handlebar switch and from there via red to the headlight and via grey to the taillight.

TEST PROCEDURE

I. NO SPARK

1) Go to terminal block, disconnect the blue wire and ground it to the engine cases. If when you turn the engine over with the spark plug held to the outside of the engine it sparks, the problem is in the brake-light system. Either the brake switches, brakelight bulb, or the blue wire running under the rear fender. --- (SEE III TO DETERMINE WHICH)

2) If still no spark disconnect the blue wire and ground it to the engine cases, and take the black wire from the mag (via jumper wire) directly to the high tension coil (the clips on both ends). This eliminates kill switch.

3) If neither of these procedures produce a spark next try a coil from another bike.

4) Supposing a new coil yields no spark, it is time to check that the mag is putting out current. This can be done quite simply without special tools or meters. Insure the blue wire is grounded to engine cases and hold the black wire against the edge of the magneto. Turn the engine over as if to start and a healthy spark should appear between the black wire

ELECTRICAL SYSTEM

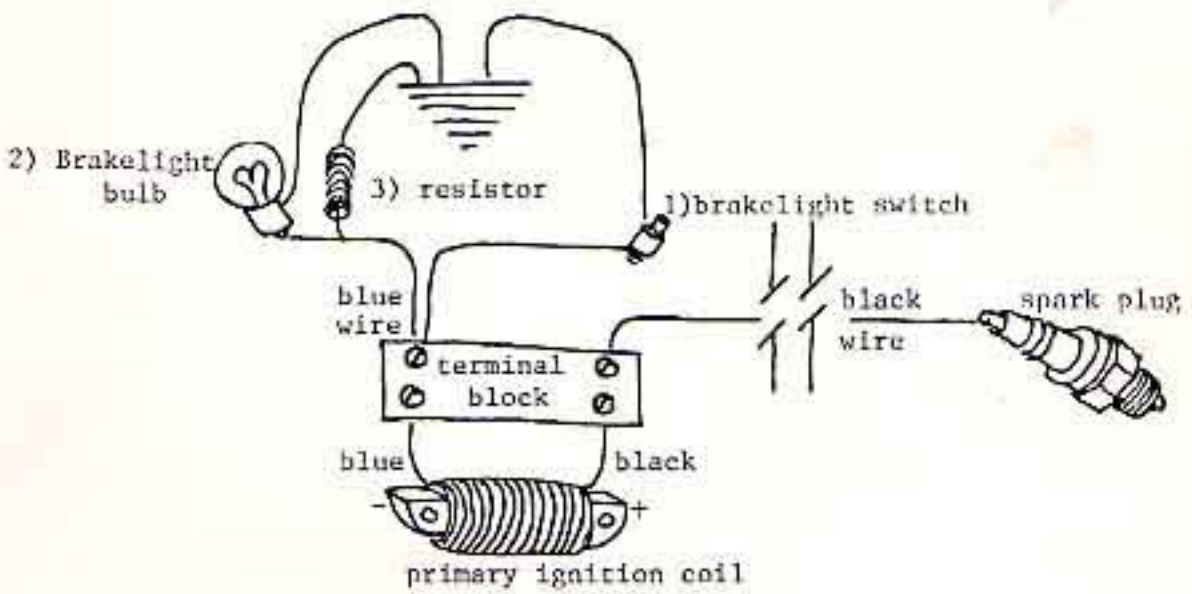
The electrics on a Garelli moped control two functions: creating a spark at the plug electrode and controlling the lights. Therefore, you may encounter the following electrical system problems.

I. NO SPARK
II. ERRATIC SPARK
III. INTERMITENT SPARK
IV. PROBLEMS WITH HEADLIGHT, TAILLIGHT, AND HORN

These first three will all prevent the engine from running or running well. Problems in the lighting system (headlight, taillight, or horn) will not interfere with engine performance. It is important to understand references to the taillight mean the taillight circuit itself and do not include the brakelight (though they are housed behind the same lens).

The brake light system is operated off the ground side of the ignition coil. The ignition coil can ground itself by three means. First, through the brakelight switches, second through the stop light filament and third through the brakelight resistor. When the brake levers are in their normal positions, not being applied, the ignition coil reaches ground through the switches. Once the brakes are applied, pulling one or both of the brake levers, the path to ground is opened forcing the ignition to reach ground through the brakelight filament which in turn causes the bulb to come on.

THREE WAYS TO GROUND



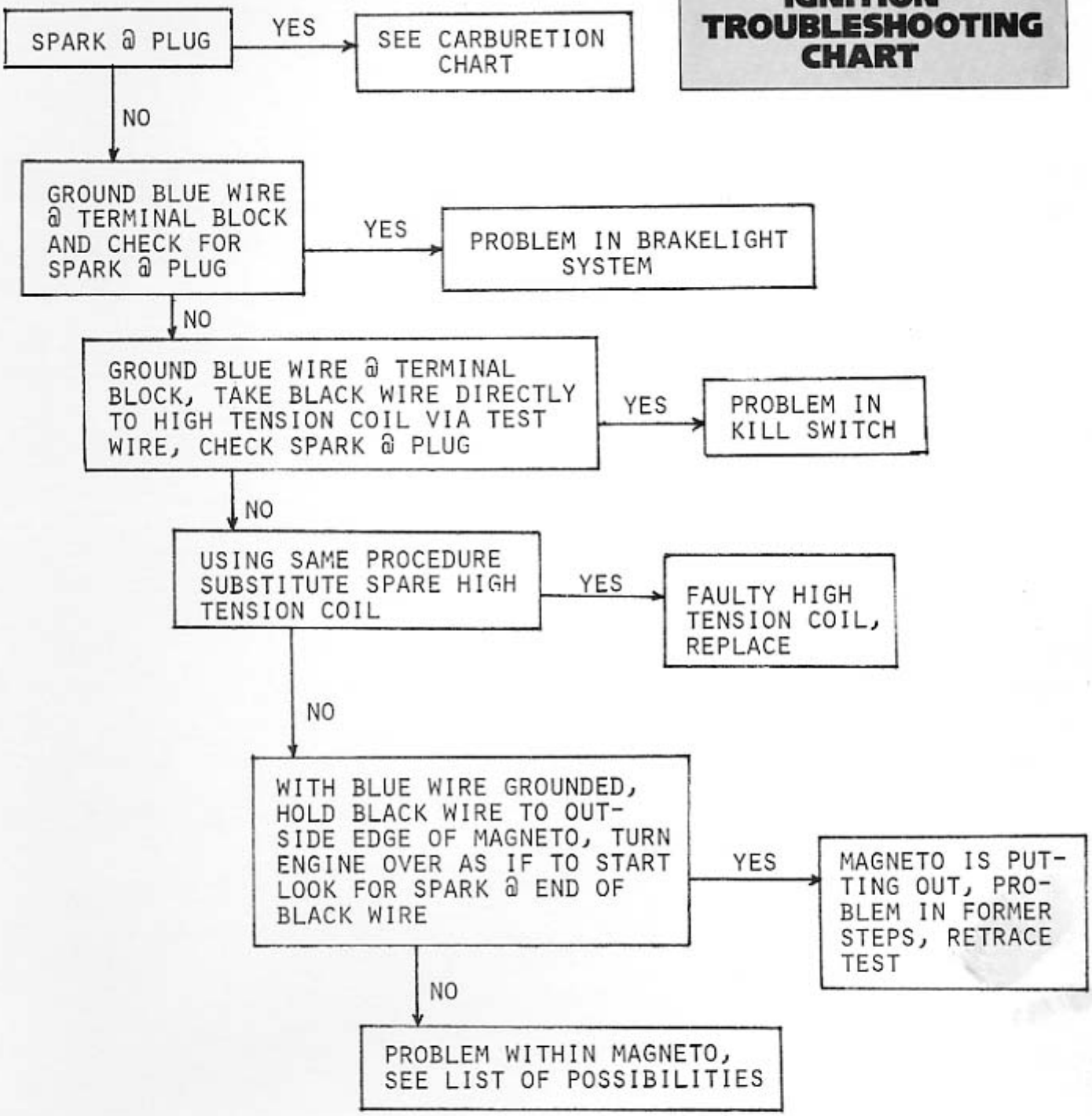
NOTICE: In the event the brakelight is not in working order or blown, ignition will reach ground through the third path, the resistor. If there is a poor ground under the rear fender, anytime the brakes are applied the engine will die. On the older model bikes the resistor was not used, therefore, anytime the brakelight bulb is blown and the brakes are applied the engine will die.

Electrical Troubleshooting Procedure

19,95
795
27.90

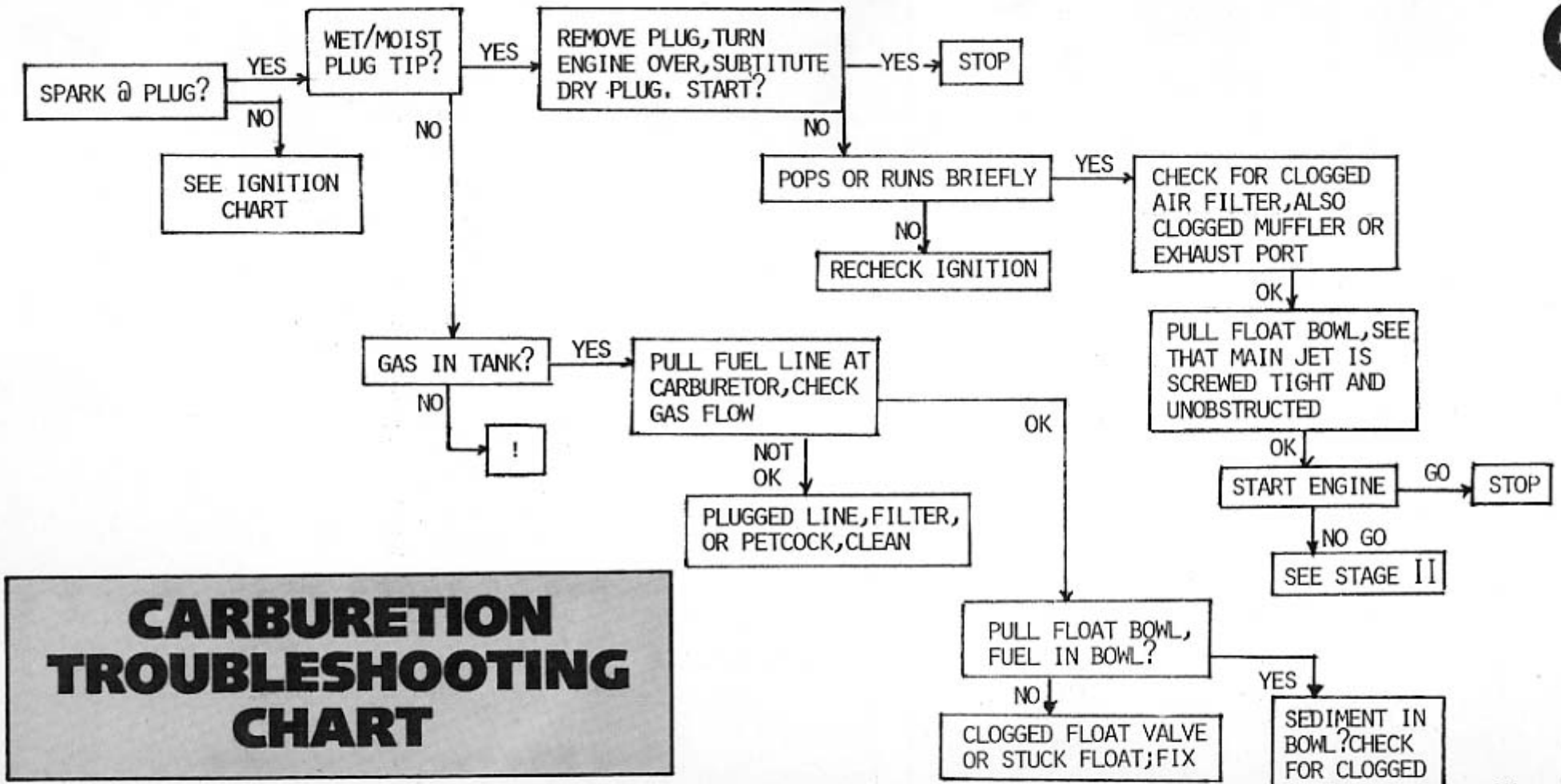
AGRATI-GARELLI CORP. OF AMERICA

IGNITION TROUBLESHOOTING CHART



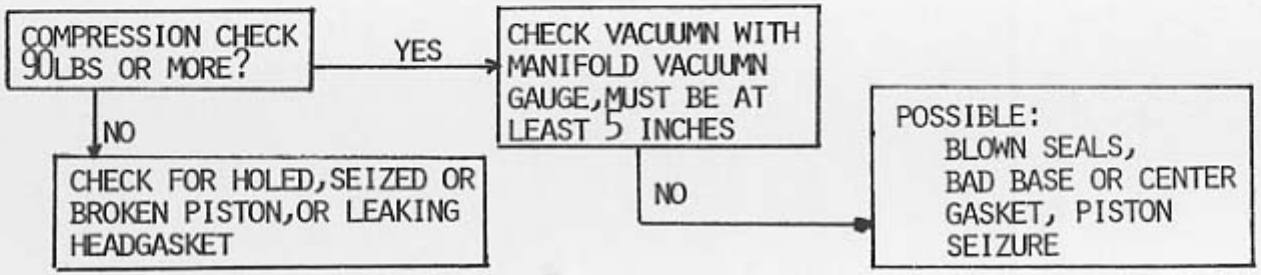
(Arranged in approximate frequency of occurrence)

1)Points not opening (adjust)
2)Point backing plate corroded (replace)
3)Condensor defective (replace)
4)Yellow wire from points to condensor worn thru (replace yellow wire)
5)Primary ignition coil wires, black wire (+), blue wire (-) worn thru by rubbing crank shaft behind stator plate. (replace wires)
6)Mag backing plate cracked allowing points to flutter (replace backing plate)
7)Woodruff key sheared (replace woodruff key)
8)Failure of primary ignition coil (using VOM set on OHM, check for continuity, besides visual inspection for damaged wires.)
9)Defective rotor (substitute; if necessary replace)



CARBURETION TROUBLESHOOTING CHART

STAGE II



DISMANTLING AND REASSEMBLY INSTRUCTIONS
VERTICAL CYLINDER ENGINES

1979 ISSUE

gruppo industriale agrati-GARELLI
s.p.a. monticello brianza (Como)
TEL. 039/931.733-4-5-6

SINGLE SPEED - 2 SPEED AUTOMATIC - 3 SPEED - 4 SPEED - 5 SPEED

La Grafica Briantea - 1500 - Giugno 1979 - Printed in Italy

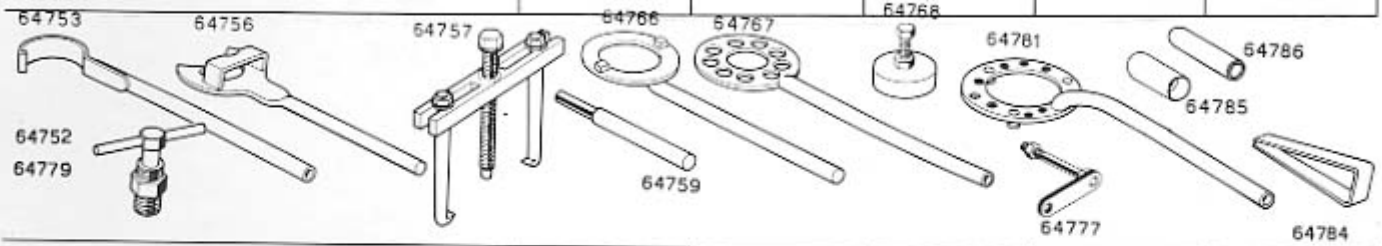
TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS

GARELLI ENGINE		SINGLE SPEED	AUTOMATIC 2 SPEED	3 SPEED	4 SPEED	5 SPEED
— Single cylinder, 2 stroke		□	□	□	□	□
— Displacement	cc. cu.in.	49 2,989	49 2,989	49 2,989	49 2,989	49,6 3,026
— Bore	mm. in.	40 1,574	40 1,574	40 1,574	40 1,574	40 1,574
— Stroke	mm. in.	39 1,535	39 1,535	39 1,535	39 1,535	39,5 1,555
— Points gap	mm. in.	0,35÷0,45 .014÷.018	0,35÷0,45 .014÷.018	0,35÷0,45 .014÷.018	0,35÷0,45 .014÷.018	0,35÷0,45 .014÷.018
— Ignition timing		23°	23°	23°	23°	26°
corresponding to	mm. in.	1,80 .070	1,80 .070	1,80 .070	1,80 .070	2,30 .090
— Starting: pedals kickstarter		□	□	□	□	□
— Clutch: centrifugal automatic in oil bath lined multidisc in oil bath		□	□	□	□	□
— Gearbox: single speed 2 speed automatic 3 speed handshift 4 speed footshift 5 speed footshift		□	□	□	□	□
— Primary reduction		18/67	18/67 25/58	18/67	18/67	18/67
— Secondary reduction, 1st speed		14/39	14/39	14/39	14/39	14/39
— Secondary reduction, 2nd speed				20/33	20/33	18/35
— Secondary reduction, 3rd speed				24/29	24/29	22/31
— Secondary reduction, 4th speed					27/26	24/29
— Secondary reduction, 5th speed						26/27
— Carburettor, Dell'Orto type		SHA 14/12	SHA 14/12	SHA 14/12	SHB 18/12 SHB 19/19B	SHB 18/12 SHB 19/19B
— Gearbox oil capacity, type FIAT VS+30 (SAE 30)	c.c. cu.in.	350 21,35	350 21,35	450 27,46	450 27,46	450 27,46

SPECIAL TOOLS - TORQUE SPECIFICATIONS FOR SCREWS & NUTS

TOOLS	SINGLE SPEED	2 SPEED AUTOMATIC	3 SPEED	4 SPEED	5 SPEED
64.752 Extractor tool for CEV and DUCATI flywheels	□	□	□	□	□
64.753 Holding tool for primary driving sprocket	□	□	□	□	□
64.756 Holding tool for crankshaft driving sprocket			□	□	□
64.757 Adjustable extractor tool	□	□	□	□	□
64.759 Drift for gudgeon pin	□	□	□	□	□
64.766 Tool for hub body		□			
64.767 Holding tool for clutch hub	□				
64.768 Clutch extractor			□	□	□
64.777 Checking tool for gears location			□	□	□
64.779 Extractor tool for Bosch flywheels	□	□	□	□	□
64.781 Holding tool for flywheel and driven gears	□	□	□	□	□
64.784 Holding tool for freewheel catches		□			
64.785 Oilseat protection tool (secondary shaft)	□	□	□	□	□
64.786 Oilseal protection tool (drive side)	□	□	□	□	□



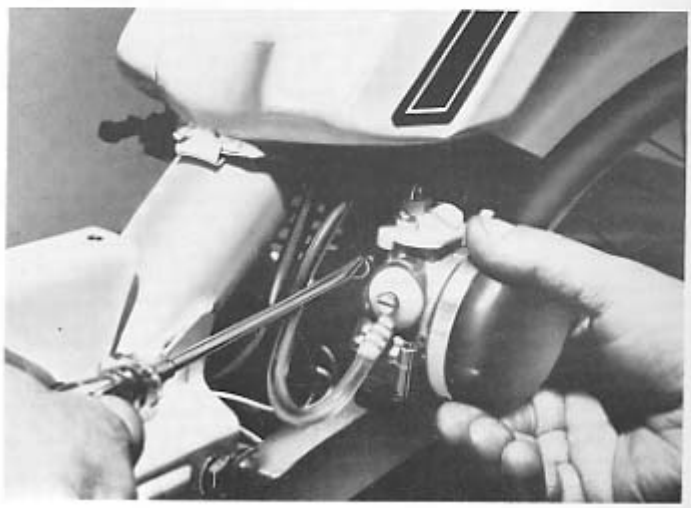
TORQUE SPECIFICATIONS		SINGLE SPEED	2 SPEED AUTOMATIC	3 SPEED	4 SPEED	5 SPEED
CYLINDER HEAD NUT	Kgm	1,5÷1,8	1,5÷1,8	1,5÷1,8	1,5÷1,8	1,5÷1,8
	in.lb.	0,084÷0,10	0,084÷0,10	0,084÷0,10	0,084÷0,10	0,084÷0,10
FLYWHEEL MAGNETO NUT	Kgm	3÷3,5	3÷3,5	3÷3,5	3÷3,5	3÷3,5
	in.lb.	0,168÷0,196	0,168÷0,196	0,168÷0,196	0,168÷0,196	0,168÷0,196
CLUTCH NUT	Kgm	3÷3,5	3,5÷4	4,5÷5	4,5÷5	4,5÷5
	in.lb.	0,168÷0,196	0,196÷0,224	0,252÷0,280	0,252÷0,280	0,252÷0,280
DRIVEN GEAR NUT	Kgm	4÷4,5	8÷8,5			
	in.lb.	0,224÷0,252	0,448÷0,476			
CHAIN SPROCKET NUT	Kgm	6÷6,5	6÷6,5	6÷6,5	6÷6,5	6÷6,5
	in.lb.	0,336÷0,364	0,336÷0,364	0,336÷0,364	0,336÷0,364	0,336÷0,364
CRANKCASE SCREW	Kgm	0,8	0,8	0,8	0,8	0,8
	in.lb.	0,044	0,044	0,044	0,044	0,044

ENGINE REMOVAL

After removing engine covers, if any, the chain cover, the starting and gearchange pedals, for which no special toois or procedures are required, proceed as follows:

— Remove the silencer using special tool 64753 (for single speed, 2 speed automatic, 3 speed models). For the other models simply loosen the two nuts with an 11 mm (.433") open end wrench.

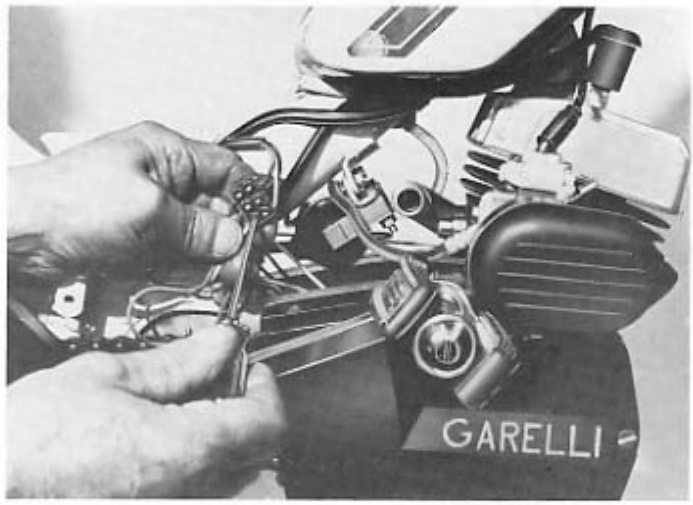
— Disconnect the starting cable using a 17 mm (.669") open end wrench as illustrated.



— With a screwdriver remove carburettor from the engine but leave it connected to the frame.

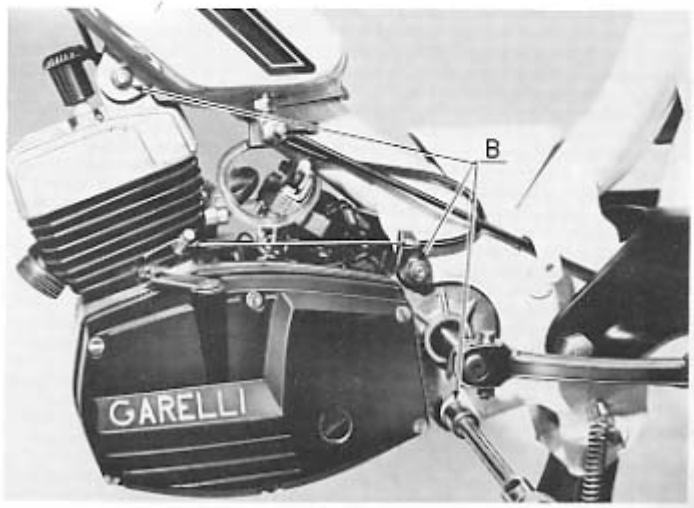
ENGINE REMOVAL

— Disconnect the wires from the terminal block, as well as the spark plug and the engine cut-off wires.



