MOTO GUZZI

CHANGES AND ADDITIONS TO THE WORKSHOP MANUAL FOR ELDORADO 850 cc AND POLICE MODELS

Reference:

Workshop manual for the V7 700 and 750 cc models 2nd Edition

MAIN FEATURES

ENGINE

Cycle	: 4-stroke
Number of cylinders	: 2
Cylinder disposition	: «V» - 90°
Bore	: 83 mm (3.26")
Stroke	: 78 mm (3.07")
Displacement	: 844.05 cc. (51.49 cu. in.)
Compression ratio	: 9.2 to 1
Revs at max engine speed	: 6500 r.p.m.
Output at maximum engine speed	: 64 HP SAE
Cylinders	: in light alloy with hard chrome liners
Cylinder heads	: in light alloy, hemispherical, with special cast iron inserted valve seats
Crankcase	: in light alloy
Crankshaft	: steel construction
Crankshaft journals	: in antifriction material pressed in suitable housings
Connecting rods	: steel construction with AL-TIN alloy thin wall bearings
Pistons	: in light alloy

Valve gear

O.H.V. push rod operated via the camshaft in the crankcase and gear driven by the crankshaft.
Inlet:
— opens 24° before TDC;
— closes 58° after BDC.
Exhaust:
— opens 58° before BDC;
— closes 22° after TDC.
Rocker clearance for valve timing: 0,5 mm (.0196").
Normal rocker clearance (cold engine):
— inlet 0.15 mm (.059");
— exhaust 0.25 mm (.098").

Carburation

Both carburetors are gravity fed from the tank. Carburetor make:
Dell'Orto VHB 29 CD (right), VHB 29 CS (left).

Standard carburetor settings

Choke	: 29 mm
Throttle slide	: 60
Atomizer	: 265
Main jet	: 145
Pilot jet	: 45
Starter jet	: 80
Taper needle	: SV5, 2nd notch from top

Idling screw opening: 1 and ½ to 2 turns for the left carburetor - 2 to ½ turns for the right carburetor.

Air intake provided with dry filter.

Lubrication

Pressure. Gear pump driven by the crankshaft.
Oil strainer in crankcase.
Normal lubricating pressure: 3.8 - 4.2 kg/cm² (35 - 43 lbs. sq. in.).
Relief valve control.
Oil pressure solenoid.

Cooling

By air. Cylinder and cylinder heads deeply finned.

Ignition

By battery with automatic advance distributor.

Initial advance	: 5°
Automatic advance	: 28°
Total advance	: 33°
Contact breaker gap	: 0,42 - 0,48 mm (.016 - .018")
Spark plugs	: n. 225 in Bosch-Marelli thermic scale or equivalents, long thread, dia. 14 x 1.25 mm
Spark plug gap	: 0.6 mm (.023")

Ignition coil.

Starting

Electric by starter motor with electromagnetic ratchet control.
Ring gear bolted to flywheel. Operated by button located on the R/H side of the handlebar.

Exhaust system

Dual exhaust pipes and mufflers.

TRANSMISSION

Clutch

Twin driven plates, dry type located on the flywheel. Controlled by lever on the L/H side of the handlebar.

Gearbox

5 speeds, frontal engagement. Constant mesh gears. Cush drive spring incorporated.
Separate case bolted on the crankcase, operated by rocker lever on the R/H side of the machine.
Engine-gearbox ratio: 1.235 to 1 (17-21).
Internal gear ratios:

low gear	2	to 1	(14-28)
second gear	1.388	to 1	(18-25)
third gear	1.047	to 1	(21-22)
fourth gear	0.869	to 1	(23-20)
high gear	0.750	to 1	(24-18)

Secondary drive

By constant speed double joint cardan shaft.
Layshaft bevel set - wheel ratio: 4,625 to 1 (8-37).

Overall gear ratios

low gear	11.424	to 1
second gear	7.929	to 1
third gear	5.980	to 1
fourth gear	4.964	to 1
high gea	4.284	to 1

Frame

Duplex cradle, tubular structure.

Suspension

Telescopic front fork incorporating hydraulic dampers; rear swinging arm with externally adjustable coil springs.

Wheels

WM 3/2.15 x 18 front and rear rims.

Tires

4.00 - 18 front and rear, studded, supersport pattern.
Tire pressure:

front	solo	1.5 kgs/sq.cm. (21 p.s.i.)
	with passenger	1.5 kgs/sq.cm. (21 p.s.i.)
rear	solo	1.8 kgs/sq.cm. (25 p.s.i.)
	with passenger	2 kgs/sq.cm. (28 p.s.i.)

N.B. - The above pressure recommendation is for normal riding (cruising speed). If using the machine at constant high speed on motorways, the above pressures should be increased by 0.2 kgs/sq. in. (2.8 p.s.i.).

Brakes

Expanding type. 220 mm dia. (8.66") - width 40 mm (1.57"). Twin leading shoes front brake hand operated from the R/H side of the handlebar.
Single leading shoe brake on the rear wheel operated by a pedal on the L/H side of the machine.

Overall dimensions and weights

Wheelbase	1.470 mts	(about 58.8")
Length	2.245 mts	(about 88.3")
Width	0.795 mts	(about 31.3")
Minimum ground clearance	0.150 mts	(about 5.9")
Height (dry)	1.050 mts	(about 32.5")
Curb weight	249 ks	(548 lbs)

Performances

Maximum permissible speeds in each gear, solo riding:
— bottom gear 67.936 kms/h
(42.22 m.p.h.)
climbability 86.5%
— second gear 98.395 kms/h
(61.15 m.p.h.) climbability 46.6%
— third gear 131.739 kms/h
(81.87 m.p.h.) climbability 28.3%
— fourth gear 164.235 kms/h
(102.07 m.p.h.) climbability 17.2%
— high gear 193 kms/h
(119.95 m.p.h.) climbability 8.9%

Passing ability

Passing of a 55 feet long truck travelling at 20 m.p.h.
— time: 6.5 seconds;
— distance travelled 334 feet.
Passing of a 55 feet long truck travelling at 50 m.p.h.
— time: 8.7 seconds;
— distance travelled: 900 feet.
The above includes a safety distance of 40 and 100 feet respectively between the passing and pace vehicle at the beginning and the end of the maneuvre.

Braking ability

Stopping distance from 60 m.p.h. (solo, using both brakes): 182 feet.
Stopping distance with passenger from 60 m.p.h. using both brakes: 198 feet.

Fuel and oil capacities

GROUP OR PART	QUANTITY		RECOMMENDATION
Fuel tank	22.5 l	(5.84 US gls.)	Petrol 98 NO R.M.
Reserve	4 l	(1 US gls.)	
Sump	3 l	(3 ¼ quarts)	Shell Super 100 multigrade or equivalent
Transmission	0.750 l	(1 ¾ pints)	Shell Spirax HD 90
Rear drive box (bevel set lubrication)	0.360 l	(12.7 oz USA) Of which	Shell Spirax HD 90 Molikote type «A» oil mixture
	0.340 l	(11.4 oz USA)	Shell Spirax HD 90
	0.020 l	(.67 oz USA)	Molykote type «A»
Front fork dampers (each leg)	0.160 l	(5.4 oz.)	Shell Tellus 33

SPECIAL TOOLS FOR STRIPPING AND ASSEMBLING THE 5-SPEED TRANSMISSION ON 850 cc. «ELDORADO» (See Fig. 3/1)

FIG. N.	ORDER N.	DESCRIPTION
26	14905400	Tool for tightening layshaft nut
27	14912800	Tool for inner clutch body to clutch shaft
28	14912600	Hooked wrench for tightening inner clutch body lockring to clutch shaft
29	14928500	Puller for bearing races on main and clutch shafts
30	14913100	Puller for main shaft roller bearing in gearbox and clutch shaft bearing in cover
31	14913700	Puller for layshaft roller bearing race in gearbox
32	14929200	Punch for removing clutch shaft bearing from gearbox and layshaft bearing from gearbox cover
33	14907000	Puller for main shaft ball bearing in gearbox cover
34	14928900	Punch for pressing clutch shaft bearing in gearbox housing and layshaft bearing in gearbox cover housing
35	14929100	Punch for pressing layshaft roller bearing race in gearbox housing
36	14928800	Punch for pressing main shaft roller bearing in gearbox and clutch shaft bearing in gearbox cover
37	14929000	Punch for pressing main shaft ball bearing in gearbox cover
38	14929400	Punch for pressing clutch shaft seal in gearbox
39	14929500	Punch for pressing layshaft seal in gearbox cover
40	14928600	Tool for layshaft bearing inner race
41	14929300	Tool for positioning sliding muffs forks
42	14928700	Tool for operating gear selector
43	14929600	Gear box support
44	13907860	Piston pin puller

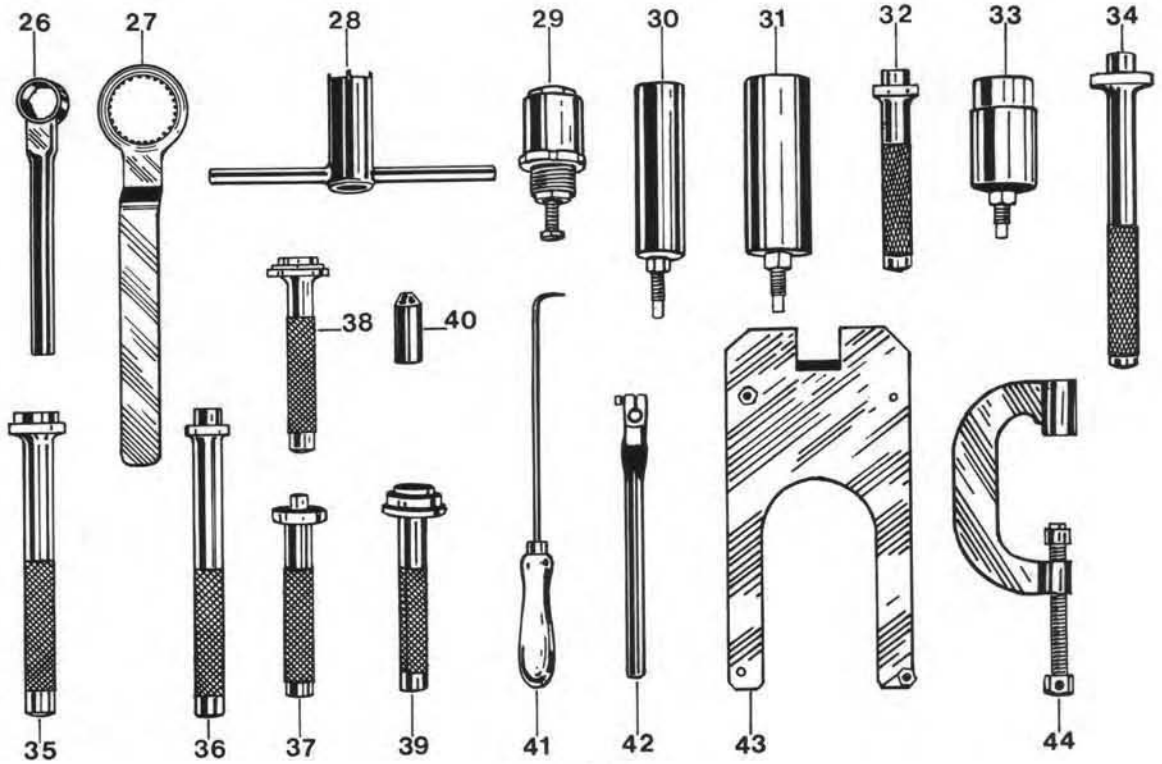


Fig. 3/1

CYLINDERS - PISTONS - PISTON RINGS

(See page 22)

SELECTION OF CYLINDER DIAMETER
V7 850 cc. ELDORADO

CLASS A mm	CLASS B mm	CLASS C mm
83.000 (3.2677")	83.006 (3.2679")	83.012 (3.2681")
83.006 (3.2679")	83.012 (3.2681")	83.018 (3.2683")

Cylinders must always be matched with pistons of same class.

SELECTION OF PISTON DIAMETERS

CLASS A mm	CLASS B mm	CLASS C mm
82.968 (3.2664")	82.974 (3.2666")	82.980 (3.2668")
82.974 (3.2666")	82.980 (3.2668")	82.986 (3.2671")

Pistons must always be matched with cylinders of same class.

