

REPAIR MANUAL
for the
MZ MOTOR-CYCLE TS 250
with Annex for the TS 250/I

VEB MOTORRADWERK ZSCHOPAU · DDR
Betrieb des IFA-Kombinats Zweiradfahrzeuge

REPAIR MANUAL

for the MZ-Motorcycle

TS 250

with Annex for the TS 250/1

With 176 illustrations

and 23 drawings of special tools

2nd edition

VEB MOTORRADWERK ZSCHOPAU

Betrieb des IFA-Kombinats Zweiradfahrzeuge

The motor-cycle type MZ TS 250 is a product from
VEB MOTORRADWERK ZSCHOPAU

This Repair Manual was written by a group of engineers in the
employ of the manufacturer

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VEB FACHBUCHVERLAG LEIPZIG

Dead line: 30. 11. 1977

Composition and print: Druckhaus Aufwärts, Leipzig III/18/20-11/79

KGB 3/129/78

RH MZ-Motorrad "TS 250", englisch, 2. Auflage

Preface

We hold lengthy comments on MZ motor-cycles to be unnecessary. In the high latitudes of Finland and, in the parching heat of Africa, under the most different operating conditions these motor-cycles run to the satisfaction of their owners.

To ensure that the vehicle remains in perfect working order and reliable in service after a long period of operation, involving a certain amount of wear, we issue this Repair Manual to give the necessary instructions to our MZ-Workshops at home and abroad.

Repair work is a matter of confidence in several respects:

Reliability and workmanship of the mechanics; the safety of the driver depends on them.

Finding the actual cause of the trouble; this ensures that no material is wasted and labour costs are restricted to a minimum.

From these items result: no retouching work, short times of inoperation and low repair costs.

A good workmanship in repairs largely depends on the use of the special tools and means recommended by MZ. We should like to underline that especially self-service workshops and amateur constructors should bear this in mind to avoid considerable additional expenditure of labour and material due to false optimism.

Our MZ-Workshops may purchase the special tools from the MZ Spare Sales Department — for home-mechanics, however, there is only the possibility of constructing them with the help of the sketches given in a supplement to this booklet.

We hope this Reference Book offers the required information to the staffs of the workshops contracted for servicing our products at home and abroad, and to the friends of MZ motor-cycles throughout the world; and we wish good success to each and all.

VEB MOTORRADWERK ZSCHOPAU
Betrieb des IFA-Kombinats Zweiradfahrzeuge
Abt. Kundendienst

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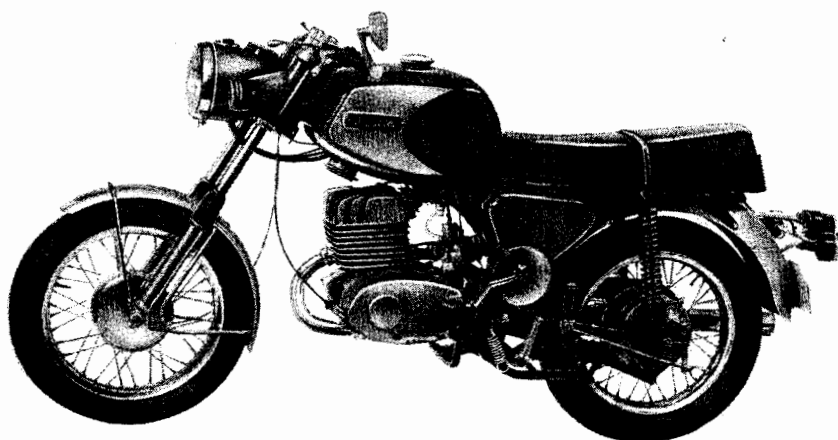


Fig. 1 a. TS 250 de luxe

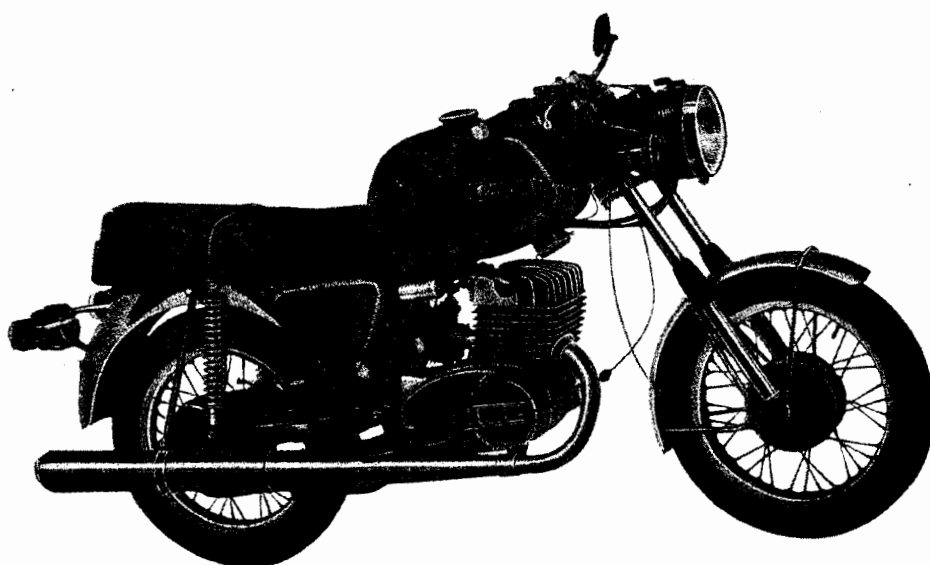


Fig. 1 b. TS 250 Standard

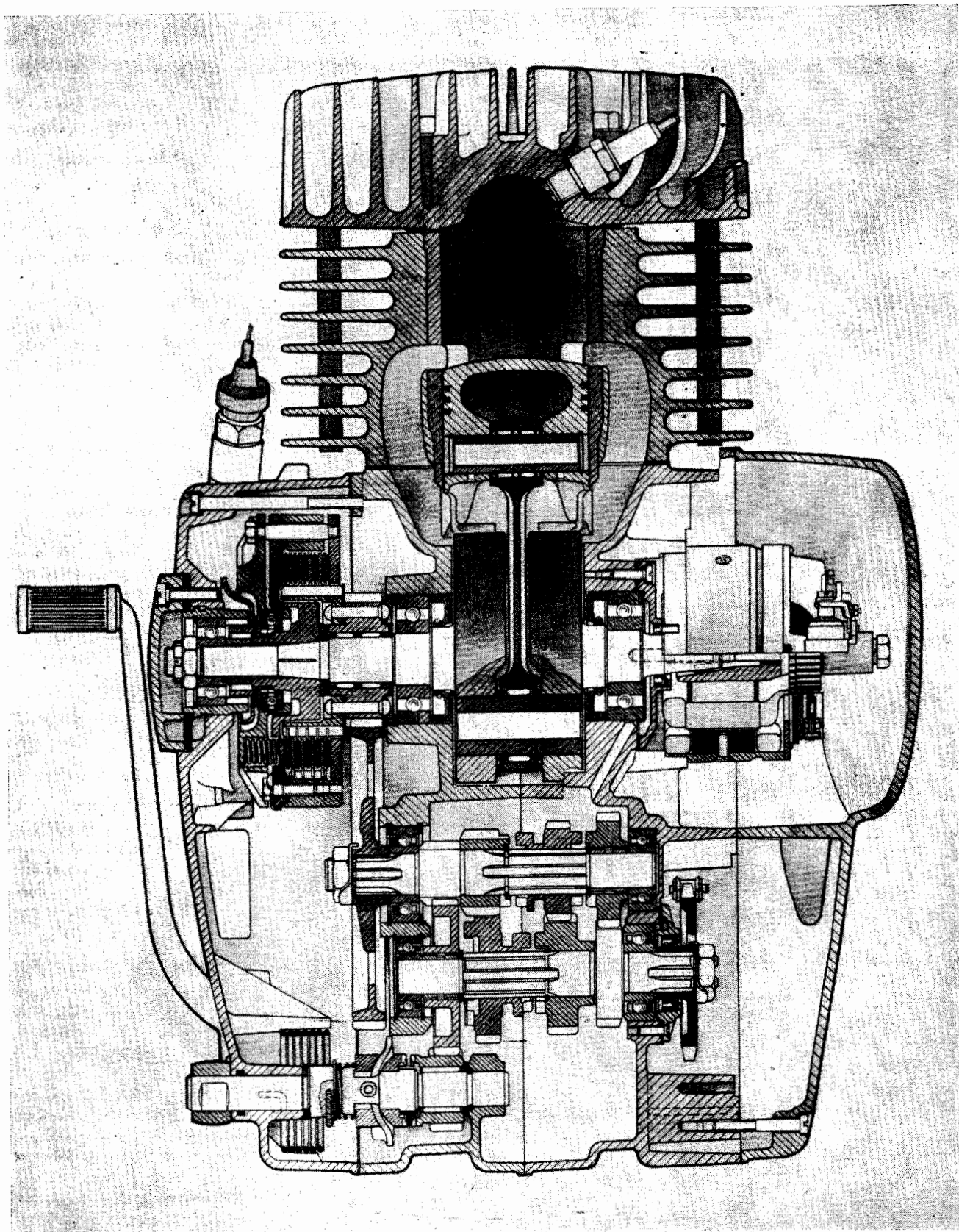


Fig. 2. Sectional view of engine

1. Technical Data

1.1. Engine

Type of engine	MM 250/3
Cycle	two-stroke reserve scavenging
Cooling system	air-cooled (relative wind)
Number of cylinders	1
Stroke/bore	65 mm/69 mm
Swept volume	243 cm ³
Ratio of compression	9.5 to 10 : 1
Compression volume of cylinder head (when assembled)	about 27 cm ³
Maximum output (at 5,700 to 5,900 rmp)	14.0 kW (19.0 DIN hp = 21 SAE-hp)
Maximum torque (at 4,700 to 5,000 rmp)	25.5 Nm (2.6 kp-m)
Lubrication	petrol lubrication
Connecting-rod bearings	cage-type needle bearings for big end (K 28 × 35 × 20) and gudgeon pin (KK 18 × 22 × 24 F)
Crankshaft main bearings	2 bearings 6305 c3f (silent) 1 bearing 6302
Lubrication of main bearings	by gear lubricant
Piston	with 3 piston-rings, side lock (Z-rings)
Weight of pistons complete with rings, gudgeonpin and locking devices	360 ^{±5} g
Broad finned cylinder	liner of special grey-cast iron with cylinder metal cast around
Timing in terms of crank angles	Inlet 155° Transfer 118° Exhaust 170°

1.2. Carburetter

Transfer port in mm	BVF 30 N 2-3 (starting carburetter)
Main jet	30
Needle jet	140
Partial-load needle No.	70
Needle position from top	C 6 with 5 notches
Starting jet	4 to 5 ¹⁾ (5th for running in)
Slow-running jet	110
Float-needle valve	35
Slow-running air screw	20
	1.5 revolutions open

1.3. Electrical Equipment

Ignition	battery ignition
Ignition timing	3,0 _{-0,5} mm B.T.D.C. 20° to 22° crank angles
Contact breaker points gap	0.3 ^{+0.1} mm
Sparkign-plug	M 14-240
Electrode gap	0.6 mm
Dynamo	direct current, 6 V, 60 W, short-time operation 90 W
Charging control light (red)	in speedometer
Regulator	RSC 60/6, under dual seat
Battery	6 V, 12 Ah (lead storage battery, flat type)
Ignition coil	6 V, on the right behind cylinder head
Headlamp	lamp opening 170 mm
Dimmer switch	at left-hand handle bar
Combined stop, tail and numberplate lighting fitting	lamp opening 100 mm
Stop light	contact at rear brake cam spindle
Electric Horn	below the lower clamping head
By-pass light signal	is actuated by pushbutton below dimmer switch
Electric bulbs	
Bilux twin, filament	6 V, 45/40 W, asymmetric passing beam
Parking light	6 V, 4 W, cap BA 9s
Stop light	6 V, 21 W, cap BA 15 S
Tail light	6 V, 5 W, cap BA 15 S

1) Besides the driving habit, the sparking-plug appearance is decisive for the adjustment.

Charging control light	6 V, 1.2 W
Idling indicating light	6 V, 1.2 W
Speedometer illumination	6 V, 1.2 W
1.4. Gearbox	
Clutch	on left-hand end of crankshaft — in oil bath (5 friction disks with cork portions)
Gear-shift system	foot-operated (rack, segment, cam barrel)
Number of speeds	4
Gear ratios	
1st speed	2.77 : 1 \triangleq 13 : 36 teeth
2nd speed	1.8 : 1 \triangleq 15 : 27 teeth
3rd speed	1.23 : 1 \triangleq 22 : 27 teeth
4th speed	0.92 : 1 \triangleq 25 : 23 teeth
Bearings on driving shaft	6204 (20 \times 47 \times 14) and 6203 (17 \times 40 \times 12)
Bearing on driven shaft	6203 (17 \times 40 \times 12) and 6204 (20 \times 47 \times 14)
Idling indicating light	electric indicator lamp (green) in speedometer
1.5. Transmission	
Transmission	
engine/gear	2.43 : 1
by helical gears	28 : 68 teeth
Transmission	
gear/rear wheel	21 : 47 teeth \triangleq 2.24 : 1
by roller chain	12.7 \times 7.75 \times 8.51 mm
	126 rollers
Total gear ratio	
1st speed	15.0 : 1
2nd speed	9.8 : 1
3rd speed	6.7 : 1
4th speed	5.0 : 1
1.6. Cycle Parts	
Frame	central tubular frame
Engine suspension (elastic)	top at cylinder head, rear at casing
Steering angle	63°
Castor	66 mm
Suspension system	
front	total travel of spring 185 mm
rear	spring pre-load adjustable, total travel of spring 105 mm
Wheels	wire spokes, non-offset
Rim size	
front	1.85 B \times 16
rear	2.15 B \times 16
Tyres	
front	3.00 — 16
rear	3.50 — 16
Tyre inflation pressure	
front	0.15 (1.5) MPa (kp/cm ²)
rear	0.19 (1.9) MPa (kp/cm ²) solo
rear	0.21 (2.1) MPa (kp/cm ²) with pillion rider
Brakes	full hub brakes
	160 mm diameter
	30 mm shoe width
1.7. Dimensions and Masses (Weights)	
Wheel base	1,330 to 1,355 mm
Length	2,050 mm
Width with/without	730/620 mm (1)
mirror	865/735 mm (2)
Height with/without mirror	1,120 mm/1,040 mm (1)
	1,180 mm/1,110 mm (2)
(1) flat handlebars	
(2) elevated handlebars	
Ground clearance, loaded, at prop stand	135 mm

	12.5-l-tank	17.5-l-tank
Weight unladen, "empty"	130 kg	131 kg
Weight unladen, ready for operation (with fuel and tools)	140.5 kg	144 kg
Permissible total mass (weight)	320 kg	320 kg
Permissible axle loads front/rear	100/220 kg	100/220 kg

1.8. Capacities

Gearbox	750 cm ³ of GL 60 gear oil for summer and winter
Fuel tank	about 12.5 or 17.5 litres of fuel-oil mixture
including reserve of	about 1.5 litres
Telescopic fork	220 cm ³ of shock-absorber oil for each unit
Suspension units, rear	70 cm ³ of shock-absorber oil for each unit

1.9. Characteristics and Diagrams

The maximum speed, depending on sitting position, is about 120 to 130 km/h.

The maximum speed of 130 km/h will only be reached if the required favourable conditions are given (rider stooping so as to be almost "lying", tightly fitting motoring suit, plane road, no headwind).

The engine characteristics, traffic fuel consumption, and acceleration are shown in the following diagrams (Figs. 3 to 5).

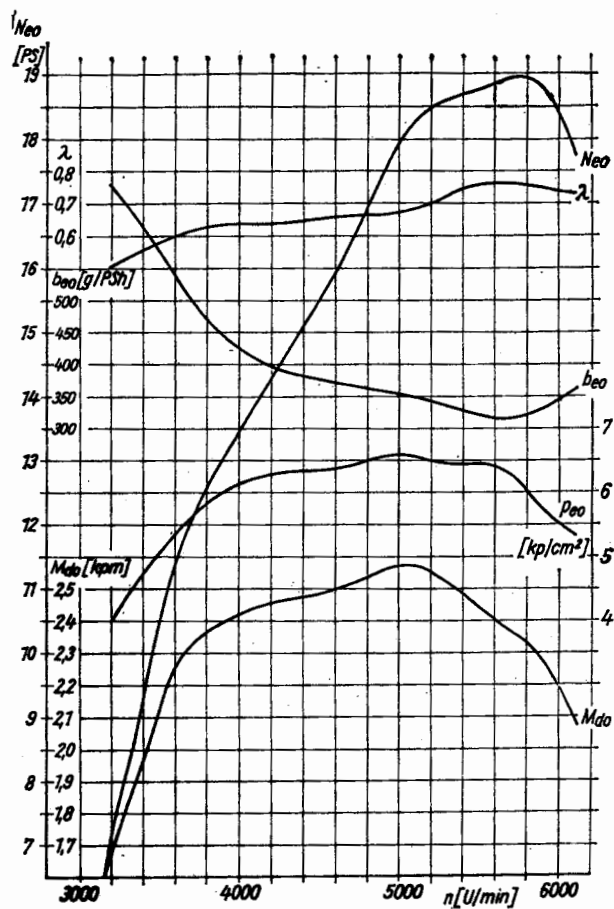


Fig. 3. Full load characteristics of the engine

N_{eo} [PS] = N_{eo} [hp];
 b_{eo} [g/PS-h] = b_{eo} [g/hp-h];
 M_{do} [kpm] = M_{do} [kp-m];
 p_{eo} [kp/cm²] = p_{eo} [kp/cm²];
 n [U/min] = n [rpm]

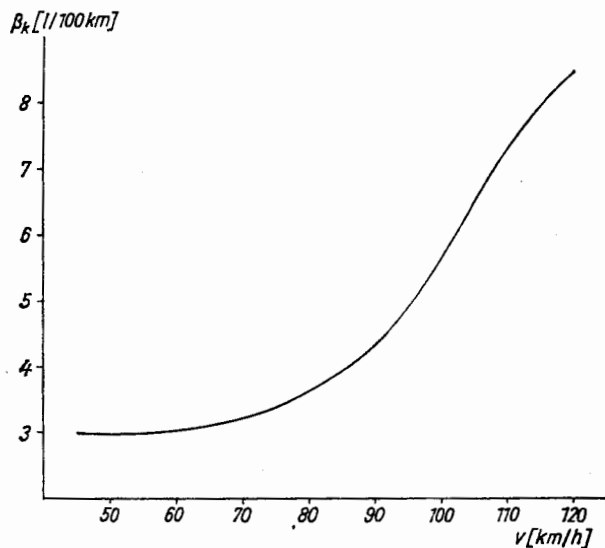


Fig. 4. Basic fuel consumption in top gear (4th speed)

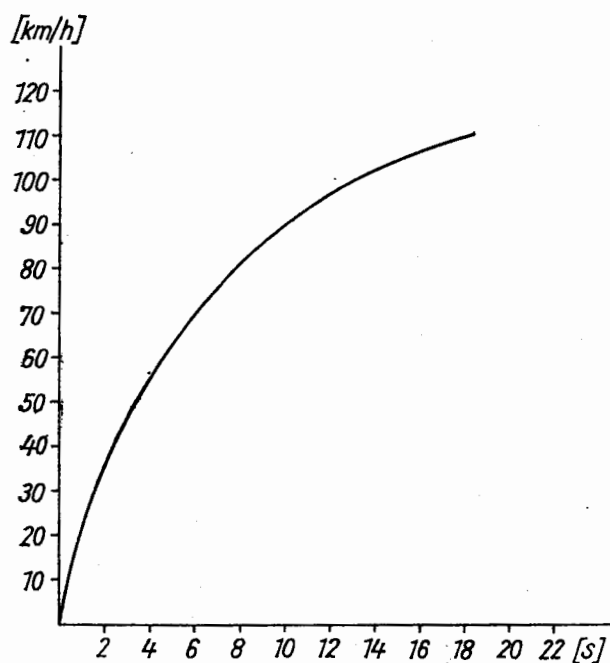


Fig. 5. Maximum acceleration when starting from standing

2. Fuel, Lubricants and Fluids

2.1. Fuel

According to the design of the engine, a petrol of an octane rating of at least 88 (abbreviated as "88") should be used.

In countries other than the GDR, the use of a fuel with a similar rating is recommended.

If fuels of a higher octane number are used, readjustment of the carburettor by resetting the partial-load needle may be necessary.

2.2. Engine Oil

Engine oil is added to petrol in the

ratio of 1 : 50

(e.g. 0.2 litres of engine oil are added to 10 litres of fuel).

For other units of measurement we refer to our conversion table (Section 10). This mixing ratio also applies to the running-in period.

This simple and reliable system of petroil lubrication supplies oil to the two connecting-rod bearings, cylinder liner and piston. Experiences gathered by us in the course of many years have shown that it is advisable to use exclusively

MZ 22 two-stroke engine oil.

This additive-type oil meets the following requirements:

viscosity at 50 °C is between 20 to 25 cSt

pour point maximum – 30 °C

It contains additives which effect a high temperature and pressure resistance. Limited tendency to coking, prevention of carbonaceous oil deposits or loosening of them. Wear reducing and corrosion preventing properties. Contains lead separating agents preventing whisker formation in sparking-plugs.

