

1195



**MOTO GUZZI**

**WORK SHOP MANUAL**

**V 1000**  
**I - CONVERT**

**ADDITIONS AND CHANGES TO THE WORKSHOP MANUAL  
FOR V7 SPORT - 750 S - 850 T**

***PREMIER* MOTOR CORPORATION**

RAILROAD STREET & PLANT ROAD, HASBROUCK HEIGHTS, NEW JERSEY 07604  
SOLE DISTRIBUTOR IN U.S. AND CANADA

## MAIN FEATURES

### ENGINE

2-cylinder, 4-stroke	
Cylinder disposition	« V » 90°
Bore	mm 88
Stroke	mm 78
Displacement	cc 948,8
Compression ratio	9,2
Max. output	HP 71 SAE at 6500 rpm

### Valve gearing

O.H.V. push rod operated.

### Carburetion

N. 2 Dell'Orto Carburettors:  
VHB 30 CD (right);  
VHB 30 CS (left).

### Lubrication

Pressure, by gear pump.  
Wire gauze and cartridge filters in oil pump.  
Normal lubrication pressure  $3,8 \div 4,2$  Kp/cm<sup>2</sup>.  
Controlled by pressure relief valve.

### Generator, Alternator

Front, on the crankshaft (14 V - 20 A).

### Ignition

By abttery, with double contact breaker and automatic advance.

Ignition data:

— initial advance (fixed)	0 ÷ 2°
— automatic advance	31 ÷ 33°
— full advance (f. + a.)	33°
— spark plugs	Marelli CW 7L Marelli CW LP Bosch W 225 T2 Champion N9 Y
— plug points gap	mm 0,6
— n. 2 ignition coils.	

### Starting

Electric starter (12 V - 0,7 HP) with electroma-  
gnetic ratche control. Ring gear bolted on the  
flywheel. Starter button (START) on the right  
side of the handlebar.

### TRANSMISSIONS

#### Hydraulic converter

Type « SACHS » allowing the motorcycle to gra-  
dually start without any clutching.  
Max. converting ratio 1,60 : 1.

#### Clutch

Dry type, multiplate. Hand controlled by lever  
on the left side of the handlebar.

#### Primary drive

By gears, ratio 1 : 1,57 (Z = 19/22).

### Gearbox

Two speed, foot operated from the left side of  
the vehicle.

Gear ratio:

- 1 st. speed (Z = 18/24) = 1 : 1,333
- 2 nd. speed (Z = 22/22) = 1 : 1

### Secondary drive

By cardan shaft, bevel gear set.

Ratio: (Z = 9/34) = 1 : 3,788

Overall ratio (engine-wheel):

- 1 st. speed 1 : 6,12
- 2 nd. speed 1 : 4,58

### CYCLE

#### Frame

Duplex cradle, tubular structure.

#### Wheels

Spoked rims, WM 3/2,15 x 18" front and rear.

#### Tyres

Front and rear ,10 H 18" or 110/90 H 18".

Tyre pressure front:

— solo, or with pillion 2,1 Kp/cm<sup>2</sup>.

Tyre pressure rear:

— solo 2,4 Kp/cm<sup>2</sup>  
— with pillion 2,6 Kp/cm<sup>2</sup>.

The above data are understood for normal riding  
(cruising speed).

If using the motorcycle at constant high speed,  
or con high ways, it is recommended to increase  
pressure by 0,2 Kp/cm<sup>2</sup>.

#### Brakes

##### Front wheel

Twin disc brake, two independent controls with  
hydraulic hoses and double cylinder calipers.  
Controls: right front brake, hand controlled by  
means of the lever joined to the master cylinder  
on the right side of the handlebar.

Left front brake, foot controlled together with  
rear brake.

Disc	∅ mm 300
Cylinder	∅ mm 38
Master cylinder	∅ mm 12,7

(right brake, hand controlled).

##### Rear wheel

Disc brake, foot controlled from the right side  
of the vehicle, hydraulic hose and double cylin-  
der caliper.

Rear brake and left front brake are connected  
throughout hydraulic circuit. Both brakes are ac-  
tuated by same pedal on the right side of the  
vehicle.

Disc  $\varnothing$  mm 242  
 Cylinder  $\varnothing$  mm 38  
 Master cylinder  $\varnothing$  mm 15,875

Max. width m 0,850  
 Max. height m 1,100  
 Min. ground clearance m 0,150  
 Curb weight  
 (without accessories) Kg 261 approx.

**Parking brake**

Mechanical brake, acting on the hydraulic rear wheel brake. The load given by a parked vehicle on its side stand comes to block up the rear braking disc through a lever transmission system.

**PERFORMANCES**

Max. speed, solo riding:  
 Low Km/h 130  
 Drive Km/h 174  
 Fuel consumption lt 6 x 100 Km

**Dimensions and weights**

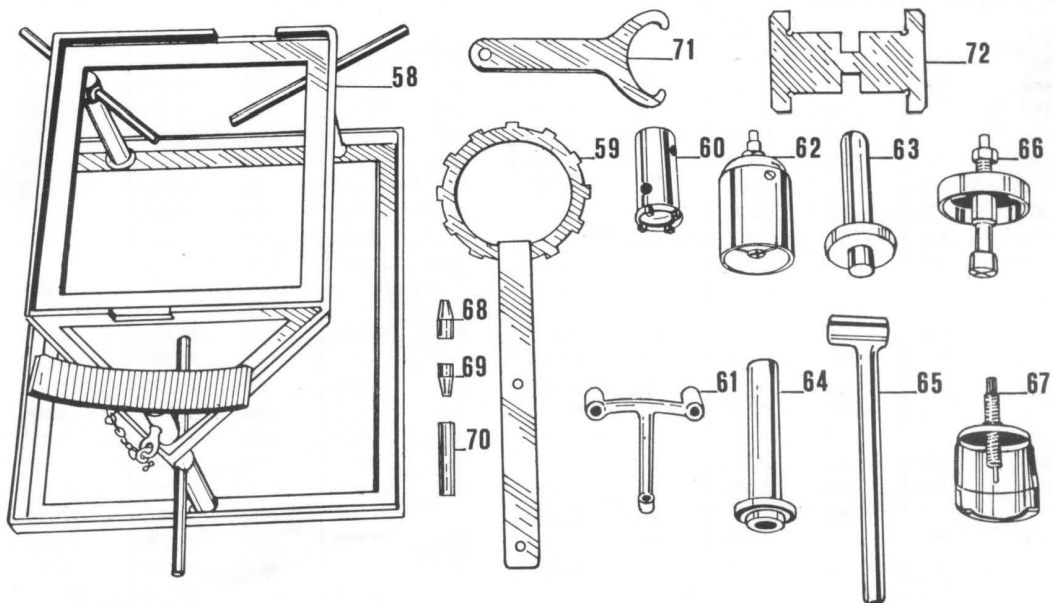
Wheelbase m 1,470  
 Max. length m 2,200

**FUEL AND OIL CAPACITIES**

GROUP OR PART	Q.TIES lt	RECOMMENDED TYPES
Fuel tank	24	Petrol 98/100 NO-RM
Reserve (warned by light)	4	
Engine oil sump	3	Oil Agip Sint 2000 SAE 10 W/50
Gear box	0,600	Oil Agip F. 1 Rotra MP SAE 90
Converter circuit (filling q.ty after eventual overhauling)	1,5 ÷ 1,7	Agip F. 1 ATF Dexron
Rear drive box	0,230	Oil Agip F. 1 Rotra MP SAE 90
	0,020	Oil « Molykote » type « A »
Front fork (each leg)	0,070	Agip F. 1 ATF Dexron
Braking circuits		Fluid Agip F. 1 Brake Fluid SAE J 1703

**SPECIFIC WORKSHOP TOOL**  
(fig. 236)

N. FIG.	N. REF.	DESCRIPTION
58	18 91 24 50	Engine support.
59	18 91 18 50	Tool, holdfast, flywheel and clutch housing.
60	18 92 76 50	Wrench, nut fixing camwheel and pinion ring.
61	18 91 38 50	Dial gauge holder.
62	18 90 69 50	Puller, removal of ball bearing on the gearbox cover.
63	18 92 91 50	Punch, pressing of the seal ring on the gearbox cover.
64	18 92 89 50	Punch, pressing of ball bearing on the gearbox.
65	18 92 71 50	Tool, holdfast, bevel gear shaft on the drive box.
66	18 92 72 50	Puller, removal of cardan joint bearing on the rear swinging fork.
67	18 92 73 50	Puller, removal of spacer and ball bearing on layshaft.
68	18 92 65 00	Tool, fitting of lip gasket on the floater in the master cylinder for right front brake (also for: 750 S 3 - 850 T 3).
69	18 92 66 00	Tool, fitting of thoroid gasket on the floater in the master cylinder for right front brake (also for: 750 S 3 - 850 T 3).
70	18 92 67 00	Tool, fitting of lock ring on master cylinder for right front brake (also for: 750 S 3 - 850 T 3).
71	12 91 27 00	Wrench, adjusting of « Lims » rear suspensions.
72	14 92 69 00	Tool, checking of floater parallelism, VHB carburetors.



## INCHES AND MILLIMETERS CONVERSION CHART

MILLIMETERS TO DECIMAL (Inches) EQUIVALENT																	
mm	=	DECIMAL (Inches)	mm	=	DECIMAL (Inches)	mm	=	DECIMAL (Inches)	mm	=	DECIMAL (Inches)	mm	=	DECIMAL (Inches)	mm	=	DECIMAL (Inches)
1	=	.039	21	=	.827	41	=	1.614	61	=	2.402	81	=	3.189	125	=	4.921
2	=	.079	22	=	.866	42	=	1.654	62	=	2.441	82	=	3.228	150	=	5.906
3	=	.118	23	=	.906	43	=	1.693	63	=	2.480	83	=	3.268	175	=	6.890
4	=	.157	24	=	.945	44	=	1.732	64	=	2.520	84	=	3.307			
5	=	.197	25	=	.984	45	=	1.772	65	=	2.559	85	=	3.346			
6	=	.236	26	=	1.024	46	=	1.811	66	=	2.598	86	=	3.386	200	=	7.874
7	=	.276	27	=	1.063	47	=	1.850	67	=	2.638	87	=	3.425	225	=	8.858
8	=	.315	28	=	1.102	48	=	1.890	68	=	2.677	88	=	3.465	250	=	9.843
9	=	.354	29	=	1.142	49	=	1.929	69	=	2.717	89	=	3.504	275	=	10.827
10	=	.394	30	=	1.181	50	=	1.969	70	=	2.756	90	=	3.543			
11	=	.433	31	=	1.220	51	=	2.008	71	=	2.795	91	=	3.583	300	=	11.811
12	=	.472	32	=	1.260	52	=	2.047	72	=	2.835	92	=	3.622	325	=	12.795
13	=	.512	33	=	1.299	53	=	2.087	73	=	2.874	93	=	3.661	350	=	13.780
14	=	.551	34	=	1.339	54	=	2.126	74	=	2.913	94	=	3.701	375	=	14.764
15	=	.591	35	=	1.378	55	=	2.165	75	=	2.953	95	=	3.740			
16	=	.630	36	=	1.417	56	=	2.205	76	=	2.992	96	=	3.780	400	=	15.748
17	=	.669	37	=	1.457	57	=	2.244	77	=	3.031	97	=	3.819			
18	=	.709	38	=	1.496	58	=	2.283	78	=	3.071	98	=	3.858			
19	=	.748	39	=	1.535	59	=	2.323	79	=	3.110	99	=	3.898			
20	=	.787	40	=	1.575	60	=	2.362	80	=	3.150	100	=	3.937			
DECIMAL (Inches) TO METRIC EQUIVALENT																	
=	mm	DECIMAL (Inches)	=	mm	DECIMAL (Inches)	=	mm	DECIMAL (Inches)	=	mm	DECIMAL (Inches)	=	mm	DECIMAL (Inches)	=	mm	DECIMAL (Inches)
.001	=	.025	.120	=	3.048	.320	=	8.128	.520	=	13.208	.720	=	18.288	.920	=	23.368
.002	=	.051	.130	=	3.302	.330	=	8.382	.530	=	13.462	.730	=	18.542	.930	=	23.622
.003	=	.076	.140	=	3.556	.340	=	8.636	.540	=	13.716	.740	=	18.796	.940	=	23.876
.004	=	.102	.150	=	3.810	.350	=	8.890	.550	=	13.970	.750	=	19.050	.950	=	24.130
.005	=	.127	.160	=	4.064	.360	=	9.144	.560	=	14.224	.760	=	19.304	.960	=	24.384
.006	=	.152	.170	=	4.318	.370	=	9.398	.570	=	14.478	.770	=	19.558	.970	=	24.638
.007	=	.178	.180	=	4.572	.380	=	9.652	.580	=	14.732	.780	=	19.812	.980	=	24.892
.008	=	.203	.190	=	4.826	.390	=	9.906	.590	=	14.986	.790	=	20.066	.990	=	25.146
.009	=	.229	.200	=	5.080	.400	=	10.160	.600	=	15.240	.800	=	20.320			
.010	=	.254	.210	=	5.334	.410	=	10.414	.610	=	15.494	.810	=	20.574	1.000	=	25.400
.020	=	.508	.220	=	5.588	.420	=	10.668	.620	=	15.748	.820	=	20.828	2.000	=	50.800
.030	=	.762	.230	=	5.842	.430	=	10.922	.630	=	16.002	.830	=	21.082	3.000	=	76.200
.040	=	1.016	.240	=	6.096	.440	=	11.176	.640	=	16.256	.840	=	21.336	4.000	=	101.600
.050	=	1.270	.250	=	6.350	.450	=	11.430	.650	=	16.510	.850	=	21.590	5.000	=	127.000
.060	=	1.524	.260	=	6.604	.460	=	11.684	.660	=	16.764	.860	=	21.844	10.000	=	254.000
.070	=	1.778	.270	=	6.858	.470	=	11.938	.670	=	17.018	.870	=	22.098	15.000	=	381.000
.080	=	2.032	.280	=	7.112	.480	=	12.192	.680	=	17.272	.880	=	22.352	20.000	=	508.000
.090	=	2.286	.290	=	7.366	.490	=	12.446	.690	=	17.526	.890	=	22.606	25.000	=	635.000
.100	=	2.540	.300	=	7.620	.500	=	12.700	.700	=	17.780	.900	=	22.860	50.000	=	1,270.000
.110	=	2.794	.310	=	7.874	.510	=	12.954	.710	=	18.034	.910	=	23.114	100.000	=	2,540.000

## INCHES AND MILLIMETERS CONVERSION CHART

FRACTIONS (inches) TO DECIMALS (inches) and METRIC EQUIVALENTS											
FRACTION (Inches)	=	DECIMAL (Inches)	=	mm	FRACTION (Inches)	=	(Inches) DECIMAL	=	mm		
1/16		1/64		.016		5/8			.625		
	1/32		.031	.397			41/64		.641	16.272	
		3/64		.047	1.191		21/32		.656	16.669	
		5/64		.078	1.984			43/64		.672	17.066
	3/32		.094	2.381			11/16		.687	17.463	
		7/64		.109	23/32		.703		17.859		
							47/64		.734	18.653	
1/8				.125	3.175	3/4			.750	19.050	
		9/64		.141	3.572			49/64		.766	19.447
	5/32		.156	3.969			25/32		.781	19.844	
		11/64		.172	4.366			51/64		.797	20.241
	3/16		.188	4.763			13/16		.813	20.638	
		13/64		.203	5.159		53/64		.828	21.034	
		7/32		.219	5.556		27/32		.844	21.431	
		15/64		.234	5.953		55/64		.859	21.828	
1/4				.250	6.350	7/8			.875	22.225	
		17/64		.266	6.747			57/64		.891	22.622
		9/32		.281	7.144			29/32		.906	23.019
	5/16		.297	7.541				59/64		.922	23.416
		19/64		.313	7.938		15/16		.938	23.813	
		21/64		.328	8.334		61/64		.953	24.209	
		11/32		.344	8.731		31/32		.969	24.606	
		23/64		.359	9.128		63/64		.984	25.003	
3/8				.375	9.525	1	1.000		25.400		
		25/64		.391	9.922	2	2.000		50.800		
		13/32		.406	10.319						
		27/64		.422	10.716	3	3.000		76.200		
	7/16		.438	11.113		4	4.000		101.600		
		29/64		.453	11.509						
		15/32		.469	11.906	5	5.000		127.000		
		31/64		.484	12.303						
1/2				.500	12.700	10	10.000		254.000		
		33/64		.516	13.097	15	15.000		381.000		
		17/32		.531	13.494						
		35/64		.547	13.891	20	20.000		508.000		
	9/16		.563	14.288		25	25.000		635.000		
		37/64		.578	14.684						
		19/32		.594	15.081	50	50.000		1270.000		
		39/64		.609	15.478						
						100	100.000		2540.000		

## DISMANTLING, INSPECTION AND RE-FITTING OF VEHICLE PARTS

Removal of the engine unit from the frame:

- set the vehicle on the center stand;
- loosen the screws and remove the windshield group together with connections;
- loosen the screws and remove side bags, side bag housings and rear safety bar;
- lift the saddle, using its proper rod;
- detach the wiring from the level indicator and electro-valve;
- by means of pliers spread the retaining springs, then remove the pipes from the fuel tap and electro-valve;
- unhook the clamp securing the fuel tank (rear side) and slide out the tank from the bushings on the frame (front side);
- loosen the screws securing exhaust pipes to cylinder heads;
- loosen the screws on the clamps securing exhaust pipes and silencers to expansion chamber;
- loosen the screws securing silencers to frame; then remove exhaust pipes and silencers;
- remove the battery covers;
- unhook the bracket and remove the tool box;
- detach the electric wiring, unhook the securing clamps and remove the battery;
- loosen the filter screw from the converter reservoir and drain the liquid from the reservoir itself;
- loosen the screw securing drain pipe to converter cover, then drain the liquid;
- undo the blind nut securing the recovery pipe, remove the pipe from the holder on the converter cover and drain the liquid from the converter radiator;
- detach the parking brake control cable from the lever on the caliper;
- loosen the screws and remove: mechanical and hydraulic caliper from the holder, paying attention to the quantity of shims between the calipers and the caliper holder, then fix the hydraulic caliper to the frame;
- loosen the wheel spindle nut on the drive box side and the screw securing the pin itself to the swing arm; then slide out the wheel spindle from drive box, wheel hub and rear swing arm;
- slide out the caliper holder together with its spacer, paying attention to the position of the spacer itself (the lowered side must face the wheel hub);
- slide out the gear on the wheel hub from the drilled pin on the drive box, shifting the wheel towards the left side of the swing arm;
- lean the vehicle to the right and remove the wheel from the drive box and the rear swing arm;
- undo the nuts securing the rear suspension to the drive box and swing arm;
- loosen the screws on the clamps securing the gaiter covering the cardan joint;
- loosen the nuts on the pivot screws, then the screws securing the swing arm to frame and remove the rear swing arm complete with drive box and u-joint from the layshaft in the gearbox;
- set the block n. 18 91 24 50 (58 in fig. 237) under the engine unit and screw in the three screws in such a way as to lift the engine unit off the ground;
- detach the wires from spark plugs and starter motor; then take off the alternator cover and detach the electric wiring from alternator, parking brake cutout, coils, oil pressure cutout;
- loosen the screws securing the front fender (rear side) and the nuts on the engine mounting bolts;
- detach the speedometer cable from the gearbox housing;
- remove the circlip and connecting pin on the control lever for the integrated braking system. Remove the cotter pin and fixing pin on the gearbox lever;
- remove the engine mounting bolts, then take off the frame cradle arms complete with center and side stands;
- loosen the securing screws and remove the starter motor from the converter cover;
- lift the frame unit, then take off the engine-gearbox unit from the frame (see fig. 238). An assistant will be needed for this operation.

To separate the engine-converter unit from the clutch-gearbox ass.y proceed as follows:

- the engine-gearbox unit has to be placed on the support block in such a way that the gearbox side is upwards, to prevent the converter oil from draining out; then loosen the securing nuts and separate the gearbox ass.y from the engine unit (see fig. 239).

## STRIPPING THE ENGINE UNIT

- drain the converter oil with a syringe (see fig. 240);
- flatten the wings of the securing plates, then loosen the retaining screws and remove the converter and the starter ring gear (see fig. 240/1);
- remove the cylinder head covers, then bring the pistons to T.D.C. (closed valves) and slide out the rocker;
- remove the rocker-push rods assembly, then loosen the nuts and remove rocker holders and cylinder heads;
- remove the alternator from the crankshaft, using the proper Allen key and pin 14906600;
- take off the gaskets between cylinders and cylinder heads, then remove the cylinders and take off the gaskets between cylinders and crankcase;
- using pliers take off the piston pin circlips, then using the special tool 26 90 78 00 (11 in fig. 17) slide out the piston pins.  
Caution: when removing cylinder head, piston and cylinder ass.ies, pay attention to take left and right ass.y well apart;
- flatten the wings of the securing plates, fit the special tool 18 91 18 50 (59 in fig. 241) on the flywheel and remove the flywheel;
- loosen the screws and remove the valve gearing cover; this cover fits the converter feed pump, which is controlled by the camshaft and the valve controlling the pressure of the converter hydraulic circuit;
- loosen the nut securing the oil pump gear, using eye wrench and holdfast tool n. 14 92 73 00;
- loosen the nut securing the camwheel using the tool 14 92 73 00 (20 in fig. 242) and special wrench 18 92 76 50 (60 in fig. 242);
- flatten the washer securing wings and take out the ring using tool 14 92 73 00 (20 in fig. 243) and special wrench 14 92 76 00 (60 in fig. 243);
- remove the valve gear and chain ass.y from the shafts;
- loosen the screws and remove the camshaft securing flange and the camshaft from the holders on the crankcase;
- loosen the screws and remove the oil sump from the crankcase. The oil sump will be complete with filters and oil pressure relief valve;
- loosen the nuts and dismantle the con-rod caps, then remove the conrods through the cylinder holes in the crankcase;
- flatten the wings of securing plates, remove piping and securing screws then remove the flange, from the crankshaft, flywheel side, using the tool 12 91 36 00 (18 in fig. 19);
- dismantle the crankshaft from the flange, valve gearing side;
- flatten the wings of the securing plates, loosen the screws and remove the flange, valve gearing side;
- dismantle the cylindre head, using tool 10 90 72 00 (12 in fig. 16) and proceed as follows;
- set the tool on the upper plate and valve;
- screw in the tool screw to tighten the tool itself; in order to avoid any tool distortion, tap on the tool head, if a strong resistance in screwing is found; this beating will make the two semicones free from the upper plate;
- screw in to remove the two semicones from the upper plate;
- take out the tool, then remove upper plate, outer spring, inner spring bottom plate, shims and finally the valve.



## **CHANGES FOR ENGINE OVERHAULING- ROCKER COVERS - CYLINDER HEADS - VALVES - SPRINGS**

### **RE-FITTING OF HEADS ON CYLINDERS**

Pay attention that the cylinder lubrication hole (arrow « A ») is aligned with both the gasket lubrication hole (arrow « B ») and the head lubrication hole (arrow « C »), fig. 244.

In order not to damage the cylinder head when locking the nuts, it is necessary to follow a crossed sequence (1 - 2 - 3 - 4 - 5 - 6 - fig. 29) and torque to  $4 \div 4,5$  Kgm (approx. 20 pounds). Remember to always replace the gasket between cylinder and head.

## CYLINDERS - PISTONS - PISTON RINGS

### CYLINDERS

#### Cylinder wearing

The cylinder bore should be measured at 3 different heights, turning the dial gauge 90°. The dial gauge has to be previously set to zero on the slip ring (see fig. 245 and Drwg. 246) also make sure that cylinder and piston are matched (A with A, or B with - see the arrow and fig. 248).

#### Selection of cylinder $\emptyset$

CLASS - A -	CLASS - B -
88,000 ÷ 88,009	88,009 ÷ 88,018

• **N.B.** - Cylinders must always be matched with pistons of the same class.

#### Oversize of cylinder $\emptyset$

For spare part purpose, two oversizes are allowed, namely:

- 4/10 oversize  $\emptyset$  = mm 88,400 ÷ 88,418
- 6/10 oversize  $\emptyset$  = mm 88,600 ÷ 88,618.

#### Coupling clearance between piston pin and bushing for con-rod small end (see Drwgs. 246-247 and fig. 249)

1/ $\emptyset$ OF BUSHING AFTER PRESSING IN AND REAMING mm	PISTON PIN $\emptyset$ mm	PIN-BUSHING CLEARANCE mm
22,025 ÷ 22,045	22,000 ÷ 22,004	0,021 ÷ 0,045

#### Coupling clearance between piston pin and piston pin holes

PISTON PIN $\emptyset$ mm	PISTON PIN HOLE $\emptyset$ mm	CLEARANCE
22,000 ÷ 22,004	22,000 ÷ 22,006	From 0,06 to a negative allowance of mm 0,04

### PISTON RINGS

Each piston fits: n. 1 upper ring, n. 1 intermediate ring, n. 1 oil scraper. When fitting, the piston ring end gap has to be out of line with each other ring.

#### Coupling clearance between piston rings and ring slots (see « A » in fig. 250)

Piston rings and oil scaper: mm 0,30 ÷ 0,062.

#### Clearance for piston ring end gap (see « B » in fig. 250)

Upper and intermediate rings: mm 0,30 ÷ 0,45.  
Oil scaper: mm 0,25 ÷ 0,40.

### PISTONS (see Drwg. 246)

#### Selection of piston $\emptyset$

CLASS - A -	CLASS - B -
87,933 ÷ 87,942	87,942 ÷ 87,951

• **N.B.** - Cylinders must always be matched with pistons of the same class.

#### Oversize of piston $\emptyset$

For spare part purpose, two oversizes are allowed, namely:

- 4/10 oversize  $\emptyset$  = 88,351 ÷ 88,333
- 6/10 oversize  $\emptyset$  = 88,551 ÷ 88,533

The measuring for  $\emptyset$  selection has to be done at 22 mm distance from the piston bottom and on a perpendicular plane in respect to the piston pin axis (see fig. 245 and Drwg. 246).

#### Fitting of piston on con-rod small end, using piston pin

Heat the piston in oil bath to a temperature of about 60 °C (140 °F).

This will dilate the hole in the piston and allow easier insertion of the piston pin.

#### Fitting of the piston on the con-rod small end (see fig. 251)

Pay attention that the side stamped (SCA) which is indicated by the arrow « A » in the picture, must face the exhaust duct, when fitting the piston to the con-rod small end.

#### Fitting of cylinder on the crankcase (see fig. 252)

Pay attention that the cylinder lubrication hole « A » is aligned with the lubrication hole « B » of the gasket between cylinder and crankcase. The cylinder hole « C » must then be aligned with the holes « A » and « B » and the lubricating hole « D » of the gasket between cylinder and head must be aligned with the holed « A », « B », « C ».

Also rember to fit the seal rings « E » on the short bolts. Fit first the gasket between crankcase and cylinders.

## CON-RODS - CRANKSHAFT - MAIN BEARINGS, FLYWHEEL AND VALVE GEARING SIDES

### Selection for crankshaft and con-rod

The con-rods « A » - white marked - must be matched with the crankshaft « B » - white marked -; while the con-rods « A » blue marked - must be matched with the crankshaft « B » - blue marked.

### Crankpin $\varnothing$ « A » and « B » class

SELECTION	ORIGINAL $\varnothing$	UNDERSIZE		
		mm 0,254	mm 0,508	mm 0,762
CLASS « A » BLUE MARKED ON SHOULDER FLY- WHEEL SIDE	44,008	43,754	43,500	43,246
	44,014			
CLASS « B » WHITE MARKED ON SHOULDER FLYWHEEL SIDE	44,014	43,766	43,512	43,258
	44,020			

- clearance between crankpin and bearing: Min. 0,030, Max. 0,054;
- coupling clearance between flange with bearing, flywheel side, and crankshaft: mm 0,040  $\div$  0,075;
- coupling clearance between flange with bearing, valve gearing side, and crankshaft: mm 0,028  $\div$  0,060;
- clearance between con-rods and crankshaft shims: mm 0,030  $\div$  0,040.

### Fitting of the flange, valve gearing side, on the crankcase (fig. 255)

Pay attention that the lubrication hole, indicated by the arrow « A » on the flange has to be aligned with the lubrication hole indicated by the arrow « B » on the crankcase.

Lock the screws with the securing wings; after locking, bend the wings on the screw hexagonal arrows.

Fit the chain tensioner, paying attention that the spacers have to be fitted between the crankcase and the chain tensioner; after locking the screws bend the securing wings on the screws. Fit then the crankshaft through the flywheel side on the bushing of the flange, valve gearing side.

### Fitting of the flange with bearings, flywheel side, on crankcase and crankshaft (fig. 257)

Pay attention that the lubrication hole indicated by arrow « A » on the flange is aligned with the lubrication hole indicated by the arrow « B » on the crankcase.

Lock the screws, then bend the screw wings.

### Fitting of con-rods on the crankshaft (fig. 256)

Pay attention to the position of the lubrication holes, indicated by the arrows « A »:

- con-rod for right cylinder; hole downwards;
  - con-rod for left cylinder; hole upwards.
- The milled surfaces of con-rod and con-rod cap must coincide (see fig. 257).

### Fitting of the flywheel on the crankshaft

Pay attention that the reference mark indicated by the arrow « A » on the crankshaft is aligned with the reference mark indicated by the arrow « B » on the outer flywheel (fig. 258).

Fit tool 18 91 50 50 on the flywheel (59 in fig. 259) and torque the bolts to about 4,2 Kp/m (10 pounds) then bend over the screw wings.

## VALVE GEARING

### TIMING DATA (fig. 260)

Referred to the clearance of 0,5 mm between rocker and valve.

#### Inlet:

- opens 20° before T.D.C.
- closes 52° after B.D.C.

#### Exhaust:

- opens 52° before B.D.C.
- closes 20° after T.D.C.
- Working clearance between rocker and valve, cold engine, mm 0,22.

### ∅ of camshaft holders and holder seats on the crankcase:

	∅ CAMSHAFT HOLDER mm	∅ HOLDER SEAT mm	COUPLING CLEARANCE mm
Valve gearing side	47,000	47,025	0,025 ÷ 0,066
	46,984	47,050	
Flywheel side	32,000	32,025	
	31,984	32,050	

### Coupling data for tappets and tappet seat on the crankcase:

	∅ TAPPET SEAT mm	∅ OUTER TAPPET mm	COUPLING CLEARANCE mm
Original ∅	22,021 ÷ 22,000	21,996 ÷ 21,978	0,004 ÷ 0,043
Oversize ∅	0,05	22,071 ÷ 22,050	
	0,10	22,121 ÷ 22,100	

### FITTING OF CAMSHAFT AND GEARING WITH CHAIN

After fitting the oil pump and the chain tensioner ass.y proceed as follows:

- fit the camshaft « A » in fig. 261 onto the seats in the crankcase and secure the shaft to the crankcase, using flange « B » in fig. 261 and screws with toother washers « C » in fig. 261;
- fit the gear ass.y with chain « D » in fig. 261 on the gears of camshaft, crankshaft, and oil pump shaft (this group has already been mounted previously) paying attention to the alignment of the reference marks « E » in fig. 261 on the gears (camwheel and engine pinion) thus indicating the valve operation is correctly timed; then fit the stop pin « F » in fig. 261 into the camshaft hole « H » in fig. 261; also pay attention to the key seat on the engine pinion « I » in fig. 261;
- lock the nut with spring washer « M » fig. 261 securing the camwheel on the camshaft using tool n. 14 92 73 00 (20 in fig. 262) and special wrench 18 92 76 50 (60 in fig. 262);

- lock the ring with washer « M » fig. 261 securing the engine pinion on the crankshaft, using tool 14 92 73 00 (20 in fig. 263) and special wrench 14 92 76 00 (60 in fig. 263); flatten one washer wing into a ring hollow;
- lock the nut with washer « N » fig. 261 securing the control gear on the oil pump shaft, using tool 14 92 73 00 and special eye wrench, remember to set the key « O » fig. 261 onto the shaft itself.

After this fitting, check again the alignment of the two reference marks on the gears (camwheel and engine pinion) « A » fig. 264, then fit tappets « Q » into the seats « P » on the crankcase (see fig. 261).

### CHECKING THE VALVE TIMING WITH ENGINE ON VEHICLE

- Remove the spark plugs from the cylinder heads;
- loosen the screws and remove the rocker covers;

- set clearance between rocker and valve to mm 1,5;
- loosen the screws and take off the flywheel cover;
- remove the rubber cap from the inspection hole on the right side of the converter cover;
- using a proper tool, rotate the alternator until the right hand piston is at T.D.C. (closed valves); looking through the inspection hole, the letter «D» must be seen at the middle of the mark on the hole rim;
- fit the tool with arrow 12 92 75 00 (26 in fig. 265) onto the valve gearing cover and lock it by means of the screw;
- loosen the screw securing alternator to crankshaft and fit the degree wheel 14927400 25 in fig. 265) on the alternator itself; after pointing the mark P.M.S. (T.D.C.) with the point of the checking tool, secure the disc-

alternator group to the crankcase by means of the alternator screw;

- looking through the inspection hole, ensure that the letter «D» of the wheel is still at the middle of the mark on the hole rim;
- rotate the alternator with the degree wheel 128° clockwise, starting from the P.M.S. (T.D.C.) mark which is aligned with the point of the checking tool.

At this stage, under normal conditions, the exhaust valve of the right cylinder must start opening. After checking everything is normal, re-set the rocker-valve clearance to 0,22 mm then fit rocker covers and rubber cap on the inspection hole; remove the checking tool from the valve gearing cover and the degree wheel from the alternator. Lock the alternator securing screw and re-fit the alternator cover on the valve gearing cover. Re-fit the spark plugs onto the cylinder heads.

## ENGINE LUBRICATION

### DESCRIPTION

This type of engine fits an oil filter which, in addition to a wire gauze, filter «D» is also provided with a filter cartridge «A» fig. 266 This ensures an almost integral filtering before the oil passes in the pump and lubricating channels.

### OIL SUMP (fig. 266)

The oil sump «C» fits:  
«A» filter cartridge, replaceable;  
«B» magnetic oil drain plug;  
«D» wire gauze filter;  
«E» oil pressure relief valve.

### FILTER CARTRIDGE, REPLACEABLE (fig. 266)

The filter cartridge «A» has to be replaced every 15.000 Km (9,000 miles) (five oil changes) by proceeding as follows:

- undo the drain plug «B» with aluminium washer as well as the plug «F» with aluminium washer on the crankcase and let the oil drain into a basin, which has been previously set under the sump «C»;
- loosen the screws securing the sump to the crankcase and remove the complete sump «C»;
- take off the cartridge «A» the wire gauze «D» and the oil pressure relief valve;
- wash the sump «C» in gasoline and blow it out with compressed air;
- wash the wire gauze filter in gasoline and blow it out with compressed air;
- using a pressure gauge check if the oil pressure relief valve «E» operates at the specified rate of  $Kp/cm^2$   $3,8 \div 4,2$  (55 - 60 p.s.i.) otherwise see the paragraph «Oil pressure relief valve».

Fit all the components onto the oil sump, replace the gasket between sump and crankcase, then secure the sump to the crankcase by means of its securing screws.

Now fill the crankcase with 3 lt (approx. 3 quarts) oil «AGIP SINT 2000 SAE 10 W/50» or equivalent.

Ensure that the oil level is at the max. mark on the oil filler dipstick; then re-fit the dipstick.

### WIRE GAUZE FILTER (fig. 266)

The wire gauze filter «D» is secured to the sump «C» by means of a bolt with a securing plate; when replacing the filter cartridge «A», it is advisable to take off the wire gauze filter too and to wash it in gasoline and blow it out with compressed air.

### OIL PRESSURE RELIEF VALVE (fig. 266)

The oil pressure relief valve «E» is screwed on the oil sump «C».

It is calibrated for allowing a pressure of  $Kp/cm^2$   $3,8 \div 4,2$  (55 - 60 p.s.i.) in the oil delivery circuit. In case of higher pressure, this valve opens,

thus adjusting the pressure to the specified limits.

If, because of any reason, the valve opens before the running pressure is reached, it is necessary to take off the valve and put one or more shims upon the spring «G» until, according to a pressure gauge reading, the valve opens at the specified pressure.

### CHECKING OF OIL LEVEL (fig. 267)

Every 500 Km (300 miles) check the oil level in the crankcase (it must be nearly at the max. mark stamped on the cap filter dipstick «A»). In case of lower level, fill with the proper oil. Check oil level after engine has run for a few minutes and fully screw the cap filler dipstick «A».

Oil to be used: «AGIP SINT 2000 SAE 10 W/50» or equivalent.

### CHECKING THE OIL PRESSURE WITH ENGINE ON VEHICLE

- Detach the electric wiring from the oil pressure solenoid, which is located on the left front side of the crankcase;
- remove the solenoid;
- connect the pressure gauge pipe to the solenoid hole in the crankcase;
- start the engine and check if the running pressure is  $Kp/cm^2$   $3,8 \div 4,2$  (55 - 60 p.s.i.). For more accurate checking, it is advisable to attach the pressure gauge to the front right safety bar and to ride for at least 5 miles at different speeds ensuring that the gauge reading is still  $Kp/cm^2$   $3,8 \div 4,2$  (55 - 60 p.s.i.). If everything is normal, remove the pressure gauge pipe, re-fit the solenoid and connect the electric wiring.

### CHECKING OIL LEAKAGE IN THE CRANKCASE

If some engine oil leaks from the relief tube which is located under the converter box, it is necessary to check the following:

- ensure that the seal ring on the flange, flywheel side, is not worn; in case of wear check that the crankshaft surface which contacts this seal is perfectly smooth;
- ensure that the crankcase does not show any casting flaws. Set the engine on a bench, the flywheel side upwards (see fig. 122). First remove converter and flywheel from the crankshaft. Fill with water and blow compressed air at about 4  $Kp/cm^2$  (55 p.s.i.) through the bleather tube («A» in fig. 122).

Casting flaw, if any, will be evidenced by small bubbles in the water. Close the casting flaws with latex or special sealers (Araldite or Devcon);

- ensure that the bands securing the rubber tubes of the engine breather are well tightened; otherwise it is possible that the oil flows between rubber and metal tubes and from there between converter box and engine;
- ensure that the two lower bolts securing the flange, flywheel side, to the crankcase

- are dry; if they are wet with oil, put some « Teflon » tape on the bolt thread;
- ensure that the lower stud bolt securing the converter box to the engine, left side, is not wet with oil at the point where the reference bushing is located; if wet, put some « Teflon » tape on the stud bolt thread.

## CARBURETION

### CARBURETTORS (see fig. 268)

N. 2 Dell'Orto: VHB 30 CD (right), VHB 30 CS (left).

### CONTROLS

- throttle control, on the right side of the handlebar;
- control lever for starting a **cold engine** "Starter" on the rocker cover for left cylinder.

This lever controls the starters of both carburetors at the same time:

- « A » starting position, for a cold engine;
- « B » riding position.

**Note** - ensure that there is mm 3 clearance between the control cable ends and the adjuster screws « H » for both carburetors, when the lever is in position « B ».

### STANDARD CARBURETTOR SETTING

Throttle	∅ mm 30
Choke	40
Atomizer	265
Main jet	130
Idling jet	50
Starting jet	80
Needle	U 9 (2nd notch)
Floater	gr 10
Idling screw opening (fuel)	1 1/2 turns.

### FLOATER LEVELLING (see fig. 268/1)

To level the floaters in carburetors proceed as follows:

- 1 loosen the screws securing the bottom chamber to the carburettor body and take out the chamber itself;
- 2 turn the carburettor upside down (without bottom chamber) so that the needle on the floater body closes the petrol flow in;
- 3 place the tool 14 92 69 00 (72 in fig. 236) on the plane of the carburettor body (where the bottom chamber is screwed to) and make sure that the two floaters lightly touch the tool inside.

Otherwise adjust either the floater pin or the floaters themselves (paying attention that these are very brittle parts) until the floaters are properly aligned with the tool. The clearance between the carburettor body plane and the floater upper side has to be:  
— mm 23,5 (for carburetors having 10 gr floaters);  
— mm 24,5 (for carburetors having 14 gr floaters).

### ADJUSTING THE CARBURETION AND THE IDLING SPEED (HAND ADJUSTMENT) (fig. 268)

Proceed as follows:

- 1 warm the engine to its normal running temperature;

- 2 fully screw in the screws « E » idling adjuster, then unscrew them one turn and a half;
- 3 check with your hands if the exhaust pipe pressures are equal.  
If necessary turn screw « D » of a carburettor until the pressure is the same. (Idling speed should be kept at about  $900 \div 1000$  rpm; as a consequence it will be necessary to screw in the screw of the carburettor for the cylinder giving a lower exhaust pressure, or to screw out the screw of the carburettor for the cylinder giving a higher exhaust pressure);
- 4 turn screws « E » to get the best carburetion for each cylinder (it is realized by an increase of rpm) and adjust idling speed according to point 3;
- 5 detach one spark plug lead at a time and check that the engine in both cases stops after firing 5-6 strokes. If this does not occur screw out screw « D » of the carburettor marking the engine fire more than 5-6 strokes, or — if this is the case — screw in the screw « D » of the carburettor making the engine fire less than 5-6 strokes;
- 6 adjust idling speed to  $900 \div 1000$  rpm by screwing or unscrewing both screws « D » by the same amount;
- 7 with throttle control grip closed, check that there is a clearance of  $1 \div 1,5$  mm between cable ends and adjuster screws « F » of both carburetors;
- 8 ensure that the throttles open simultaneously by proceeding as follows:  
— gradually turn the throttle control grip and check that the exhaust pipe pressure increases in synchronization, using both hands (an assistant will be needed for this operation).

If the pressure increase of one cylinder is advanced, adjust its carburettor by gradually screwing in adjuster « F », after loosening counter-nut « G », until the synchronization of both exhaust pipes pressure is reached.

### ADJUSTING THE CARBURETION BY MEANS OF A VACUUM GAUGE (fig. 269)

- 1 using screw « A » adjust the fuel flow: by unscrewing is the fuel flow increased, by screwing is the fuel flow decreased.  
To adjust, fully screw in then unscrew one turn and a half;
- 2 remove the hole caps from the inlet tubes and connect the "Vacuum gauge" pipes « F » to the holes « E »;
- 3 adjust idling speed by means of throttle adjusters (to be done on a warm engine); start the engine with throttle control grip closed ( $900 \div 1000$  rpm) and turn throttle adjusters « B » until the two mercury columns of the "Vacuum gauge" « F » are aligned;



- 4 adjust the position of the fuel flow adjusting screws «A» to reach the highest possible idling speed, then re-check the position of the two mercury columns of the "Vacuum gauge". repeat eventually the adjustment according to point 3;
- 5 Synchronization of carburetors:
  - idling speed adjusted, synchronize the carburetors by proceeding as follows:
    - start the engine and gradually open the throttle control grip, checking that the two mercury columns of the "Vacuum gauge" «F» are aligned, otherwise turn the adjusters of control cables «C» (loosen first the counter-nuts) until the alignment is reached;
    - ensure now that the two cables have an idle travel of  $1 \div 1,5$  mm at the screw connections;
    - remove then the pipes from the holes «E» and re-fit the screws with their washers;
    - also check that the two control cables for the "Starters" have an idle travel of mm 3 at the adjuster screw connections.

#### **AIR FILTER CARTRIDGE REPLACEMENT ON ASSEMBLED VEHICLES (fig. 270)**

Every 10.000 Km (6000 miles) replace the air

filter cartridge «C»; it is housed in a box together with the oil breather ass'y, under the fuel tank.

To remove the air filter cartridge «C» from the housing «A» proceed as follows:

- lift the saddle and secure it with the proper rod;
  - remove the tool box, unhooking the bracket;
- unhook the fuel tank holder, rear side, and remove the fuel tank itself (first close the taps and detach the pipes);
- detach the electric wiring from the battery, unhook the battery brackets and remove the battery;
- unhook the springs securing the brackets «E», slide out the rubber sleeve «F» from carburetors and breather;
- unhook the breather «G» with pipes «I» from the holders «H», then undo the securing nut «B» and remove the filter «C» with bottom «D». Paying attention to: reference notch and assembling positioning.

Replace the filter «C» with a new one and re-fit the components reversing the dismantling sequence.

## CONVERTER

### CONVERTER

The hydraulic converter "SACHS" allows the motorcycle to gradually start without any clutching.

Max. converting ratio: 1,60 : 1.

### CONVERTER OIL CIRCUIT (fig. 271)

#### Description

The oil is circulated by the pump « C », on the valve gearing cover, through the pipe « B » from the reservoir « A » and is then delivered to the converter through the pipe « D ».

The oil then goes to the radiator « F », through the pipe « E », and from the radiator « F » to the reservoir « A » through the pipe « G ».

A drain pipe « I » delivers the oil to the reservoir « A » from the converter cover « H ». The reservoir also includes a breathing tube « L ».

### INSPECTION AND CHECKING

#### Converter oil piping

Check the condition of all pipes and inspect them.

If damaged or leaking, replace them. Remove the pipes and wash in gasoline, blow with compressed air to dry.

#### Oil converter radiator

Inspect the radiator and if leaking replace it. If the reservoir is not damaged, blow it out with compressed air.

#### Converter reservoir filter

Ensure that the filter gauze is not damaged, otherwise replace the filter. Wash the filter in gasoline and blow it with compressed air for blowing.

#### Converter oil reservoir

Remove and wash in gasoline, dry with compressed air.

### CONVERTER LUBRICATION (fig. 271)

#### Checking the oil level

Every 500 Km (300 miles) check the oil level in the reservoir. This level must never be over the (MAX) or under the (MIN) marks, stamped on the inspection cap dipstick « M ».

For filling use only the recommended lubricant, paying attention that the necessary quantity to bring the level from (MIN) to (MAX) is about 1 0,250 (Approx 8 ounces).

The inspection cap is to be fully screwed in. Recommended lubricant: AGIP F. 1 ATF Dexron or equivalent.

### Replacing the oil in the converter hydraulic circuit (fig. 271)

Every 30.000 Km (18000 miles) it is necessary to replace the oil in the hydraulic circuit by proceeding as follows:

- unscrew the filler cap « M » on the reservoir;
- remove the filter « N » from the reservoir;
- loosen the connection « O » on the gearbox housing.

Drain the oil from reservoir and radiator, wash the filter « N » in gasoline and blow it with compressed air; re-fit by reversing the removal sequence. Pay attention to the fact that the converter oil will never be fully drained.

Refill with new oil (about 1,5 lt) (approx. 1 1/2 quarts) in the reservoir and proceed according to the following paragraph.

### Filling the converter hydraulic circuit (after eventual overhauling)

If, when overhauling, the converter, the pipes and the reservoir have been fully drained, reservoir filling and level checking will have to be done according to the following procedure:

- set the motorcycle on the center stand, in level position, and fill up the reservoir until (MAX) mark. (1,7 lt about) (approx. 1 1/2 quarts);
- start the engine and let it idle for a few minutes, ensuring that there is still oil in the reservoir, add oil if necessary;
- stop the engine and check the oil level according paragraph "Converter lubrication checking the oil level".

### Converter oil pump (fig. 272)

The converter oil pump is located on the valve gearing cover and directly controlled by the camshaft.

The pump consists of:

- outer rotor « A »;
- inner rotor « B »;
- rotor control pin « C »;
- pump control shaft « D »;
- pump control intermediate shaft « E »;
- pump body « F » with OR and seal ring « G », seeger ring « I » or plate « L » and screws securing the pump body to the cover « M ».

### INSPECTION AND CHECKING (fig. 273)

- **valve gearing cover:** check the condition of the converter pump seat; it must not be damaged or scored in any way.  
Ø of converter pump seat: mm 40,650 ÷ 40,675;
- **outer rotor:** check the inner and outer profiles for damage or scoring:  
outer Ø: mm 40,570 ÷ 40,540;  
thick.: mm 9,025 ÷ 9,010;

outer profile: mm 35,895 ÷ 35,870;  
 inner profile: mm 24,230 ÷ 24,205;  
 eccentricity between  
 inner profile and outer: mm 0,05 max.;  
 flank plane in respect  
 to axis: mm 0,030 max.  
 according to dial gauge reading;

- **inner rotor:** check trueness of inner and outer profiles;  
 ∅ outer profile: mm 29,770 ÷ 29,745;  
 ∅ inner profile: mm 11,018 ÷ 11,000;  
 length of the control pin hollow: mm 15,150 ÷ 15,000;  
 rotor thick.: mm 9,025 ÷ 9,010;  
 eccentricity between hole and outer profile: mm 0,050 max.;  
 flank plane in respect to axis: mm 0,030 max.  
 according to dial gauge reading;
- **control shaft:** check trueness of the same; outer ∅ for pump body:  
 body: mm 14,000 ÷ 13,973;  
 ∅ for inner rotor: mm 10,984 ÷ 10,966;  
 length: mm 34,780 ÷ 34,760;
- **control pin on the shaft:**  
 length: mm 14,500 ÷ 14,650;
- **intermediate shaft:**  
 max. length: mm 31,600 ÷ 31,400;
- **oil pump body:** check the trueness of the side entering the seat on the valve gearing cover:  
 ∅ for the side entering the seat on the valve gearing cover: mm 40,625 ÷ 40,586;  
 inner ∅: mm 14,018 ÷ 14,000;  
 thick. for the side entering the seat on the valve gearing cover: mm 19,960 ÷ 19,908;
- **coupling clearances:**  
 between seat on the valve gearing cover and pump body: mm 0,050 ÷ 0,064;  
 between hole on the pump body and control shaft: mm 0,000 ÷ 0,045;  
 between inner rotor hole and pump control shaft: mm 0,016 ÷ 0,052;  
 between inner rotor hollow and control pin: mm 0,500

#### CONVERTER OIL PRESSURE RELIEF VALVE (fig. 272)

This valve is located on the valve gearing cover and consists of the following:

- valve cap « N »;
- cap gasket « O »;
- pressure adjuster bottom « P »;
- valve spring « Q »;
- valve balls « R ».