— Break the chain by removing master link

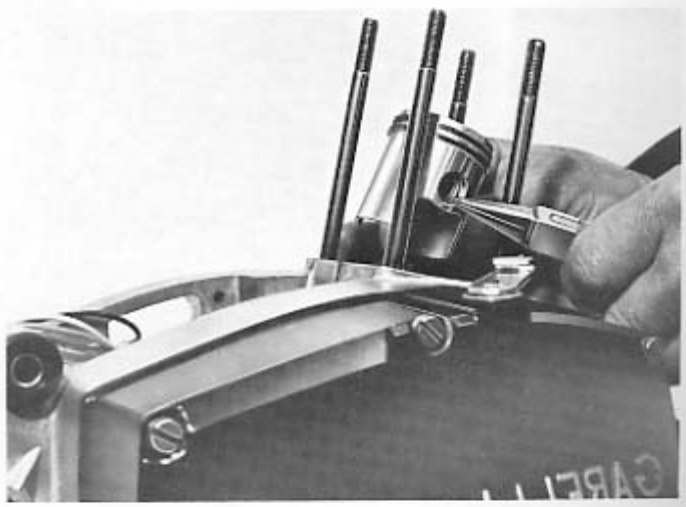
— Remove the engine by loosening the 3 «B» mounting bolts, using a 13 mm (.511'') socket.



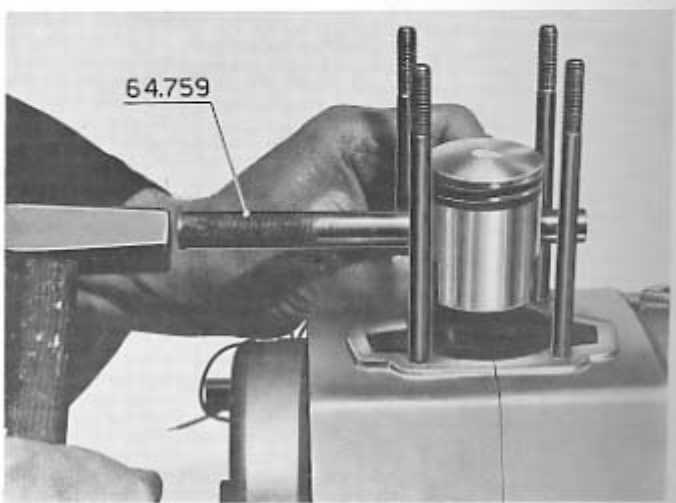
ENGINE DISASSEMBLY - COMMON OPERATIONS TO ALL MODELS

— Remove the 4 nuts holding the cylinder head using one 11 mm (.433") box spanner. Lift the head and the barrel over the 4 studs and remove the cylinder base gasket.

— Remove the two gudgeon pin retaining circlips with the pliers.

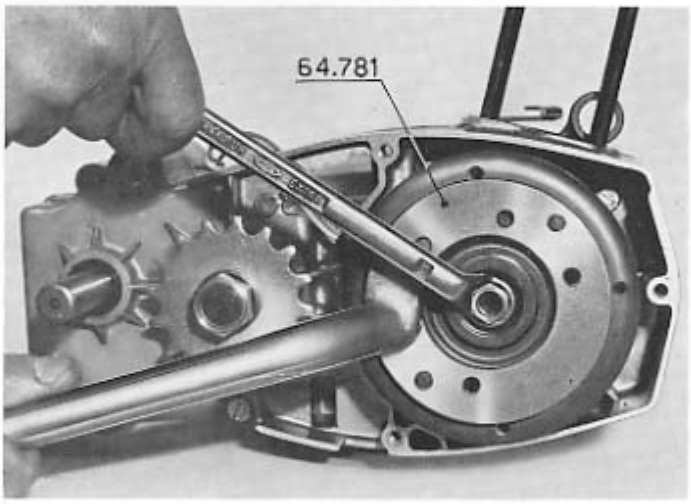


— Remove the piston gudgeon pin using the extractor 64759 and a mallet, being careful to support the piston on the opposite side.

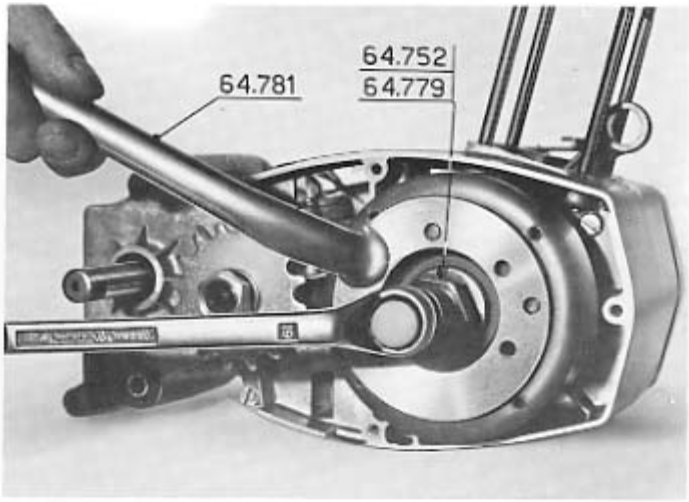


ENGINE DISASSEMBLY - COMMON OPERATIONS TO ALL MODELS

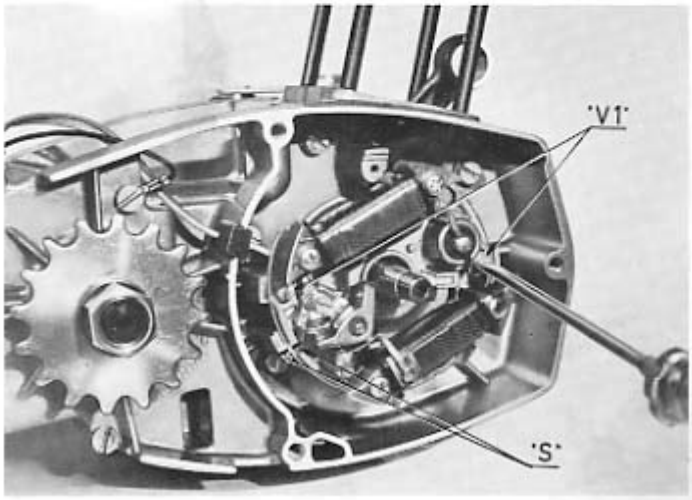
— Using the tool 64781 to hold the flywheel, unscrew the flywheel retaining nut with a 14 mm (.551") socket.
Remove the spring washer.



— CAUTION
Before using the extractor, the external threads and those of the center bolt should be lightly greased. Screw the extractor 64779 (for Bosch flywheels) or 64752 (for the others) into the threads of the flywheel, then turn the extractor center bolt in a clockwise direction to pull the flywheel off the taper; keep holding the rotor with the tool 64781

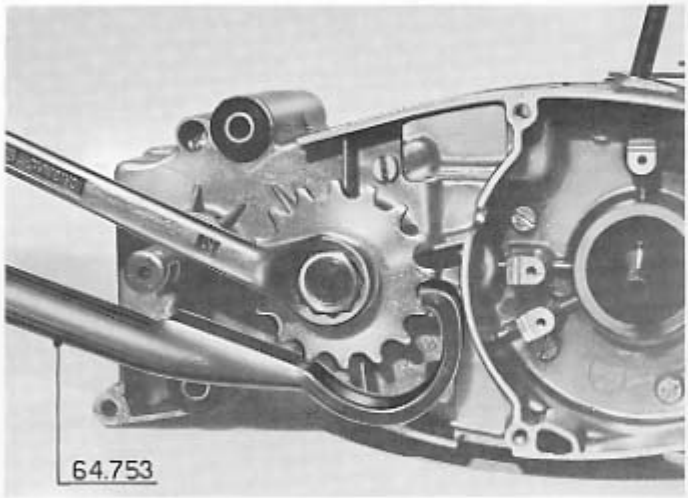


— Make a scriber mark «S» across the bottom of the stator plate and the crankcase in order to facilitate re-timing on assembly. Remove the screws «V1» holding the stator plate to the crankcase. Remove the Woodruff key from the crankshaft.



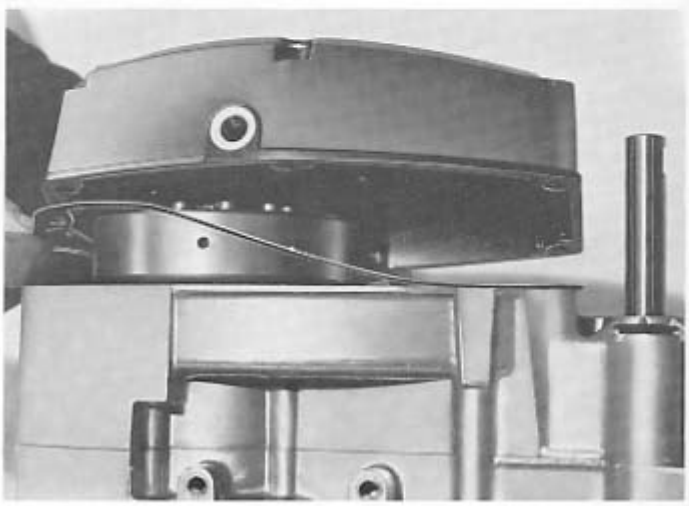
ENGINE DISASSEMBLY - COMMON OPERATIONS TO ALL MODELS

— Using the tool 64753 and 22 mm (.866") wrench remove the nut and the lock washer, then pull the sprocket from the shaft.



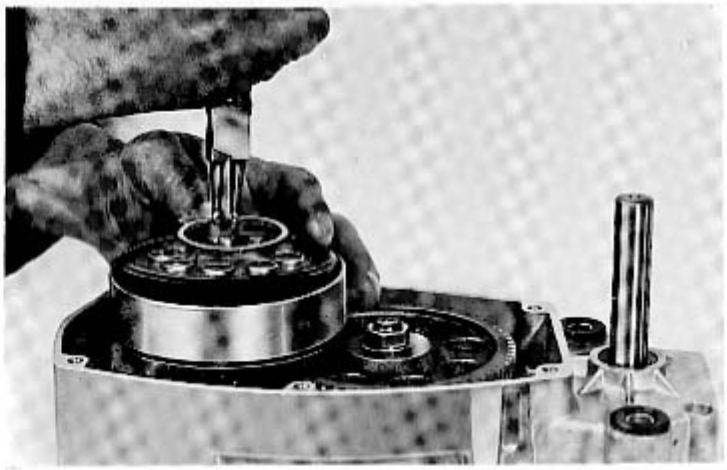
— Drain oil from the gearbox and clutch by removing the drain plug on the bottom of the engine.

— Remove the left sidecover and its gasket by taking out the six screws that hold it to the crankcase.

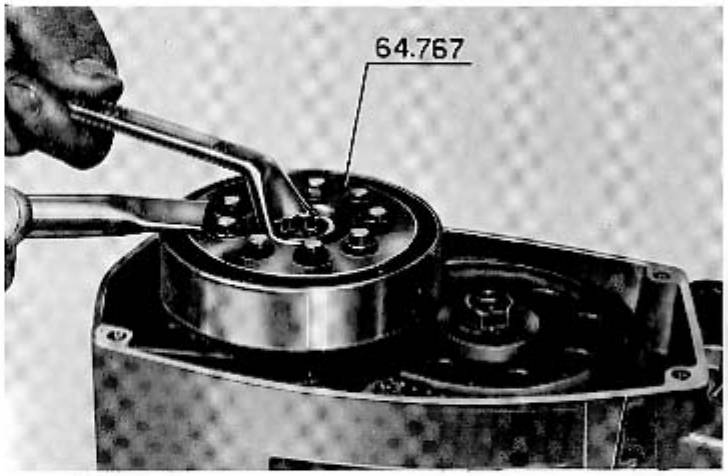


CLUTCH DISMANTLING - SINGLE SPEED

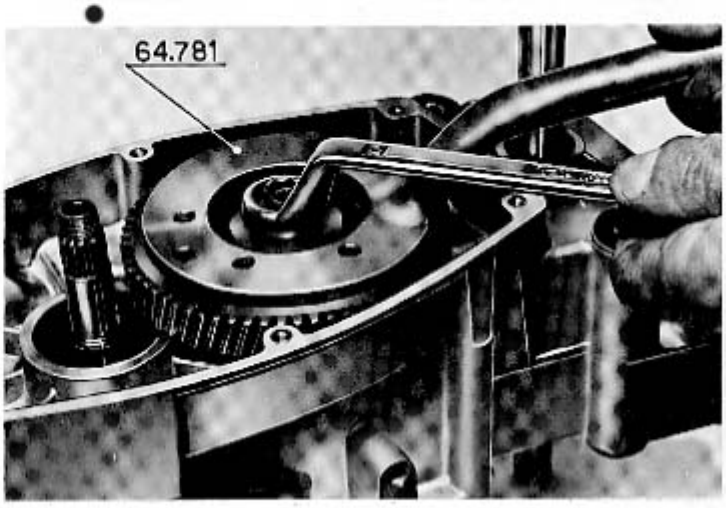
— Using the needlenose pliers remove the circlip and the spring from the clutch assembly.



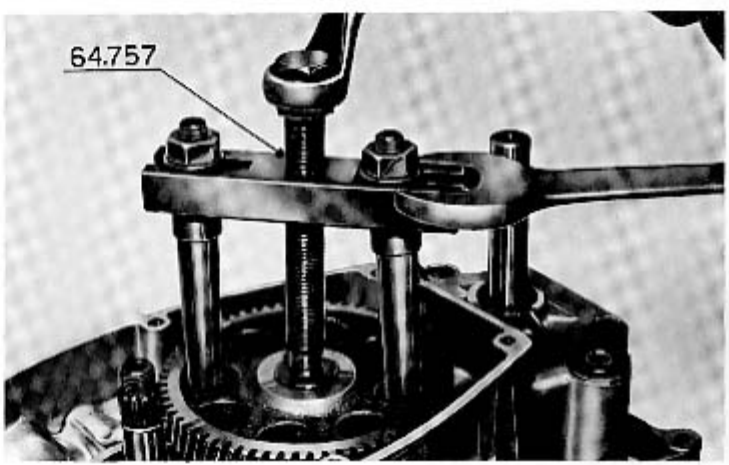
— Using the tool 64767 and a 17 mm (.669") socket remove the nut locking the clutch hub. Then slide the clutch hub and housing from the crankshaft.



— Holding the gear with the tool 64781, unscrew the nut with a 17 mm (.669") socket.

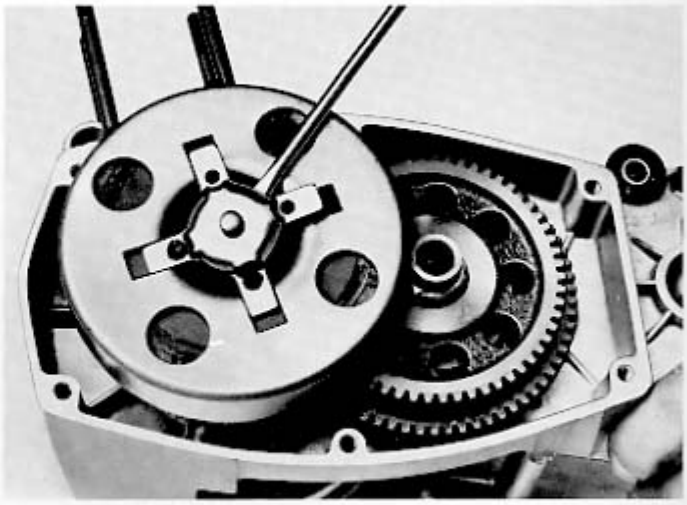


— Use extractor tool 64757 and a 19 mm (.748") wrench to remove the gear.

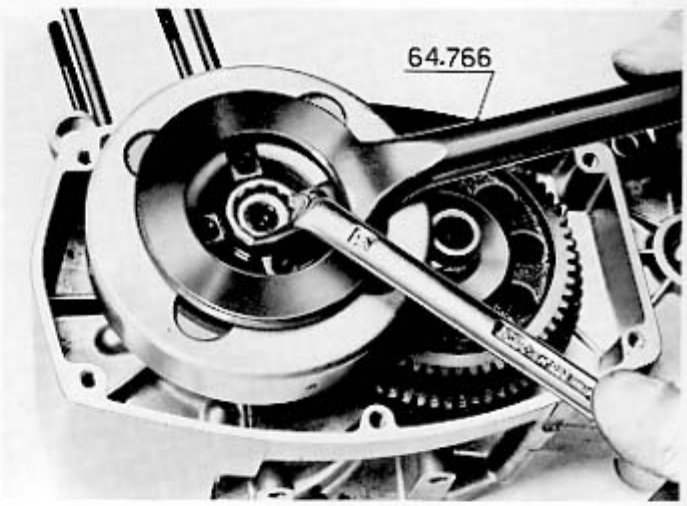


CLUTCH DISMANTLING - 2 SPEED AUTOMATIC

— Remove with the screwdriver the pressure plate from the 4 rubbers.

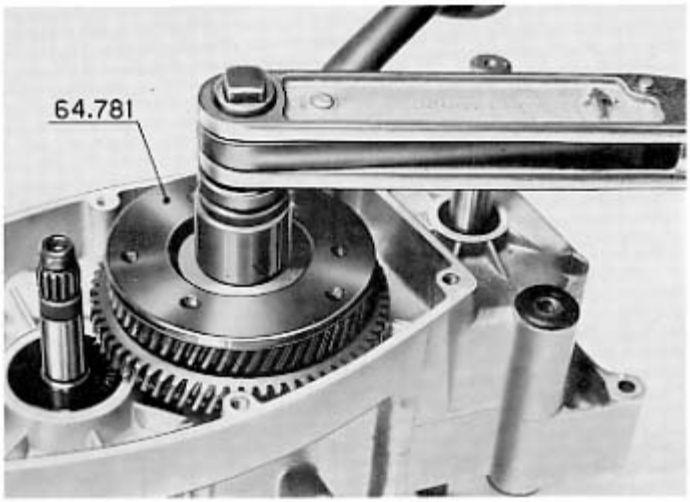


— Holding the clutch body with the tool 64766, use a 17 mm (.669") socket to unscrew the nut, then remove the washer.

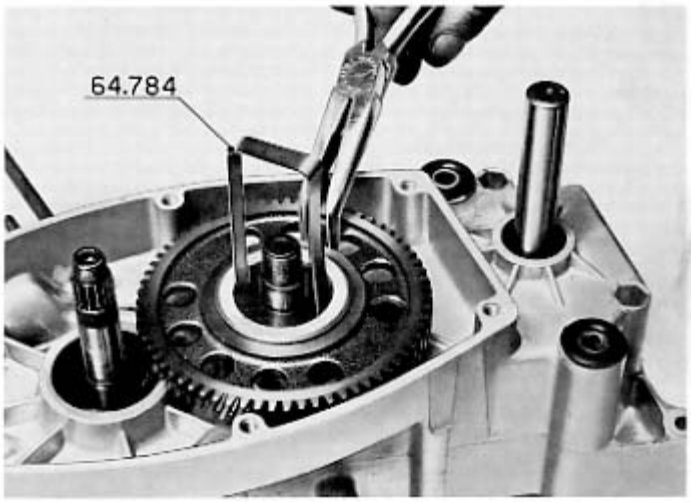


— Take the assembly of two clutches complete with gears and slide it from the crankshaft.

CLUTCH DISMANTLING - 2 SPEED AUTOMATIC



— Hold the gear with the tool 64781 while unscrewing the nut with a torque wrench.

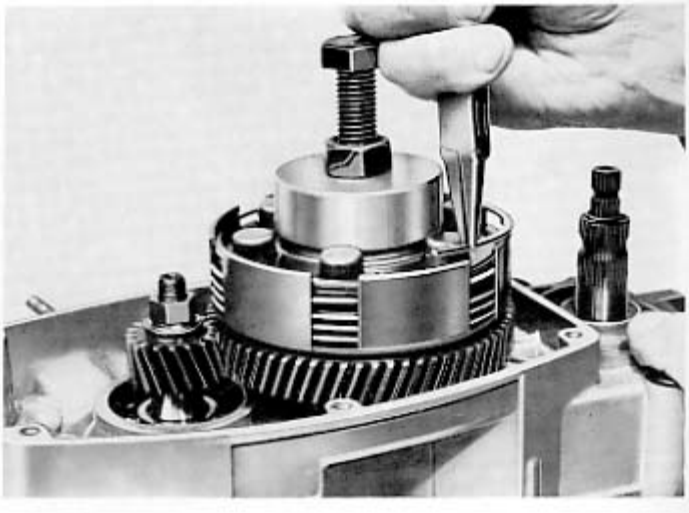


— Remove the 2nd speed gear and then the 1st', while holding the catches with the tool 64784.
Then slide the clutch hub and washers.

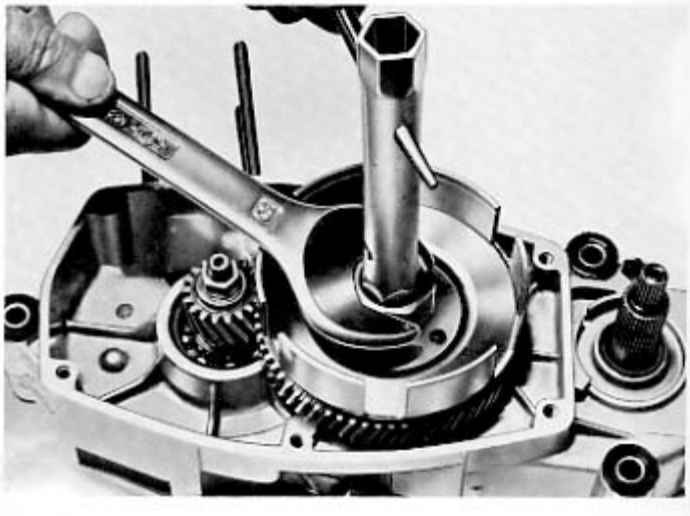
CLUTCH AND PRIMARY DRIVE DISMANTLING 3-4-5 SPEED

— Take off the lock nut and unscrew the clutch rod. Take the extractor 64768, act on its screw first, then tighten the nut «D» with a 22 mm (.866") socket to make the spring group pack together.

— With the pliers remove the circlip, the spring plate and the clutch discs.



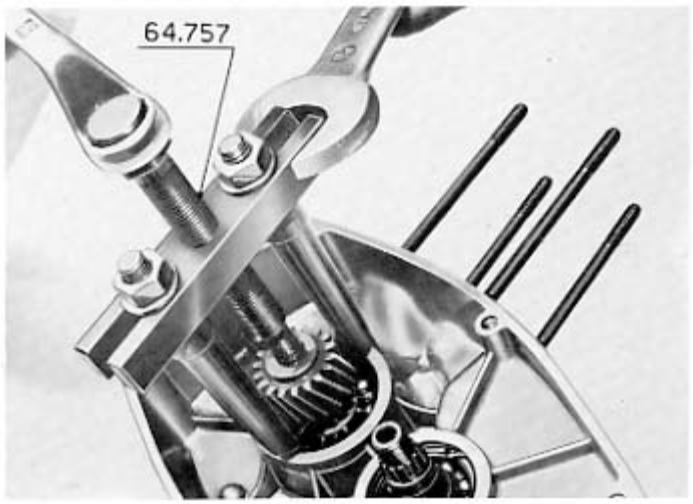
— Hold the clutch hub with a 30 mm (1.181") wrench, unscrew the lock nut with a 17 mm (.669") socket, slide the washers, the nut and the hexagonal body.



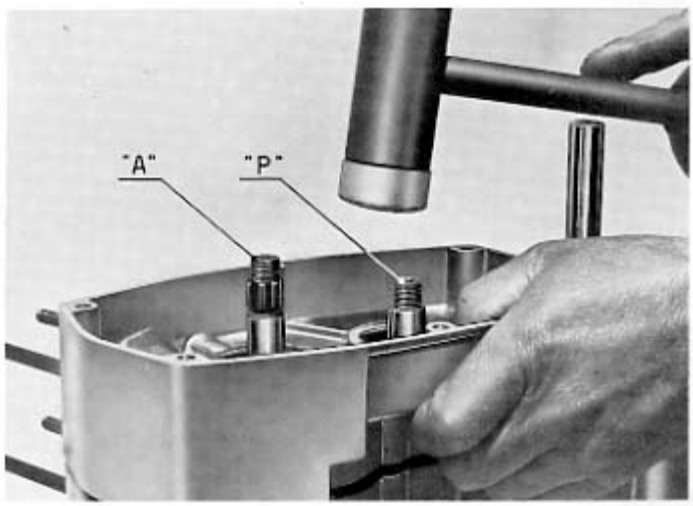
CLUTCH AND PRIMARY DRIVE DISMANTLING 3-4-5 SPEED

— Hold the gear with the tool 64756, remove the nut with a 14 mm (.551") polygonal wrench, remove the spring washer.