For MZ motor-cycles operated in countries other than the GDR we also recommend exclusive use of two-stroke engine oils which possess these properties (e.g. Shell 2 T, Castrol 2 T, Arol 2 T, Mixol "S", LT-2T).

2.3. Gear Oil

For gearbox and primary drive, an amount of 750 cm³ of GL 60 gear oil is required. This is an additive-type gear oil which is suitable for the lubrication of changespeed gearbox and axle drives. It is an ageing-resistant refined lubricating oil with additives for an increase of load-bearing capacity and a reduction of wear.

It has favourable low-temperature properties and meets the following technical requirements:

viscosity at 50 °C	53 to 68 cSt (corresponds to about 8° E)
--------------------	--

pour point maximum	25 °C
--------------------	-------

flashpoint	180 °C
------------	--------

water content	0.1 %
---------------	-------

In countries other than the GDR a gear oil with similar viscosity values and properties should be used (SAE 80).

2.4. Lubricants for Cycle Parts

The swing arm bearing and the lever for rear-wheel brake actuation must also be lubricated with GL 60 gear oil. (Oil filled grease gun: swing arm bearing to be lubricated thoroughly until oil emerges from the lubrication points; for brake lever only 2 to 3 strokes.)

The following lubricating points of the cycle parts must be lubricated with "Ceritol+k 2" or "Ceritol+k 3" antifriction bearing grease:

Steering bearing, wheel bearings, bearing for rear-wheel drive, secondary chain, brake cams and brake shoe bearings, foot-operated brake shaft and speedometer drive (the latter only when being mounted or repaired).

This antifriction bearing grease has a pour point of about 130 to 150 °C, can be used for a temperature range from – 20 to +100 °C, and is water-resistant at +50 °C. In countries other than the GDR, an antifriction bearing grease of similar characteristics should be used.

2.5. Shock-absorber Fluid

For the telescopic fork and the spring-loaded suspension units, a shock-absorber fluid of a viscosity of 8 to 11 cSt (corresponds to 1.65 to 1.92 °E) at 50 °C should be used.

The damping characteristics of the telescopic fork and the spring-loaded suspension units are based on this viscosity. Springing and roadability will be impaired if shock-absorber fluids of a different viscosity will be used.

2.6. Lubricant for Contact Breaker

"Unterbröl" – special oil for contact breaker, viscosity 535 cSt at 50 °C.

3. Diassembly of the Engine

3.1. Mounting and Dismounting the Engine

The engine of the TS 250 is dismounted easily and within a short time. Cylinder head and cylinder can also be replaced or repaired in the assembly state shown in Fig. 6. This also applies to the elastic engine mounting at the cylinder. This will be dealt with in full detail in Section 5.3.

The operations described below are included in the disassembling of the engine. The mounting operations are to be done in the inverse order of the disassembling operations.

The abbreviation in German "SW" which is also found on spanners and, therefore, used in the following text means "width over flats" of the respective tool.

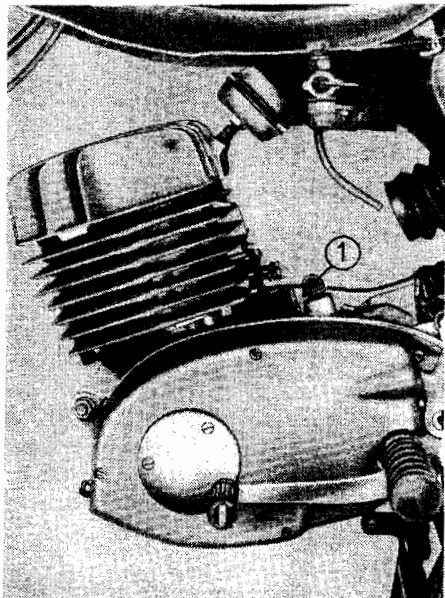


Fig. 6.
Cylinder head
changing
(1) Oil filling hole

3.1.1. Preliminaries

It is advisable, before starting the disassembling operations, to disconnect the battery (1) and to remove it from the vehicle.

During the repair period, it can be serviced and recharged.

If the moto-cycle is kept in the workshop, it is recommendable for reasons of safety to remove the two fuses (2).

During the subsequent operations, the gear oil is allowed to drain (oil drain plugs see Fig. 16, item 4).

Note: The gear-shift mechanism detent screw (Fig. 16, item 5) does not serve for oil draining!

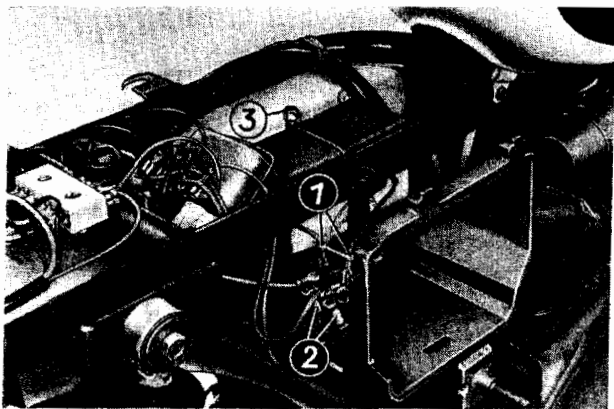


Fig. 7. Disconnecting the cables from the battery terminals

3.1.2. Right-hand Side of Motor-cycle

At the right-hand side, the operations are started with disassembling the exhaust system:

Clamping screw (1) to be loosened by means of hook spanner, fastening at engine (2) (SW 17) and at the rear brace (3) by means of open-end wrench SW 13.

Then remove dynamo cover (4) (use a screw-driver) and withdraw the sparking-plug connector (5).

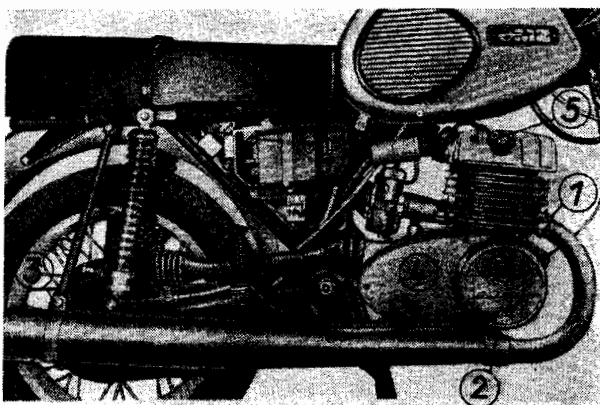


Fig. 8. Right-hand side of motor-cycle

After having removed the cables (1) from the dynamo (they may be marked in the manner shown in Fig. 10 — and identification is also possible when you take the cable colours and the wiring diagram given in Section 6., Electrical Equipment, into consideration), loosen the two M 5 screws (2) (using a screw-driver) and withdraw the pole cap (3).

Tapping the box spanner (SW 13) will loosen the cam fastening (4). The cam can be removed by slightly shaking the screw (with M 7 thread).

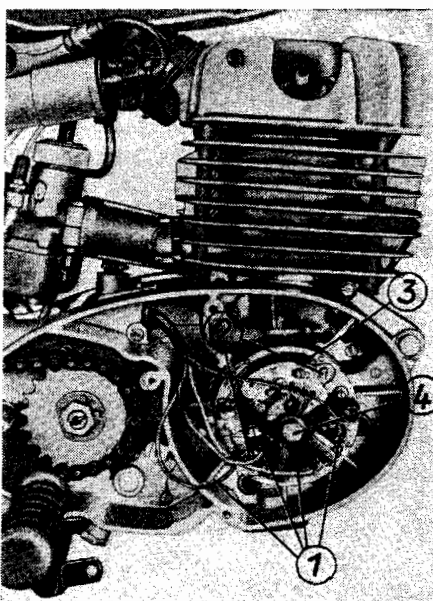


Fig. 9.
Removal
of dynamo

The 02-MW 39-4 (1) armature puller removes the armature from the cone; support the armature with the hands. For home-mechanics or amateur constructors, a M 10 × 100 screw will do good service.

Open the chain connecting links (2) (flat-nosed or combination pliers) and — after removing the secondary chain — push back the chain protecting (3). After having disconnected the cable for the idling indicating device from the

contact maker (item 2 in Fig.27), we now can proceed to the operations to be done at the left-hand side of the vehicle.

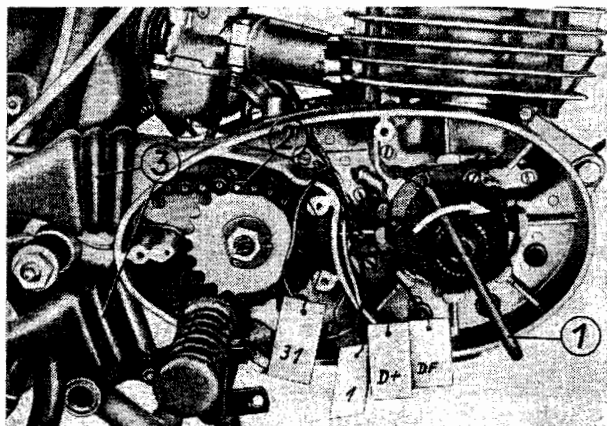


Fig. 10. Armature and secondary drive

3.1.3. Left-hand Side of Motor-cycle

3.1.3.1. Dismantling the Carburetter

After having withdrawn the fuel-feed hose, the carburetter can be dismantled and removed from the motor-cycle.

Sequence of operations:

- (1) Unscrew screw cap with throttle valve, starting carburetter actuating device (wrench SW 13),
- (2) Loosen the clamping connection carburetter/induction pipe (use a screw-driver),
- (3) Remove two nuts of the induction pipe connection.

Remove the induction pipe connection from the stud bolt at cylinder, slew the carburetter round and, while turning it to and fro, withdraw it from the induction pipe.

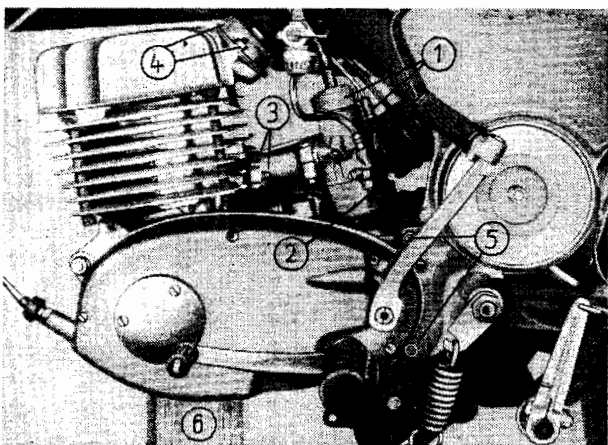


Fig. 11. Carburetter

(4) to (6) see Section 3.1.3.3.

3.1.3.2. Unhooking the Clutch Cable Control

After drawingback the protective rubber cap, remove the plug-type nipple (1). Then unscrew the cable control holder (2) by means of an open-end wrench of SW 19. Then the clutch cable control can easily be unhooked.

3.1.3.3. Removing the Engine

It is advisable to prop the engine by means of a suitable wooden block (6) (see Fig. 11) before loosening the two nuts (4) from the cylinder head (use an open-end wrench of width over flats 13) and the two rear (5) fastening screws (use width over flats 13 socket wrench).

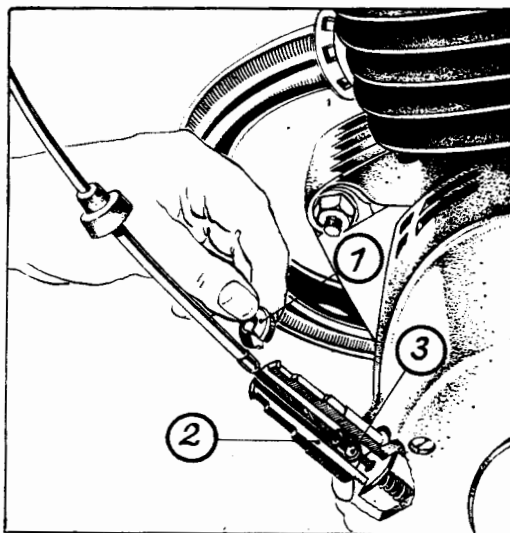


Fig. 12. Clutch cable control

3.2. Dismantling the Engine

3.2.1. Preliminaries

Before disassembling the engine removed from the motor-cycle into its parts, we think you agree that the engine should be cleaned externally. It also goes without saying that all parts should be so placed or kept that nothing can be lost or damaged.

Before the engine is placed into the fixture 05-MV 197-0 (see Fig. 16), remove the clamping screw (1) (SW 17) and beat out the fitting sleeve underneath by means of the drift 11 MW 3-4 (2).

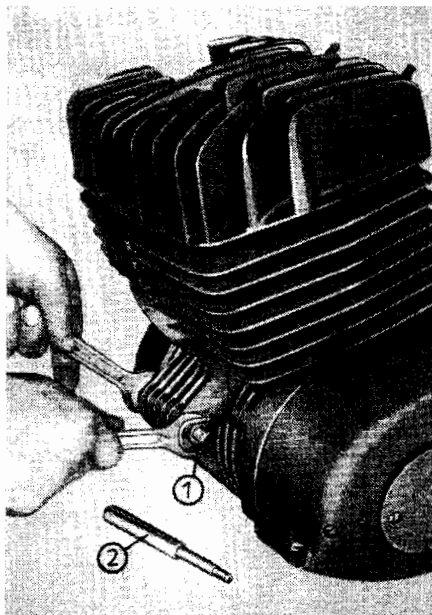


Fig. 13. Removing the clamping screw and fitting sleeve

3.2.2. Right-hand Side of Engine

Bent off the locking plate of the fastening nut (SW 22) for the sprocket.

The 05-MW 45-3 holder (1) facilitates loosening the nut by means of a box wrench (right-handed thread).

The casing screws are removed later (see Section 3.2.5.).

If the sprocket wheel has a very tight fit, puller 05-MV 45-3 will be helpful.

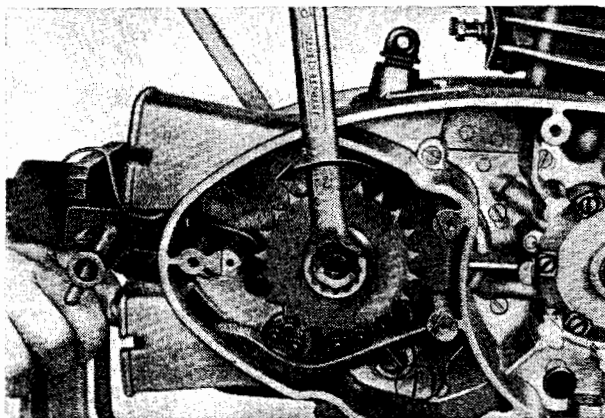


Fig. 14. Right-hand side of engine

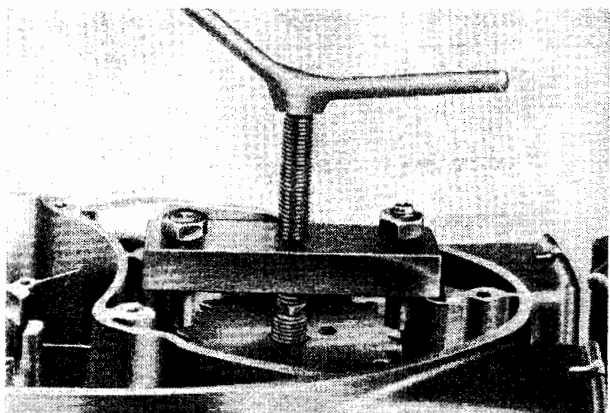


Fig. 15. Withdrawing the sprocket wheel

3.2.3. Disassembly of the Primary Drive

The first thing to do is to remove the gearshift pedal (while the kick-starter is left in place), the cover with adjusting plate and rubber sealing ring (1). The split pin inserted in the crankshaft must also be removed. The nut (2) is loosened by tapping the box spanner SW 22 (right-handed thread).

Use a mallet of a non-metallic material to tap against the collars (3) to overcome the transition fit of the 6302

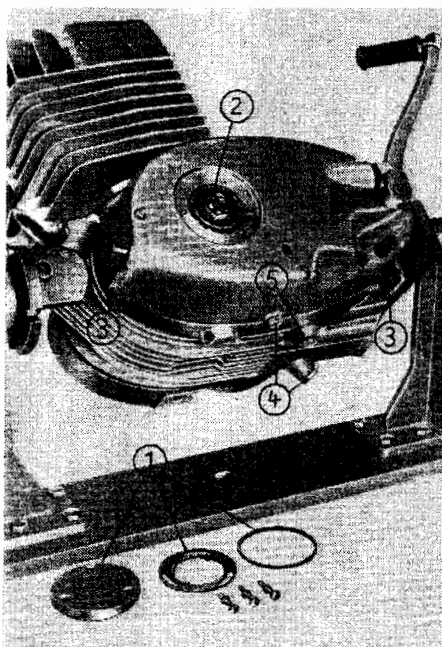


Fig. 16.
Clutch cover
(4) to (5) see
section 3.1.1.

bearing and the fitting sleeve — then the clutch cover can be removed.

Since June, 1973, a hexagon nut, M 14 × 1.5, TGL 0-934-6, has been used for fastening the clutch on the crankshaft. Locking is provided by a spring ring B 14, TGL 7403. This fastening can be provided on older vehicles subsequently and it must be checked that it is tight on the occasion of any inspection (or every 5,000 km) (torque 8 to 10 kp-m). The 22-50.413 holder (1) facilitates the following operation.

Using the 05-MW 20-4 puller (2), separate the clutch from the taper of the crankshaft end (before this can be done, the spacer ring must be removed). Take care that the puller is properly tightened. This cannot be achieved without vigorously striking against the puller handle.

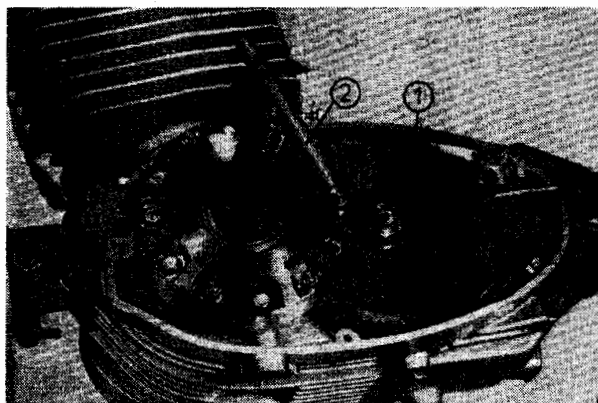


Fig. 17. Extracting the clutch

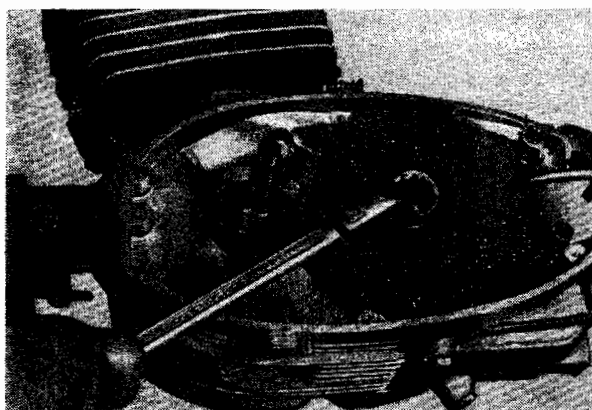


Fig. 18. Loosening the nut for the driving gear

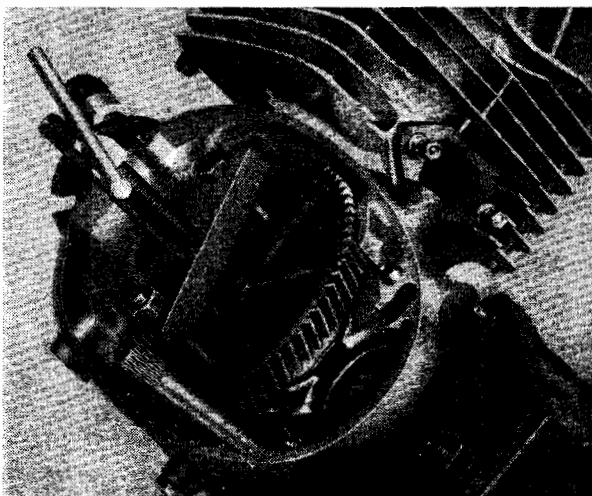


Fig. 19. Removing the driving gear

This shows that the inner clutch driver has already been removed with the required care (needle bearing). The next operations include bending off the lock plate, loosening the fastening nut (SW 24) for the toothed wheel on the driving shaft, using the holder 22-50.413, before this 68-teeth wheel is removed with the 05-MV 45-3 puller (Fig. 19).

3.2.3.1. Disassembling the Clutch

The 05-MV 150-2 device enables an easy disassembling of the clutch. For this purpose, put the clutch with its inner driver (1) on this device. The capstan-head nut (2) releases the clutch flange so that the hexagon nuts and hexagon head screws (SW 10) can be loosened after bending off the lock plates.