The valve is calibrated to allow a running pressure of 1,8 ÷ 2 Kg/cm<sup>2</sup> (25-29 P.S.I.). If the pressure is higher, the valve opens adjusting the pressure to specified limits. Should the valve not open at the running pressure, take out one pressure adjuster bottom « P » and re-check until the valve opens at proper pressure rates.

#### FITTING THE CONVERTER OIL PUMP OR PRESSURE RELIEF VALVE ON THE VALVE GEARING COVER (fig. 272)

First pay attention that, when mounting the pump onto the valve gearing cover, the two rotors show the reference mark « 1 » outwards and the oil passage hollows « 2 » of the pump body are aligned with the cover hollows, the pin « C » on the rotor shaft « D » fits well into the hollow of the inner rotor « B » and the seal ring « OR » between pump body and cover « G » is not damaged, the seal ring on the pump body « H » shows no profile damage; the seeger « I » (for vehicles mounting this ring) is not damaged. If vehicles mount the plate « L », check plate smoothness and adhesion to the inner surface of the pump body « F ». Check also the trueness of the intermediate shaft ends « E ».

After fitting, tighten the screws in crossed sequence.

When mounting the oil pressure relief valve check the trueness of the spring (a new spring has a free length of mm 38 ± 0,35, while under compression of about Kg 2,5 ± 0,125 or 5 pounds, it has a length of mm 19,5). Also check trueness of the ball and the flat aluminium washer, then lock the cap.

To ensure that the valve opens at the running pressure of Kp/cm<sup>2</sup> 1,8 ÷ 2 (25-30 p.s.i.), it is necessary to fit a pressure gauge onto one of the cover holes, while compressed air is blown onto the other.

#### FITTING THE CONVERTER AND THE STARTING RING GEAR ON THE FLYWHEEL

To fit the converter and the starting ring gear on the flywheel, proceed as follows:

- set the ring gear, aligning ring gear with flywheel holes;
- set the converter and screw in the four screws with plates securing ring gear and converter to the flywheel, tighten slightly;
- on the crankcase stud bolts fit first the gauge holder 18 91 38 50 (61 in fig. 273/1) then fit the gauge « A » on the holder;
- rotate the converter slowly, paying attention that the gauge indicator does not move more than 0,05 ÷ 0,06 mm;
- if the indicator displacement is larger, take out the converter and turn it one or two turns, until the displacement of the indicator is within the specified limits;
- at this stage remove the dial gauge and the holding block from the crankcase;
- fit tool 12 91 18 01 (21 in fig. 274) on the stud bolts, after setting two bushings under the tool, for aligning the bolts with the ring teeth;
- tighten the screws in crossed sequence, then bend the screw wings and remove the tool with the bushings.

If the engine-converter ass.y is not immediately fitted on the clutch-gearbox ass.y it is advisable to cover the oil input hole on the converter, using a proper cap, to prevent foreign materials from entering the oil circuit.

## CLUTCH-GEARBOX ASS.Y

### CLUTCH

Dry type, multiplate. Hand controlled by lever on the left side of the handlebar.

### PRIMARY DRIVE BY GEARS

Ratio: 1 : 1,57 (Z = 19/22).

### GEARBOX

Two speed, foot operated from the left side of the vehicle (see fig. 274/1).

Ratio:

1st. speed (Low)

(Z = 18/24) = 1 : 1,33 (Toe down);

2nd. speed (Drive)

(Z = 22/22) = 1 : 1 (Heel down).

### REMOVAL OF THE CONVERTER COVER FROM THE GEARBOX HOUSING (fig. 275)

Loosen the screw « A » which secures the pipe « B » at the bottom of the converter cover, then undo the screws securing the cover to the gearbox housing « C » and remove the converter cover, complete with clutch inner body « D », from the gearbox housing « E ».

### REMOVAL OF THE CLUTCH INNER BODY FROM THE CONVERTER COVER (fig. 276-277)

Rotate the clutch inner body quite slowly, thus making possible an access in sequence to the various screws through the static body hole (see the arrow « A » in fig. 276); loosen the screws using the proper wrench. Then slide out the clutch body « B » from the cover « A ». From the body shaft remove: the seal ring « C » (OR type) the seeger ring « D », using proper pliers, the bearing « E » and the flange « F » complete with retaining ring.

Remove the oil passages « G » and the flanged shaft « H » from the cover « A », then take off the seal rings « I » and « L » (OR type) in fig. 274 from the flanged shaft.

### INSPECTION AND OVERHAULING OF VARIOUS COMPONENTS (fig. 277)

- check the trueness of the hole « A » on the cover, where the flanged shaft « H » is fitted; no damage or scores;
- check the trueness of flanged shaft « H » surface contacting the cover « A » and ensure that the shaft tang entering the converter is quite smooth;
- check the trueness of the seal rings « I » - « L » - « C » and « F » (on the flange);
- check the trueness of the clutch body « B » and the body shaft tang teeth.

### COUPLING DATA COVER/FLANGED SHAFT - FLANGED SHAFT/CONVERTER (fig. 278)

#### Converter housing

- $\varnothing$  of flanged shaft seat: mm 60,000  $\div$  60,030.

#### Flanged shaft

- $\varnothing$  of the shaft side entering the converter housing: mm 59,990  $\div$  59,971;
- $\varnothing$  of the shaft side entering the converter: mm 27,700  $\div$  27,679;
- $\varnothing$  of bushing seat: mm 22,000  $\div$  22,021.

#### Bushing for flanged shaft

- outer  $\varnothing$ : mm 21,972  $\div$  21,942;
- inner  $\varnothing$ : mm 18,000  $\div$  18,018.

#### Shaft with clutch plate holder

- $\varnothing$  of side entering the flanged shaft bushing: mm 17,994  $\div$  17,983.

#### Crankshaft

- $\varnothing$  of the hole on the shaft hub, flywheel side, where the converter pin enters: mm 13,000  $\div$  13,027.

#### Converter

- $\varnothing$  of the flanged shaft seat: mm 27,770  $\div$  27,783;
- $\varnothing$  of the converter pin which enters the seat on the crankshaft: mm 12,985  $\div$  12,957.

#### Coupling clearances

- between converter cover  $\varnothing$  and flanged shaft: mm 0,010  $\div$  0,059;
- between seat  $\varnothing$  on the converter and flanged shaft side entering the seat: mm 0,070  $\div$  0,104;
- between bushing seat  $\varnothing$  and bushing outer  $\varnothing$ : mm 0,058  $\div$  0,149;
- between bushing inner  $\varnothing$  and  $\varnothing$  of the shaft with clutch plate holder: mm 0,006  $\div$  0,035;
- between converter pin and hole on the crankshaft: mm 0,016  $\div$  0,043.

### FITTING OF THE FLANGED SHAFT AND SHAFT WITH CLUTCH PLATE HOLDER ON THE CONVERTER HOUSING (fig. 277)

In fitting the flanged shaft « H » on the housing « A » pay attention to following alignments: holes « M » on the shaft with holes « N » on the housing; hole « O » on the flanged shaft with hole « P » on the housing.

First check trueness, then fit the seal ring « L » (OR type) between housing and shaft; then fit the flanged shaft « H », and the seal ring « I » (OR type). Now fit the flanged shaft, already complete with: flange, seal ring « F », bearing « E », seeger ring sealing for bearing and flange, on the shaft « D » and seal ring « C » (OR type). Rotate the shaft to ensure the alignment between flanged shaft hole and housing threaded hole (through the gear hole) and screw in the screws according to the access sequence. Remember to re-fit the oil passages « G » and the pipe « Q », onto the housing, using the proper screw.

#### **REMOVAL OF THE CLUTCH ASS.Y FROM THE GEARBOX HOUSING**

Take off the ring securing the clutch ass.y to its housing, using the special tool (« A » in fig. 279 - 55 90 04 00) and screw in the pressure plate rod until the plates are free in the housing. At this stage remove the ring securing the plates, using screw drive « B » (fig. 279) then slide out (fig. 280) externally toothed plates « B »; loosen counternut « C », adjuster nut « D » and take off the rod « E » with bushing « F » and bearing « G », the spring pusher « H » with springs « I » and shims « L »; first take out the circlip « N », then remove the pin « M », the lever « O » with cap « P » and the lever return spring « Q ».

#### **REMOVAL OF THE CLUTCH HOUSING**

To remove the clutch housing from the shaft, fit tool 18 91 18 50 (59 in fig. 281) on the housing and using tool n. 14 92 76 00 (30 in fig. 281) undo the nut securing the housing to the shaft, then slide out the housing with the seal ring (OR type).

#### **REMOVAL OF THE GEARBOX HOUSING COVER** (fig. 282)

First drain the oil, take off the bottom « A », the element « B », the spacer « C », the seal ring « D » (OR ring), the drain plug with the aluminium washer « E », the cap with washer spring and gear stop pin « F »; then loosen the screws « G » and take off the cover « H » and the gasket « I ».

#### **REMOVAL OF BEARINGS FROM THE GEARBOX HOUSING COVER**

- using puller 18 90 65 50, remove the ball bearing (62 in fig. 283);
- if the ball bearing is locked on the shaft (due to the spacer), use puller 18 92 73 50 (67 in fig. 285) to remove bearing and spacer for layshaft;
- using puller 14-91 31 00 (39 in fig. 284) remove the roller bearings.

#### **RE-FITTING OF BEARINGS ON THE GEARBOX HOUSING COVER**

- press the roller bearings on the cover, using punch 14 92 92 00 (41 in fig. 286);

- press the ball bearing on the cover, using punch 18 92 89 50 (64 in fig. 287);
- press the ball bearing seal ring on the cover, using punch 18 92 91 50 (63 in fig. 288).

#### **REMOVAL OF SHAFTS, GEAR, SLEEVE, FORK AND FORK CONTROL SHAFT ON THE GEARBOX HOUSING** (fig. 289-290)

Remove the spacer ring « A », the gear on the layshaft « B », the main shaft « C », the clutch shaft « D » (if some resistance is found in removing the clutch shaft, using a leather mallet tap from outside to inside).

First loosen the securing screw on the fork « F », then remove the fork control shaft « E ». Remove the fork « G » from the sleeve, the sleeve « H » from the layshaft, then the layshaft « I » from its seat on the gearbox housing, finally remove the low speed gear « L ».

#### **REMOVAL OF BEARINGS FROM THE GEARBOX HOUSING**

Using puller 12 91 37 00 (40 in fig. 291), remove the bearing for clutch, main and layshafts. First flatten the wings of the securing plates, then loosen the screws and remove the piece securing bearing to gearbox housing.

#### **RE-FITTING OF BEARINGS AND SECURING RING ON THE GEARBOX HOUSING**

To re-fit the bearings on the gearbox housing use the special tool 14 92 89 00 (43 in fig. 292). Fit the clutch shaft bearing, set the securing piece and lock the screws with securing plates; then bend the plate wings on the screws. Now press the clutch shaft securing ring, using punch 14 92 94 00 (47 in fig. 293).

#### **RE-FITTING OF SHAFTS, SLEEVES, FORK WITH CONTROL SHAFT, AND GEARS ON THE GEARBOX HOUSING**

Before fitting the layshaft « A » on the gearbox housing, fit the low speed gear « B » and the shim « C » with the bevelled side facing the gear on the shaft itself (see fig. 294).

Then fit the clutch shaft « D » in fig. 289, the main shaft « C » in fig. 289, the sleeve « H » in fig. 289 on the layshaft; the fork « G » fig. 289 on the sleeve « H » in fig. 289; the control shaft « E » in fig. 289 (with lever in horizontal position) on the fork; then secure the shaft to the fork, using the screws « F » in fig. 289, the drive speed « B » and the shim « A ».

Then fit the throwout bearing « A » in fig. 295 and one or more shims « B » in fig. 295. Clearance between shim and bearing on gearbox housing cover: mm 0,15 ÷ 0,20.

#### **RE-FITTING OF THE GEARBOX HOUSING COVER ON THE GEARBOX HOUSING** (fig. 282)

Fit a new gasket « I » between housing and cover, then fit the cover « H » and secure it to the housing with screws « G », screwing in crossed sequence; then fit the gear stop pin and the spring and lock the securing cap with aluminium washer « F » onto the gearbox housing cover.

Finally, fit the seal ring «A» in fig. 296 (OR type), the spacer «B» in fig. 296 (it must not rotate freely on the shaft) the seeger ring, spacer stop, «C» in fig. 296 onto the layshaft, pay attention that the seal ring «C» is properly seated on the layshaft, then fit the piece «D» in fig. 296 and bottom «E» in fig. 296.

#### RE-FITTING OF THE CLUTCH HOUSING

Before re-fitting the clutch housing «M» in fig. 282, remember to fit the seal ring «L» (OR type) fig. 282 on the shaft and screw in the nut «N» in fig. 282.

To lock this nut use tool 18 91 18 50 (59 in fig. 297) and special tool 14 92 76 00 (30 in fig. 297).

#### RE-FITTING OF THE CLUTCH ASS.Y

Fit the springs «A» in fig. 298 into their seats on the clutch housing, the shims «B» in fig. 298 on their seats on the spring pusher plate (pay attention that these shims do not fall down when fitting the spring pusher plate «C» fig. 298 onto the clutch housing; it will be useful to slightly grease them before entering their seats on the clutch housing).

Fit the bearing «A» in fig. 299, the bushing «B» in fig. 299, the clutch rod «C» in fig. 299 into the seat on the spring pusher plate, then screw in the nut on the rod, cover side, to sufficiently compress the springs, thus allowing the fitting of the clutch plates onto the clutch housing.

Set one shaft with plate holder «A» in fig. 300 n. 18 24 58 50 on the spring pusher plate (the holder centralizes the plates). Fit the clutch plates starting with an externally toothed friction plate, then fit an internally toothed metal plate and so until the last externally toothed disc with no friction material; then fit the ring securing the clutch plates in its seat on the clutch housing. This type of clutch consists of:

- n. 6 friction plates (Ferodo) externally toothed «B» in fig. 300;
- n. 5 metal plates internally toothed «C» in fig. 300;
- n. 1 metal plate externally toothed «D» in fig. 300 for the securing ring;
- n. 1 ring securing the clutch plate ass.y on the clutch housing «E» in fig. 300.

At this stage, it is necessary to undo the nut «A» in fig. 301 and fit the clutch control lever «B» in fig. 301 with cap «C» in fig. 301 on the cover, using the fixing pin «D» in fig. 301 and circlip «E» in fig. 301; remember to fit the spring «F» in fig. 301 into the seat on the housing and onto the lever tang.

#### ADJUSTING THE CLUTCH LEVER (fig. 301)

Screw in the nut «A» on the clutch control rod, holding the rod fast by means of tool 55 90 04 00; the clearance between the cable adjuster holder «H» and the inner seat of the control cable end «I» must be:

- 33 mm on a new engine;
- 30 mm on a used engine.

#### RE-FITTING OF THE GEARBOX HOUSING ONTO THE ENGINE-CONVERTER ASS.Y (fig. 302)

When fitting the gearbox housing onto the engine-converter ass.y, it is necessary to pay attention to the position of the bushing «A»; the bushing notched side must face the converter. Fit the gearbox housing on the crankcase stud bolts, lock the nuts using the proper tool, then fit the starter motor on the crankcase cover.

#### INSPECTION AND CHECKING CLUTCH PLATES

The friction plates (Ferodo) have a thickness of mm  $3,15 \div 3,35$ ; replace them if thickness is mm 0,5 lower.

The internally toothed plates must be quite even and without damage or scoring, otherwise replace them.

#### CLUTCH SPRINGS (fig. 79)

Check the trueness of the springs.

The spring free length is mm  $27,970 \div 28,000$ . A spring compression to 20 mm gives a load of Kg  $21,0 \div 21,5$  (45-47 lbs).

A spring compression to 17 mm gives a load of Kg  $28,7 \div 29,7$  (63-65 lbs).

Should these specifications not be found, replace the springs.

#### CLUTCH PRESSURE ROD

Ensure that the rod is straight and check the trueness of the thread holding the adjuster; if the thread is in any way damaged, replace it.

#### MAIN SHAFT

Check the trueness of the gear teeth; if too worn, replace the gears.

#### CLUTCH SHAFT

Check the trueness of gear and shaft teeth, if too worn, replace.

#### LAYSHAFT (see Drwg. 303)

Check the trueness of the teeth where the sleeve is sliding; if too worn, replace the shaft.

Ø of the shaft where the low and drive speed gear bushings are working: mm  $27,960 \div 27,927$ .

#### LOW AND DRIVE SPEED GEARS (see Drwg. 303)

Check the trueness of the gear teeth; if they are too worn, replace the gears:

- inner Ø of gears (bushing seat):  
mm  $32,000 \div 32,039$ .

#### LOW AND DRIVE SPEED GEAR BUSHINGS (see Drwg. 303)

Ensure that the bushings are not scored or damaged, otherwise replace them:

- bushing outer Ø: mm 32,000;
- bushing inner Ø: mm  $28,000 \div 28,033$ .

### **THROWOUT BEARING ON THE MAIN SHAFT**

Check the working condition of the rollers, if they are damaged or worn replace the bearing.

### **COUPLING CLEARANCE, SHAFT/BUSHING - GEAR/BUSHING**

Between layshaft and low and drive speed gear bushing: mm 0,040 ÷ 0,106.  
Between low and drive speed gear and bushing: mm 0,000 ÷ 0,390.

### **SLIDING SLEEVE CONTROLLING LOW AND DRIVE SPEEDS**

Ensure that the inner teeth sliding on the layshaft and the outer teeth engaging low and drive speed are not damaged or worn, otherwise replace the sleeve itself.

If this sleeve is not of modified type, it is advisable to replace also the fork and the fork control shaft.

The modified sleeves have been introduced starting from the gearbox housing number G 01001.

### **SLEEVE CONTROL FORK**

The old fork is a unit type; therefore if the control pawls are too worn, it is necessary to replace the whole fork.

The modified fork has removable pawls, therefore if the pawls are too worn it is necessary to replace the pawl links only.

This modification has been introduced starting from the gearbox housing number G 01001.

### **FORK CONTROL SHAFT**

Check that the shaft is straight and the teeth engaging on the fork are not damaged or worn, otherwise replace the shaft.

If the shaft is old type, it is advisable to replace also the fork and the sleeve.

The modification has been introduced starting from the gearbox housing number G 01001.

### **CLUTCH HOUSING**

If the clutch slides, this may be caused by:

- oil flowing from the gearbox to the clutch due to a defective sealing of the ring on the clutch housing hub because of the ring being worn or the hub not being smooth. If this is the case, replace ring and housing as well.
- in case of the above, the oil level in the gearbox housing decreases.

### **SEAL RINGS**

Ensure that the rings on the housing and on the shaft are not damaged; otherwise replace them.

## REAR WHEEL DRIVE

### RATIO:

Bevel gear ratio (gearbox-wheel): ( $Z = 9/34$ )  
1 : 3,788.

### OVERALL RATIO (engine-wheel):

- 1st speed (Low) 1 : 6,12;
- 2nd speed (Drive) 1 : 4,58.

### REMOVAL OF THE REAR DRIVE BOX (fig. 304)

Before removing the rear drive box, drain the oil by undoing the drain screw «C» with Al. washer, the filling screw «B» with Al. washer and the level inspection screw «A» its Al. washer:

- loosen the nuts securing rear drive box to rear swing arm and take off the box with the gasket (OR type) «D»;
- from the box take off the housing complete with pinion «E» and gasket (OR type) «F»;
- flatten the securing plate wings and loosen the screws «G» which secure the cover «H» to the box «I»;
- remove the cover «H» and the gaskets «L» with shim «M»;
- from the box take off the drilled pin «N» with crown;
- then take off spacer «O» seal ring «P» roller bearing «Q».

### DISMANTLING OF THE HOUSING

To loosen the nut securing pinion to housing use proper tool 18 92 71 50 (65 in fig. 305) and wrench.

The nut loosened, the following parts can be removed from the housing:

- bevel gear with shims;
- bevel bearings;
- spacer between bearings;
- shims between bearing and spacer;
- finally, base housing.

### SELECTION OF PINION-CROWN

Pinion and crown must have the same number (see «A» and «B» fig. 306).

### ASSEMBLING OF THE HOUSING

To assemble, reverse the dismantling sequence; if no part has been replaced, ensure that there is the same quantity of shims spacer/bearing and bearing/pinion.

If some replacement has been made, it will be necessary to adjust shimming. The nut must be locked using tool 18 92 71 50 (65 in fig. 305) and proper eye wrench.

### FITTING OF THE HOUSING ONTO THE BOX (fig. 306/1)

When fitting the housing «A» on the box «B» pay attention to align the box lubricating holes «B» with the housing lubricating holes «C»; remember to fit the seal ring «D» (OR type) between housing and box.

Also ensure that, when fitting the connection sleeve between pinion and cardan shaft «E», the sleeve hollowed side faces the bevel pinion «I» (see arrow «F»). When fitting the complete rear drive box, onto the rear swing arm, remember to fit the seal ring «G» (OR type) between box and arm.

### COUPLING, PINION-CROWN (fig. 307)

Check the correspondence of the plane formed by the gear couple.

This checking is made as follows:

- provisionally secure the housing to the rear drive box, using two nuts «A» with washer;
- smear the crown teeth with lead oxyde;
- rotate the pinion, hold the crown in such a way that the rotation leaves a contact trace on the crown smeared surface. If contact is normal, the trace of the pinion teeth on the crown will be even along the whole tooth flank.

Also make sure that the pinion teeth are  $1 \div 2$  mm longer than the crown teeth (see arrow «B»).

### FITTING OF THE COVER ONTO THE REAR DRIVE BOX (fig. 308)

Proceed as follows:

- onto the box fit first the gasket «A», then the shim «B» and finally the other gasket «A»; pay attention to the alignment of the lubrication holes.

Also pay attention that the wording «BASSO» «C» is downwards and the arrow stamped on the cover «D» is aligned with the arrow stamped on the box «E»; this checked, screw in the screws fully but without locking.

### CHECKING THE CLEARANCE BETWEEN PINION AND CROWN (fig. 309)

- Insert the legs of a universal puller «A» and connect them inside the ass.y crown-drilled pin;
- fit also a piece of light alloy «B» and screw the puller on this piece;
- using one hand rotate the pinion «C», the other hand will draw and release the tool «A» in such a way as to make sure that the clearance is normal.

If clearance is not normal, it is necessary to replace the shim «B» in fig. 308 to bring clearance to normal tolerance.



The shims are supplied in various sizes, namely:

- partn. 17 35 54 00 (mm 0,8);
- partn. 17 35 54 02 (mm 0,9);
- partn. 17 35 54 04 (mm 1,0);
- partn. 17 35 54 06 (mm 1,1);
- partn. 17 35 54 08 (mm 1,2);
- partn. 17 35 54 10 (mm 1,3).

#### **CHECKING OF OIL LEAKAGE FROM THE REAR DRIVE BOX**

Proceed as follows:

- fit the tool « C » fig. 124 onto the box (this tool can be made from a used rear swinging fork right arm, welding on its top a plate with a valve from an inner tube);
- set the box in a small tank full of water and blow compressed air through the tool valve « C » fig. 124, with about 4 Kp/cm<sup>2</sup> (57 p.s.i.) pressure.

Porosity will be determined by air bubbles in the water.

If this in the case, seal any holes with latex or special sealers (Araldite or Devcon).

Ensure also that there is no oil leaking between the rear drive box and the lower pin securing the rear suspension. If the pin is wet because

of oil, put some « Teflon » tape on the pin thread.

#### **FITTING OF THE REAR DRIVE BOX ONTO THE RIGHT SIDE OF THE REAR SWING ARM**

Proceed as follows:

- fit the sleeve « E » in fig. 306 onto the bevel pinion, paying attention that the sleeve hollowed side must face the pinion shaft;
- fit the seal ring « G » in fig. 306 (OR type) between housing and rear swing arm, then fit the four box stud bolts into the holes on the rear swing arm « A » in fig. 310;
- fit the wheel spindle « B » in fig. 310 on both the rear swing arm and rear drive box;
- lock the nuts « C » in fig. 310 with washers.

The nuts locked, take off the wheel spindle « B », making sure that it slides smoothly.

If some resistance is found in taking off the wheel spindle, it is necessary to slacken the nuts « C » and turn the box to the right or to the left until the spindle « B » slides properly. Then fit the cardan joint « H » in fig. 306 onto the bearing on the right side of the rear swing arm « A » in fig. 310 and onto the sleeve, which has already been fitted on the bevel pinion shaft « I » in fig. 306.

## FRAME

The frame consists of two parts: the upper part, which is technically called the frame, and two lower tubes which form the engine holding cradle.

### CHECKING AND OVERHAULING

After an accident, inspect the frame for distortion or cracking, particularly on welded points. For this inspection follow the measures which are indicated on the Drwg. in fig. 310/1. In case of very high frame distortion, it is advisable to replace it.

### RETURN SPRING FOR CENTER AND SIDE STANDS

Inspect the springs for distortion and check their trueness.

#### Central stand return spring:

Free length: mm 94 ÷ 95.  
Tension under load of Kg 30 (66 lbs) ± 5%:  
mm 10.

#### Side stand return spring:

Free length: mm 183.  
Tension under load of Kg 10,2 (22 lbs):  
mm 7.

## REAR SWING ARM

### OVERHAULING

Inspect the rear swing arm for abnormal bending or cracking at welded points, check the condition of bearing seats and the smoothness of the connecting surface to the rear drive box. For this inspection see Drwg. 311.

### REMOVAL OF BEARINGS FROM THE REAR SWING ARM

The cardan joint bearing is removed using puller 18 92 72 50 (66 in fig. 312); the rear fork pin

bearings are removed using puller 12 90 47 00 (14 in fig. 125).

### ADJUSTING THE REAR SWING ARM PLAY (fig. 313)

The rear swing arm has to swing freely, without any play.

Pay attention that for proper adjustment the pins must extend the same length.

For this adjustment use a screw driver « A » and a gauge « B ».

## FRONT SUSPENSION

### FRONT FORK

After an accident, inspect the front fork for abnormal bending.

Centerline distance between fork legs: mm 195,000 ÷ 195,115.

For other measures, see Drwg. fig. 188.

**Fork spring, partn.** 14 52 66 00

Free length: mm 421 ± 2,5.

Load given by mm 16 compression: Kg 11,3 (25 lbs.).

Load given by mm 141 compression (travel end): Kg 104,4 (230 lbs).

**Fork spring, partn.** 18 52 66 00

Free length: mm 415 ± 2,5.

Load given by mm 13,5 compression: Kg 12 (26 lbs.) ± 3%.

Load given by mm 138,5 compression: Kg 123,7 (272 lbs.) ± 3%.

## REMOVAL OF FORK COVER ASS.Y WITH ROD AND DAMPER FROM THE FORK LEGS

After removing the front wheel from the fork legs (see chapter removal of the front wheel from the fork legs) proceed as follows:

- drain the oil, undoing the screws with gasket « A » from the fork covers « B »;
- loosen the screws securing the mudguard « D » to the fork cover « B »;
- loosen the upper screw « E » securing the cover ass.y to the fork legs « F ».

### REMOVAL OF FORK LEGS (fig. 316)

First loosen the following:

- the screws securing the fork legs to the steering head « A »;
- the screws securing the fork legs to the steering bottom « B ».

Then slide out the two fork legs « C » (see arrow « D »).

### OVERHAULING

#### Fork legs

Check the trueness of the leg chromed surface sliding into the cover; it must be in good condition and without damage or scoring, it must also be straight and the threading must be in good condition.

The  $\varnothing$  of the leg chromed part sliding into the cover is mm 34,715  $\div$  34,690.

#### Fork cover

The fork cover is made of light alloy. Ensure that the inner surface where the leg is sliding into, is not scored or too worn.

The inner  $\varnothing$  of the cover, where the leg is sliding into, is mm 34,750  $\div$  34,790.

#### Coupling clearance between leg and cover

mm 0,045  $\div$  0,100.

### FITTING OF DAMPERS WITH ROD AND SPRINGS ONTO THE FORK COVERS (fig. 317)

Pay attention to the following:

- the two hollows must insert into the inner pawls of the bushing « A » while the outer pawl « B » of the above bushing must properly insert into the inner hollow of the cover « C ».

To properly insert, it is necessary (after fitting the damper ass.y into the cover) to slightly turn the cover to the right or to the left (see arrow « D ») until the inserting click occurs.

At this stage, screw in the screw « E » with Al. washer on the cover bottom, to secure the ass.y damper/rod/spring to the cover itself.

### FILLING THE FORK COVERS WITH OIL

Before fitting and securing the cover ass.y with dampers onto the fork legs, it is necessary to fill each cover with lt 0,070 (approx. 2 ounces) of oil « Agip F. 1 ATF Dexron ».

## WHEELS AND BRAKES

### REMOVAL OF THE FRONT WHEEL FROM THE FORK LEGS (fig. 318)

- Fit the stand 18 91 24 50 (58 in fig. 211) under the engine crankcase sump, the side holding the gearbox housing must face the front wheel; then screw in the stand screws in such a way as to lift the machine;
- loosen the screws « A » securing the hydraulic caliper « B » to the fork left leg « C »;
- loosen the nut on the wheel spindle « D » (right side);
- loosen the screws « E » securing the spindle to the fork covers « C »;
- slide out the spindle « F » from fork covers and wheel hub, then take the braking disc off right caliper and fork legs. Make sure that the spacer « G » is located on the right side.

Re-fitting takes place in reversed sequence.

### REMOVAL OF THE REAR WHEEL FROM REAR DRIVE BOX AND REAR SWING ARM LEFT SIDE (fig. 319)

- set the machine on the center stand;
- first loosen the screw securing the clamp « B » which attaches silencer to expansion chamber, then loosen the screw with nut washer « A » securing the left silencer;
- detach the parking brake control cable « C » from the lever on the mechanical caliper;
- loosen the screws « D » and take the mechanical caliper « F » off the braking disc « E »;
- loosen the nut with washer « H » on the wheel spindle rear drive box side;
- loosen the screw « I » securing the wheel spindle to the left rear swing arm, then take off the wheel spindle « L »;
- take off the caliper holder with hydraulic calipers « G » from the stop pawl on the left rear swing arm (it is advisable to secure the calipers/holder ass.y to the frame);
- take off the space between caliper holder and hub « M »;
- shift the wheel towards the left swing arm in such a way as to take the wheel gear off the drilled pin on the rear drive box;
- lean the vehicle to the right side to remove the wheel from drive box and swing arm.

Re-fitting takes place in reversed sequence, paying attention to fit the caliper holder onto the stop pawl of the left swing arm.

The lowered side of the spacer « M » between caliper holder and wheel hub must face the hub itself and the spacer must be trued onto the hub.

Re-fit the mechanical caliper on its holder and secure it by means of screws and washers, using shims to eventually true the caliper itself. Connect the parking brake control cable to the lever on the mechanical caliper.

### CHECKING THE PLAY FOR THE PARKING BRAKE CONTROL LEVER (fig. 320)

If this cable is not properly adjusted, loosen the two counternuts « A » and screw in or out the adjuster « B ».

### CHECKING THE CLEARANCE BETWEEN THE FLOATER IN FRONT BRAKE MASTER CYLINDER AND ITS CONTROL LEVER (fig. 321)

This clearance must be within mm  $0,05 \div 0,15$ . To correctly adjust, fit a feeler gauge « A » 12 90 90 90 and screw in or out the adjuster « B » until the proper clearance is reached.

### BRAKING DISC TRUING BETWEEN THE BRAKE PADS (fig. 322)

To correctly true the braking disc between the braking pads « A » it is necessary to increase or decrease the shim quantity on the screws « B » which secure the caliper to the fork leg, until the disc is correctly trued between the pads.

The shims are supplied in the following thicknesses:

- partn. 95 10 02 32 (mm 0,5);
- partn. 95 10 02 33 (mm 0,8).

### CHECKING THE CLEARANCE BETWEEN BRAKE LEVER AND FLOATER IN MASTER CYLINDER AND ADJUSTING THE POSITION OF THE CONTROL PEDAL, FOR LEFT FRONT AND REAR BRAKES (fig. 323)

The clearance between floater and lever « B » must be within mm  $0,05 \div 0,15$ .

To correctly adjust this clearance, set a feeler gauge « A » 12 90 90 90 between lever and floater and screw in or out the adjuster « C » until the specified clearance is reached.

To adjust the position of the control pedal « D » it is necessary to take out the circlip and then the securing pin « E »; then loosen the counter nut « F » and screw in or out fork « O » to bring the control pedal to the desired position.

Then lock the counternut « F » on the fork « G » and fit pin and circlip.

The position adjusted, loosen its counternut and adjust then the screw « H » stopping the lever return travel.

### REPLACING THE BRAKING PADS IN CALIPERS (fig. 324)

For this replacement it is necessary to remove the hole cover « A », then to take off the pins « B » pad retainers, the positioning spring « C » and the pin « D »; then replace the pads « E ». The pads replaced, it is necessary to operate several times the hand control lever, if for the right front brake, or the foot control pedal if for the rear and left front brake, until the pads properly couple the discs.

**CHECKING THE FLUID LEVEL IN THE MASTER CYLINDER (FLUID RESERVOIR) FOR RIGHT FRONT BRAKE** (fig. 325)

- loosen the cap « A » and check if the oil level is between the first and second ring of the rubber gaiter (see arrow « B »). This level must never fall more than 6 mm under "Max." mark (see Drwg. « C »).

**FLUID LEVEL IN THE MASTER CYLINDER (FLUID RESERVOIR) FOR REAR AND LEFT FRONT BRAKE** (fig. 323)

When the fluid level falls under « Min » mark, the floater with rod « I » contacts the electric clamps on the master cylinder cover « L », thus activating the red warning light « Brake » on the instrument panel.

In this case it is necessary to bring the fluid level to « Max » mark.

**AIR BLEEDING, RIGHT FRONT BRAKING CIRCUIT** (fig. 326)

- Turn the handlebar until the master cylinder (fluid reservoir) reaches the horizontal position;
- if necessary add fluid, paying attention that during the bleeding, the liquid itself does not fall more than 6 mm under the recommended level;
- work on one caliper half at a time;
- remove the caps « A » and the cover « B » fit the flexible transparent tubes « C » onto the drain plugs, insert the other end of these

tubes into a transparent container « D » which is partially filled with fluid of recommended type;

- loosen the drain plug « E » of one caliper half;
  - fully operate the hand control lever « F » on the handlebar, release it slowly before operating it again. Repeat until the tube in the transparent container emits airless fluid;
  - hold the lever « F » drawn and lock the drain plug « E » then work on the other caliper half; now take off the pipe « C » and re-fit the cover « B » and the rubber caps « A ».
- If the air bleeding has been properly carried out, the direct and non-spongy action of the lever will be realized immediately after the initial idle movement of the lever itself. If this does not occur, it is necessary to repeat the bleeding.

**AIR BLEEDING, REAR AND LEFT FRONT BRAKING CIRCUIT** (fig. 327)

Proceed as specified in the previous chapter, but operate the foot control pedal « F » on the right side of the machine.

Notice: if it is necessary to replace the lip gasket, the thoroid gasket and the lock ring on the master cylinder for right front hydraulic brake (for 750 S 3 - 850 T 3 - V 1000 Convert) use the tools n. 68 - partn. 18 92 65 00; n. 69 - partn. 18 92 66 00; n. 70 - partn. 18 92 67 00; as indicated under chapter « Specific Tools » and in fig. 236.

## ELECTRIC EQUIPMENT

### ALTERNATOR

#### Main Features

**Brand** Bosch (G1 - 14V - 20 A 21")  
**Control** Directly controlled by the crankshaft  
**Max. output** 280 W - 14 V  
**Max. amperage** 20 Amp  
**Charge starting** 1000 rpm  
**Peak** 10.000 rpm  
**Rotation** Clockwise  
 (as seen from commutator side)

### STARTER MOTOR

**Brand** Bosch (DF(L) 12 0,6 PS)  
**Voltage** 12 V  
**Output** 6 HP  
**Amperage** 35 Amp  
**Pinion** 8-teeth, mod. 2,5  
**Pinion rotation** counterclockwise

### TEST DATA

RUNNING	VOLTAGE	AMPERAGE	RPM
Vacuum	11,5 V	20 ÷ 40 A	6500 ÷ 8500
Load	9 V	170 A	3200 ÷ 3500
Short circuit	8 V	280 ÷ 360 A	—



## IGNITION SYSTEM

### DOUBLE CONTACT BREAKER

#### Main features

Contact points gap: mm  $0,37 \div 0,43$   
Contact pressure: gr  $550 \pm 50$   
Opening angle:  $180^\circ \pm 5^\circ$   
Closing angle:  $180^\circ \pm 5^\circ$   
Timing angle  
between the two points:  $225^\circ \pm 1^\circ$   
Ignition automatic advance diagram (see Drwg. 327/1).

### ADJUSTING THE CONTACT POINTS FOR RIGHT CYLINDER BREAKER (RED CABLE) (fig. 328)

Rotate the breaker shaft until the contact points reach their max. gap; at this stage fit the feeler gauge «A» 12 90 90 90 between the contact points, check that the gap is as specified: mm  $0,37 \div 0,43$  (.015"-.018").

If the gap is more or less, loosen the screws «B» and «C» and turn the plate «D» to the right or to the left, acting on the notch «E» with a screw driver, until the specified gap is reached.

### ADJUSTING THE CONTACT POINTS FOR LEFT CYLINDER BREAKER (GREEN CABLE) (fig. 239)

Rotate the breaker shaft until the contact points reach their max. gap; at this stage fit the feeler gauge «A» 12 90 90 90 between the contact points, checking that the gap is as specified: mm  $0,37 \div 0,43$  (.015"-.018").

If the gap is more or less, loosen the screws «B» and «C» and turn the plate «D» to the right or to the left, acting on notch «E» with a screw driver, until the specified gap is reached.

### IGNITION TIMING FOR RIGHT CYLINDER (RED CABLE) (fig. 330)

After adjusting the breaker contact points and fitting the double breaker onto the engine, proceed as follows:

- connect the feed clamp of unit «A» to the red cable, and the ground clamp «B» to a fin on the engine crankcase;
- rotate the alternator clockwise, using tool «C», until the letter «D» stamped on the flywheel (right cylinder) is aligned with the mark at the middle of the inspection hole rim «E»; piston must be at T.D.C. (closed valves);
- rotate the alternator counterclockwise until the mark «A.F.» stamped on the flywheel (static advance) is aligned with the mark at the middle of the inspection hole rim «E».

At this stage, the indicator «F» starts moving clockwise.

If the indicator does not move the above specified point, loosen the screws securing double breaker to crankcase using tool 14 92 70 00 (13 in fig. 330) and turn the breaker to the left or to the right until the indicator «F» starts moving at the specified point.

Then lock the screws securing breaker to crankcase and detach the clamps from the red cable.

### IGNITION TIMING FOR LEFT CYLINDER (GREEN CABLE) (fig. 331)

After timing the right cylinder (red cable), proceed with the left cylinder (green cable). Proceed as specified under the previous paragraph, paying attention to the followings changes.

- Connect the feed clamp «G» to the green cable;
- rotate the alternator clockwise, using tool «C», until the letter «S» stamped on the flywheel (left cylinder) is aligned with the mark at the middle of the inspection hole rim «E».

If the indicator does not move at the above specified point, loosen the screws «H» using a screwdriver and turn the plate to the right or to the left until the indicator starts moving at the specified point.

Then lock the screws and detach the feed clamp from the green cable, the ground clamp from the crankcase fin, then re-fit the breaker cover.

### CHECKING THE IGNITION ADVANCE (STATIC + AUTOMATIC) FOR RIGHT CYLINDER BY MEANS OF A «STROBOSCOPE LAMP» (fig. 332-333/1)

- Remove the rubber cap from the inspection hole «A», which is located on the gearbox housing, right side;
- connect the stroboscope cable «A» to the right cylinder spark plug lead;
- connect the stroboscope clamped cables to the battery; the clamp «B» marked (+) to the battery positive pole (+), the clamp «C» marked (—) to the battery negative pole (—);
- first remove the cover, then rotate the flywheel, using the proper screw, clockwise in such a way as to align the letter «D» stamped on the flywheel with the mark at the middle of the inspection hole rim «E»;
- start the engine and point the stroboscope light into hole «E», checking that the advance mark «AF» is aligned with the mark at the middle of the inspection hole rim «A» at  $1000 \div 1200$  rpm  $\pm 200$  and the full advance mark (static + dynamic) «AT» is aligned with the mark at the middle of the inspection hole rim «F» at  $6000 \div 6200$  rpm  $\pm 200$ .

If the marks for static and full advances align with the mark at the middle of the inspection hole rim at above rpm, this means that everything is normal.

**CHECKING THE IGNITION ADVANCE  
(STATIC + DYNAMIC) FOR LEFT CYLINDER  
BY MEANS OF A STROBOSCOPE LAMP**  
fig. 333/1)

Proceed as specified in the previous paragraph,

paying attention to connect the stroboscope cable to the spark plug lead for the left cylinder and bring the letter « S » stamped on the flywheel in line with the mark at the middle of the inspection hole rim « F ».

**IGNITION DATA**

Initial advance (Static)	0 ÷ 2°
Automatic (Dynamic)	31°
Full advance	31° ± 3°

## LIGHTING EQUIPMENT

### HEADLIGHT (EUROPE MODEL)

(fig. 334)

The headlight insert is adjustable type; it can be laterally adjusted by turning screws «A» and vertically adjusted by turning screws «C». The center of the high beam must not exceed the height of m 0,86 (34 inches) measured at m 3 (10 feet) distance with machine not on stand and rider on saddle.

To replace the bulbs, loosen the screw «B», unhook the headlight insert, remove the two holders and replace the bulbs.

### TAIL LIGHT (fig. 335)

#### Bulb replacement

Access to the bulbs is made possible by unscrewing the screws «D» securing reflector to tail light housing, pressing the bulb, turning and taking out at the same time.

### NUMBER PLATE LIGHT (fig. 335)

#### Bulb replacement

Loosen the screws «F» securing the transparent cover to the light housing, press the bulb in, turn and take out at the same time.

### TURN SIGNALS (fig. 335)

#### Bulb replacement

Loosen the screws «E» securing the reflectors to the signal light housing, press the bulb in, turn and take out at the same time.

**Caution: in re-fitting the reflectors onto tail light, number plate light, and turn signal light, do not screw in too tightly to avoid breaking the reflector.**

## BULBS

### Headlight

- high and low beam 40/45 W - 12 V
- town driving or parking light 3 W - 12 V

### Tail light

- parking and stop light 5/21 W - 12 V

**Number plate light** 5 W - 12 V

**Turn signals** 21 W - 12 V

**Warning lights** 1,2 W - 12 V

**Instrument lighting** 3 W - 12 V

(tach/speedometer - rev. counter)

### INSTRUMENT PANEL (fig. 336)

- 1 Tach/speedometer;
- 2 Warning light (green); left turn signal;
- 3 Warning light (green); right turn signal;
- 4 «h» Warning light (Europe model, blue, U.S.A. model red), high beam;

5 «n» warning light (orange) signalling the disengagement of transmission power and supply of engine starting relay;

6 «gen» warning light, (red) indicating current delivery from alternator. It must go out when the engine reaches a certain number of revs;

7 «oil» warning light (red) oil pressure gauge. It goes out when the oil pressure is sufficient for normal engine lubrication. Should it remain on, this means that oil pressure is not correct. In this case the engine has to be stopped and suitable checkings are to be carried out;

8 «Park» warning light (green) indicating parking brake engaged. This warning light flashes by turning the ignition key to position «2» fig. 337. If the side stand is not up, the engine cannot be started;

9 «I» warning light (Europe model, green, U.S.A. model red) indicating parking lights on (by parking);

10 «Brake» warning light (red) indicating incorrect fluid level in rear and left front brake reservoir. When this warning light is on, fill the fluid reservoir and check that the braking circuit has no leaks;

11 «Fuel» warning light (red) fuel reserve. To use the reserve fuel, bring the tap lever on the right fuel tank in position «R»;

12 «light» courtesy light switch (available);

13 «Emerg» switch, right and left emergency flashers;

14 Odometer reset.

### IGNITION KEY (fig. 337)

«0» vertical, standstill - key removable;  
«1» turned counterclockwise: standstill, button «A» (Lights) fig. 242 in line with «Park» lights parking light on - key removable;  
«2» turned clockwise, all controls in - key not removable. After making sure that the side stand is in rest-position (warning light «Park» out) and power transmission is disengaged (warning light «n» on) start the engine by pressing button «Start» fig. 339.

### LIGHTING SWITCH (LIGHTS) (fig. 338)

It is located on the left side of the handlebar and has four positions:

- 1 «Off» lights out;
- 2 «Park» parking light or town driving;
- 3 «L» low beam;
- 4 «H» high beam.

Light selection is obtained by turning the switch «A» (LIGHTS) to the above positions. To go from position «2» (Park) to position «1» (Off) it is necessary to shift safety button «5» to the left.

### **HORN, FLASHING LIGHT AND TURN SIGNALS** (fig. 338)

Controls are incorporated in block « B »:

- 6** « Horn » horn control switch;
- 7** « Flash » flashing light control (headlight);
- 8** turn signal control button when turned to the right (position **9**) operates the right signals, when turned to the left (position **10**) operates the left signals.

### **ENGINE STARTING AND STOP BUTTON** (fig. 339)

Right, on the handlebar.

With the ignition key in position « 2 » fig. 337, the engine is ready to be started.

To start the engine press button « 1 » (START). To stop the engine (in case of emergency) turn the lever « 2 » to position « 3 » or « 4 ».

After stopping the engine, set the ignition key fig. 241 to position « 0 ».

### **ELECTROVALVE**

The electrovalve (electronic petcock) « A » (see fig. 268) is mounted on the left side of the motorcycle, under the fuel tank and feeds the carburetors.

It works when the ignition key fig. 337 is in position « 2 ».

### **TERMINAL BLOCK WITH FUSES** (fig. 340)

It is located on the right side of the motorcycle,

and is accessible on removal of right battery cover and block cover. It holds n. 6 16 A fuses.

### **Key controlled**

- « 1 » Rear stop light - Horn - Flash;
- « 2 » Starter relay - Warning light « n » - Electrovalve.
- « 3 » Warning lights: oil - Gen - Brake - Fuel. Headlights: high and low beam and warning lights;
- « 4 » Parking light - Instrument lighting - Warning light « L ».

### **Out of key control**

- « 5 » Additional courtesy light;
- « 6 » Turn signals and warning lights.

### **MOTORCYCLE SIDE STAND AND PARKING BRAKE LIGHT** (fig. 341)

The motorcycle is equipped with a rod « A » which acts as side stand and parking brake control as well.

When it is in parking position (fully out) a special device breaks current delivery to ignition coils.