— Hold the gear with the tool 64. 757 operate its centre screw and slide the gear from the crankshaft with a 19 mm (.748") wrench.



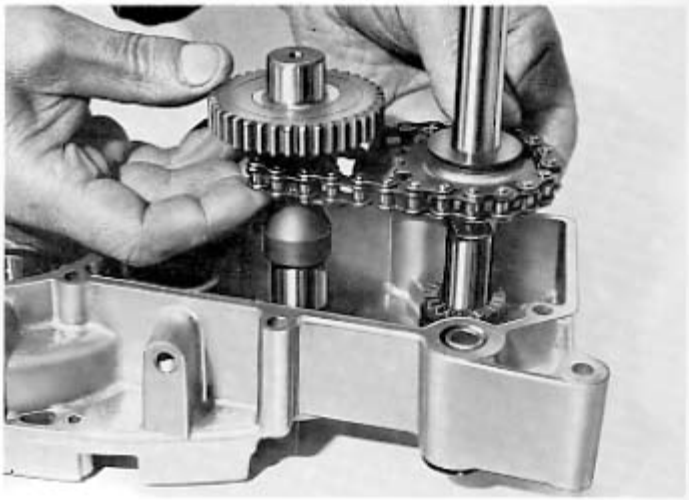
— **COMMON OPERATION TO ALL MODELS**
Remove the 10 crankcase screws from the right hand crankcase. Strike the ends of the crankshaft «A» and of the primary shaft «P» alternately with a mallet until the two halves of the crankcase separate.



GEARBOX AND SECONDARY DRIVE DISMANTLING

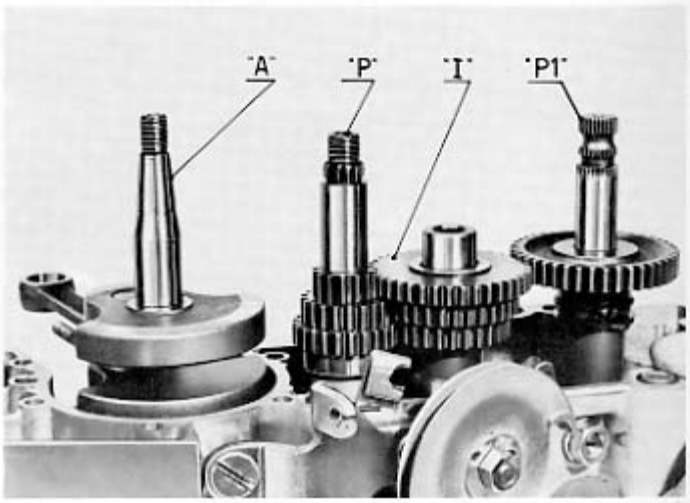
SINGLE SPEED - 2 SPEED AUTOMATIC

— Remove the crankshaft, the primary shaft, and the secondary shaft and the pedal shaft together.

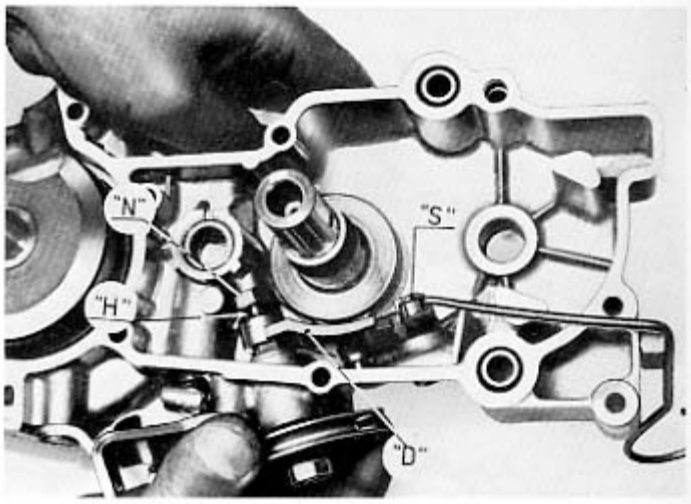


3 SPEED

— Slide the starting assembly «P1», the gears «I» from the secondary shaft, the primary shaft «P» and the crankshaft «A» from the crankcase, using a mallet if necessary. Making use of a magnet, remove the 7 pips from their housings in the secondary shaft.

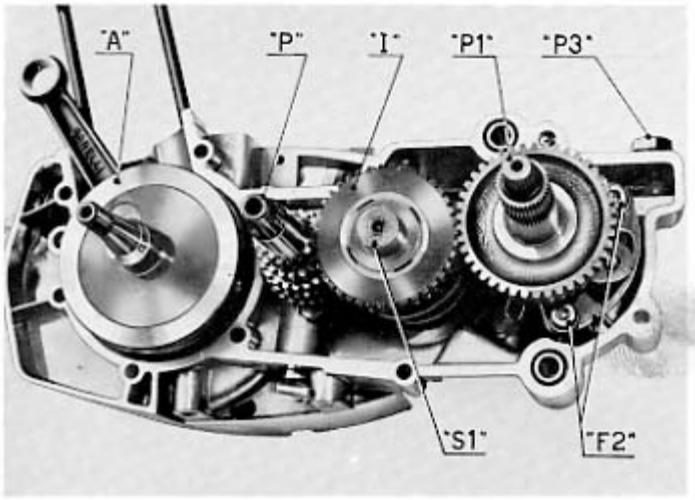


— Unscrew the nut «N» that secures the selector «D» to the shaft «H», slide out the shaft complete and the secondary shaft. To make this operation easier, secure in the open position the catch «S».

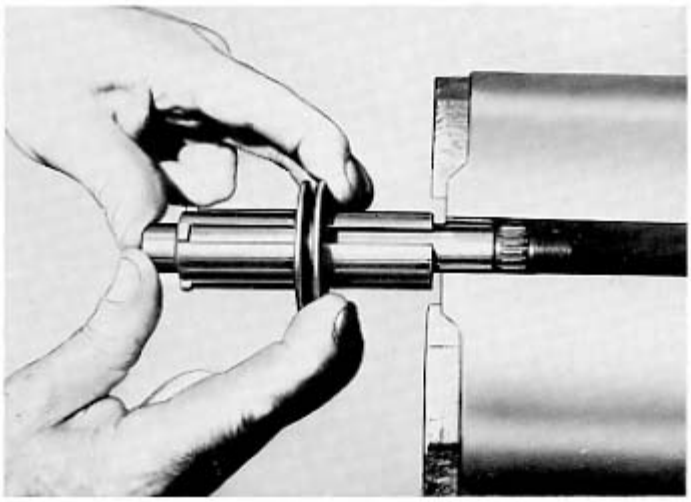


GEARBOX AND SECONDARY DRIVE DISMANTLING 4-5 SPEED

— Slide the starting assembly «P1», the gears «I» from the secondary shaft, the primary shaft «P» and the crankshaft «A» from the crankcase, using a mallet if necessary.
For the 4 speed engines only: making use of a magnet remove the 9 pips from their housings in the secondary shaft.
Remove the secondary shaft «S1» together with the selector assembly, taking care to remove first the 2 hexagonal screws «F2» and the top spindle «P3».



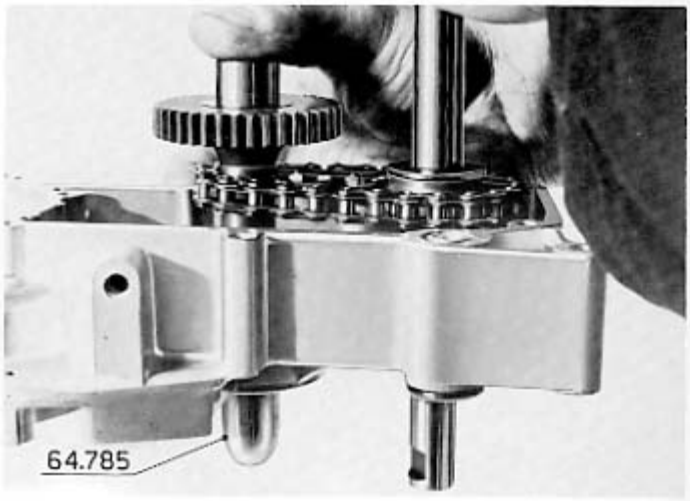
— Secure in a vice the secondary shaft of the 5 speed engine, draw back and slide off the slider taking care not to lose the springs and locating balls.



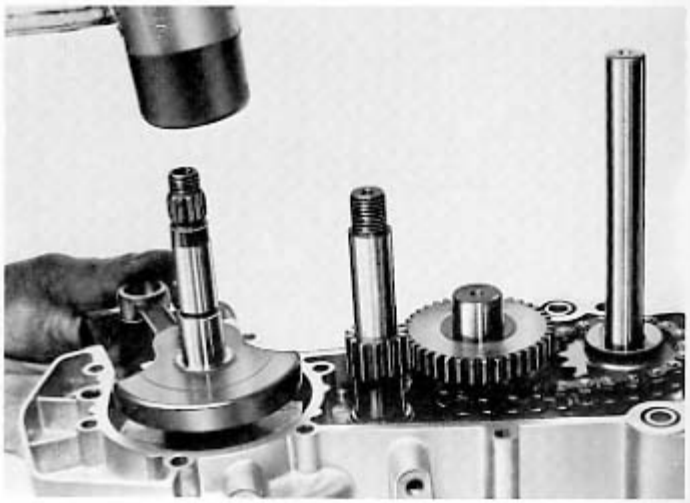
ENGINE REASSEMBLY - SINGLE SPEED, 2 SPEED AUTOMATIC

Before starting to assemble the unit, carefully clean and slightly oil all the parts.

— Using the tool 64785 insert in the right hand crankcase the secondary shaft along with the pedals shaft with the chain, the starting spring and the starting assembly. Then fit the primary shaft and shim washer.



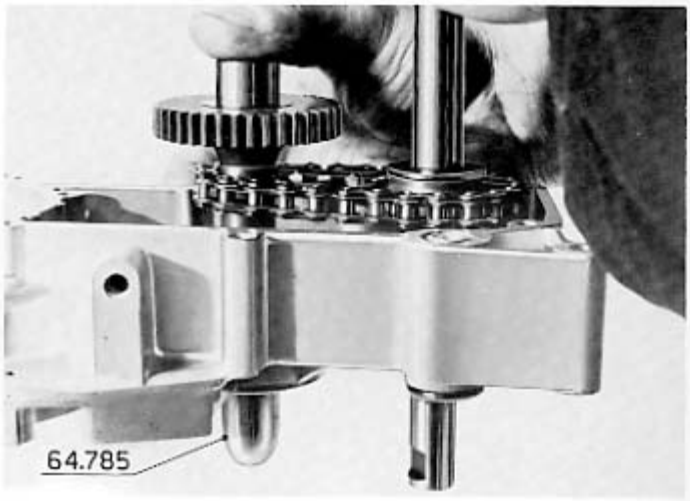
— Insert the crankshaft into the crankcase, lightly tapping it with a mallet.



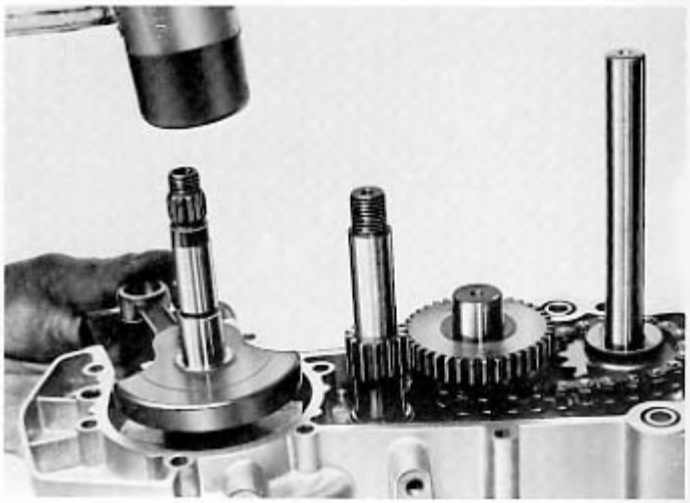
ENGINE REASSEMBLY - SINGLE SPEED, 2 SPEED AUTOMATIC

Before starting to assemble the unit, carefully clean and slightly oil all the parts.

— Using the tool 64785 insert in the right hand crankcase the secondary shaft along with the pedals shaft with the chain, the starting spring and the starting assembly. Then fit the primary shaft and shim washer.

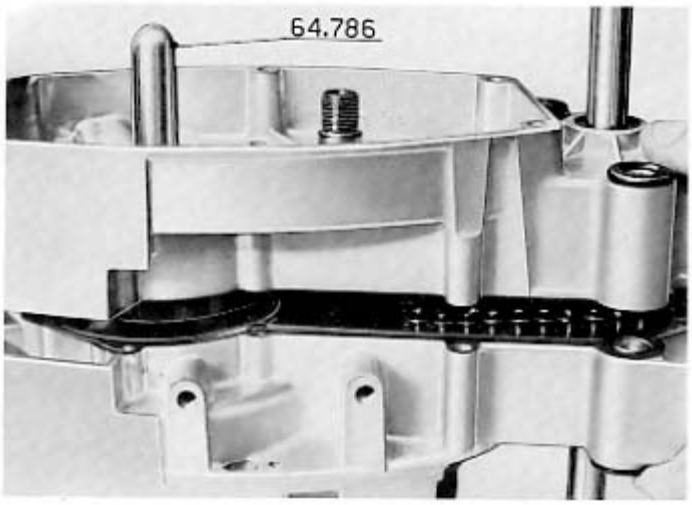


— Insert the crankshaft into the crankcase, lightly tapping it with a mallet.

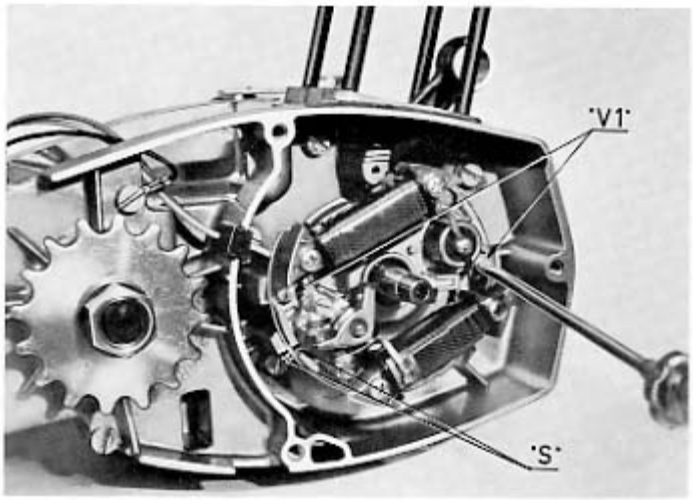


ENGINE REASSEMBLY - SINGLE SPEED, 2 SPEED AUTOMATIC

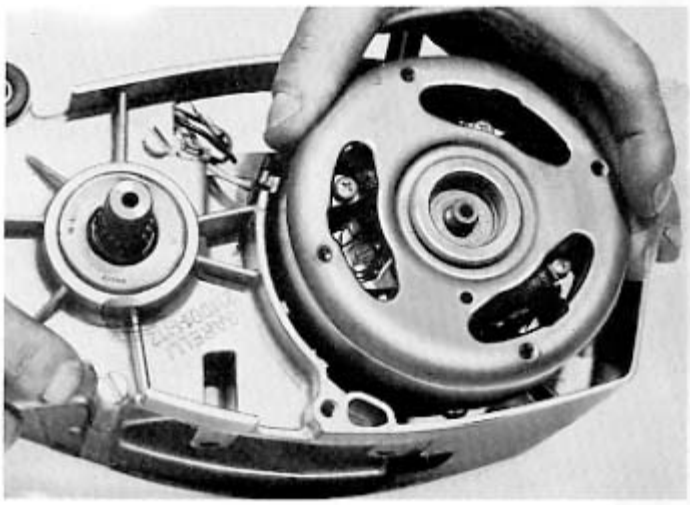
— Join the left crankcase with the right one acting as follows:
  a) Make sure that the faces of the cases are clean and free from burrs and that the dowels are in position.
  b) Slightly grease a new gasket on both sides, which is to to be inserted between the two crankcase halves.
  c) Using the tool 64786, press the two crankcases by hand and then tap them together with a mallet.
  d) Fit and tighten the 10 screws joining the cases.
  e) Check that the crankshaft, the primary shaft, the secondary shaft and the pedal shaft turn freely.



— With the exception of the Bosch flywheel, insert the distance piece under the stator plate, fit the plate so that the scriber mark «S» previously made is in line, tighten the mounting screws «V1».

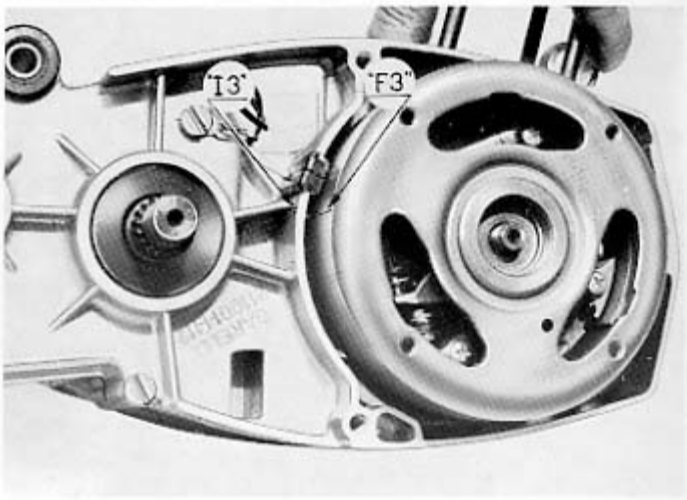


— Fit the woodruff key in position on the crankshaft, slip the flywheel and rotate it until it is felt that the key is correctly seated.

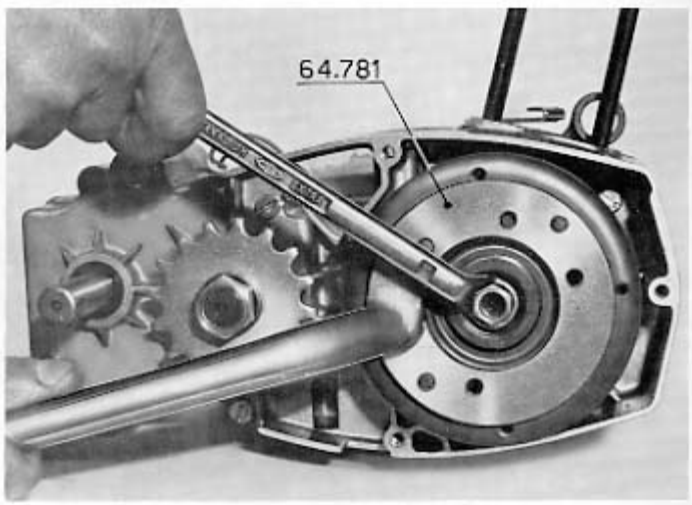


ENGINE REASSEMBLY - SINGLE SPEED, 2 SPEED AUTOMATIC

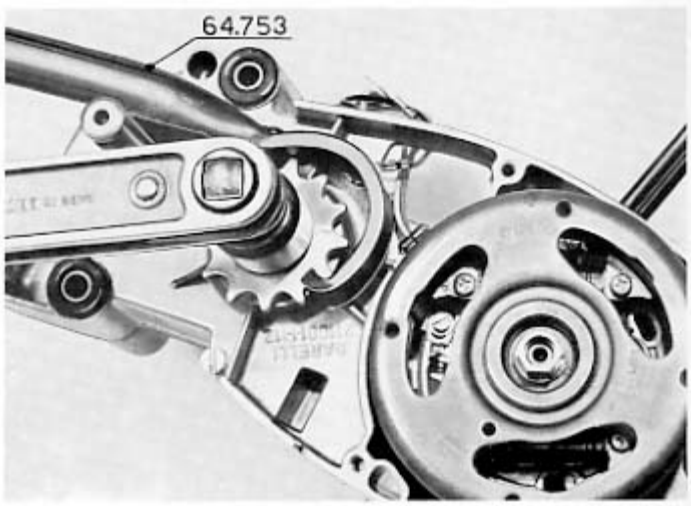
— Rotate the flywheel by hand in the clockwise direction until the points gap is in the widest position. At this instant check the gap with a feeler gauge, resetting if necessary to 0,35÷0,45 mm (.014"÷.018")
Check the timing, which is correctly set when the points begin to open at 23° B.T.D.C. (for 5 speed only: 26° B.T.D.C.) (see owner's manual).
To check the timing rotate the flywheel in the clockwise direction so as to line up the arrow «F3» on the flywheel and the mark «I3» on the crankcase; in this position the points should just begin to open. If they do not, slip off the flywheel, loosen the stator plate fastening screws, rotate the plate in the appropriate direction, lightly refit the screws, refit the flywheel, check the gap.



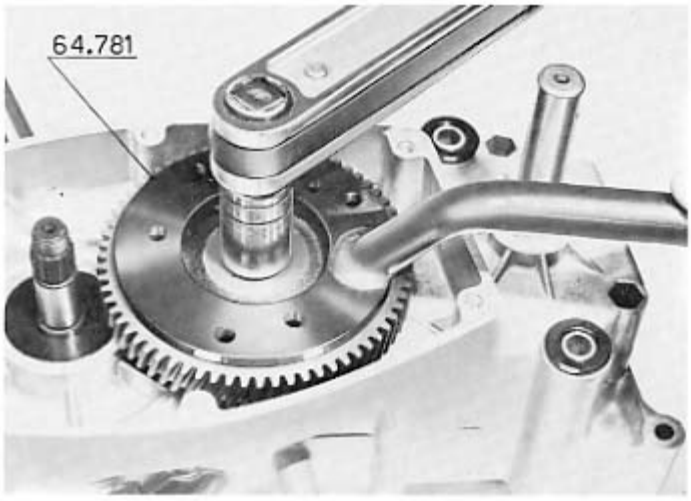
— When satisfied that the gap is set correctly, fit the washer and tighten the fastening nut, using the tool 64781 and the 14 mm (.551") socket previously used when dismantling.



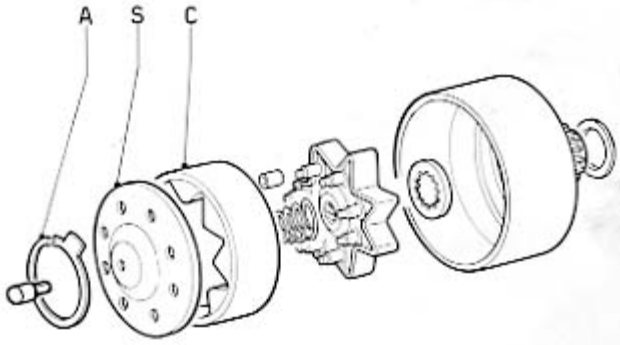
— Fit the chain gear and the two shim washers on the secondary shaft, using the tool 64753 and a torque wrench tighten the nut to 6÷ 6,5 kpm. (in. lb. 0,336÷0,364).



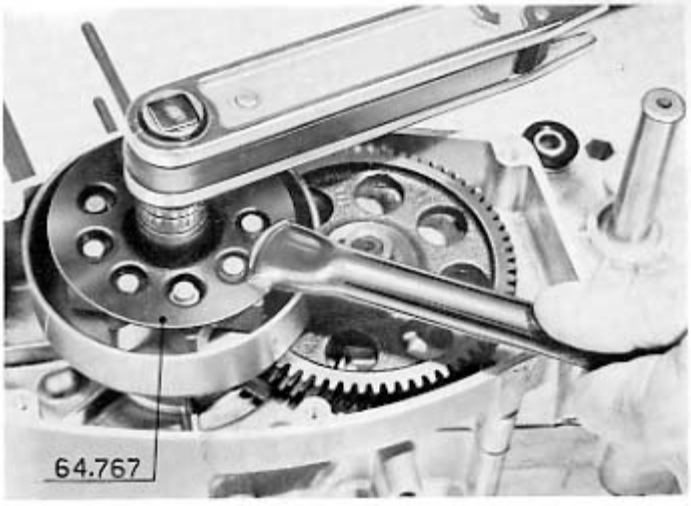
REASSEMBLY OF DRIVEN GEAR AND CLUTCH SINGLE SPEED



— Turn the engine the opposite side, place on the primary shaft the gear, the washer and the nut and, using the tool 64781, tighten it to 4÷4,5 kpm (in. lb. 0,224÷0,252) with the torque wrench.