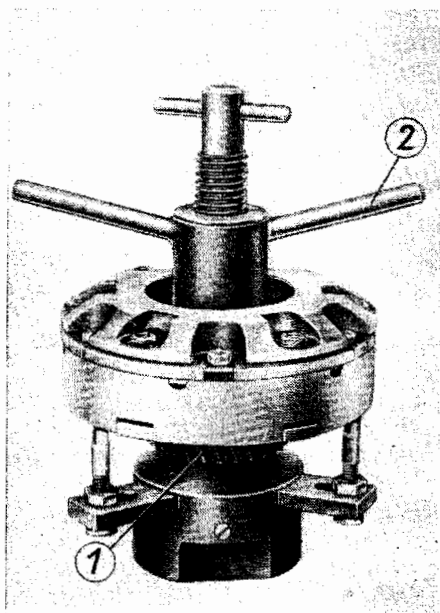


Fig. 20.
Disassembling
the clutch

3.2.3.2. Removal of the Kick-starter Shaft and the Clutch Actuation

Please, when clamping the bearing collar of the kick-starter shaft in a vice, at any rate use copper jaws or wooden backing strips.

When loosening the splined bolt of the kick-starter mounting, take care not to damage the thread. The M 6 nut, therefore, should only be slackened back just far enough to produce a "thread protecting action" when the splined bolt is driven out.

3.2.4. Removal of the Cylinder Assembly

Gradually and crosswise loosen the nuts (SW 13) on the studs, withdraw the cylinder head and then the cylinder (see Fig. 70).

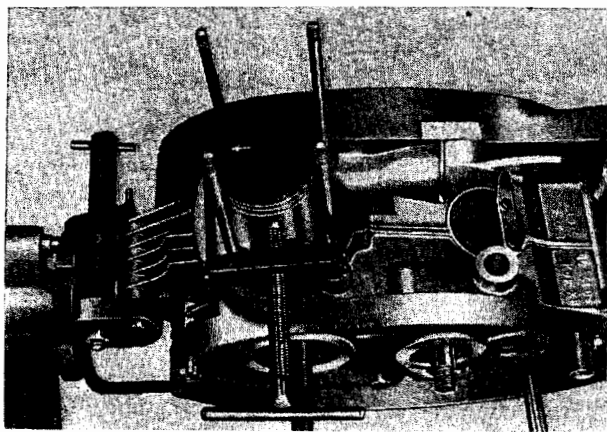


Fig. 21. Driving out the gudgeon pin

Caution! If the engine is not disassembled, cover the opening of the crankshaft compartment with a clean cloth before the two gudgeon-pin locking devices are taken out.

Drive out the gudgeon pin by means of the 22-50.010 device. Beating out the gudgeon pins will damage the crankshaft.

3.2.5. Pulling-off the Right-hand Casing Half

Remove the nut (1) (SW 10) from casing joint and the inspection-hole cover (2).

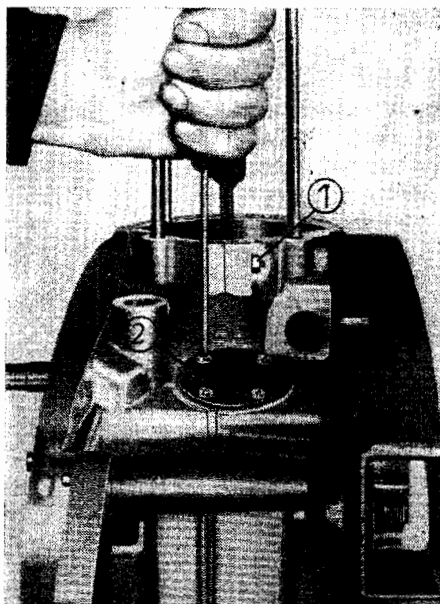


Fig. 22. Inspection
hole cover

Pull the cylinder roller (1) from the crankshaft end (use side cutting pliers). Remove the sealing caps (2) and loosen all 15 casing screws by means of a good screw-driver or a breast drill. The screws are under the rubber stopper (3).

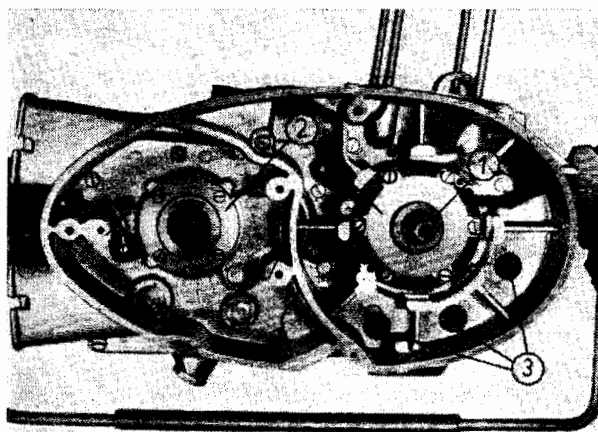


Fig. 23. Loosening the casing screws

The first speed is not engaged and the clamping pieces of the 05-MV 197-0 device are loosened and turned to the sides.

Two 22-50.012 separating screws (at the driven shaft without ancillary ring) are tightly screwed to the casing. Their spindles when tightened uniformly and the same time press the righthand casing half out of its place.

Please separate the engine only in this way. Other methods using undue force will lead to scrap!

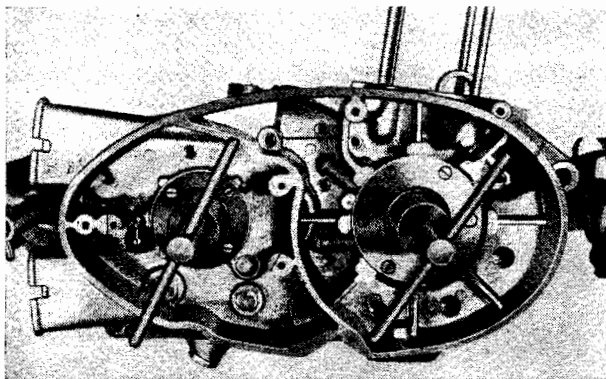


Fig. 24. Separating the casing halves

3.2.6. Dismantling the Gear

First clamp the left-hand casing half. Unscrew the gear-shift mechanism detent screw (1). Take care that the ball is not lost! Withdraw the toothed segment (2) together with the complete gear-shifting shaft and the guide pin (3). Then the cam drum (4) and the two selector forks can also be removed.

Then tap the complete driving and driven shafts out of their place (applying taps of a rawhide mallet alternately).

Use soft tools so that threads and centring of the shafts cannot be damaged!

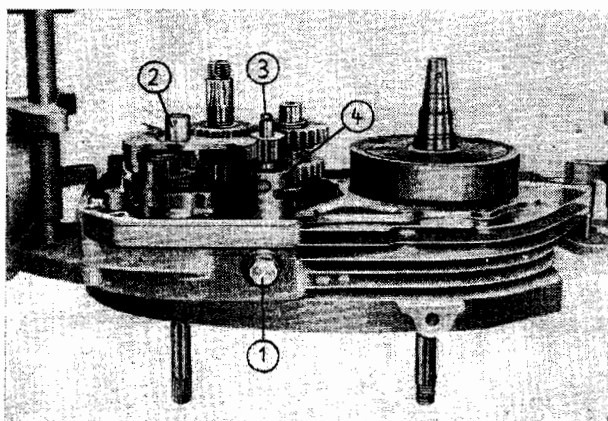


Fig. 25. Removing the gearbox

3.2.7. Driving-out the Crankshaft

First screw together 22-50.013 device and 22-50.012 separating screw (without washer) and then screw this combination of tools to the casing.

Press the crankshaft out of its place by means of the spindle. Use your free hand to protect the shaft from falling on to the ground. Do not use undue force! Otherwise the crankshaft will no longer be useful.

3.2.8. Dismounting the Bearings

Remove the circlips from the left-hand half of the casing. Heat the casing to a temperature between 80 and 100 °C. Then drive the bearings out of their place.

The "blind hole" bearing (driving shaft) can readily be driven out by applying taps (by means of a rubber mallet) if the right-hand casing half is properly heated. If this fails use an offset screw-driver.

For the other gearbox bearings use the 11-MW 7-4 mandrel or a piece of pipe of 42 mm in diameter \times 2 \times 100 mm, and for the crankshaft bearings including the packing rings the 22-50.414 mandrel. The latter bearings, when removing them, should always be pressed from outside towards the pre-compression compartment.

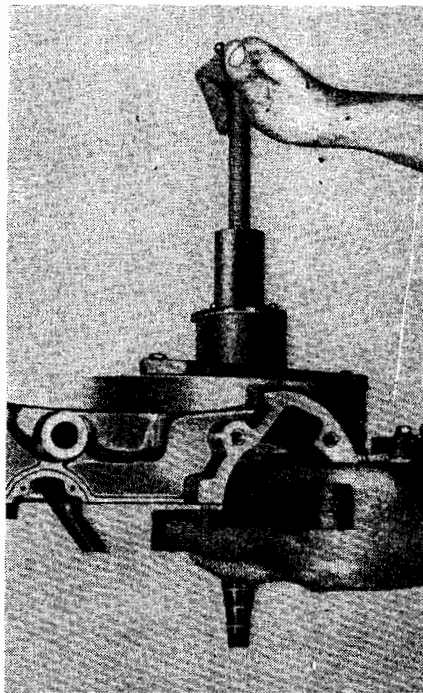


Fig. 26.
Pushing out
the crankshaft

3.2.9. Cleaning of All Parts

Before checking the engine parts for wear, they must be thoroughly cleaned. The type of equipment and the methods to be used largely depend on the given facilities.

It should be borne in mind, however, that all parts must be properly cleaned and not corroded before they are subjected to further treatment.

Take care to see to it that the passage from the gearbox compartment to the crankshaft bearing at the side of the dynamo is always free.

To be sure push a wire through the lubricating ducts (1).

In the cylinder clean carbonised places on the exhaust port and transfer ports. Use a wire brush to remove the loose scaly remains from the piston head. The adhering layer of carbonaceous deposits is left because it protects the piston head from absorbing an uncalled-for amount of heat.

The treatment of the piston ring grooves will be described later below in Section 3.3.2.1.

The chamber of combustion in the cylinder head must also be cleaned to remove all carbonaceous oil deposits.

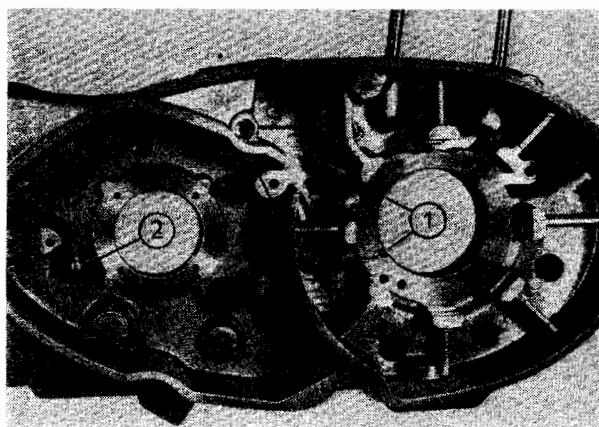


Fig. 27. Lubricating ducts of the crankshaft bearing
(1) Lubricating ducts
(2) Contact for idling indicating light

3.3. Inspections for Wear

3.3.1. Gearbox Parts

3.3.1.1. Clutch

Parts particularly subjected to wear:

– Disk with friction lining (teeth inside)

The rate of wear will be increased in the case of an incorrect clutch adjustment (no or insufficient clearance and if the clutch is allowed to slip for a prolonged period of time). In an extreme case the friction lining will burn away.

If there is no allowance for re-adjusting the clutch, new friction disks must be fitted. This especially applies if part 1 contacts part 2 (Fig. 72) or the gap between them has been reduced to about 0.5 to 1 mm.

New disks have a thickness of 0.3 ± 0.1 mm (wear allowance – 0.3 mm).

– Steel disk (teeth outside)

They must be replaced when their colour has changed to blue due to clutch slipping (they have become soft!) or when they are distorted.

Thickness in a new condition $1.5_{-0.1}^{+0.1}$ mm.

Deviation from the plane of the surface maximum 0.2 mm.

– Compression springs

They may slacken – thus, their full travel is reduced. In severe cases, the clutch will slip even if all other components are in perfect working order and the setting is correct.

Values in new condition:

Length, relaxed	28.3 ± 0.6 mm
Mounting length	17.0 mm
Spring power in mounted condition	$132 \text{ N (13.5 kp)} \pm 11\%$

– Toothing of driver and outer ring

The backlash of teeth the driver is checked in the manner shown in the accompanying illustration. It should not exceed 0.3 mm, otherwise in increased emission of noise must be reckoned with and the disk with friction lining will be “beaten into” the tothing.

Consequence: the clutch will no longer separate properly. All that has been said above also applies analogously to the steel disks and the outer ring.

If the backlash has exceeded 0.3 mm, the disks should be replaced and driver and outer ring in addition if the teeth already show cross scratches.

– Needle bearing and thrust bearing

These parts will not show any significant wear even after a long service life. If necessary, use a clutch driver of the lower tolerance limit (inner diameter $26_{-0}^{+0.013}$ mm).



Fig. 28.
Clearance between
clutch driver –
disk with friction
lining

– Spacing washer, thrust washer

If the axial play of the clutch driver is larger than 0.1 mm, the primary drive will emit an abnormal noise which disappears when the clutch lever is actuated. In this event, replace worn washers (also see Section 4.5.2.).

– Taper in clutch body

Due to slipping of the clutch on the crankshaft because of improper mounting, the taper may be damaged.

In slight cases, the basic clutch body can again be used on the taper of the crankshaft after grinding by means of abrasive paste (see also text for Fig. 76).

– Thrust lever and bearing bushing (Fig. 79, items 1 and 2)

Formation of burr, pressure points and sharp edges at the teeth of both parts will cause jerky operation of the clutch.

These flaws are removed by means of a corundum stone.

3.3.1.2. Gears, Shafts, Gear-shift Mechanism

– Primary drive

If the backlash between the drive gear (28 teeth) rivetted to the clutch driver and the drive gear (68 teeth) connected with the gearbox is excessive, noise will be emitted. In new condition, the backlash should be 0.036 to maximum 0.131 mm.

As a makeshift, it can be determined by means of a lead foil put between the gears in mesh and a micrometer screw. If the reading is more than 0.25 mm – after having turned the gears to draw the lead foil through –, a new pair of spur gears must be mounted. Naturally, the radial play of the bearings 6305 and 6203 should also be taken into consideration. If the bearings are worn out, checking the backlash is of no use.

– Forced disengagement of the kick-starter

Wear can be expected at the cam plate (1) and at the bolt (2) if there will be wear at all.

The spring (3) must exert a force of 14.7 N (1.5 kp) in order that the forced disengagement becomes effective. Insignificant noise emitted when the kick-starter returns after starting the engine are harmless.

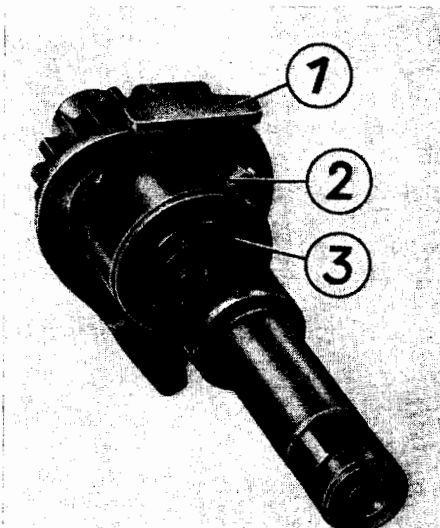


Fig. 29. Forced
disen-gagement
of the kick-starter

– Gearbox

The gear-shift dogs were machine-relieved at an angle of 5° . They must be in a state where they bear on an area of three quarters of the original area, otherwise the gears will not remain in mesh under load.

Worn tooth profiles increase the gearbox noise. If necessary replace gears in pairs. Selector forks that have turned blue in colour and from which more than 0.4 mm have been removed by wear and tear must be replaced.

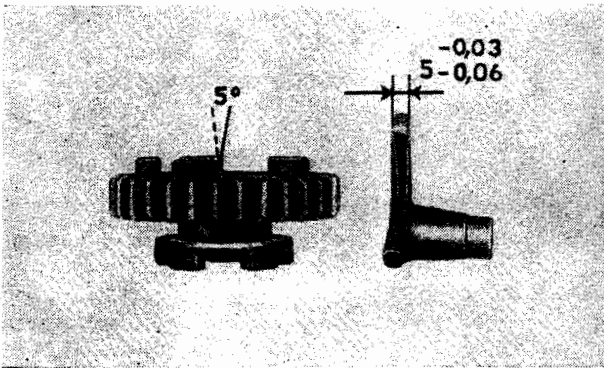


Fig. 30. Gear-shift dogs and selector fork

The bushings (1) and thrust washers (2) must be checked for wear after a longer period of operation. Heavily worn thrust washers may cause the engaged gears to jump out of mesh. This also applies to slak circlips (3).

The driving shaft (A) and the driven shaft (B) must not be out of true more than 0.02 mm. You may measure the amount of eccentricity in the manner indicated in Fig. 40. Please, take care that the centrings of the shafts, are not deformed when driving them out of their place.

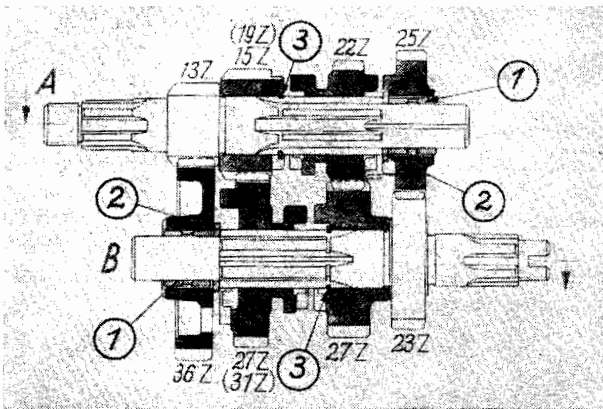


Fig. 31. Gear-shift mechanism

— Gear-shift Mechanism

Return spring (1) and shift pawl spring (2) will scarcely show any wear. Nevertheless, their tension should be checked whenever dismantling the engine.

The arrow-heads in the illustration show points on the shift pawls that may be subjected to wear.

The serration (3) is particularly subjected to wear. If the gear-shift lever can no longer be arrested, then replace the gear-shift shaft with gear-shift member.

The thrust washer (2) in Fig. 57 must not show heavy wear marks. If this is the case, the cam drum has excessive axial play (permissible 0.53 mm — desired 0.3 mm) and gear-shifting errors may occur (this can be neutralised by inserting shims — also see Section 3.3.3.).

The dimension "a" of the stop (Fig. 48) is 16.6 mm in new condition. This dimension should be checked if gear-shifting errors occur. The angle between (1) and (2) shown in Fig. 48 should also be checked in this event. It should be $35^{\circ} 30' \pm 10'$.

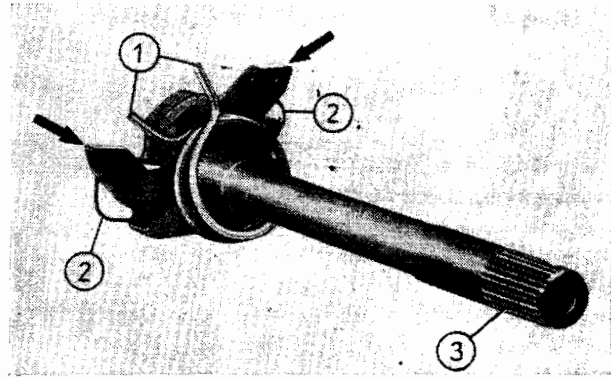


Fig. 32. Gear-shift shaft

3.3.2. Crank Assembly

3.3.2.1. Cylinder, Piston

— Mating of piston and cylinder

In a new condition the play between piston and cylinder is fixed at 0.04 mm. The pair of piston and cylinder can be used until a play of 0.1 mm has been reached. To find out whether this value has already been reached, the cylinder is measured. The piston is only measured when it is new. A piston that has already been in operation is deformed.

The nominal dimension is the diameter between the lower edge of the piston skirt up to 15 mm in the direction of the piston head (also see Section 4.1.1.).

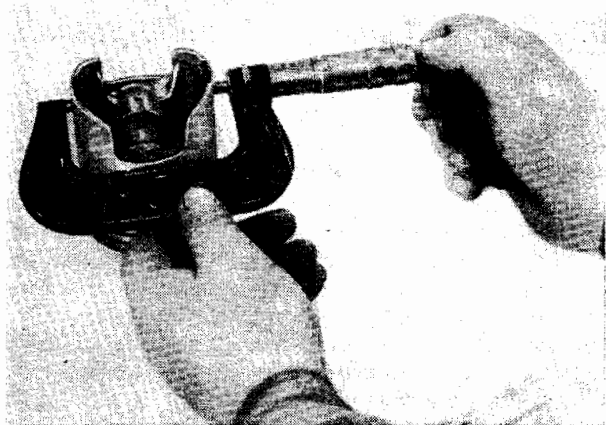


Fig. 33. Measuring the piston

Fig. 34 demonstrates how the cylinder should be measured by means of an internal caliper gauge in the lower and upper third of the liner. Without the help of any measuring instrument, the wear on piston and cylinder can be subjectively assessed when inspecting the upper edge of the cylinder liner.

When the piston has jammed (Piston A), in less severe cases the piston can be restored to proper working order by refinishing the seized points (frequently immerse the workpiece in a fuel-oil mixture) by means of a corundum stone.

If the cylinder shows heavy seizure marks, reboring and fitting a new piston are recommendable. Slight seizure marks in the cylinder should be removed by means of a very fine abrasive paper (approximately 400 granulation) with every care.

Piston B shows a normal wear pattern. The more intense on-sided blackening of the upper portion of the piston is due to the particular design where the connecting rod is arranged above the piston.