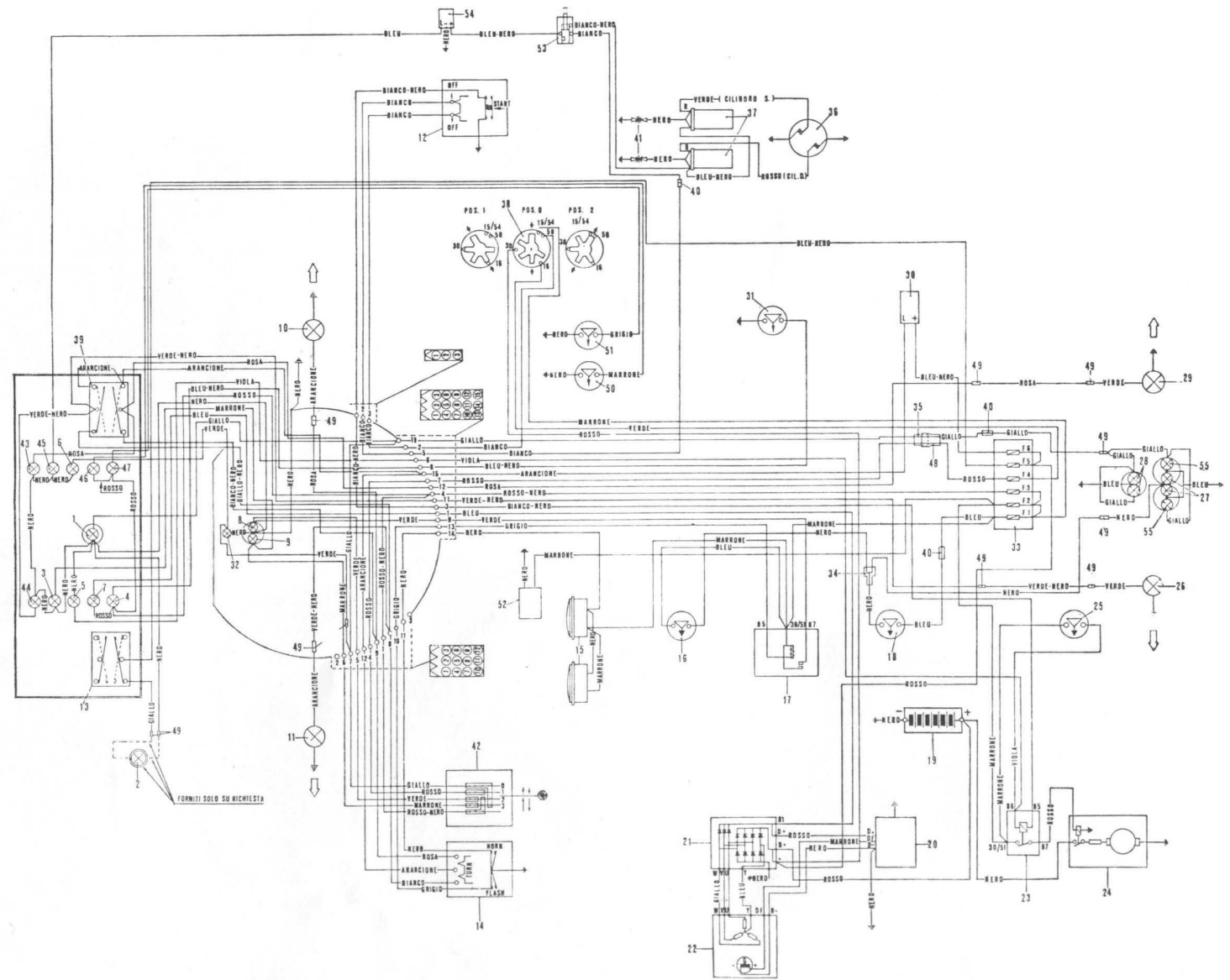
The warning light « Park » on the instrument panel, alerts the rider by flashing to bring the side stand in rest position to allow the engine to be started.

**WIRING DIAGRAM (EUROPE MODEL)**  
(fig. 342)

- 1 Speedometer (bulb 3 W)
- 2 Additional light (bulb 5) - only on request
- 3 High beam warning light (bulb 1,2 W) « H »
- 4 Oil pressure warning light (bulb 1,2 W) « Oil »
- 5 Neutral position warning light (bulb 1,2 W) « N »
- 6 Town driving warning light (bulb 1,2 W) « L »
- 7 Generator charge warning light (bulb 1,2 W) « Gen »
- 8 Low beam } bulb 40/45 W
- 9 High beam } bulb 40/45 W
- 10 Turn indicator light - front, right (bulb 21 W)
- 11 Turn indicator light - left, front (bulb 21 W)
- 12 Engine starting and stopping control
- 13 Additional light switch
- 14 Control: Turn indicator lights, horns, flashing lights
- 15 Horns (Consumption: 7 A)
- 16 Front brake switch
- 17 Flashing light (Flash) relay
- 18 Rear brake switch
- 19 Battery
- 20 Regulator
- 21 Rectifier
- 22 Alternator
- 23 Starter motor relay
- 24 Starter motor
- 25 Switch on clutch control wire
- 26 Turn indicator light - rear, left (bulb 21 W)
- 27 Rear stop light (bulbs 5/21 W)
- 28 Number plate light (bulb 5 W)
- 29 Turn indicator light - rear, front (bulb 21 W)
- 30 Turn indicator lights, flasher unit
- 31 Oil pressure switch (on the engine crankcase)
- 32 Town driving light, front (bulb 3 W)
- 33 Terminal block with fuses (16 A fuses)
- 34 3 way connector
- 35 4 way connector « Amp »
- 36 Breaker
- 37 Coils
- 38 Ignition switch (3 positions)
- 39 Switch actuating rear turn indicator lights flashing
- 40 2 way connector
- 41 Spark plugs
- 42 Light switch with travel limit from position « High/Low beam » to position « Town driving light »
- 43 Right turn indicator warning light (bulb 1,2 W)
- 44 Left turn indicator warning light (bulb 1,2 W)
- 45 Warning light indicating « Side Stand » in position « Park » (bulb 1,2 W)
- 46 Brake fluid level warning light « Brake » (bulb 1,2 W)
- 47 Fuel level warning light « Fuel » (bulb 1,2 W)
- 48 4 way connector (Amp)
- 49 Connection
- 50 Brake fluid level indicator
- 51 Fuel level indicator
- 52 Electrovalve (2,5 W)
- 53 Coil control device
- 54 Commutator for side stand warning light « Park » position
- 55 Rear parking light (bulb 5/21 W)

**COLORS LEGEND**

Nero	= Black	Giallo	= Yellow
Bianco	= White	Azzurro	= Blue
Verde	= Green	Rosso/Nero	= Red/Black
Grigio	= Grey	Azzurro/Nero	= Blue/Black
Viola	= Violet	Verde/Nero	= Green/Black
Arancio	= Orange	Bianco/Nero	= White/Black
Rosa	= Pink	Giallo/Nero	= Yellow/Black
Rosso	= Red	Grigio/Nero	= Grey/Black
Marrone	= Brown	Grigio/Rosso	= Grey/Red



## CHANGES FOR (EUROPE POLICE MODEL)

### INSTRUMENTS AND CONTROLS (fig. 343)

- 1 Tach./speedometer.
- 2 Left turn indicator warning light.
- 3 Right turn indicator warning light.
- 4 « H » high beam warning light.
- 5 « N » neutral position warning light.
- 6 « Gen » warning light indicating insufficient battery charge from alternator.
- 7 « Oil » warning light indicating insufficient oil pressure.
- 8 « Park » warning light indicating side stand in parking position.
- 9 « L » warning light, parking.
- 10 « Purs » warning light indicating red lights on.
- 11 « Rad » warning light indicating radio on.
- 12 « Light » switch for additional lights.
- 13 « Emerg » switch controlling simultaneous flashing of rear turn indicator lights (the switch controls also the flashing of warning lights « 2 » and « 3 »).
- 14 Odometer resetting.

### CONTROL BUTTONS FOR RADIO, SIREN AND RED LIGHTS (fig. 344)

This group is mounted on the right handlebar:

- « 1 » Radio control button (white).
- « 2 » Sirene control button (blue).
- « 3 » Red lights control (red).
- « 4 » Siren control (blue).

### FUEL TAPS

The motorcycle fits two fuel taps under the fuel tank, rear.

Tap position:

- « A » Open (vertical).
- « R » Reserve (horizontal - see « R » on the taps).
- « C » Closed (horizontal - see « C » on the taps).

### TERMINAL BLOCK WITH FUSES (fig. 340)

The terminal block is located on the right side of the motorcycle.

Access to the terminal block is made possible by removal of the right side cover and terminal block cover.

It incorporates n. 6, 16 A fuses.

### Key controlled

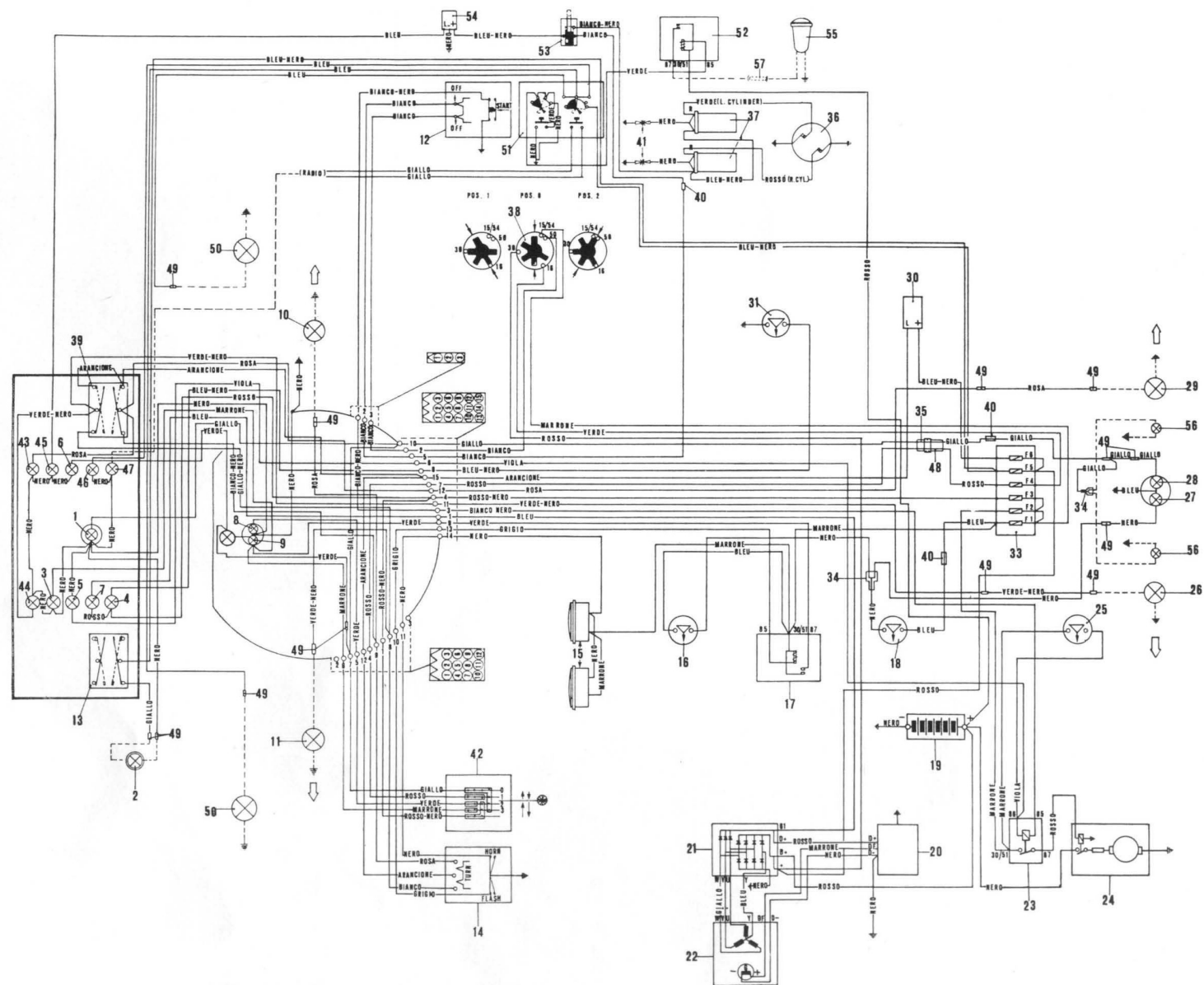
- « 1 » Rear stop light, horns, flashing lights.
- « 2 » Starter motor relay, warning light « N ».
- « 3 » Warning lights: « Oil - Gen » - Head-lights: high beam, low beam and warning lights.
- « 4 » Rear parking lights, instrument lighting, warning light « L » rear blue lights.

### Out of key control

- « 5 » Red lights and warning light « Purs »; additional light.
- « 6 » Turn indicator lights with their warning lights.

**WIRING DIAGRAM (EUROPE POLICE MODEL)**  
(fig. 345)

- 1 Speedometer (bulb 3 W)
- 2 Additional light (bulb 5) - only on request
- 3 High beam warning light (bulb 1,2 W) « H »
- 4 Oil pressure warning light (bulb 1,2 W) « Oil »
- 5 Neutral position warning light (bulb 1,2 W) « N »
- 6 Town driving warning light (bulb 1,2 W) « L »
- 7 Generator charge warning light (bulb 1,2 W) « Gen »
- 8 Low beam { bulb 40/45 W
- 9 High beam {
- 10 Turn indicator light - front, right (bulb 21 W)
- 11 Turn indicator light - left, front (bulb 21 W)
- 12 Engine starting and stopping control
- 13 Additional light switch
- 14 Control: Turn indicator lights, horns, flashing lights
- 15 Horns (Consumption: 7 A)
- 16 Front brake switch
- 17 Flashing light (Flash) relay
- 18 Rear brake switch
- 19 Battery
- 20 Regulator
- 21 Rectifier
- 22 Alternator
- 23 Starter motor relay
- 24 Starter motor
- 25 Switch on clutch control wire
- 26 Turn indicator light - rear, left (bulb 21 W)
- 27 Rear stop light (bulbs 5/21 W)
- 28 Number plate light (bulb 5 W)
- 29 Turn indicator light - rear, front (bulb 21 W)
- 30 Turn indicator lights, flasher unit
- 31 Oil pressure switch (on the engine crankcase)
- 32 Town driving light, front (bulb 3 W)
- 33 Terminal block with fuses (16 A fuses)
- 34 3 way connector
- 35 4 way connector « Amp »
- 36 Breaker
- 37 Coils
- 38 Ignition switch (3 positions)
- 39 Switch actuating rear turn indicator lights flashing
- 40 2 way connector
- 41 Spark plugs
- 42 Light switch with travel limit from position « High/Low beam » to position « Town driving light »
- 43 Right turn indicator warning light (bulb 1,2 W)
- 44 Left turn indicator warning light (bulb 1,2 W)
- 45 Warning light indicating « Side Stand » in position « Park » (bulb 1,2 W)
- 46 Brake fluid level warning light « Brake » (bulb 1,2 W)
- 47 Fuel level warning light « Fuel » (bulb 1,2 W)
- 48 4 way connector (Amp)
- 49 Connection
- 50 Red pursuing lights (front) - (bulb 35 W)
- 51 Control: red lights - radio - syrene
- 52 Syrene relay
- 53 Coil control device
- 54 Control device for side stand warning light
- 55 Syrenes (90 W)
- 56 Rear blue lights (bulb 5 W)
- 57 Spare fuse



**COLORS LEGEND**

Nero	= Black	Giallo	= Yellow
Bianco	= White	Azzurro	= Blue
Verde	= Green	Rosso/Nero	= Red/Black
Grigio	= Grey	Azzurro/Nero	= Blue/Black
Viola	= Violet	Verde/Nero	= Green/Black
Arancio	= Orange	Bianco/Nero	= White/Black
Rosa	= Pink	Giallo/Nero	= Yellow/Black
Rosso	= Red	Grigio/Nero	= Grey/Black
Marrone	= Brown	Grigio/Rosso	= Grey/Red

## CHANGES FOR USA MODEL

### HEADLIGHT (fig. 346)

Sealed beam insert 40/45 W.

### REPLACING OF BULBS

#### Tail light (fig. 335)

Undo screws « D » securing reflector to tail light, push the bulb in and turn it at the same time, then slip it out.

#### Turn indicator light (fig. 335)

Undo screw « E » securing reflector to turn indicator lights, push the bulbs in and turn them at the same time, then slip them out.

By re-fitting of reflectors, screw in carefully the fixing screws to avoid breaking the reflectors.

#### Number plate light (fig. 335)

Undo screws « F » securing the light glass, push the bulb in and turn it at the same time, then slip it out.

#### Instrument panel, Speedometer, Rev. Counter

Take bulb sockets out of instrument panel, speedometer and rev. counter, then replace the bulbs.

### BULBS

#### Headlight:

— sealed beam insert 45/40 W

#### Tail light:

— parking and stop light 5/21 W

— number plate light 5 W

**Turn indicator lights** 21 W

**Warning lights** 1,2 W

**Speedometer and rev. counter lights** 3 W

### ADJUSTING THE HEADLIGHT BEAM (fig. 336)

The headlight must always be adjusted at the right height, either for safe riding or to avoid annoyance to oncoming riders. For horizontal adjusting turn screw « A », for vertical adjusting turn screw « C » until the correct height is reached.

The high beam centre must not be higher than m 0,86 (approx 3.4") measured at m 3 (approx 11") distance with motorcycle not on stand, rider on saddle.



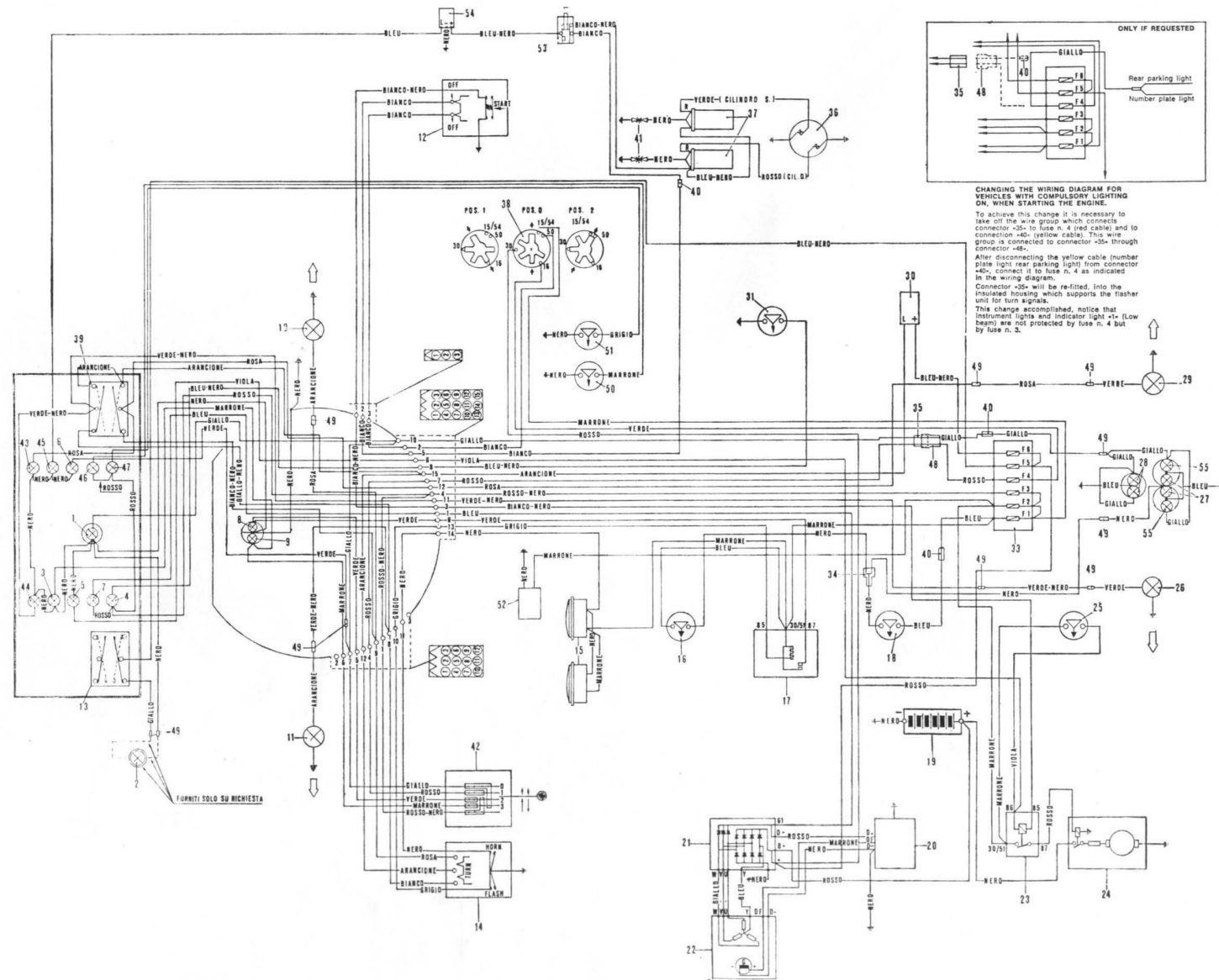
# WIRING DIAGRAM (U.S.A. MODEL)

(fig. 347)

- 1 Mile counter, speedometer (bulb 3 W)
- 2 Additional light (bulb 5) - only on request
- 3 High beam warning light (bulb 1,2 W) « H »
- 4 Oil pressure warning light (bulb 1,2 W) « Oil »
- 5 Neutral position warning light (bulb 1,2 W) « N »
- 6 Low beam and parking warning light (bulb 1,2 W) « L »
- 7 Generator charge warning light (bulb 1,2 W) « Gen »
- 8 Low beam } bulb 40/45 W
- 9 High beam } bulb 40/45 W
- 10 Turn indicator light - right, front (bulb 21 W)
- 11 Turn indicator light - left, front (bulb 21 W)
- 12 Engine starting and stopping control
- 13 Additional light switch
- 14 Control: Turn indicator lights, horns, flashing lights
- 15 Horns (Consumption: 7 A)
- 16 Front brake switch
- 17 Flashing light (Flash) relay
- 18 Rear brake switch
- 19 Battery
- 20 Regulator
- 21 Rectifier
- 22 Alternator
- 23 Starter motor relay
- 24 Starter motor
- 25 Switch on clutch control wire
- 26 Turn indicator light - rear, left (bulb 21 W)
- 27 Rear stop light (bulbs 5/21 W)
- 28 Number plate light (bulb 5 W)
- 29 Turn indicator light (bulb 21 W) left, rear
- 30 Turn indicator lights, flasher unit
- 31 Oil pressure switch (on the engine crankcase)
- 32 Town driving light, front (bulb 3 W)
- 33 Terminal block with fuses (16 A fuses)
- 34 3 way connector
- 35 4 way connector « Amp »
- 36 Breaker
- 37 Coils
- 38 Ignition switch (3 positions)
- 39 Switch actuating rear turn indicator lights flashing
- 40 2 way connector
- 41 Spark plugs
- 42 Light switch with travel limit from position « High/Low beam » to position « Town driving light »
- 43 Right turn indicator warning light (bulb 1,2 W)
- 44 Left turn indicator warning light (bulb 1,2 W)
- 45 Warning light indicating « Side Stand » in position « Park » (bulb 1,2 W)
- 46 Brake fluid level warning light « Brake » (bulb 1,2 W)
- 47 Fuel level warning light « Fuel » (bulb 1,2 W)
- 48 4 way connector (Amp)
- 49 Connection
- 50 Brake fluid level indicator
- 51 Fuel level indicator
- 52 Electrovalve (2,5 W)
- 53 Coil control device
- 54 Commutator for side stand warning light « Park » position
- 55 Rear parking light (bulb 5/21 W)

## COLORS LEGEND

Nero	=	Black	Giallo	=	Yellow
Bianco	=	White	Azzurro	=	Blue
Verde	=	Green	Rosso/Nero	=	Red/Black
Grigio	=	Grey	Azzurro/Nero	=	Blue/Black
Viola	=	Violet	Verde/Nero	=	Green/Black
Arancio	=	Orange	Bianco/Nero	=	White/Black
Rosa	=	Pink	Giallo/Nero	=	Yellow/Black
Rosso	=	Red	Grigio/Nero	=	Grey/Black
Marrone	=	Brown	Grigio/Rosso	=	Grey/Red



## CHANGES FOR U.S.A. « LAPD » MODEL

### INSTRUMENTS AND CONTROLS (fig. 343)

- 1 Mile counter, speedometer.
- 2 Left turn indicator warning light (green).
- 3 Right turn indicator warning light (green).
- 4 « H » high beam warning light (red).
- 5 « N » neutral position warning light (orange).
- 6 « Gen » warning light indicating insufficient battery charge from generator (red).
- 7 « Oil » warning light indicating insufficient oil pressure (red).
- 8 « Park » warning light (green) indicating side stand in parking position.
- 9 « L » warning light, parking (red).
- 10 « Purs » warning light (red) indicating red lights on.
- 11 « Rad » warning light (violet) indicating radio on.
- 12 « Light » switch for additional lights.
- 13 « Emerg » switch controlling simultaneous flashing of rear turn indicator lights (the switch controls also the flashing of warning lights « 2 » and « 3 »).
- 14 Odometer resetting.

### CONTROL BUTTONS FOR RADIO, SIRENE AND RED LIGHTS (fig. 344)

This group is mounted on the right handlebar:

- « 1 » Radio control button (white).
- « 2 » Sirene control button (blue).
- « 3 » Red lights control (red).
- « 4 » Sirene control (blue).

### FUEL TAPS

The motorcycle fits two fuel taps under the fuel tank, rear.

Tap position:

- « A » Open (vertical).
- « R » Reserve (horizontal - see « R » on the taps).
- « C » Closed (horizontal - see « C » on the taps).

### TERMINAL BLOCK WITH FUSES (fig. 340)

The terminal block is located on the right side of the motorcycle.

Access to the terminal block is made possible by removal of the right side cover and terminal block cover.

#### Key controlled

It incorporates n. 6, 16 A fuses.

- « 1 » Rear stop light, horns, flashing lights.
- « 2 » Starter motor relay, warning light « N ».
- « 3 » Warning lights: « Oil - Gen » - Headlights: high beam, low beam and warning lights.
- « 4 » Rear parking lights, instrument lighting, warning light « L » rear blue lights.

#### Out of key control

- « 5 » Red lights and warning light « Purs »; additional light.
- « 6 » Turn indicator lights with their warning lights.

## MAINTENANCE AND ADJUSTMENTS

### CHECKING THE FLUID LEVEL IN THE FLUID RESERVOIR (MASTER CYLINDER) FOR FRONT LEFT AND REAR BRAKING CIRCUIT (fig. 347)

For a proper working of braking circuits follow these directions:

- often check the fluid level; a correct level must be nearly at the rubber gaiter « E » in the fluid reservoir (master cylinder) « A ». Such level must never be lower than mm 8 (.3149") under max.;
- top up periodically or whenever necessary in the fluid reservoirs (master cylinders) « A » after loosening caps « F » and removing rubber gaiters « E ».

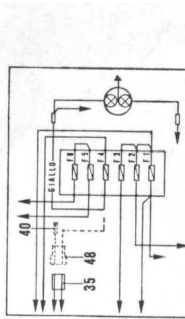
For all other maintenance and adjustments see paragraph from page 27 to page 28.

**WIRING DIAGRAM (U.S.A. - LAPD MODEL)**  
(fig. 348)

- 1 Mile counter, speedometer (bulb 3 W)
- 2 Additional light (bulb 5 W)
- 3 «H» High beam warning light (bulb 1,2 W)
- 4 «O» Oil pressure warning light (bulb 1,2 W)
- 5 «N» Neutral position warning light (bulb 1,2 W)
- 6 «L» Low beam and parking warning light (bulb 1,2 W)
- 7 «Gen» Generator warning light
- 8 Low beam } bulb 40/45 W
- 9 High beam }
- 10 Turn indicator light, front/right (bulb 21 W)
- 11 Turn indicator light, left/front (bulb 21 W)
- 12 Engine starting and stopping control
- 13 Additional light switch
- 14 Control switch: turn indicator lights, horns, flashing
- 15 Horns (Consumption: 7 A)
- 16 Front brake switch
- 17 Flashing light relay
- 18 Rear brake switch
- 19 Battery
- 20 Regulator
- 21 Rectifier
- 22 Alternator
- 23 Starter motor relay
- 24 Starter motor
- 25 Switch on clutch control wire
- 26 Turn indicator light - rear, left (bulb 21 W)
- 27 Rear stop light (bulbs 5/21 W)
- 28 Number plate and tail light (bulb 5 W)
- 29 Turn indicator light - rear, front (bulb 21 W)
- 30 Turn indicator lights, flasher unit
- 31 Oil pressure switch
- 32 Town driving light, front (bulb 3 W)
- 33 Terminal block with fuses (16 A fuses)
- 34 3 way connector
- 35 4 way connector « Amp »
- 36 Breaker
- 37 Coils
- 38 Ignition switch (3 positions)
- 39 Control actuating simultaneous flashing of turn indicator lights
- 40 4 way connector
- 41 Spark plugs
- 42 Light switch with travel limit from position «High/Low beam» to position «Town driving light»
- 43 Right turn indicator warning light (bulb 1,2 W)
- 44 Left turn indicator warning light (bulb 1,2 W)
- 45 «Park» Side stand parking position warning light (bulb 1,2 W)
- 46 «Purs» Red pursuing lights warning lights (bulb 1,2 W)
- 47 «Rad» Radio warning light (bulb 1,2 W)
- 48 4 way connector (Amp)
- 49 Connection
- 50 Red pursuing lights (front) - (bulb 35 W)
- 51 Control: red lights - radio - siren
- 52 Siren relay
- 53 Coil control device
- 54 Control device for side stand warning light
- 55 Sirenes (60 W)
- 56 Rear blue lights (bulb 5 W)
- 57 Spare fuse

**COLORS LEGEND**

Nero	=	Black
Bianco	=	White
Verde	=	Green
Giallo	=	Yellow
Violet	=	Violet
Arancio	=	Orange
Rossa	=	Pink
Rosso	=	Red
Marrone	=	Brown
Giallo	=	Yellow
Azzurro	=	Blue
Rosso/Nero	=	Red/Black
Azzurro/Nero	=	Blue/Black
Verde/Nero	=	Green/Black
Bianco/Nero	=	White/Black
Giallo/Nero	=	Yellow/Black
Grigio/Nero	=	Grey/Black
Grigio/Rosso	=	Grey/Red



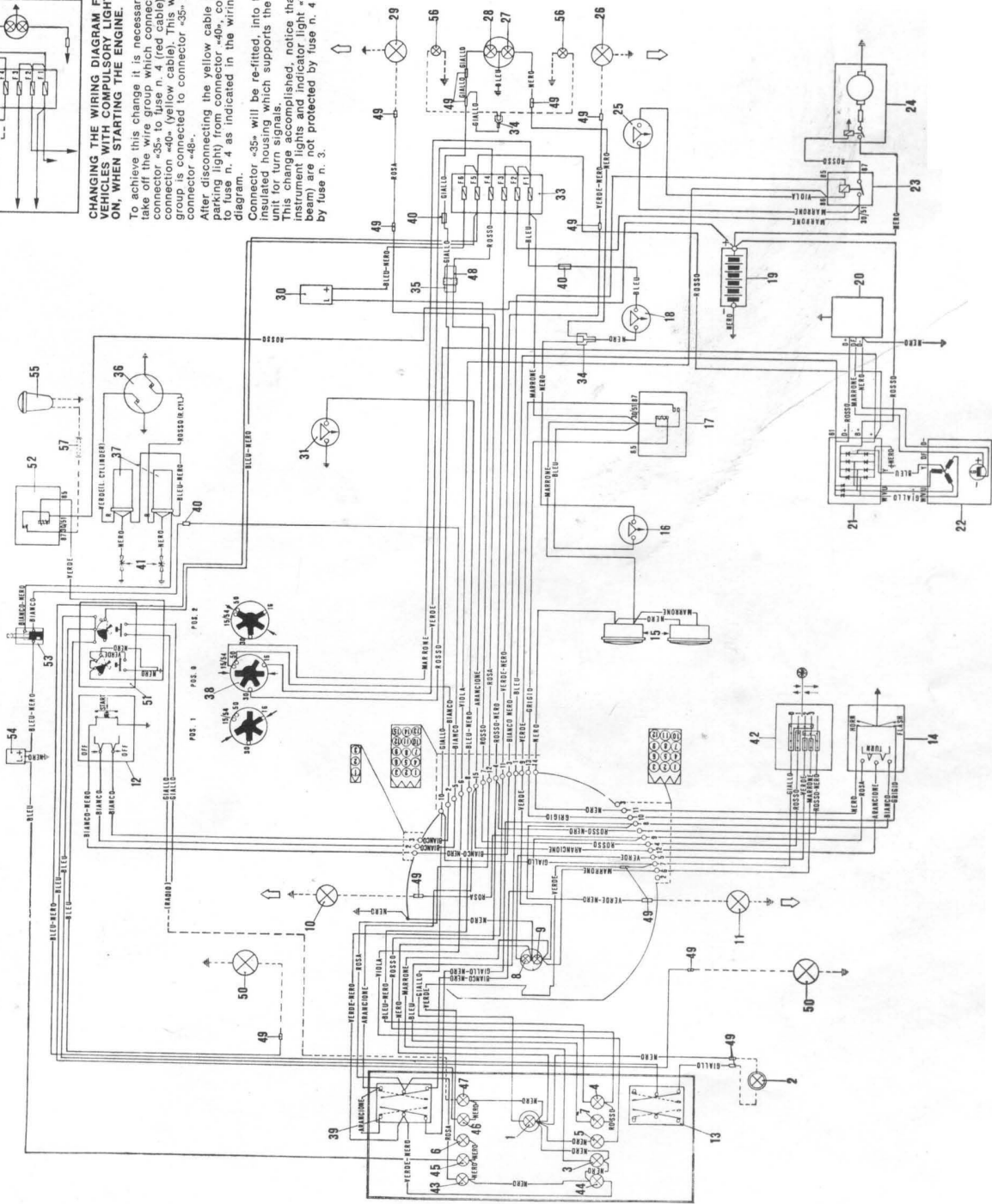
**CHANGING THE WIRING DIAGRAM FOR VEHICLES WITH COMPULSORY LIGHTING ON, WHEN STARTING THE ENGINE.**

To achieve this change it is necessary to take off the wire group which connects connector «35» to fuse n. 4 (red cable) and to connect it to the yellow cable. This wire group is connected to connector «35» through connector «48».

After disconnecting the yellow cable (rear parking light) from connector «40», connect it to fuse n. 4 as indicated in the wiring diagram.

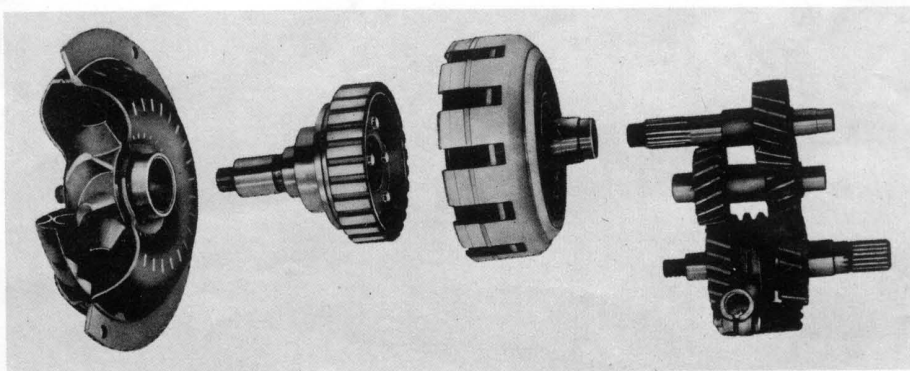
Connector «35» will be re-fitted, into the unit for turn indicator lights.

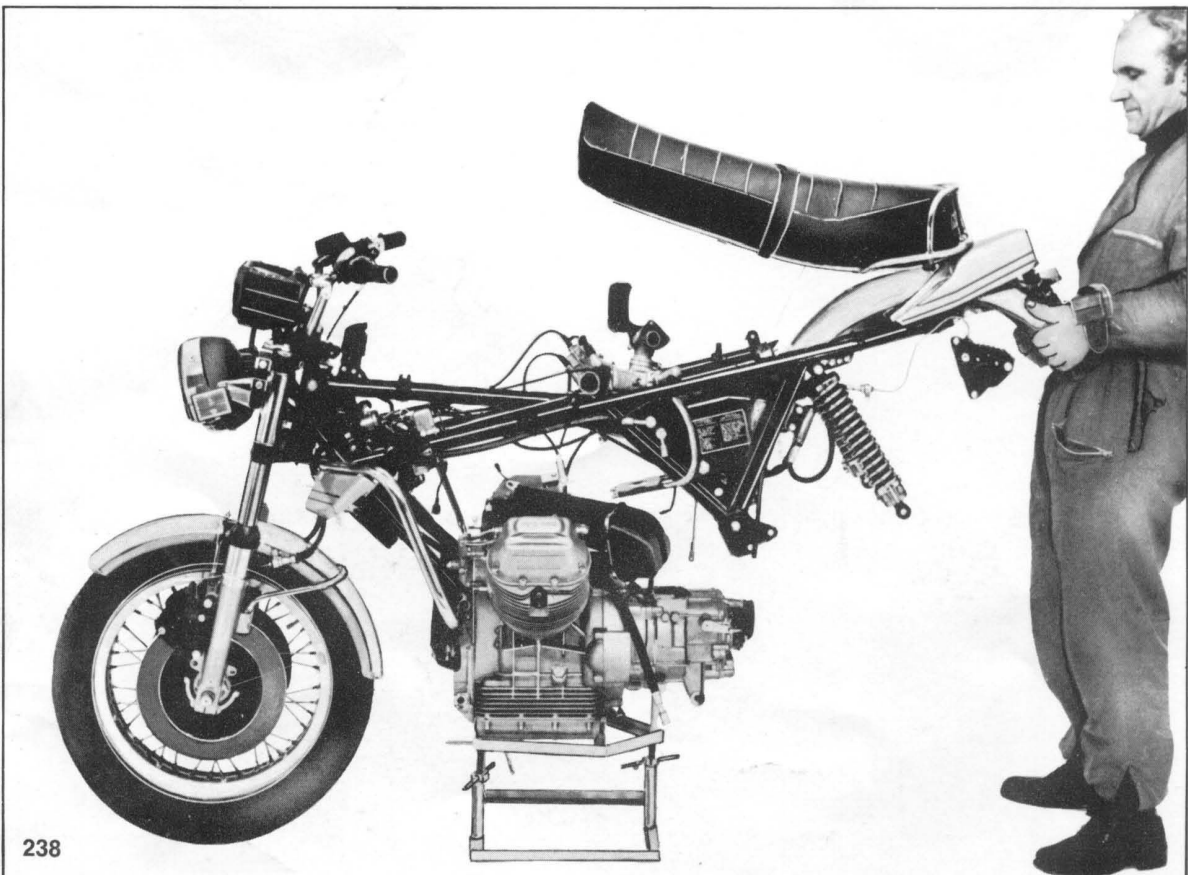
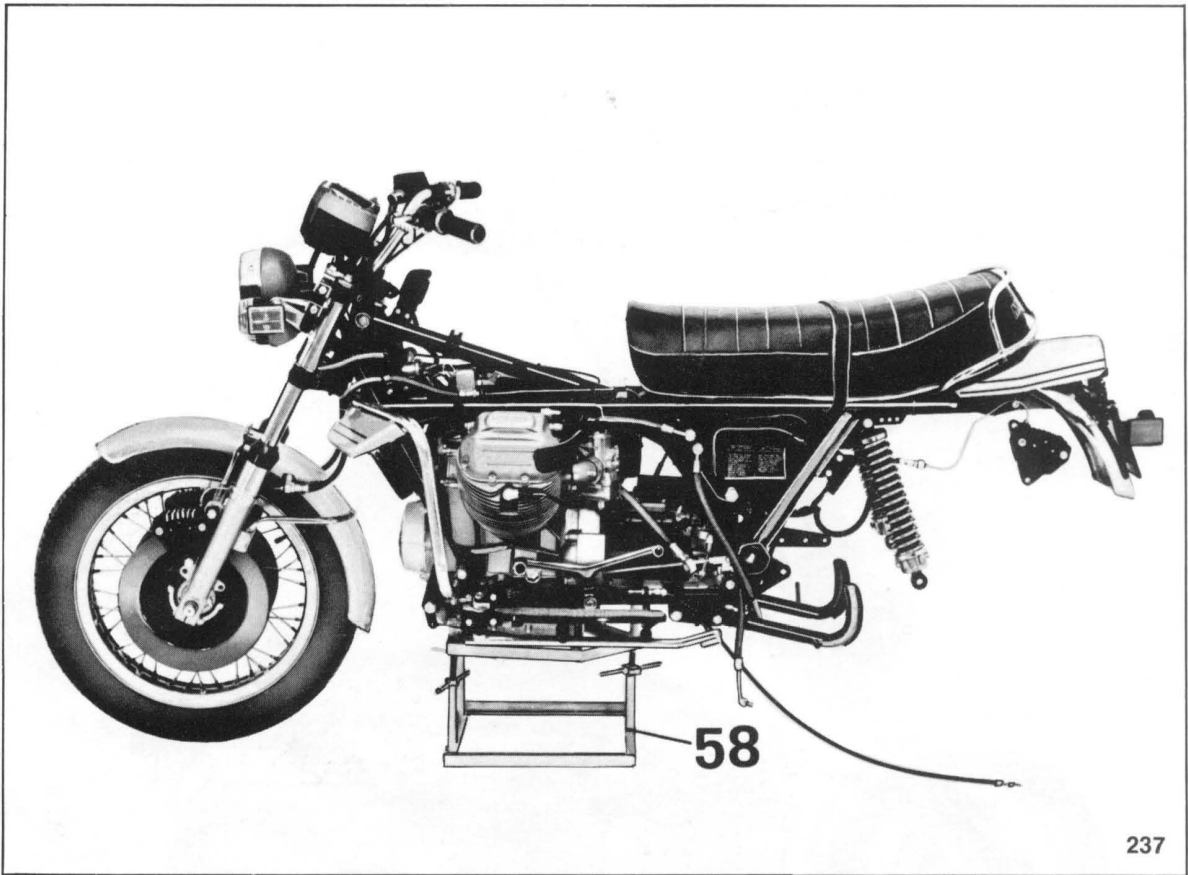
This change accomplished, notice that instrument lights and indicator light «1» (Low beam) are not protected by fuse n. 3.

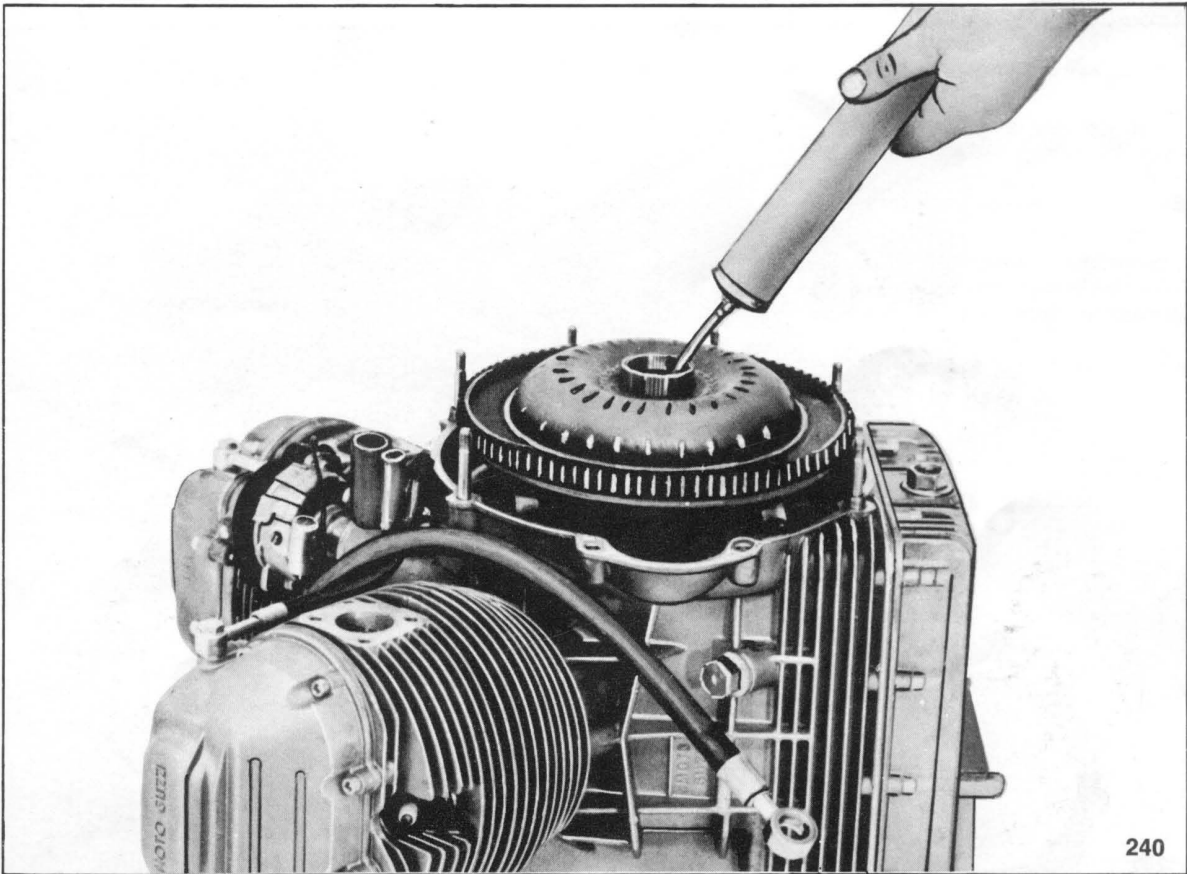
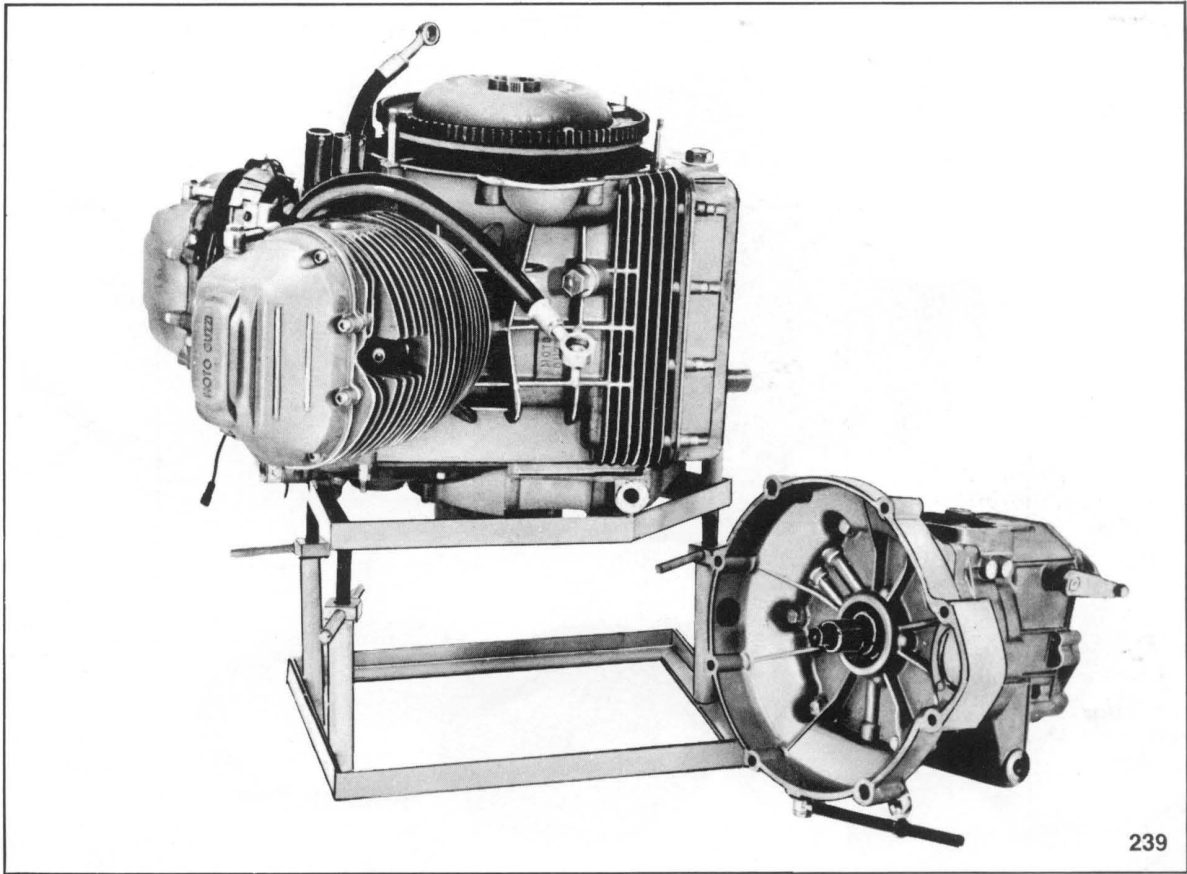