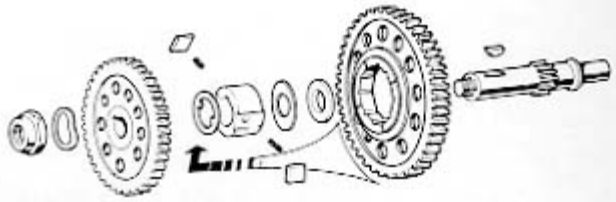
— Fit the clutch assembly and hub following the illustration.



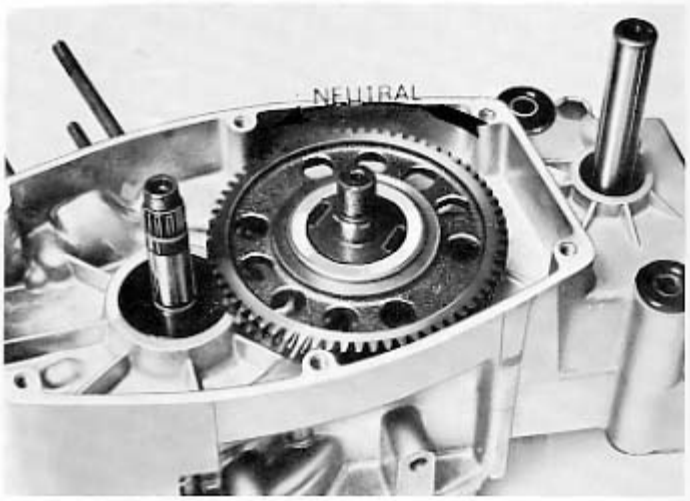
— Before mounting the plate «S», the elastic body «C» and the circlip «A», with the tool 64767 and torque wrench tighten to 3÷3,5 kpm (in.lb. 0,168÷0,196) the nut fixing the clutch hub to the crankshaft.

REASSEMBLY OF DRIVEN GEARS FREEWHEEL AND CLUTCH

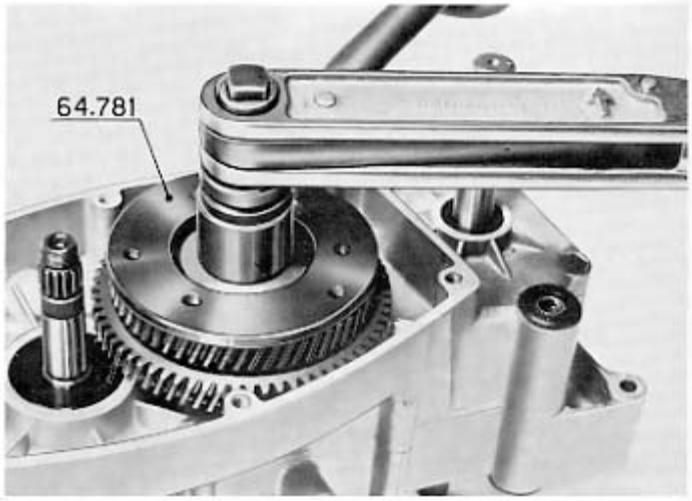
2 SPEED AUTOMATIC



— Place gears and freewheel on the primary shaft as per illustration. Use the tool 64784 to hold in place springs and catches when sliding the 1st speed gear.



— CAUTION: the freewheel hub shall be fitted so as to allow the 1st speed gear to turn free when rotated in the counter-clockwise direction.

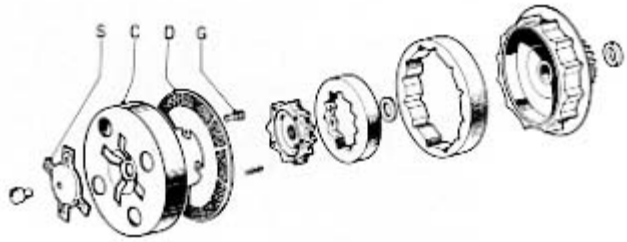


— With the tool 64781 and torque wrench tighten to 8÷8,5 kpm (in.lb. 0,448÷0,476) the nut fixing the gears on the primary shaft.

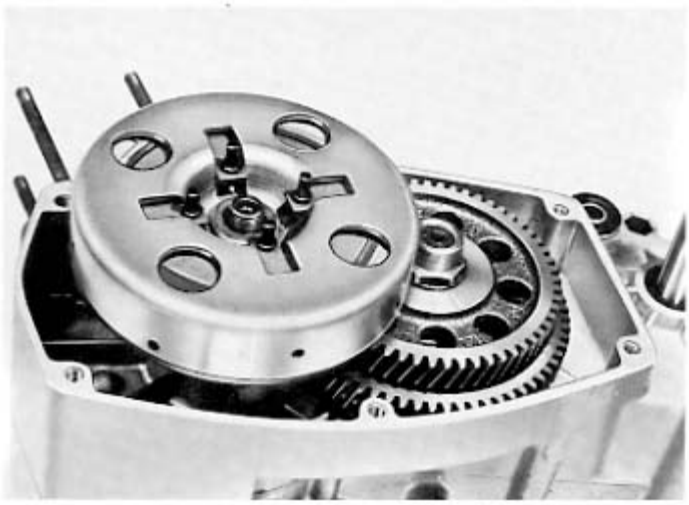
REASSEMBLY OF DRIVEN GEARS FREEWHEEL AND CLUTCH

2 SPEED AUTOMATIC

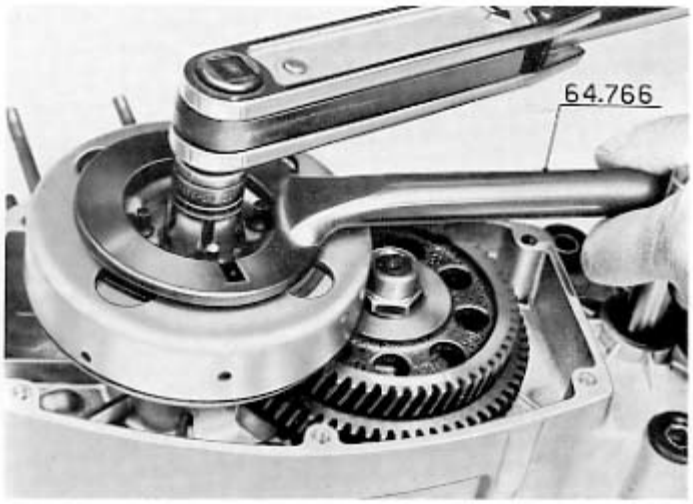
— Reassemble the clutch assembly as illustrated.



— When at the disc «D», place the 4 rubbers «G» in the correspondig holes. The rubbers ends should face towards the outer side of the engine and the thicker lined face of the disc towards the inner side.



— Hold the 2nd speed housing «C» with the tool 64766 and tighten the nut to 3÷4 kpm (in.lb. 0,168÷0,224) with the torque wrench.

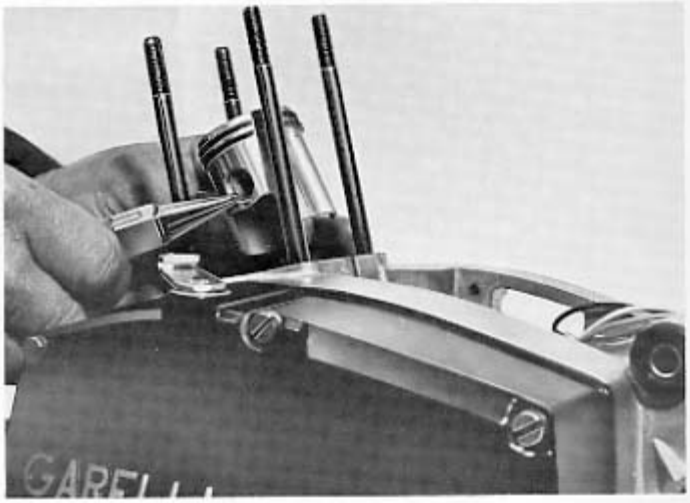


— Slide the cross shaped plate «S» with the pliers on the 4 rubbers «G» as illustrated, then cut the 4 rubbers ends.

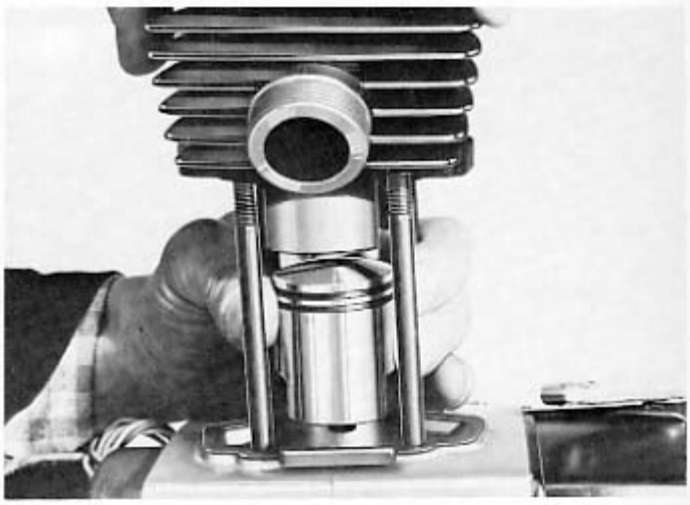
ENGINE REASSEMBLY - PISTON, CYLINDER, CYLINDER HEAD
SINGLE SPEED, 2 SPEED AUTOMATIC, 3 SPEED

Once the mentioned operations are accomplished, before fitting the cover make sure the two rubber bodies turn free on the hubs.
Make sure that the faces of the left hand crankcase and of the cover are clean and free from burrs, slightly grease a new gasket and place it on the crankcase face, Make certain that the cover fits the oil plug and washer. Place the cover on the crankcase and tighten the 6 joining screws.

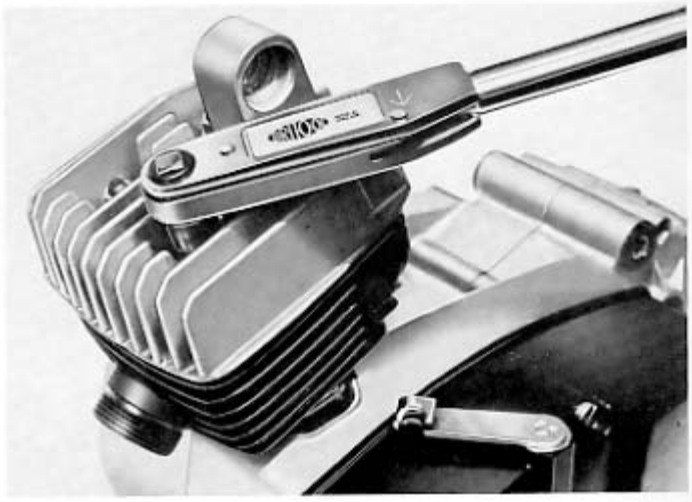
— Refit piston with needlebearing, gudgeon pin and circlips as illustrated and make certain that the circlips are properly inserted in their grooves.
Make sure that «S» on the piston is towards the exhaust port.



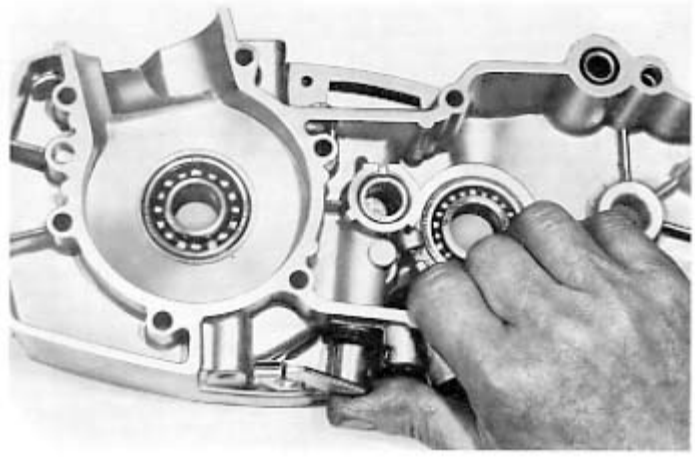
— Check that the crankcase upper face and the cylinder base are clean and free from burrs. Lightly grease a new gasket on both sides and lay it on the crankcase face. Oil the cylinder bore and the piston skirt.
Lower the cylinder onto the piston with fingers compressing the rings into the bore. Make sure that the ends of the piston rings are properly fitted in position against the pegs of the ring grooves. Slide the cylinder along the 4 studs and fit it in place.



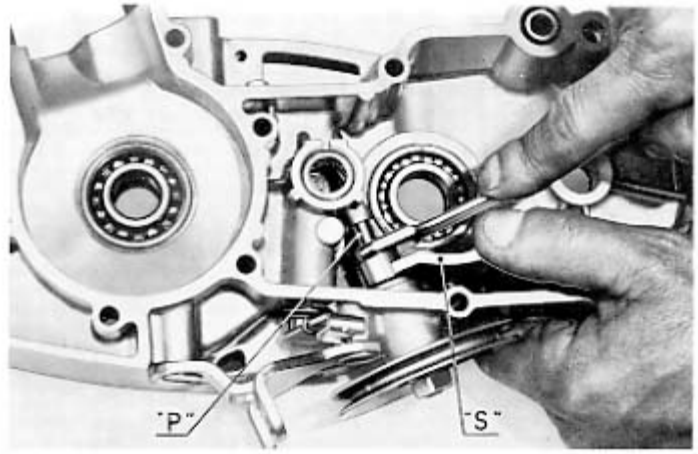
— Check that the top of the cylinder and the face of the head are clean and undamaged. Fit the head over the studs and place the 4 washers and nuts on the studs.
Tighten the nuts gradually in a cross pattern.
The final torque should be 1,5÷1,8 kpm (in.lb. 0,084÷0,10).
Refit the spark plug.
Through the hole on the left hand cover fill the crankcase with abt. 350 cc. (cu.in. 21,35) of FIAT VS+ 30 (SAE 30) oil.



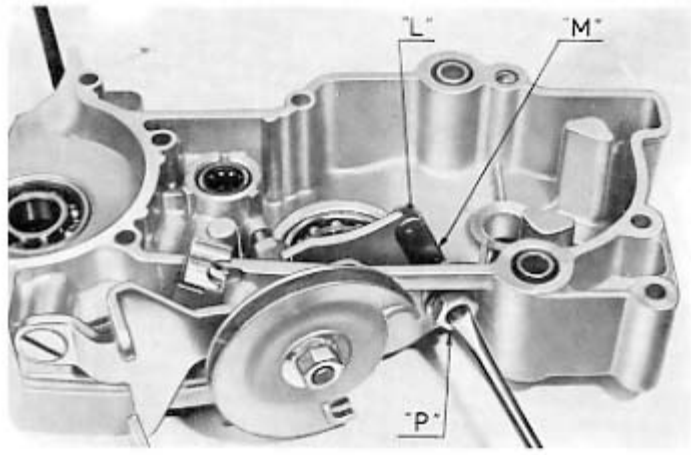
— Fit as illustrated the clutch lever with return spring and tighten the screw on the opposite side of the crankcase. (This operation also applies to the 4 speed and 5 speed engines).



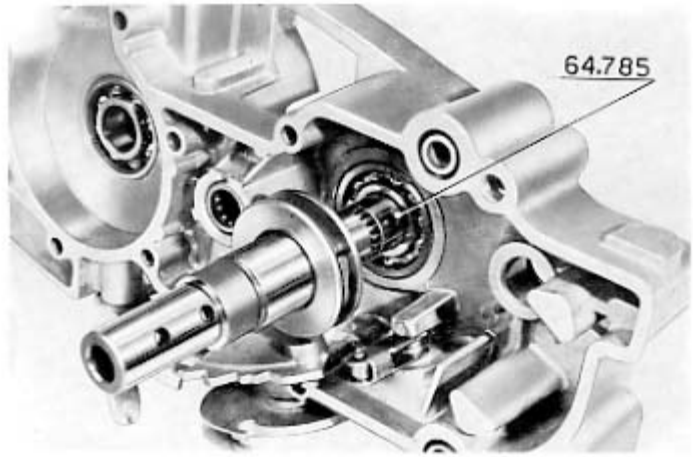
— Fit the selector «S», the pin «P» and tighten the nut inside the crankcase.



— Mount the pin «P», the spring «M» and the gears locating lever, screw but do not tighten the locknut.

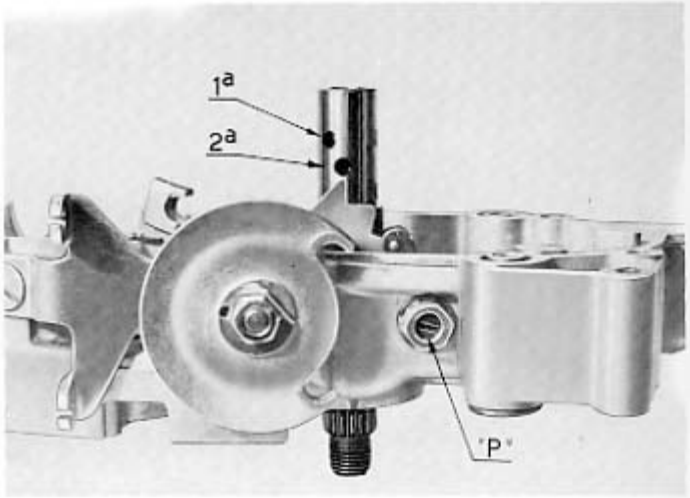


— Slide the secondary shaft in the support and then in the bearing, using the tool 64785.

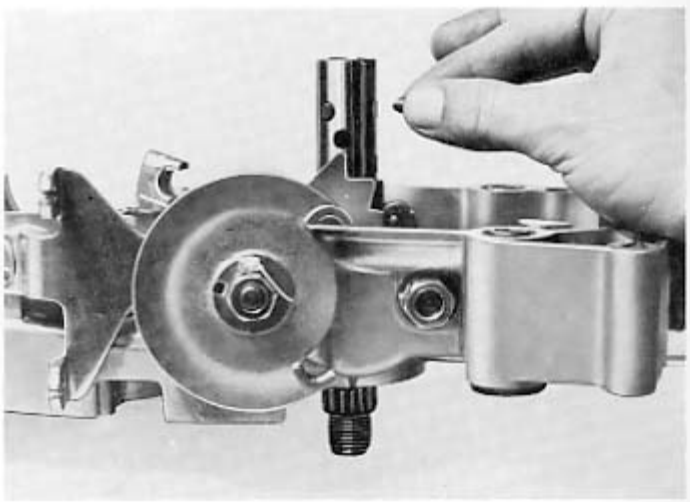


ENGINE REASSEMBLY 3 SPEED

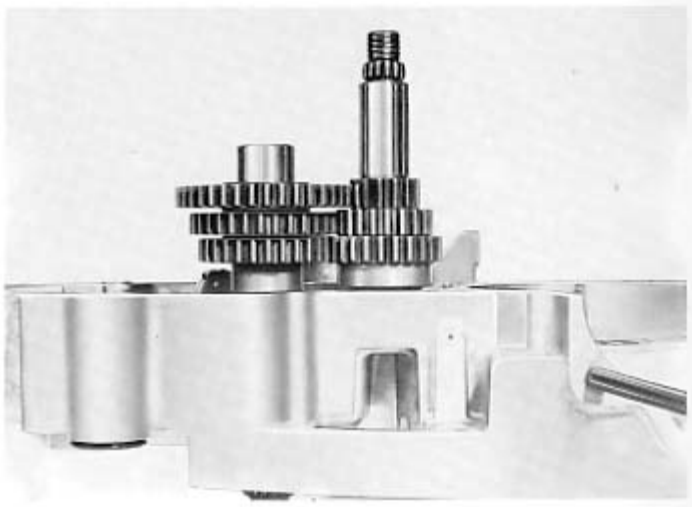
— Put the gearchange in the «neutral» position and adjust it acting with a screwdriver on the pin «P» until when the protrusion on the sliding axle is in the centre between the hole of the 1st speed and that of the 2nd speed.



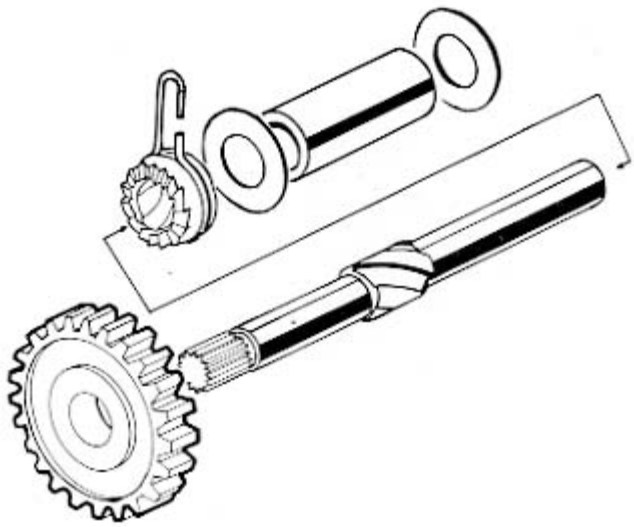
— Place the balls in the respective holes on the secondary shaft and hold them in place with some grease.



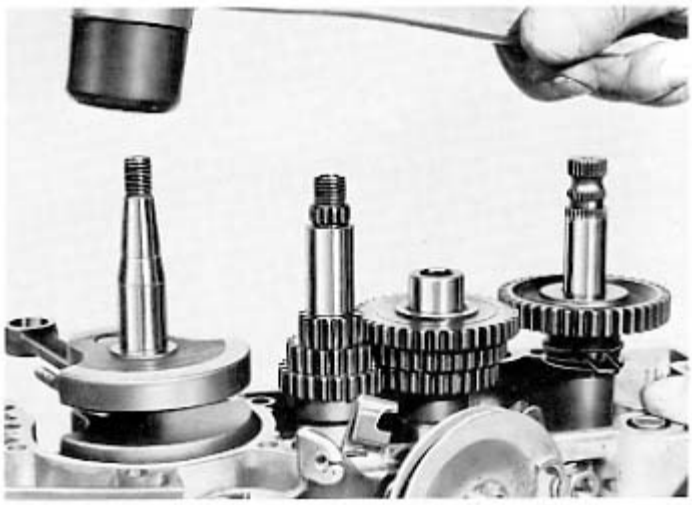
— Mount the primary shaft and then the gears on the secondary shaft. Make sure that the toothings are in line.



ENGINE REASSEMBLY 3 SPEED



— Mount the distance piece, the shaft, the engagement for starting with gear as shown in the illustration.

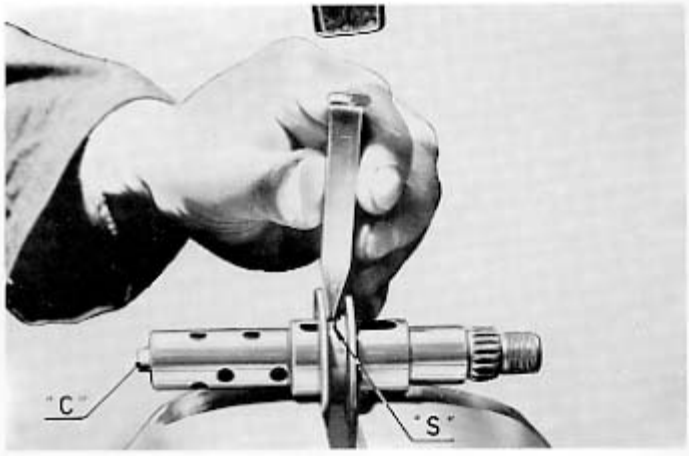


— Slide the crankshaft, lightly tapping it with a mallet.