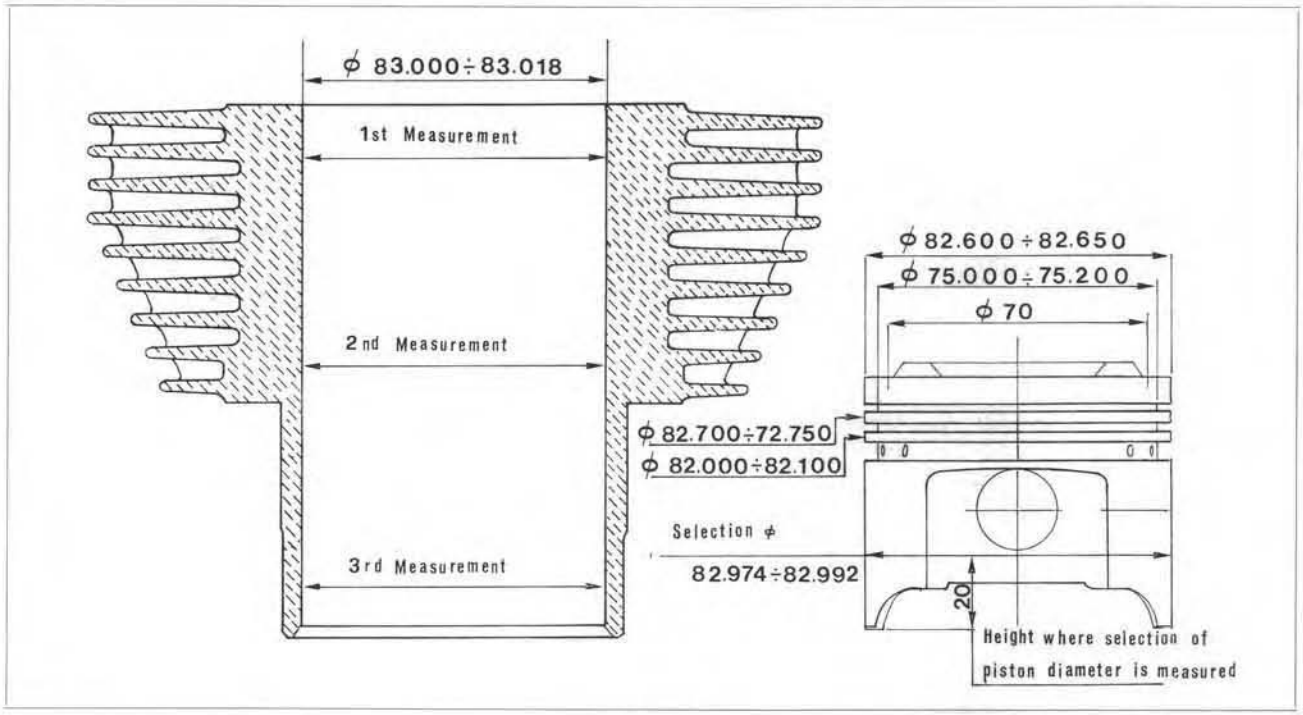


Fig. 27/2

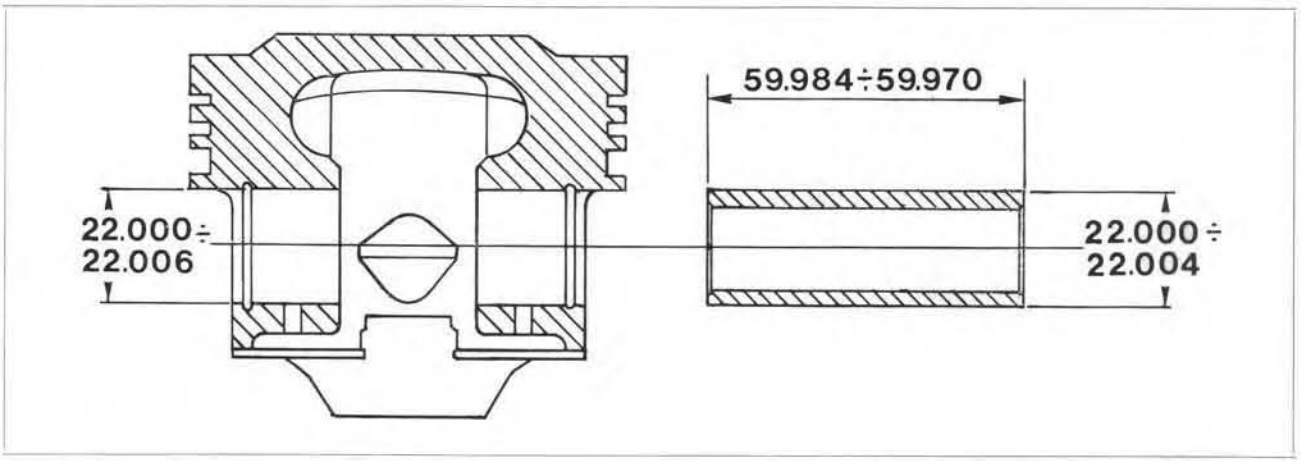


Fig. 31/2

REMOVING AND RE-FITTING OF PISTON PIN

Removal

After taking off the circlips (44 in fig. 14/1), withdraw the pin from the piston and the small end.

Assembly

Before fitting the pin, the piston should be heated in an oil bath at a temperature of about 60 °C (140 °F) in order to cause a slight dilatation of the piston hole and so an easier introduction of the pin in the piston and the small end.

Piston hole - piston pin matching data

This goes from a clearance of 0.006 mm (.00023") to a negative allowance of 0.004 mm (.00015").

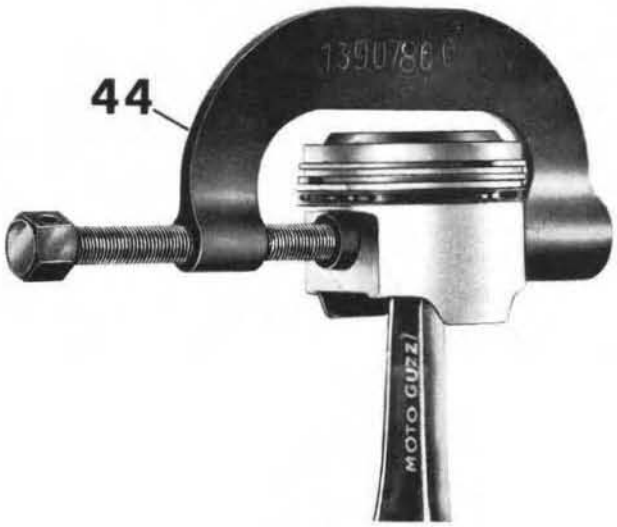


Fig. 14/1

5-SPEED TRANSMISSION - 850 cc. ELDORADO AND POLICE MODEL

(See fig. 76/1 and 77/1)

The gearbox is bolted to the engine block and can be separated.
It incorporates constant mesh gears with frontal engagement.
Engine-gearbox ratio: 1.235 to 1 (17-21).

Fig. 76/1

Internal gear ratios:

Low gear	2 to 1	(14-28)
2nd gear	1.3 to 1	(18-25)
3rd gear	1.047 to 1	(21-22)
4th gear	0.869 to 1	(23-20)
High gear	0.750 to 1	(24-18)

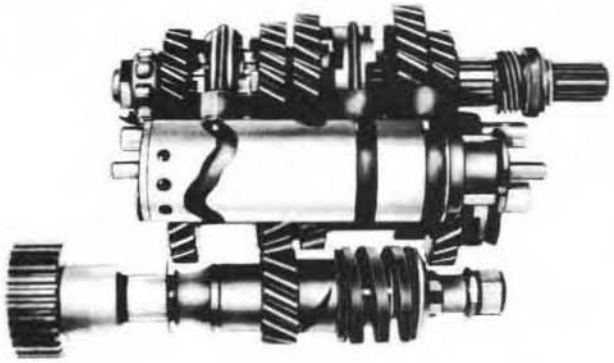


Fig. 77/1

GEARSHIFT PEDAL

(Fig. 78/1)

The rocker type pedal is located at the L/H side of the machine.
Low gear is engaged by heel pressure and the higher gears by heel pressure.
The free position (neutral) is in between 1st and 2nd gear and it is engaged by first shifting back to low gear and then by slight heel pressure (half a stroke) to find the free position.

STRIPPING THE GEARBOX ON THE BENCH

As a first operation drain the oil by unscrewing plug C, level plug A, and filler plug B (See fig. 78/2).

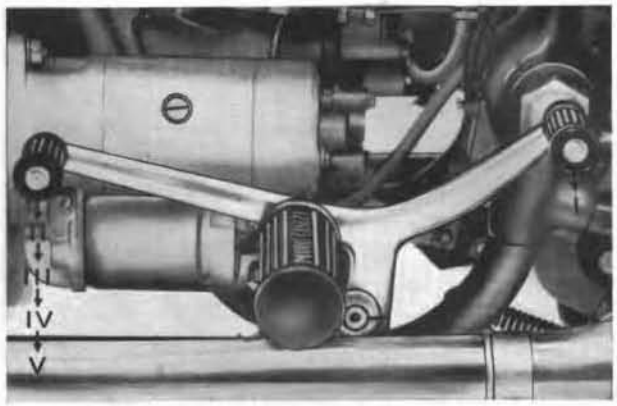


Fig. 78/1

Then set up the gearbox support n. 14929600 (43 in fig. 3/1) in a vice and from the gearbox remove:

— gear selector operating lever;
— speedo drive;
— Loosen layshaft securing nut using tool 12907100 (18 in fig. 79/1) to hold the layshaft fast and tool 14905400 (26 in fig. 79/1) to unscrew the nut;
— withdraw the speedo drive gear paying particular attention to the ball which acts as a lock key;
— clutch operating lever;
— lever return spring, outer retainer, throwout bearing, inner clutch body, and clutch rod.

REMOVAL OF TRANSMISSION COVER

To remove the cover it is first necessary to **set the gearbox in the neutral position**. Undo the Allen head securing screws and using a hide mallet tap the cover to allow it to be taken off. When slipping out the layshaft from its bearing make sure not to lose the speedo gear shim.

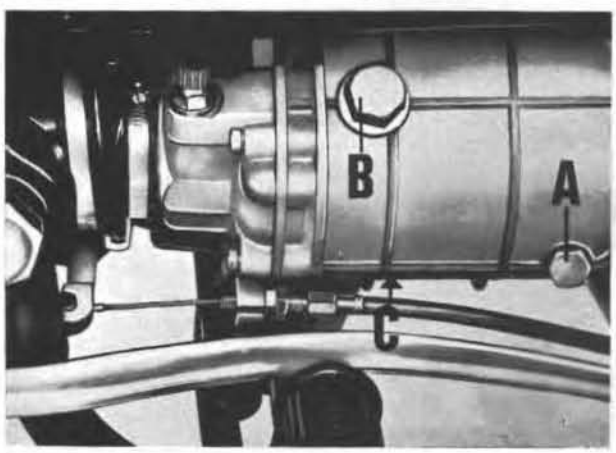


Fig. 78/2

REMOVAL OF GEAR BOX COMPONENTS SELECTOR FORK - SLIDING SLEEVES AND HIGH SPEED GEAR

Remove:

— fork selector rod;
— high speed gear fork;
— high speed gear sliding sleeve;
— high speed gear from layshaft;
— high speed gear from main shaft complete with roller cage and bush. This is done by the aid of a pointed rod. Force the stop pin down into its housing, turn the bushing to the right or left, and withdraw the gear complete with roller cage and bushing to a position near the shaft hole. Place the L/H thumb on the spring loaded stop pin to prevent this from shooting away and at the same time withdraw the gear-cage-bushing assembly with the right hand. Remove now pin and spring from the shaft hole.

SELECTOR DRUM

Unscrew the oil breather plug from the top of the gearbox and remove the spring. The oil breather plug has also the function of retaining the

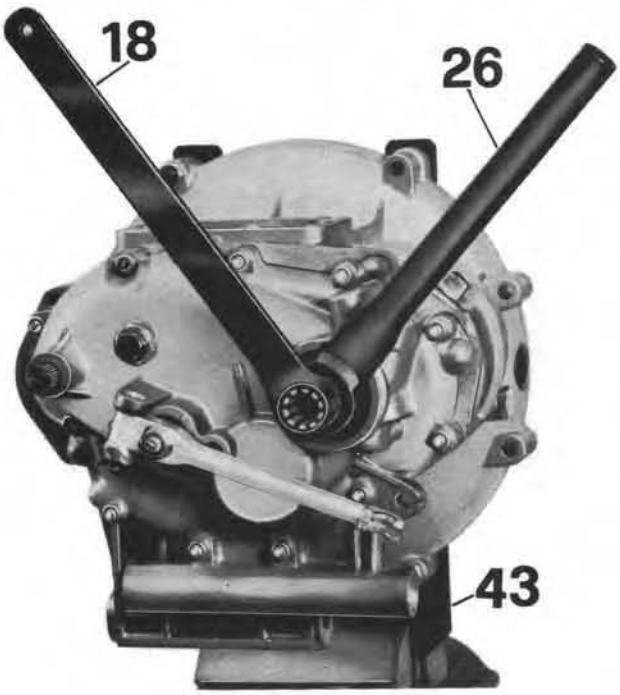


Fig. 79/1

pawl which acts on the selector drum. This pawl will remain in its housing and can only be removed after the gearbox has been completely dismantled.