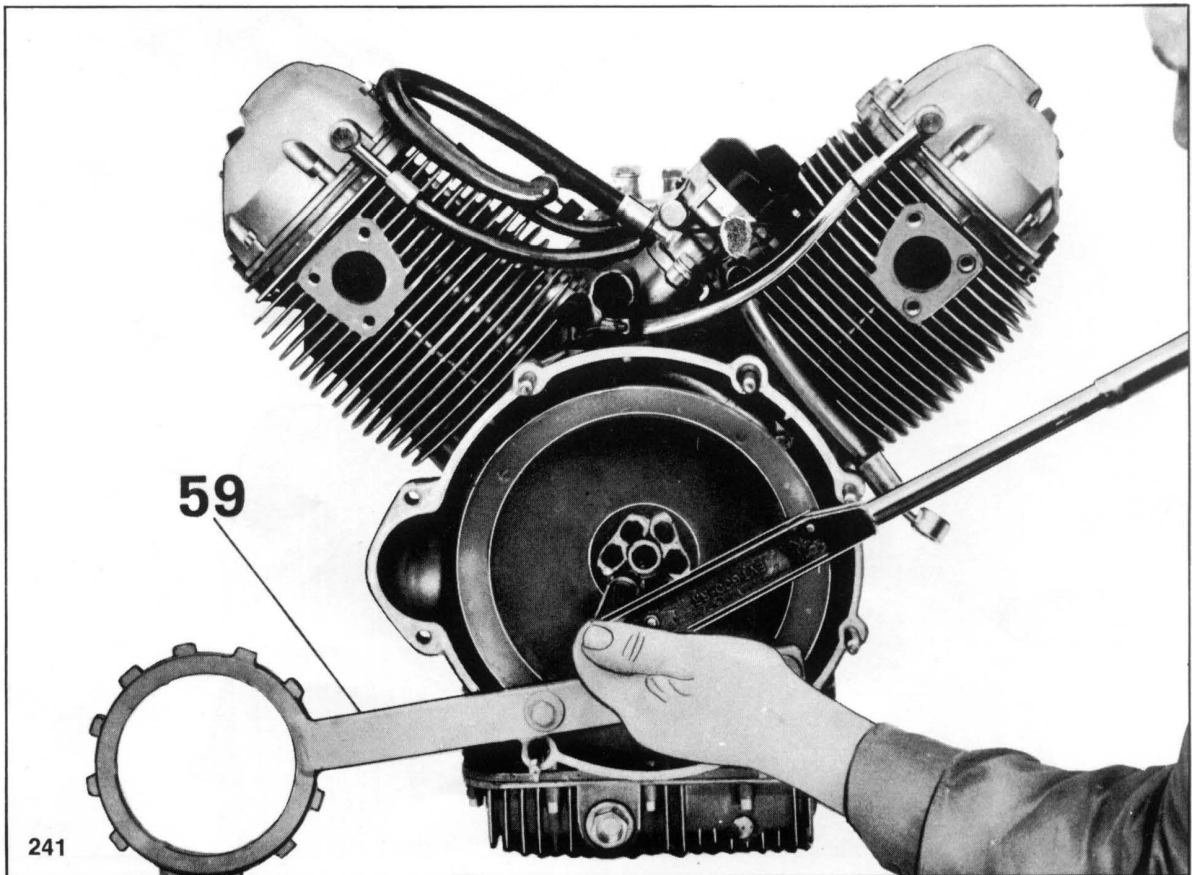
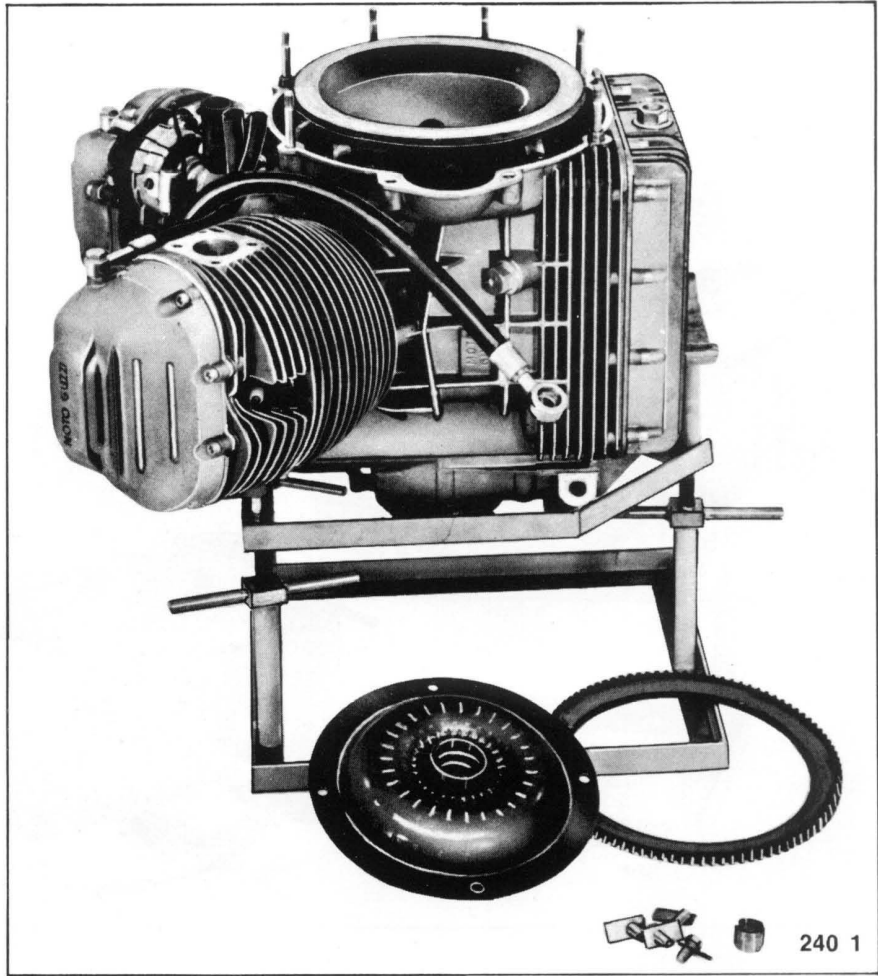


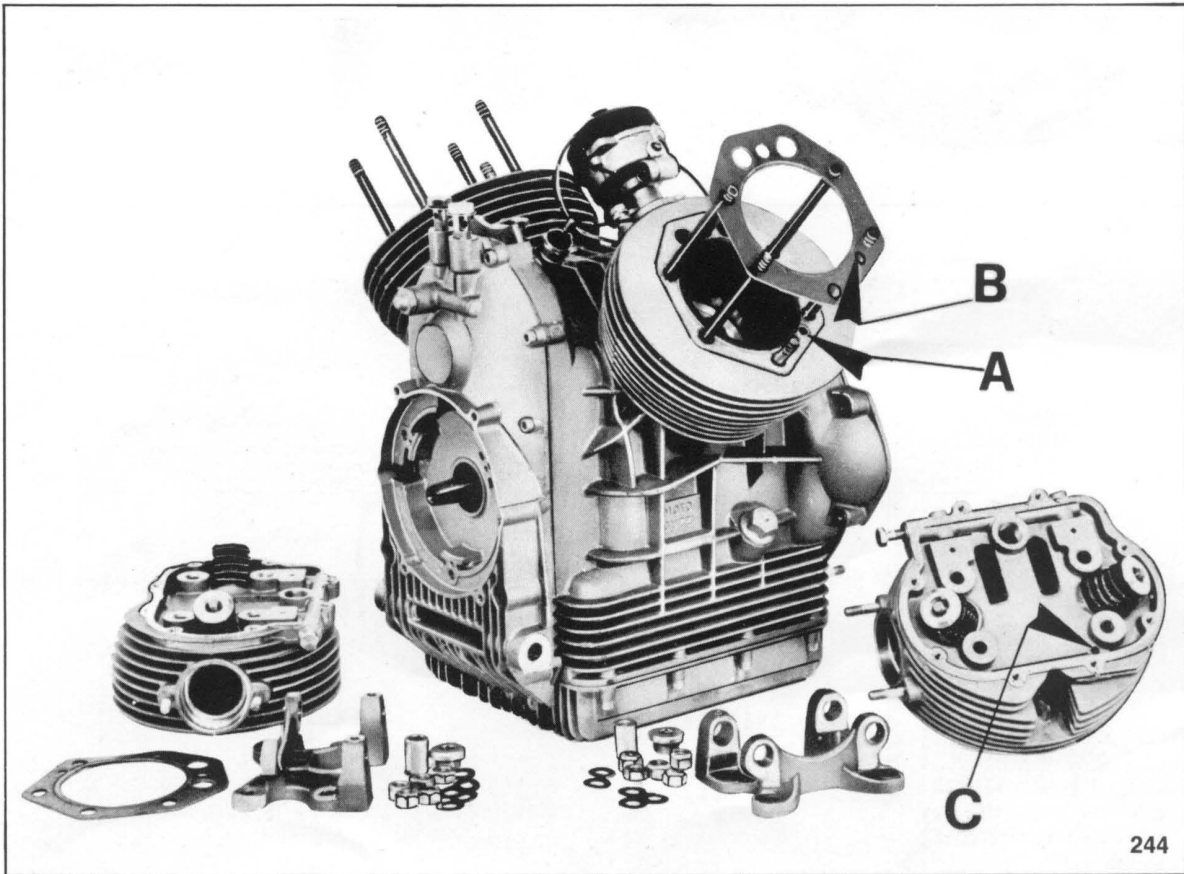
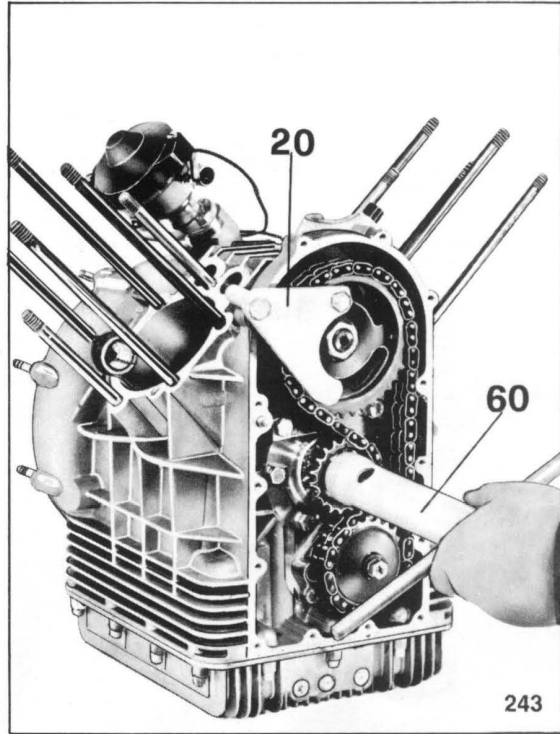
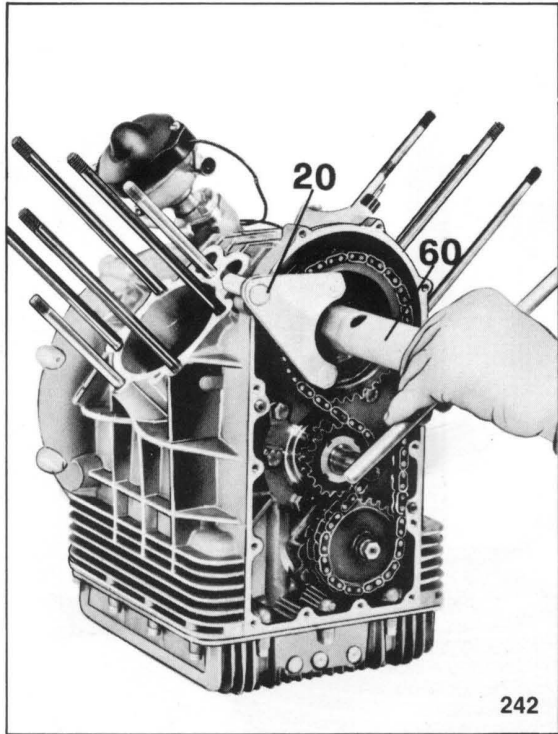
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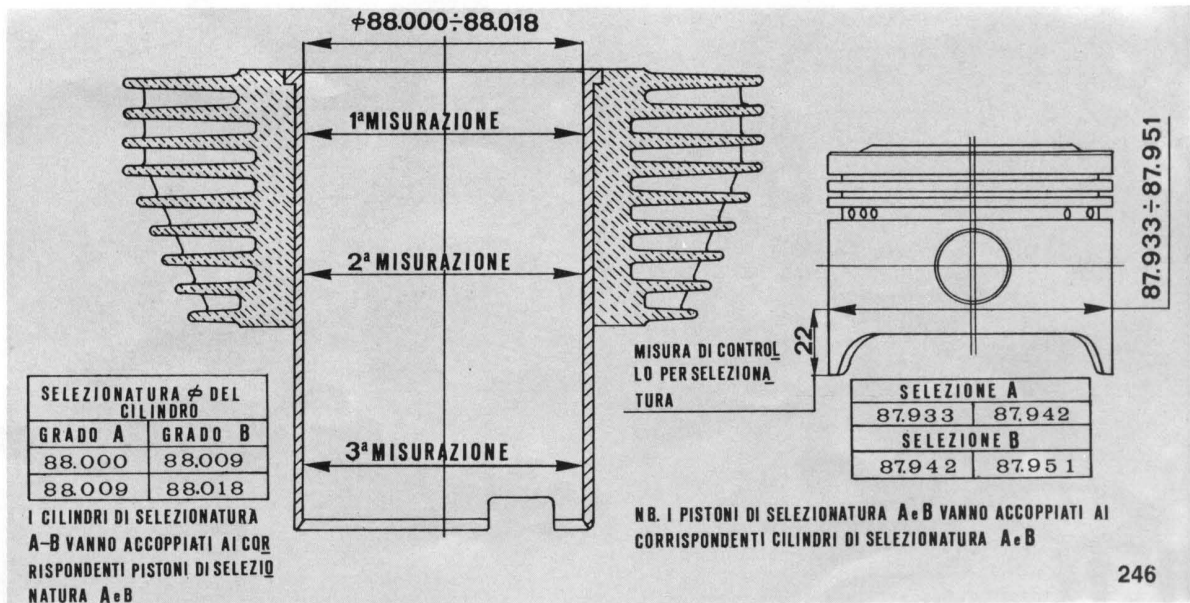




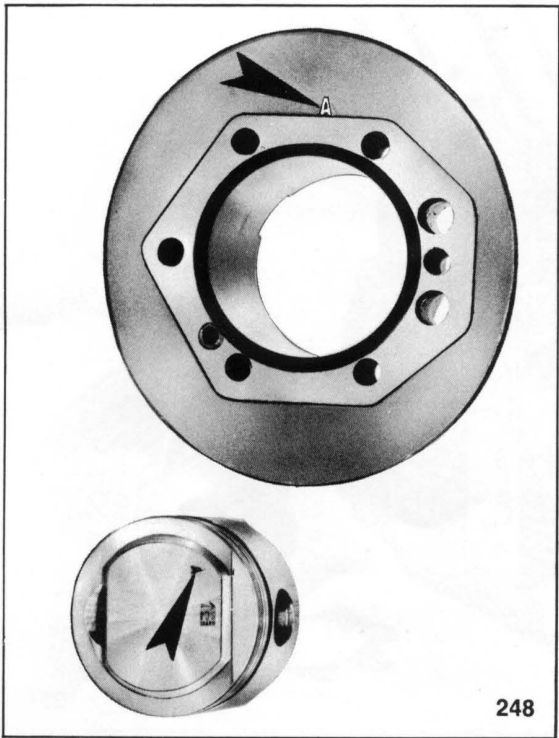
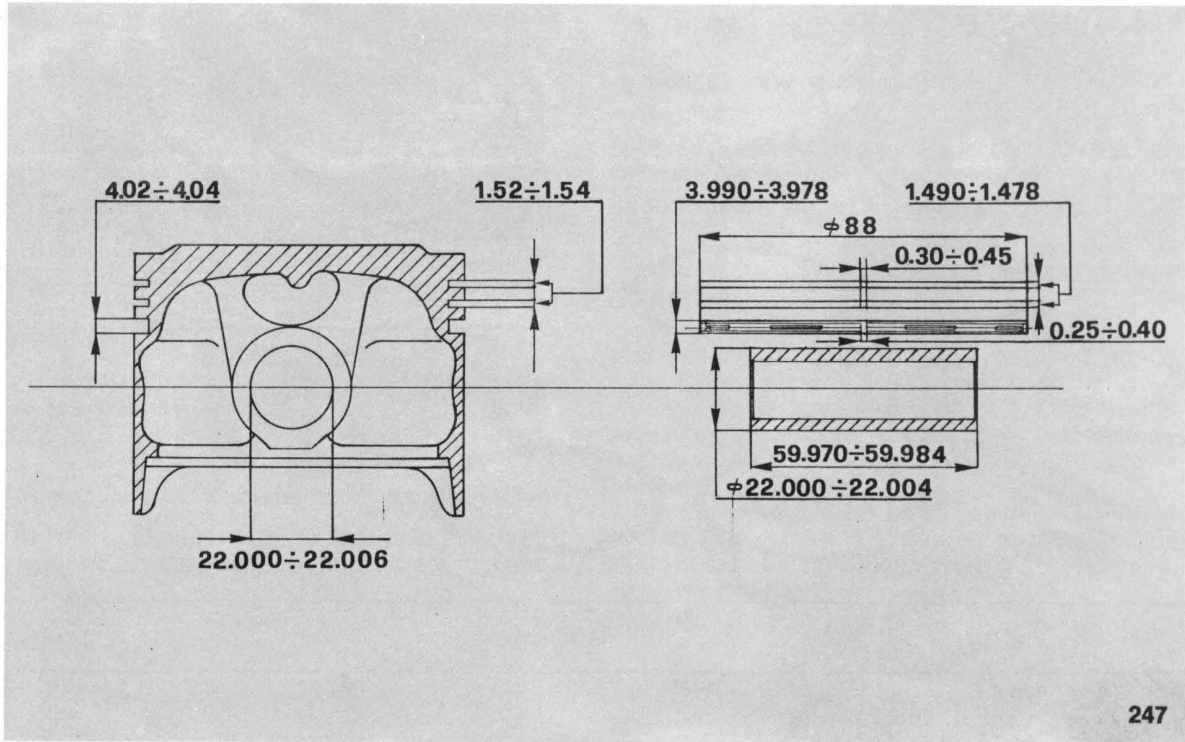


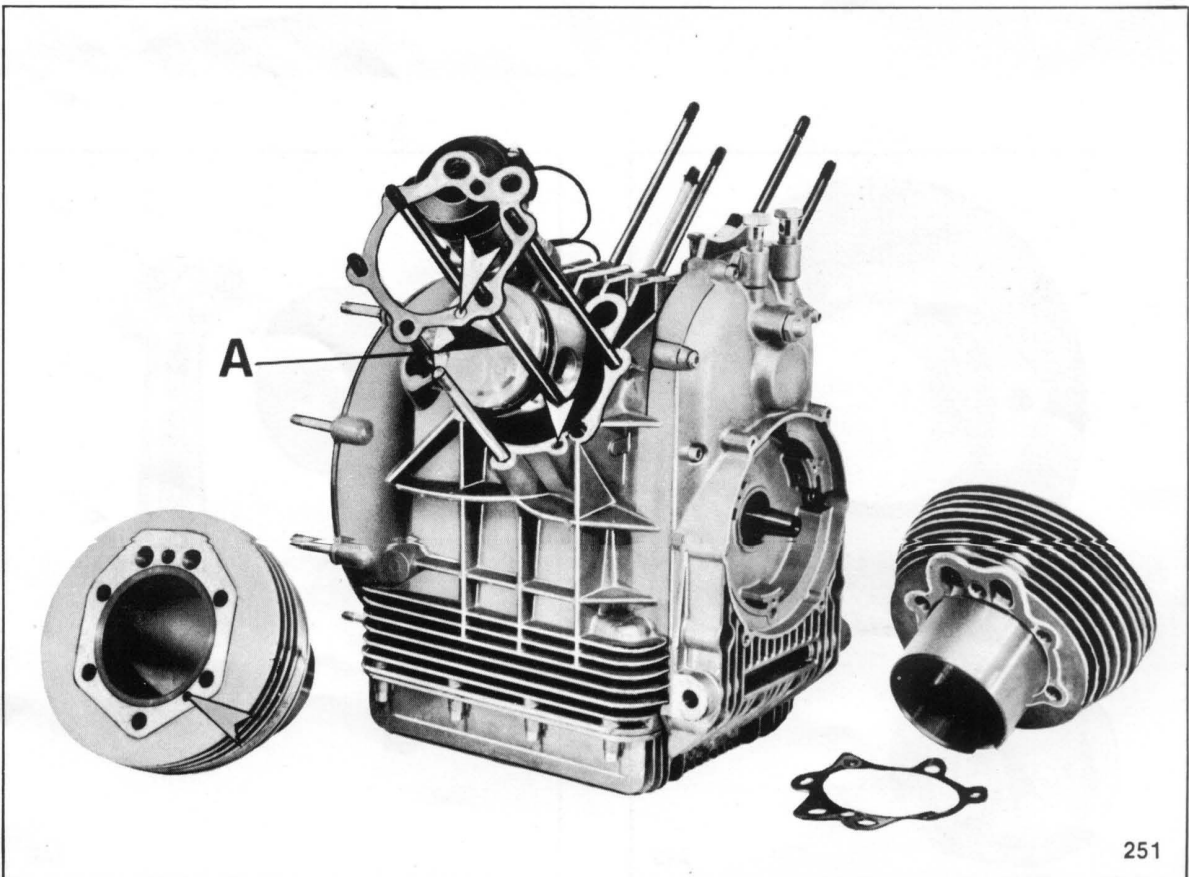
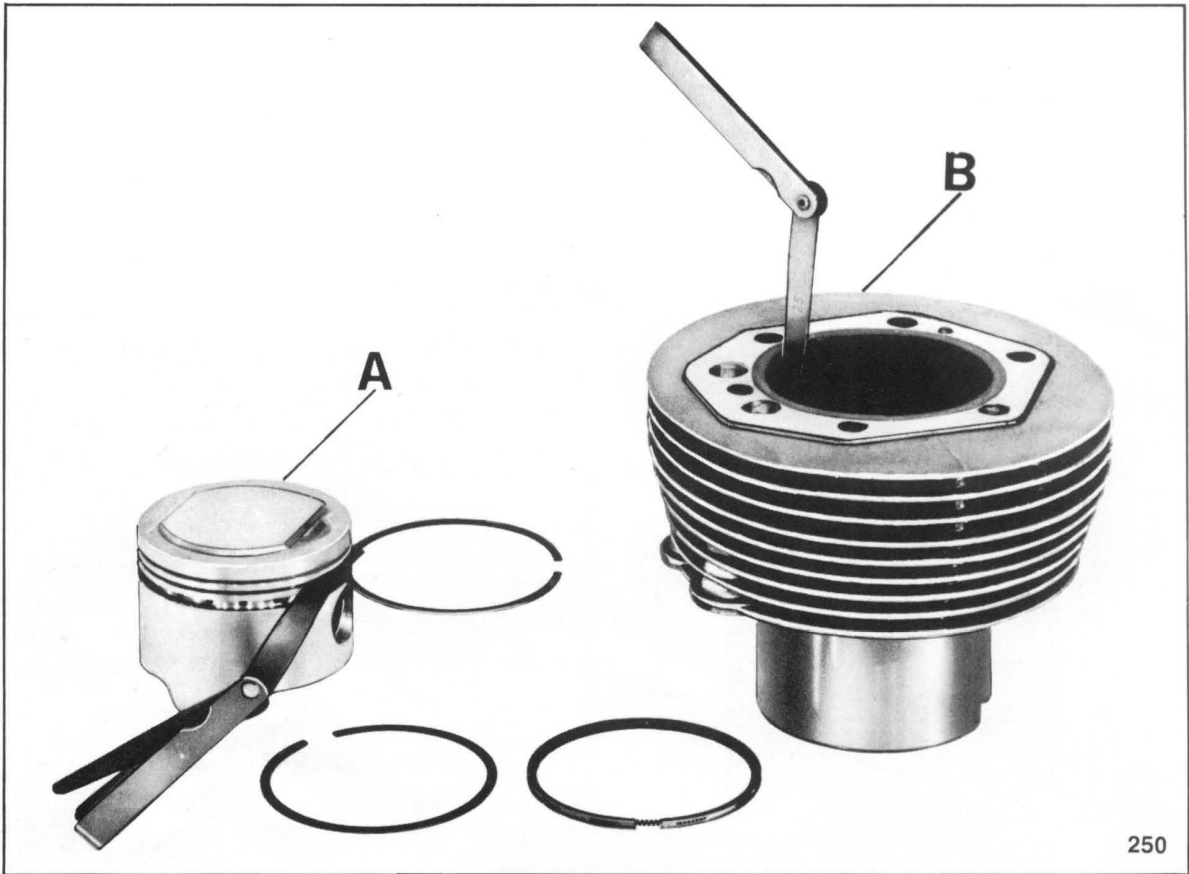


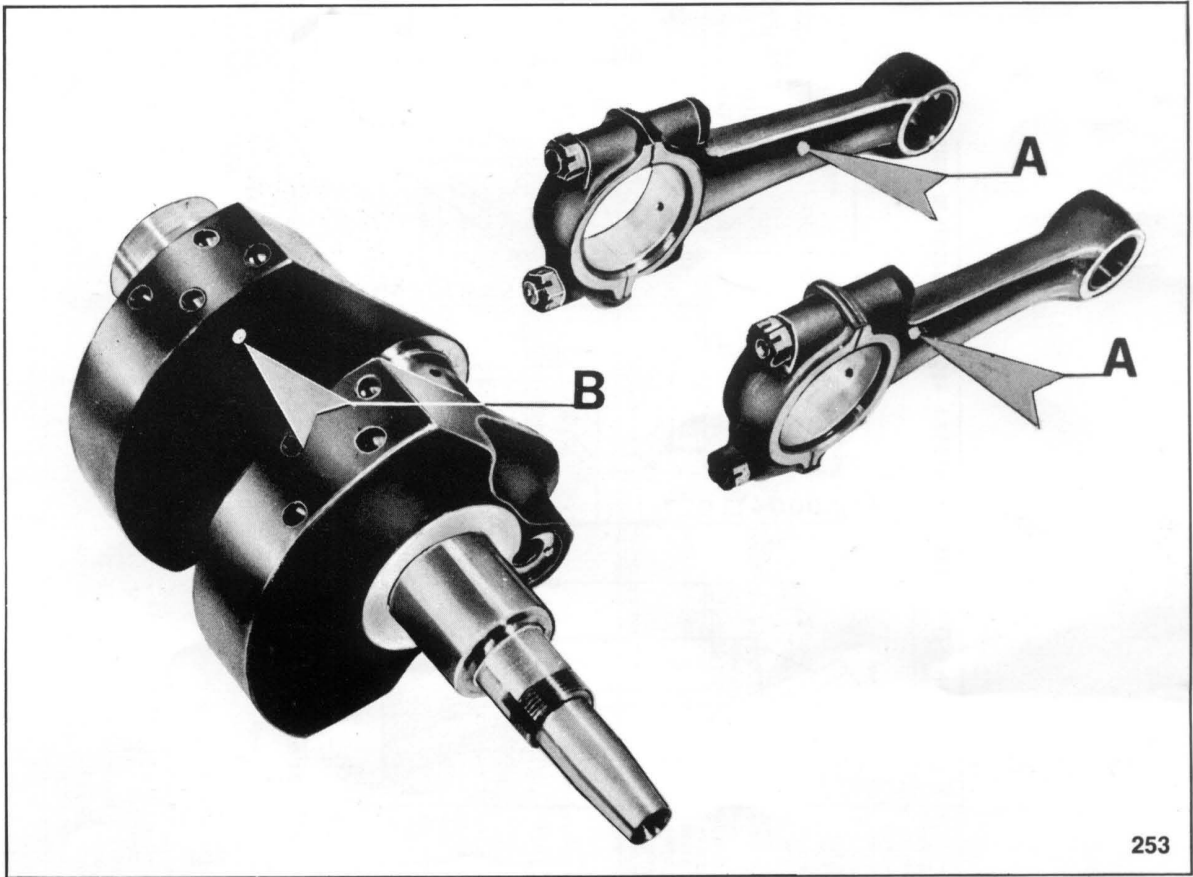
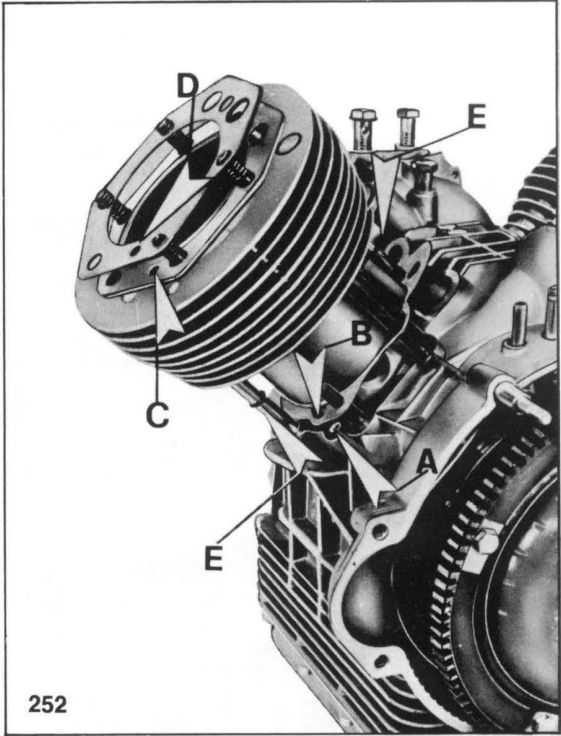
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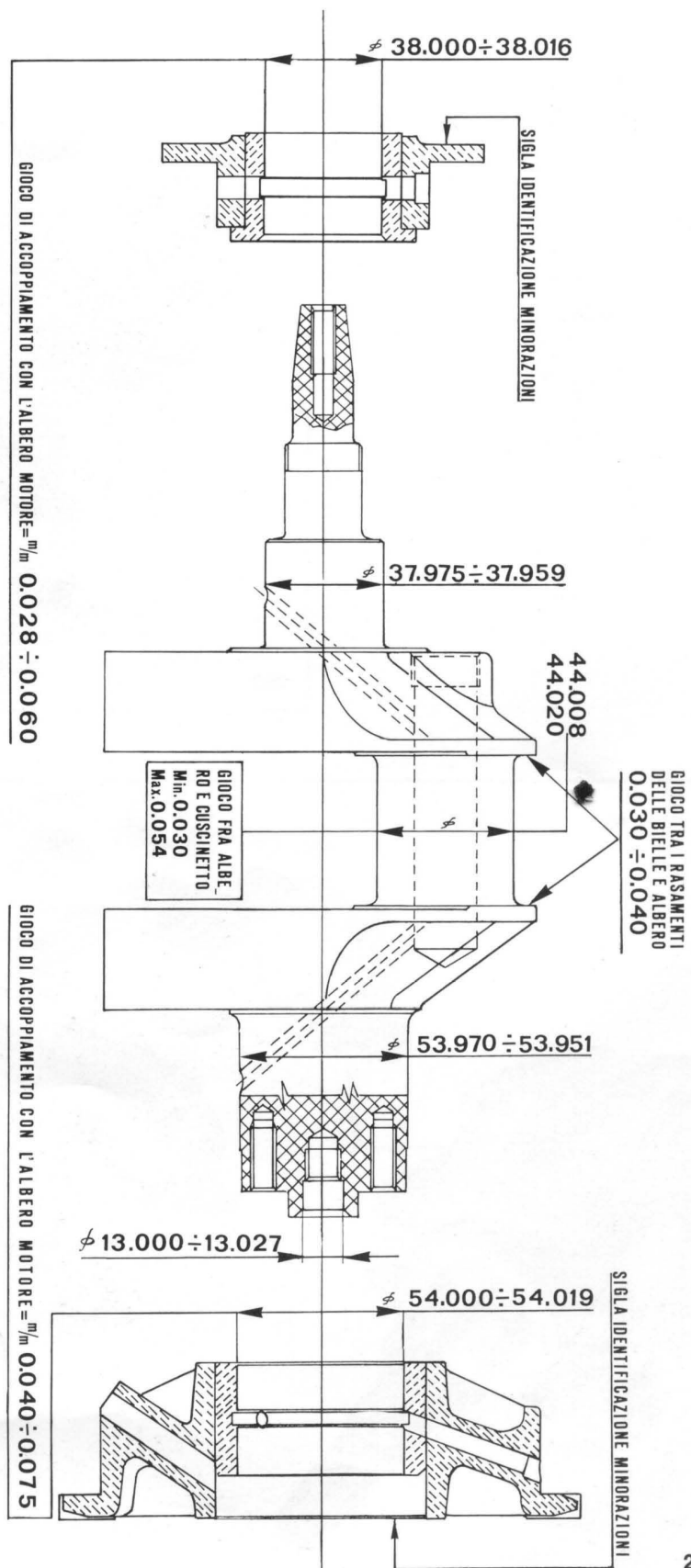


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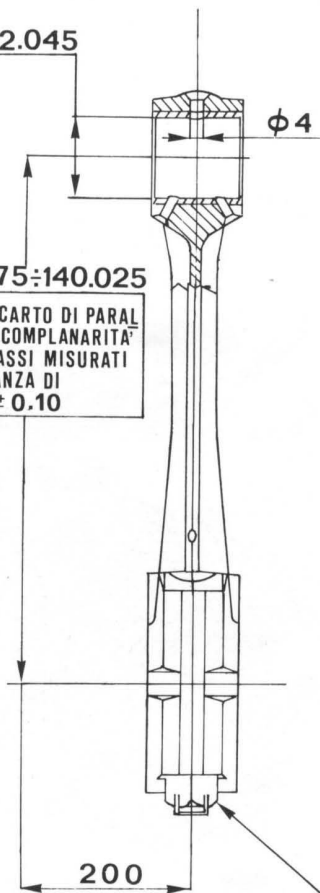


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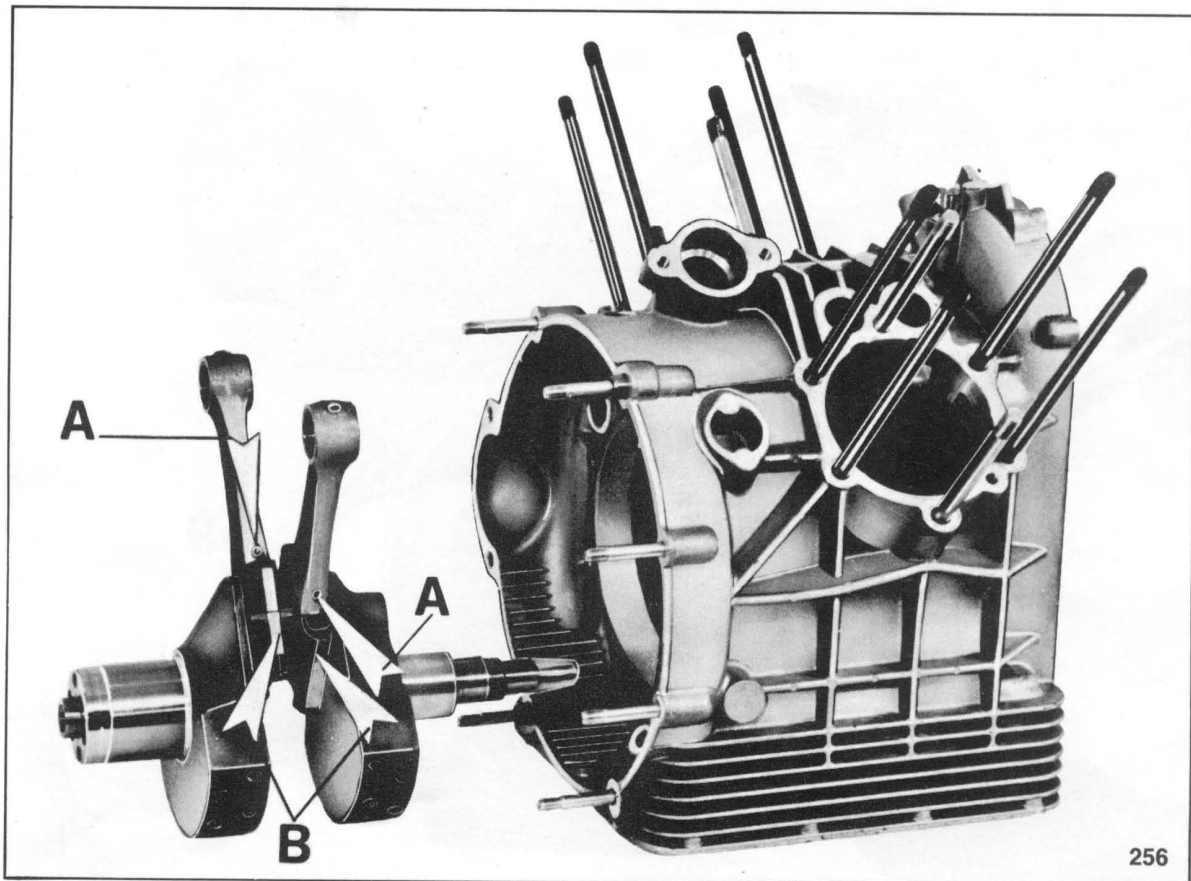
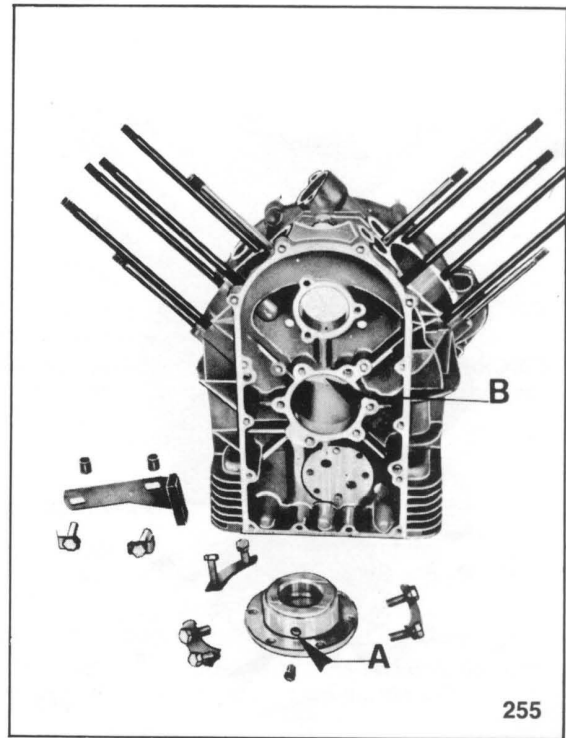
139.975 ÷ 140.025

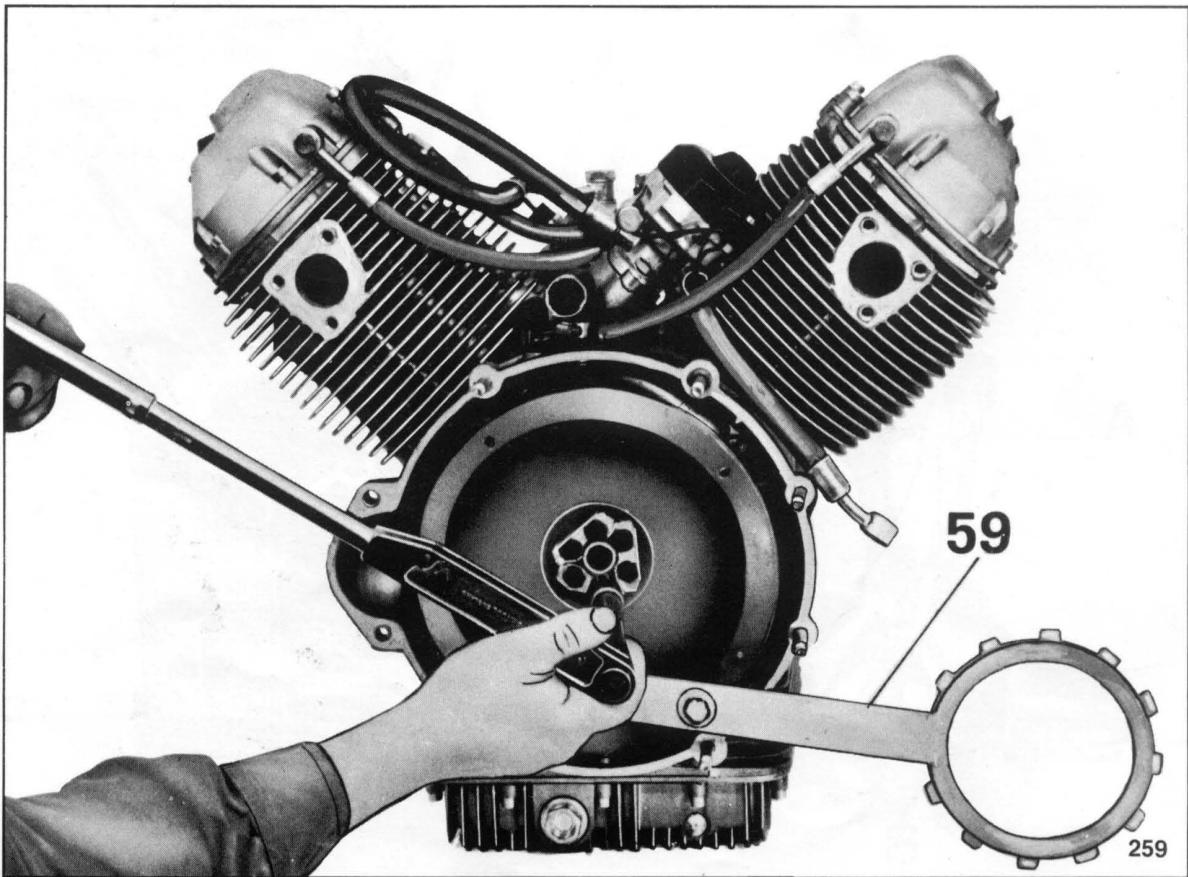
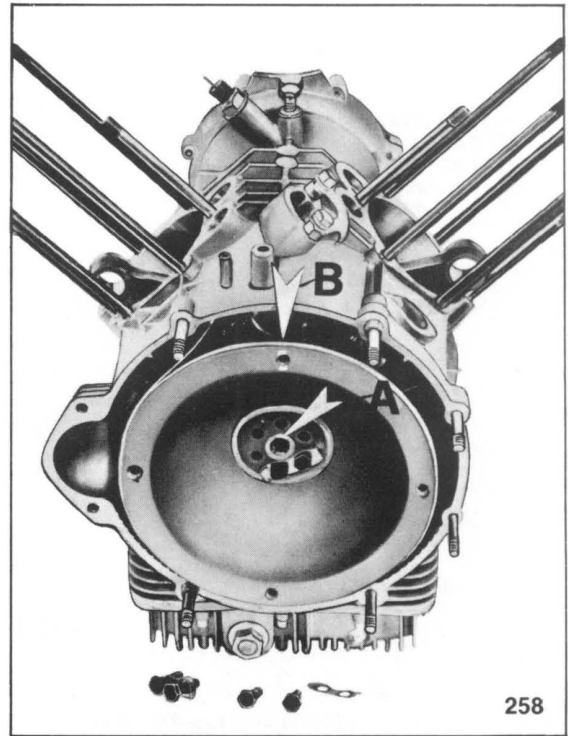
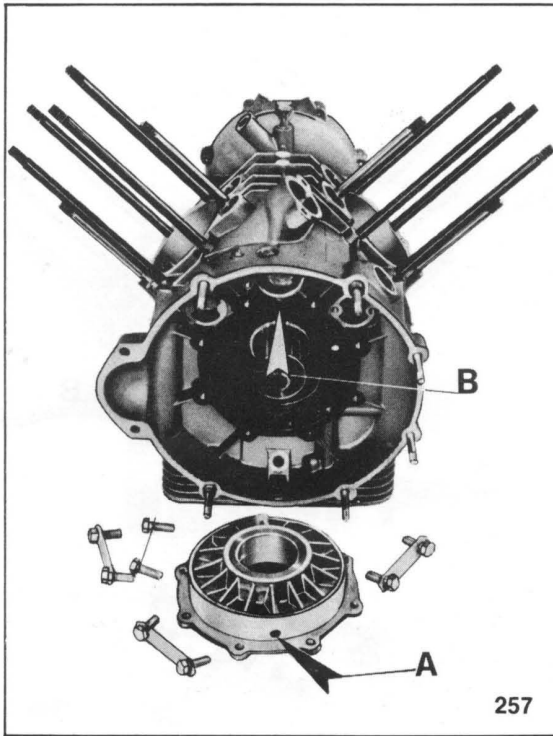
MASSIMO SCARTO DI PARALLELISMO E COMPLANARITÀ TRA I DUE ASSI MISURATI ALLA DISTANZA DI m/m 200 ± 0.10

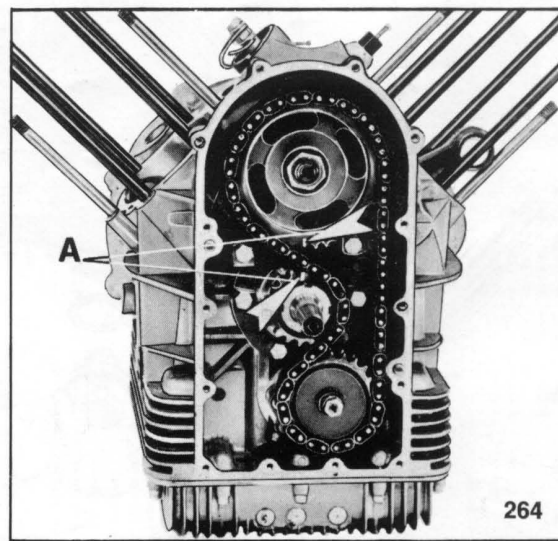
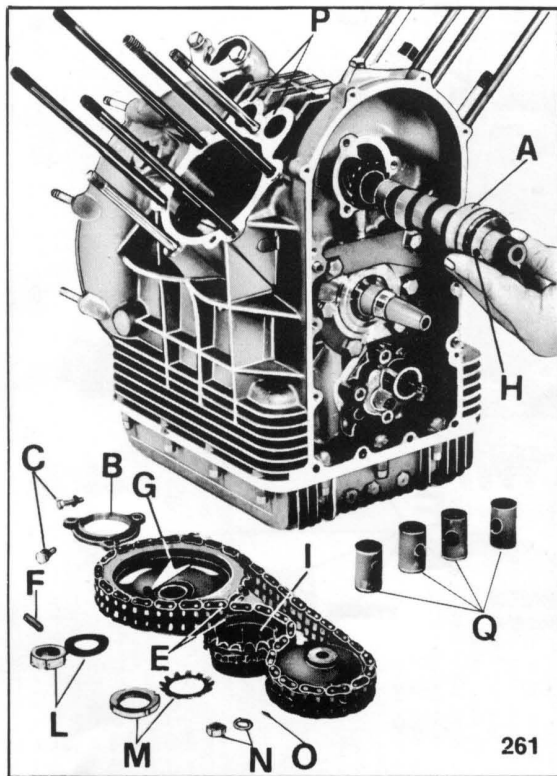
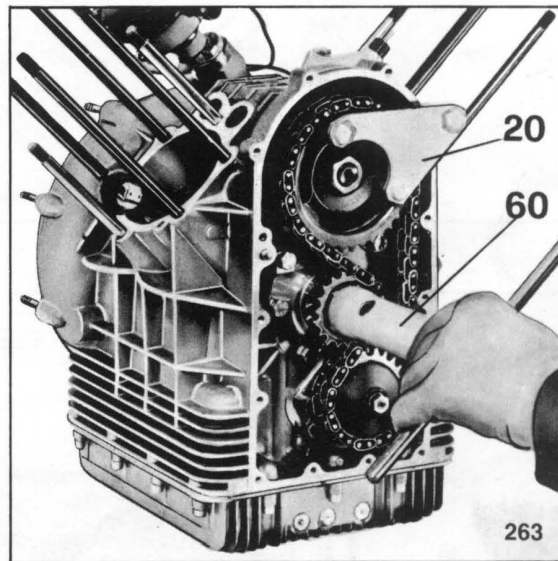
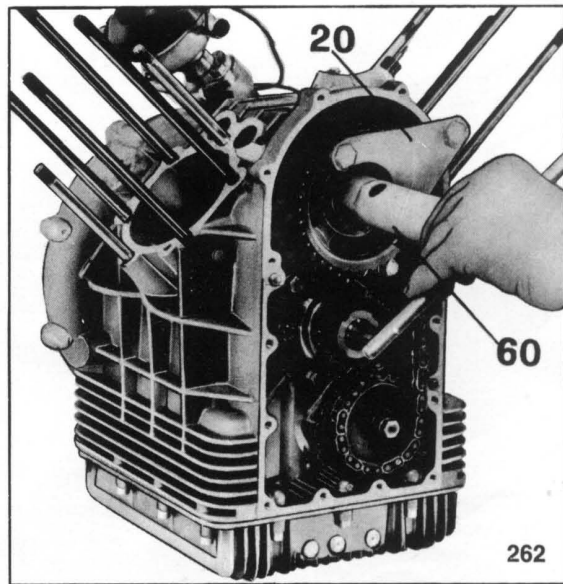
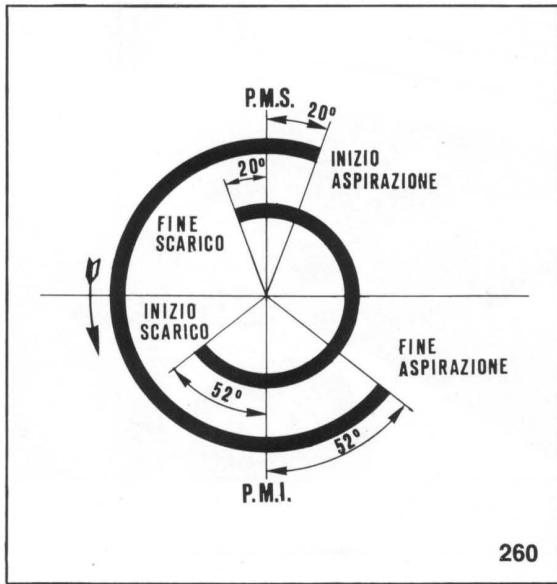
COPPIA SERRAGGIO DADI Kg m 4.6 ÷ 4.8