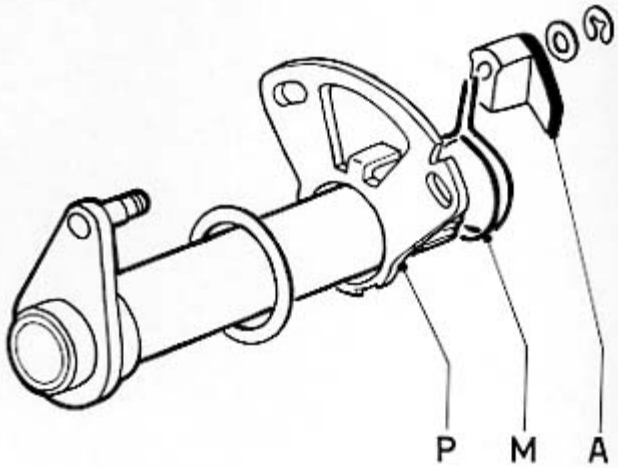
— Join the left crankcase with the right one acting as follows:
a) Make sure that the faces of the cases are clean and free from burrs and that the dowels are in place.
b) Slightly grease a new gasket on both sides, which is to be inserted between the two crankcase halves.
c) Press the two crankcases, by hand then tap them together with a mallet.
d) Fit and tighten the 10 screws joining the cases.
e) Check that the crakshaft, the rimary shaft, the secondary shaft turn freely.

ENGINE REASSEMBLY 4 SPEED

— To mount the sleeve and slider on the secondary shaft, hold the assembly in a vice as illustrated. .
The sleeve side having the hole of 4 mm ∅ should be up.
Slide the dowel «S» fully in with a 3 mm ∅ center punch, which should engage also into the transverse hole of the slider «C».
With a calking tool make a cross mark on the hole to avoid that the dowel may get out.
Note: Check that the mark is such as to hold the dowel in place.

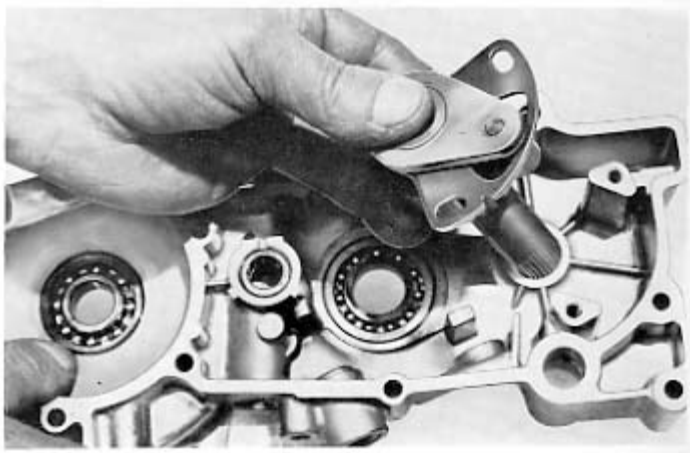


— Assemble the selector group as illustrated.



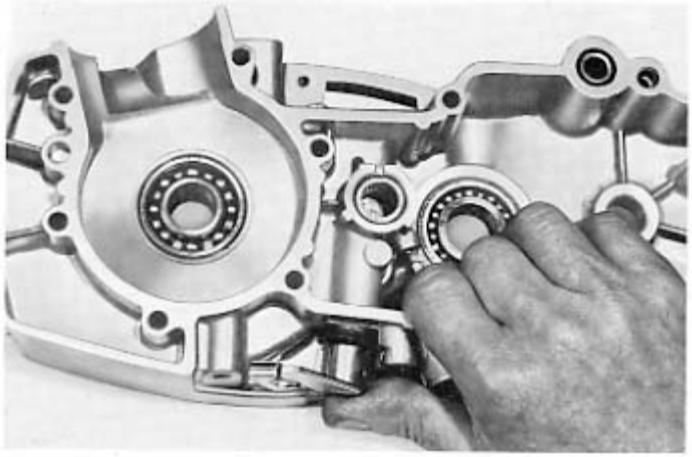
— Once the group is assembled, the spring «M» should be engaged with the plate «P» and anchor «A» as illustrated.

— Slide the selector group into the right hand crankcase, lightly tighten the 2 hexagonal screws.

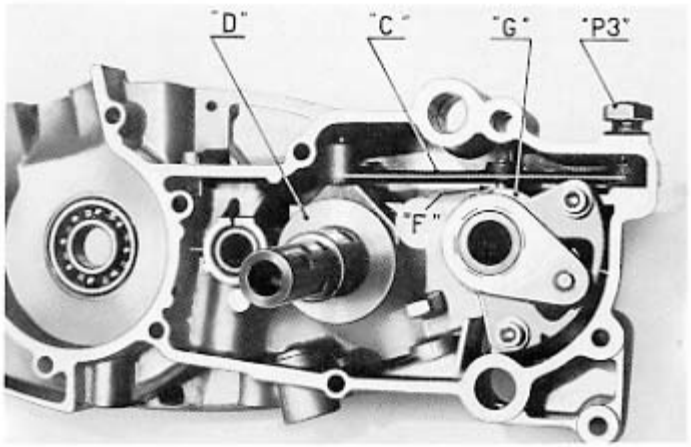


ENGINE REASSEMBLY 4 SPEED

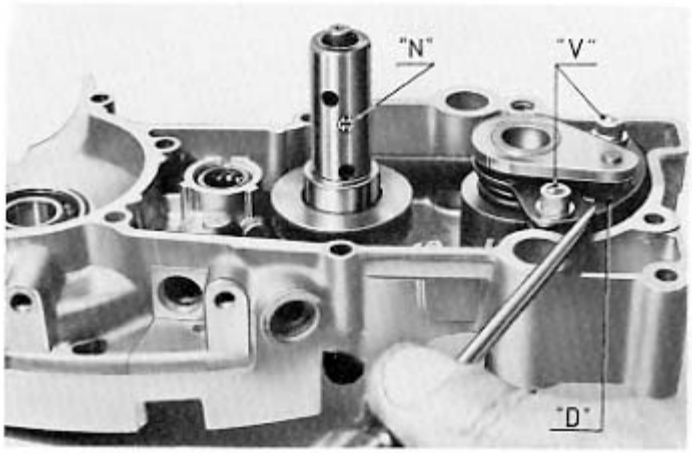
— Fit the clutch lever and spring and tighten the screw on the opposite side of the crankcase.



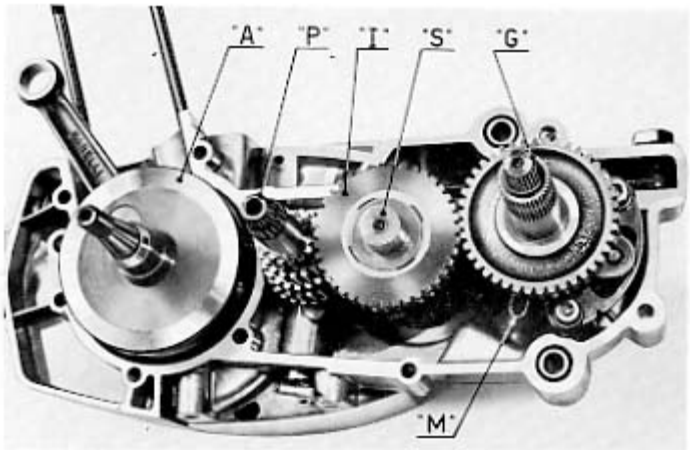
— Fit the gearchange lever «C» slipping the gears operating slider into the sleeve «D» placed on the secondary shaft.
Insert the secondary shaft in place making sure that the grub screw «F» on the lever «C» is properly seated in the slide of the selector drum «G».
Then tighten the screw «P3».



— To check and adjust if necessary the gears position, act as follows:
a) Operate the gearchange lever to drive the sliding axle protrusion in the 2nd or 3 rd speed position and make sure that the slider sideway swivel (both up and down) is steady and not excessive or defective.
b) To regulate this, rotate the gear selector quadrant «D» in the appropriate direction until adjustment is got, then tighten the 2 screws «V».

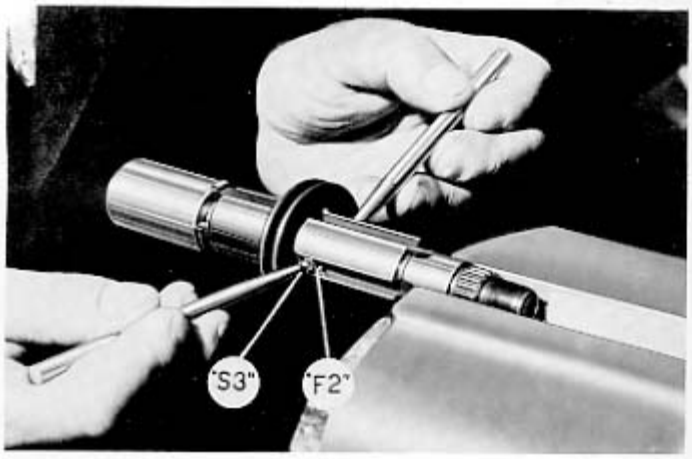


— Slide the crankshaft «A» in the right hand crankcase and the primary shaft «P» in place.
Slide the gears group «I» on the secondary shaft «S» taking care that the balls previously fitted do not get out from the shaft.
Fit the starting assembly «G» in the selector group.
Make sure that the spring «M» is correctly seated.

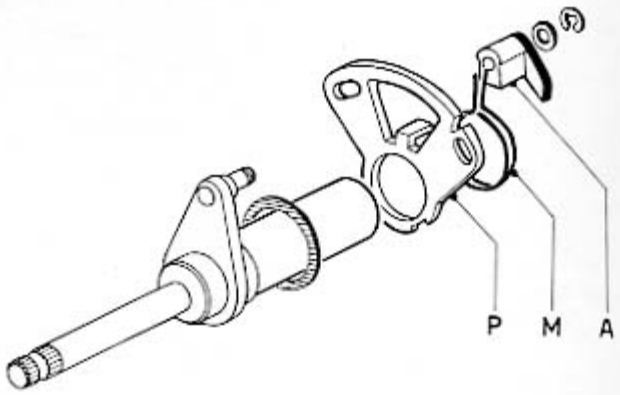


ENGINE REASSEMBLY 5 SPEED

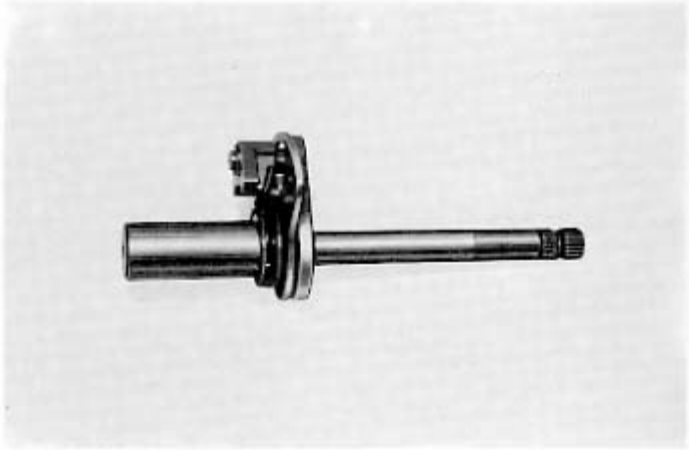
— Hold the secondary shaft in a vice. Slide the sleeve far enough to leave the hole «F2» exposed. Place in the hole the springs and the 3/16'' balls «S3» (one each side).
Using two punches press the balls inward towards one another and at the same time push the sleeve over them.



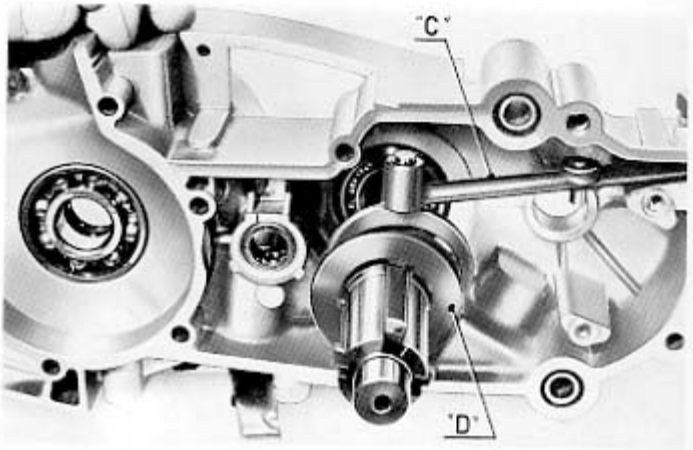
— Assemble the selector group as illustrated



— To have the group assembled correctly, the spring «M» should be engaged with the plate «P» and the anchor «A» as per illustration.

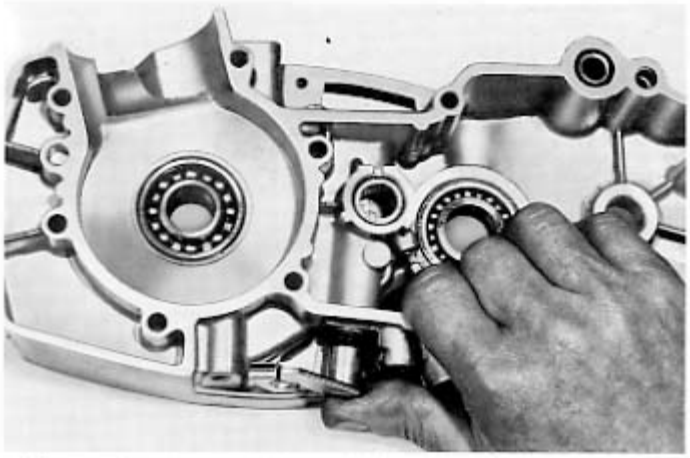


— Fit the gearchange lever «C» sliding the control fork into the sleeve «D», then place the sleeve in place using the tool 64785.

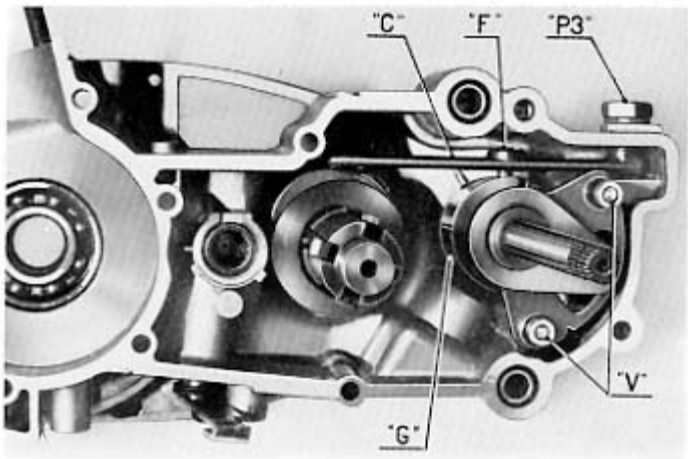


ENGINE REASSEMBLY 5 SPEED

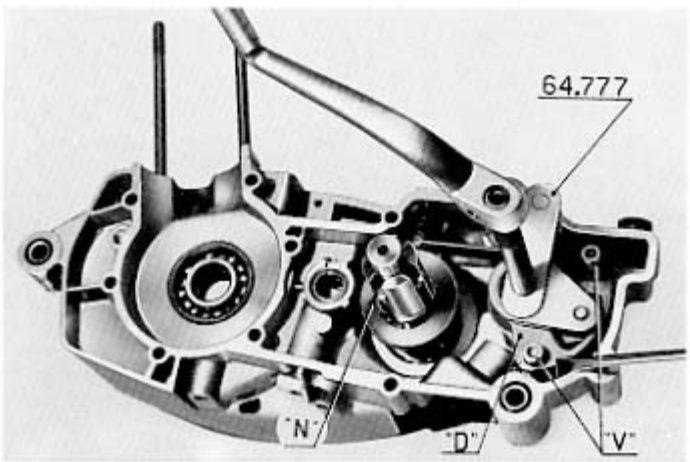
— Fit the clutch lever and spring and tighten the screw on the opposite side of the crankcase.



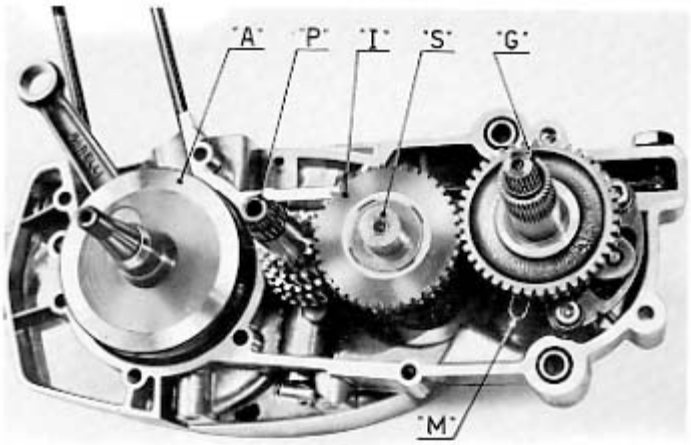
— Insert the selector group in the right hand crankcase, making sure that the grub screw «F» on the lever «C» is properly seated in the slide of the selector drum «G». Tighten the 2 hexagonal screws «V».
Then tighten the screw «P3» and nut. The more the screw is tight, the more accurate is the speed passage.



— Using the tool 64777, operate the gearchange lever to drive the sleeve nibs «N» in the 2nd and then in the 3rd speed position, and make sure that the slider sideway swivel (both up and down) is steady.
To regulate this, rotate the gear selector quadrant «D» in the appropriate direction until adjustment is got, then tighten the 2 screws «V».

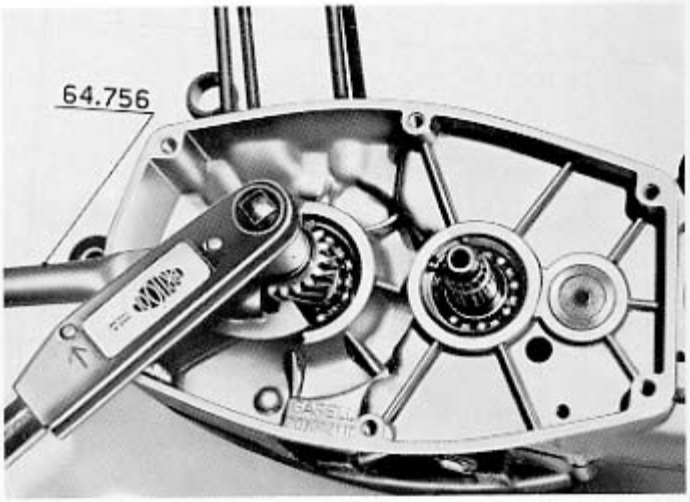


— Slide the crankshaft «A» in the right hand crankcase and the primary shaft «P» in place.
Slide the gears group «I» on the secondary shaft «S», as well as the shim washer and the starting group «G».
Check that at each pull the sleeve nib is in the centre of the gears marks.
Make sure that the spring «M» is correctly seated.

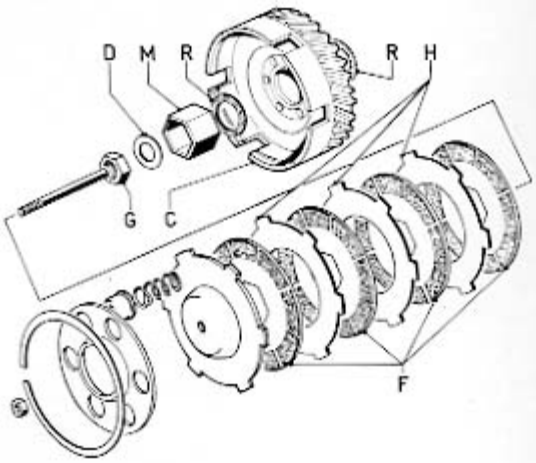


REASSEMBLY OF CLUTCH - 3-4-5 SPEED

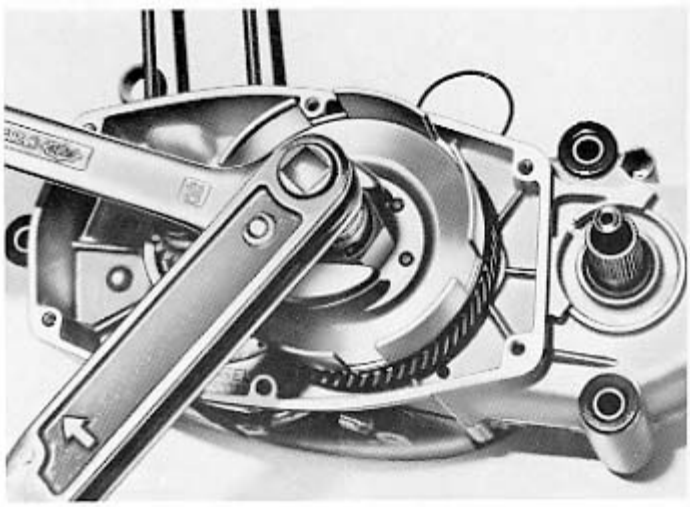
— Place the gear and the elastic washer on the end of the crankshaft. With the tool 64756 and torque wrench tighten to 3,5÷4 kpm. (in.lb. 0,196÷0,224).



— Assemble the clutch as illustrated

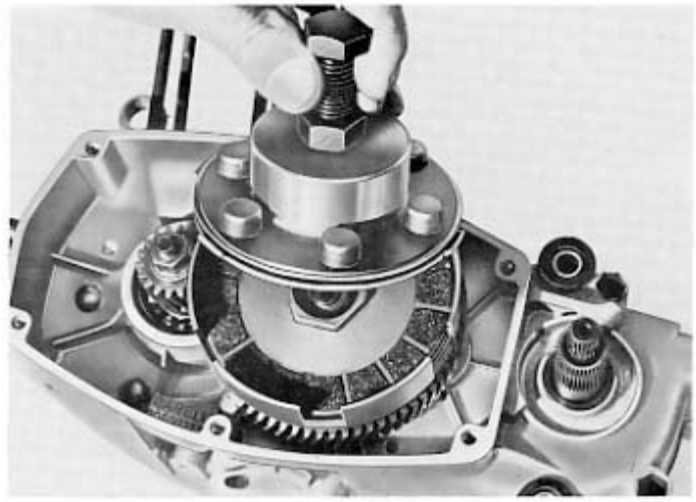


— Place on the primary shaft the shim washer «R», the clutch housing «C», the other shim washer «R», fit the clutch hub «M», the washer «D» and the nut «G». Hold the clutch hub with a 30 mm socket and tighten the nut «G» to 4,5÷5 kpm (in.lb. 0,252÷0,280) with the torque wrench.

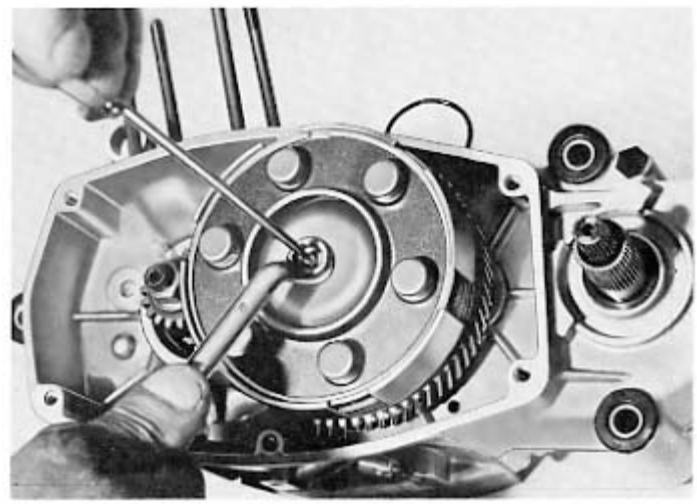


REASSEMBLY OF CLUTCH - 3-4-5 SPEED

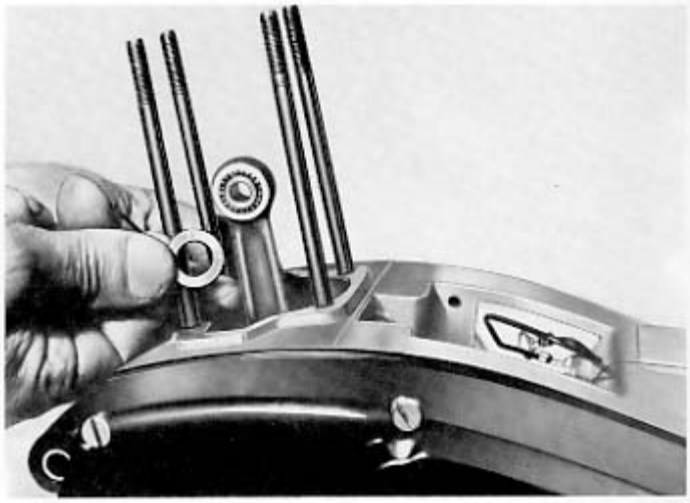
— Place the clutch discs «F-H» taking care that the «H» discs nibs face outwards.
Mount the springs holder plate, following the inverse procedure as when dismantling.