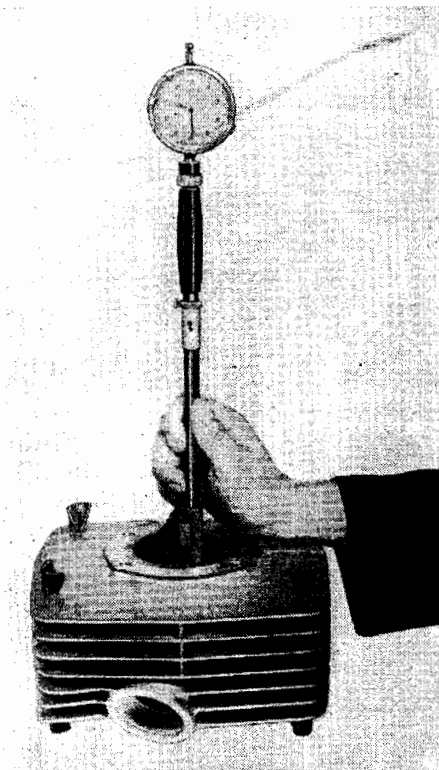


Fig. 34
Measuring
the cylinder

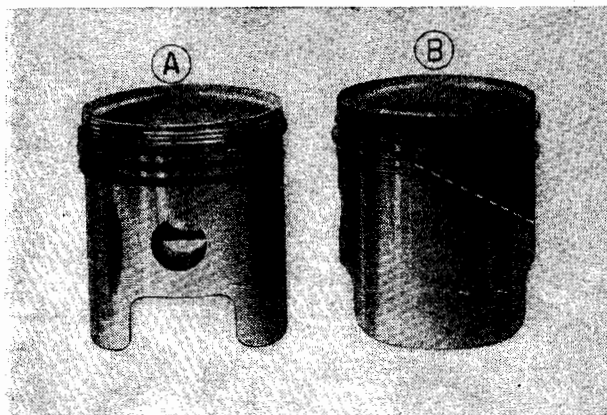


Fig. 35. Piston wear patterns

— Piston rings

Before re-using used pistons, particular attention should be paid to the piston rings (two-stroke rings).

Piston rings sticking due to an excessive supply of, or unsuitable, oil in the fuel are carefully removed. To take care that the rings are not broken or overstressed, use the 05-MW 141-4 pliers with clamping ring 05-MW 147-4, the appropriate tool for this purpose. Without the use of these means there is the risk of distorting the rings. Later they will jam in the ring grooves.

Always place the rings in the same groove.

The rings grooves can be cleaned by means of a piece of sharpened ring. When using other tools, the width of the grooves may be increased to an impermissible dimension.

The width should be

upper ring	$2.06^{+0.02}$ mm
central and lower rings	$2.04^{+0.02}$ mm.

If the groove becomes wider than 2.10 mm, gases of combustion will blow through. Then the piston must be replaced by a new one — be it for the noise involved. Before the rings are re-fitted to the piston, check the state of wear of their outer diameter. For this purpose

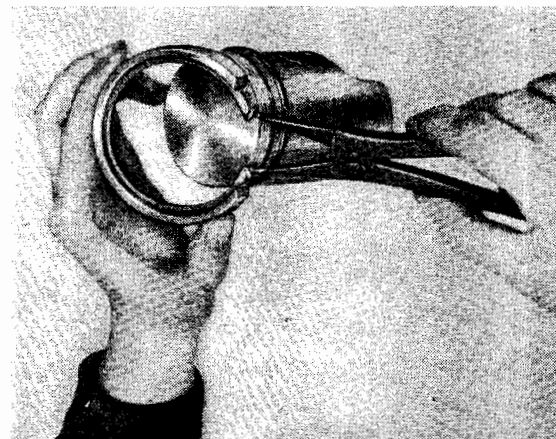


Fig. 36. Removing the piston rings

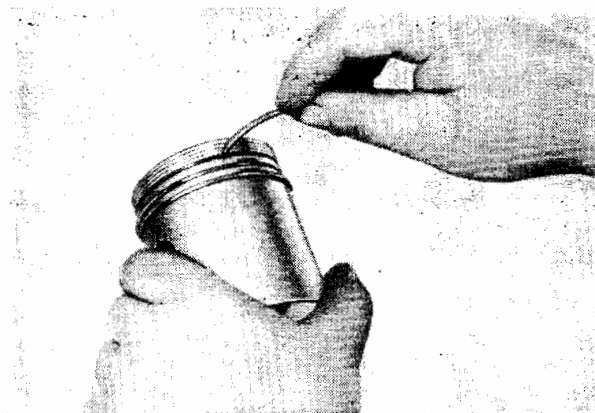


Fig. 37. Cleaning the piston ring grooves

measure the gap between the abutting ends. In assembled condition, it should be 0.2 mm (new state). If the gap between the abutting ends of the piston ring is more than 1.6 mm, the rings are useless and, possibly, piston and cylinder in addition.

Piston and cylinder will also become useless because changing the piston rings is not advisable after a longer period of operation. New piston rings will not readily adapt themselves to the cylinder liner — blowby of the combustion gases past the piston rings will occur and, consequently, the rings will be distorted and become useless.

If the locking pins (arrow-heads in Fig. 65) in the piston have worked loose (faces of the pins are bright) or are missing, a new piston and cylinder (or ground out) are required, too.

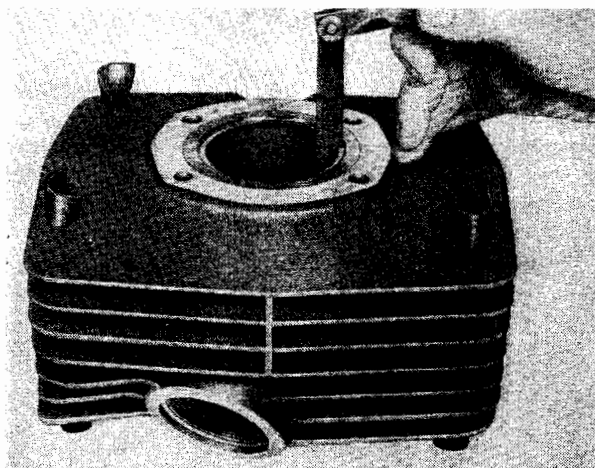


Fig. 38. Measuring the gap between the abutting piston ring ends

Note: The edges of the port windows must be chamfered, otherwise there will be unpleasant noise. Therefore, always chamfer the windows of re-ground cylinders.

3.3.2.2. Crankshaft

An inspection will show whether the collars of the sealing rings (1) are worn too much, whether the thread of the clutch fastening means (2) and of the armature fastening screw (3) as well as the tapers for the clutch (4) and for the armature (5) are in proper condition.

If the defects found cannot be removed by refinishing, mount a new (or properly overhauled) crankshaft.

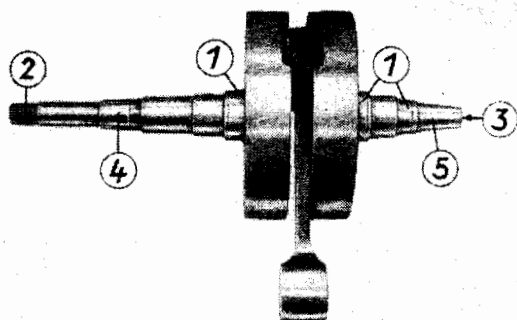


Fig. 39. Crankshaft

Then the amount the crankshaft is out of true is measured at the marked points between the tips of a testing apparatus or between the centres of a lathe.

The permissible amount is 0.02 mm. Greater values cause the crankshaft in mounted condition to vibrate or ignition troubles. In these cases, the engine output will be insufficient.

Therefore, treat the crankshaft with every care!

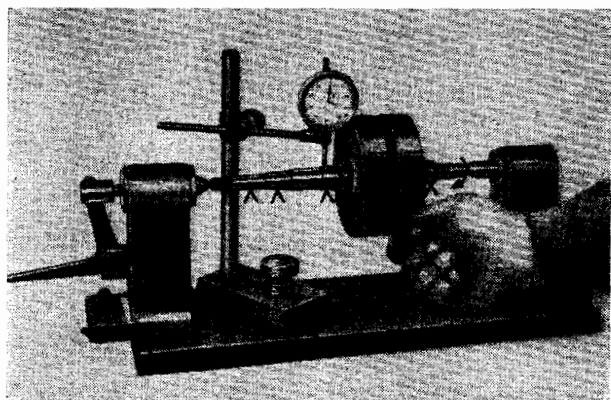


Fig. 40. Measuring the amount the crankshaft is out of true

Worn needle bearings in the big end and small end of the connecting rod are indicated by noise. If there was no noise in an unsatisfactorily operating engine, the radial play of the connecting rod should still be measured. Do not tilt the connecting rod in measuring.

With the connecting rod in a new state it must be 0.015 to 0.03 mm. If more than 0.050 mm are given, the crankshaft is worn.

The condition of the bearing in the small-end boss can only be judged subjectively with the conventional workshop equipment. The gudgeon pin must be free from play and fit in such a way that it can be turned without jamming while a resistance to motion can just be felt. Gudgeon pins that show signs of wear are useless. Pay attention to Fig. 46.

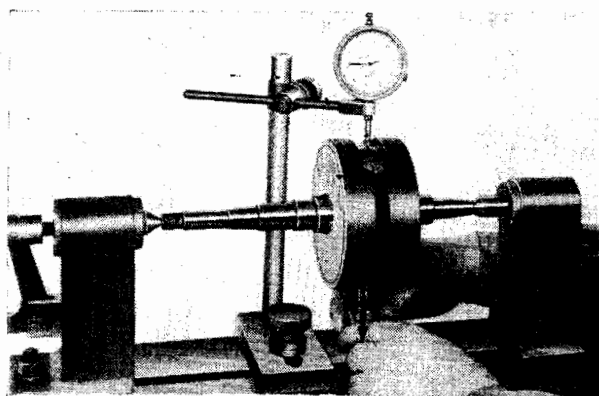


Fig. 41. Measuring the radial play

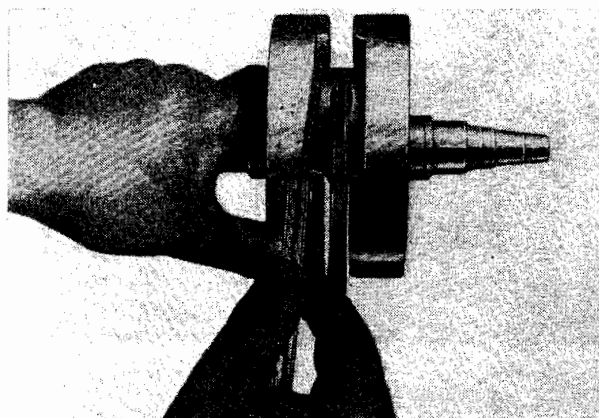


Fig. 42. Checking the end play

The axial play between connecting rod or needle bearing and disks of the crankshaft and piston can be determined in the manner shown in Fig. 43.

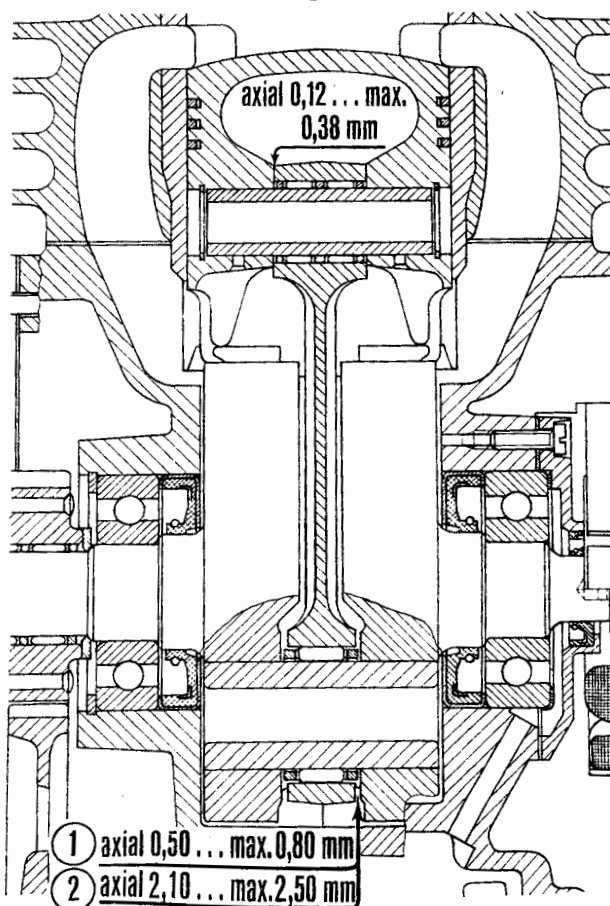


Fig. 43. Crank assembly

(1) Axial play between connecting rod and crank disk

(2) Axial play between needle cage and crank disk

axial 0,12 ... max. 0,38 mm = axially 0.12 to maximum 0.38 mm

3.3.3. Casing, Seals

In the first place, inspections should determine the state of the sealing surfaces of the casing. If the sealing surfaces are damaged, they can be restored to proper condition on a touching-up plate with fine abrasive cloth placed underneath in a manner shown in Fig. 44 for the cylinder head.

This can be done in light cases only because, mildly exaggerated, you cannot remove 0.5 mm from each casing half in this manner. Therefore, we once more underline that the engine should be disassembled in accordance with the rules of good workmanship.

Further you should inspect the bearing seats and grooves for the circlips for proper condition.

Defective bearing seats can be indentified during disassembly by the fact that the bearings can be withdrawn from the right-hand half of the casing. Then knurling the bearing seats will be no remedy but only a new casing is the way out.

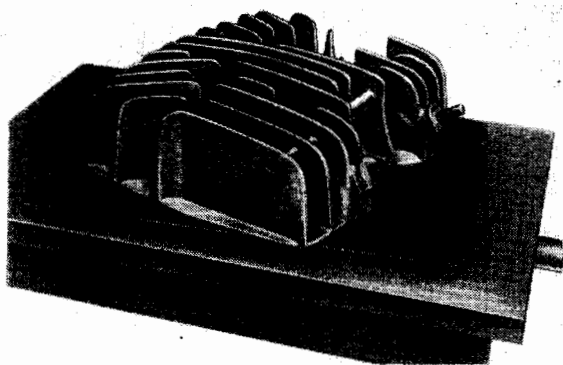


Fig. 44. Refinishing the cylinder head

If the gear-shift drum has produced wear marks in the left-hand half of the casing, axially with the end of the large diameter, then the excessive end play must be reduced to the permissible value of 0.3 mm by inserting shims or washers (by way of trial put the two halves of the casing and the gear-shift drum together). As a rule, all paper gaskets must be replaced by new ones.

Check the radial oil seals for cracks in the sealing lip, the wear on the latter (flattening) and for tension, further, for the presence of the spring in the groove intended for this spring and the quality of the two spring ends.

It is better to replace a seal ring prematurely than to repair the engine once more before long because of this relatively cheap part.

3.3.4. Bearings

The bearings in question are the radial grooved ball bearings of the crankshaft and the gearbox.

Defective crankshaft bearings can be identified by the characteristic engine noise, by the fuel diluted with gear oil (radial seal rings defective) and by the impossibility to time the ignition correctly.

The condition of the bearing track and the balls can be found by inspection after pressing the bearings with plastics cage apart. Worn bearings are damaged by pitting.

For the bearings the rule also holds that after a prolonged period of operation of the engine all bearings should be replaced by new ones (on the occasion of a general overhaul).

4. Assembling the Engine

4.1. Preliminaries

It is taken for granted that all engine parts are properly cleaned. Defective parts were identified according to the criteria described in Section 3.3. and rejected. Parts that are further usable were prepared for re-fitting, as far as necessary. Before describing the assembly of the engine, we below give some instructions regarding the selection and mating of various units of construction.

4.1.1. Selection of Piston and Cylinder

By means of the dimensions shown in Fig. 45, the required piston and cylinder are selected, i. e. mated for proper operation. The clearance in mounted condition between these two parts must be 0.04 mm.

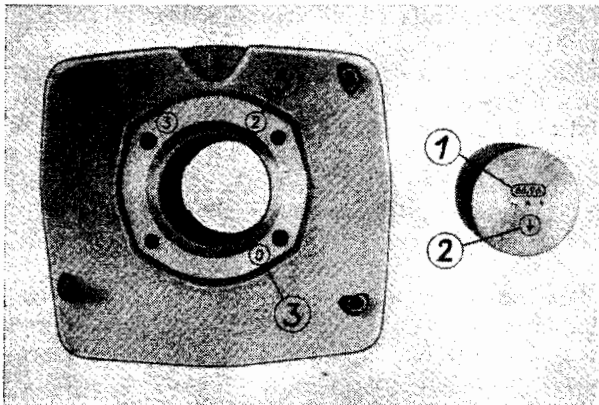


Fig. 45. Marking of piston and cylinder

- (1) Nominal dimension of piston
- (2) Mounting direction of piston
- (3) Tolerance group of cylinder
- (4) } Month and year of construction (in this case March 1972)
- (5) }

The following table facilitates selection:

Cylinder		Piston
Marking (tolerance group)	Nominal Dimension in mm	Nominal Dimension in mm
- 1	68.99	68.95
0	69.00	68.96
+ 1	69.01	68.97
+ 2	69.02	68.98

Since tolerances are specified for the dimensions listed in the above Table, it is advisable to measure piston (see Fig. 33) and cylinder (see Fig. 34) in addition to the pre-selection. If this is observed, you will surely adhere to the specified design dimension of the clearance in mounted condition.

In the case of oversize pistons, please, proceed analogously. Oversize pistons can be used up to 2 mm over the nominal diameter of the cylinder bore.

4.1.2. Selection of the Needle Bearing for the Gudgeon Pin

The selection of the suitable needle bearing is facilitated by the use of the following Table.

Please note that the commercial packings are marked only with the medium allowance (determined from the upper and lower allowance for the needle). The needle bearings are not provided with a marking. Therefore keep the partly used packing separately.

If gudgeon pin, piston and crankshaft are re-used, fit the needle bearing with the necessary feel. The gudgeon pin must be practically free from play but should not jam.

4.1.3. Bearings, Seal Rings

For the gearbox, MZ uses bearings with plastics cage (2 X 6204 and 6203).

The crankshaft bearings 6305 should only be used if they belong to the assorted group c3f (silent bearings with maximum bearing clearance).

The radial oil seal rings must be fuel-proof and oilproof. That is why you should only use original seal rings.

4.1.4. Gearbox Parts

If gears must be replaced, it is advisable to replace mating gears together. This ensures favourable wear rates.

4.1.5. Preparing the Assembling Operations

All tools required and the engine parts under consideration should be placed so that they are within easy reach. The two shafts in the gearbox and the gear-shift shaft have already been mounted (Figs. 31 and 32).

Legends to Fig. 46:

Kolbenbolzen	= gudgeon pin	grün	= green
Kennzeichnung	= marking	weiß	= white
Toleranz in μm	= toleranz in μm	schwarz	= black
Pleuelbohrung	= small-end bore	gelb	= yellow
Nadel-Abmaß	= needle allowance	blau	= blue
Radial-Spiel	= radial play	braun	= brown
bis	= to		

Pleuelbohrung = $22 \pm 0,007$ $-0,016$													
Kolbenbolzen	Kennzeichnung gelb +0,007 bis +0,004		Kennzeichnung schwarz +0,003 bis 0		Kennzeichnung grün -0,001 bis -0,004		Kennzeichnung weiß -0,005 bis -0,008		Kennzeichnung blau -0,009 bis -0,012		Kennzeichnung braun -0,013 bis -0,016		
18 $+0,0025$ $-0,0050$	Nadel- Abmaß μm	Radial- Spiel μm	Nadel- Abmaß μm	Radial- Spiel μm	Nadel- Abmaß μm	Radial- Spiel μm	Nadel- Abmaß μm	Radial- Spiel μm	Nadel- Abmaß μm	Radial- Spiel μm	Nadel- Abmaß μm	Radial- Spiel μm	
grün $+2,5$ 0	0 -2	1,5 bis 11	-2 -4	1,5 bis 11	-4 -6	1,5 bis 11	-6 -8	1,5 bis 11					
weiß 0 -2,5	0 -2	4 bis 13,5	-2 -4	4 bis 13,5	-4 -6	4 bis 13,5	-6 -8	4 bis 13,5	-8 -10	4 bis 13,5			
schwarz $-2,5$ -5,0			0 -2	2,5 bis 12	-2 -4	2,5 bis 12	-4 -6	2,5 bis 12	-6 -8	2,5 bis 12	-8 -10	2,5 bis 12	

Fig. 46. Table for bearing selection (dimensions without unit of measurement are in mm)

4.2. Assembling the Left-hand Half of Casing

4.2.1. Mounting the Gearbox and Crankshaft Bearings

Assembly should begin with fitting the circlips in the grooves at the side of the clutch by means of a taper-nose pliers. Take care that the rings are properly tight.