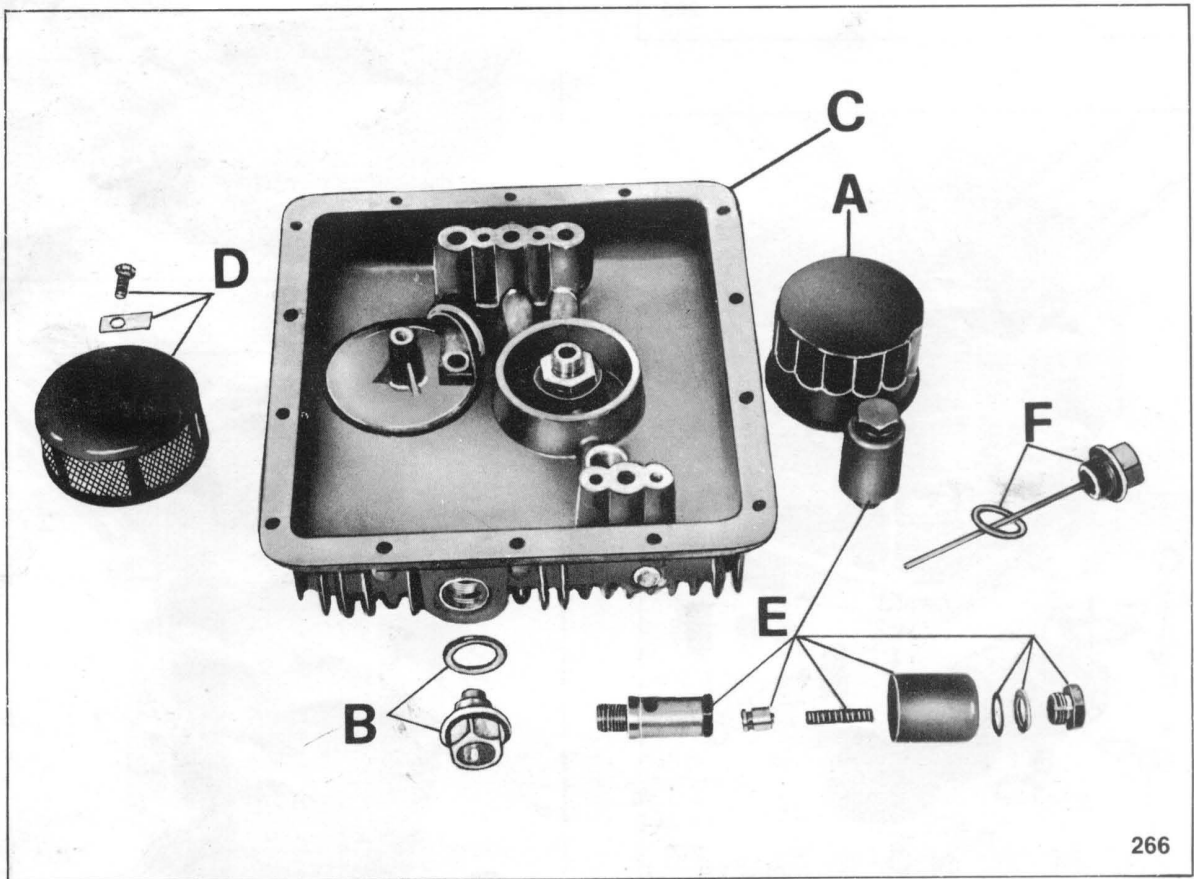
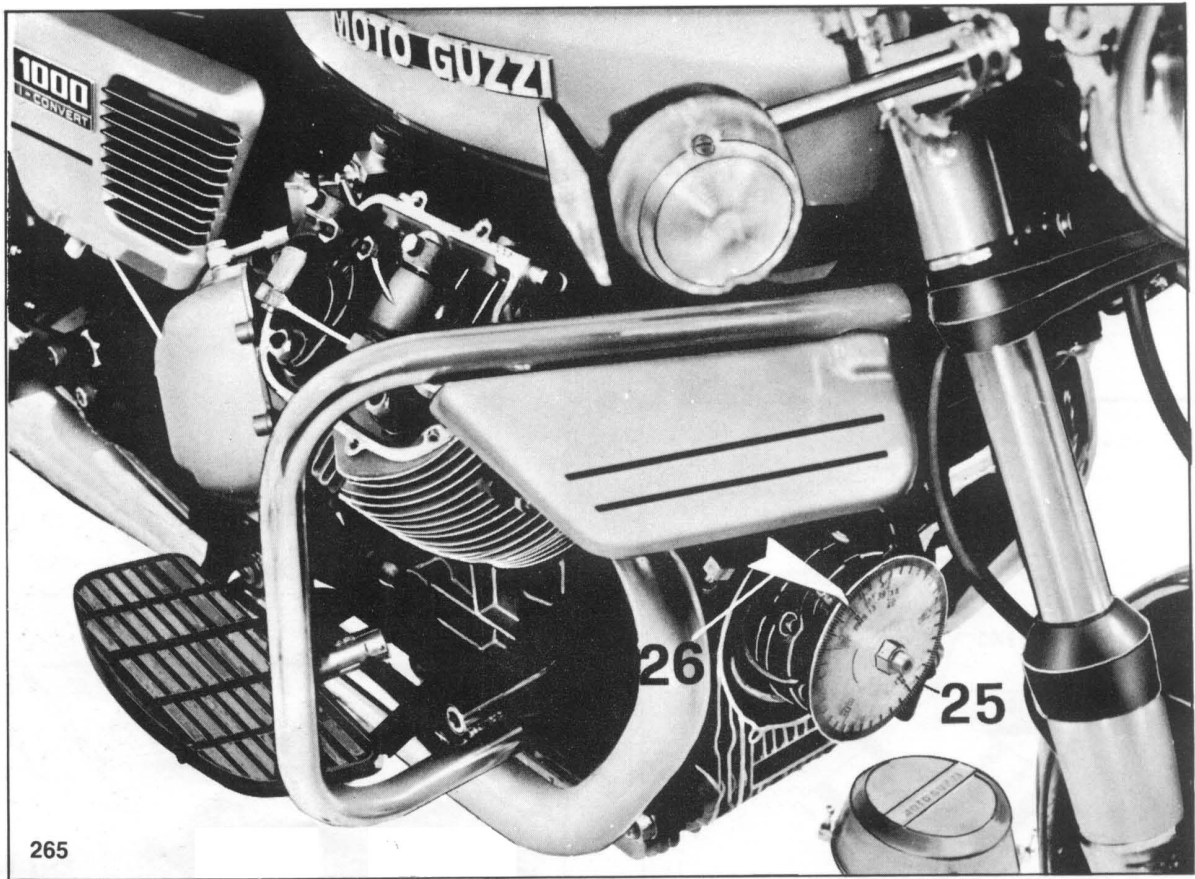
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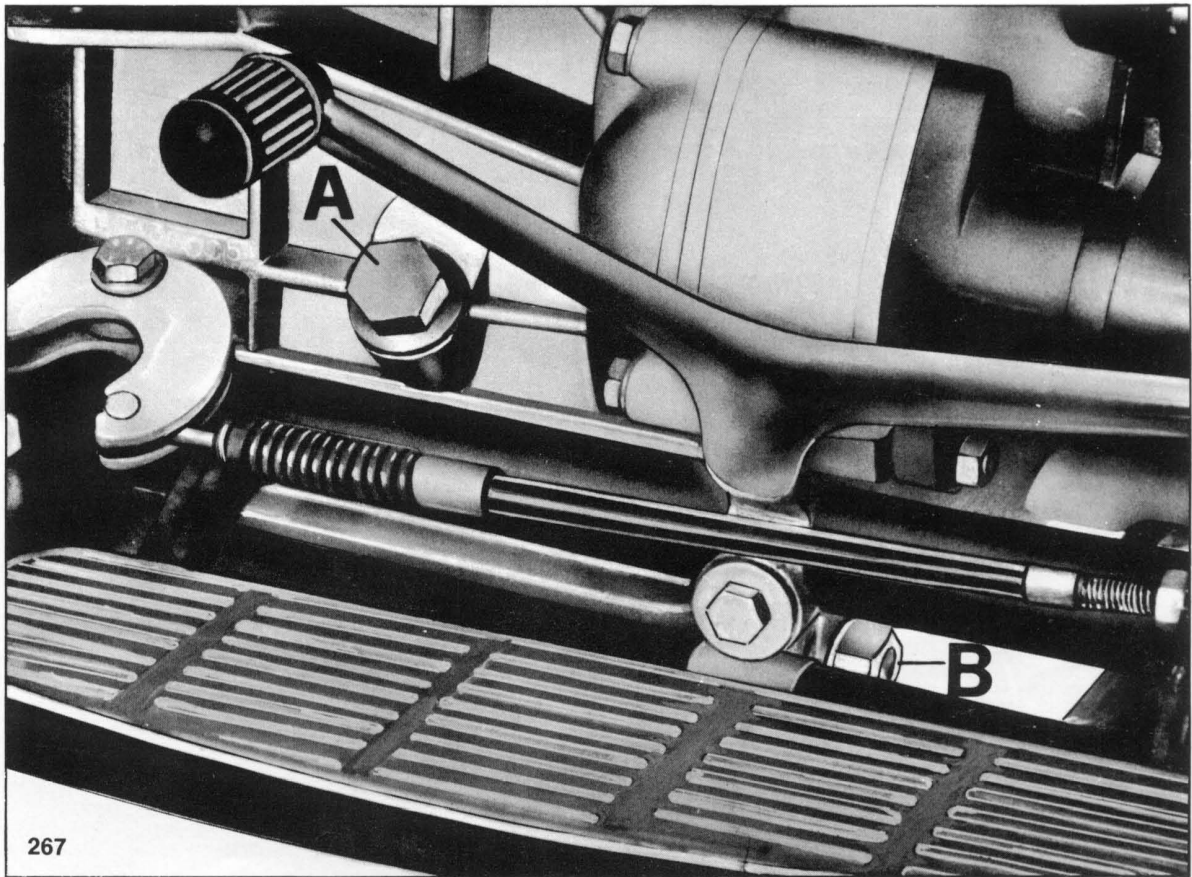




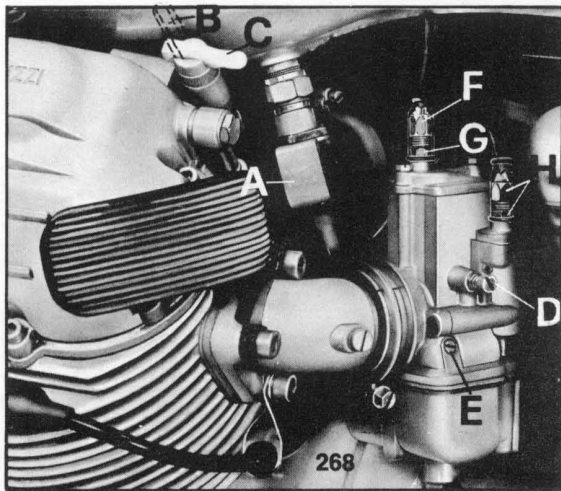




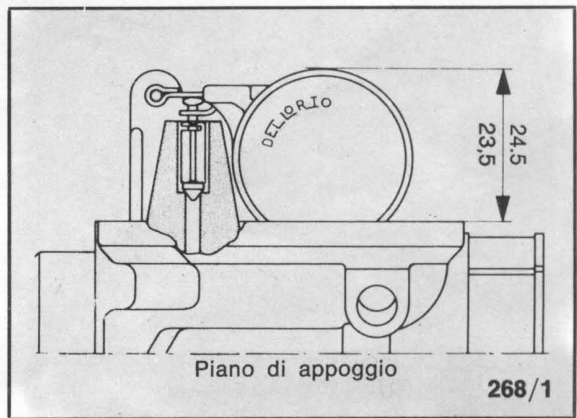


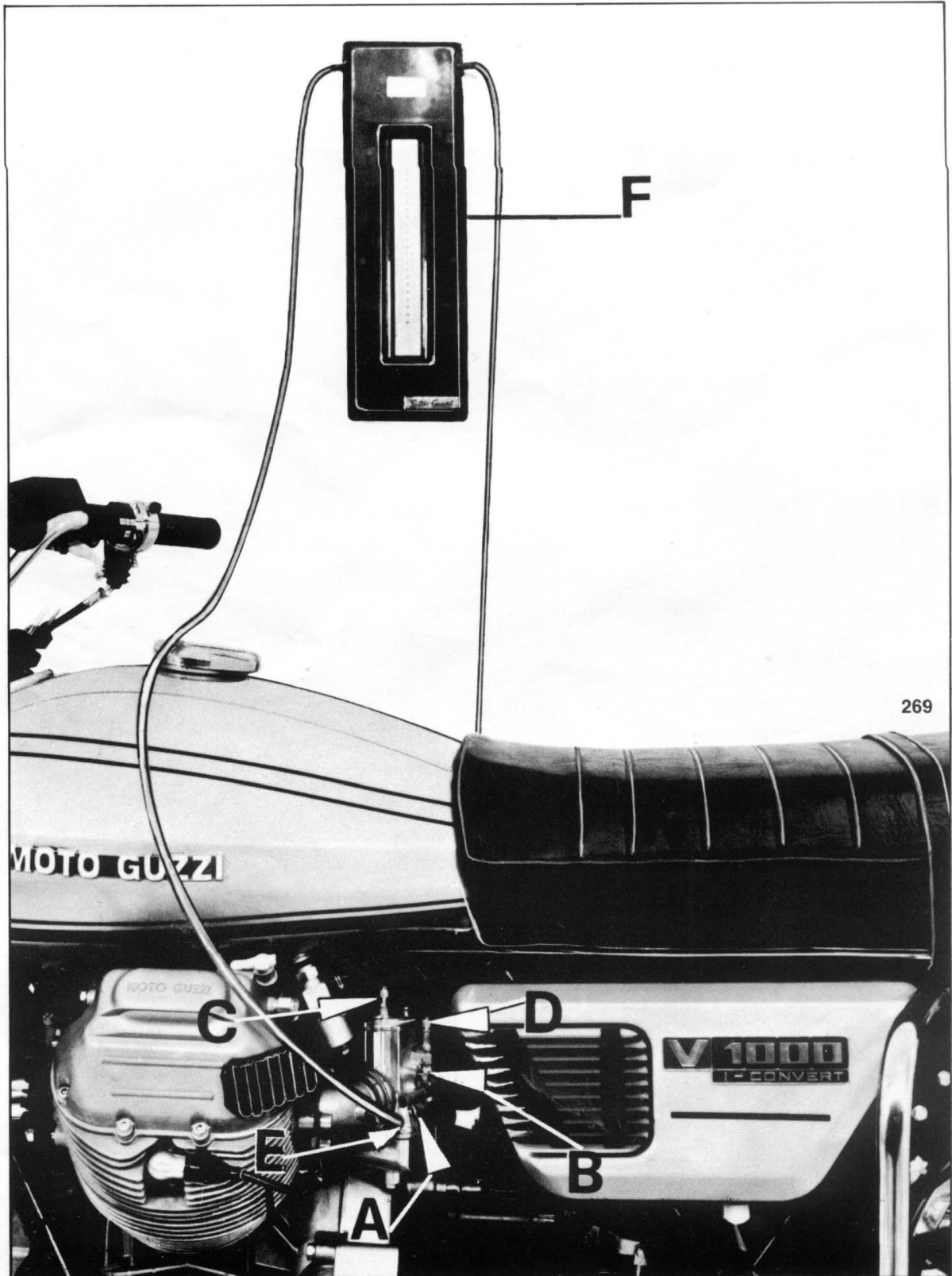


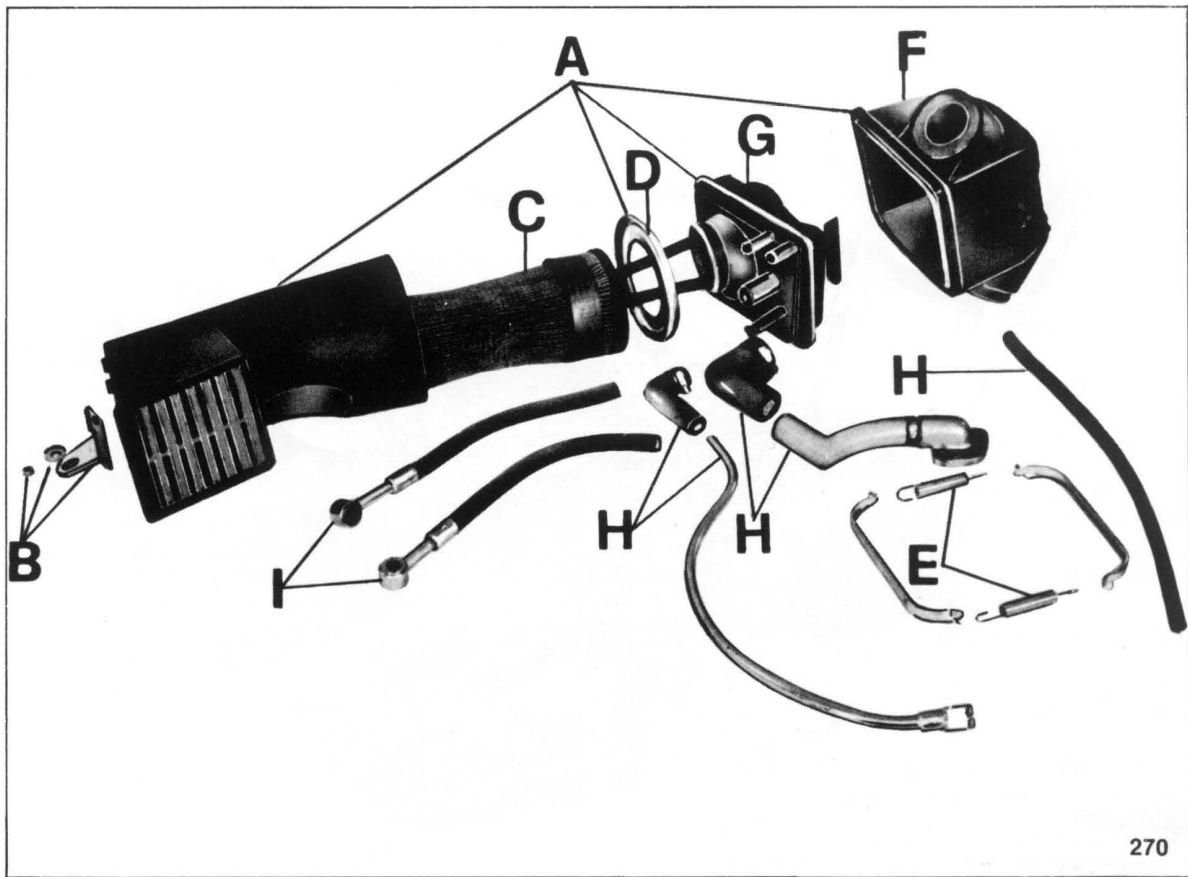
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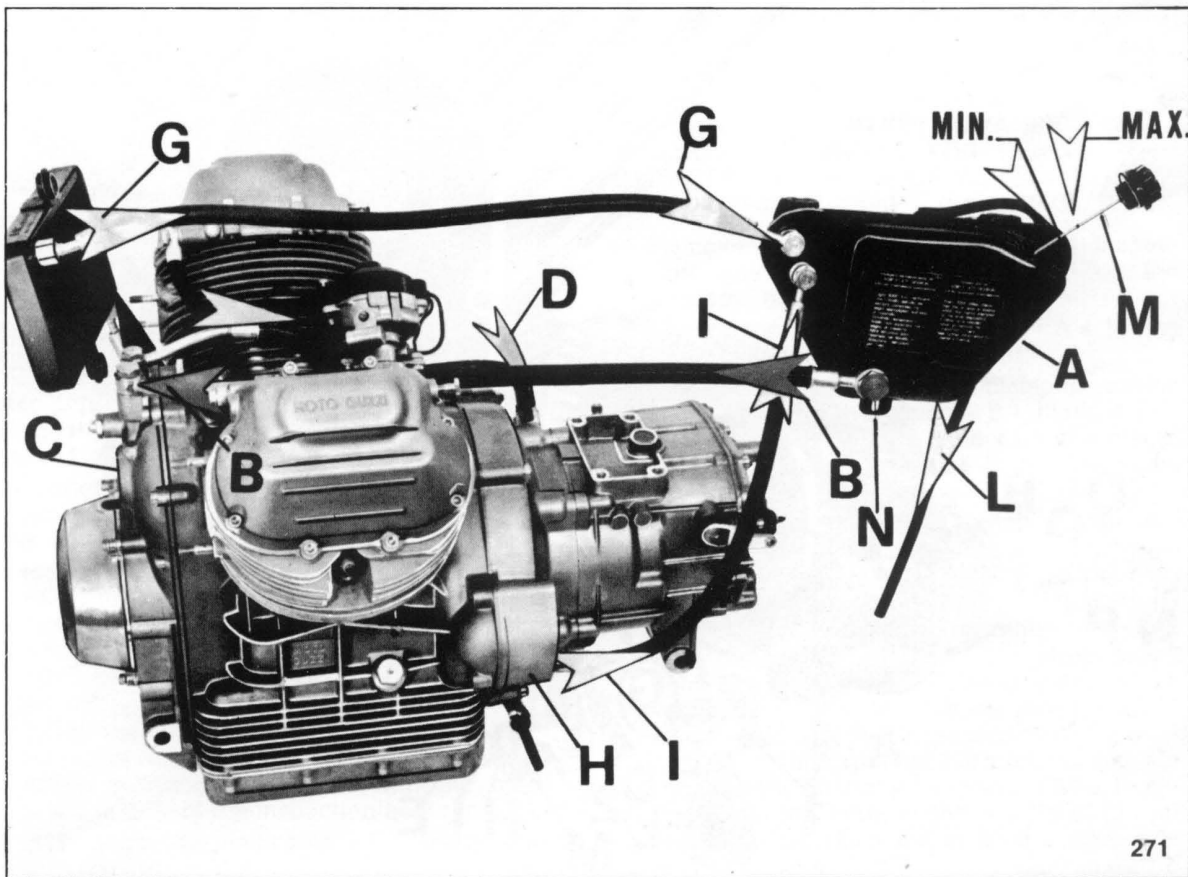
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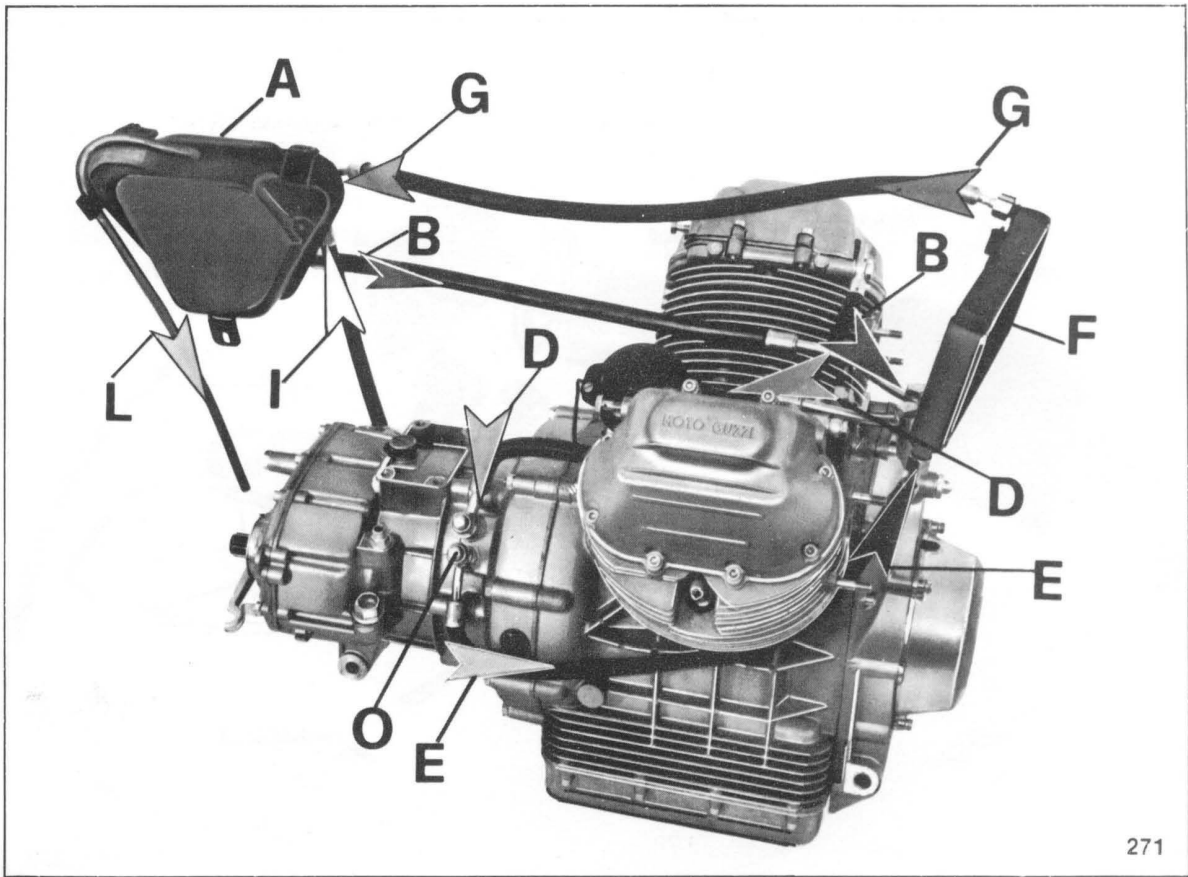




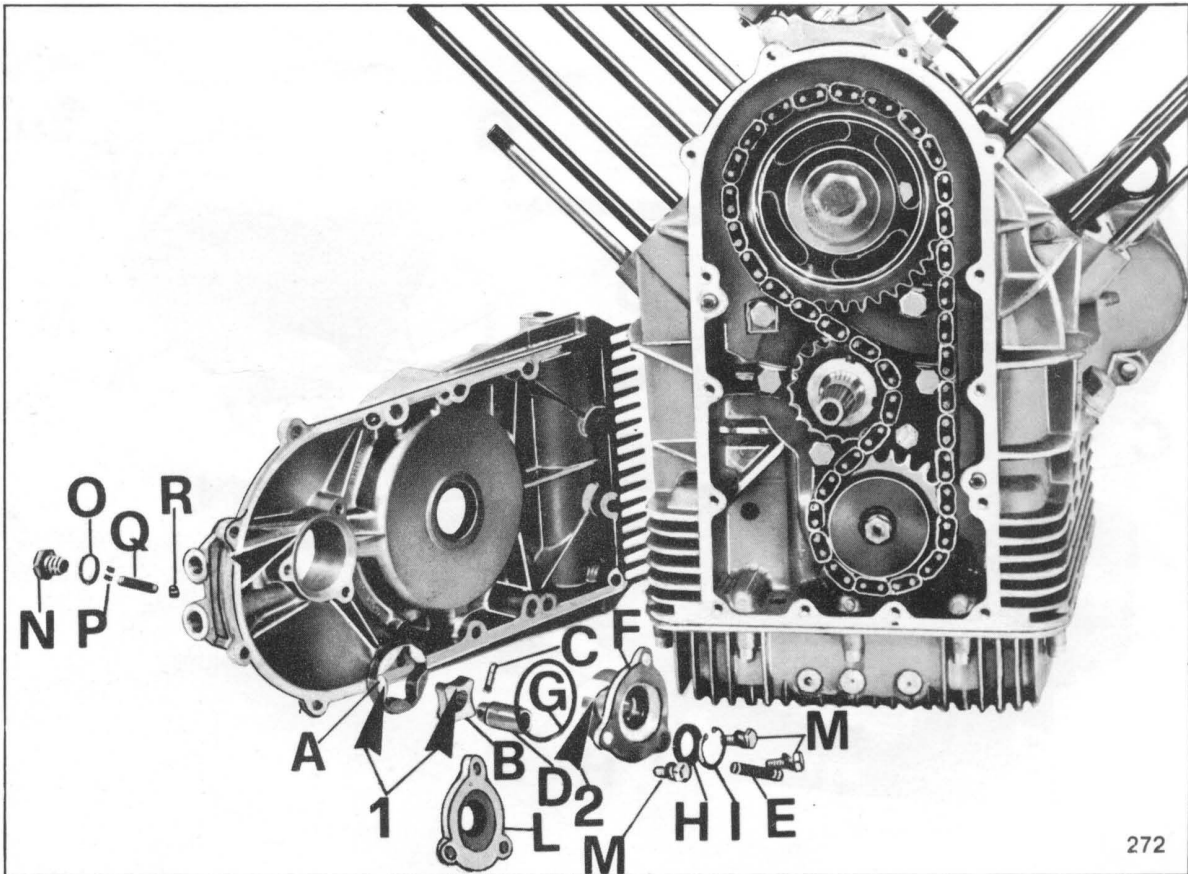
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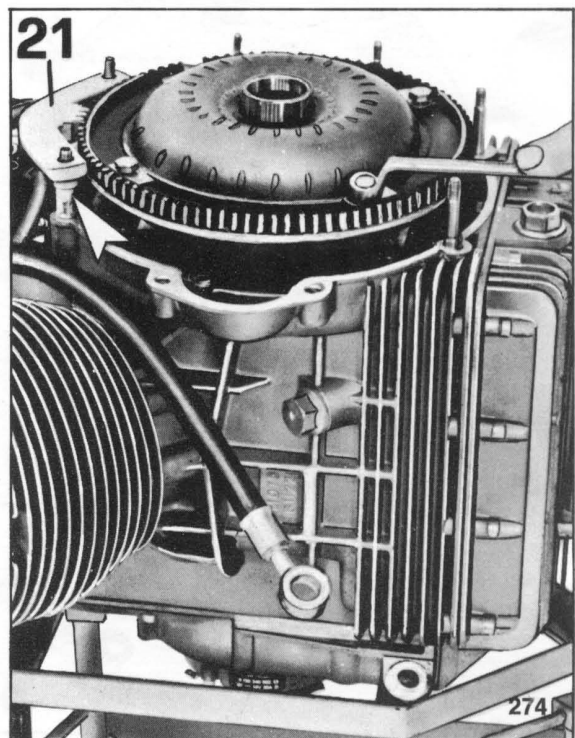
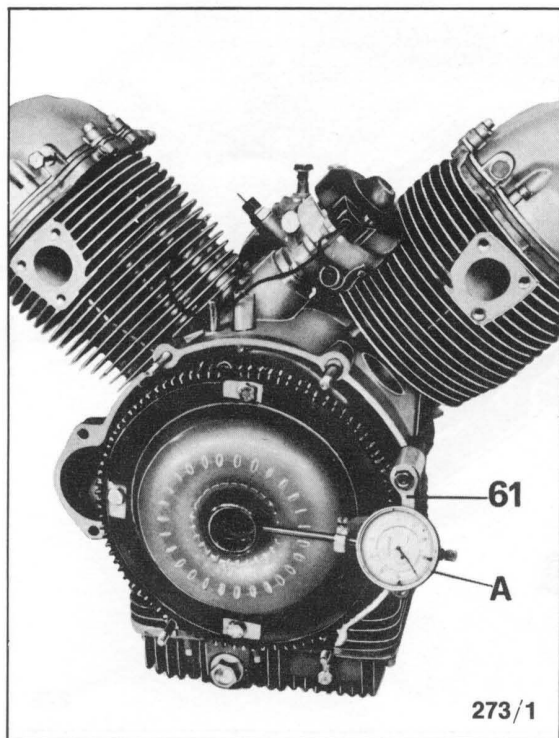
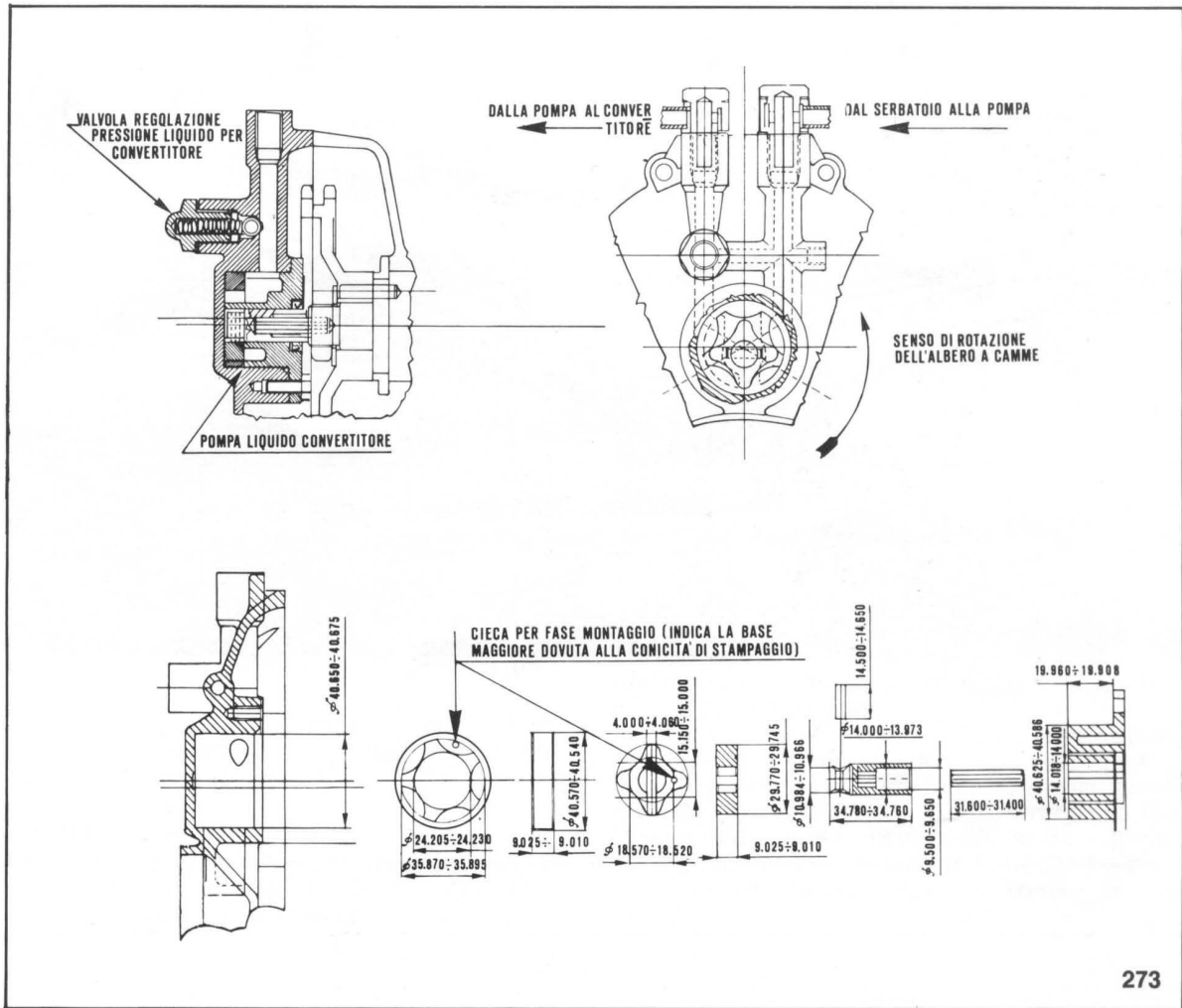
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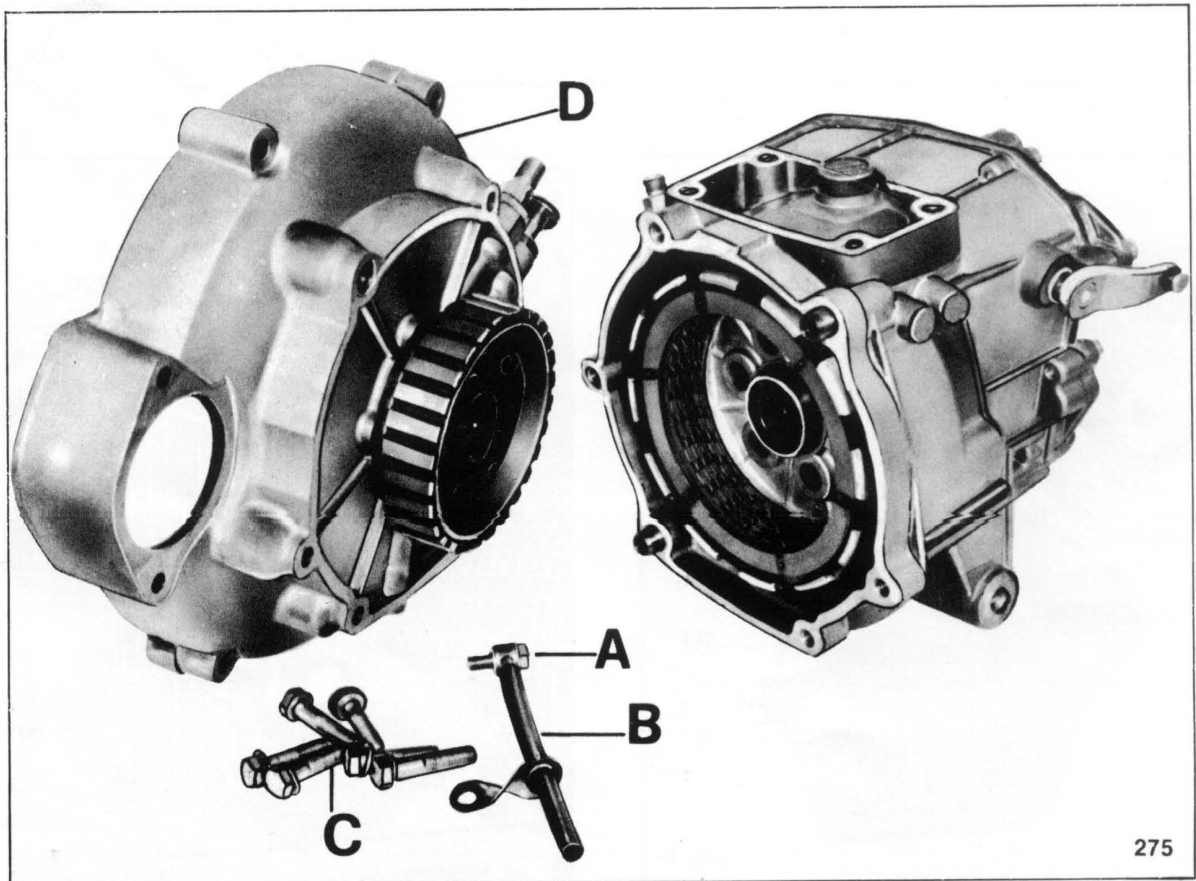
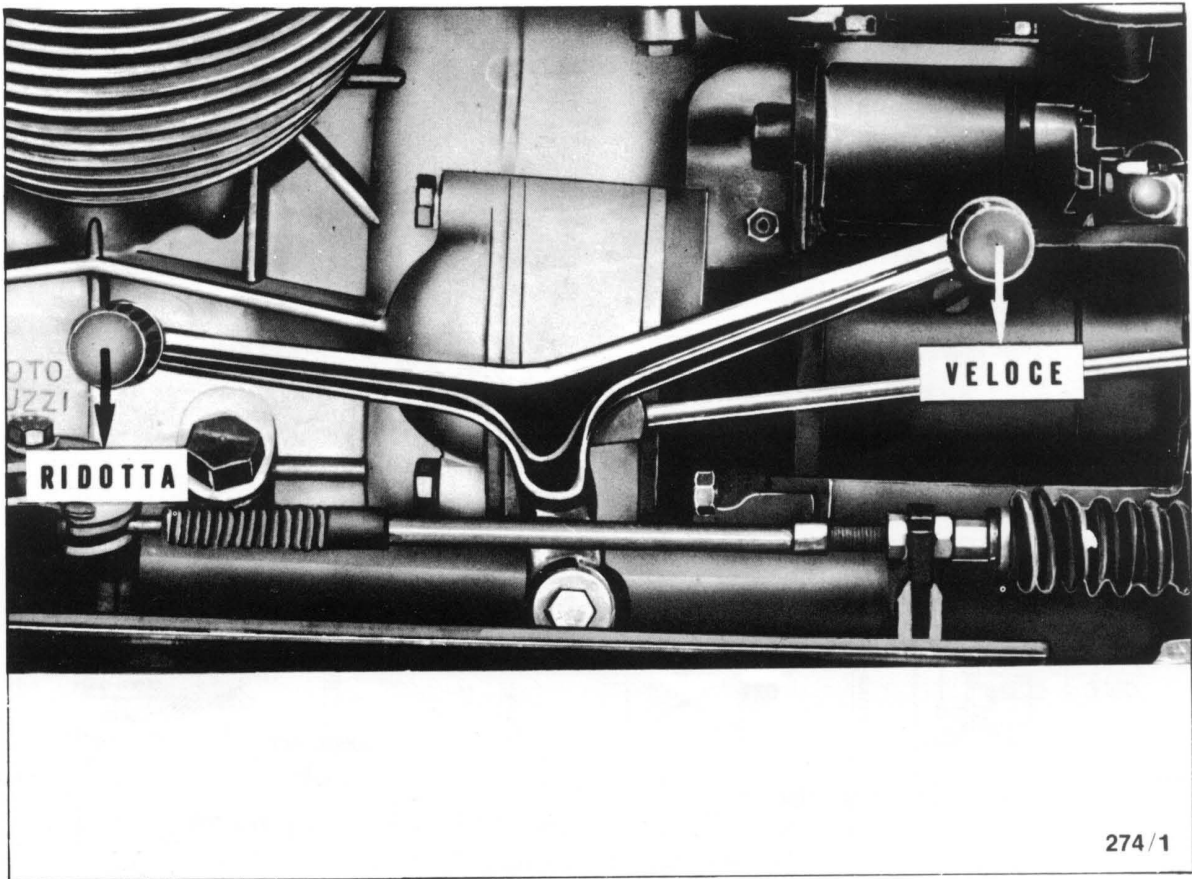