— With a 10 mm (.393") socket and screwdriver adjust the play (6÷8 mm) (.236"÷.314") of the clutch discs control rod.

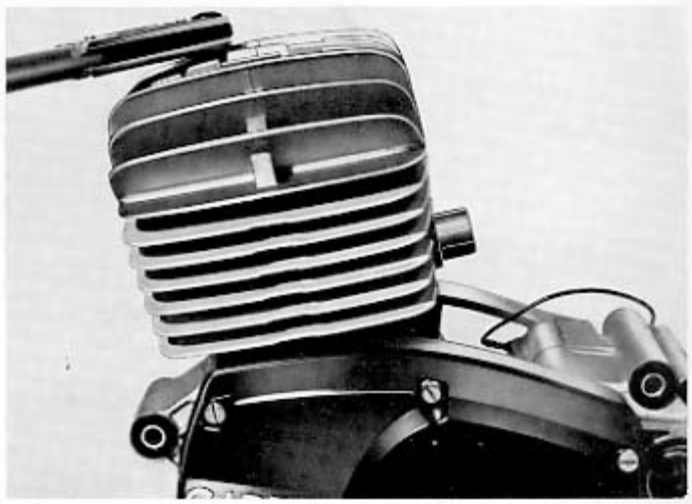


ENGINE REASSEMBLY - PISTON, CYLINDER, CYLINDER HEAD 4-5 SPEED



— Grease the bore of the small end and the 21 needles 2 x 11,8, insert them in the small end eye holding them in place with the drift pin bush 64759.
Slide the piston over the connecting rod making sure that the «S» on the piston is towards the exhaust port.
Place the gudgeon pin on the drift pin 64759, insert it through the piston and the small end bore forcing out the bush, then slide it out. Fit in place the two gudgeon pin rings and the piston rings into their grooves.

— Check that the crankcase upper face and the cylinder base are clean and free from burrs. Lightly grease a new gasket on both sides and lay it on the crankcase face. Oil the cylinder bore and the piston skirt.
Lower the cylinder onto the piston with fingers compressing the rings into the bore. Make sure that the ends of the piston rings are properly fitted in position against the pegs of the rings grooves. Slide the cylinder along the 4 studs and fit it in place.



— Check that the top of the cylinder and the face of the head are clean and undamaged. Fit the gasket and the studs and place the 4 washers and nuts on the studs.
Tighten the nuts gradually in a cross pattern.
The final torque should be 1,5÷1,8 kpm. (in.lb. 0,084÷0,10).
Then refit the gearchange and starting pedals, the carburettor and the spark plug.
Through the hole on the left hand cover fill the crankcase with abt. 450 cc. (cu.in 27,46) of FIAT VS + 30 (SAE 30) oil.

For reassembly of flywheel magneto and chain gear follow the same procedure as illustrated at pages 17 - 18.
No special instructions are needed to mount the complete engines on the frames, but follow the inverse procedure as shown at pages 4-5.

DISMANTLING AND REASSEMBLY INSTRUCTIONS
HORYZONTAL CYLINDER ENGINES

1979 ISSUE

SINGLE SPEED - 2 SPEED AUTOMATIC PEDALS STARTING AND KICKSTARTING

agrati-GARELLI
gruppo industriale
s.p.a. monticello brianza (Como)
TEL. 039/931.733-4-5-6

La Grafica Briantea - 1500 - Giugno 1979 - Printed in Italy

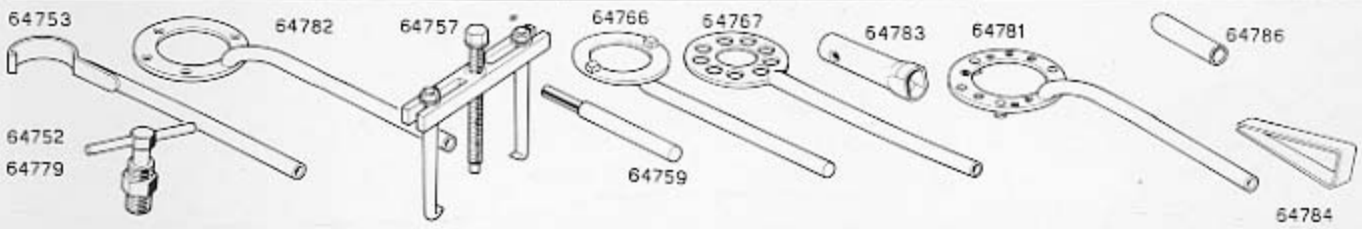
TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS

GARELLI ENGINE		SINGLE SPEED PEDALS	SINGLE SPEED KIKSTARTER	AUTOMATIC PEDALS	AUTOMATIC KICK
— Single cylinder, 2 stroke		□	□	□	□
— Displacement	cc. cu.in.	49 2,989	49 2,989	49 2,989	49 2,989
— Bore	mm. in.	40 1,574	40 1,574	40 1,574	40 1,574
— Stroke	mm. in.	39 1,535	39 1,535	39 1,535	39 1,535
— Points gap	mm. in.	0,35÷0,45 .014÷.018	0,35÷0,45 .014÷.018	0,35÷0,45 .014÷.018	0,35÷0,45 .014÷.018
— Ignition timing correspondig to	mm. in.	18° 1,2 .047	18° 1,2 .047	18° 1,2 .047	18° 1,2 .047
— Starting: pedals kickstarter		□	□	□	□
— Clutch: centrifugal automatic in oil bath		□	□	□	□
— Gearbox: single speed 2 speed automatic		□	□	□	□
— Primary reduction		16/71	16/71	16/71 23/64	16/71 23/64
— Carburettor, Dell'Orto type		SHA 14/12	SHA 14/12	SHA 14/12	SHA 14/12
— Gearbox oil capacity, type FIAT VS+30 (SAE 30)	cc. cu.in.	350 21,35	350 21,35	350 21,35	350 21,35

SPECIAL TOOLS - TORQUE SPECIFICATIONS FOR SCREWS & NUTS

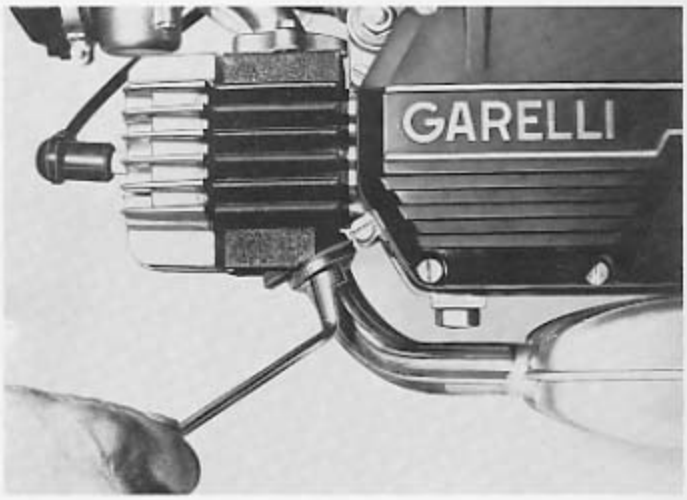
TOOLS	SINGLE SPEED PEDALS	SINGLE SPEED KICKSTARTER	AUTOMATIC PEDALS	AUTOMATIC KICK
64752 Extractor tool for CEV an DUCATI flywheels	□	□	□	□
64753 Holding tool for primary driving sprocket	□	□	□	□
64782 Tool for clutch hub		□		
64.757 Adjustable extractor tool	□	□	□	□
64.759 Drift for gudgeon pin	□	□	□	□
64.766 Tool for hub body			□	□
64.767 Holding tool for clutch hub	□			
64.783 Tool for starting assy. nut		□		□
64.779 Extractor tool for Bosch flywheels	□	□	□	□
64.781 Holding tool for flywheel and driven gears	□	□	□	□
64.784 Holding tool for freewheel catches			□	□
64.786 Oilseal protection tool (drive side, crankshaft, primary shaft)	□	□	□	□



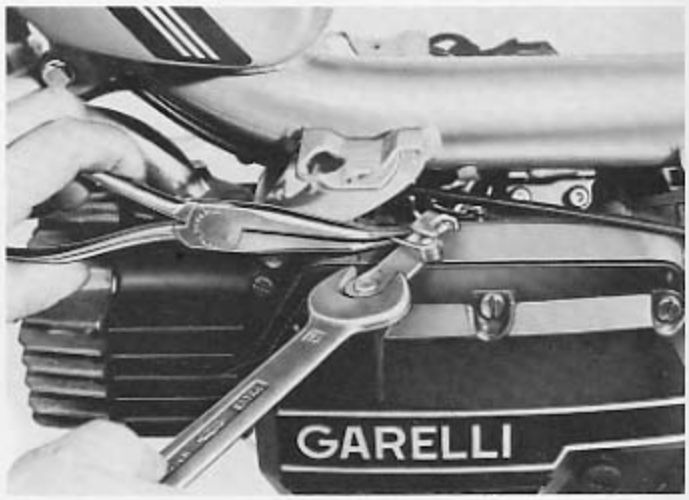
TORQUE SPECIFICATIONS		SINGLE SPEED PEDALS	SINGLE SPEED KICKSTARTER	AUTOMATIC PEDALS	AUTOMATIC KICK
CYLINDER HEAD NUT	Kgm in.lb.	1,5÷1,8 0,084÷0,10	1,5÷1,8 0,084÷0,10	1,5÷1,8 0,084÷0,10	1,5÷1,8 0,084÷0,10
FLYWHEEL MAGNETO NUT	Kgm in.lb.	3÷3,5 0,168÷0,196	3÷3,5 0,168÷0,196	3÷3,5 0,168÷0,196	3÷3,5 0,168÷0,196
CLUTCH NUT	Kgm in.lb.	3÷3,5 0,168÷0,196	3÷3,5 0,168÷0,196	3,5÷4 0,196÷0,224	3,5÷4 0,196÷0,224
DRIVEN GEAR NUT	Kgm in.lb.	4÷4,5 0,224÷0,252	4÷4,5 0,224÷0,252	8÷8,5 0,448÷0,476	8÷8,5 0,448÷0,476
CHAIN SPROCKET NUT	Kgm in.lb.	6÷6,5 0,336÷0,364	6÷6,5 0,336÷0,364	6÷6,5 0,336÷0,364	6÷6,5 0,336÷0,364
CRANKCASE SCREW	Kgm in.lb.	0,8 0,044	0,8 0,044	0,8 0,044	0,8 0,044
SIDE COVERS SCREW	Kgm in.lb.	0,8 0,044	0,8 0,044	0,8 0,044	0,8 0,044

ENGINE REMOVAL

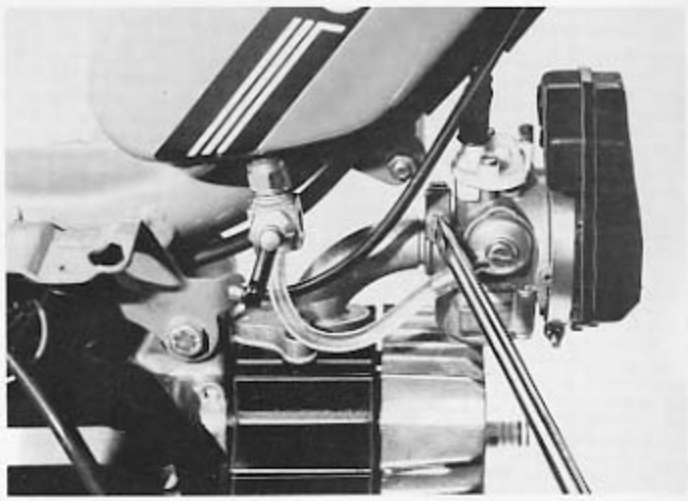
After removing engine covers, if any, the chain cover, the starting and gearchange pedals, for which no special tools or procedures are required, proceeds as follows:



— Remove the silencer loosening the three nuts and screws with an 11 mm (.433") open end wrench. Take off the gasket.



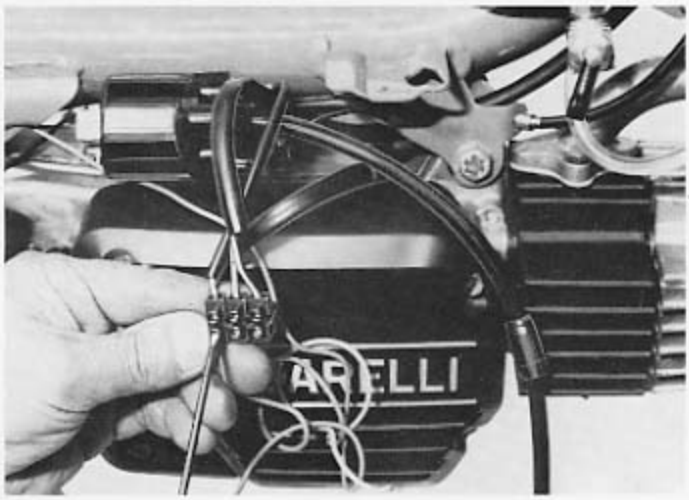
— On the pedals model only, disconnect the starting cable using a 17 mm (.669") open end wrench as illustrated.



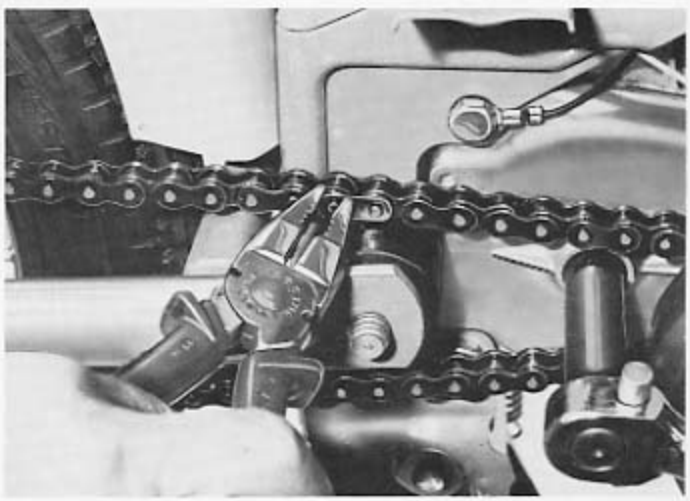
— With a screwdriver remove carburettor from the engine but leave it connected to the frame.

ENGINE REMOVAL

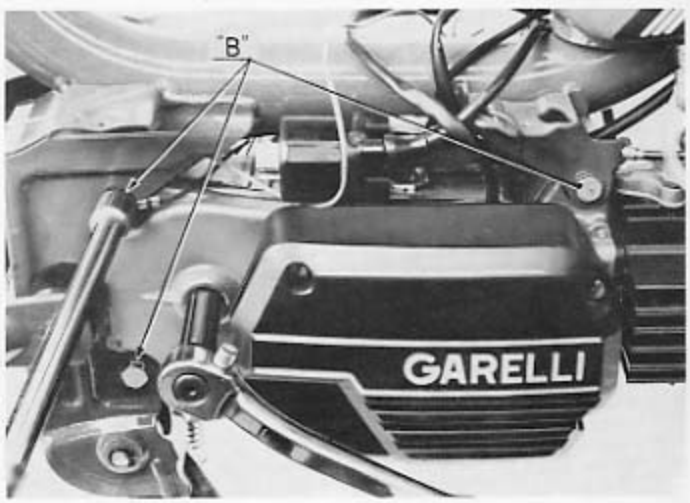
— Disconnect the wires from the terminal block, as well as the spark plug and the engine cut-off wires.



— Break the chain by removing master link

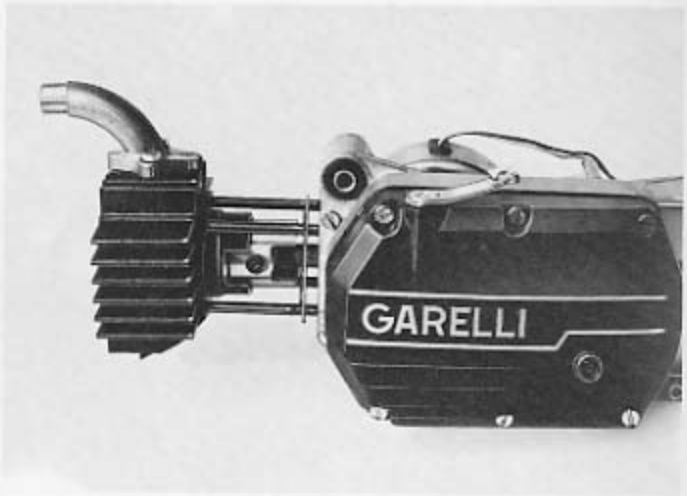


— Remove the engine by loosening the 3 «B» mounting bolts, using a 13 mm (.551'') socket.



ENGINE DISASSEMBLY - COMMON OPERATIONS TO ALL MODELS

— Remove the 4 nuts holding the cylinder head using one 11 mm (.433") box spanner. Lift the head and the barrel over the 4 studs and remove the cylinder base gasket.

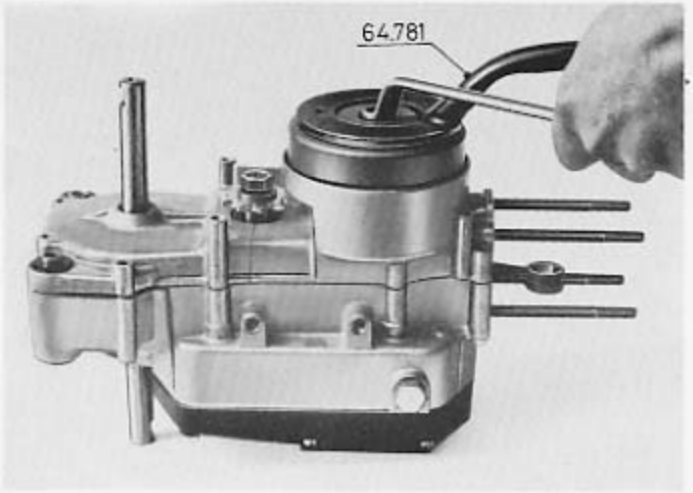


— Remove the two gudgeon pin retaining circlips with the pliers.

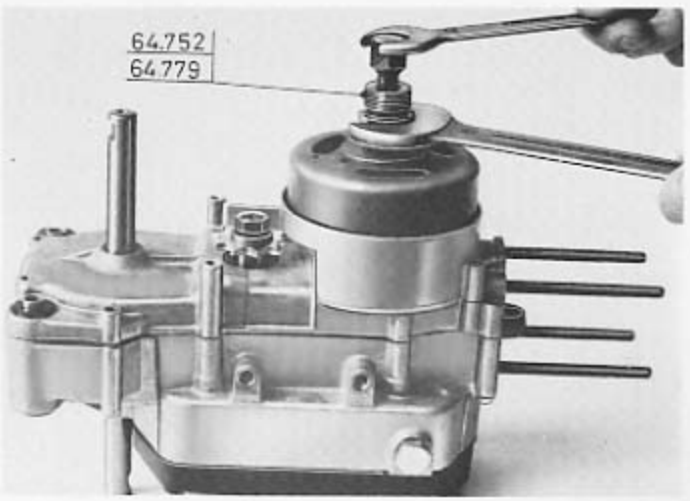
— Remove the piston gudgeon pin using the extractor 64759 and a mallet, being careful to support the piston on the opposite side.

Head mike
26,41

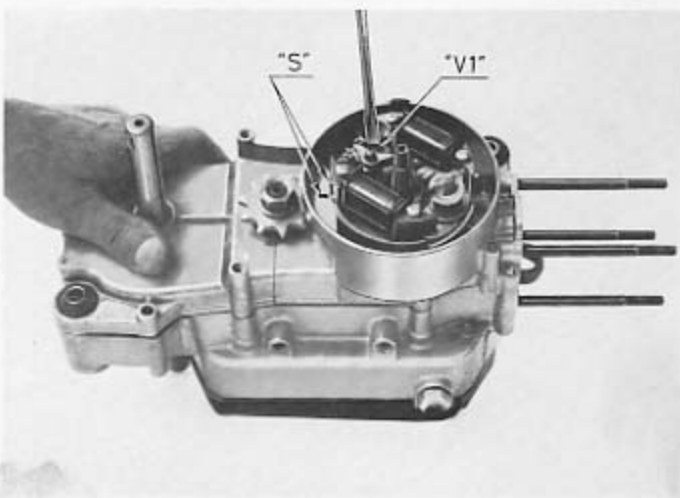
— Using the tool 64781 to hold the flywheel, unscrew the flywheel retaining nut with a 12 mm (.472") socket. Remove the spring washer.



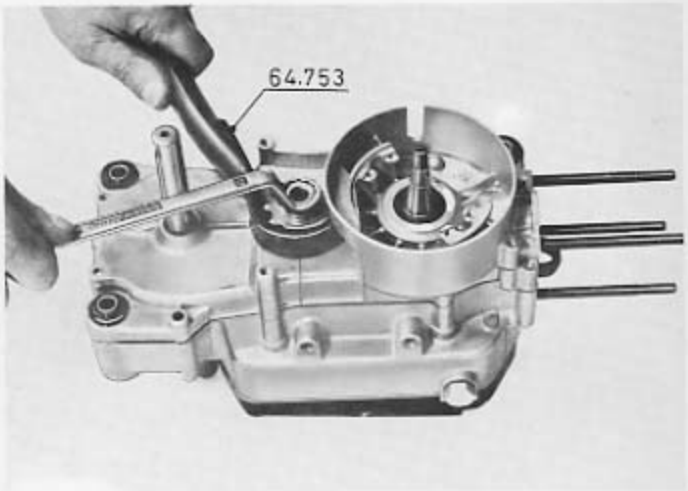
— Before using the extractor, the external threads and those of the center bolt should be lightly greased. Screw the extractor 64779 (for Bosch flywheels) or 64752 (for the others) into the threads of the flywheel, then turn the extractor center bolt in a clockwise direction to pull the flywheel off the taper; keep holding the rotor with the tool 64781.



— CAUTION
Make a scriber mark «S» across the bottom of the stator plate and the crankcase in order to facilitate re-timing on assembly. Remove the screws «V1» holding the stator plate to the crankcase. Remove the Woodruff key from the crankshaft.



— Using the tool 64753 and a 17 mm (.669") wrench remove the nut and the lock washer, then pull the sprocket from the shaft.

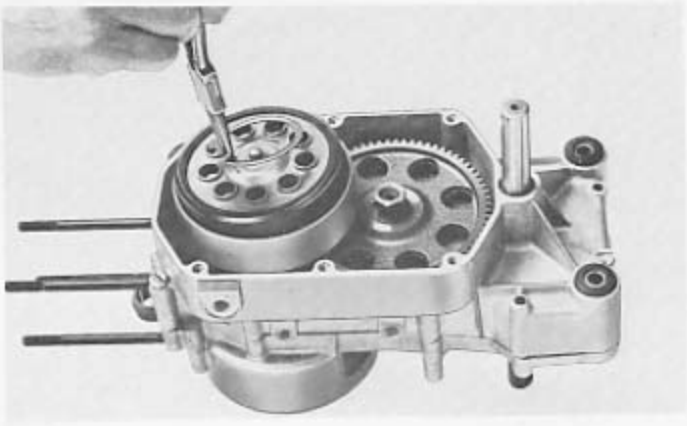


— Drain oil from the gearbox and clutch by removing the drain plug on the bottom of the engine.

— Remove the left sidecover and its gasket by taking out the six screws that hold it to the crankcase.
On the kickstarter models only: remove the starting assy. from the left hand cover taking off the 3 screws fixing the plate, then remove the various parts.