— Undo the securing screws and slip off the neutral indicator unit from its housing in the gearbox.
— Withdraw the gear selector drum complete with rod, paying particular attention to the position of the shims.
— Withdraw the rod from the drum.

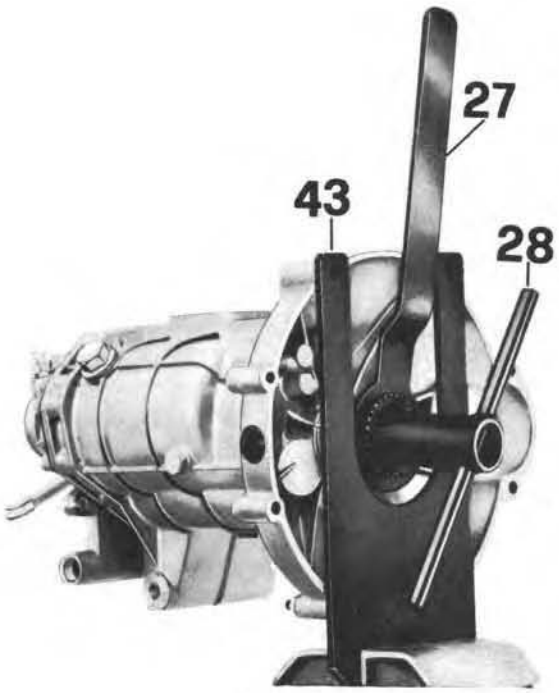


Fig. 79/2

MAIN AND LAYSHAFTS COMPLETE WITH GEARS AND SLIDING MUFFS FORKS

LAYSHAFT

Remove the complete layshaft from the gearbox and from the shaft take off:

– sealing ring at the box cover end;
— low speed gear, roller cage and bushing;
— sliding sleeve for 1st and 2nd speed;
— nut at the 4th speed gear side;
— roller bearing;
— adjusting washers;
— fourth speed gear with roller cage and bushing;
— sliding sleeve for 3rd and 4th speed;
— fixed sleeve on shaft;
— shim;
— 3rd speed gear with roller cage and bushing.

MAIN SHAFT

Slip off the shaft from the gearbox. All gears on this shaft are fixed except the high speed gear which is floating on its roller bearing and the

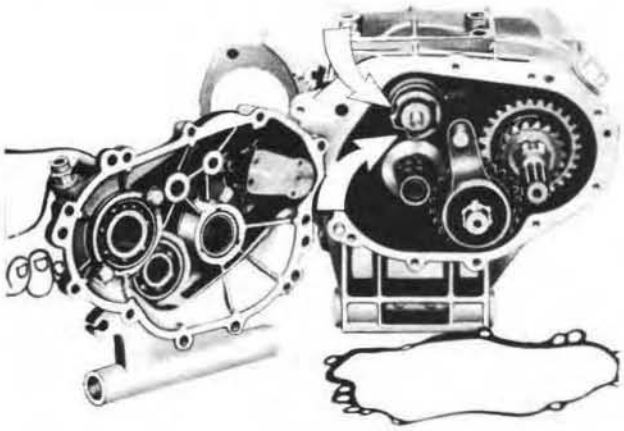


Fig. 81/1

high speed sliding muff which together with the bush retaining pin and spring have already been dismantled.
When taking off the main shaft pay attentation to the position of the shims and bronze ring.
The main shaft inner bearing race is fitted in the transmission box by means of special tool n. 14928500 (29 in fig. 82/3).

CLUTCH SHAFT

Using tool 14912800 (27 in fig. 79/2) and hooked wrench 14912600 (28 in fig. 79/2) and after flattening the flaps of the safety washer, remove the clutch body retaining ring from the clutch side.
When dismantling the fixed clutch body observe the position of the seal between body and bearing and the seal in the shaft groove.
Slide out the clutch shaft from the bearing and, if necessary, use a hide mallet to lightly tap it, making sure not to lose the oil scoop between shaft and bearing.

REMOVING THE CLUTCH SHAFT COMPONENTS

Using puller 14928500 (29 in fig. 82/1) withdraw the inner race of the roller bearing and the spacer nut.
Set up the complete shaft in a vice and using puller 12905900 (23 in fig. 91) compress the spring to the point where the cush drive plate retainers can be slipped off.

Then remove:

— cush plate;
— spring;
— sliding muff;
— intermediate gear.

Fig. 82/1

REMOVING THE BEARINGS FROM THE GEAR BOX

If the bearings have been assembled with loctite, proceed as follows:

— put che complete gear box in an oven and heat up to 150-160 °C (300-350 °F);
— extract the mainshaft roller bearing using puller 1497100 (30 in fig. 83/1);

Fig. 82/3

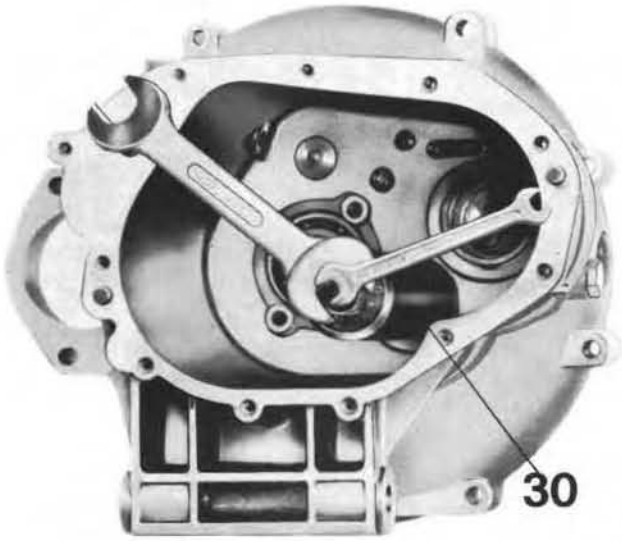


Fig. 83/1

— take off the outer race of the main shaft roller bearing using puller 14913700 (31 in fig. 83/2);

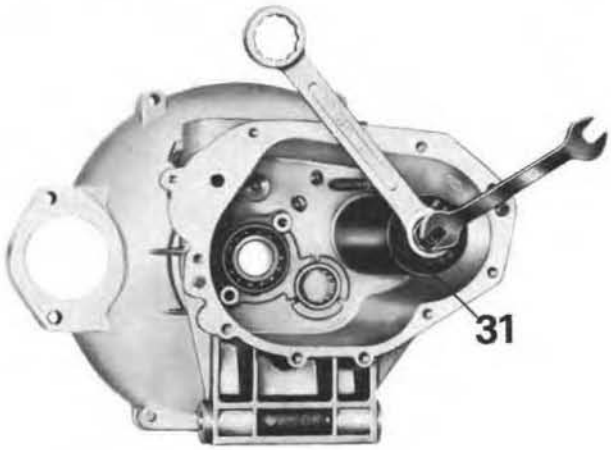


Fig. 83/2

— remove the clutch shaft seal;
— unscrew the lockplate securing bolts;
— remove the lock plate;
— remove clutch shaft bearing using punch 14929200 (32 in fig. 84/1).

Removing the gear box cover components

STRIPPING OF SELECTOR ASSEMBLY

(See A fig. 86/16)

Using a hide mallet tap off the selector assembly from the gearbox cover. This group consists of:

— selector return spring;

Fig. 84/1

— spring guiding pin;
— selector drum operating pawls;
— pawl return springs. To separate the pawls from the selector it is necessary to use the special 3 mm tool to take off the retaining pins from the selector body.
— after loosening the locknut, remove the selector adjusting screw from the gearbox cover.

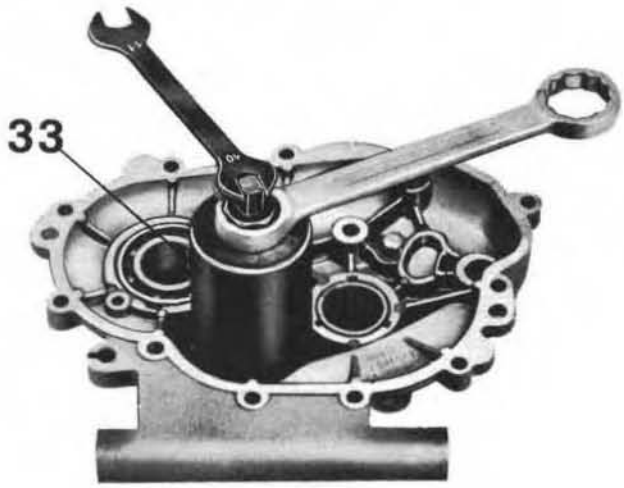


Fig. 85/1

REMOVAL OF BEARINGS FROM THE GEARBOX COVER

If fitted with loctite, these bearings are removed as follows:

— put the transmission cover in an oven and heat up to 150-160 °C (300-350 °F);
— using puller 14907000 withdraw the mainshaft ball bearing (33 in fig. 85/1);
— using puller 14913100 (30 in fig. 85/2) re-

move the clutch shaft roller bearing;
— remove the layshaft seal;
— unscrew the lockplate securing screw;

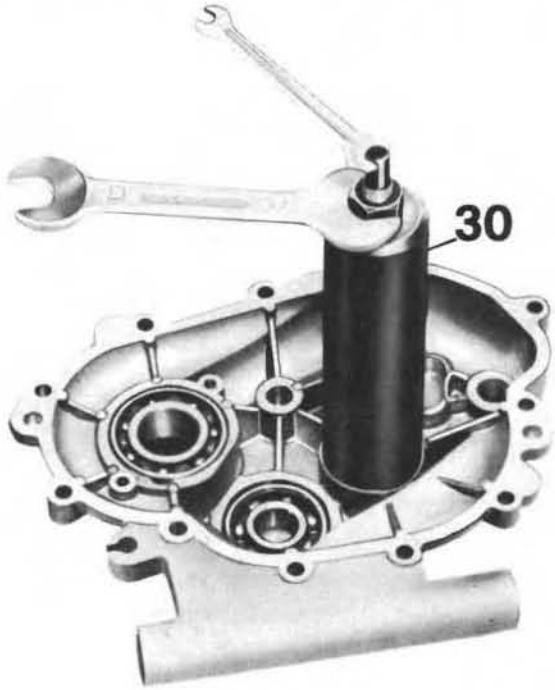


Fig. 85/2

— remove lockplate;
— remove layshaft bearing using tool 14929200 (32 in fig. 86/1).

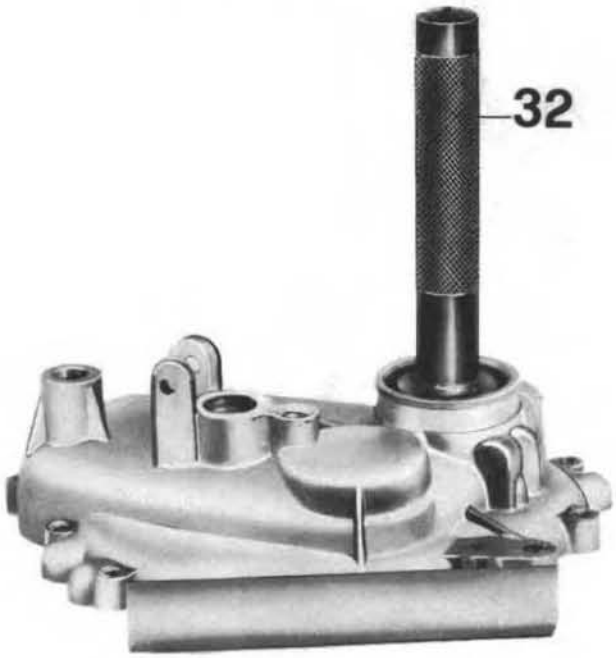


Fig. 86/1

CHECKING AND OVERHAULING OF THE GEARBOX COMPONENTS

BOX AND COVER

Check for cracks, also that the union faces are undamaged and the bosses threads not stripped.