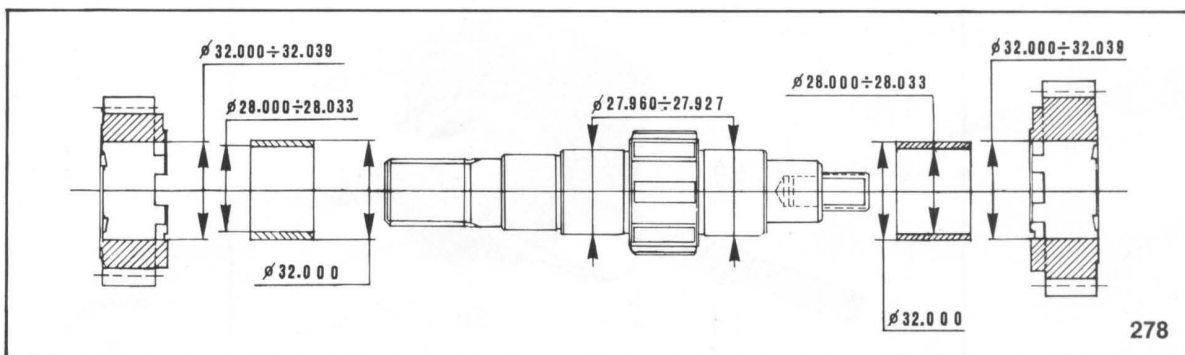
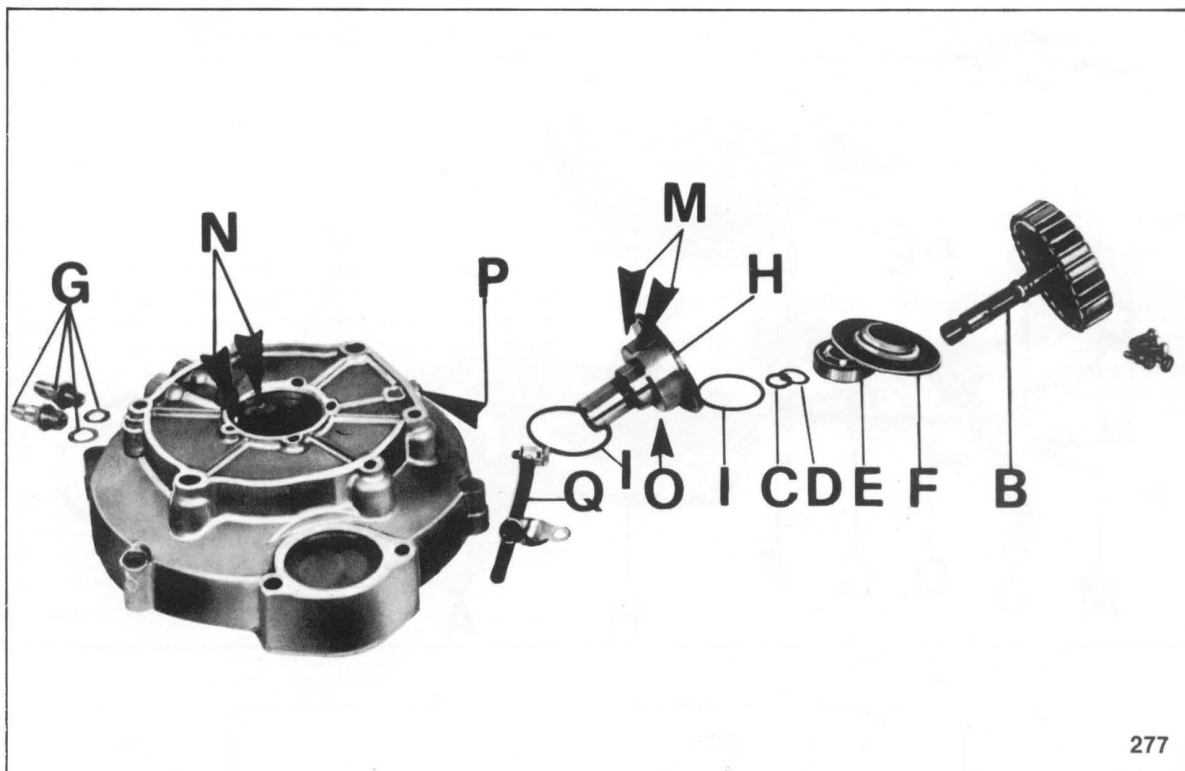
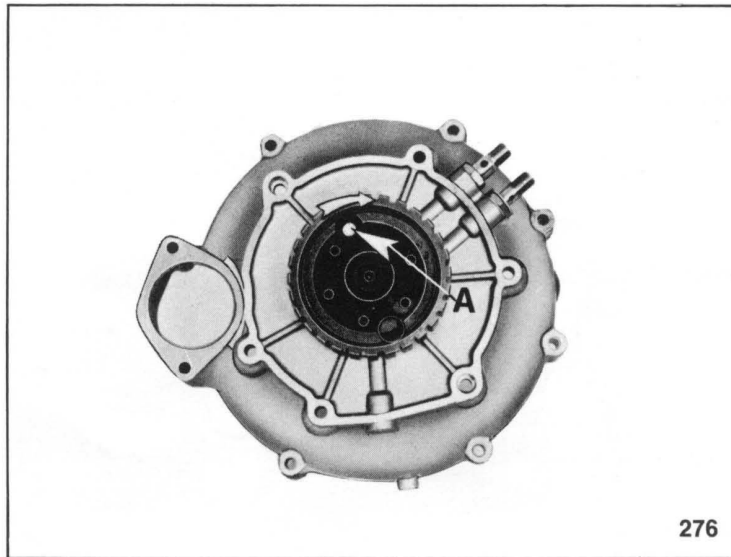
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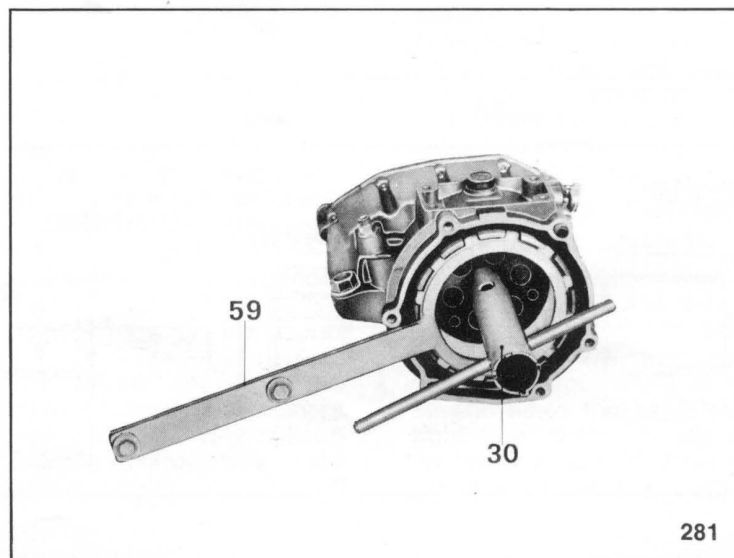
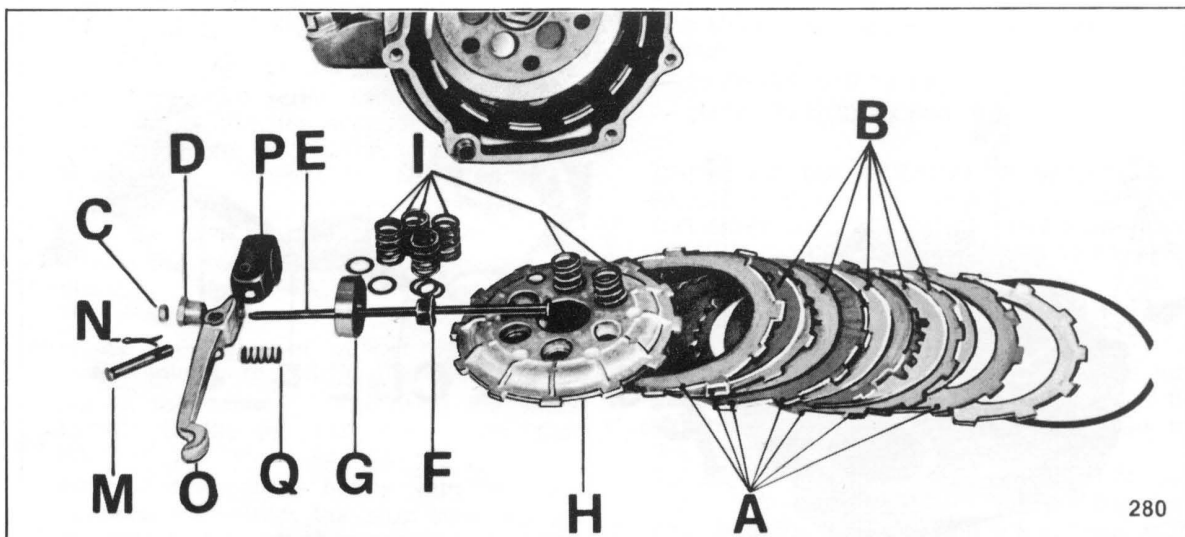
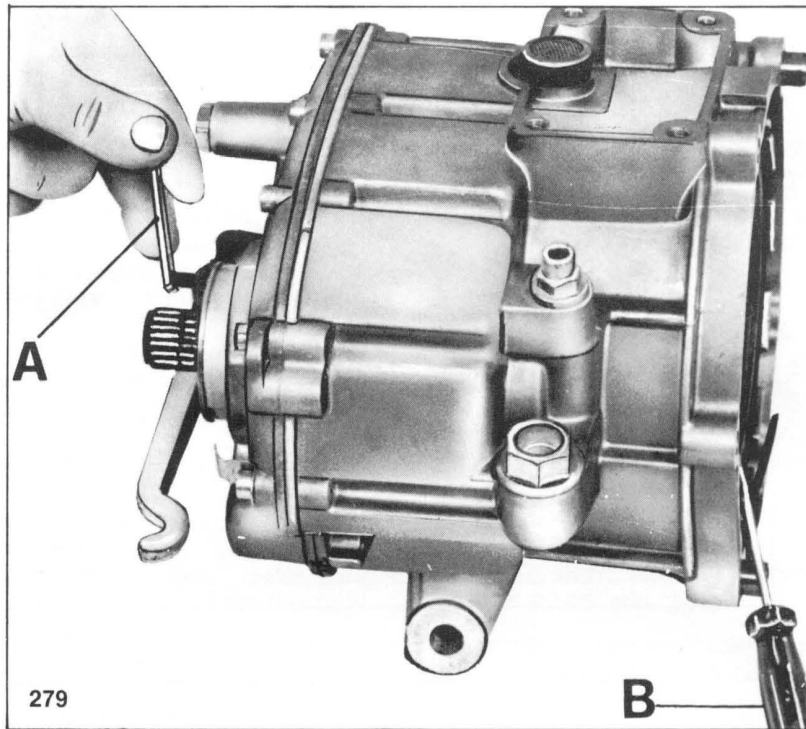
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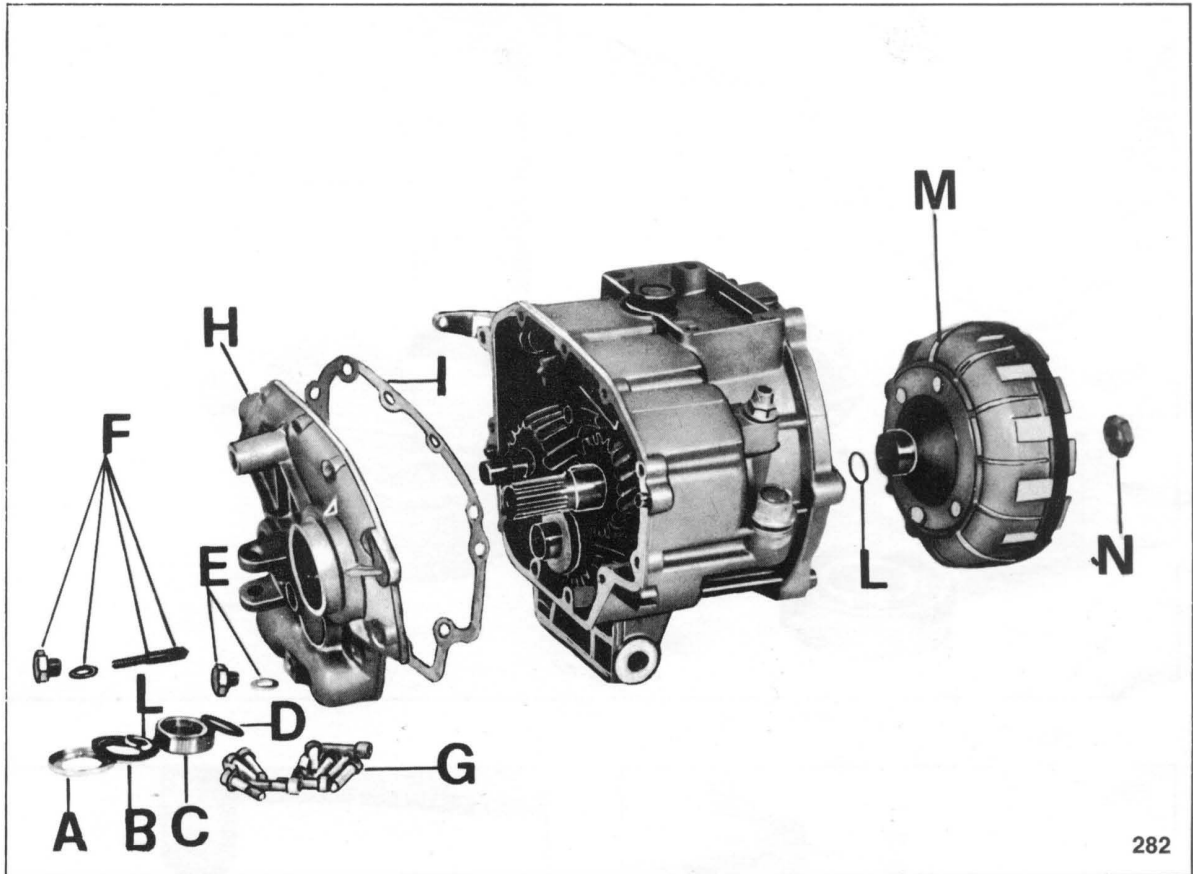




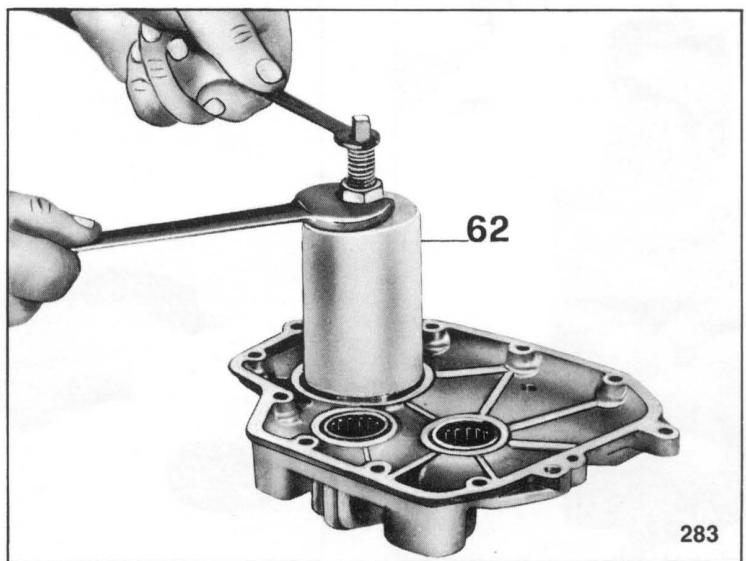




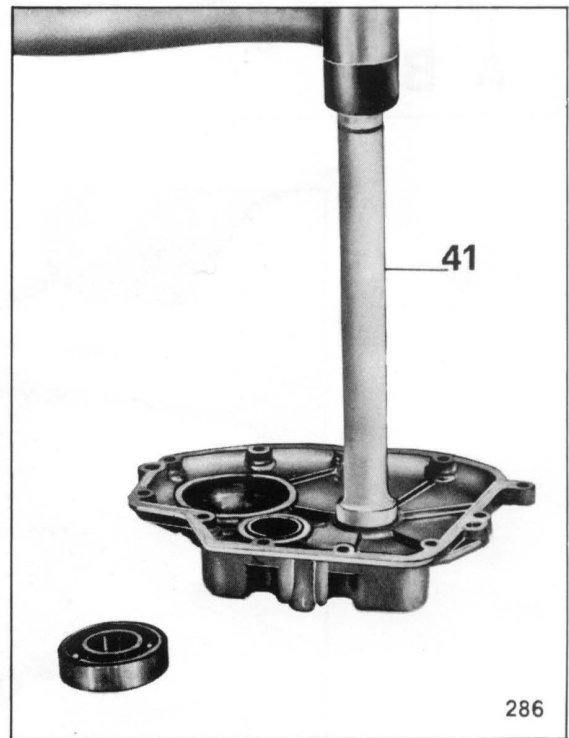
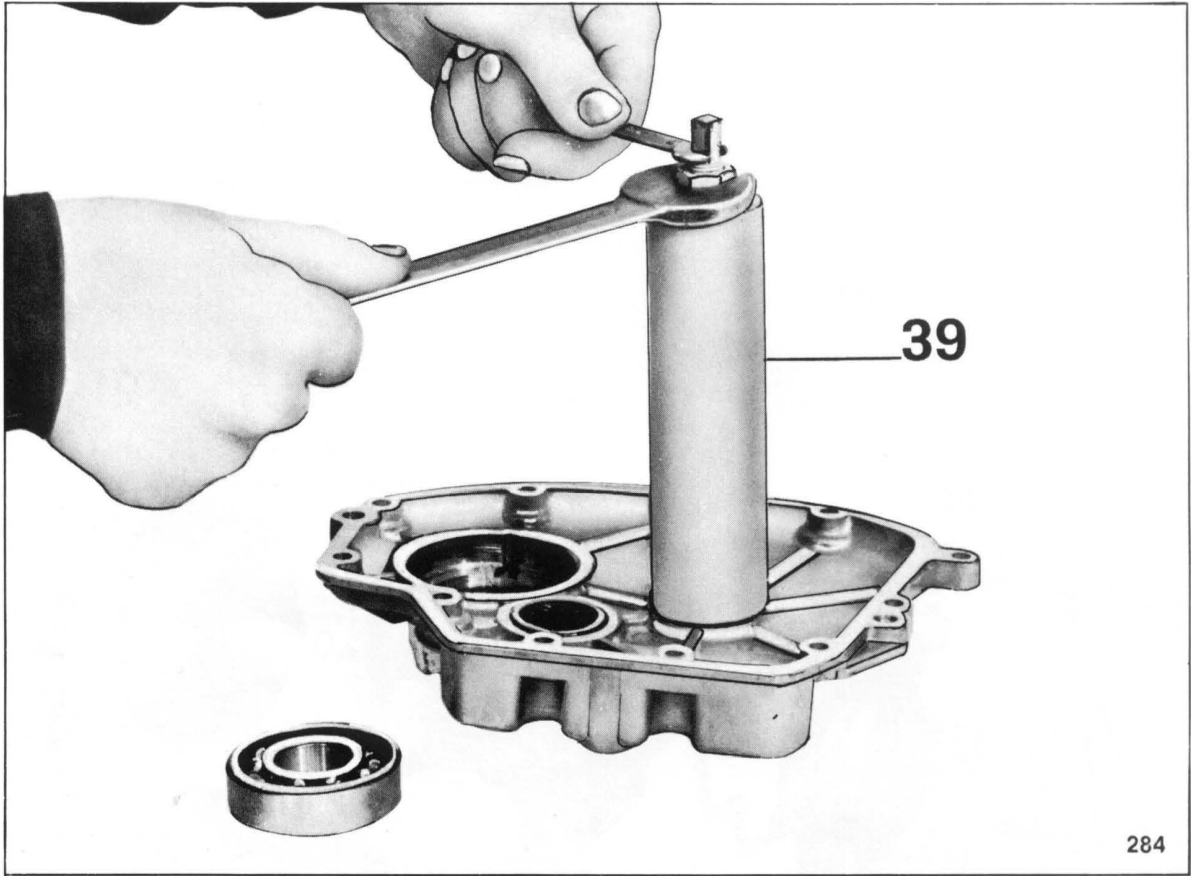


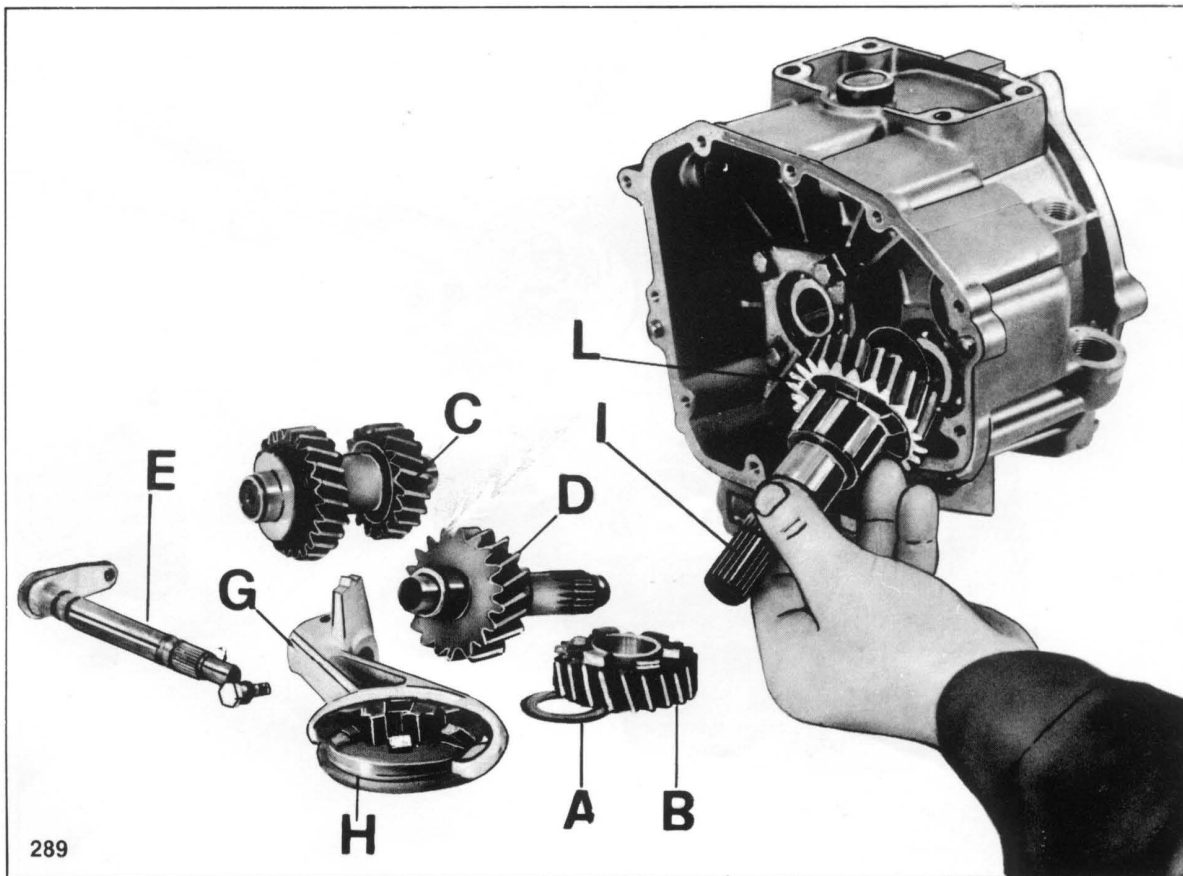
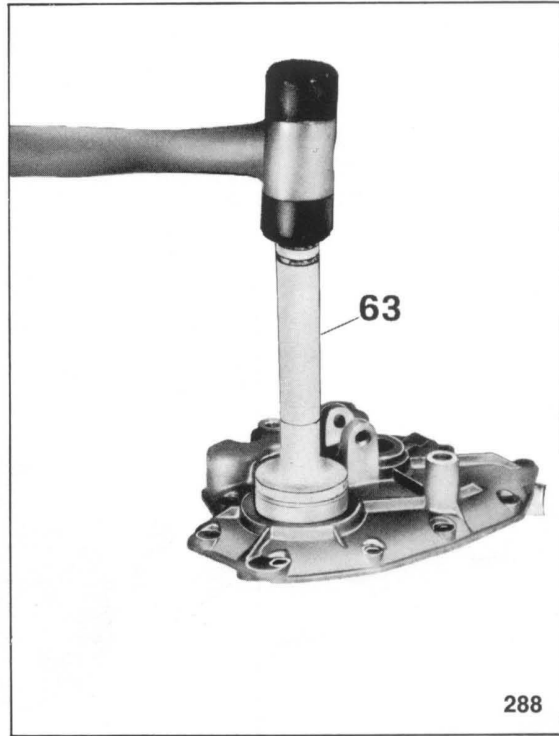
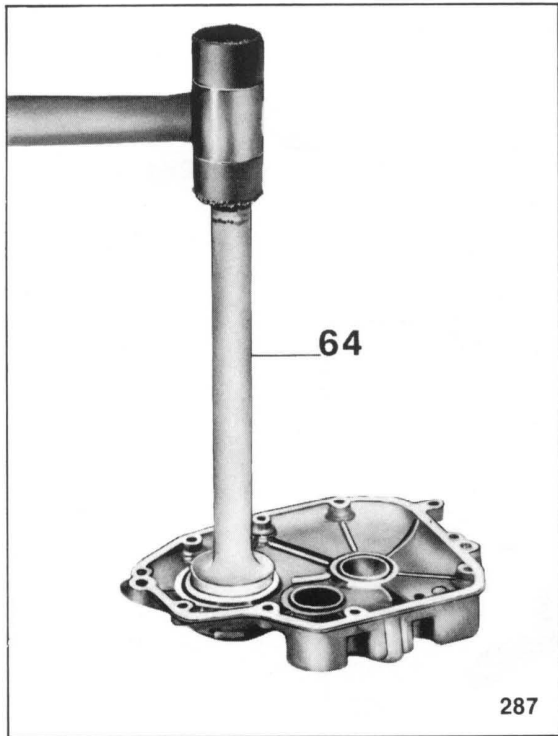


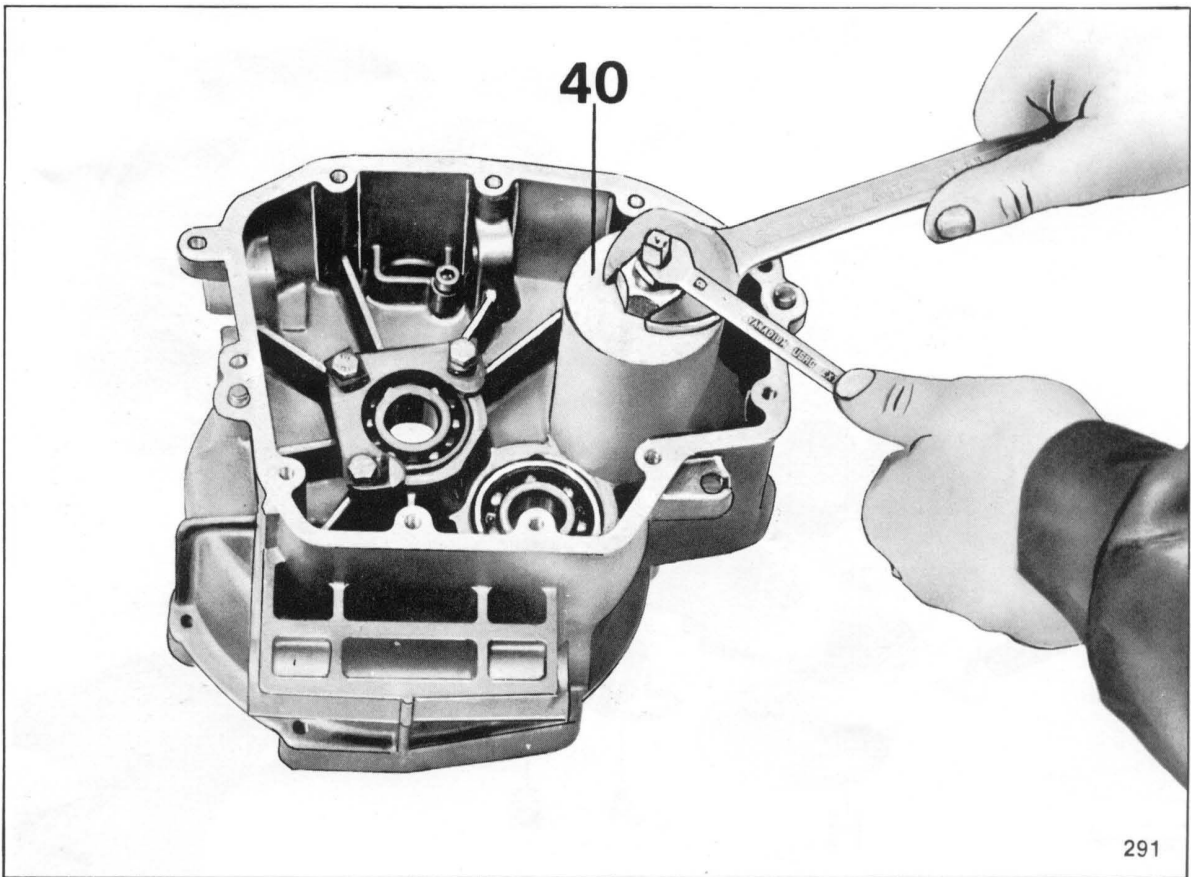
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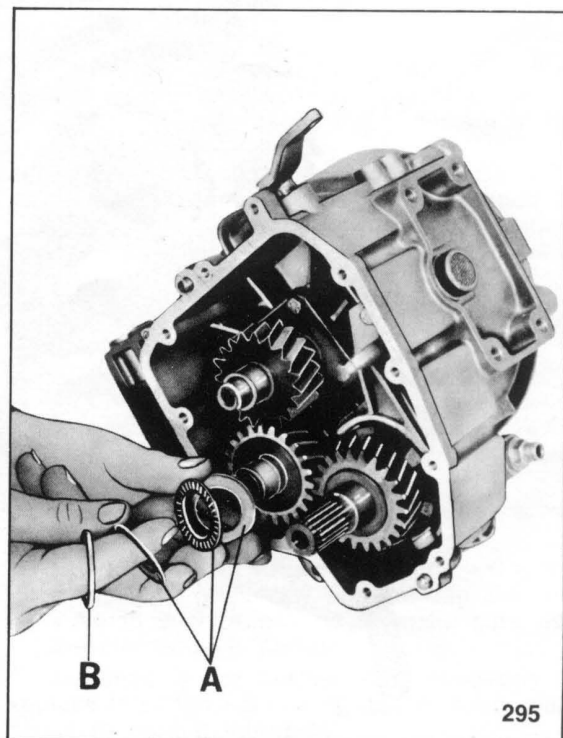
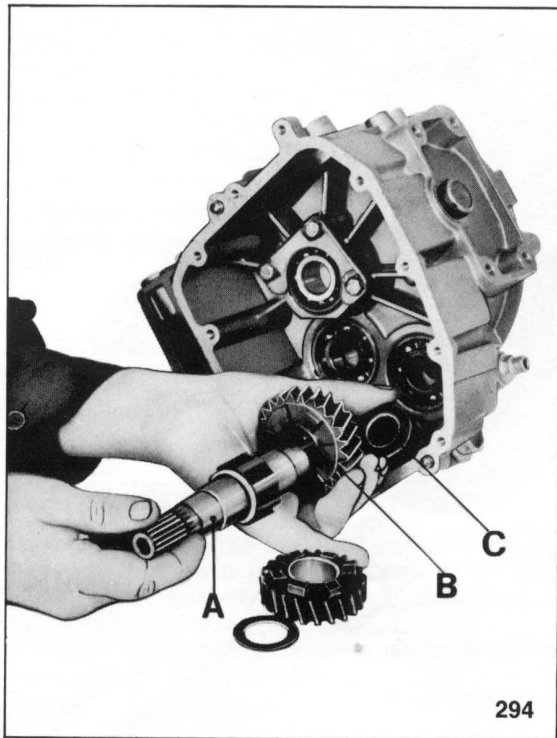
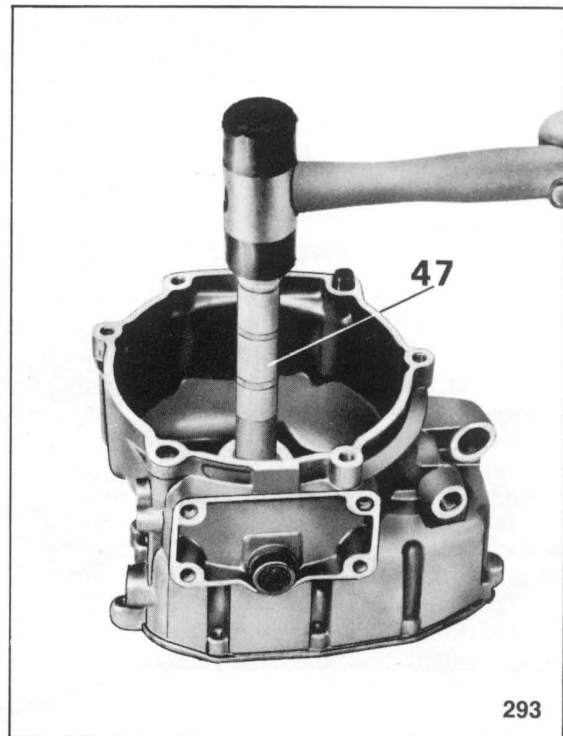
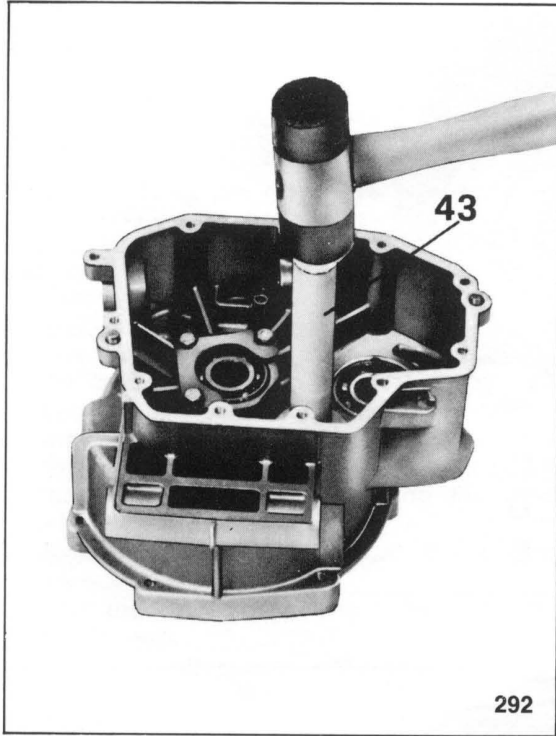


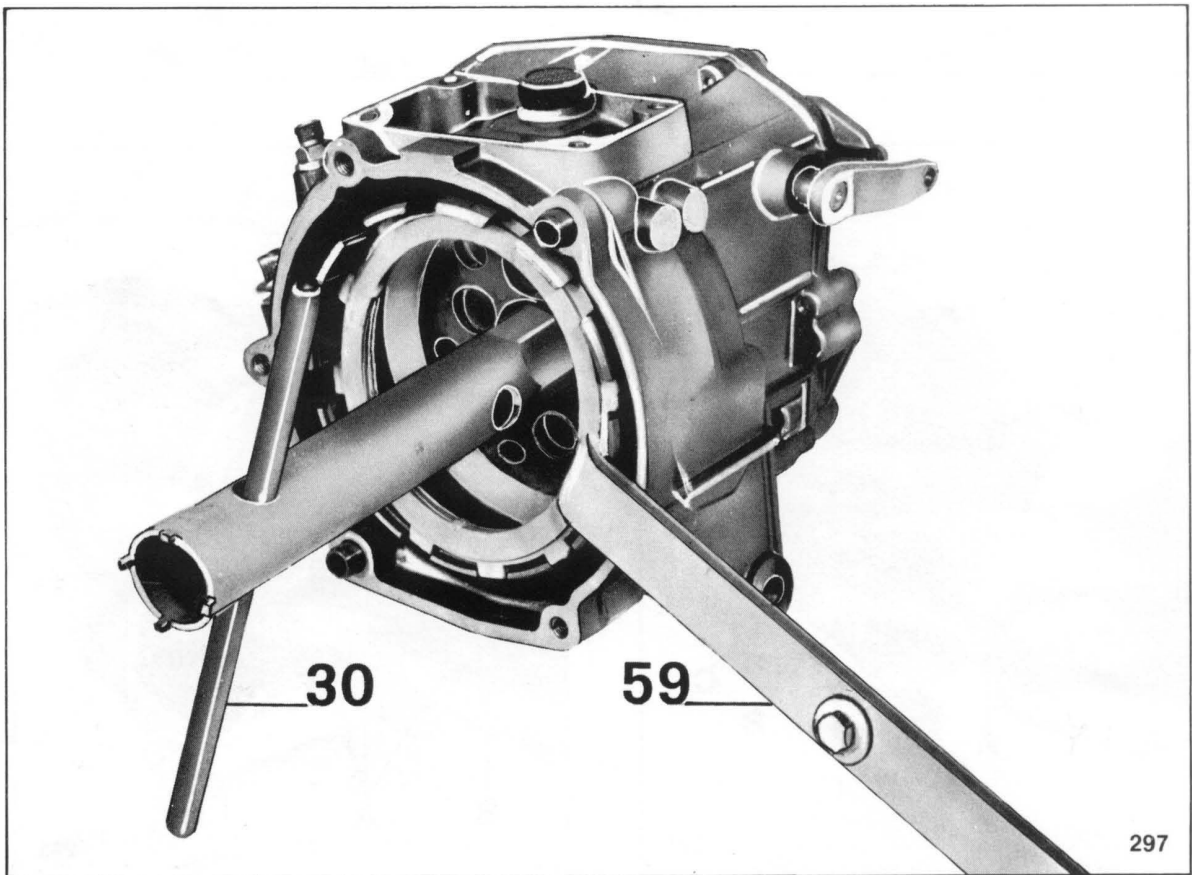
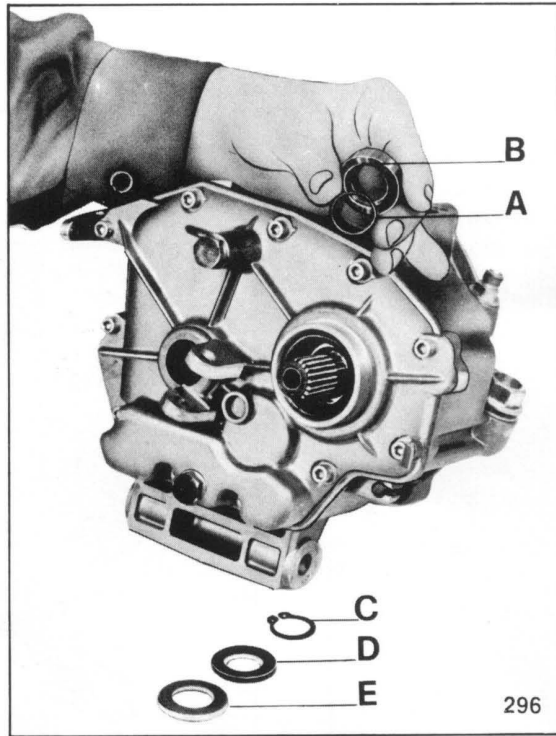
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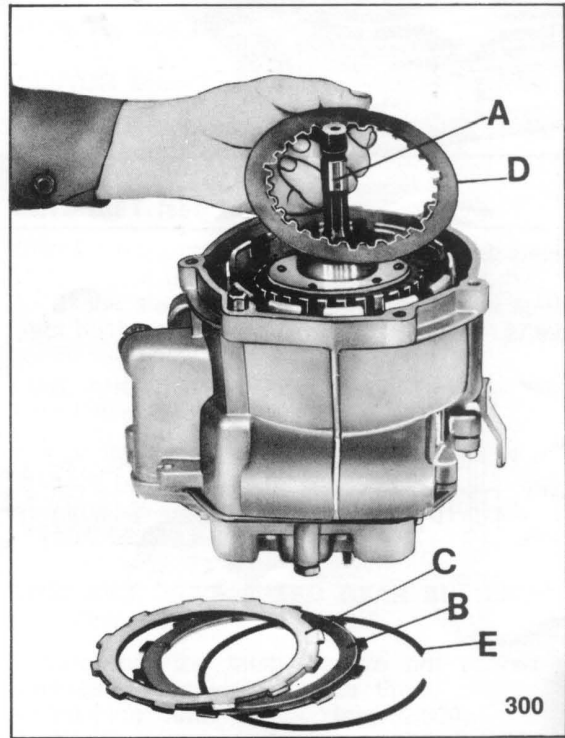
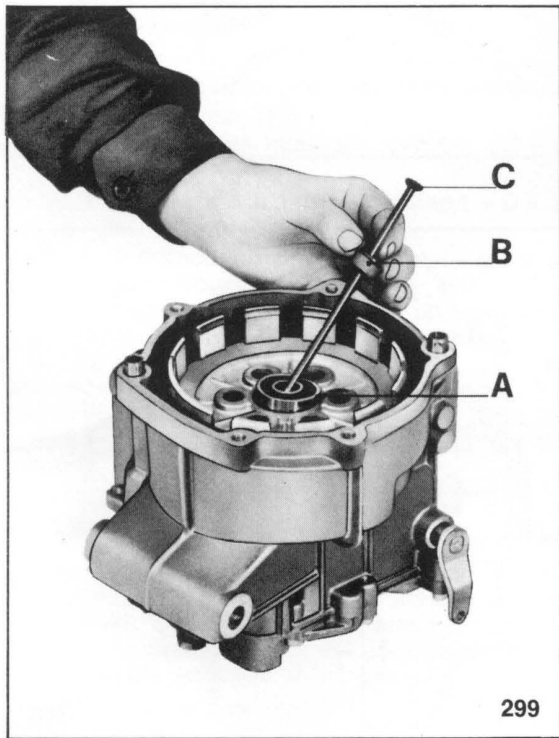
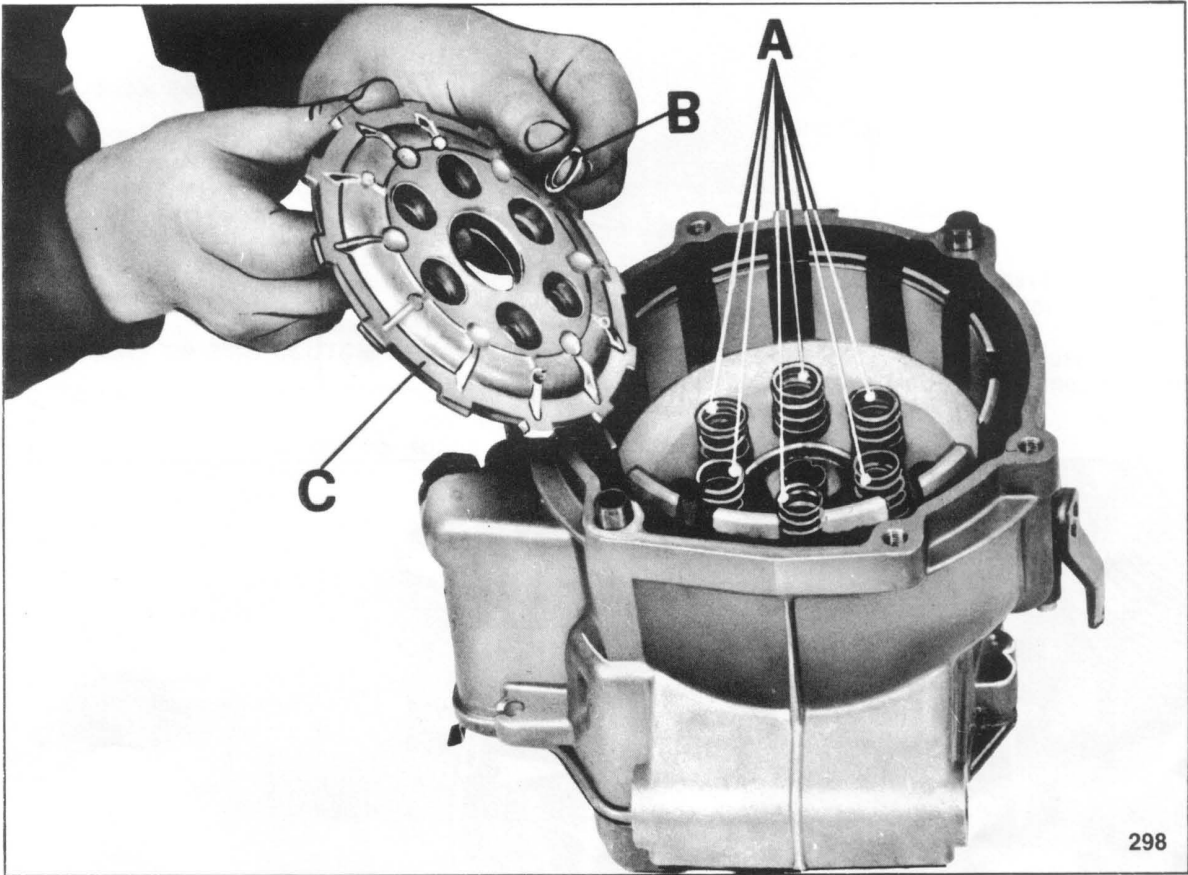