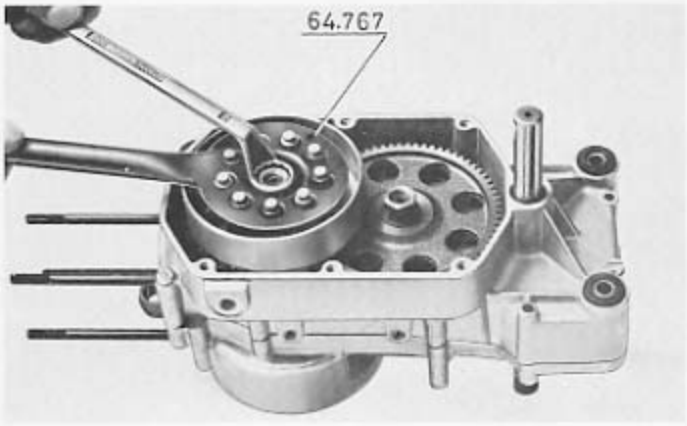
CLUTCH DISMANTLING - SINGLE SPEED

— On the pedals models only:
Using the needlenose pliers remove the circlip and the spring from the clutch assembly.

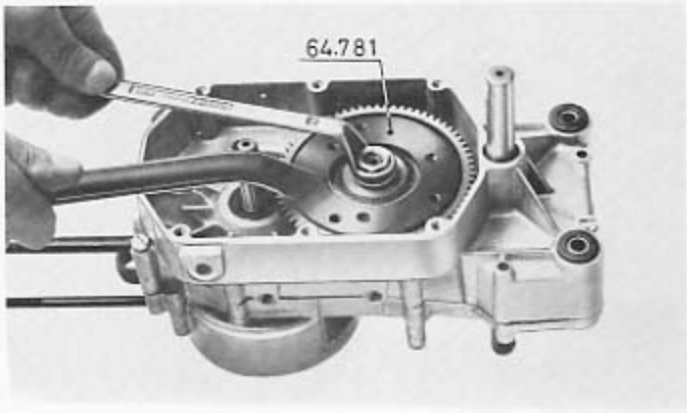


— On the pedals models: Using the tool 64767 and 17 mm (.669") socket remove the nut locking the clutch hub. Then slide the clutch hub and housing from the crankshaft.

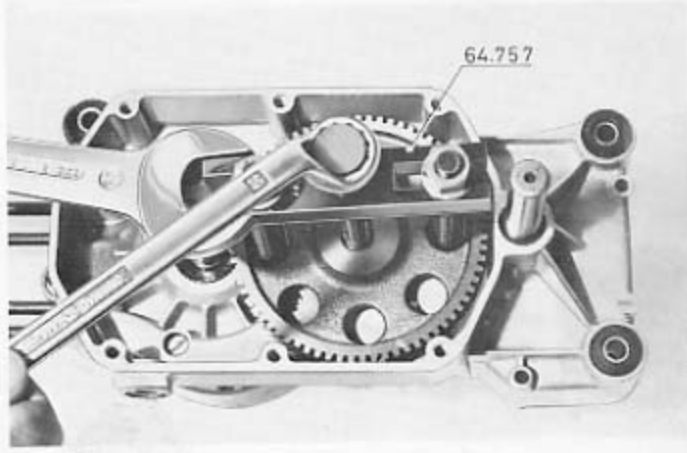
— On the kickstarter models: follow the same procedure using the tools 64782 and 64783.



— Holding the gear with the tool 64781, unscrew the nut with a 17 mm (.669") socket.

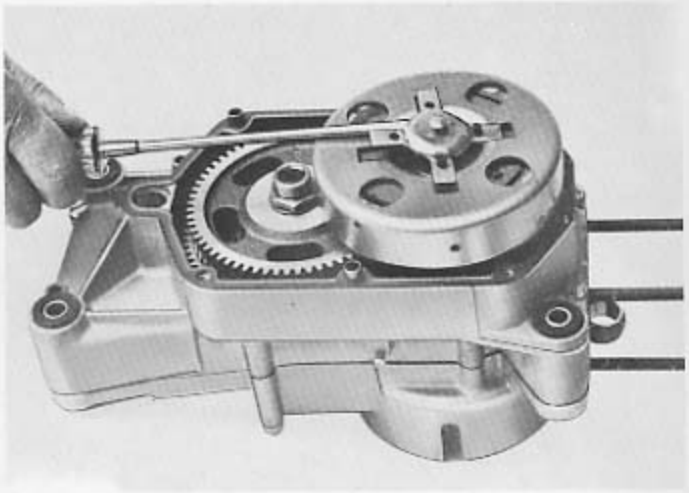


— Use extractor tool 64757 and a 19 mm (.748") wrench to remove the gear.



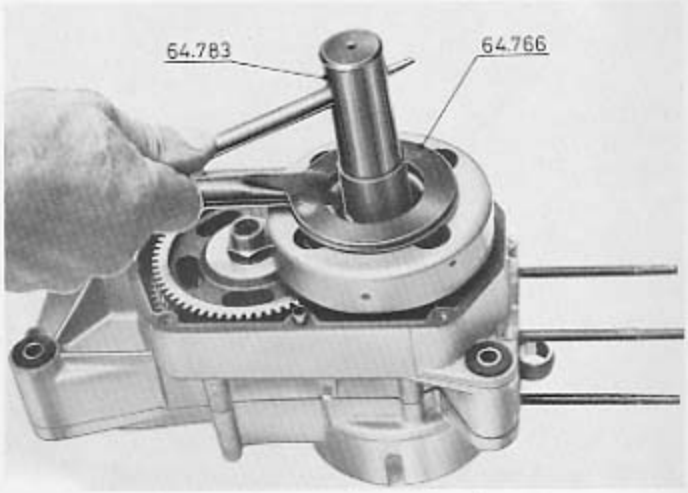
CLUTCH DISMANTLING - 2 SPEED AUTOMATIC

— On the pedals models only: remove with a screwdriver the pressure plate from the 4 rubbers.

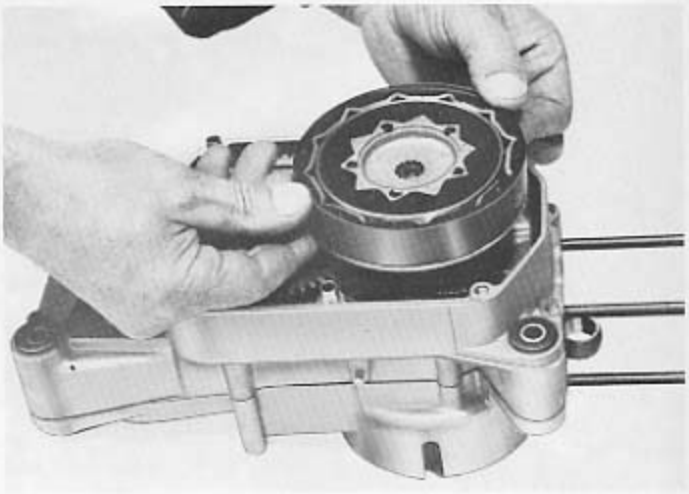


— On the kickstarter models: holding the clutch body with tool 64766, use the tool 64783 to unscrew the nut, then remove the washer.

— On the pedals models: follow the same procedure using a 17 mm (.669") socket.

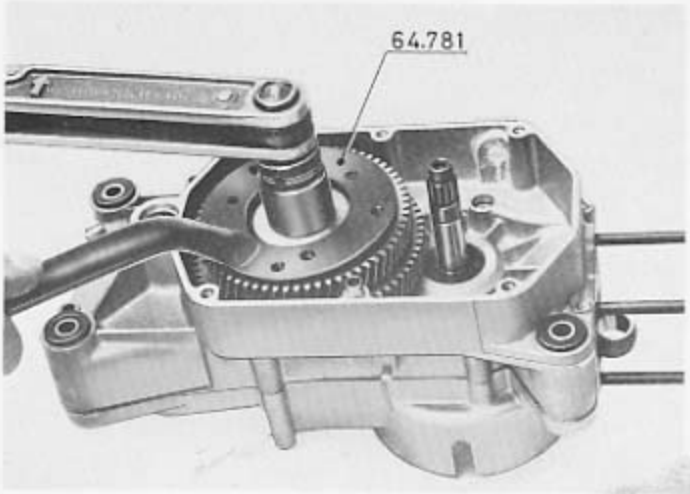


— Take the assembly of two clutches complete with gears and slide it from the crankshaft.

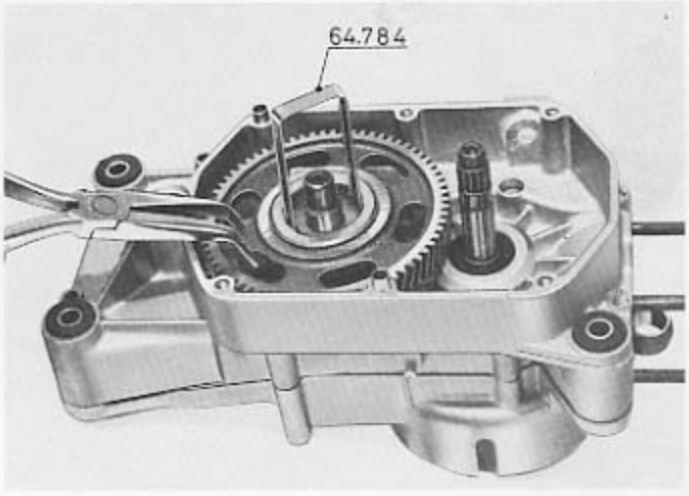


CLUTCH DISMANTLING - 2 SPEED AUTOMATIC

— Hold the gear with the tool 64781 while unscrewing the nut with a torque wrench.

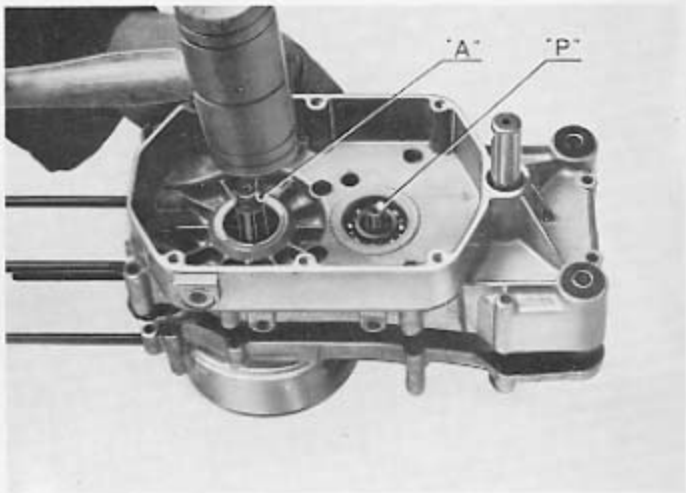


— Remove the 2nd speed gear and then the 1st', while holding the catches with the tool 64784.
Then slide the clutch hub and washers.



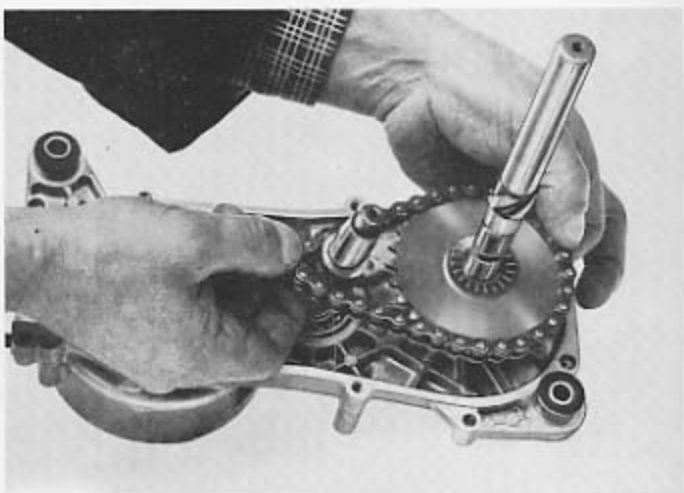
ENGINE DISASSEMBLY - COMMON OPERATIONS TO ALL MODELS

— Remove the 10 crankcase screws from the right hand crankcase. Strike the ends of the crankshaft «A» and of the primary shaft «P» alternatively with a mallet until the two halves of the crankcase separate.



— On the pedals models: remove the crankshaft, the primary shaft and the pedals shaft together.

— On the kickstarter models: remove the crankshaft and then simply take off the primary shaft.

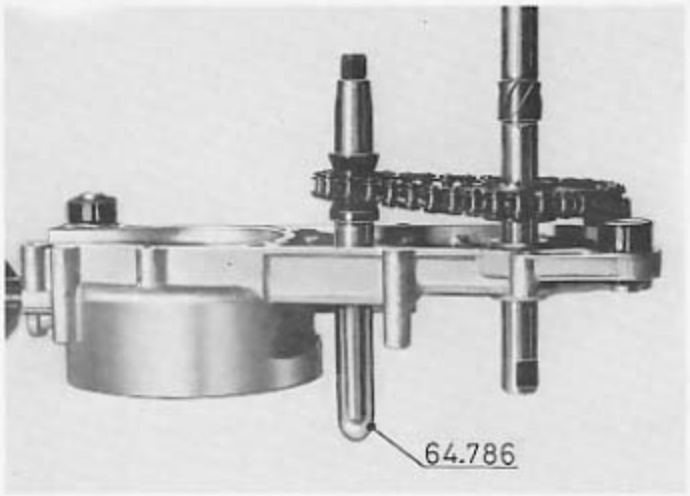


ENGINE REASSEMBLY - SINGLE SPEED, 2 SPEED AUTOMATIC

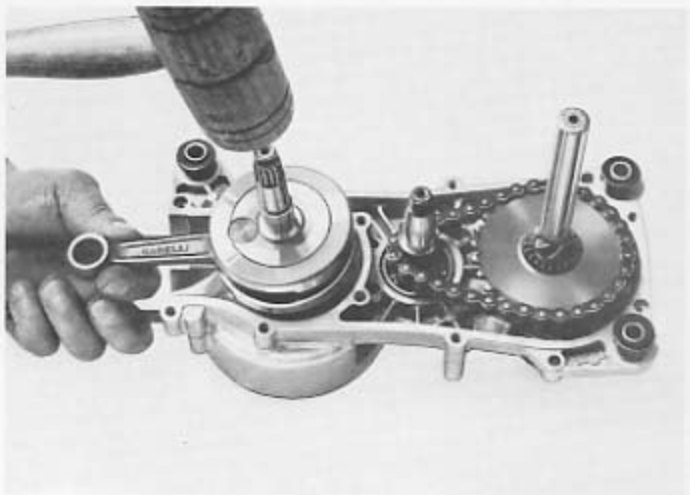
Before starting to assemble the unit, carefully clean and slightly oil all the parts.

— On the pedals models: Using the tool 64785 insert in the right hand crankcase the primary shaft along with the pedals shaft with the chain, the starting spring and the starting assembly.

— On the kickstarter models: simply slide the primary shaft in place.

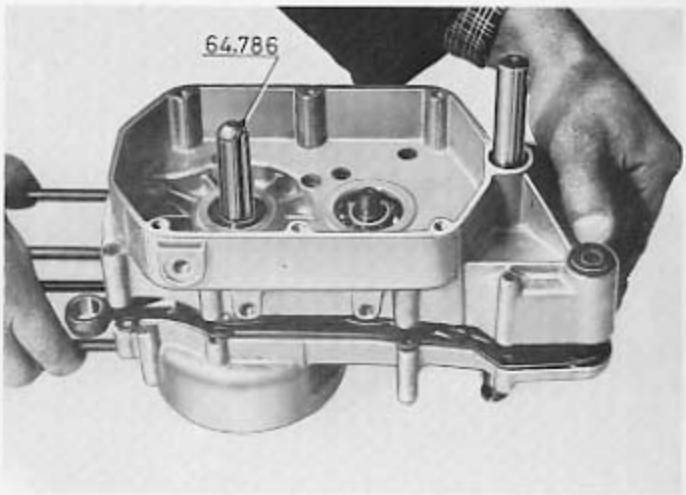


— Insert the crankshaft into the crankcase, lightly tapping it with a mallet.

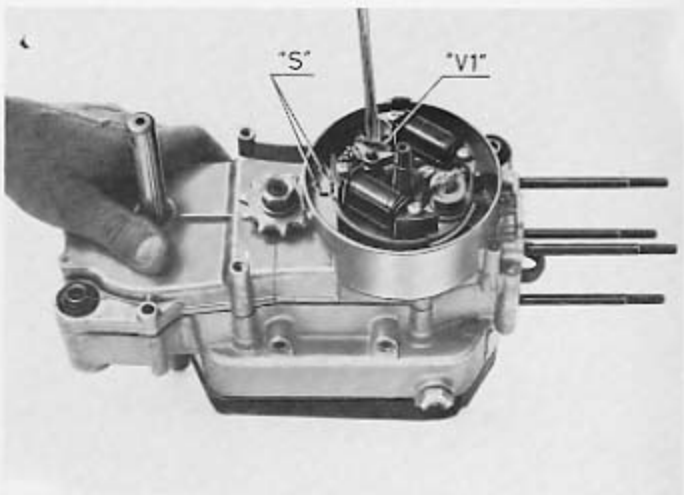


ENGINE REASSEMBLY - SINGLE SPEED, 2 SPEED AUTOMATIC

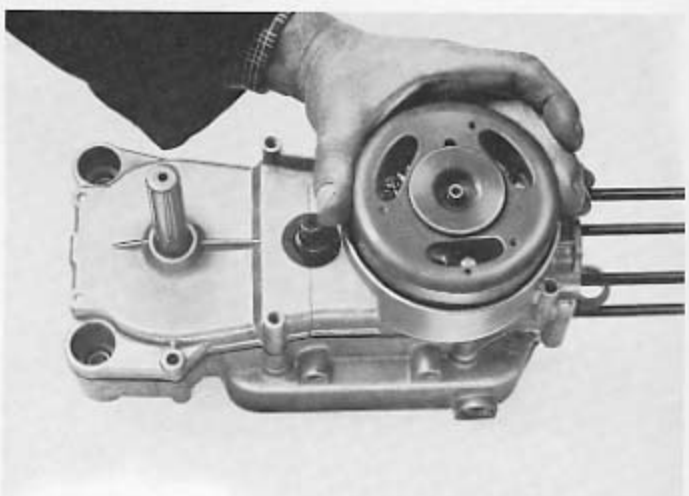
— Join the left crankcase with the right one acting as follows:
  a) Make sure that the faces of the cases are clean and free from burrs and that the dowels are in position.
  b) Slightly grease a new gasket on both sides, which is to be inserted between the two crankcase halves.
  c) Using the tool 64786, press the two crankcases by hand and then tap them together with a mallet.
  d) Fit and tighten the 10 screws joining the cases.
  e) Check that the crankshaft, the primary shaft, and the pedal shaft turn freely.



— Caution
Fit the plate so that the scriber mark «S» previously made is in line, tighten the mouting screws «V1».



— Fit the woodruff key in position on the crankshaft, slip the flywheel and rotate it until it is felt that the key is correctly seated.

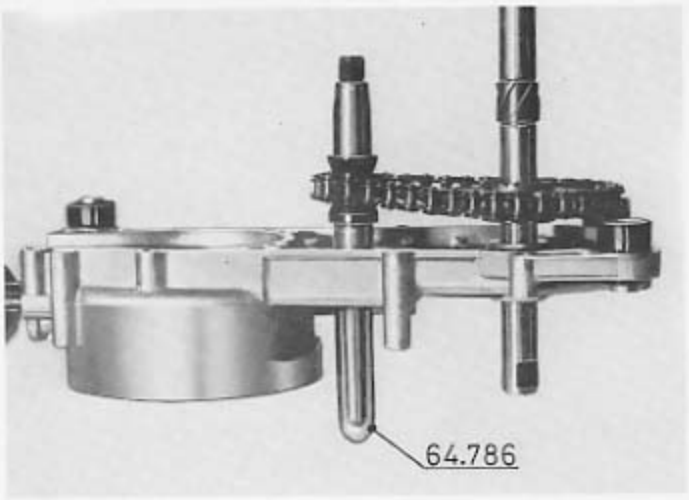


ENGINE REASSEMBLY - SINGLE SPEED, 2 SPEED AUTOMATIC

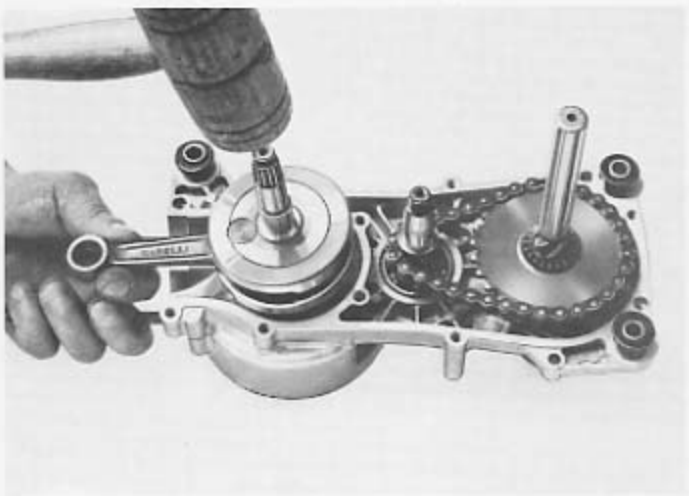
Before starting to assemble the unit, carefully clean and slightly oil all the parts.

— On the pedals models: Using the tool 64785 insert in the right hand crankcase the primary shaft along with the pedals shaft with the chain, the starting spring and the starting assembly.

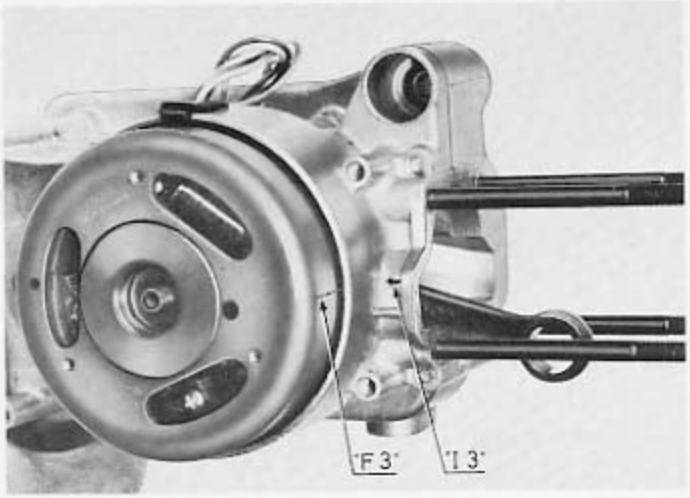
— On the kickstarter models: simply slide the primary shaft in place.



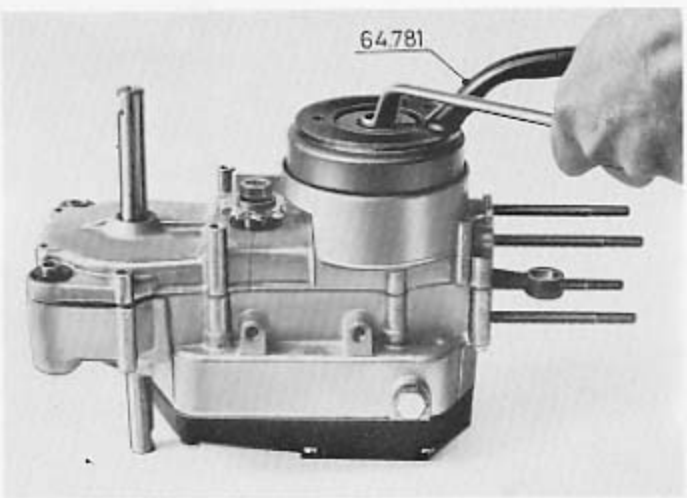
— Insert the crankshaft into the crankcase, lightly tapping it with a mallet.