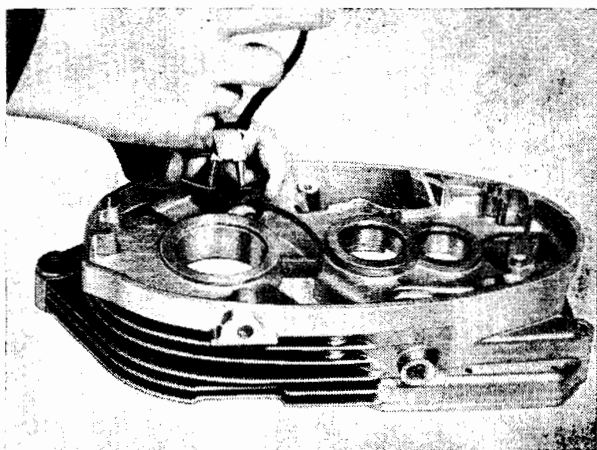


Fig. 47. Fitting the circlips

Then the left-hand casing half is heated to a temperature of about 100 °C on a boiling plate (do not use a welding torch — the casing may become distorted!). Assembling should be finished within a short time — the temperature of the casing must not drop below approximately 80 °C.

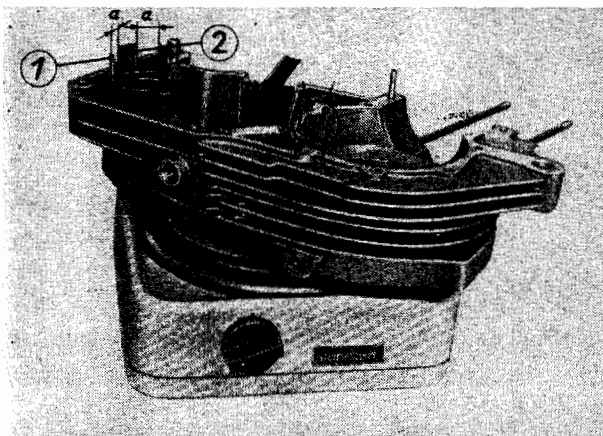


Fig. 48. Heating the engine casing

Then the gearbox bearings (arrow-heads in Fig. 49) are mounted with the help of the 11-MW 7-4 drift (manner of fitting the cages as shown in the illustration).

The 6305 bearing is put together with the sealing ring 30 × 62 × 10 on the 22-50.415 fitting mandrel and then pushed into the casing half.

Then place the circlips into the grooves of the gearbox side.

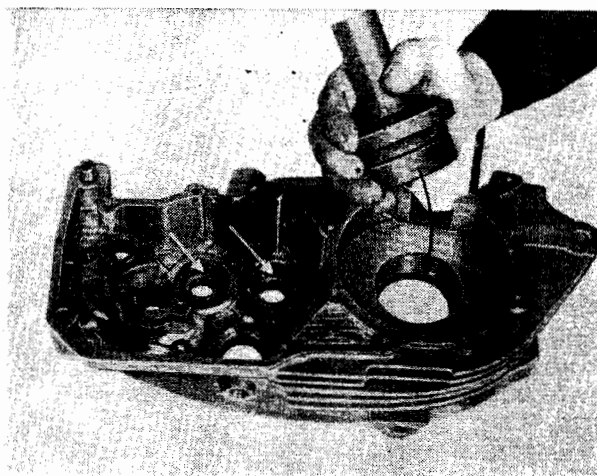


Fig. 49. Mounting the bearing

4.2.2. Mounting the Crankshaft

The inner ring of the 6305 bearing should be re-heated before fitting the crankshaft by means of a heating mandrel (1) which can easily be made by yourself. In this way, the crankshaft will easily slide into its seat.

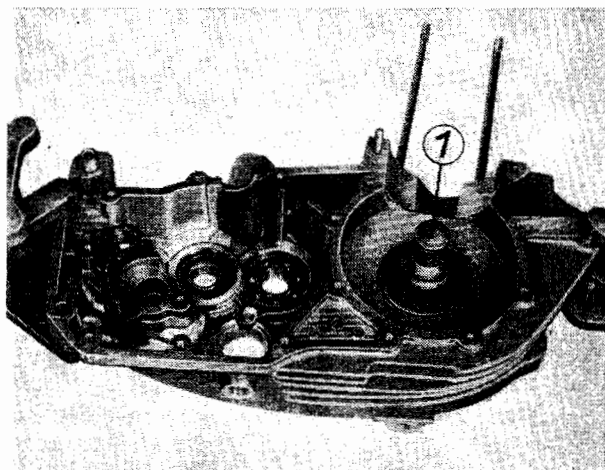


Fig. 50. Heating the ball bearing inner race

If it sticks, nevertheless, do not use a hammer but the upper part of the 05-MV 150-2 clutch assembling fixture and a fitting piece of pipe for final fitting.

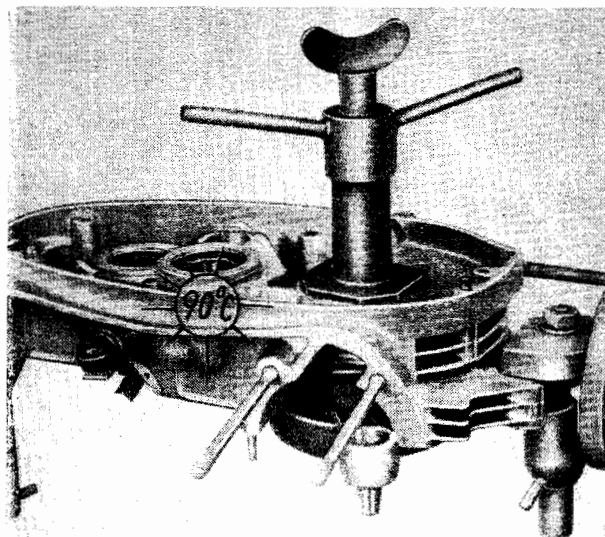


Fig. 51. Final fitting of crankshaft

4.2.3. Assembling the Gearbox

4.2.3.1. Mounting the Gears and Shafts

Before assembling the gearbox parts, make sure that all parts here properly preliminarily assembled according to Fig. 31, 32 and 52.

Meanwhile, the inner rings of the gearbox bearings have taken up heat from the casing so that driving and driven shafts can be completely driven in place down to the stop (!) by applying taps of a rawhide mallet.

Then push the (unequal) selector forks into the grooves of the gear-shift wheels. If the washers $8 \times 13 \times 1.5$ for the guide pin have been fitted in place, then insert gear-shift drum and guide pins of the selector forks into their drill-holes. When doing this, turn the gear-shift drum in such a way that the dogs of the selector forks can also be inserted into the cam tracks.

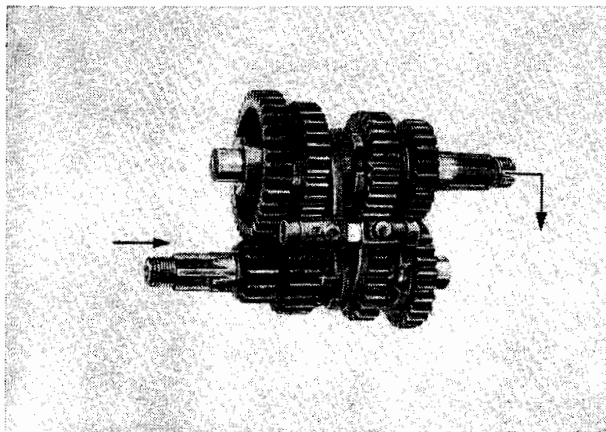


Fig. 52. Gear set and position of the selector forks

4.2.3.2. Checking the Position of the Gear-shift Mechanism

After having inserted the gear-shift drum into the shift stop and screwed the gear-shift mechanism detent screw with original spring (!) and ball into the casing (gear-shift drum in neutral position — large arresting groove points to drill-hole), check that all dogs are in full engagement by turning the gear-shift drum (use 02-MW 60-3 profiled socket wrench).

If a selector fork is found to be applied with undue force, it should be re-aligned to prevent premature wear due to continuous rubbing.

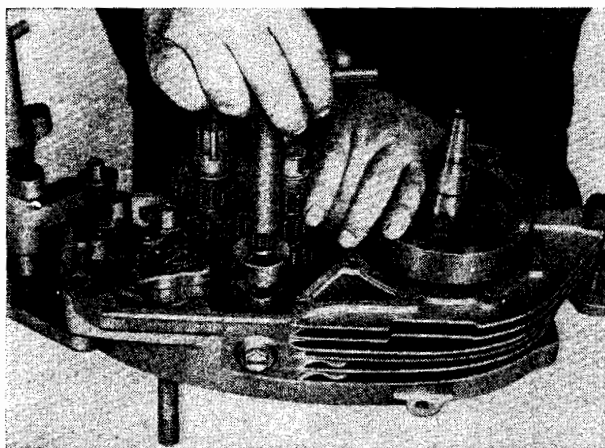


Fig. 53. Checking the position of the gear-shift mechanism

The gear-shift segment (S) can then be inserted in such a way that the tooth space marked by a punch mark (arrow-head) is opposite to the chamfered tooth (1) of the gear-shift drum.

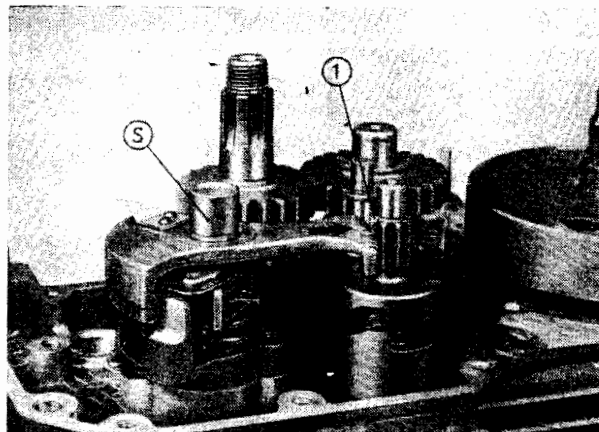


Fig. 54. Fitting the gear-shift segment

On this occasion, the correct distance of the contact blade from the gear-shift segment should be checked otherwise it may be inevitable after assembling the engine to unscrew the contact member (Fig. 27) and to re-bend the blade.

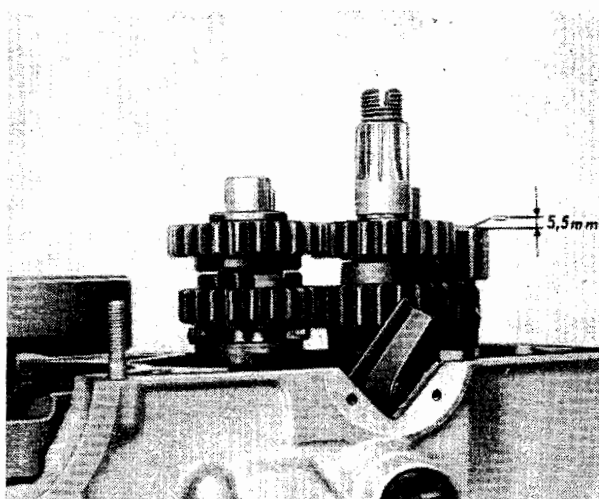


Fig. 55. Contact of the idling indicating light

4.2.4. Final Operations

Meanwhile, the inner rings of the gearbox bearings have been heated by means of a heating mandrel (1) and can now be fitted by means of the 11 MW 7-4 drift.

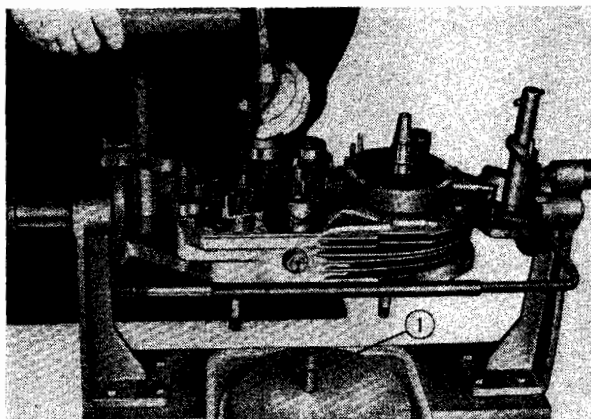


Fig. 56. Mounting the gearbox bearing

Bear in mind that the drift should only be slightly tapped. Finally, place the washer (1) $8 \times 13 \times 1.5$ on the guide pin and the thrust washer (2) $10 \times 24 \times 1.5$ on the cam drum and apply a coat of jointing compound on the sealing surfaces of the casing (take care not to clog the tapped holes).

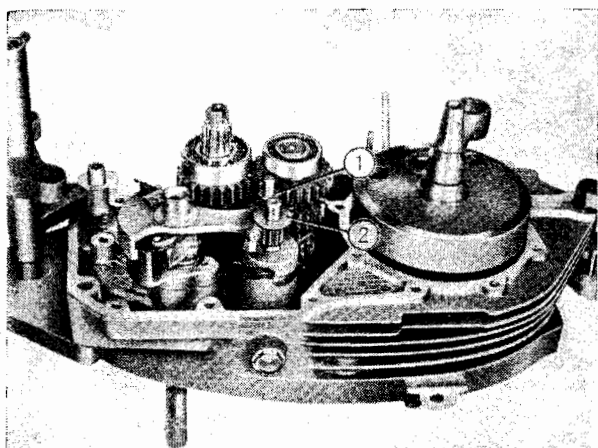


Fig. 57. Ready assembled left-hand casing half

4.3. Mounting the Right-hand Half of the Casing

During the last operations on the left-hand casing half, the right-hand casing part has been heated on a boiling plate to a temperature of approximately 100 °C – this also means that the next operations have to be performed rapidly.

The radial oil seal ring 30 × 62 × 10 is fitted by means of the 22-50.415 drift. The sealing lip of the ring points in the direction of the dynamo compartment (see Fig. 2).

Only use the heated drift. It prevents the oil seal ring from being inserted too deep so that it cannot strike against the crankshaft and rub on it when the bearing 6305 is fitted later.

Before the next operation, loosen the clamping elements of the 05-MW 197-0 fixture and turn them to the sides.

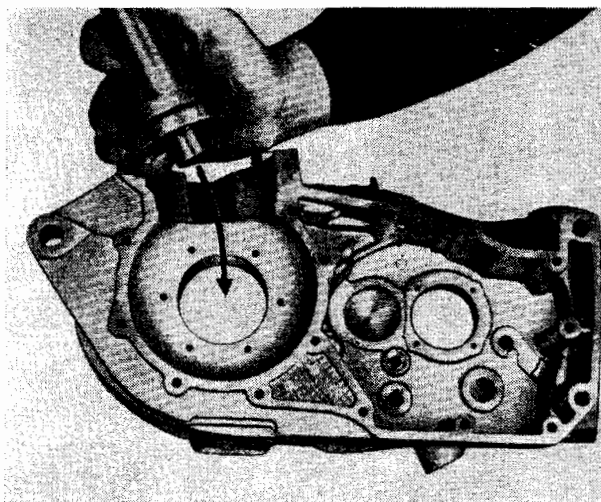


Fig. 58. Fitting the radial oil seal ring

4.3.1. Mounting and Screwing

The right-hand casing half is put on the other one and forced in place by applying slight blows of a plastic mallet (or rawhide) so that it contacts the mating part close by the gearbox bearings. Then fix the position of the casing by driving the fitting sleeve in place (11 MW 3-4 drift). Then tightly clamp the engine.

For the following mounting of the 6305 bearing, the casing must still have a temperature of at least 80 to 90 °C. Meanwhile, the inner ring of the bearing has been heated by means of a heating mandrel (see Fig. 50).



Fig. 59
Driving the
fitting sleeve in
place

Now drive the bearing down to the stop, using the 22-50.414 drift – the cold outer ring of the bearing will readily slide into the hot casing and the hot inner ring of the bearing onto the crankshaft.

This operation must be performed quickly and with every care!

Tighten all 15 casing screws (Fig. 23) and the nut (item 1 in Fig. 22). Start in the centre of the casing and proceed crosswise, alternately tightening a left-hand and then a right-hand screw.

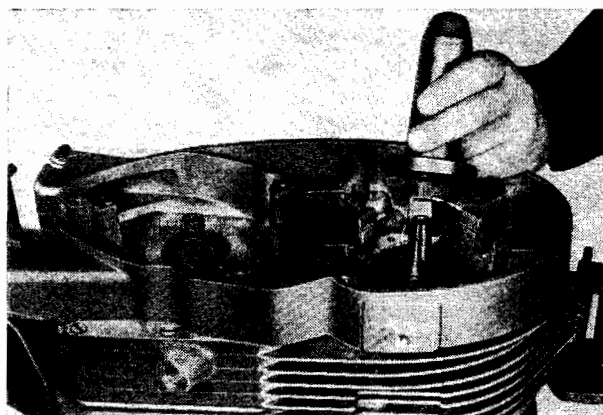


Fig. 60. Pushing the crankshaft bearing in place

4.3.2. Mounting the Sealing Caps (item 2 in Fig. 23)

An axial clearance of 0.2 to 0.4 mm must be ensured between outer race of the bearing and the sealing cap (1). This clearance can be obtained by inserting spacers (2).

The necessary thickness of the spacer can be calculated from the distance between the outer race and the sealing surface (A), the dimension (B) of the sealing cap and the thickness of a new paper gasket (usually 0.5 mm – it is advisable, however, to measure it).

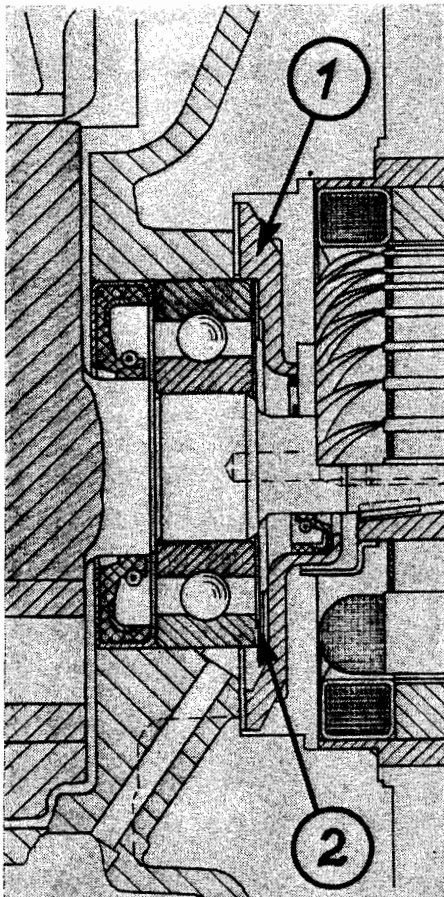


Fig. 61. Checking the function of the gearbox

The distances are measured by means of a vernier caliper, as is shown in Fig. 62.

The following holds:

$$s = (B + D) - (A + 0.2 \text{ to } 0.3) \text{ crankshaft — sealing cap}$$

$$s = (A + D) - (B + 0.3 \text{ to } 0.4) \text{ drive shaft — sealing cap}$$

Where:

s Thickness of the spacer

A Distance between outer race of bearing — sealing surface of engine casing

B Distance between sealing surface of the cap — contact surface of the spacer

D Thickness of gasket

0.2 to 0.3 necessary axial play in mm (crankshaft)

0.3 to 0.4 necessary axial play in mm (drive shaft)

After having inserted the required spacers, tighten the two sealing acps crosswise. For the new paper gaskets no jointing compound is required.

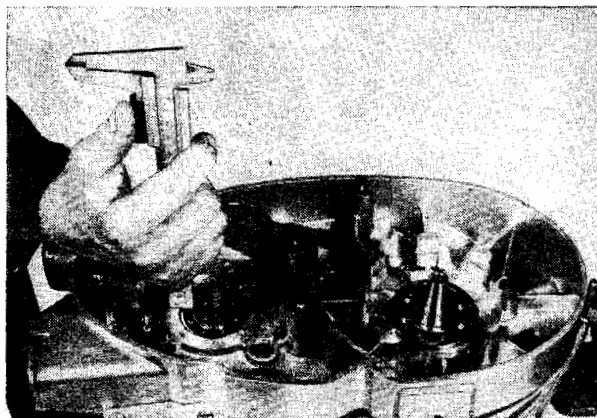


Fig. 62 Bearing at the dynamo side (sectional view)

Finally mount the gearbox sprocket, screw it in place and lock it (see also Section 3.2.2. and Fig. 14).

4.3.3. Checking Gear-shift Mechanism and Crankshaft for Ease of Motion

If the assembling operations were correctly performed, the crankshaft can be turned easily. However, you should not mistake a certain resistance to motion due to new radial oil seal rings for a wrong assembly. It is advisable to take Section 4.7. into consideration.

Check the gearbox by engaging and disengaging all speeds while turning the gear shafts at the same time (in order that gear-shift dogs can catch) (also see Section 4.2.3.2.).

If the end play of the gears for the first speed (36 Z in Fig. 31) and fourth speed [25 Z in Fig. 31 — checked through the inspection hole (2 in Fig. 22)] is 0.2 mm, then the “floating” bearing bushings (item 1 in Fig. 31) are free — the gears move easily.

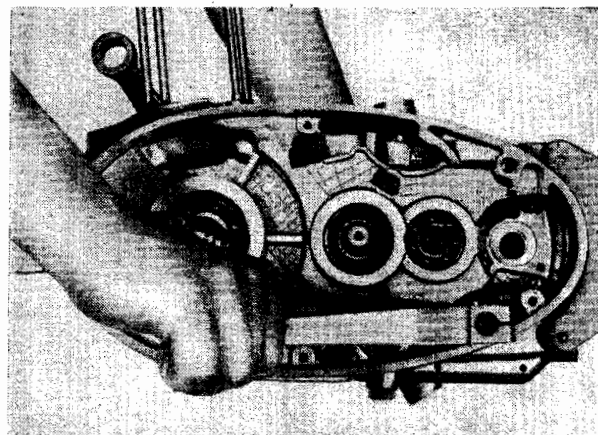


Fig. 63. Measuring the distance „A“

Adjust the specified clearances by applying slight blows to driving shaft and driven shaft (copper mandrel!). For this purpose observe Fig. 31.