SEALS

Whenever these are removed from their housings, they should be generally changed in order to assure a perfect tightness.

BALL AND ROLLER BEARINGS

Check their condition and that they are not excessively slack. All rolling surfaces should show up very smooth, the balls and rollers as well.
If there are any doubts about the efficiency of the bearings, it is best to have them replaced. (See section «Ball and roller bearings»).

MAIN SHAFT

Check wear of the shaft gear teeth and if unduly worn, replace the shaft.

HIGH SPEED GEAR ON MAIN SHAFT

Check for wear of its teeth and if necessary, replace the gear.

HIGH SPEED GEAR BUSHING

Ensure the surface contacted by the rollers is quite smooth, also the surface of the inner grooves. If scored or nicked, replace the bushing.

HIGH SPEED BUSHING RETAINER

Replace the retainer if scored or nicked.

SPRING FOR HIGH SPEED GEAR RETAINER

If deformed or has lost its efficiency, replace it. Spring should show a load of 1.40 kgs. (3.08 lbs.) when compressed to 8 mm (.031").

LAYSHAFT

Should show up very smooth at its contact surfaces. If scored or if the threaded portions are stripped, replace the shaft.

SLIDING SLEEVES

Check smoothness of all sliding surfaces and ensure the frontal engaging dogs are undamaged.

SEALS BETWEEN CLUTCH FIXED BODY AND BEARING ON CLUTCH SHAFT

If crumbled or no longer efficient, replace the seals.

INNER CLUTCH SHAFT GEAR

Check that all teeth are in good condition and the contact surfaces dead smooth. If not, replace the gear.

CUSH PLATE RETAINERS ON CLUTCH SHAFT

If deformed, scored, or nicked, replace the retainers.

CUSH SPRING PLATE ON CLUTCH SHAFT

All it needs is to have the inner grooves well smooth.

CUSH SPRING ON CLUTCH SHAFT

Check its elasticity and if deformed or no longer efficient, replace the spring.
When compressed to 37 mm (1.45") this spring should give a load of 190 kgs (308 lbs.).

COUPLING SLEEVE ON CLUTCH SHAFT

Check smoothness of the internal splines and that it is not too worn at the engaging end.

IDLE GEAR ON CLUTCH SHAFT

Should not show any imperfection or excessive wear. Teeth contact surfaces should be bright and unscored. Replace the gear, if necessary.

GEAR SELECTOR ASSEMBLY

Make sure the pawls slide freely in their seats. If not, remove the pins by the aid of a 3-4 mm (.11 - .15") tool to slip out both pawls and springs. Then use a 10 mm diameter (.39") reamer to re-bore the pawl housings, clean with an air jet, lubricate the housings, and re-fit spring and pawls, securing them to the selector body with flexible pegs.

PAWL ON SELECTOR BODY

Ensure its contact surface is perfectly smooth, especially the rounded section which operates

on the splined drum. This section should never have sharp ends and in such cases smooth out with a fine cut file.

SELECTOR PAWL RETURN SPRING

Check if cracked, deformed or has lost its elasticity. Replace, as necessary.

GEARS ON LAYSHAFT

Check wear of the teeth and of front engaging dogs. The teeth contact surface should be quite smooth and free from scoring or nicks. In any such case, the gears should be replaced.

ROLLER BEARING SECURING NUT ON LAYSHAFT

Make sure it is not stripped or damaged, otherwise replace the nut.

BUSHINGS FOR THE ROLLER CAGE ON THE LAYSHAFT FOR 2nd 3rd, 4th GEARS

Check that the surface contacted by the cages is not scored or nicked. Replace if not perfectly smooth.

CAGES FOR 1st, 2nd, 3rd AND 4th GEARS ON LAYSHAFT

Ensure that all rollers are in good condition or else replace the cages.

SLIDING SLEEVES OPERATING FORKS

Make sure all working surfaces are smooth and not worn to such an extent as to have lost their hardness, also that the pawls working in the drum splines are not unduly worn. In either case, replace the forks.

ASSEMBLING THE GEARBOX ON THE BENCH

After all parts have been inspected, checked or replaced, the gearbox unit is assembled as follows:

BEARINGS IN GEARBOX AND COVER

As a first operation the bearing housings and outer races should be throughly cleaned with a solvent (preferebly trichloroethylene). Using a loctite soaked brush, smear lightly the outer races and the bearing housings in box and cover. Make sure that no loctite enters into the balls and/or rollers. The bearings to be fitted with loctite are:

— clutch shaft bearing in the gearbox;
— layshaft bearing in the gearbox;
— layshaft bearing in the box cover.

Use green loctite n. 601 (611805).

PRESSING OF BEARINGS IN THE GEARBOX HOUSINGS

After smearing with loctite, the clutch shaft bearing is pressed into its housing by means of punch 14928900 (34 in fig. 86/2):

— the outer layshaft bearing race is pressed in by means of punch 14929100 (35 in fig. 86/3);
— main shaft bearing is pressed in with punch 14928800 (36 in fig. 86/4).

PRESSING OF BEARINGS IN GEARBOX COVER

— after smearing it with loctite, press the layshaft bearing in its housing by the aid of punch 14928900 (34 in fig. 86/5);

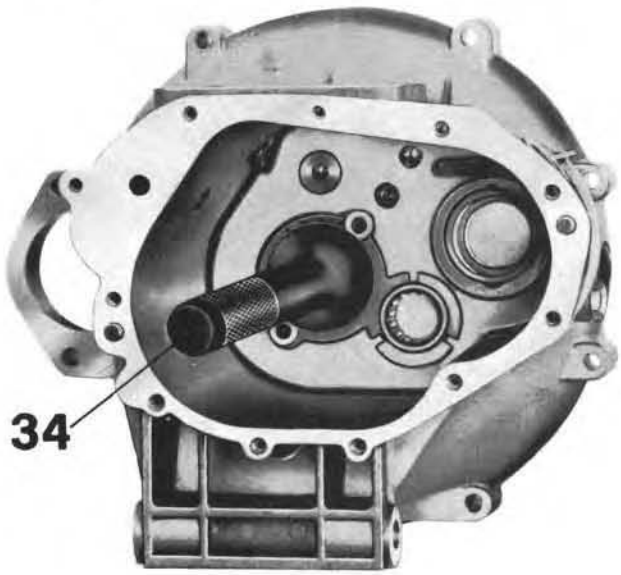


Fig. 86/2

— The main shaft bearing is pressed in with punch 14929000 (37 in fig. 86/6) after having smeared it with loctite;
— the clutch shaft bearing is pressed in with punch 14928800 (36 in fig. 86/7).

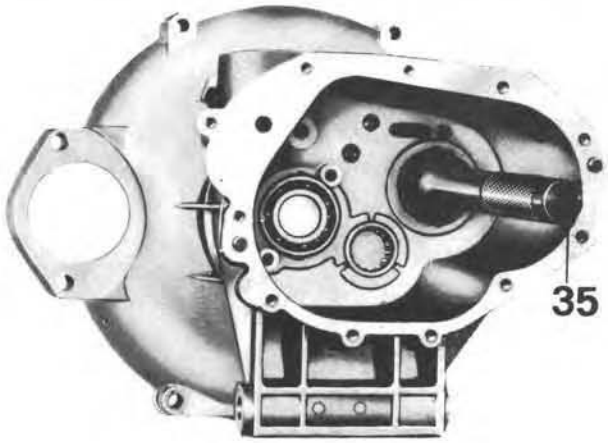


Fig. 86/3

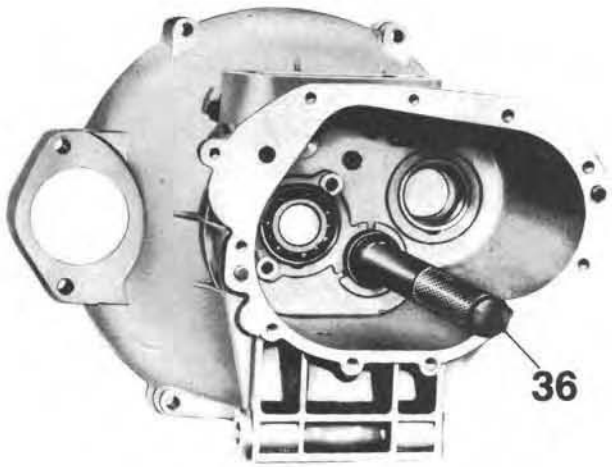


Fig. 86/4

After pressing the bearings into their housings, leave them to rest for about 12 hours to allow the loctite compound to dry up completely before proceeding with the re-assembly of the gearbox components.

ASSEMBLY OF THE CLUTCH SHAFT BEARING IN GEARBOX AND LAYSHAFT BEARING RETAINERS IN THE GEARBOX COVER

Make absolutely, sure that these retainers are flush with the outer bearing races all over their surfaces and that they are of modified type

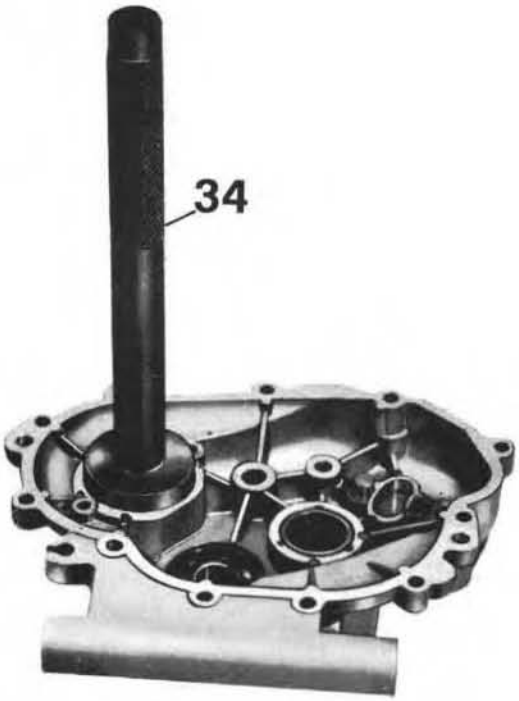


Fig. 86/5

Fig. 86/7

(part n. 14213802). If not perfectly adherent to the races, it will be necessary to spot-face or mill away the projecting ribbings to allow perfect adherence. The threaded portion of the re-

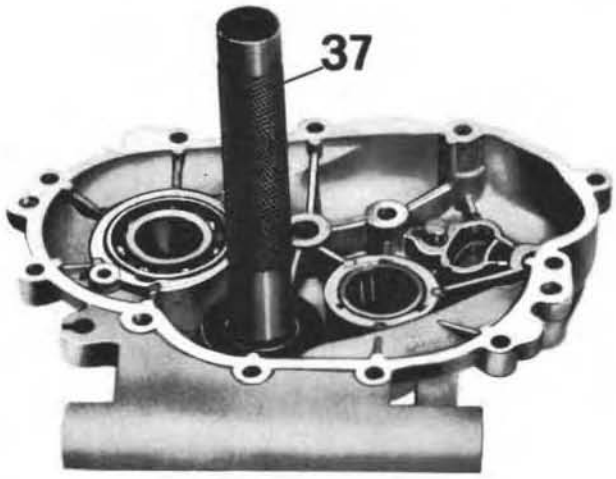


Fig. 86/6

tainer bolts should be smeared with green loctite n. 601 (611805) (Green).

FITTING OF THE GEARBOX SEALS FOR CLUTCH SHAFT AND SEALS IN COVER FOR LAYSHAFT AND SELECTOR SHAFT

The seal for the clutch shaft in the gearbox is fitted by means of punch 14929400 (38 in fig. 86/8).
The seal for the layshaft in the gearbox cover is fitted by means of punch 14929500 (39 in fig. 86/9).
The seal for the selector shaft is inserted in its housing in the gearbox cover.

Fig. 86/8

FITTING OF THE SELECTOR ASSEMBLY IN GEAR BOX

(See fig. 81/1 and A fig. 86/16)

As a first operation, it is necessary to re-assemble the springs and pawls securing them to the selector body by means of flexible pins. Fit then the spring guiding pin, selector return spring, and insert the complete gear selector unit in its housing on the gearbox cover.