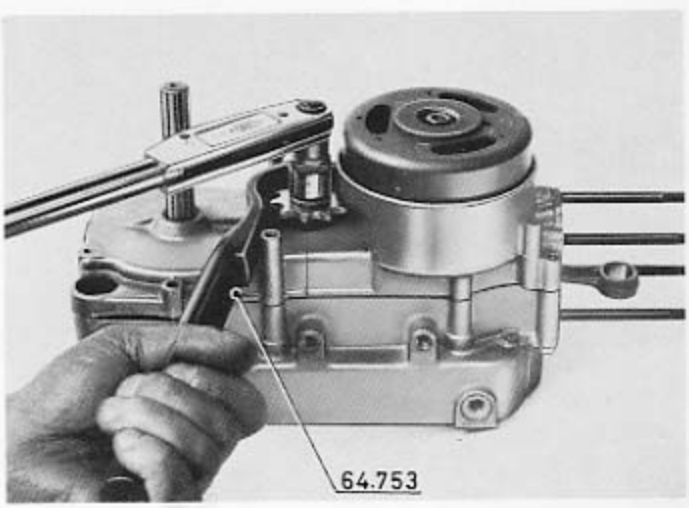
— Rotate the flywheel by hand in the counter clockwise direction until the points gap is in the widest position. At this instant check the gap with a feeler gauge, resetting if necessary to 0,35÷0,45 mm. (.014"÷.018").
Check the timing, which is correctly set when the points begin to open at 18° B.T.D.C.
To check the timing rotate the flywheel in the counter-clockwise direction so as to line up the arrow «F3» on the flywheel and the mark «I3» on the crankcase, in this position the points should just begin to open. If they do not, slip off the flywheel, loosen the stator plate fastening screws, rotate the plate in the appropriate direction, lightly refit the screws, refit the flywheel, check the gap.



— When satisfied that the gap is set correctly, fit the washer and tighten the fastening nut, using the tool 64781 and the 12 mm (.472") socket previously used when dismantling.



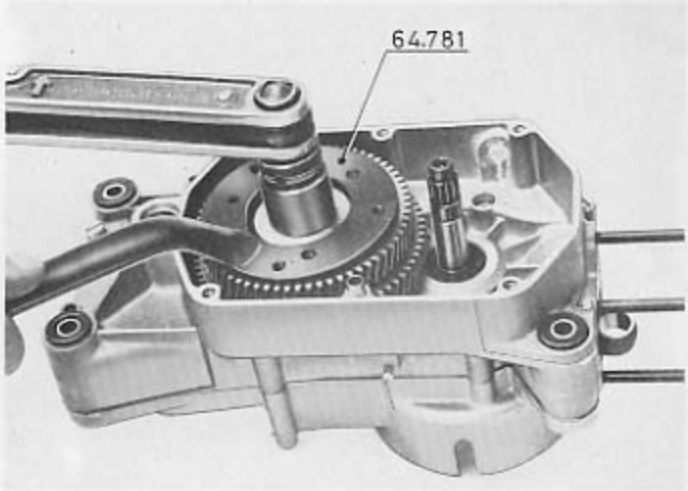
— Fit the chain gear and the two shim washers on the primary shaft, using the tool 64753 and a torque wrench tighten the nut to 6÷6,5 Kpm. (in.lb. 0,336÷0,364).



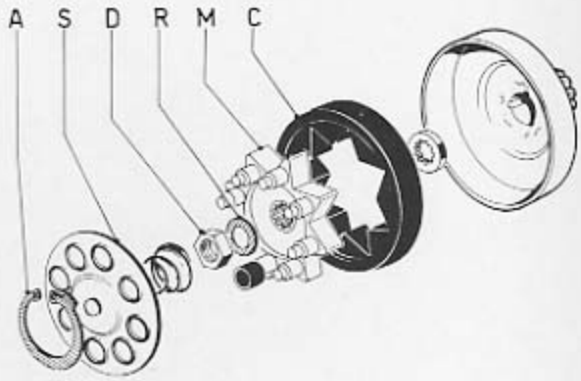
REASSEMBLY OF DRIVEN GEAR AND CLUTCH

SINGLE SPEED, PEDALS

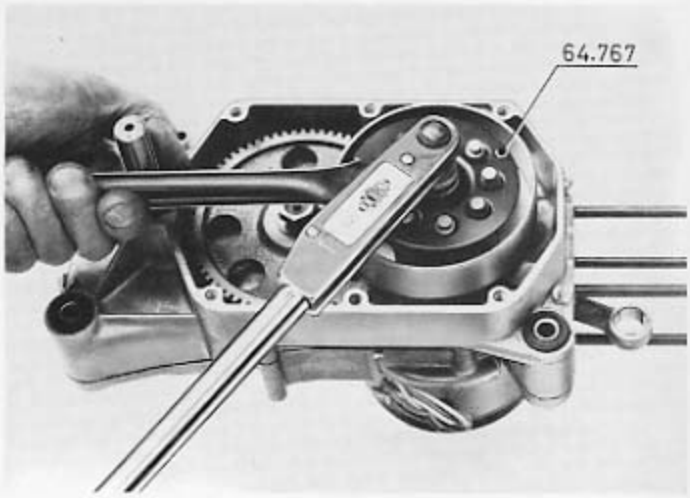
— Turn the engine the opposite side, place on the primary shaft the gear, the washer and the nut and, using the tool 64781, tighten it to 4÷4,5 kpm (in.lb. 0,224÷0,252) with the torque wrench.



— Fit the clutch assembly and hub following the illustration.



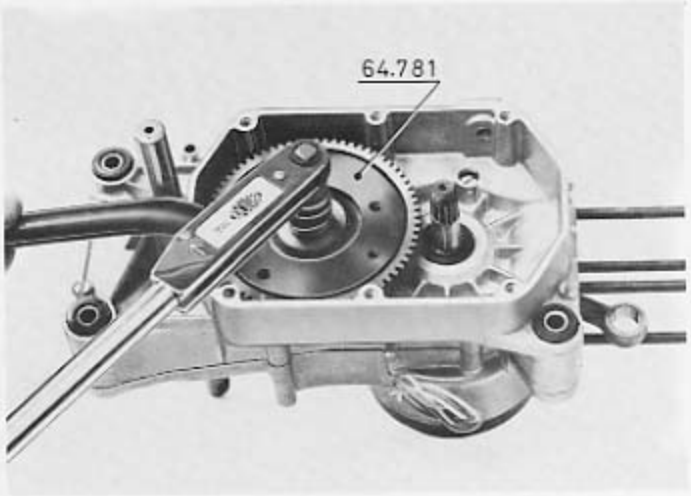
— Before mounting the plate «S» the elastic body «C» and the circlip «A», with the tool 64767 and torque wrench tighten to 3÷3,5 kpm (in.lb. 0,168÷0,196) the nut «D» and the washer «R» fixing the clutch hub «M» to the crankshaft.



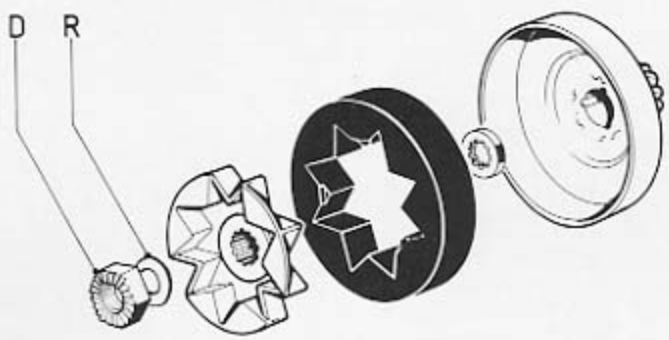
REASSEMBLY OF DRIVEN GEAR AND CLUTCH

SINGLE SPEED, KICKSTARTER

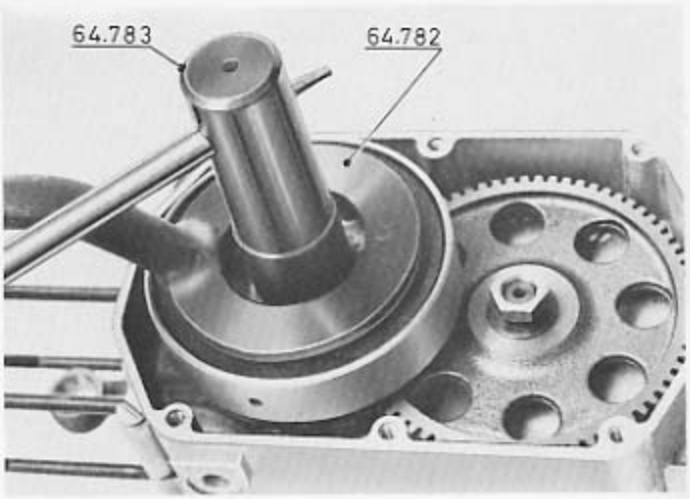
— Turn the engine the opposite side, place on the primary shaft the gear, the washer and the nut and, using the tool 64781, tighten it to 4÷ 4,5 Kpm (in.lb. 0,224÷0,252) with the torque wrench.



— Fit the clutch assembly and hub following the illustration.

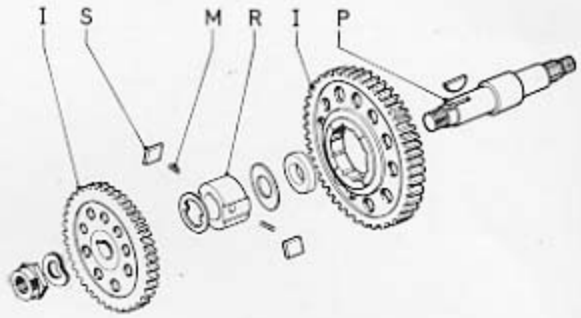


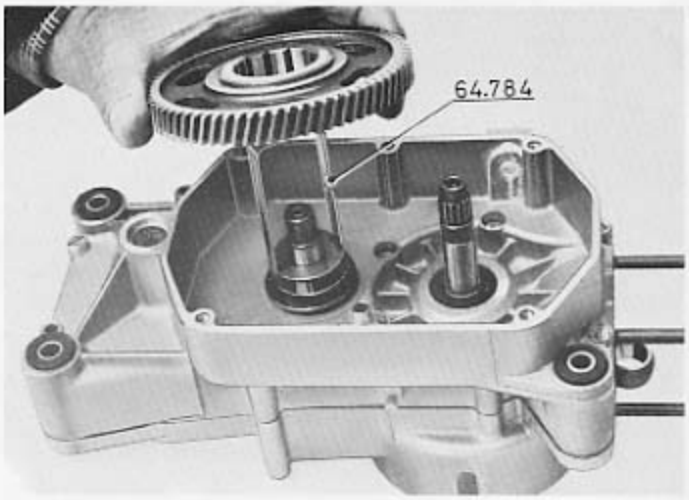
— With the tool 64782 hold the clutch hub and tighten with the tool 64783 the nut «D» and washer «R» fixing it to the crankshaft.



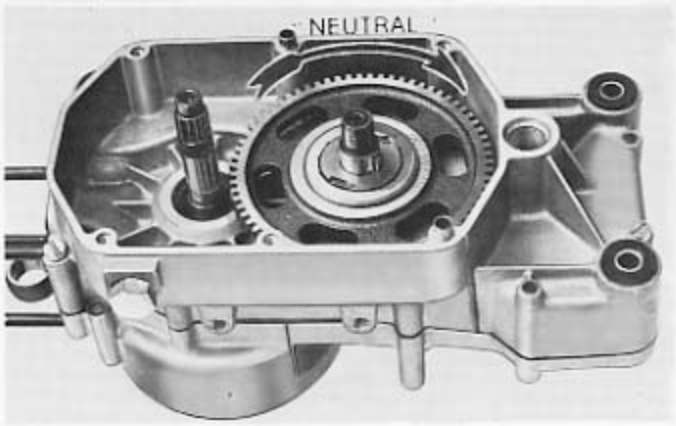
REASSEMBLY OF DRIVEN GEARS FREEWHEEL AND CLUTCH

2 SPEED AUTOMATIC

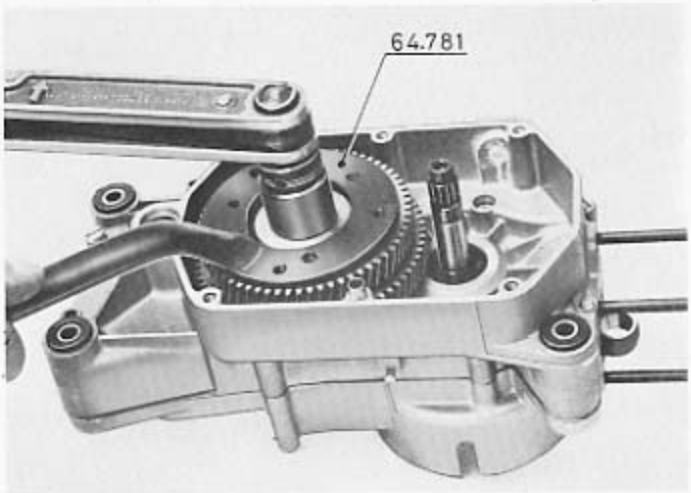




— Place gears «I» and freewheel «R» on the primary shaft «P» as per illustration. Use the tool 64784 to hold in place the springs «M» and catches «S» when sliding the 1st speed gear on.



— CAUTION: the freewheel hub shall be fitted so as to allow the 1st speed gear to turn free when rotated in the clockwise direction.

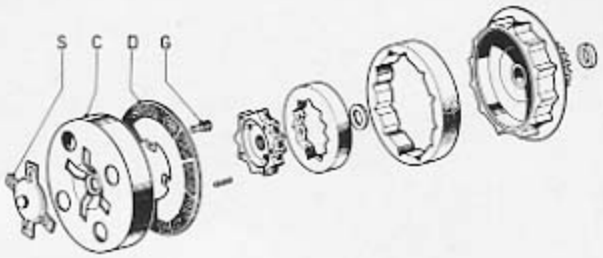


— With the tool 64781 and torque wrench tighten to 8÷8,5 kpm (in.lb. 0,448÷0,476) the nut fixing the gears on the primary shaft.

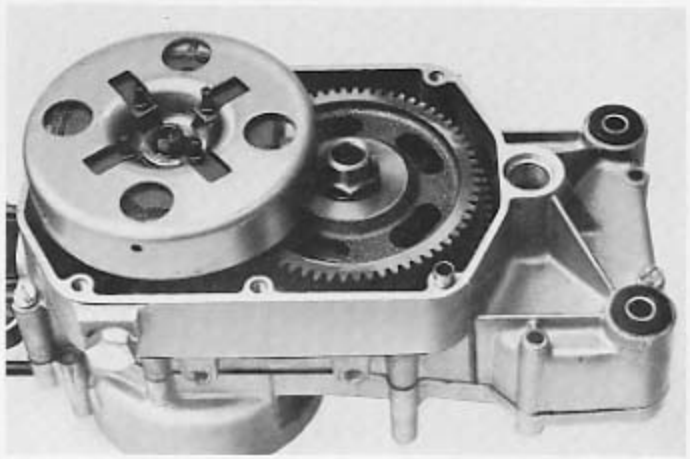
REASSEMBLY OF DRIVEN GEARS FREEWHEEL AND CLUTCH

2 SPEED AUTOMATIC, PEDALS

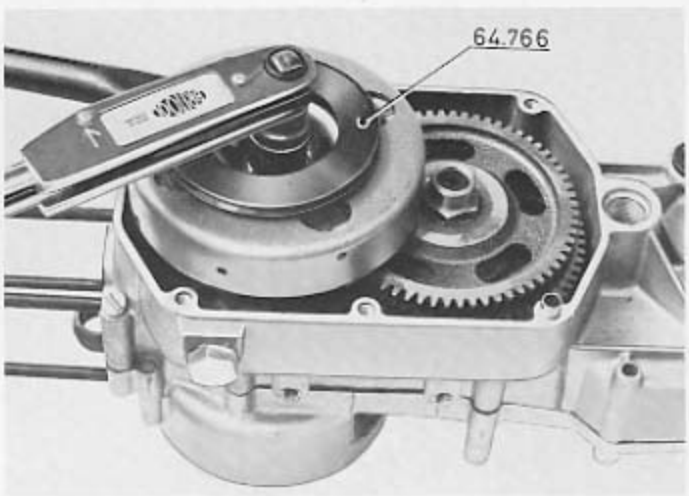
— Reassemble the clutch assembly as illustrated.



— When at the disc «D», place the 4 rubbers «G» in the corresponding holes. The rubbers ends should face towards the outer side of the engine and the thicker lined face of the disc towards the inner side of engine.



— Hold the 2nd speed housing «C» with the tool 64766 and tighten the nut to 3÷4 kpm (in.lb. 0,168÷0,224) with torque wrench.

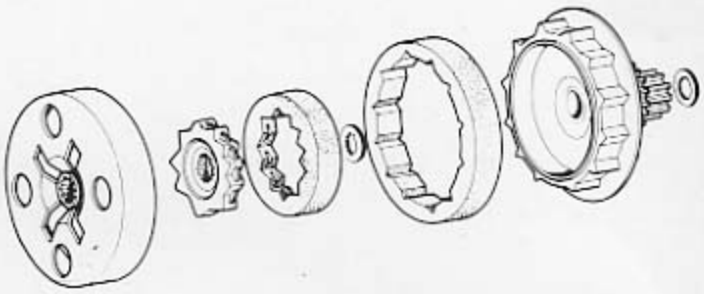


— Slide the cross shaped plate «S» with the pliers on the 4 rubbers «G» as illustrated, then cut the 4 rubbers ends.

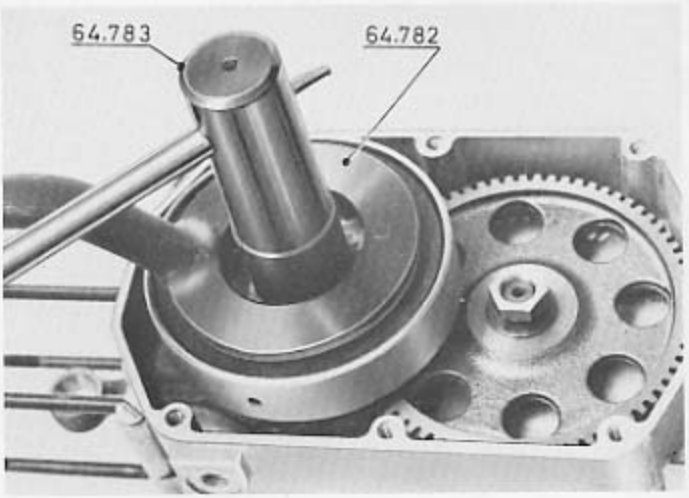
REASSEMBLY OF DRIVEN GEARS FREEWHEEL AND CLUTCH

2 SPEED AUTOMATIC, KICKSTARTER

— Reassemble the clutch assy. as illustrated.

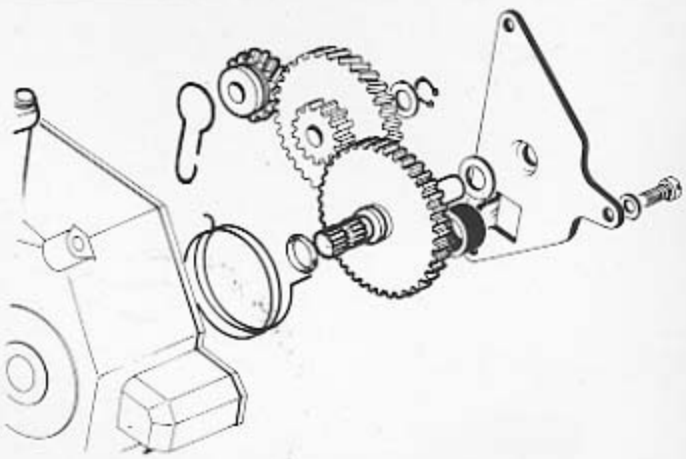


— Hold the 2nd speed housing with the tool 64766 and tighten the nut with the tool 64783.

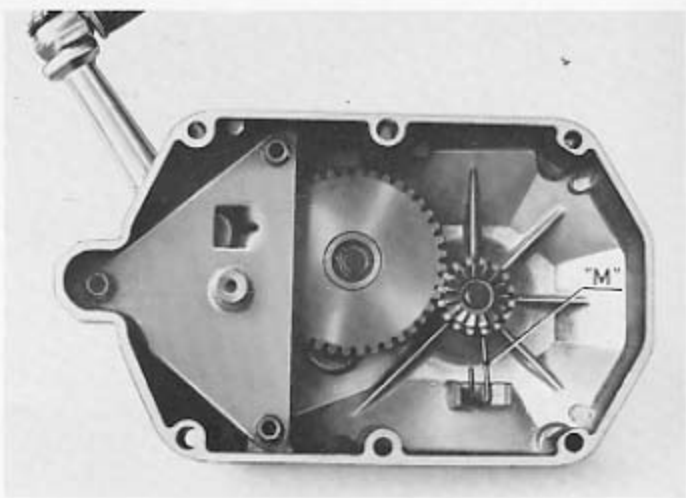


— Assemble the starting assy. as illustrated. (This operation also applies to the single speed kickstarter models).

65
30



— When refitting the starting assy., make sure that the return spring «M» is correctly in place as illustrated. (this operation also applies to the single speed kickstarter models).



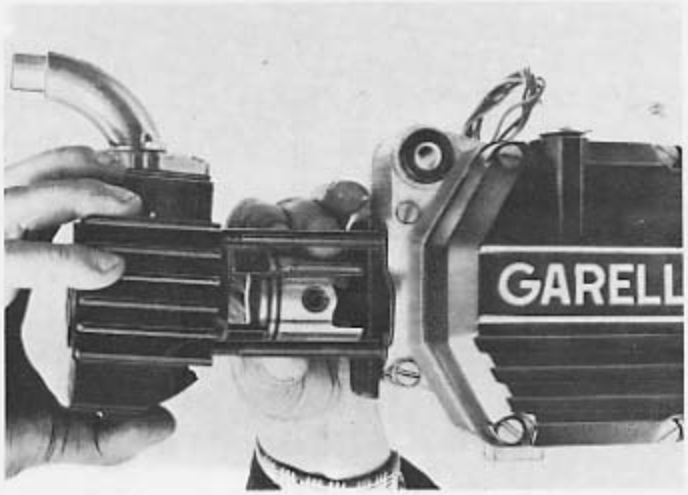
REASSEMBLY OF PISTON, CYLINDER AND CYLINDER HEAD

SINGLE SPEED, 2 SPEED AUTOMATIC

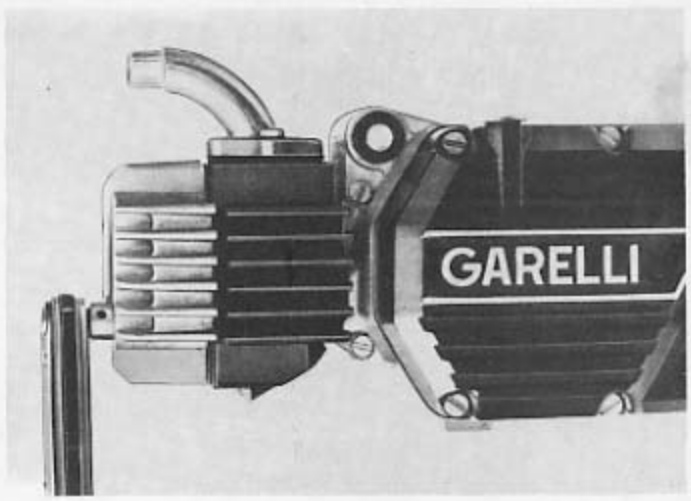
Once the mentioned operations are accomplished, before fitting the cover make sure the two rubber bodies turn free on the hubs.
Make sure that the faces of the left hand crankcase and of the cover are clean and free from burrs, slightly grease a new gasket and place it on the crankcase face. Make certain that the left hand crankcase fits the oil plug and washer. Place the cover on the crankcase and tighten the 6 joining screws.

— Refit piston with needlebearing, gudgeon pin and circlips as illustrated and make certain that the circlips are properly inserted in their grooves.
Make sure that the «S» on the piston is towards the exhaust port.

— Check that the crankcase upper face and the cylinder base are clean and free from burrs. Lightly grease a new gasket on both sides and lay it on the crankcase face. Oil the cylinder bore and the piston skirt.
Lower the cylinder onto the piston with fingers compressing the rings into the bore. Make sure that the ends of the piston rings are properly fitted in position against the pegs of the ring grooves. Slide the cylinder along the 4 studs and fit it in place.



— Check that the top of the cylinder and the face of the head are clean and undamaged. Fit the gasket and the head over the studs and place the 4 washers and nuts on the studs. Tighten the nuts gradually in a cross pattern.
The final torque should be 1,5÷1,8 kpm. (in.lb. 0,084÷0,10).
Refit the spark plug.
Through the hole on the left hand cover fill the crankcase with abt. 350 cc (cu.in. 21,35) of FIAT VS + 30 (SAE 30) oil.



No special instructions are needed to mount the complete engines on the frames, but follow the inverse procedure as shown at pages 4-5.