4.4. Mounting Piston, Cylinder and Cylinder Head

Information about the correct selection of mating parts has already been given in Section 4.1. The operations to be done now regard assembling, control of the timing and of the ratio of compression.

4.4.1. Piston and Cylinder

In order that the gudgeon pin can be readily inserted, the piston must have a temperature of anything between 40 and 50 °C. (Please, take care to see that pin and piston show the same identification colour!) This temperature is obtained on a boiling plate.

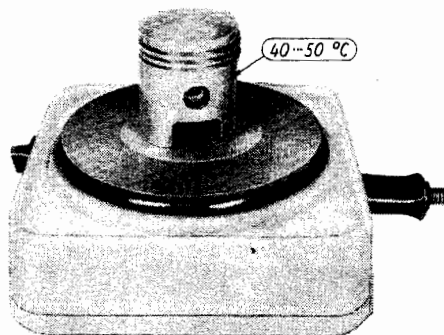


Fig. 64 Heating the piston

During this heating time, fit the needle bearing selected in accordance with Fig. 46 (or find the correct one by trial) into the small-end boss — naturally apply a few drops oil. Mount the piston correctly. The arrow-head on the piston head (Fig. 65) must point in the forward direction. Turn the connecting rod in such a way that piston bore and connecting rod bore practically coincide when the piston rests on the piston support (1), No. 22-50.412. Then the 05-MW 19-4 guide mandrel (2) — with the tapered end forward to avoid damage to the needle bearing — is inserted together with the gudgeon pin into the hot piston. Gudgeon pin and guide mandrel must be in a cold state! If the temperature difference and thus the difference between the diameters of piston bore and gudgeon pin where too small, only use the 22-50.010 pusher for driving the jamming pin in place; blows will cause damage to the crankshaft!

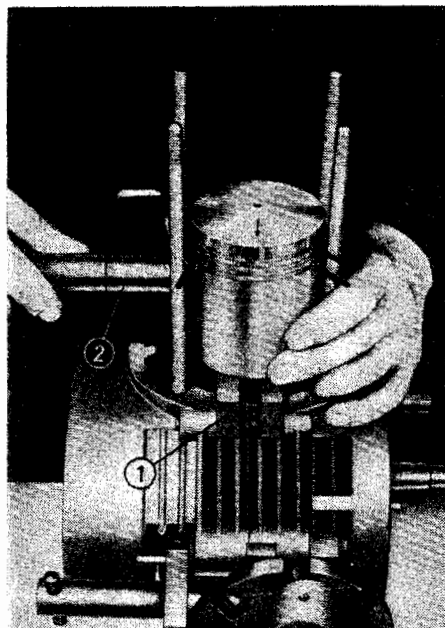


Fig. 65
Pushing the
gudgeon pin
into the boss

The two (always new) circlips (1) must then be fitted by means of a taper-nose pliers. The gap in the circlip must point upwards or downwards. See to it that they properly fit in the grooves.

Turn the piston rings in such a way that the locking pins are located between the ring butts (Fig. 65, long arrow-heads), otherwise the piston rings will jam inside the cylinder. Do not omit the base gasket!

Then slip the slightly oiled cylinder on the piston. The 22-50.412 piston support (2) holds the piston in the correct position. It is removed as soon as the cylinder covers the piston. Then fully slip the cylinder in place.

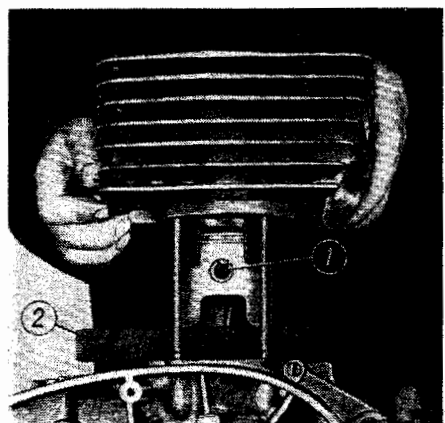


Fig. 66
Mounting the
cylinder

4.4.2. Checking the Timing

Fig. 67 shows that the engine MM 250/3 has a symmetrical timing diagram. Insufficient output may be due to incorrect timing. In such cases the timing can be checked when the engine is in the stage of assembling reached in Section 4.4.1.

For this purpose use a 360°-protractor and a pointer, similar to the tools shown in Fig. 148. Before starting this operation, provisionally fasten the cylinder.

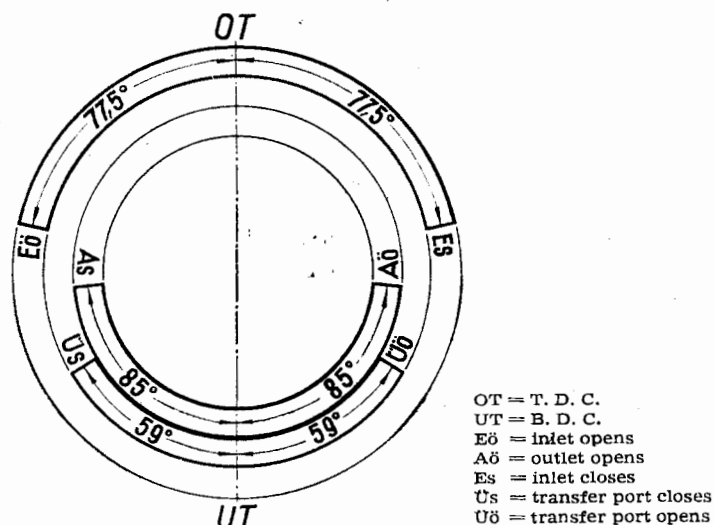


Fig. 67. Timing diagram

4.4.3. Cylinder Head and Ratio of Compression

The engine emits hard noise if the compression ratio of $\epsilon = 9.5$ to $10 : 1$ is exceeded. If ϵ is below $9.5 : 1$, the engine is not capable of delivering its full output.

When the compression ratio is correct, the chamber of combustion has a capacity of 27 cm^3 (piston in top dead centre; unscrew sparking-plug; place engine in such an inclined position that the plug seat is horizontal; pour so-called flushing oil in the chamber up to the first thread of the tapped bore for the sparking-plug by means of a graduated cylinder; take the reading).

About 34.5 cm^3 of fuel-oil mixture can be poured in the combustion chamber of the removed cylinder head (spark-plug screwed in place, combustion chamber is placed as a "bowl" with the surface of the liquid on top).

Besides measuring the capacity of the chamber of combustion, the correct dimension of the gap (1) must be ensured. The permissible dimension is 1.2 to 1.6 mm .

Fig. 68 shows the method of measurement. A lead wire having a thickness of anything between 2 to 2.5 mm is inserted through the sparking-plug hole. The piston cranked to pass over the top dead centre presses the wire flat. A vernier caliper or a micrometer screw should be used to determine the dimension of the gap.

Shims shown in Fig. 69 should be used to correct the piston ring gap.

These shims are available in the thicknesses 0.2 mm and 0.4 mm . Please, only use original shims (of aluminium).

Too soft shims will be flattened out when tightening. They project into the chamber of combustion and burn partly away. The joint between cylinder and cylinder head becomes leaky.

In the meantime, the cylinder was provided with a 1.5 mm high collar at the top of the liner. This collar centres the balancing disks. (Now with full corners and four bores 10 mm in diameter.) The cylinder cover is turned at the sealing area (1.5 mm deep).

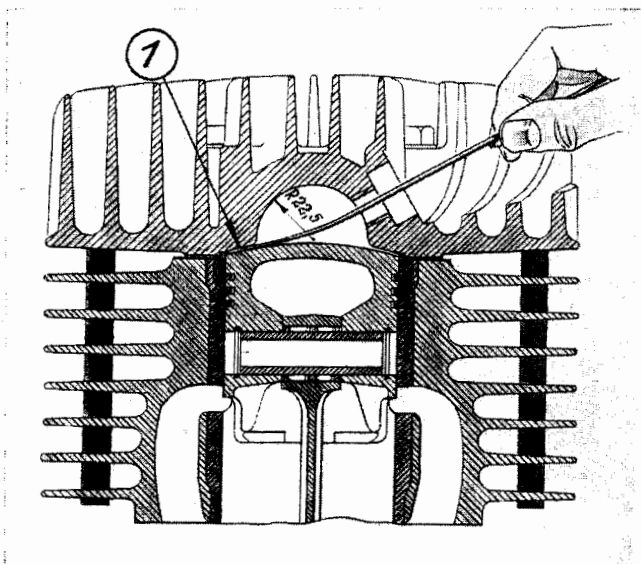


Fig. 68. Measuring the dimension of the gap

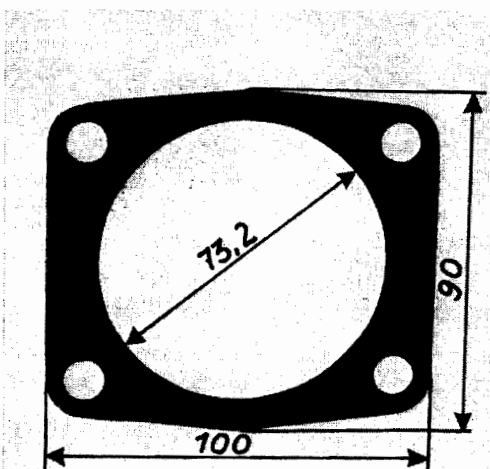


Fig. 69. Shim for adjusting the gap to correct dimension

The four studs for fastening the cylinder are tightly screwed into the engine casing — this has already been checked before putting the cylinder in place.

The shims centre themselves so that you only have to apply them.

Use a socket wrench, width over flats 13, to tighten the cylinder head gradually in the sequence of numbers (1), (2), (3), (4) [torque for the nuts 34.3 Nm (3.5 kp-m)].

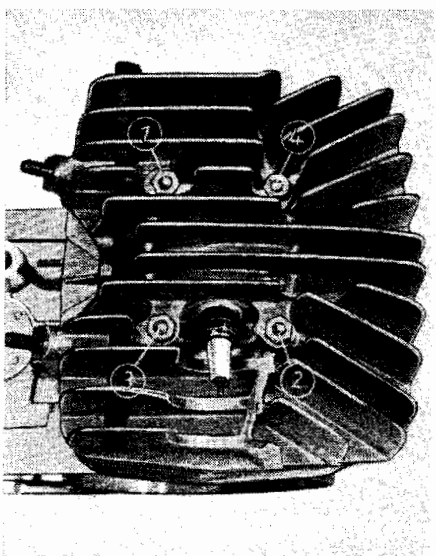


Fig. 70
Tightening the
cylinder head

4.5. Assembling the Primary Drive

4.5.1. Driving Gear to Gearbox

All that has to be done is to push the gear in place. To facilitate this operation, use nut SW 24 and by gradually tightening it, fully fit the gear. On no account should the gear be beaten in place! This would annul the result of the operations performed according to Section 4.3.2.

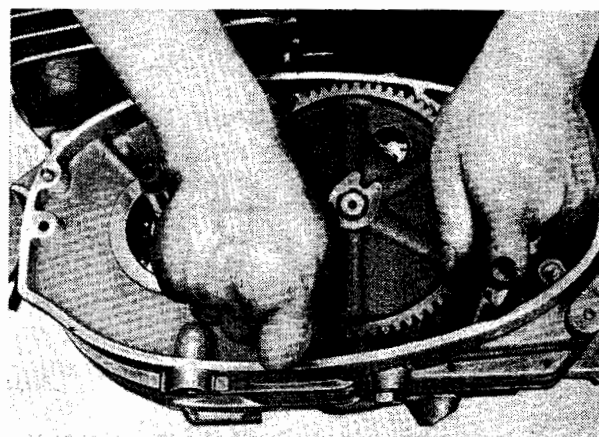


Fig. 71. Fitting the driving gear

4.5.2. Clutch

Before assembling, re-tighten the spacing bolts at part (1). Assemble the clutch in the order of the numbers given in Fig. 72. The bolts of the 05-MV 150-2 clutch dissassembling device support the thrust ring (1).

Pay attention to the marking of the parts 1, 2, 5, 7. The clutch was balanced in the MZ works — it must be mounted in the same way as the first time (see also Fig. 20).

For a performance test of the clutch, loosen the clamp handle of the assembling fixture, turn the clutch in the manner shown in Fig. 20 and then tighten the clamp handle. Now, the interior driver must be capable of being turned.

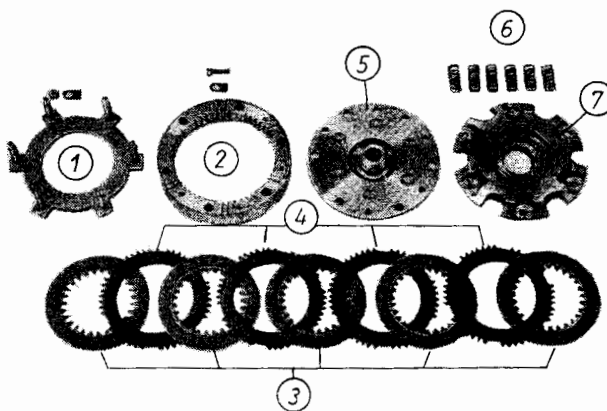


Fig. 72. Clutch, dismantled

The axial play of the clutch driver has been fixed at 0.05 to 0.1 mm.

If 0.1 mm are exceeded, noise will occur which will cease when the clutch is actuated.

If the play is smaller than 0.05 mm, the driving gear rivetted to the clutch driver may jam — as a consequence, the clutch fails to interrupt the power train or the clutch may slip on the crankshaft.

Use the 05-ML 13-4 instrument to determine the actual clearance — for this purpose place a thrust washer 19 × 34 × 2.3 under the measuring device which must be so ground that the measuring pin can rest on the driver.

When measuring, all parts must be free from oil!

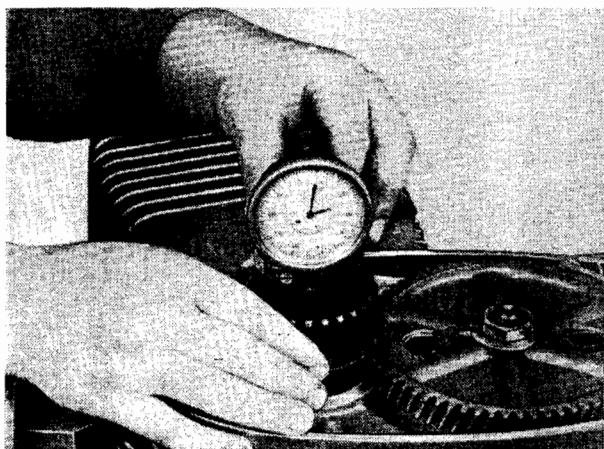


Fig. 73. Measuring the end play of the clutch driver

The spacing washer (1) for adjusting the axial play is available in the thicknesses of 1.9, 1.95 and 2.0 mm. The chamfered side of the washer must point to the collar of the crankshaft (diameter 22×34 mm). Slightly oil the needle bearing (2) before fitting it in place together with the driver (dimension K $22 \times 26 \times 26$).

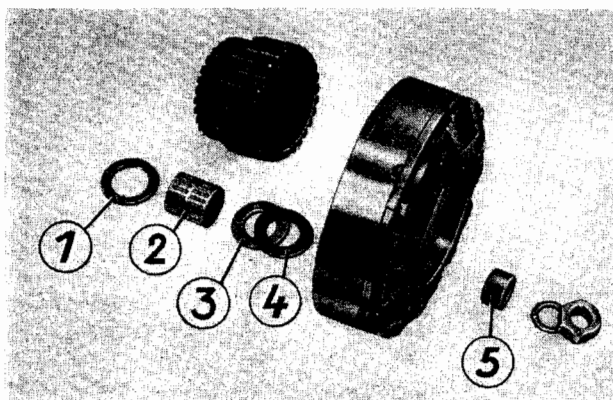


Fig. 74. Assembling sequence of the clutch components

Mount the thrust washer also in such a way that the chamfered side points to the crankshaft collar (Fig. 74, item 3).

The spring lock washer ($19 \times 34 \times 1$) ensures a tight fit of the thrust washer (Fig. 74, item 4 and Fig. 75, item 1). Then the clutch itself is mounted (take the condition of the tapers into consideration — also see Section 3.3.1.1.). Prior to this remove all oil from the tapers of crankshaft and clutch!

Using the spacer tube (1 in Fig. 76), tighten the clutch with a torque of 78,5 to 98 Nm (8 to 10 kpm). The 22-50.413

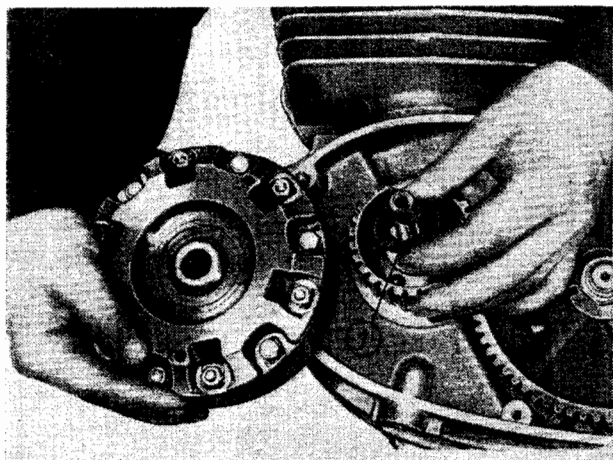


Fig. 75. Mounting the clutch

locking plate (2) is inserted. After loosening the nut, the clutch must be properly fastened. If this is not the case, regrind the tapers by means of abrasive paper until the jointing surfaces bear thoroughly. Protect the 6305 bearing from dust and other impurities and once more check the axial play of the clutch driver.

4.5.3. Clutch Cover

The cover is an assembly of its own and must first be completed.

4.5.3.1. Kick-starter

The kick-starter is provided with a positive disengagement device. It prevents the transmission of a possibly occurring back-kick moment to the transmission parts.

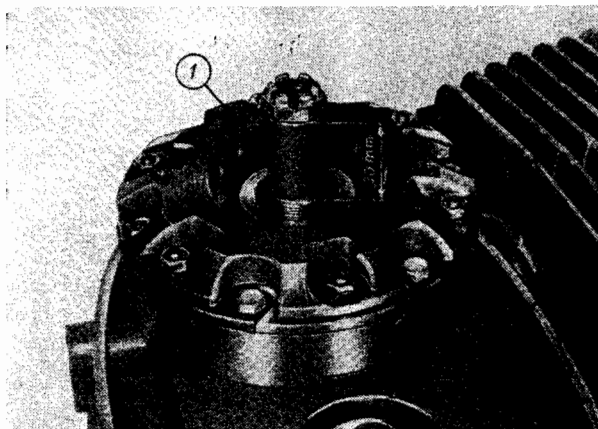


Fig. 76. Tightening the clutch

Sequence of assembling the kick-starter shaft

1. Pressure spring (2) — spring force 14.7 N (1.5 kg) — must be shifted on the kick-starter shaft (1).
2. Shift the driver (3) and the cam plate (4) on the spline profile — for mounting position see Fig. 81.
3. Put the check plate in place.
4. Grease the bore-hole of the kick-starter wheel (6) and fit 24 bearing needles (allowance minus $5.5 \mu\text{m}$ and all needles of the same allowance)
5. Fit the kick-starter wheel and the check plate (8) and fasten them with a snap ring (9).
6. Insert the kick-starter spring with the end bent to the centre of the spring into the bore-hole (10) of the kick-starter shaft.

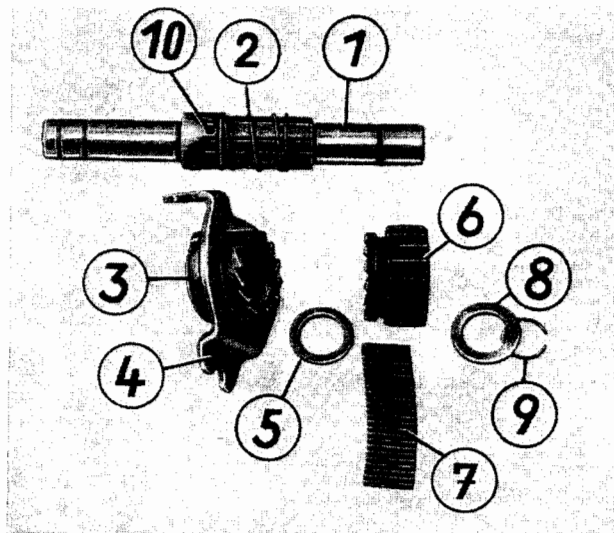


Fig. 77. Components of the kick-starter shaft

Then, as has been described above, clamp the shaft, turn the cover through approximately $1\frac{1}{4}$ revolutions anti-clockwise, drive the splined bolt through the provisionally fitted kick-starter lever and screw them down.