INSTALLATION OF THE COMPLETE GEARSHIFT UNIT IN THE CASING

Assembly of the various components in the box is made as follows: Before re-fitting the main shaft in the gearbox it should be shimmed so as to obtain a distance of 167.1 - 167.2 mm (6.578 - 6.582″) between the bearing in the box and the cover bearing (See fig. 86/10).
This distance is obtained by the use of shims which are available in the following sizes: 2, 2.1, 2.2, and 2.4 mm (.078, .086, .094″).
The shims are fitted on the shaft at the gearbox end interposing a bronze ring between them.

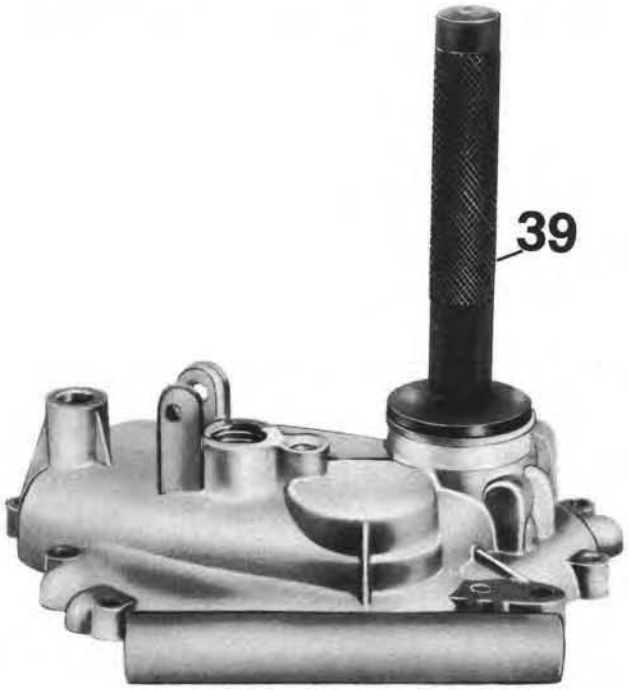


Fig. 86/9

Fig. 86/11

At the end of this operation press in the roller bearing inner race on the shaft at the gearbox end by the aid of special tool part n. 14928600 (40 in fig. 86/11).

ASSEMBLY OF LAYSHAFT IN GEARBOX

Before proceeding with this operation it is necessary to re-fit the sliding sleeves as follows:

ON SHAFT AT THE GEARBOX END:

— insert the 2nd speed gear bushing on the shaft making sure that the bushing head faces the gearbox cover;

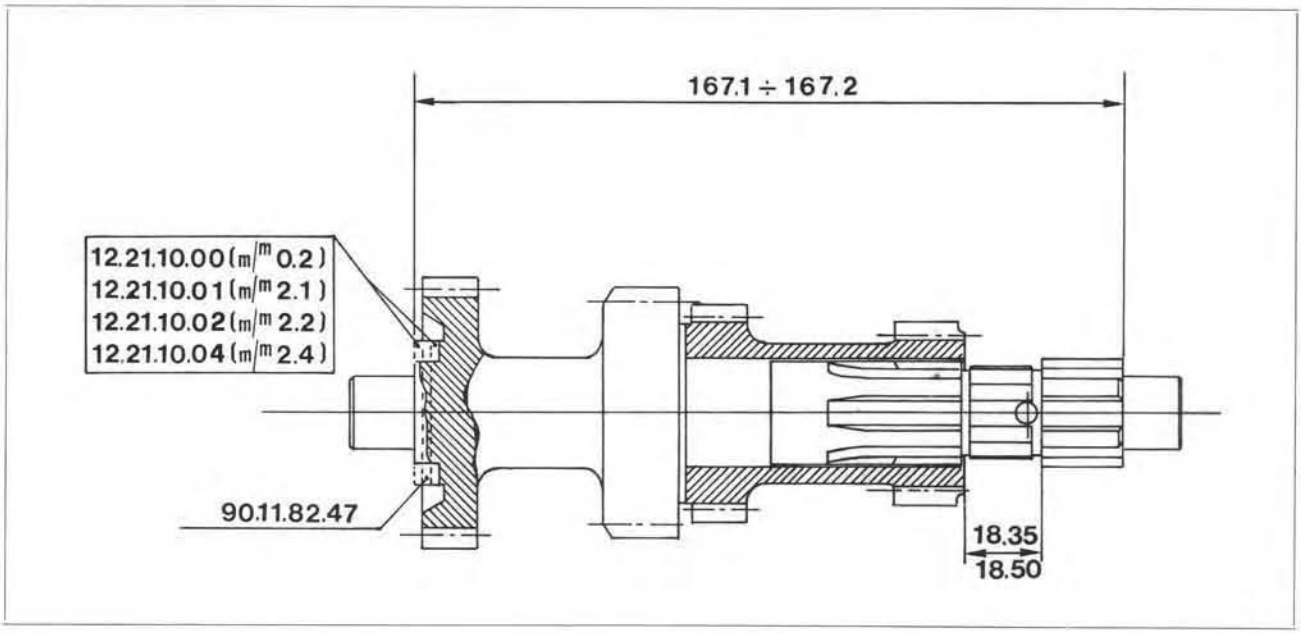


Fig. 86/10

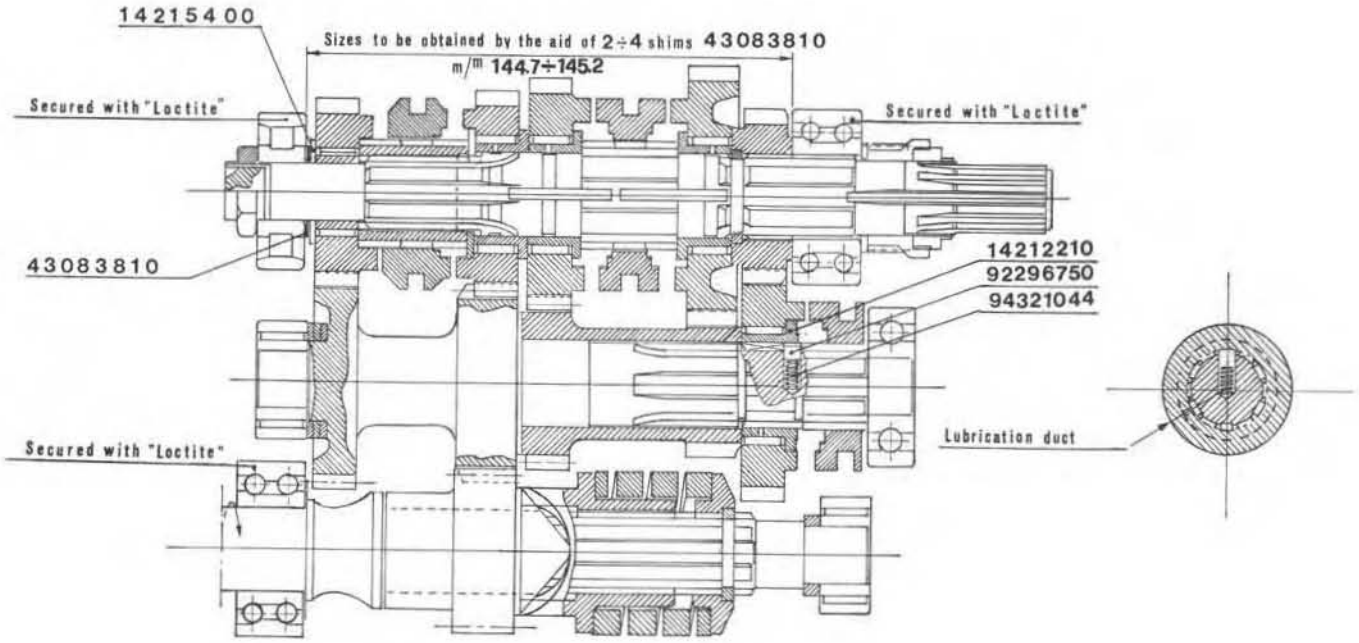


Fig. 86/12

— roller cage for 2nd speed gear on bushing;
— 2nd speed gear on the cage with frontal engaging dogs turned towards the gearbox cover;
— 3rd speed bushing on shaft with its head facing the 2nd speed gear;
— roller cage for 3rd speed gear on bushing;
— 3rd speed gear on roller cage with front dogs toward gearbox;
— shim between 3rd speed gear and fixed sleeve;
— fixed muff, ensuring that the stepped down end is facing the 3rd speed gear;
— sliding muff for 3rd and 4th speed engagement, ensuring that the stepped down end faces the 3rd speed gear;
— bushing for 4th speed gear;
— roller cage on bushing;
— 4th speed gear on shaft, ensuring that the front engaging dogs face the sliding sleeve;

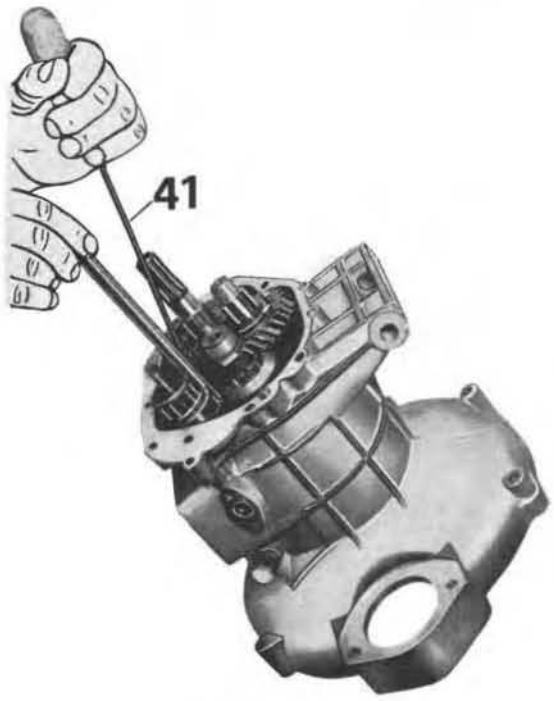


Fig. 86/13

Fig. 86/14

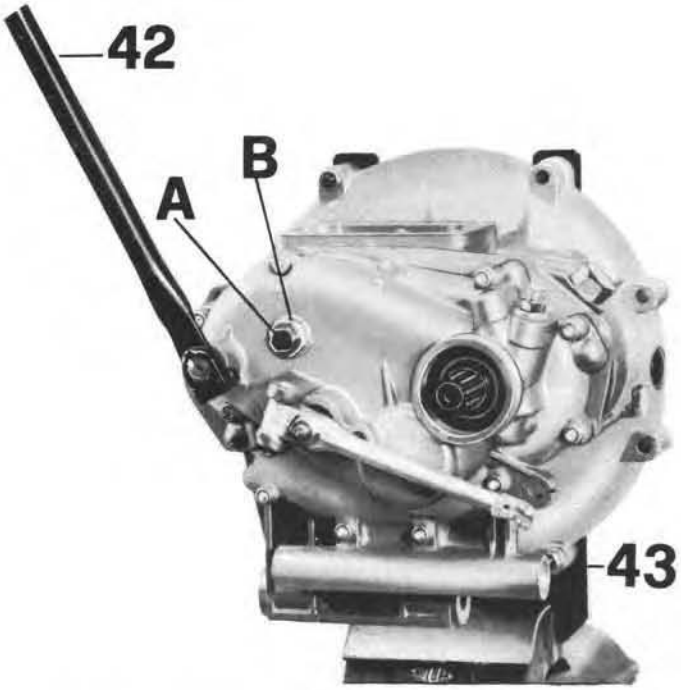


Fig. 86/15

ON THE SHAFT, GEARBOX COVER END

Assemble:

— 1st and 2nd speed engaging sleeves;
— bushing for 1st speed gear with its head facing the 2nd speed gear;
— roller cage in 1st speed gear bushing;
— 1st speed gear on roller cage;
— seal in shaft groove;
— high speed gear with stepped down end fitted on the seal ring.

SHIMMING OF LAYSHAFT

— Fit adjusting washer at the 4th speed gear side and add shims until between these and the high speed gear there is a distance of 144.7 - 145.2 mm (5.692 - 5.715″).
This distance is normally obtained by the addition of 2 to 4 shims.
(See fig. 86/12)
— Fit roller bearing in shaft at the 4th speed gear side.
— Tighten nut on layshaft at the 4th speed gear side and then hammer on the nut tang with a chisel in correspondence with the shaft groove in order to form a stop for the nut.
Fit now the complete layshaft in the gearbox.

ASSEMBLY OF GEAR SELECTION FORKS AND SELECTOR DRUM

— Fit the 1st, 2nd, 3rd, and 4th speed selecting forks on the layshaft sliding sleeves.
— Fit the splined selector drum complete with rod in its housings on the gearbox together with a spacer.