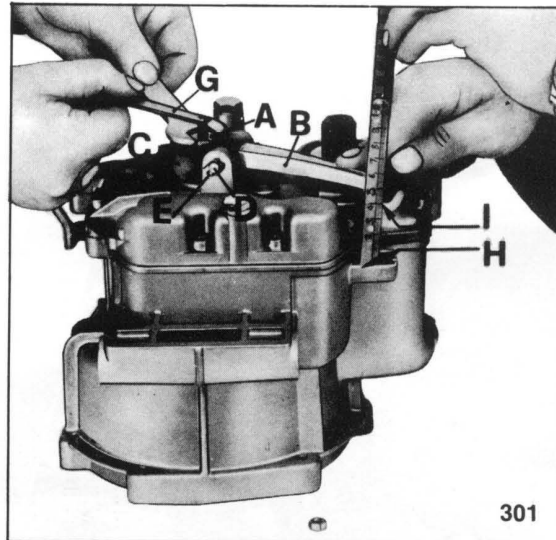




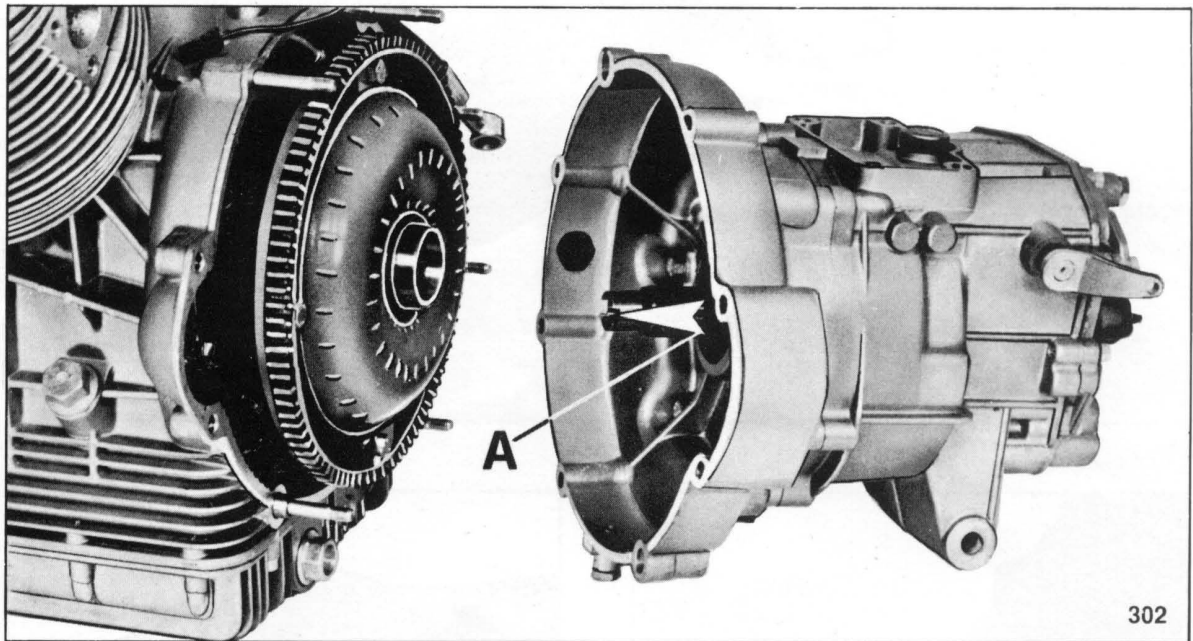




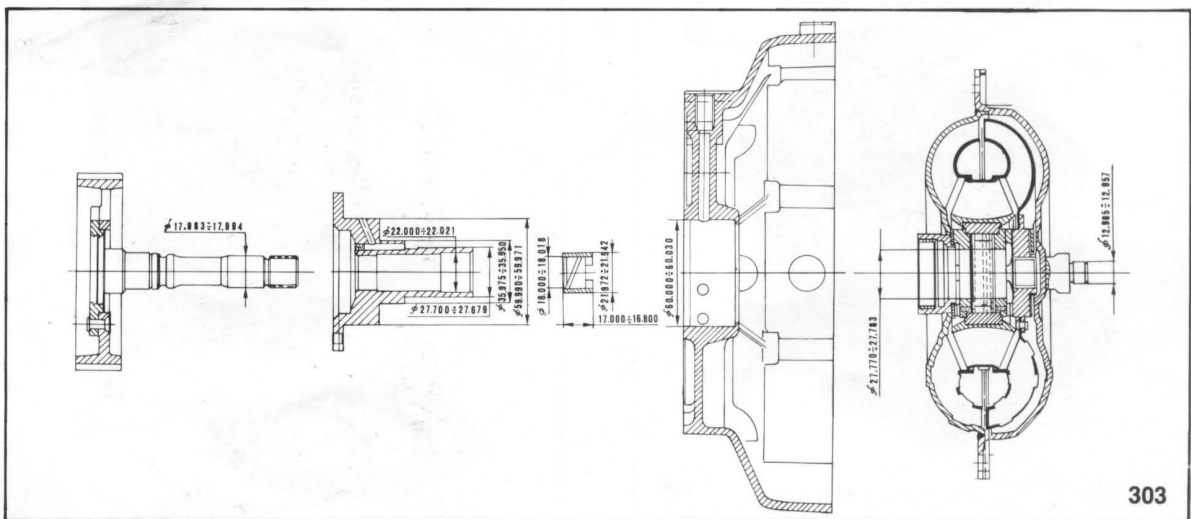




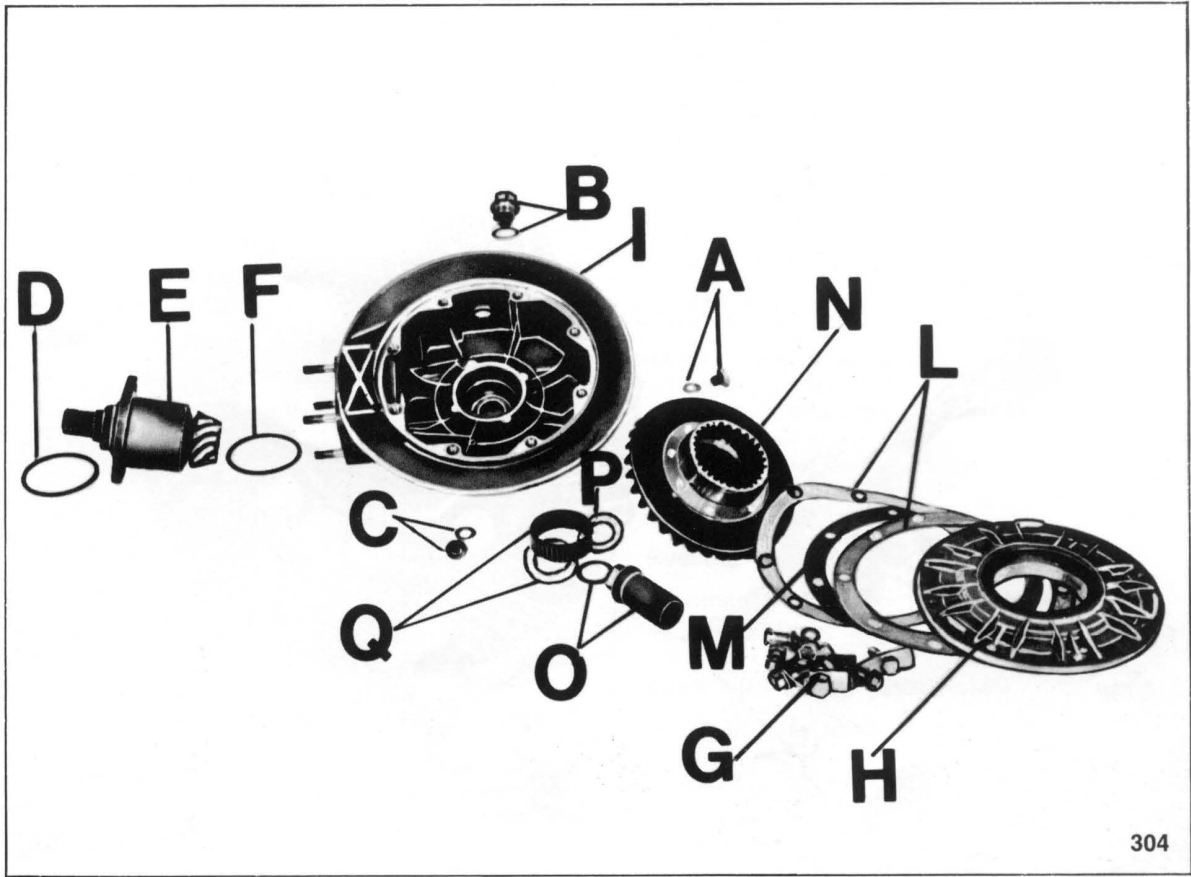
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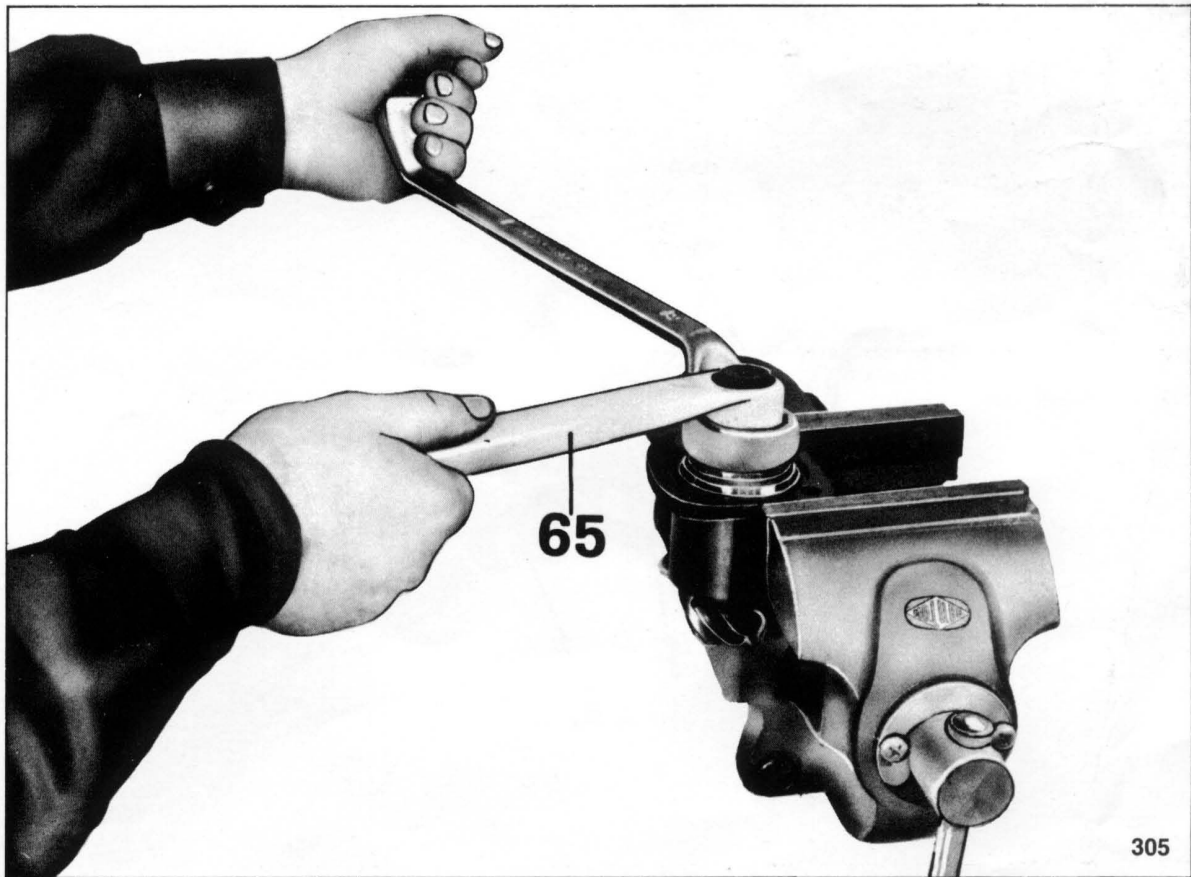
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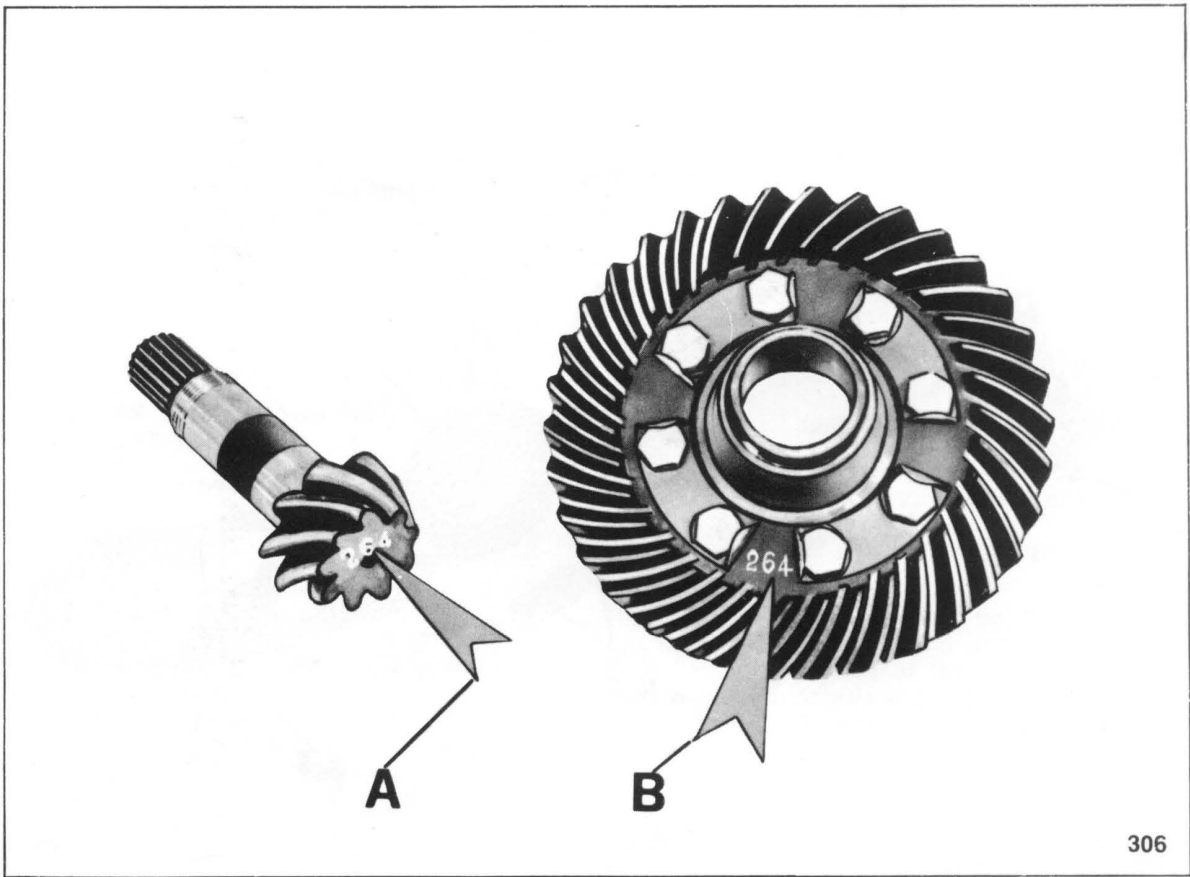
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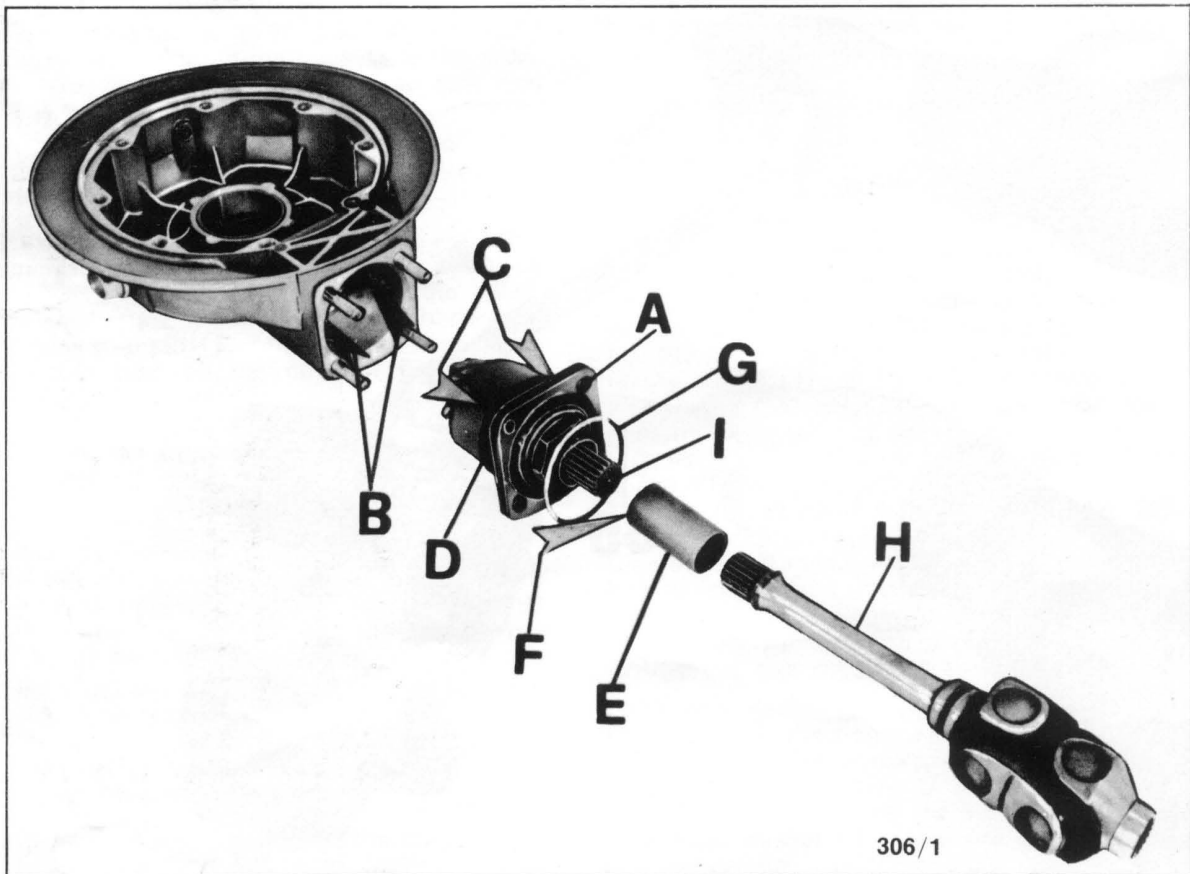
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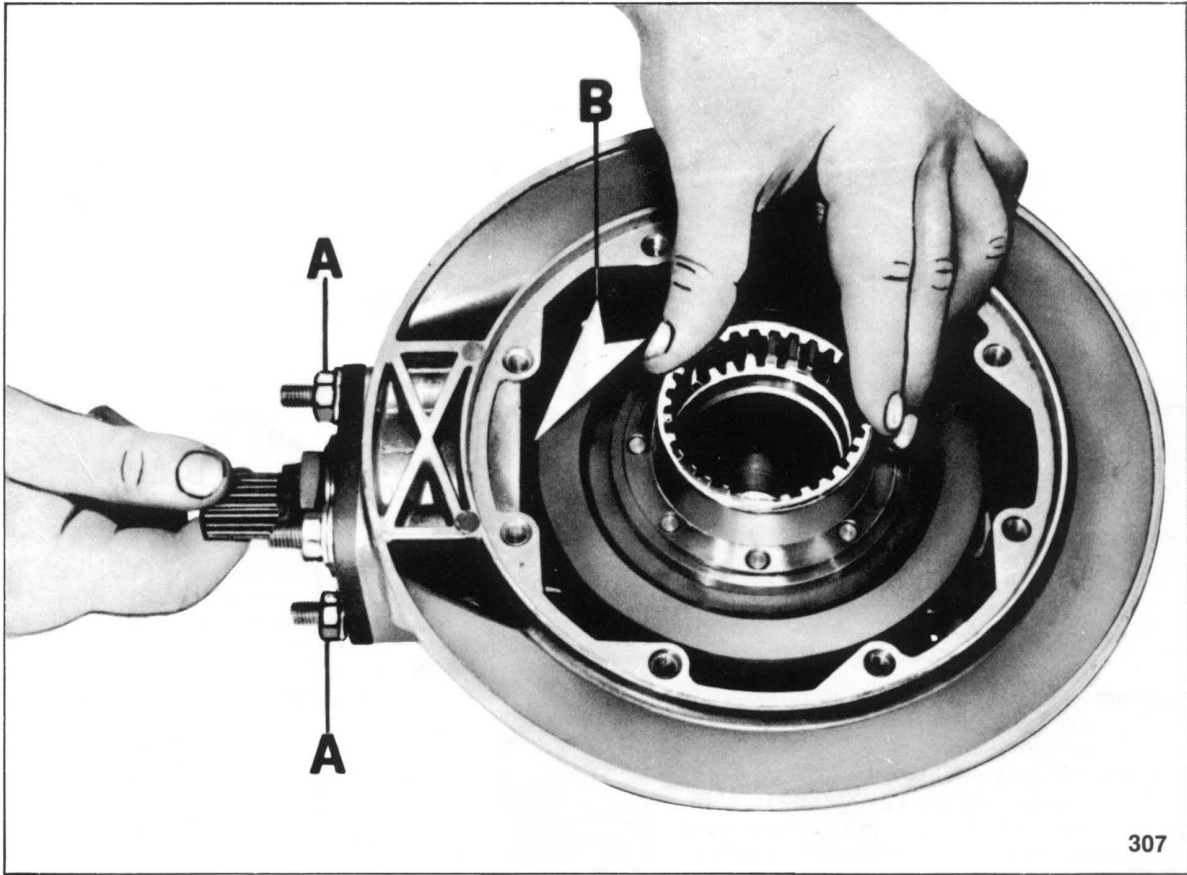
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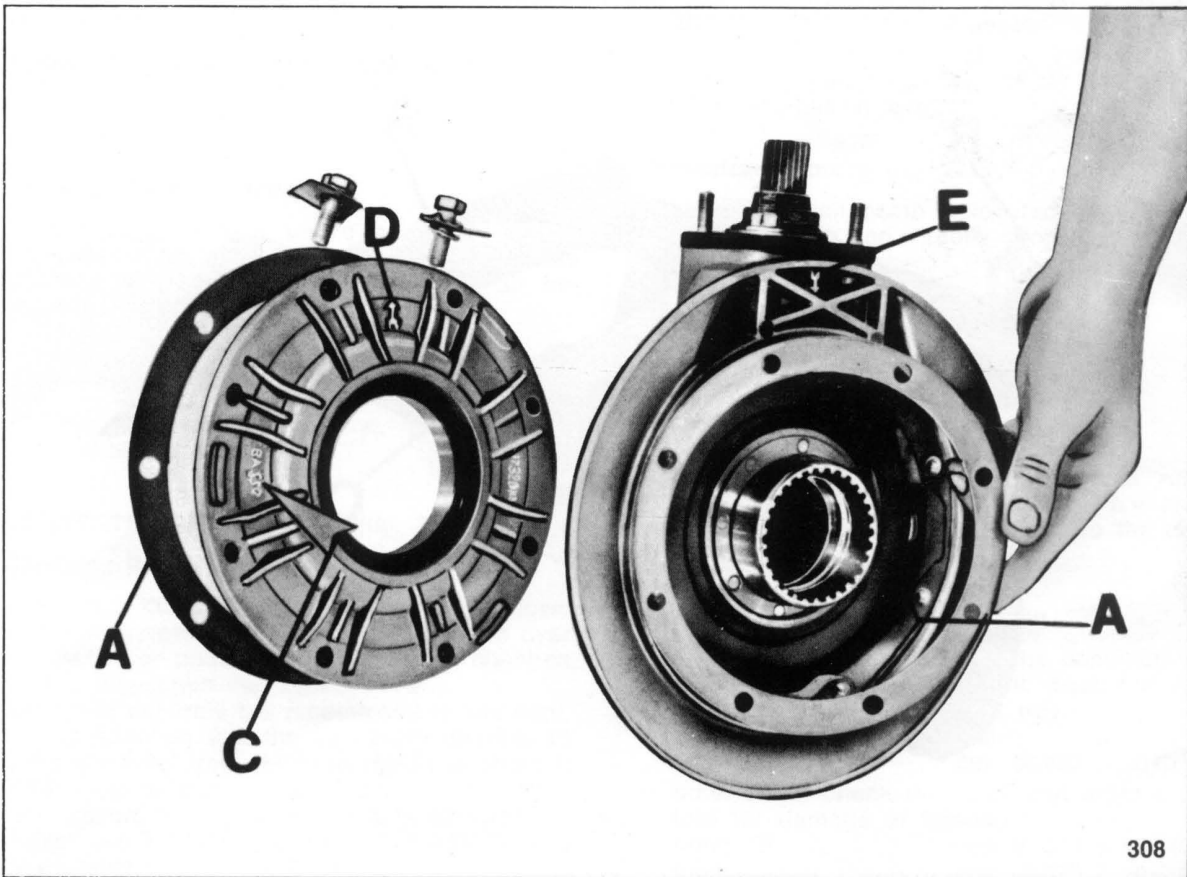
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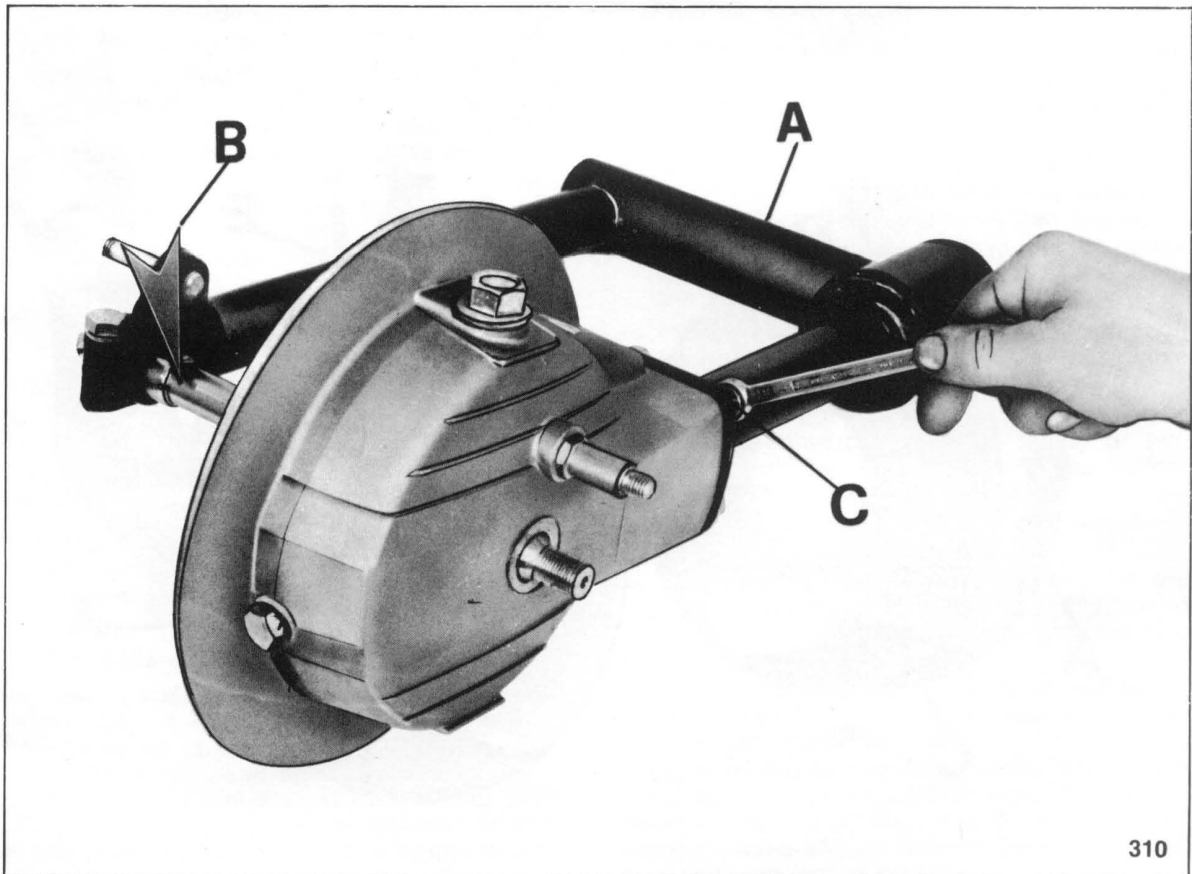
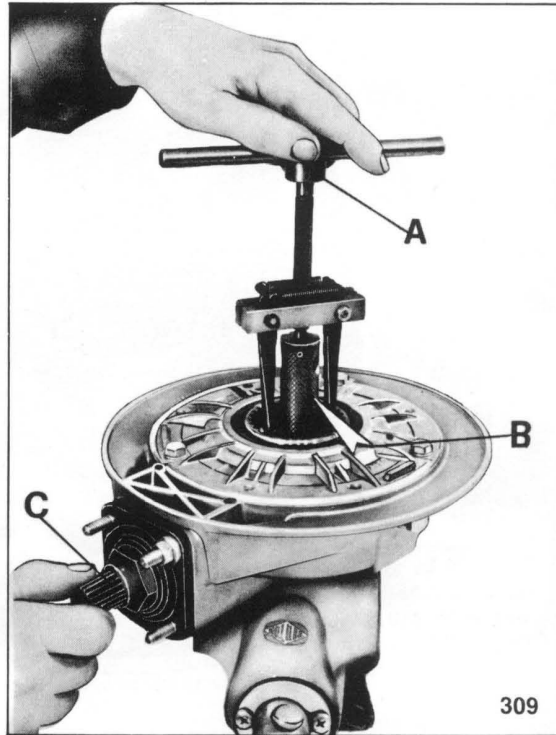
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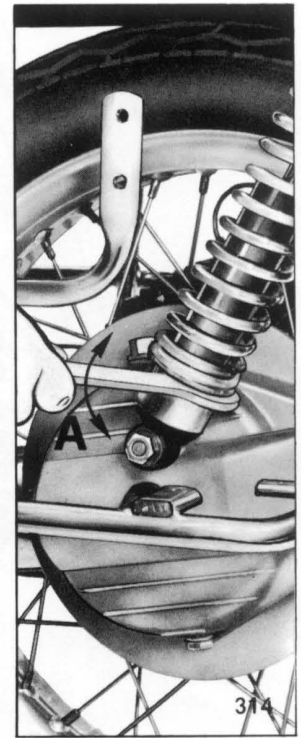
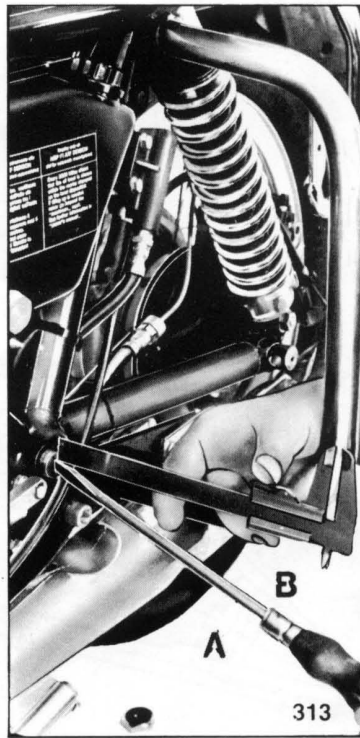
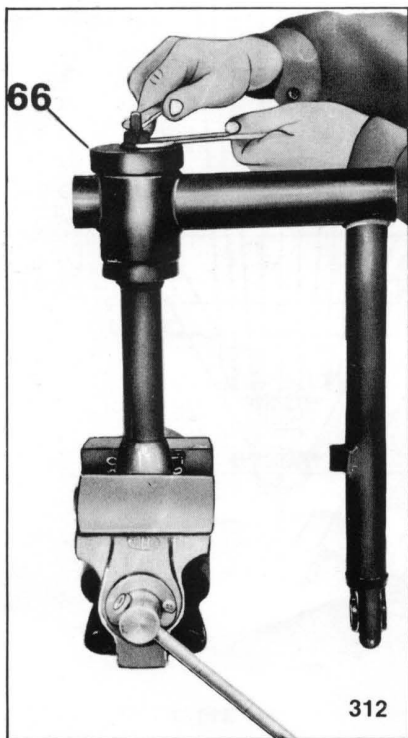
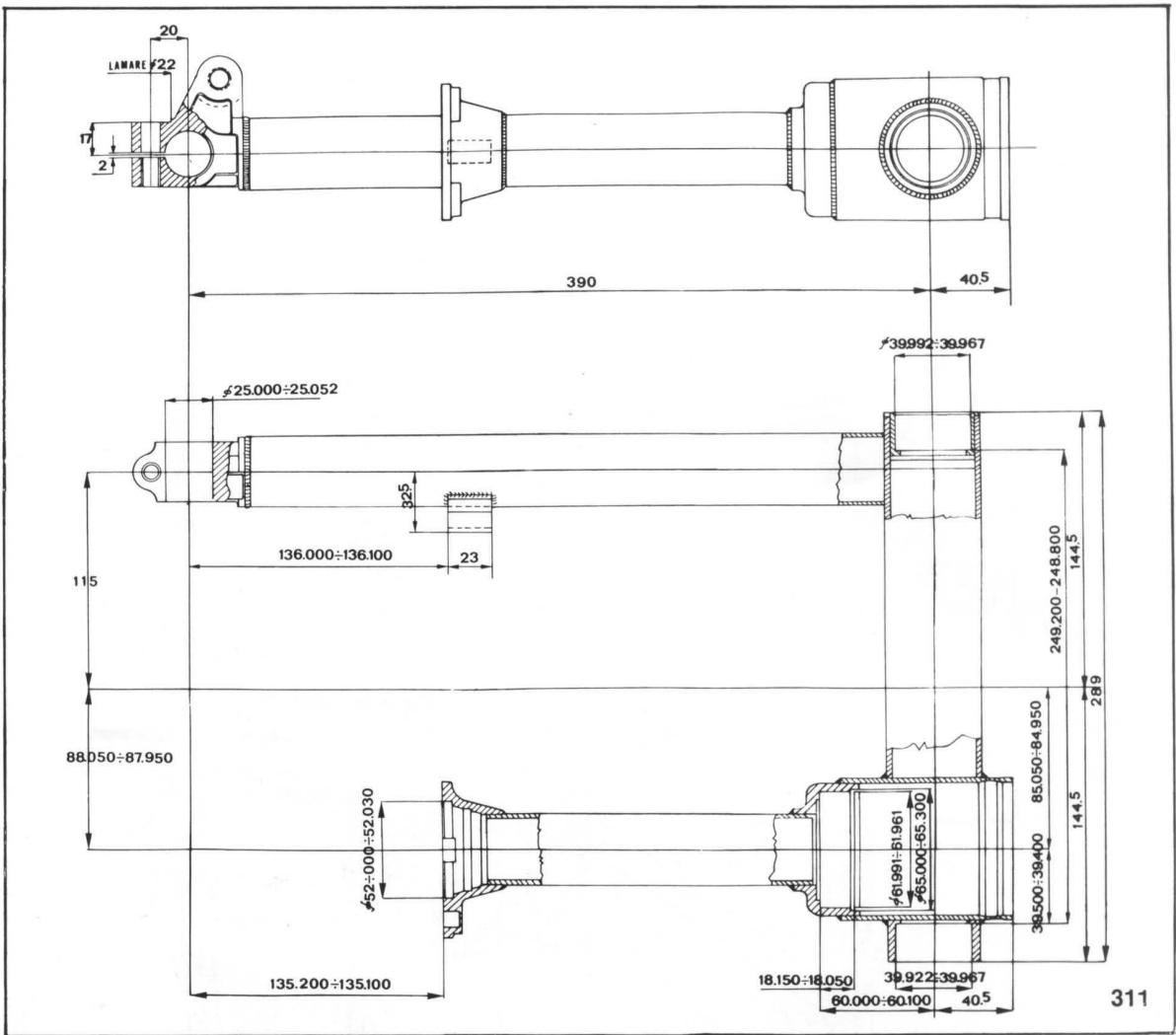
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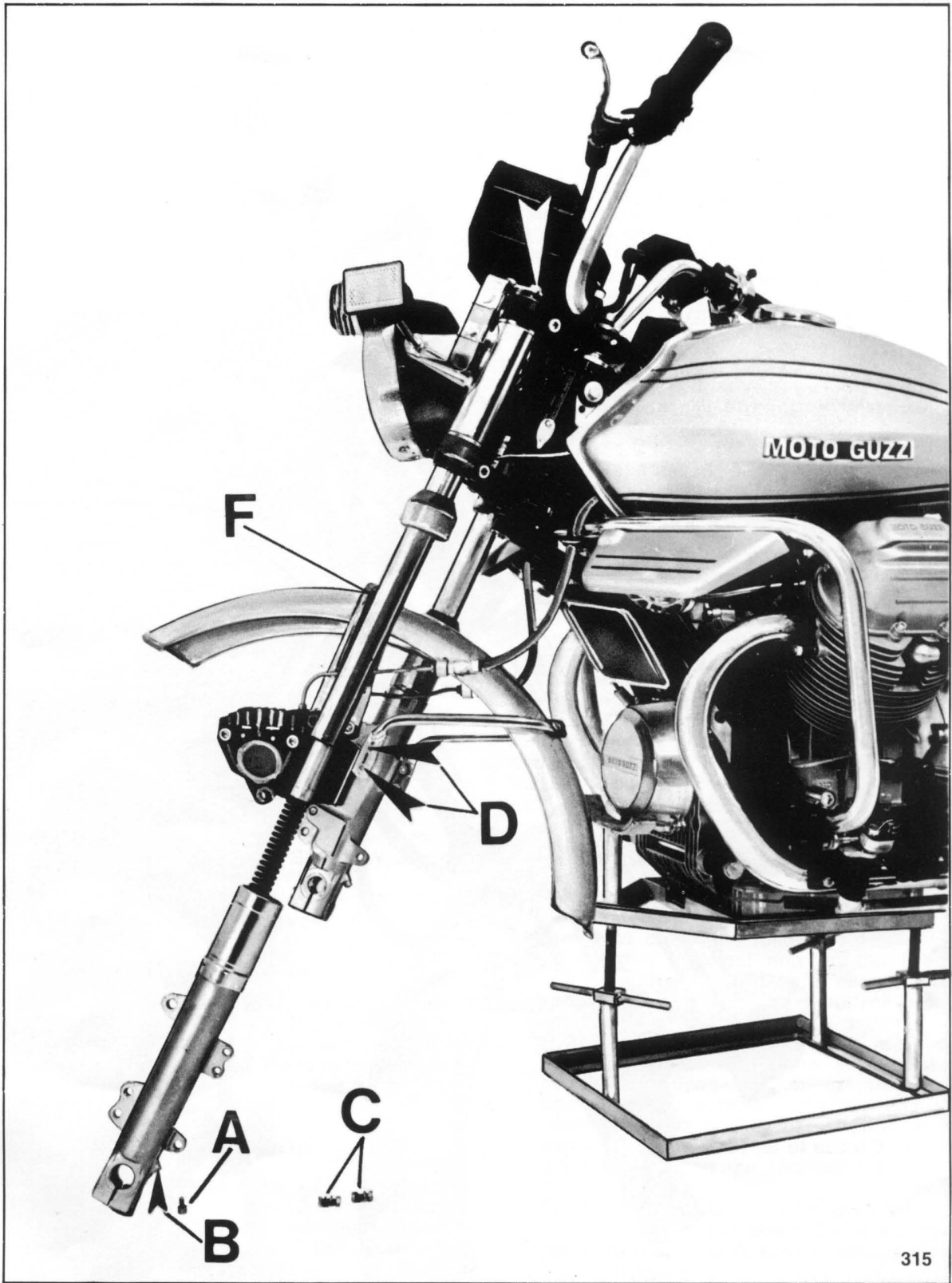


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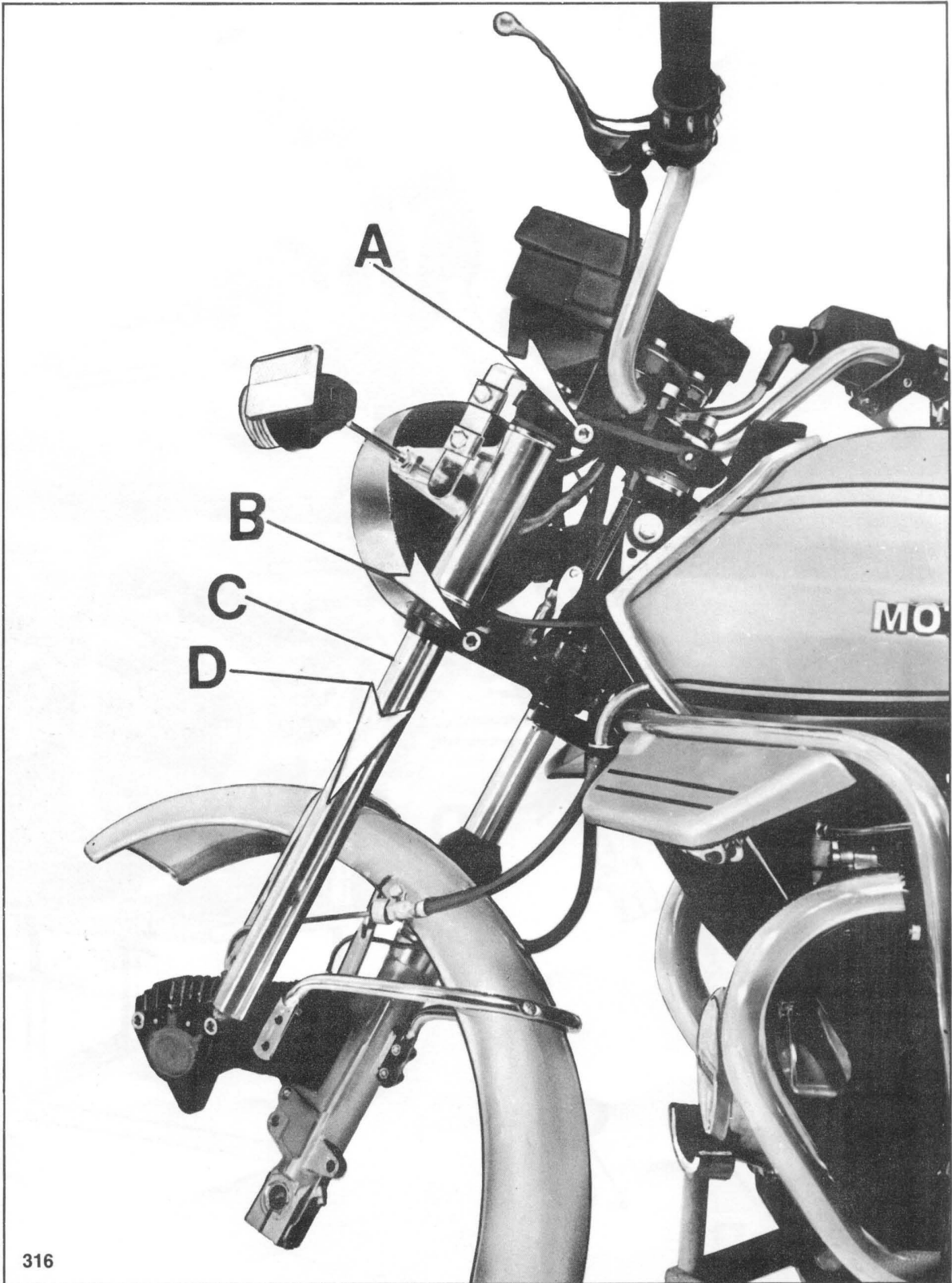




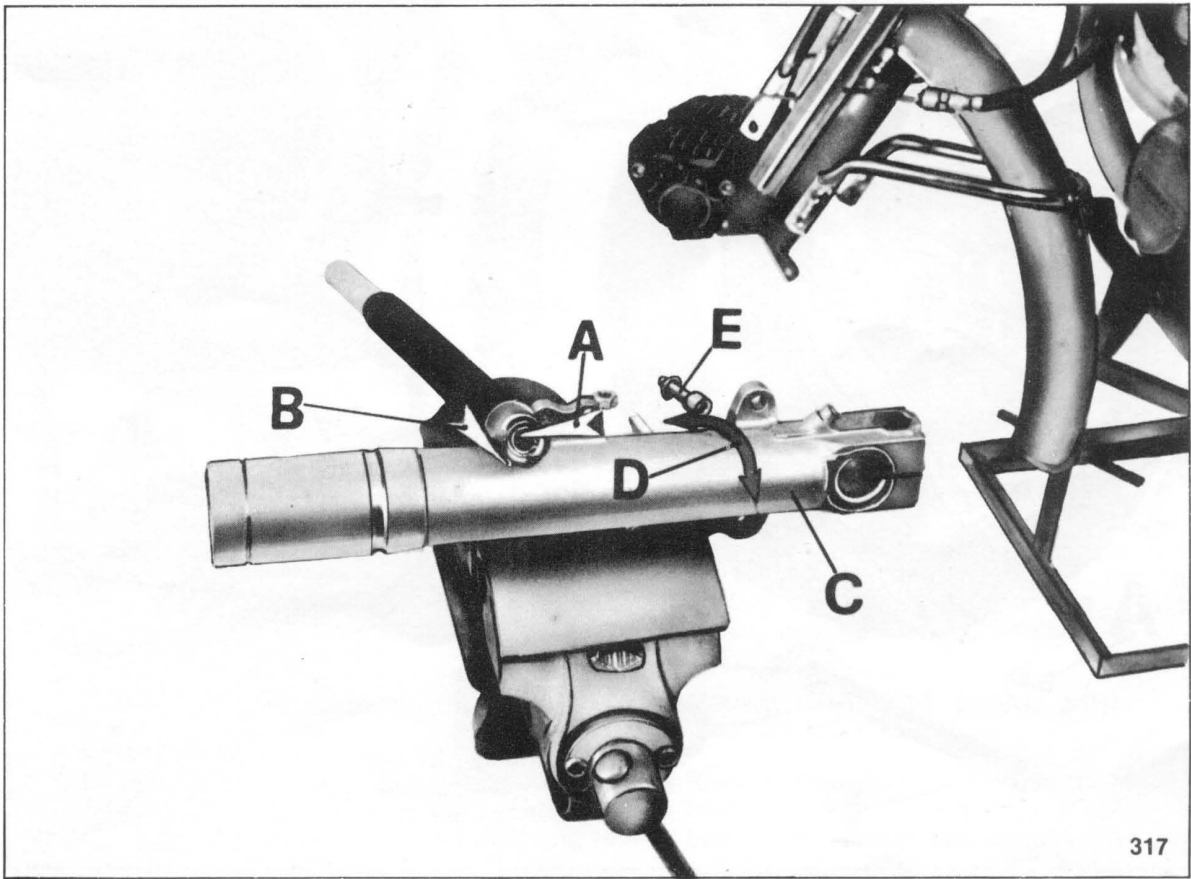


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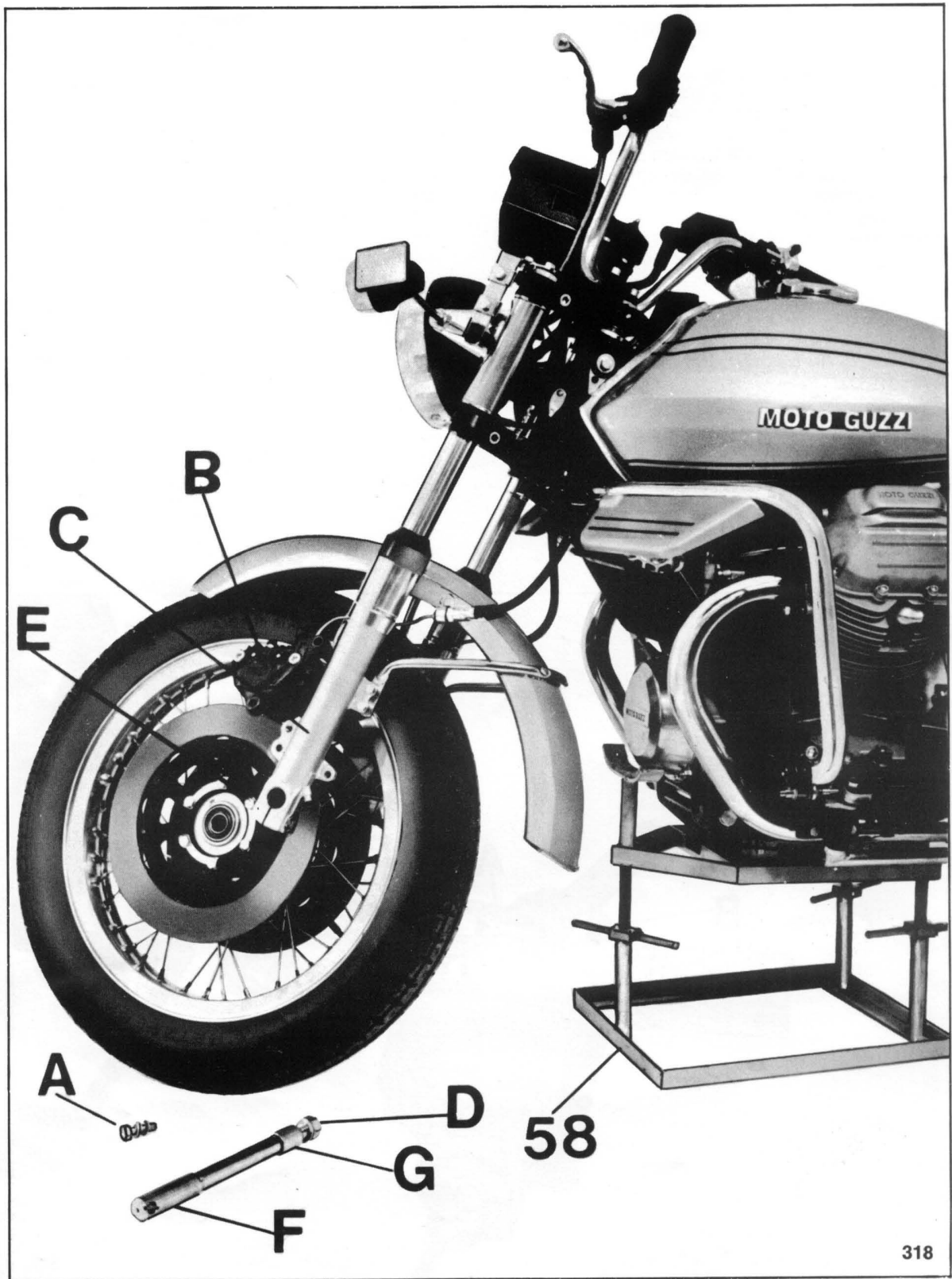


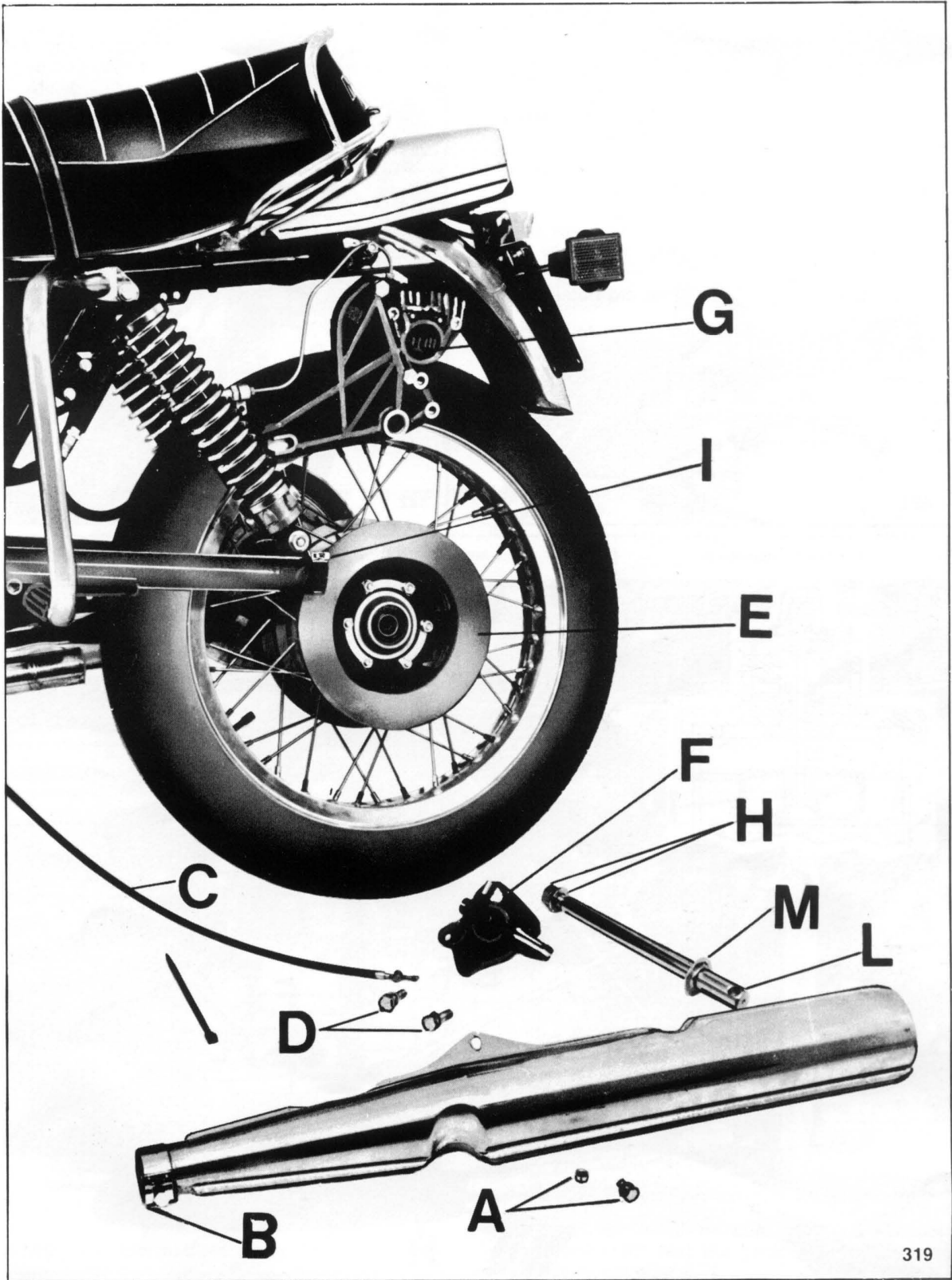


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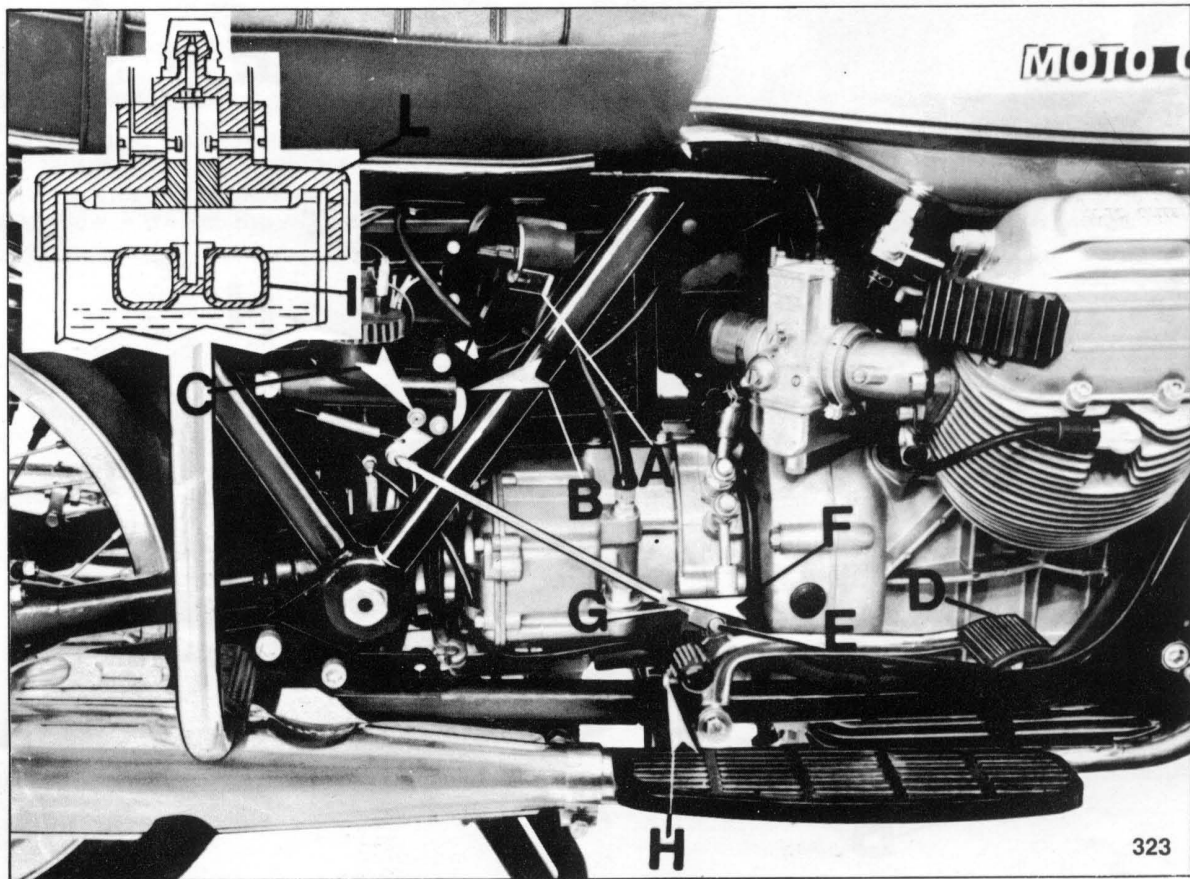
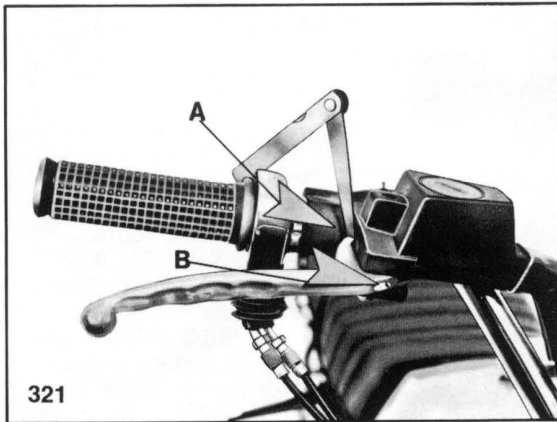
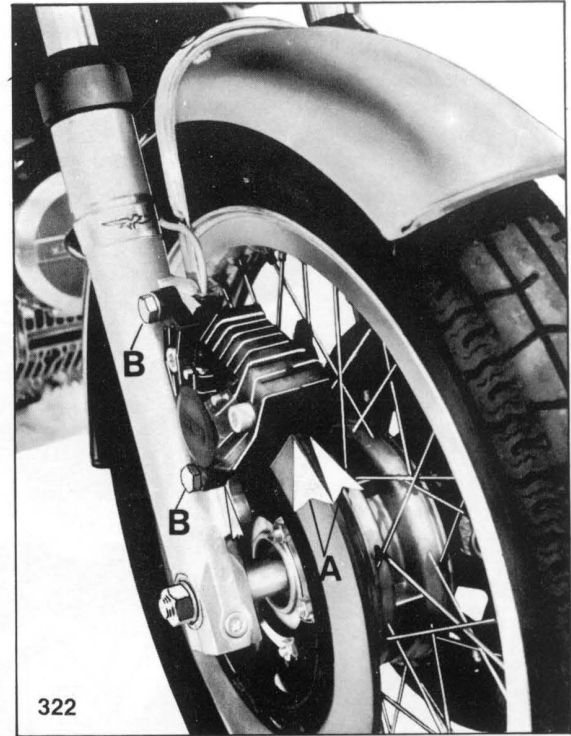
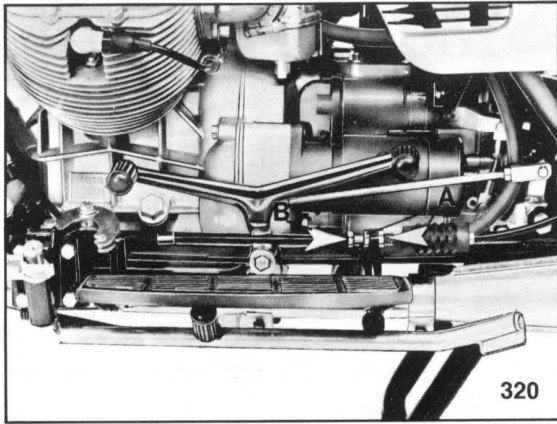