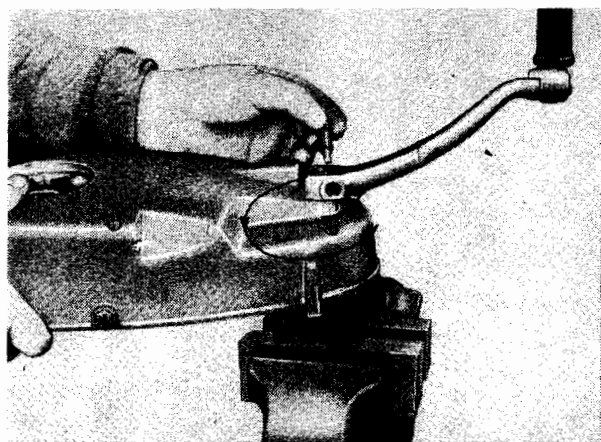


Fig. 78. Fastening the kick-starter lever

4.5.3.2. Clutch Actuation Mechanism

Push the bearing bushing (2) together with the supporting bearing of the crankshaft, No. 6302 (retained by cir-clip), into the clutch cover from outside. Then screw the thrust lever (1) into the thread of the bearing bushing from inside (until it contacts the mating part).

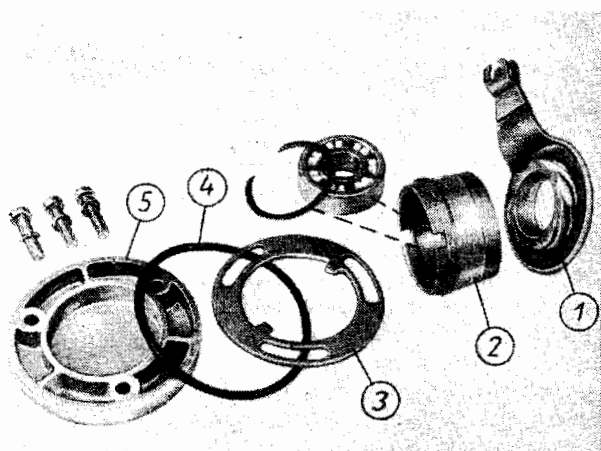


Fig. 79. Parts of the clutch actuation mechanism

- (3) Adjusting plate
- (4) Packing ring
- (5) Cover

The distance between thrust lever (1) and stop rib must be about 6 mm. The distance must be adjusted before mounting the cover.

The piece of pipe prepared according to Fig. 80 must be placed over the nipple eyelet and the mandrel put through the pipe into the nipple eyelet. Then turn the thrust lever in the direction of the stop rib until the pipe makes contact — thus, the distance of 6 mm is provided.

4.5.3.3. Mounting the Clutch Cover

The first thing to do is to check that the 12 mm long distance sleeve (Fig. 74, item 5) is already on the crankshaft end.

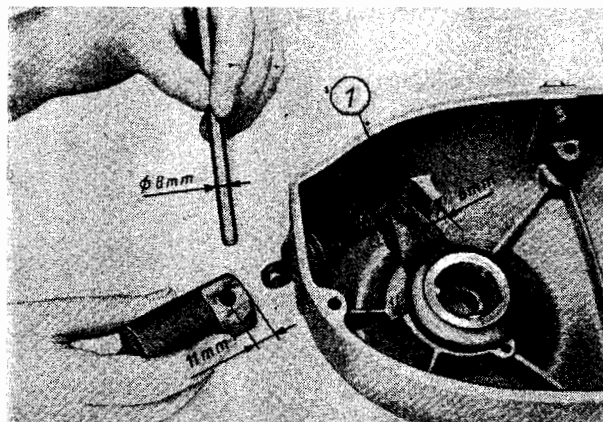


Fig. 80. Coarse adjustment of the clutch actuation mechanism

Now we can finally fit the clutch cover.

Fit the paper packing without jointing compound, after having cleaned the sealing surfaces.

Insert the cam plate with the nose (1) into the casing as is illustrated in Fig. 81. The fastening screw (2) retains the plate at the lower end.

In Fig. 81, the casing cover is not mounted for the purpose of giving a clear illustration.

Then the 5 casing screws (4 with new packings) must be tightened crosswise (bit brace with well fitting insert).

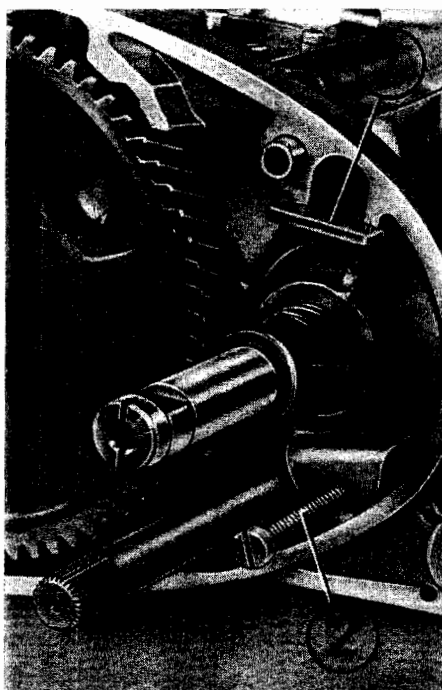


Fig. 81. Correct position of the cam plate

Tighten the nut (1) to 78.5 to 98 Nm (8 to 10 kp-m) by means of a box spanner (SW 22). For this purpose, engage the first gear and retain the pinion (using the 05-MW 45-3 holder). Lock the nut by means of a split pin.

Place the adjusting plate, a rubber ring that is in proper condition and cover (numbers 3, 4, 5 in Fig. 79) on the assembly and fasten them with the three slottedhead screws (new packing rings!).

The oblong holes (2) enable the coarse adjustment of the clutch to be changed if the distance of 6 mm mentioned in the explanation regarding Fig. 80 is removed due to wear on the clutch disks so that the rapid adjusting device at the hand lever becomes effective.

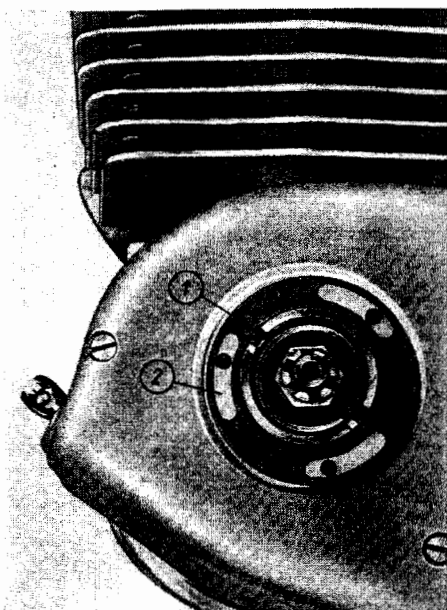


Fig. 82. Fastening clutch and adjusting plate

4.6. Mounting the Engine

When having completed the operations illustrated in Fig. 82, the engine is ready for mounting in the vehicle. — For mounting observe the operations mentioned in Section 3.1. but in the inverse order.

Do not forget to pour 750 cm³ of oil into the gearbox (for oil filler hole see Fig. 6, item 1).

Any engine repair necessitates the subsequent adjustment of ignition and carburettor. The required information is given in Sections 6 and 7.

The alignment of the wheels will also be necessary — this is explained in Section 5.

4.7. Assembling Faults

We have pointed out a few faults in the above text. The most important faults have not been mentioned so far. These are the faults during the mounting of the crankshaft.

This shows that a drift was not used for mounting, but a piece of a pipe was used to blow against the outer race. Now the crankshaft is exposed to axial pressure because

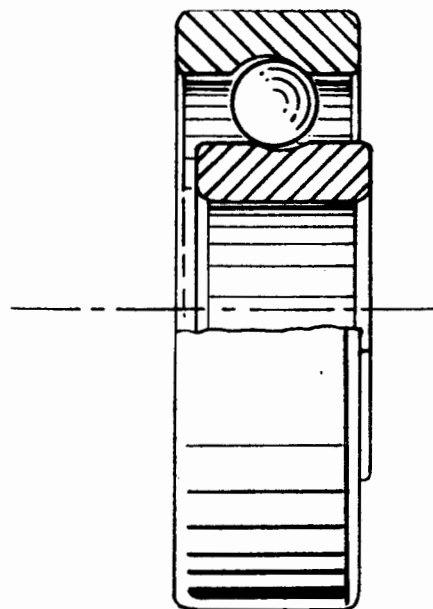


Fig. 83. Tilted 6305 bearing

the bearing was driven in too far (without the necessary feel). The inner race presses the crankshaft back which is resilient to a certain degree. As a consequence, the radial clearance (necessary for the lubricating film) of the left-hand bearing is removed. The balls are no longer loaded radially but run sideways — until the premature failure of the balls they produce a whining, hissing sound. If the force with which the crankshaft was beaten in was even higher, the crankcase will be laterally compressed. This means that it is "out of true" and is practically useless for the following reasons:

1. The contact breaker fails to lift at the specified point or the adjusting range of the contact breaker base plate is insufficient.
2. This amount the crankshaft is out of true induces heavy engine vibrations so that the promised output cannot be achieved by the engine. The elastic engine mounting cannot neutralise the effects of this fault. To the contrary, as the chassis is no longer capable of acting as a "vibration damper", the consequences are even graver.

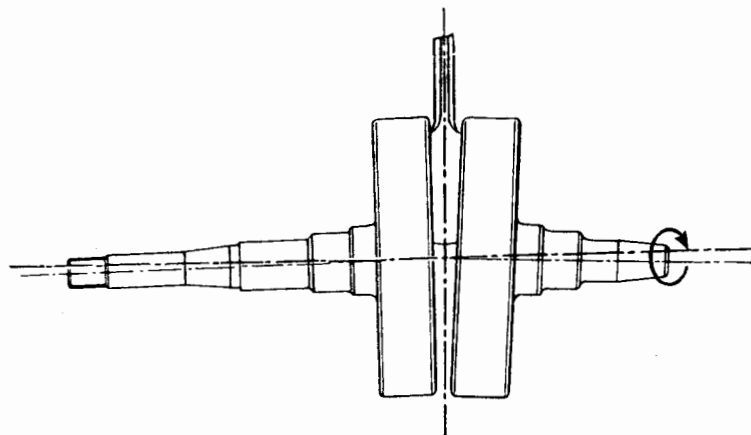


Fig. 84. Compressed crankshaft

If a bearing is driven in place while its inner racer or ring is not heated to the specified temperature, the undue force applied may in addition lead to the fact that the outer bearing rings is tilted, that is to say, that it is not in an axially parallel position.

Such a casing is no longer useful because even a correctly mounted bearing would be tilted by the damaged bearing seat! (To demonstrate the facts clearly, the illustrations are somewhat exaggerated.)

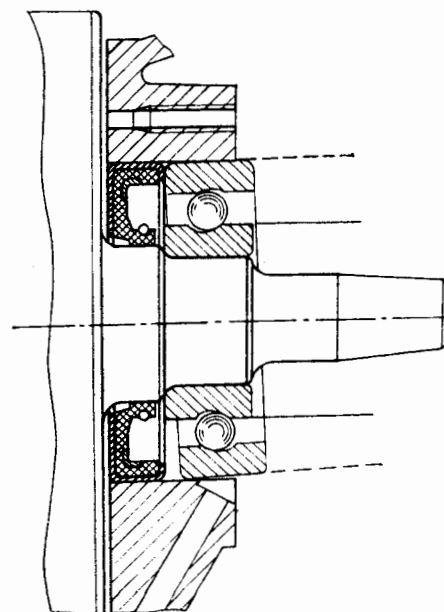


Fig. 85. Bearing driven in place in oblique position

5. Cycle Parts

5.1. Swing Fork Bearing

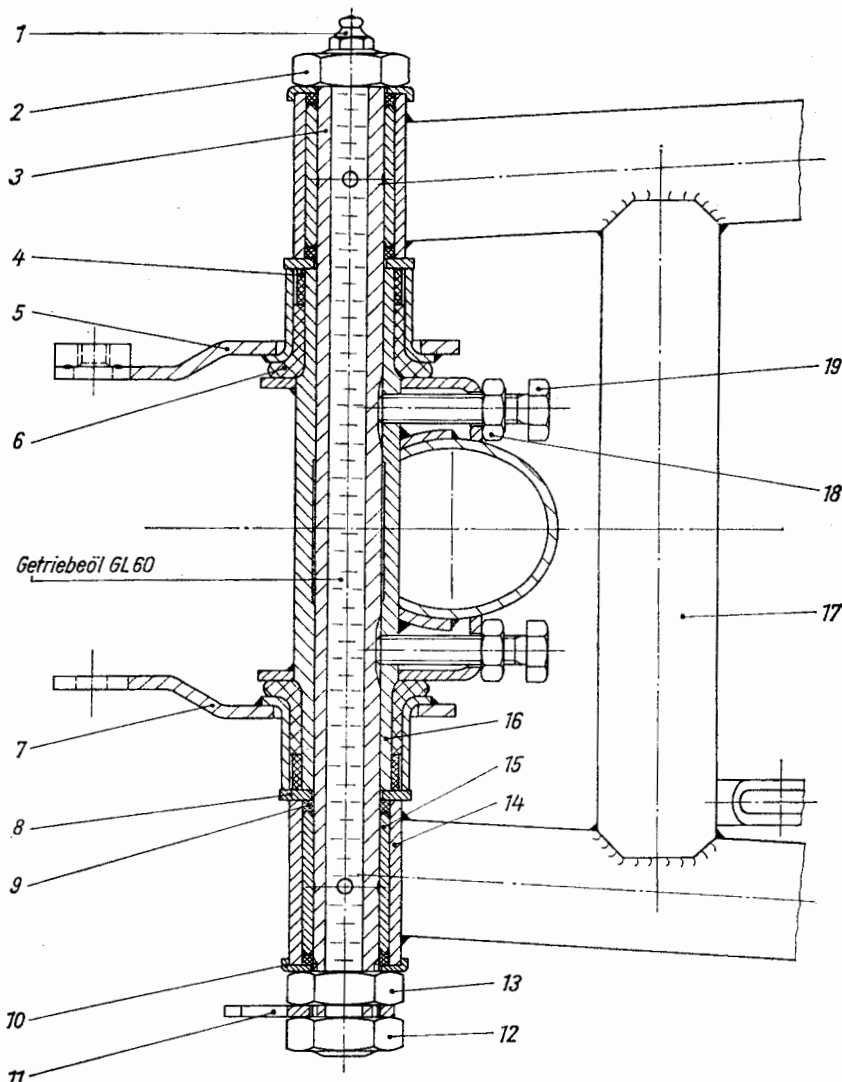


Fig. 86. Swing bearing and elastic mounting of the rear engine mounting plates (sectional view)

- | | |
|----------------------------------|--|
| (1) Ball-type lubricating nipple | (11) Fastening plate for prop stand – tension spring |
| (2) Fixed nut M 18 × 1.5 | (12) Lock nut |
| (3) Swing bearing pin | (13) Adjusting nut |
| (4) Spacer | (14) Swing bearing tube |
| (5) Engine mounting plate, right | (15) Bearing bushing |
| (6) Bearing rubber | (16) Frame bearing tube |
| (7) Engine mounting plate, left | (17) Rear wheel swing |
| (8) Thrust washer | (18) Lock nut |
| (9) Rubber sealing ring | (19) Clamping screw |
| (10) Protective cap | |

Getriebeöl GL 60 = Gear oil of grade GL 60

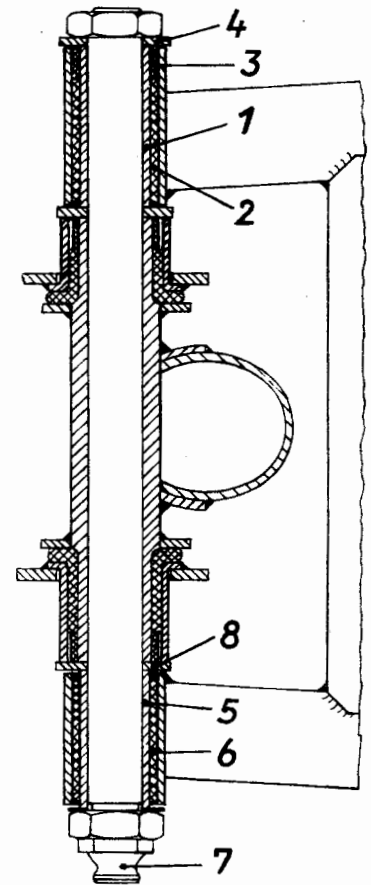


Fig. 87. Rubber-mounted swing

- | |
|---|
| (1) Right-hand inner tube, 45 mm long |
| (2) Right-hand rubber bush, 25 mm long |
| (3) Spacer sleeve (polyamide), 10 mm long |
| (4) Check plate |
| (5) Left-hand inner tube, 44 mm long |
| (6) Left-hand rubber bush, 25 mm long |
| (7) Groove for kick-starter spring |
| (8) Check plate |

The load-carrying part of the bearing is the precision chromium-plated swing-fork bearing bolt which is clamped in the frame bearing tube. Bearing bushes of grey cast-iron GGL-25 are pressed into swing bearing tube, interference fit 23.9 E 9/24 s6, bearing fit 18 H7/f7.

Parts subject to wear of the bearing are the swing-fork bearing bolt, the bearing bushes (the swing-forks are capable of being repaired), the sealing rings, the thrust washers and the protective cap.

The wear limit for the bearing is a radial play of maximum 0.1 mm. It can be measured by means of a dial gauge mounted on the swing-fork bearing bolt which is used to trace or scan the swing bearing tube. Before measuring, the check nut and adjusting nut must be loosened.

Removal of the swing-fork bearing bolt

1. Loosen the check nut and adjusting nut.
2. Unscrew the clamping screws.
3. Drive out the swing-fork bearing bolt by means of an ancillary mandrel.

Assembly of the rear swing-fork bearing including engine mounting (engine removed)

1. Slip bearing rubber pad, spacer ring and engine mounting plates on the frame bearing tube on the right-hand and left-hand sides (see Fig. 86).
2. Axially compress the engine mounting plates to the length of the frame bearing tube by means of the pressure rings. (See Fig. 88 and 89.)

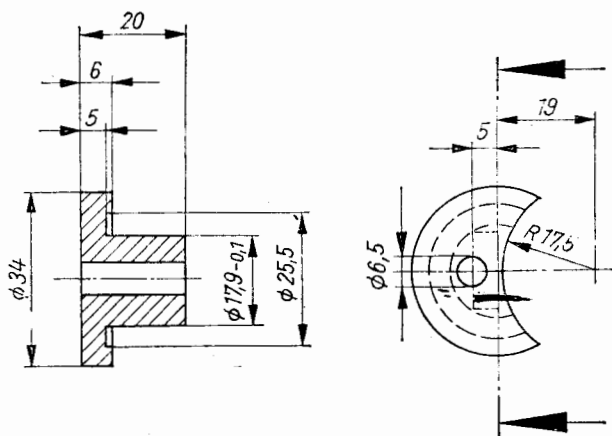


Fig. 88. Sketch for thrust ring

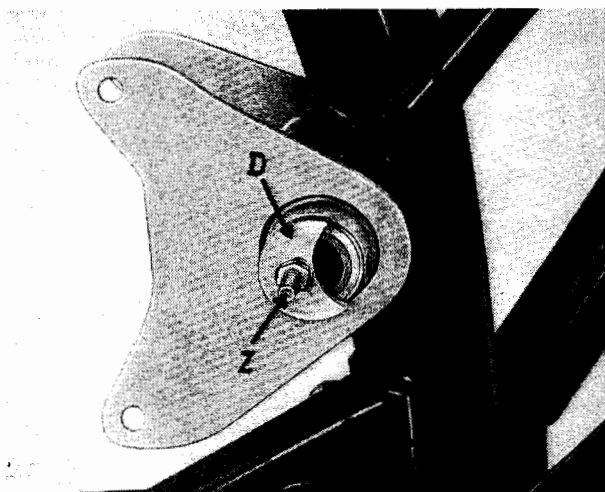


Fig. 89. Engine mounting plates axially compressed by thrust ring (D) and draw-in bolt (Z) M 6

3. Provide the rear wheel swing-fork with rubber sealing rings.

Put the rear wheel swing-fork with thrust washers on the lateral engine mounting plates (Fig. 89), remove the pressure rings (Fig. 90).

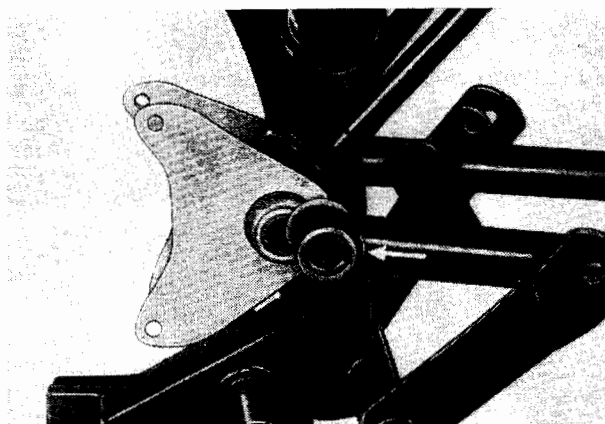


Fig. 90. Thrust ring removed, put on the rear wheel swing together with thrust washers in the direction of the arrowhead up to the centre of the bore-hole

4. Drive in the ancillary mandrel (Fig. 91) from the left-hand side to centre the bearing.
5. Drive the swing-fork bearing bolt with protective cap and check nut screwed in place into the bearing from the right-hand side (only use a rubber or wooden or rawhide mallet, and mark the arresting areas for the clamping screws at the outside of the swing-fork (bearing bolt) — turn the swing-fork bearing bolt in

such a way that the fastening areas point in the direction of the clamping screws.