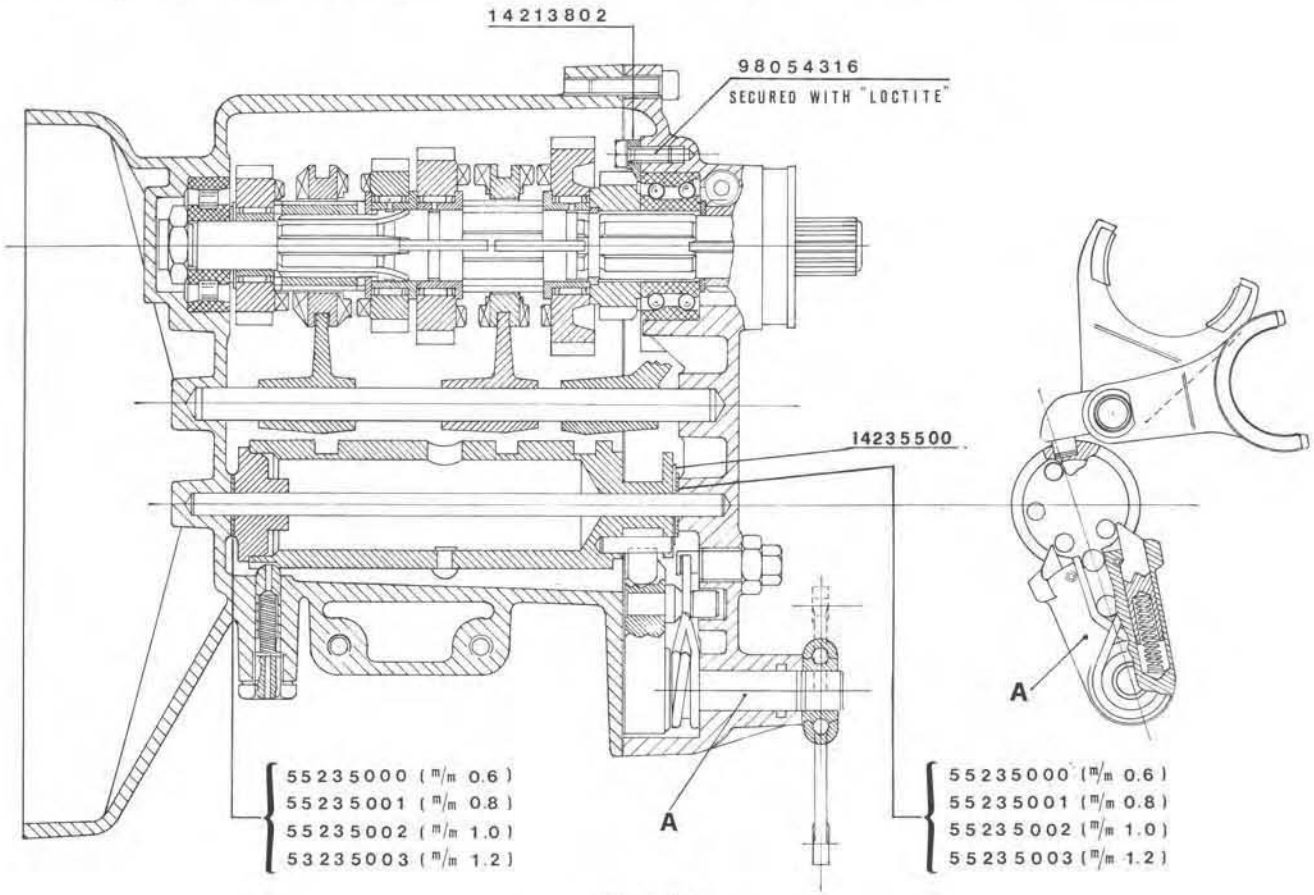


Fig. 86/16

Looking through the orifice in the ratchet pawl it should be ascertained that one of the 6 holes in the drum is in axis with the pawl hole.
If not, the spacer should be replaced with a larger or smaller one until both holes in the pawl and the drum are dead straight with each other.

— Fit the fork tip in the drum grooves. To position these in the grooves use special tool part n. 14929300 (41 in fig. 86/13).
Fit the peg in the gearbox drilling, spring, and plug screwing it on provisionally.
Insert the fork retaining rod into the fork holes.
Assemble the neutral indicator unit on the gearbox ensuring that the blade contacts the button on the drum. Secure this indicator to the gearbox with screws and washers.

RE-ASSEMBLING THE CLUTCH SHAFT

As a first operation it is necessary to assemble the following parts on the shaft:

— idle gear with its engaging teeth facing the gearbox cover;
— coupling sleeve with its engaging end towards the idle gear;
— spring;
— cush spring plate;
— using special tool 12905900 (23 in fig. 82) set up on the spring pressure plate, compress the spring until the 2 retainers can be inserted;
— spacer nut;
— roller bearing inner race in gearbox cover using special tool 14928600 (40 in fig. 86/14);

On the shaft at the gearbox end fit now:

— seal in its groove on the shaft;
— oil scoop between shaft and gearbox bearing;
— complete shaft in the bearing and on the retaining ring in the gearbox.

ASSEMBLY OF THE HIGH SPEED GEAR AND COUPLING SLEEVE ON THE MAIN SHAFT

Proceed as follows:

— fit roller cage part n. 92251030 and gear part n. 14211710 on bushing 14212210;
— insert the gear-cage-bush assembly in the splined section of shaft 14210511 until it is near the hole drilled in the shaft;
— introduce spring part n. 94321044 in the shaft drilling and position stop pin part n. 92296750 on top of the spring;
— with the left hand thumb keep the pin pressed down and with the right hand push bushing 14212210 with cage and gear right in;
— turn the bushing to the right or left until the stop peg clicks into one of the six splines of the bush.
— fit high speed engaging sleeve with selector fork on the shaft, then the fork on the rod inserting the tip of the fork in the groove on the splined drum.

ASSEMBLY OF GEARBOX COVER

— fit the retaining washer on the drum together with one or more shims;
— set the drum in the neutral position;
— fit a new cover-gearbox union gasket;
— assemble the gearbox cover tapping it lightly with a hide mallet to ensure that all shafts seat perfectly in their housings and the union faces are flush with each other.

N.B. - When the gearbox cover is re-assembled with the selector unit, ensure that the selector drum is set at the neutral position as otherwise the selector pawls might not enter freely in the two slots indicated by the arrows.
(See fig. 81/1)

— screw on the 4 cover screws lightly;
— insert the shim, speedo gear and its stop ball on the layshaft;
— set provisionally the layshaft securing nut;
— mount tool 14928700 (42 in fig. 86/15) on the selector shaft;
— adjust the gearbox by means of screw A, after having undone locknut B in fig. 86/15;
— Check gear engagement by changing up and down and feeling for the neutral position. If gearshifting presents some difficulty, take the gearbox cover down and remove or add some shims between drum and gearbox if the problem is difficult 1st and 3rd speed gear engagement, and between gearbox cover and drum if the 2nd and 4th gears do not engage properly.

Shim sizes available for this operation are: 0,6 - 0,8 - 1 and 1,2 mm (.023 + .031 - .039 and .047").
(See fig. 86/16)

When this operation has been done, re-fit the cover as above described and check again if gears engage properly.
If so, lock the layshaft nut tightly using tool 14905400 (26 in fig. 79/1) and layshaft holding tool 12907100 (18 in fig. 79/1).
After tightening this nut, hammer it with a chisel in correspondence of the shaft groove to lock it completely.
Tighten the cover securing screws and remove the tool previously fitted on the selector shaft. Insert the operating lever on the selector shaft and tighten its securing screw.

Lock tightly the oil breather plug which is also the retainer of the spring and stop peg on the gearbox.

RE-FITTING INNER BODIES ON THE CLUTCH SHAFT AND CLUTCH ASSEMBLY

Re-fit:
— bearing inner body seal;
— inner body;
— safety washer;
— inner body locking nut on clutch shaft. Tighten this using tool 14912800 (27 in fig. 79/2) and hooked wrench 14912600 (28 in fig. 79/2);
— bend one ear of the safety washer in one of the locknut grooves.

REFITTING THE COMPLETE CLUTCH UNIT ON THE MAIN SHAFT AND GEARBOX COVER

Re-fit:
— small rubber tube in shaft;
— inner body;
— throwout bearing on inner body;
— outer body fitted with seal on gearbox cover;
— operating rod in shaft at gearbox end;
— operating lever on gearbox cover complete with adjusting screw and locknut and securing with cotters and pins;
— lever return spring in its housing in gearbox cover.

Adjust the clutch operating lever on the gearbox. Do this by screwing in or out adjusting screw B after loosening counternut A.

This adjustment is correct when there is a distance of 67-69 mm (2.63 - 2.71") from the gearbox cover to the center of the round slot which retains the cable terminal.
(See fig. 87/1)

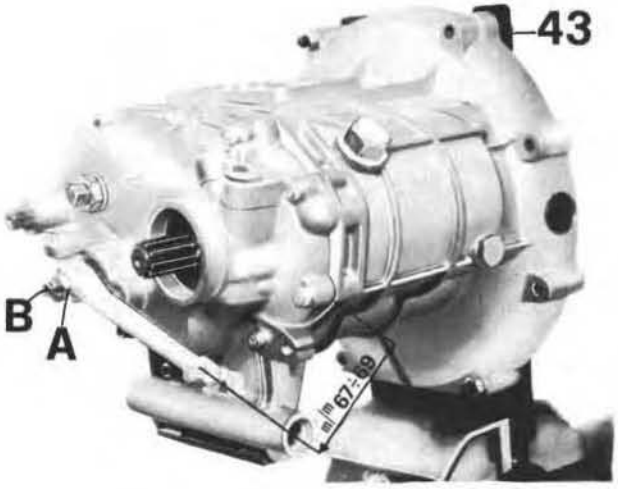


Fig. 87/1

FILLING UP GEARBOX OIL

(See fig. 78/2)

Remove drain plug C and introduce 0.750 liters (1 and 3/4 pints) of Shell Spirax HD 90 oil or an equivalent through filler plug B. Correct oil level is when it starts seeping through level plug A.
Re-fit plugs A and B.
At this stage the gearbox is ready to be fitted on the machine.

REAR DRIVE

Layshaft bevel gears - wheel ratio: 1 to 4,625 (8 - 37).

OVERALL GEAR RATIOS

Low gear	11.424 to 1
Second gear	7.928 to 1
Third gear	5.980 to 1
Fourth gear	4.963 to 1
High gear	4.284 to 1

LUBRICATION OF REAR WHEEL DRIVE

Oil quantity required: about 0.360 litres (12.07 oz USA).

Of which:

— 0.340 litres (11.4 oz USA) of SHELL Spirax HD 90;
— 0.020 litres (.67 oz USA) of MOLYKOTE oil type «A».

IGNITION

CHECKING OF IGNITION ADVANCE (FIXED AND AUTOMATIC) USING A STROBOSCOPE LIGHT

To check the ignition advance, the crankshaft driven generator pulley of the V 850 cc. Eldorado has been provided with 3 checking marks. When these are in coincidence with arrow A stamped on the timing cover they determine if the ignition timing is correct.

The reference marks on the pulley (See fig. 129/3 and diagram 129/4) can be defined as follows:

— «B» (first on left) is the TDC position mark for cylinder n. 2 (on the left as seen astride the saddle);
— «C» is the 5° fixed advance mark to the TDC;
— «D» is the 25° automatic advance mark to the TDC;
— «E» is the 33° total advance mark to the TDC.

With the engine assembled on the machine, this control is made as follows:

Fig. 129/3

— remove the generator belt cover by unscrewing the 3 retaining screws;
— connect the timing device cable to the left cylinder plug (n. 2);
— connect the 2 stroboscope cables with clamps to a battery ensuring that clamp (+) is connected to battery pole (+) and the other to pole (—).

After these connections to the battery and plug have been made, start the engine and direct the stroboscope light on to arrow «A» on the timing cover.

Check that the arrow is in coincidence with pulley marks «C», «D», «E» at the following engine speeds:

Mark «C» at 1200 ± 100 r.p.m.
Mark «D» at 2200 ± 100 r.p.m.
Mark «E» at 3600 ± 100 r.p.m.

If this control shows that arrow «A» coincides with the above pulley marks at the indicated engine speeds, then the ignition timing is correct.