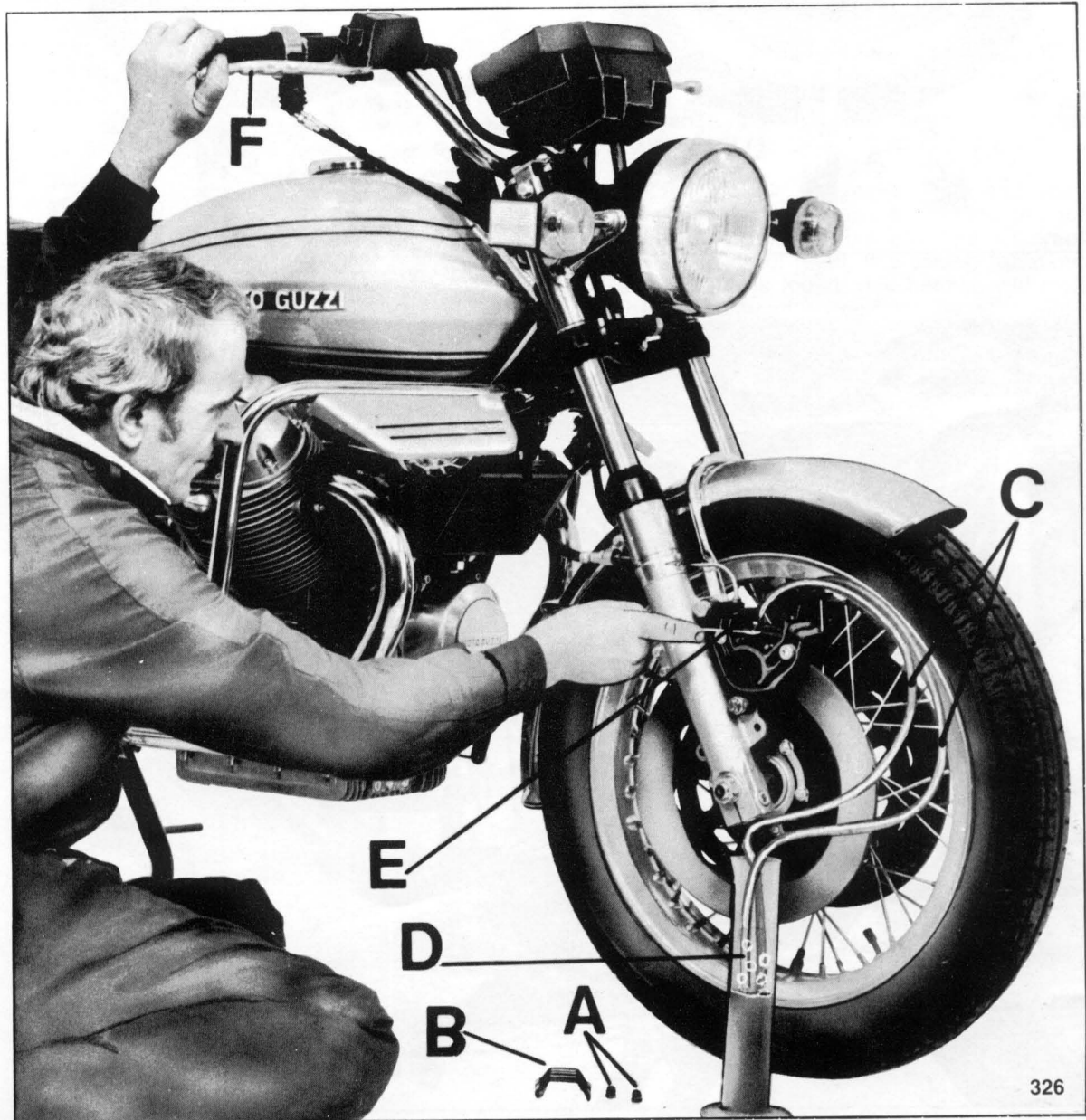
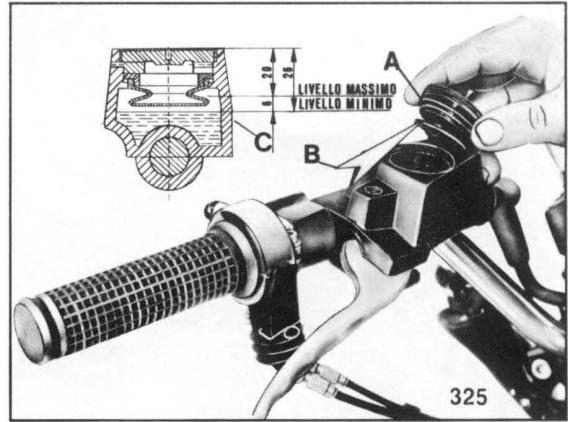
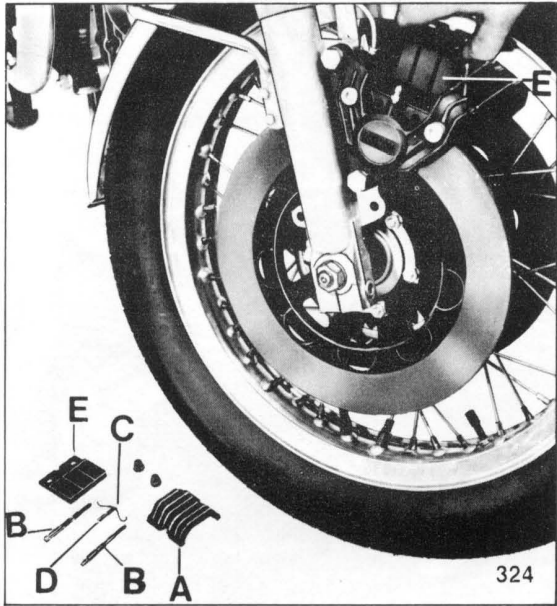
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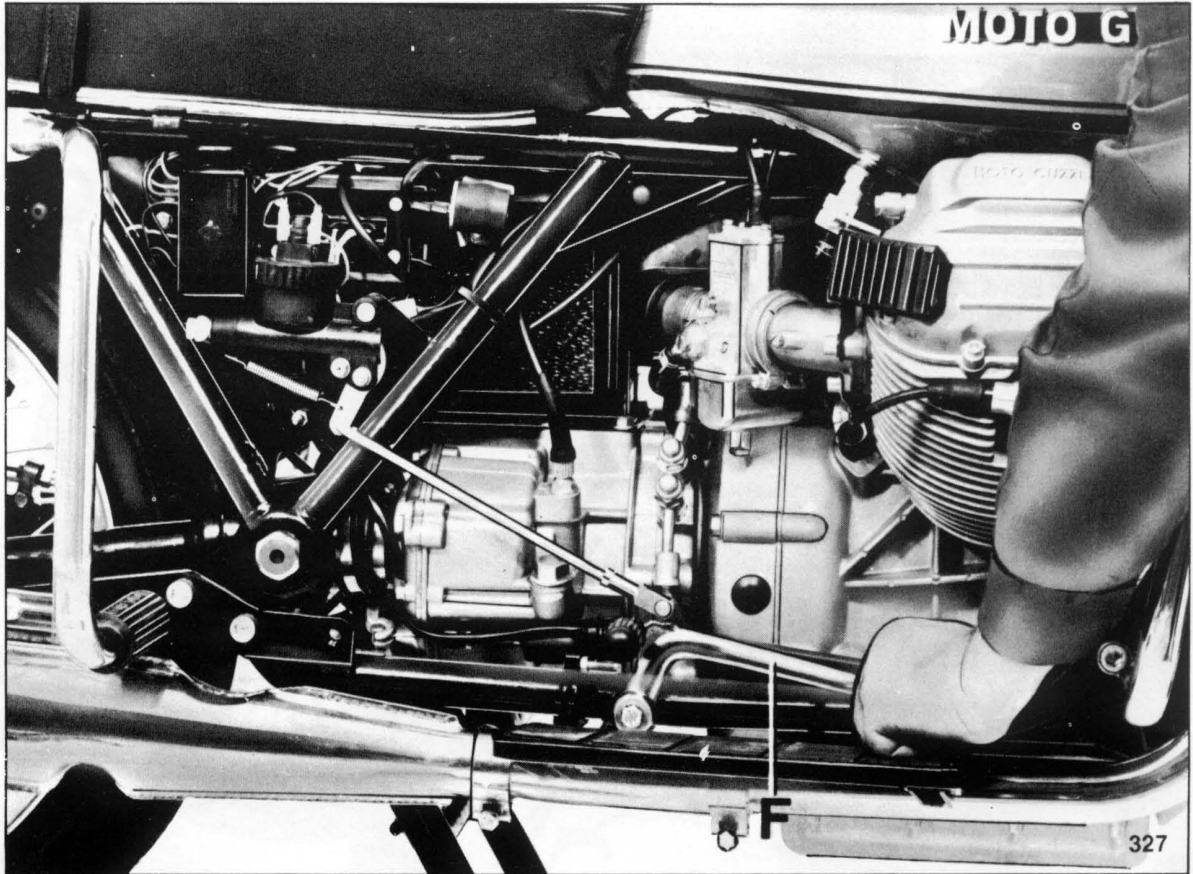
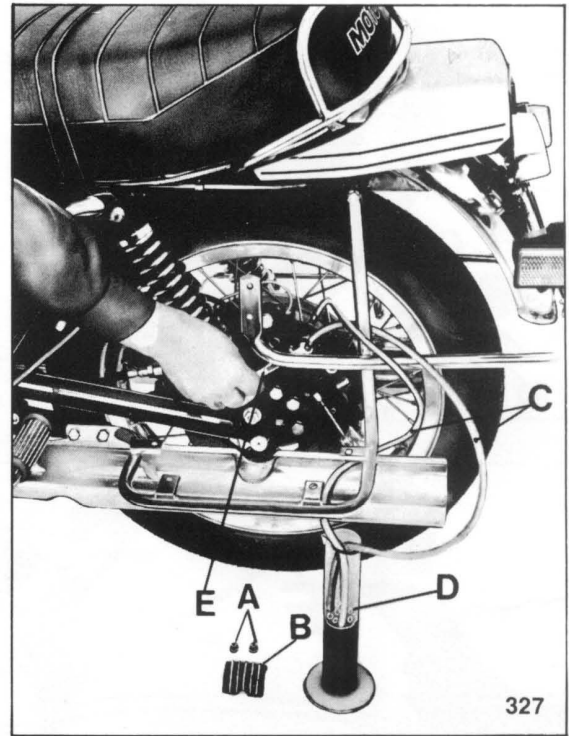
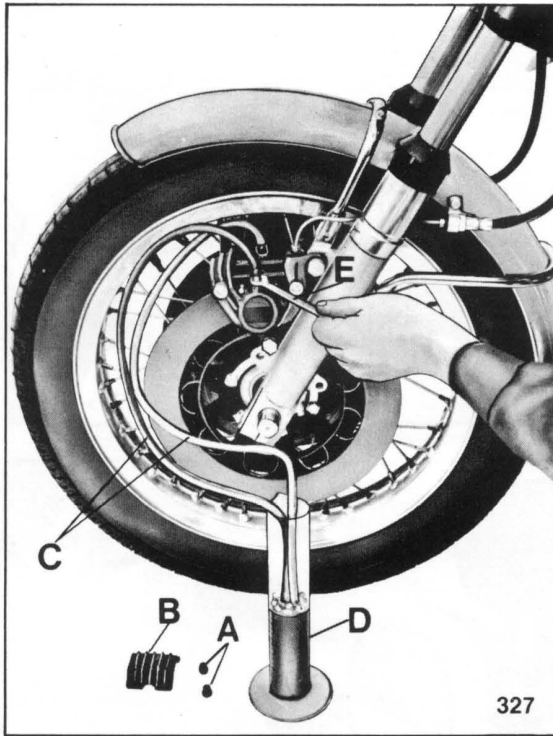


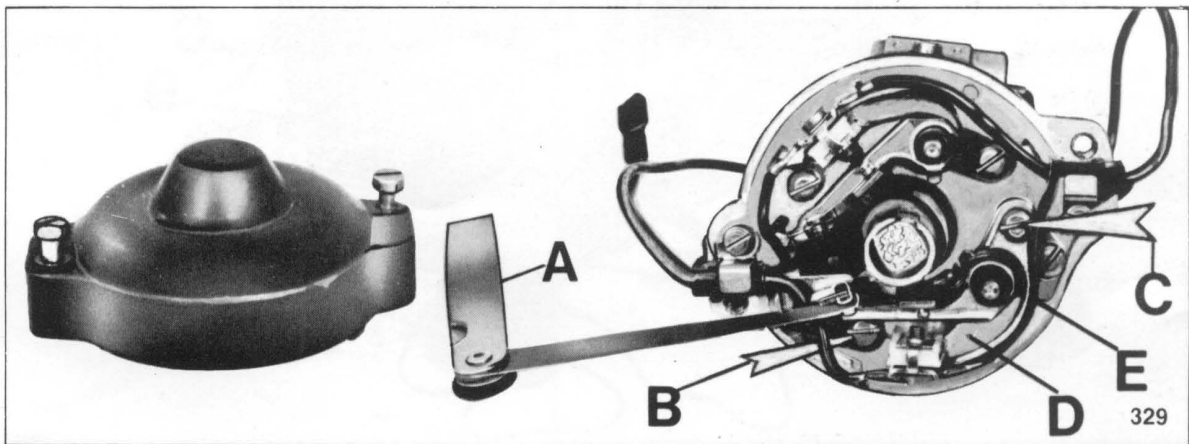
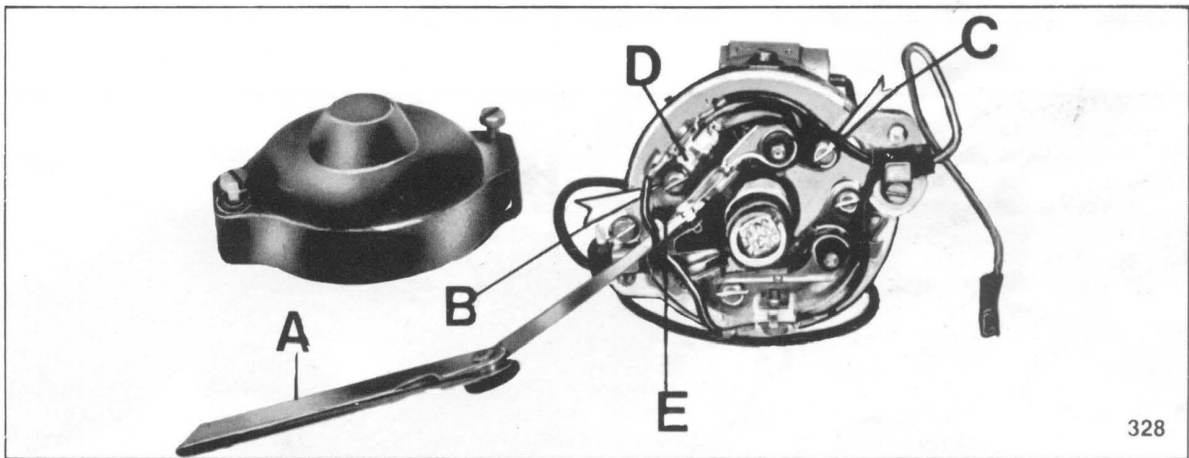
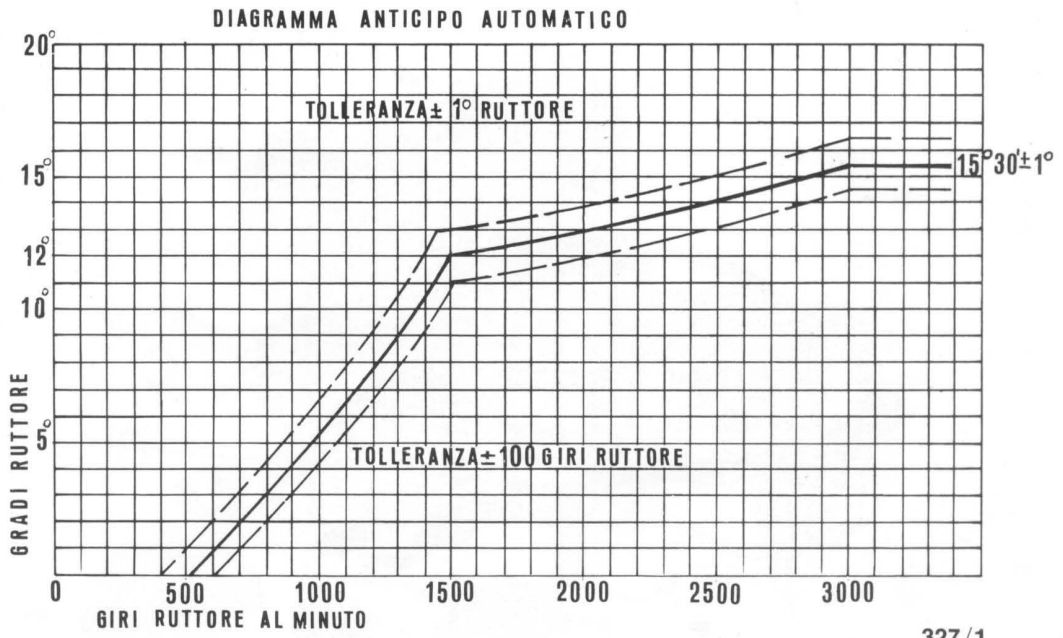


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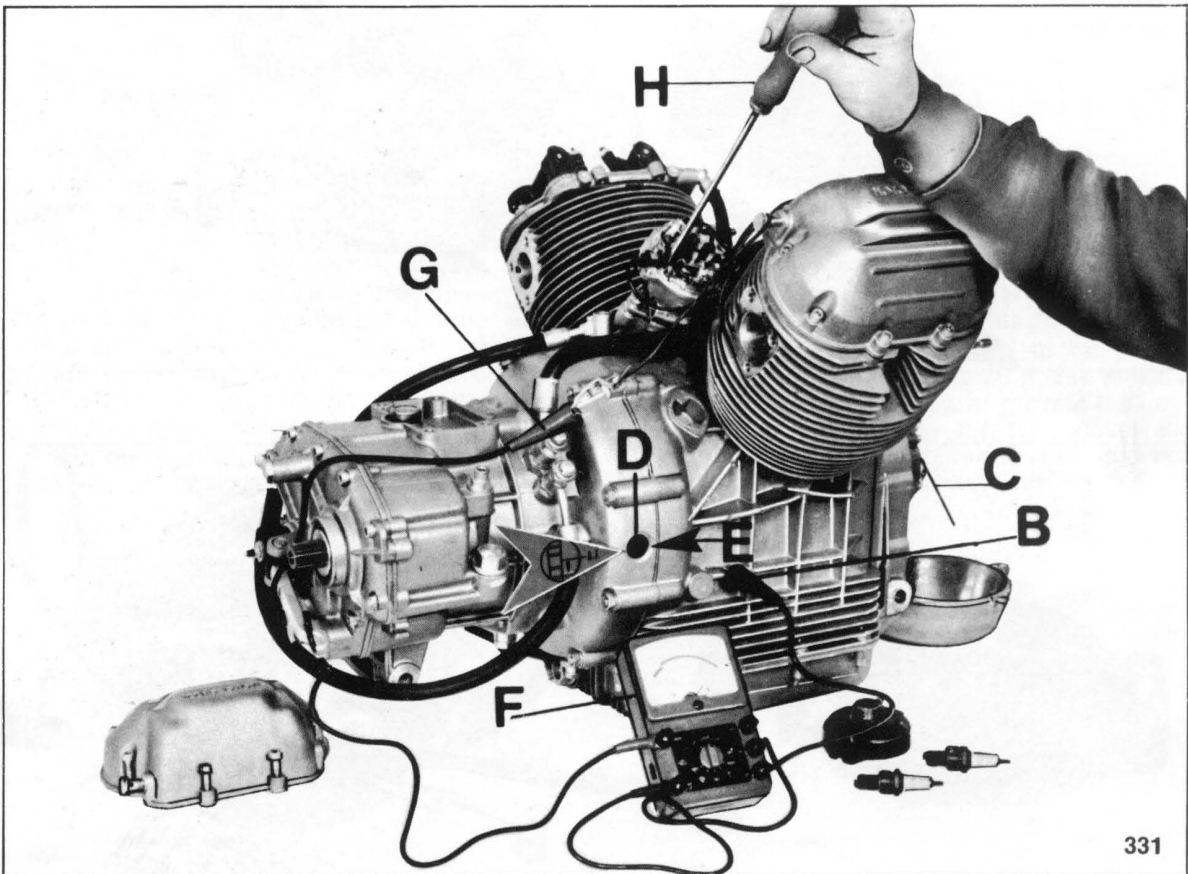
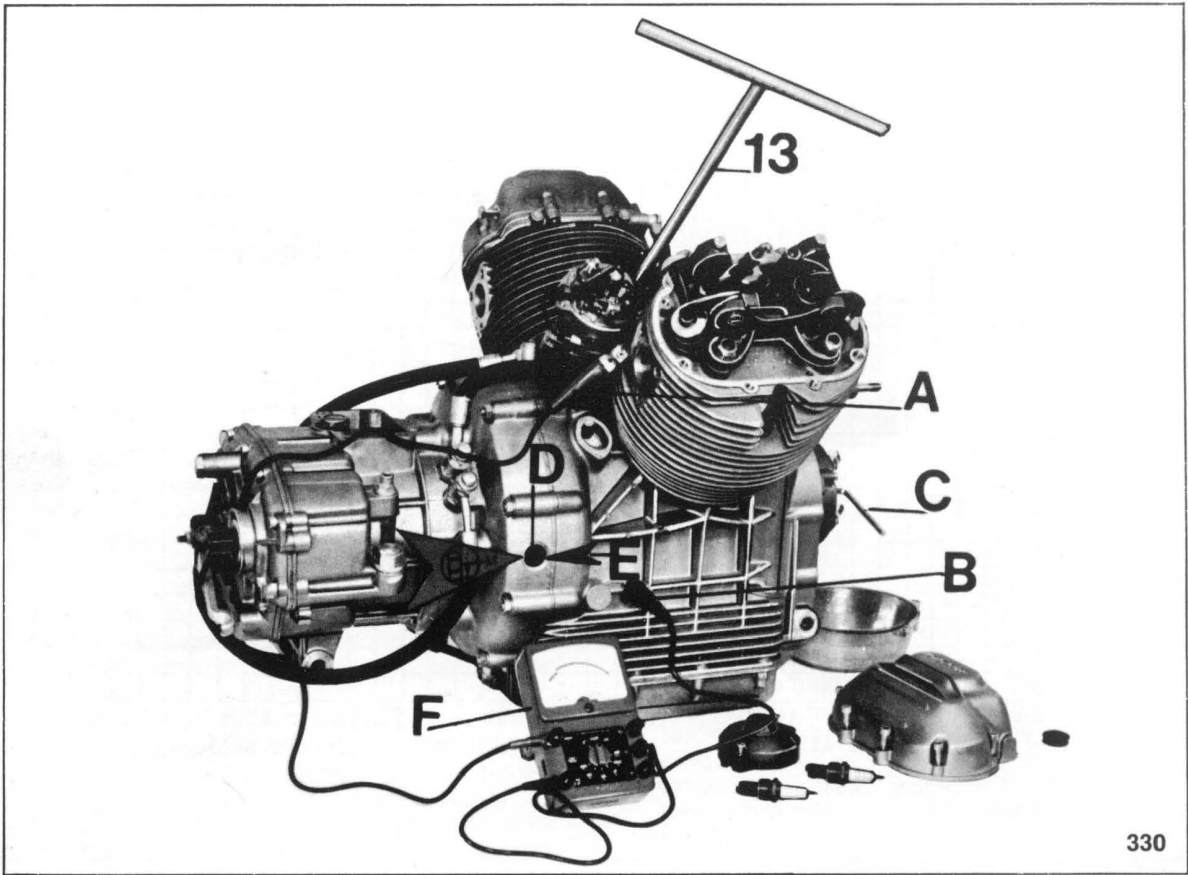












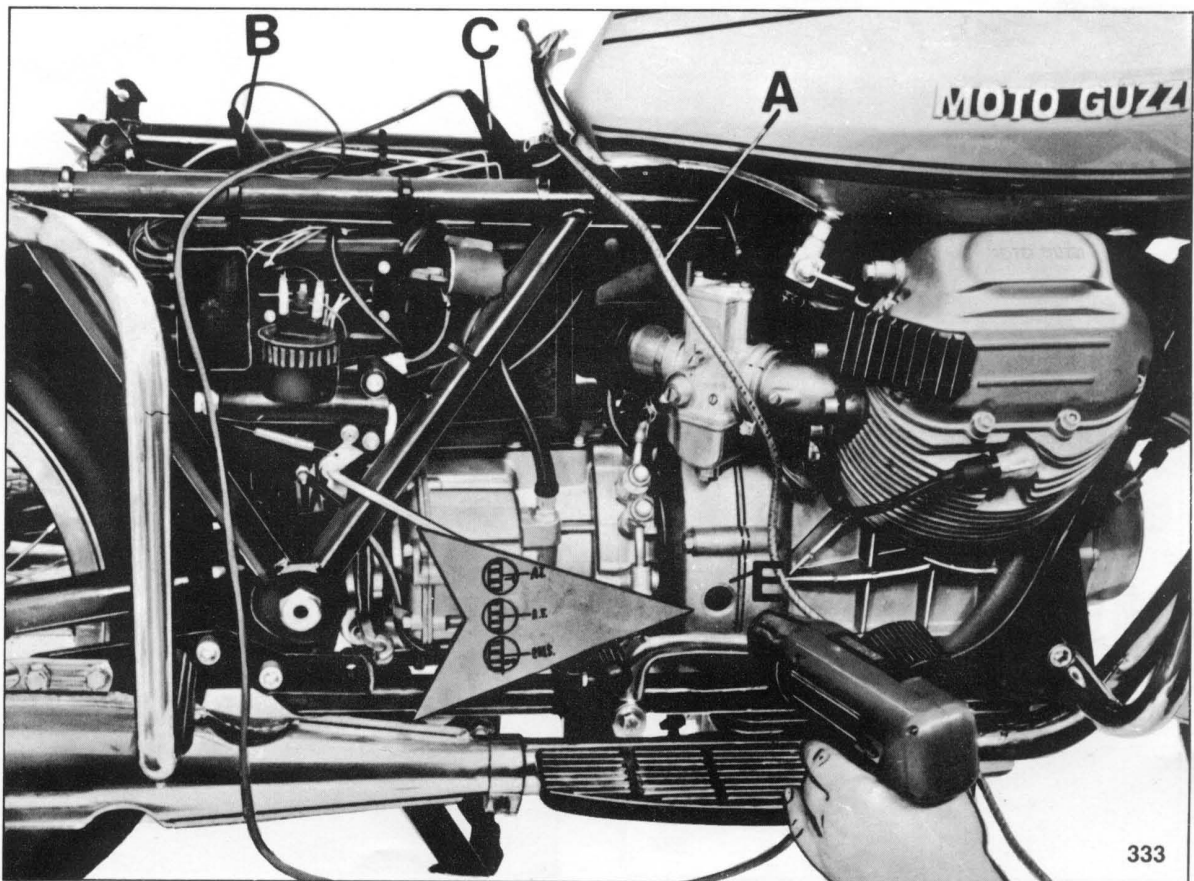
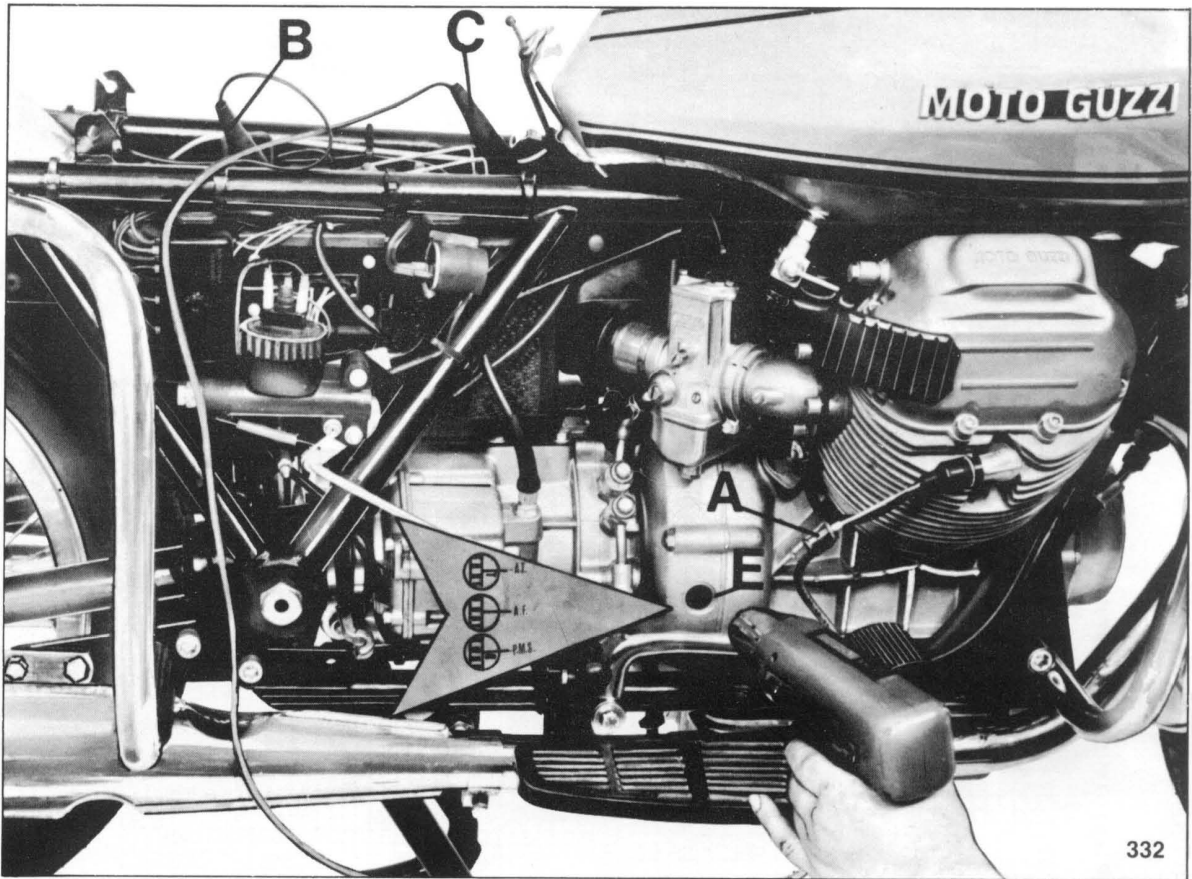
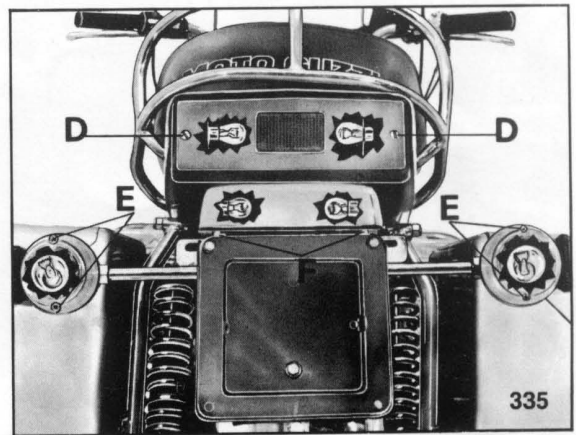
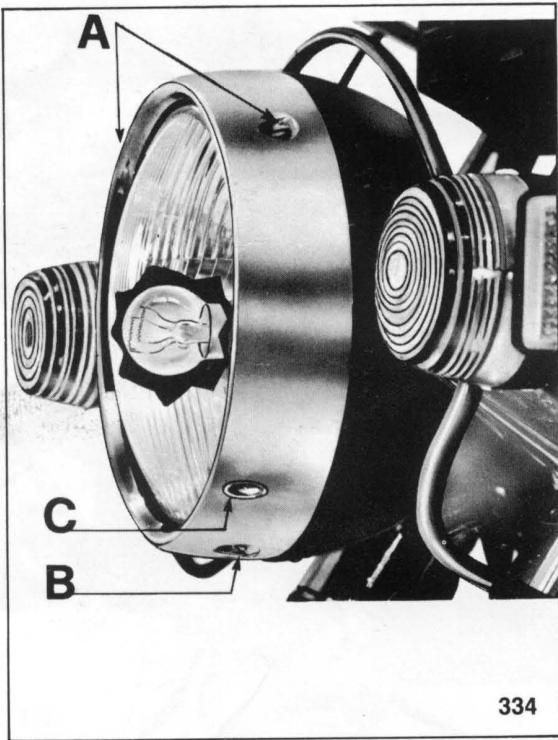
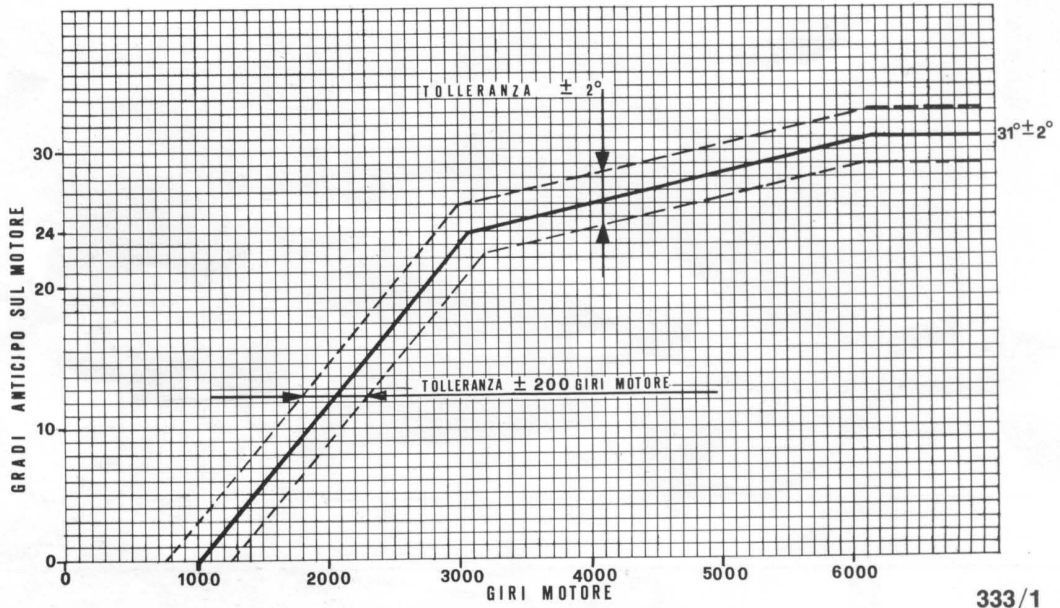
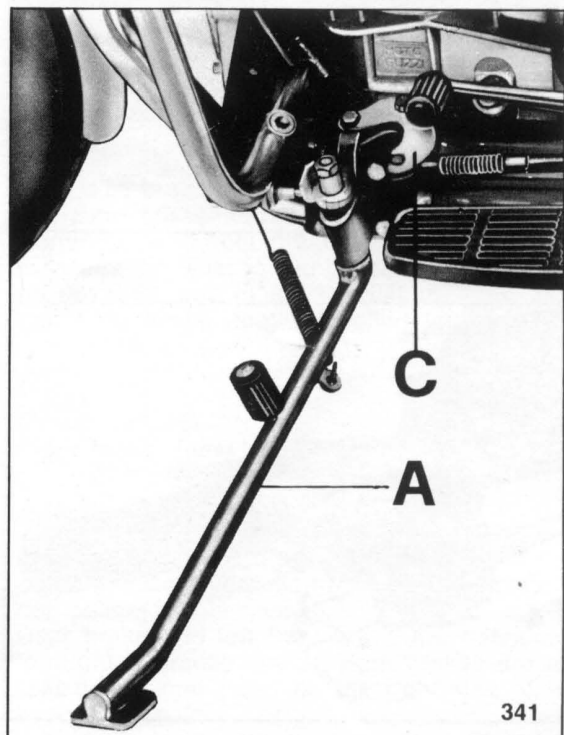
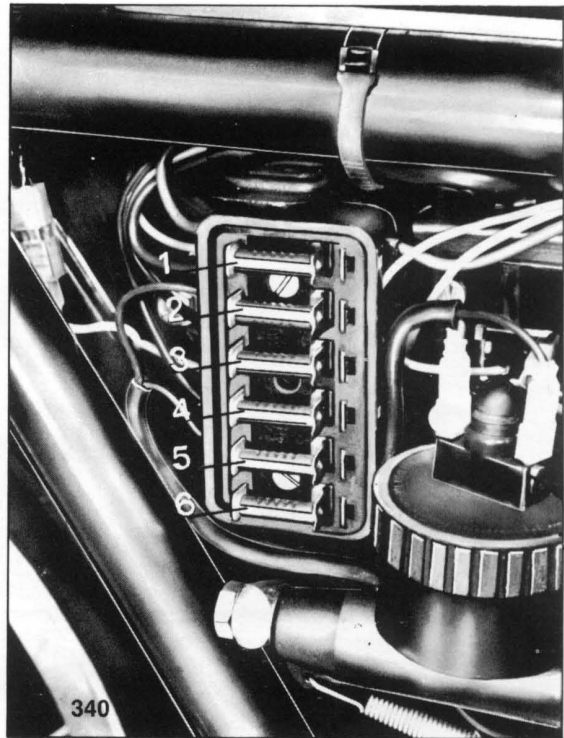
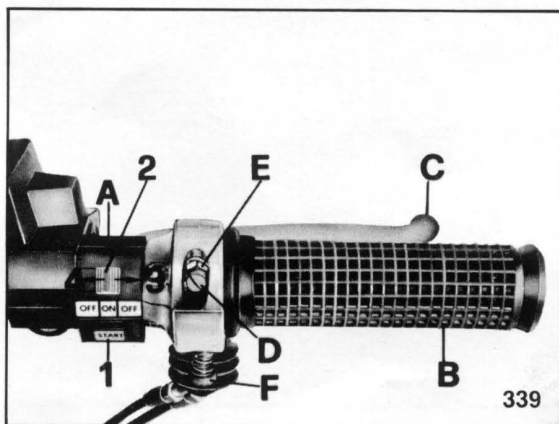
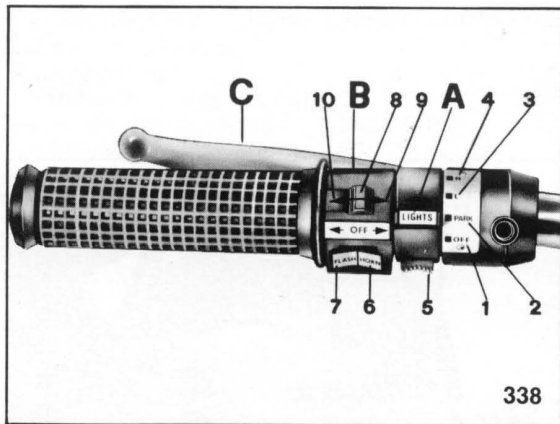
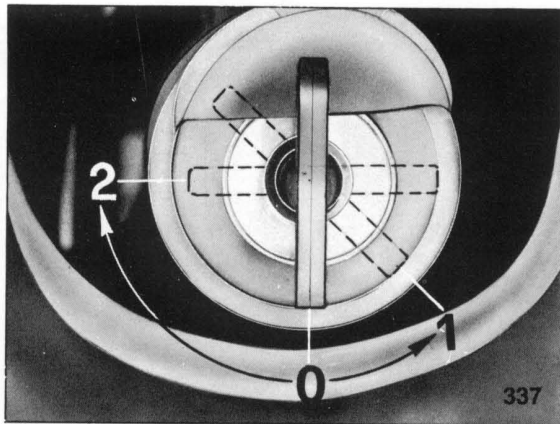
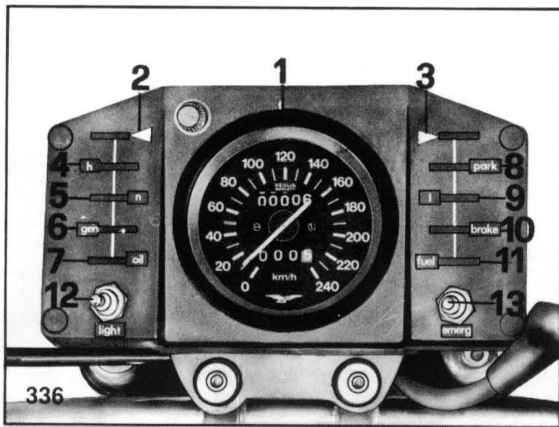
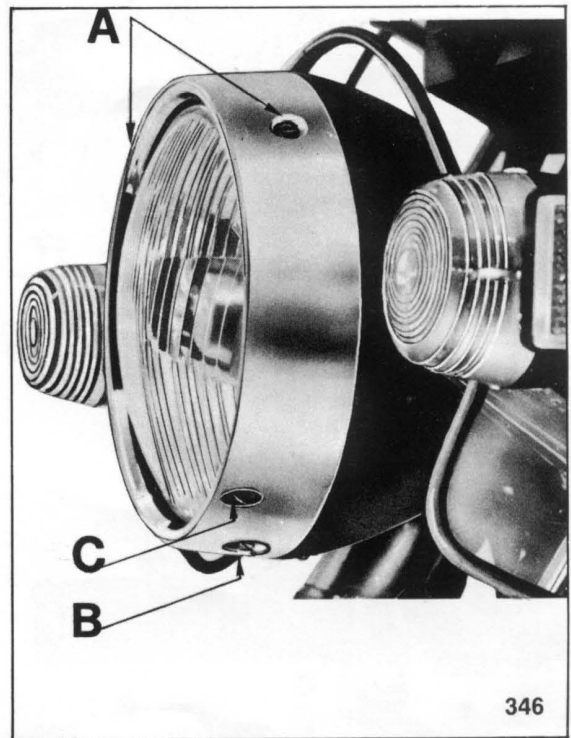
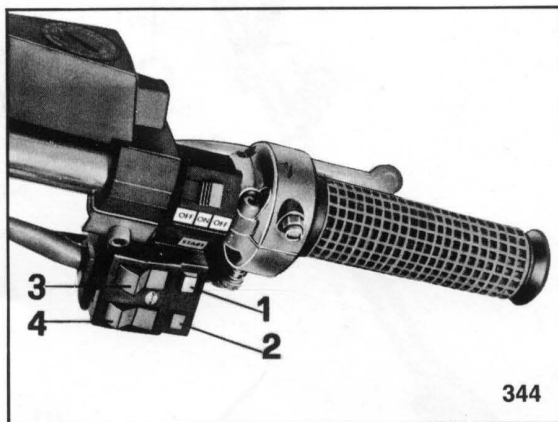
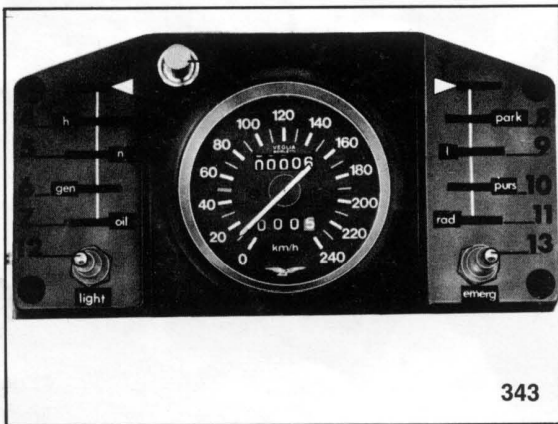
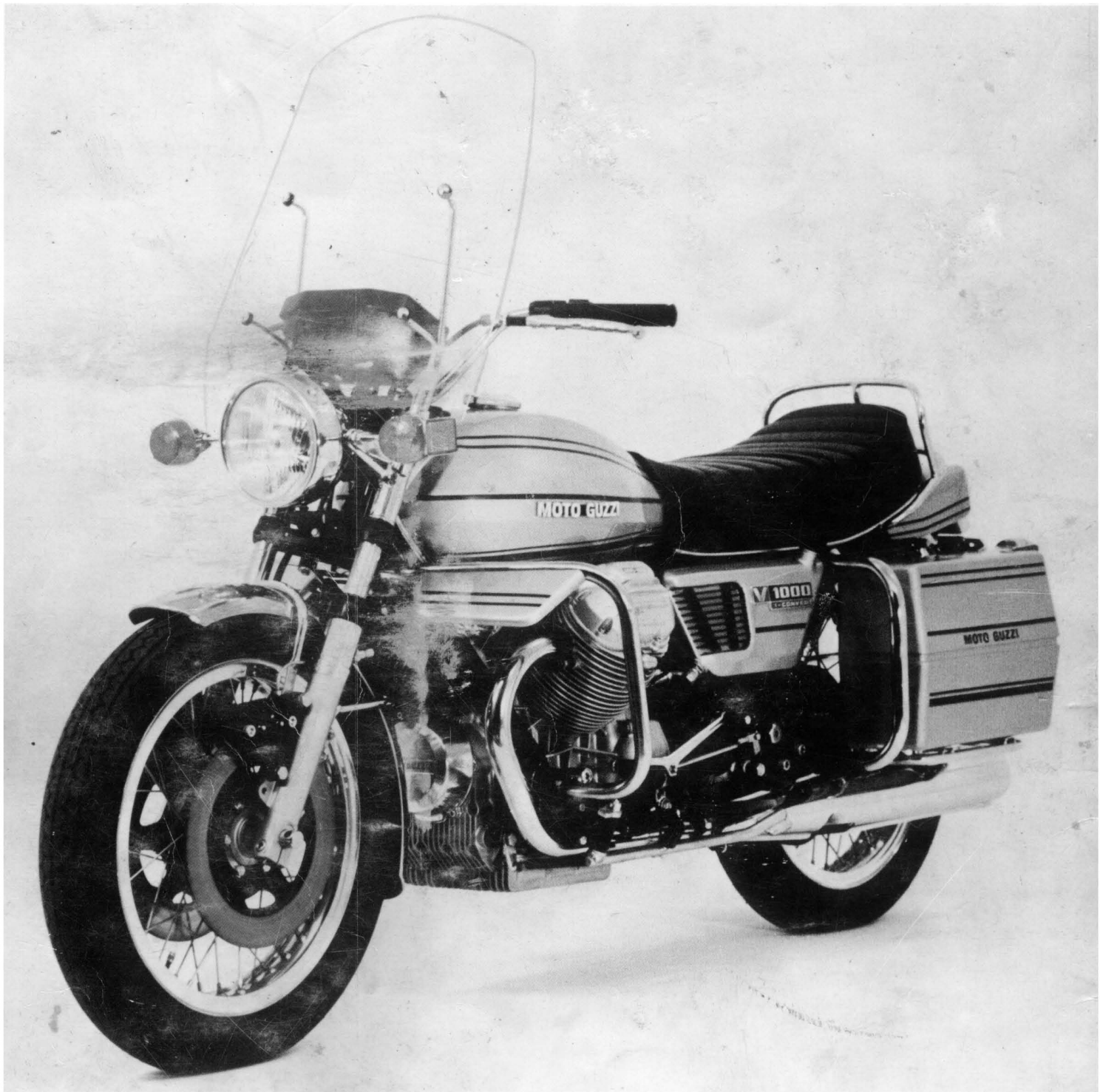


DIAGRAMMA ACCENSIONE









**1000**  
**AUTOMATIC**