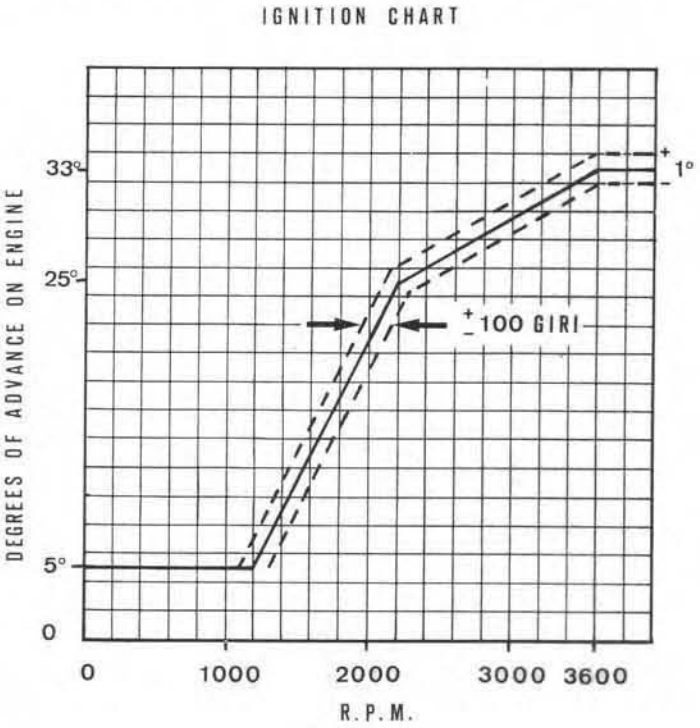


Fig. 129/4

ELECTRICAL EQUIPMENT - INSTRUMENTS AND CONTROLS
V 76 AMBASSADOR - V 850 ELDORADO

Instrument panel (See fig. 132/1)

1 — Speedometer
2 — Green light indicating lights on
3 — Red warning light indicating insufficient flow of current from generator for battery charge. Should go out when the engine has reached a certain number of revolutions
4 — Orange neutral indicator. This light will light up when the gearbox is in neutral but before starting it is well to ensure that the gearbox is effectively in the free position between first and second gear.
5 — Red warning light. Oil pressure gauge. Will go out when oil pressure for normal engine operation is sufficient.
6 — Revolution counter

Ignition key (Fig. 132/2)

This key has 3 positions:

0 — Machine at standstill, key removable, all electrics switched off

Fig. 132/1

Fig. 132/2

1 — Machine at standstill, key removable, parking lights on
2 — Machine ready to be started and normal riding position. All controls on. For daylight no other position necessary. For night driving levers A and B on the left handlebar must be switched on

Starting button (See fig. 132/3)

On right handlebar. With the ignition key in position 2 the machine is ready to be started.

Fig. 132/3

WIRING DIAGRAM
V 76 AMBASSADOR - V 850 ELDORADO
Fig. 138/1

A = Headlight
B = Main driving lights
C = Terminal block with fuses
D = Distributing block
E = Light switch and horn button
F = Spark plugs
G = Distributor
H = Contact breaker
I = H.T. coil
L = Starter button
M = Horn
N = Neutral indicator cutout
O = Stop light cutout
P = Oil pressure cutout
Q = Ignition switch
R = Number plate and tail light
S = Plate illumination and stop light
T = Generator
U = Regulator
V = Battery
Z = Starter motor solenoid
X = Starter motor
AA = Speedometer (with illumination bulb)
BB = Rev-counter (with illumination bulb)
CC = Lights on indicator (red)
DD = Neutral indicator (orange)
EE = Generator charge (red)
FF = Oil pressure indicator (red)
K = Relay for starter solenoid

IGNITION SWITCH POSITION

0 —
1 — 30/30 - INT.
2 — 30/30 - INT. 15/54
3 — 30/30 - INT. 15/54 - 50

N.B. - Position 3 does not serve on machines with starter button.

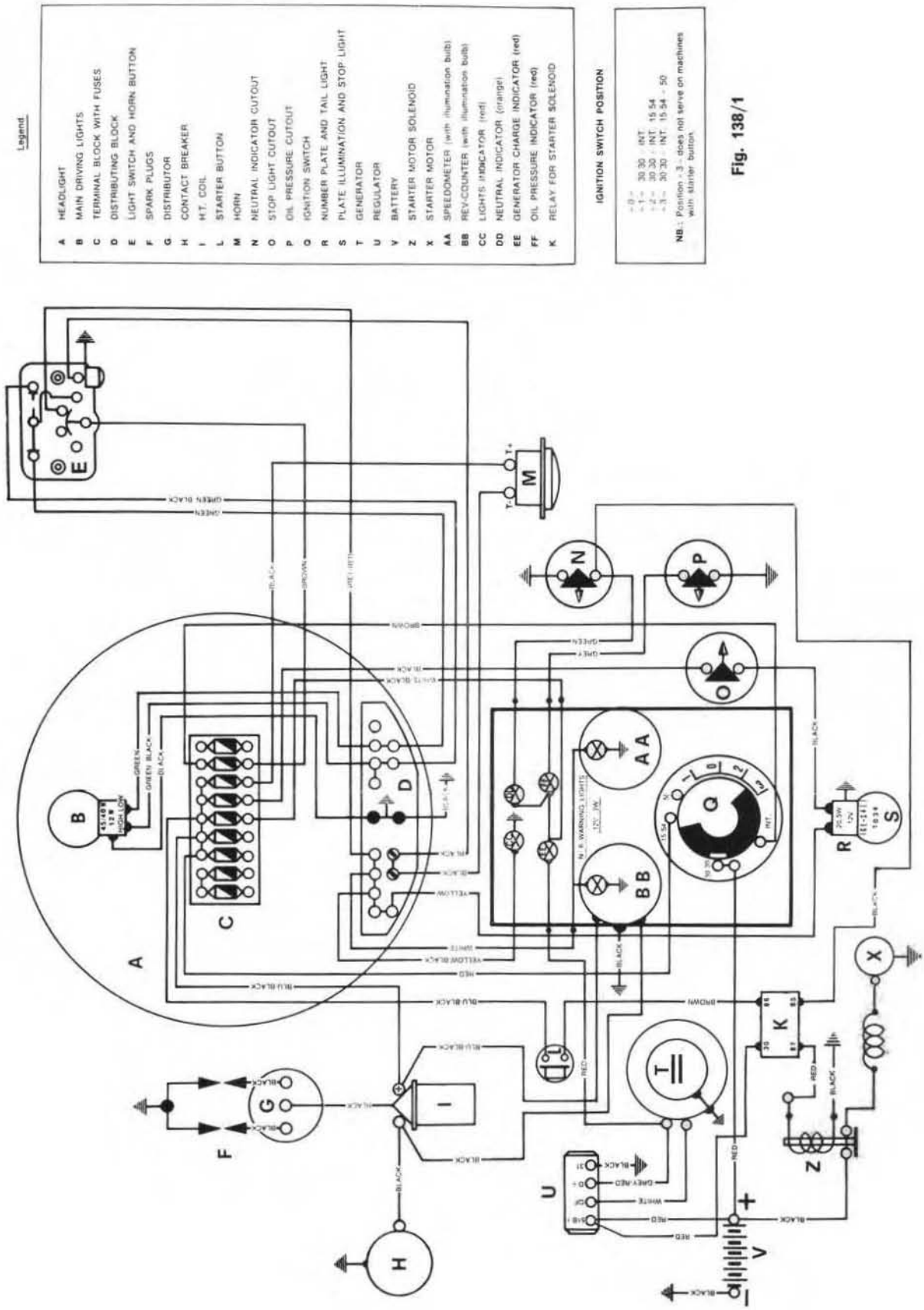

Legend
A HEADLIGHT
B MAIN DRIVING LIGHTS
C TERMINAL BLOCK WITH FUSES
D DISTRIBUTING BLOCK
E LIGHT SWITCH AND HORN BUTTON
F SPARK PLUGS
G DISTRIBUTOR
H CONTACT BREAKER
I HT. COIL
L STARTER BUTTON
M HORN
N NEUTRAL INDICATOR CUTOUT
O STOP LIGHT CUTOUT
P OIL PRESSURE CUTOUT
Q IGNITION SWITCH
R NUMBER PLATE AND TAIL LIGHT
S PLATE ILLUMINATION AND STOP LIGHT
T GENERATOR
U REGULATOR
V BATTERY
Z STARTER MOTOR SOLENOID
X STARTER MOTOR
AA SPEEDOMETER (with illumination bulb)
BB REV-COUNTER (with illumination bulb)
CC LIGHTS INDICATOR (red)
DD NEUTRAL INDICATOR (orange)
EE GENERATOR CHARGE INDICATOR (red)
FF OIL PRESSURE INDICATOR (red)
K RELAY FOR STARTER SOLENOID
IGNITION SWITCH POSITION
- 0 -
- 1 - 30 30 - INT
- 2 - 30 30 - INT. 15 54
- 3 - 30 30 - INT. 15 54 - 50
NB.: Position - 3 - does not serve on machines with starter button.

Fig. 138/1

ELECTRICAL EQUIPMENT - INSTRUMENT PANEL - CONTROLS - GEARSHIFT AND SYREN CONTROL

INSTRUMENT PANEL AND CONTROLS
(V7 850 - LAPD MODEL)

Instrument panel (See fig. 144)

1 — Courtesy light switch
2 — Right and left turn lights and rear parking lights switch
3 — Green light, indicating L/H turn light on (3W - 12V bulb)
4 — Red light, indicating front red lights on (3W - 12V bulb)
5 — Red warning light indicating high beam on (3W - 12V bulb)
6 — Red light, generator charge (3W - 12V bulb)
7 — Orange light, neutral indicator (3W - 12V bulb)
8 — Red light, oil pressure (3W - 12V bulb)
9 — Green light, R/H turn light on (3W - 12V bulb)
10 — Coil disconnecting switch
11 — Mile calibrated speedometer

Courtesy light switch (1 in fig. 144)

It is on the L/H side of the panel and has 2 positions:
— pulled up = contact closed;
— pushed down = contact open.

Coil disconnecting switch (10 in fig. 144)

It is on the R/H side of the panel and has 2 positions:

pushed down	= contact open	(the engine stops)
pulled up	= contact closed	(the machine with ignition key on position «2» is ready to be started and ridden)

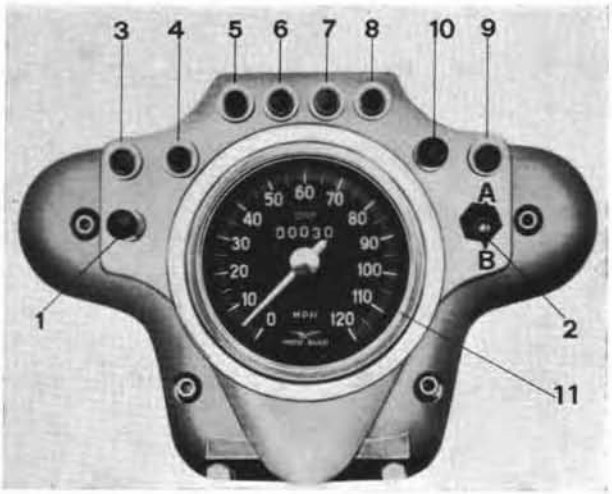


Fig. 144

Right and left turn light and rear flasher light switch (2 in fig. 144)

It is on the R/H side of the panel and has two positions:
A = Switch on. The left or right turn light indicators are operated by turning the handlebar switch lever on position 1 or 2 (See fig. 2).
B = Rear flashing lights on.

Turn lights switch, rear flashing lights switch, radio control switch (Fig. 145)

It is on the R/H side of the handlebar and incorporates turn lights control with 2 positions:
— position 1" — R/H turn lights on;
— position 2" — L/H turn lights on.

Front red lights switch with 2 positions:
— position 3 — contact closed;
— position 4 — contact open;
— position 5 — radio control switch.

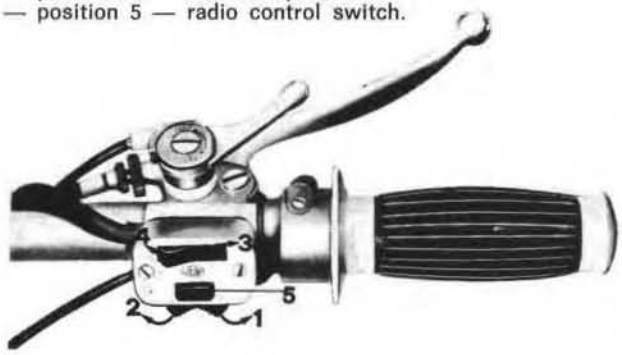


Fig. 145

Ignition key switch (fig. 146)

It is on the left hand side of the rear frame.
The key has 3 positions:
— position 0 — machine at standstill, key removable, all controls off;
— position 1 — machine at standstill, key removable, parking light on;
— position 2 — machine ready to be started and normal riding position.

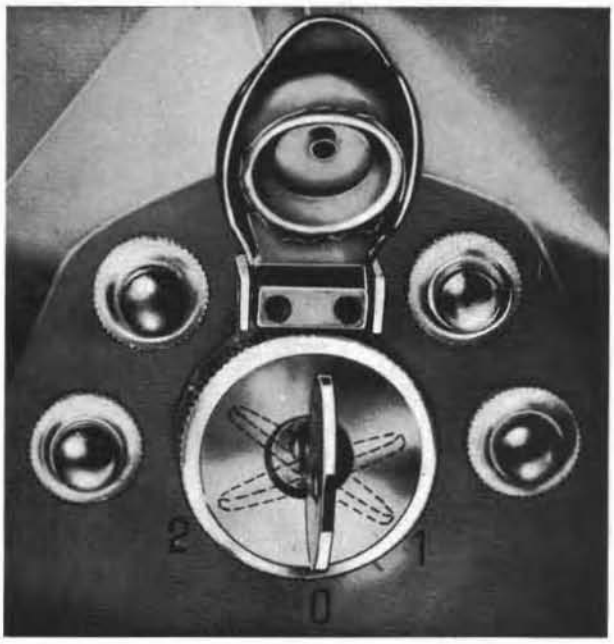
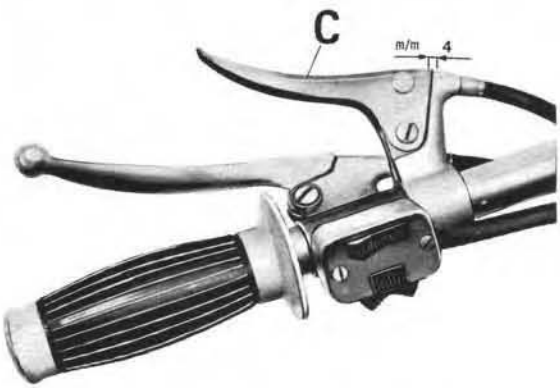


Fig. 146

Adjustment of syren control lever (A-B-C in fig. 147)

This lever is on the L/H side of the handlebar.
Play is correct when there is about 4 mm play between lever and fulcrum. Adjust as follows when necessary:
— Loosen locknut A and screw in or out adjuster B on the L/H side of the frame until the correct play is obtained. Re-tighten locknut A.



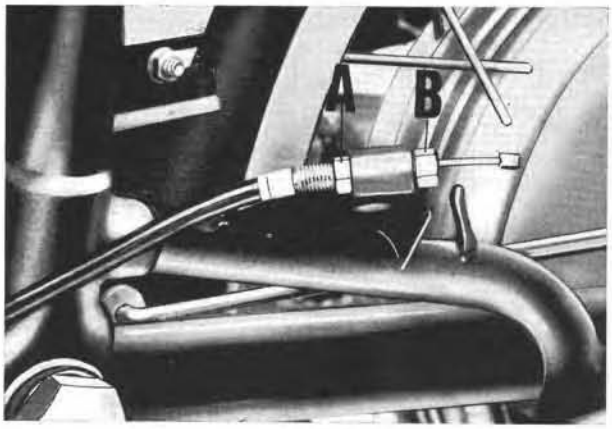


Fig. 147

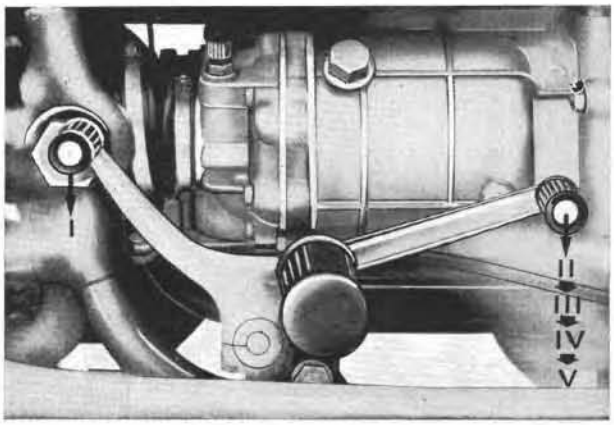


Fig. 148

Gearshift lever (Fig. 148)

It is on the L/H side of the motorcycle.
The lever is actuated as follows.
Low gear is inserted by toe pressure. The higher gears are engaged by heel pressure. Neutral position is engaged by passing from the higher gears to the low gear and then to feel for the neutral position by heel pressure (half stroke).

INSPECTION OF THE STEERING DAMPER UNIT (See fig. 149)

It is strongly recommended to occasionally check the steering damper unit as with time this may lose its efficiency and cause possible wobbling of the machine at high speed.

This check is carried out as follows:

— hang the damper up in a vertical position by the fixed eyelet;

— hook a 3.2 kgs. weight (7 lbs) on the other eyelet welded on the inner sliding rod;

— with this weight attached to it, pull or rotate down the rod on different positions. The braking effect should be such as to never let the rod be dragged down in any of the tested positions.
This test should particularly be made with the sliding rod in the middle position of its travel with both eyelets parallel to each other.

If the damper does not withstand the above mentioned load and should drag the rod down even slightly, the damper should be replaced immediately with a new one.

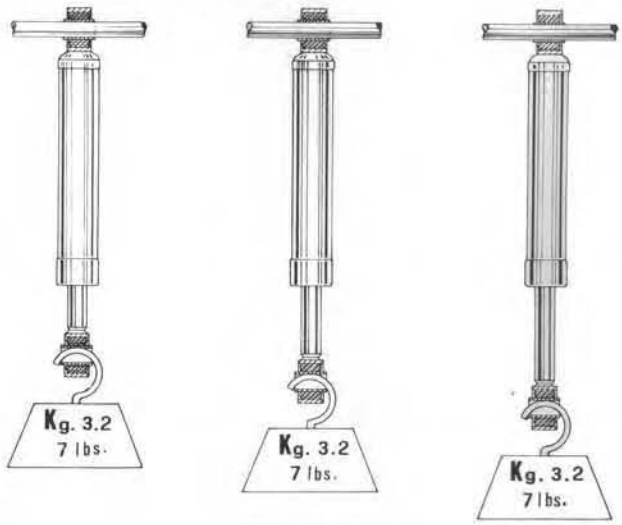


Fig. 149

WIRING DIAGRAM

(Fig. 150)

LEGEND

1 — Headlight
2 — High and low beam bulb (45/40W - 12V)
3 — Terminal block with fuses
4 — Distributing block in headlight
5 — Horn fuse
6 — Courtesy light cutout
7 — Coil disconnetion cutout
8 — Red warning light, front red lights on
9 — Turn lights and rear flashing lights switch
10 — Green warning light, L/H turn light on (3W - 12V bulb)
11 — Green warning light, R/H turn light on (3W - 12V bulb)
12 — Instrument panel
13 — Shunting connection, front
14 — Mile speedometer
15 — Bulb, speedo illumination (3W - 12V)
16 — Red warning light, high light on (3W - 12V bulb)
17 — Red warning light, oil pressure (3W - 12V bulb)
18 — Orange warning light, neutral indicator (3W - 12V bulb)
19 — Red warning light, generator charge (3W - 12V)
20 — Ignition switch
21 — Generator
22 — Voltage regulator
23 — Battery
24 — Starter motor relay
25 — Starter motor
26 — Distributor
27 — Contact breaker
28 — Coil
29 — Spark plug
30 — Light switch and horn button
31 — Ground switch for relay
32 — Turn lights, front red lights, and radio control switch
33 — Starter button
34 — Flasher unit for turn lights, and rear lights
35 — Horn
36 — Rear brake stop cutout
37 — Front brake stop cutout
38 — Oil pressure hydraulic cutout
39 — Neutral indicator cutout
40 — Rear shunting connections
41 — Plate and stop light (5/21W - 12V bulb)
42 — Rear orange flashing light (21W - 12V bulb), R/H
43 — Rear orange flashing light, L/H (21W - 12V vulb)
44 — Rear R/H blue light (5W - 12V bulb)
45 — Rear L/H blue light (5W - 12V bulb)
46 — Front R/H red light (21W - 12V bulb)
47 — Front L/H red light (21W - 12V bulb)
48 — Front R/H turn light indicator (orange) (15W - 12V
49 — Front L/H orange turn light indicator (15W - 12V bulb)
50 — Supplementary light
51 — Starter motor solenoid relay

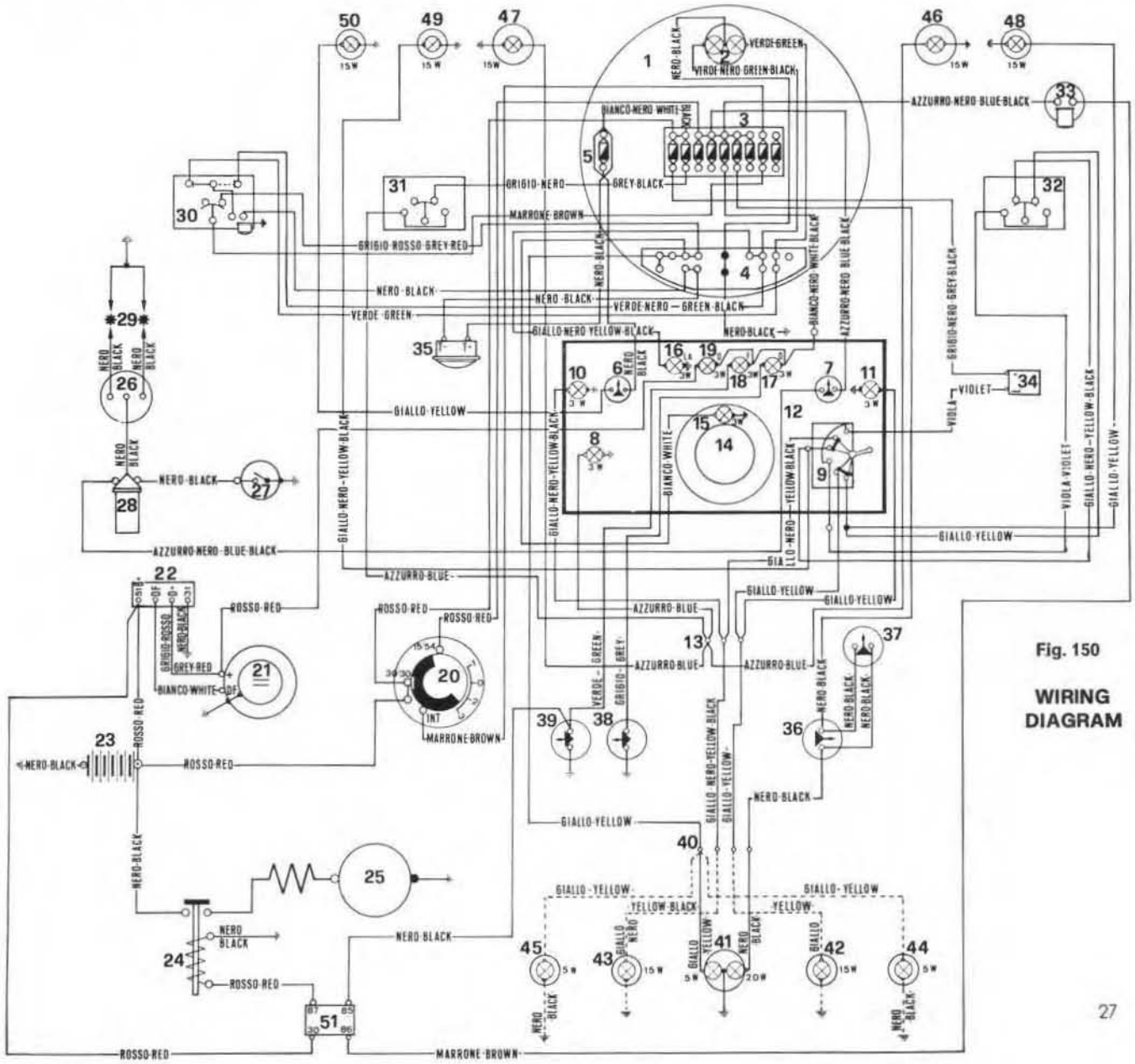


Fig. 150

WIRING DIAGRAM