6. Slightly tighten the clamping screws (just far enough to ensure that the swing-fork bearing bolt cannot be turned).
7. Slip on the left-hand protective cap and screw the adjusting nut in place.
8. By means of the adjusting nut, adjust the bearing clearance at the sides in such a way that the swing fork (suspension units and wheel removed) does not move downwards due to its own weight.
9. Tighten the clamping screws and apply check nuts.
10. Properly tighten the check nut on the adjusting nut; when doing this, retain the adjusting nut so that it cannot be displaced.

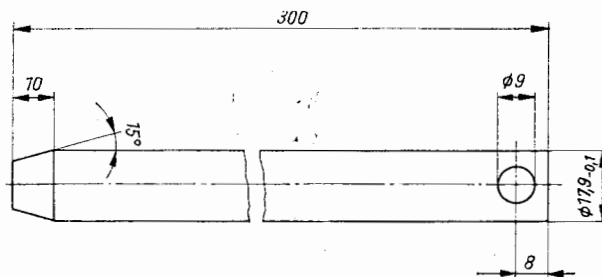


Fig. 91. Sketch for ancillary mandrel

Replacement of the rubber bearing for the rear-wheel swing arm

- Press out the inner tubes (1) and (2) by means of the mandrel (3) on a mandrel press in *one pass*.
- Cut up and press out the rubbers (4) and (5).
- Press the new rubbers (4) and (5) in place, using the mandrel (6), proceeding from the outer sides of the swing. Insert the intermediate ring (7) between table of the mandrel press and swing. For the left-hand side of the swing, use the short cylindrical extension and for the right-hand side the longer one because, here, the spacer sleeve (8) — 10 mm wide — must be pressed in place.
- Apply soap solution to the rubbers (4) and (5) — do not use oil! Slip the inner tube (1) or (2) prior to this on the cylindrical end of mandrel (3) with the conical end ahead and in *one pass* until the inner tube projects uniformly from the two ends of the swing tube.

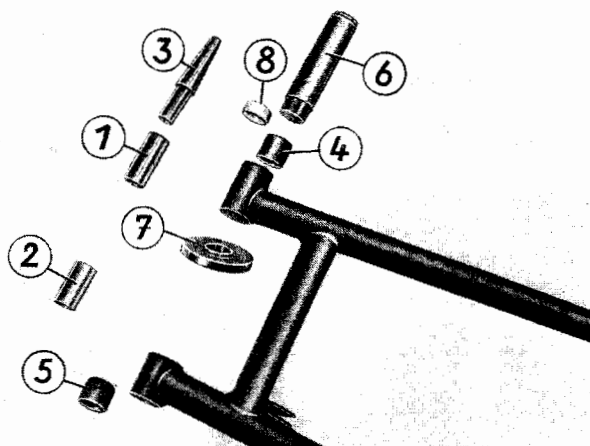


Fig. 92. Mounting the rubber bearings

5.2. Rear Engine Mounting

The bearing rubber pads and distance rings of the rear engine mounting can only be changed when the rear wheel swing fork is dismantled according to the above instructions.

The wear limit is reached when the engine mounting plates fail to show any pre-stress in mounted condition and can be moved laterally to and fro by hand. When replacing the bearing rubber pads and distance rings by new ones, check the bearing collars of the engine mounting plates for signs of wear. If inside the bore-hole, at the point where the distance ring is applied, a slight offset can be felt, it is advisable in the interest of a long service life of the new rubber and distance rings also to replace the engine mounting plates by new ones.

5.3. Front (Upper) Engine Mounting (Fig. 93)

When replacing the rubber elements it is necessary — in order that the engine can hang down as far as possible — to unscrew the carrying tube for the footrests and the fastening screws between rear exhaust pipe clip and exhaust pipe brace.

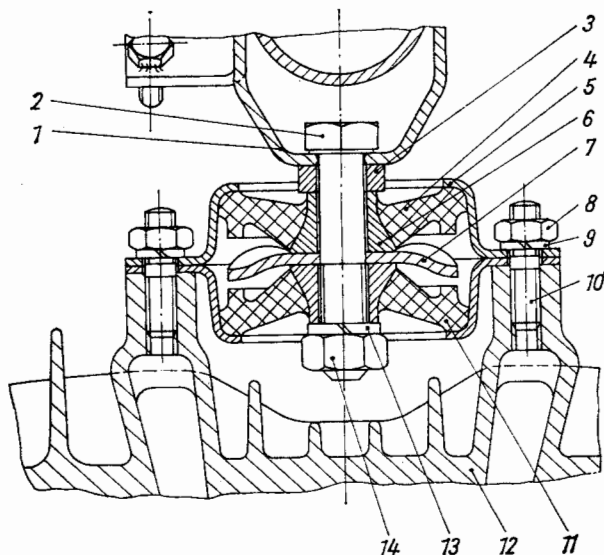


Fig. 93. Upper elastic engine mounting (sectional view)

- (1) Frame with welded-in hexagon head screw (2) (M 12)
- (3) Spacers
- (4) Rubber element with carrying plate vulcanised in place (5)
- (6) Spacer
- (7) Check plate
- (8) Hexagon nut M 8
- (9) Spring ring
- (10) Stud bolt M 8
- (11) Rubber element, same as part (4)
- (12) Cylinder head
- (13) Spring ring
- (14) Hexagon nut M 12

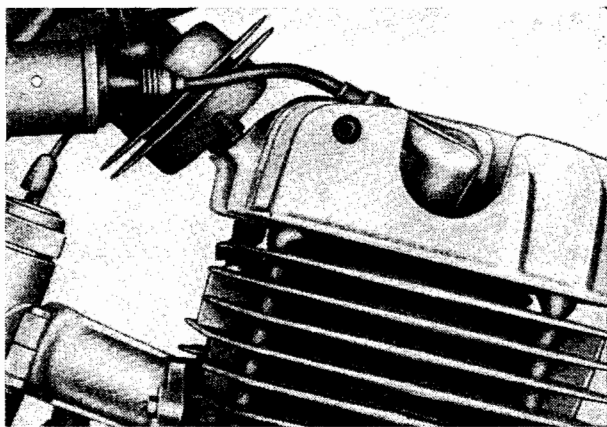


Fig. 94. Position of the rubber elements of the upper engine mounting when replacing them

After loosening the fastening nut and turning the rubber elements, (Fig. 93) they can be replaced by new ones. When mounting, take care that the thrust washer is properly positioned (if grossly deflected, place it with the sag on top; if less deflected — indicated by a groove turned in — to the bottom).

5.4. Steering Bearing

The ball bearings are driven into the frame in the following manner:

1. Press the lower bearing down to the stop, using the intermediate ring 54 mm in diameter \times 20 mm, so that pressure is exerted on the outer ring;
2. Insert the distance sleeve;
3. Press the upper bearing down until its inner ring contacts the distance sleeve; in this operation take care to see that the distance ring, 54 mm in diameter \times 40 mm, is placed under the lower bearing in order that the lower bearing is not pressed out; and then also exert pressure on the intermediate ring, 54 mm in diameter \times 20 mm, in order that the inner and outer rings of the upper bearing properly contact their mating parts.

Since the steering components are mounted on ball bearings, no adjusting operations are required. The steering bearing is in perfect working condition if the ball bearings have a proper press fit and the covering nut is properly tightened.

The specified torque for this operation is 147 Nm (15 kp-m) (use a box spanner or socket wrench only). Do not forget to lock the screwed joint by folding down the locking plate.

This Legend belongs to the illustration given on page 37

Left half of illustration: Design "guide tubes exposed", spring fully expanded

Right half of illustration: Design "guide tubes covered by protective sleeve", spring fully compressed

- (1) Nut for steering tube
- (2) Cap
- (3) Upper clamping head
- (4) 6006 ball bearing
- (5) Steering head tube of the frame
- (6) Screw plug
- (7) Rubber ring for head lamp holder
- (8) Headlamp holder
- (9) Compression spring for telescopic fork
- (10) Spacer
- (11) Steering tube
- (12) 6006 ball bearing
- (13) Lower clamping head
- (14) Wire circlip 38
- (15) Protective sleeve
- (16) Wire circlip 30
- (17) Guide tube
- (18) Supporting ring
- (19) Radial sealing ring D 32 \times 45 \times 7
- (20) Threaded ring
- (21) Sliding tube
- (22) Upper sliding bush
- (23) Circlip 32
- (24) Compression spring for damping valve
- (25) Packing ring for damping valve
- (26) Wire circlip 32
- (27) Lower sliding bush
- (28) Circlip 32
- (29) Protective cap
- (30) Felt ring holder
- (31) Felt ring
- (32) Spindle bush

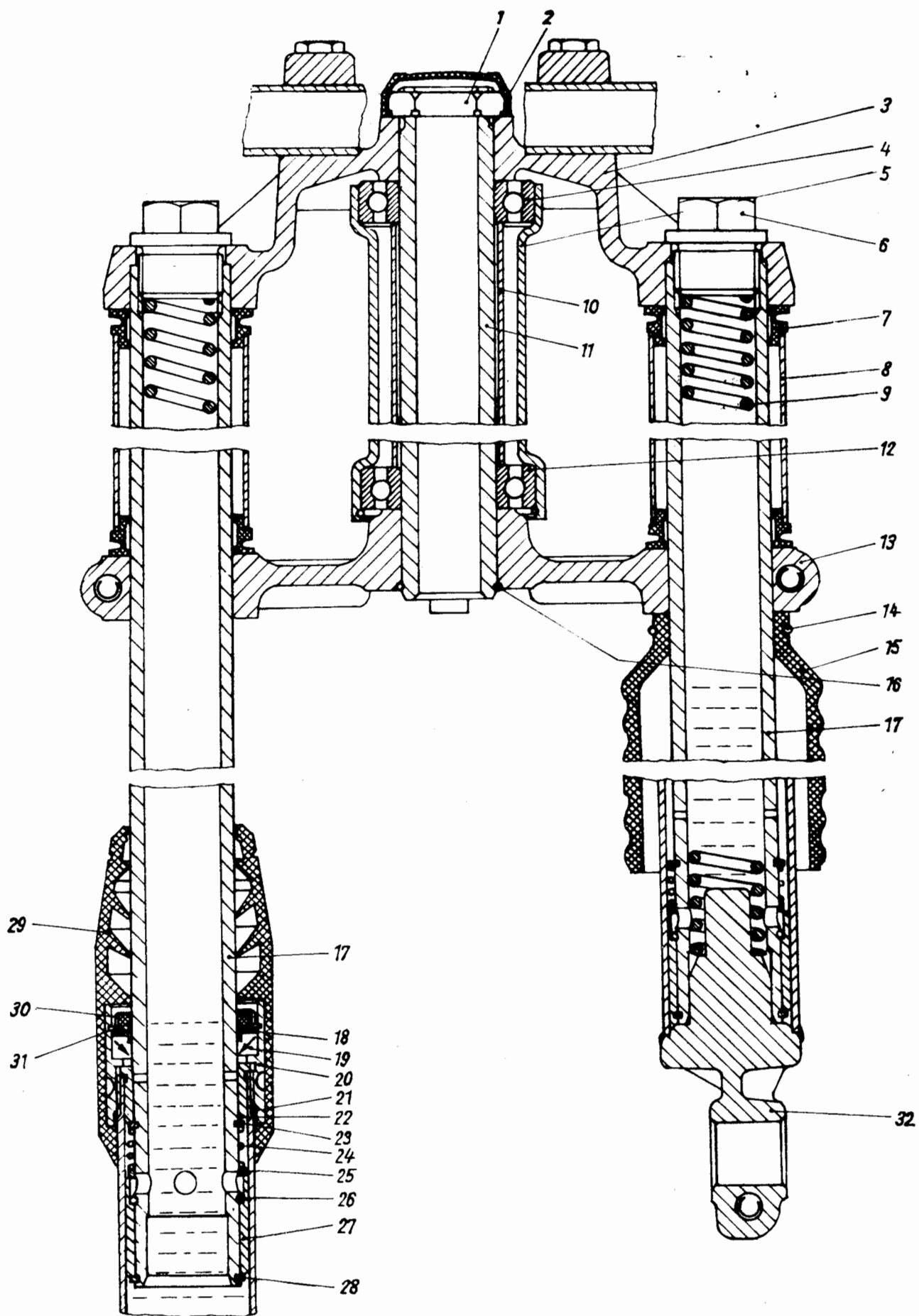


Fig. 95. Steering bearing with telescopic fork (sectional view)

The ball bearings should be removed from the frame in the manner illustrated in Figs. 96 to 98, using the 22-51.006 extractor. For fitting and removing the clamping heads and the other components of the telescopic fork see Section 5.5.

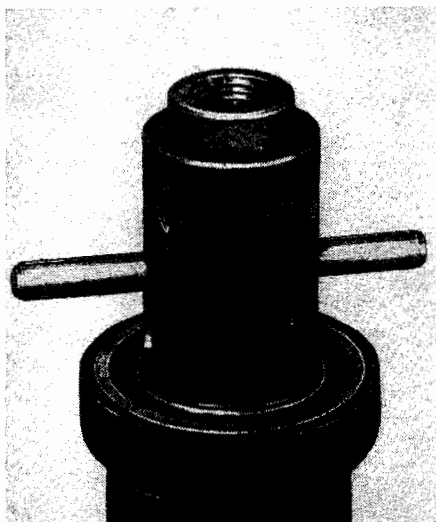


Fig. 96
Press the interior part of the extractor into the ball bearing and pull upwards by means of the cross pin



Fig. 97. Applying the upper part of the extractor

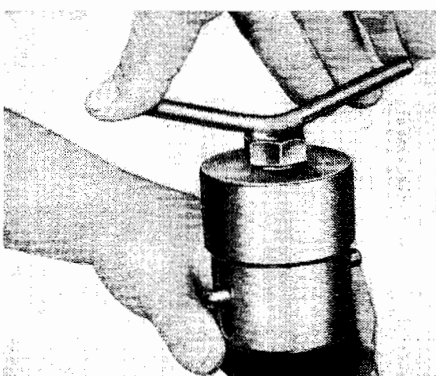


Fig. 98
Screwing the screw in place, tightening and drawing the bearing out of the frame with it

The design of the steering bearing with steering assembly damping is illustrated in Fig. 99. It should be noted that the connection between holder and steering lock of the frame must be free from any clearance.

5.5. Telescopic Fork (see also Fig. 96, Section 5.4.)

The front part of the machine is disassembled into the main components as follows:

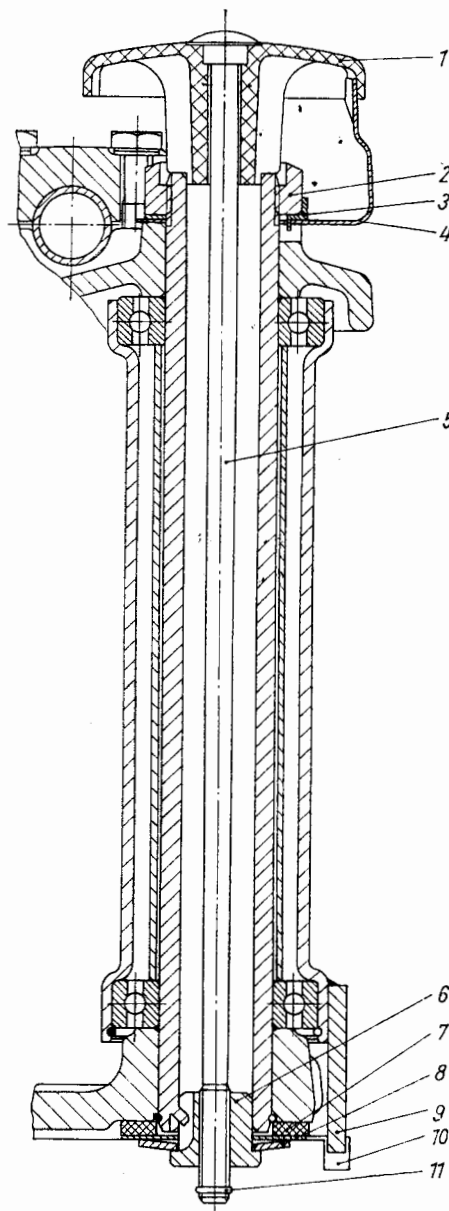


Fig. 99. Steering bearing with steering damping

- | | |
|----------------------|------------------------------|
| (1) Adjusting handle | (7) Friction washer |
| (2) Cap nut | (8) Belleville spring B 20 r |
| (3) Lock plate | (9) Steering stop of frame |
| (4) Retaining plate | (10) Holder |
| (5) Spindle | (11) Split pin 1.6 × 20 |
| (6) Guide body | |

1. Remove front wheel and front wheel mudguard.
2. Remove handlebars and place them on the fuel tank (place a protective cloth underneath).
3. Loosen cable connections and speedometer spindle from headlamp (mark the plug-in type connections for identification) and dismantle headlamp.
4. Loosen screw plugs and covering nut.
5. Remove the upper clamping head (drive upwards by means of a rubber mallet) together with headlamp holder and rubber pad for headlamp holder.
6. Withdraw the lower clamping head together with the guide tubes downwards, tapping the control tube by means of a rubber mallet, if required (note that the guide tubes should remain clamped in the lower clamping head, unless the telescopic units have to be dismantled).

Mounting is to be done in the inverse order of the disassembling operations.

The screwed joints should be tightened in the following order (Fig. 100):

1. Covering nut.
2. Screw plugs for telescopic units, applying a thin film of the "Chemisol 1405" adhesive lacquer (manufacturer: VEB Schuh-Chemie, Erfurt) to the thread of the screw plugs for sealing them.
Torque: 147 Nm (15 kp-m).
("Chemisol" is made on the basis of synthetic caoutchouc, viscosity: 30 s run out time of 50 ml with a 5-mm jet. In countries other than the GDR, an adhesive lacquer of similar properties should be used for sealing.)
3. Clamping screws at the lower clamping head, torque 34 to 44 Nm (3.5 to 4.5 kp-m).
4. Nut of the knockout spindle; then, while the motorcycle is stationary, vigorously move the system several times through the full travel from bump to rebound (while the mudguard screws are still loose) to ensure that the knockout spindle assumes proper position in the opening provided for the spindle, the spindle bush, where a sliding fit must be ensured; if necessary, finish ream the left-hand spindle receiving bush to a size of 20 mm in diameter.
5. Clamping screw for knockout spindle.

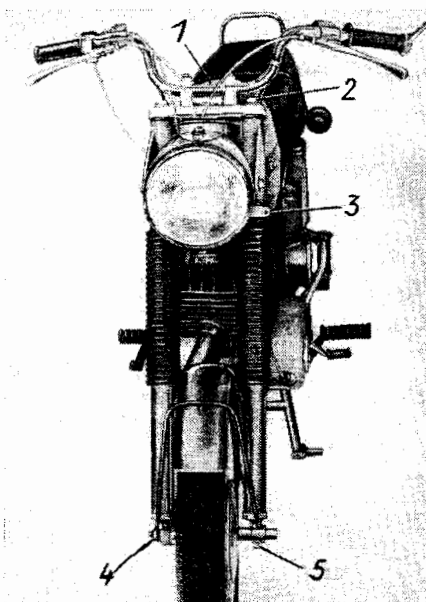


Fig. 100. Sequence in tightening the screws

Repairing the telescopic units of the fork

The permissible amount of wear is reached if the fully extended slide tubes of the units can be moved to and fro at the spindle bush through a distance of more than 3.5 mm. In this test, the two fork units must not be subjected to any deformation because this would reduce the actual play. In cases of doubt, the telescopic units must be completely removed from the assembly, the guide tubes gently clamped in "soft protective jaws", and the actual play measured at the spindle bush by means of a dial gauge.

When completely removing the telescopic members, the clamping heads and the headlamp holders can be left at the vehicle.

After removing the front wheel and the front wheel mudguard, and after loosening the screw plugs and the clamping screws from the lower clamping head, the telescopic units are driven out by means of the combined assembly spanner (19-MW 22-1) (Fig. 101).

For this purpose, the spanner is screwed into the M 27 \times 2 thread of the guide tubes. The assembled position of the guide tubes must be marked by colour dots below the lower clamping head before dismantling.

To facilitate re-assembling, it is advisable, immediately after having removed one telescopic unit, to insert another guide tube or a suitable piece of pipe with a diameter of anything between 31.7 and 31.8 mm from the bottom end in order that the rubber pads for the headlamp will not be dislocated.

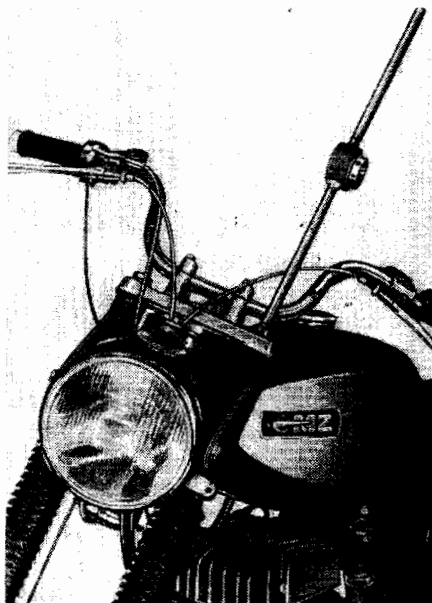


Fig. 101
Fitting and removing the guide tubes by means of the combined assembling spanner

For assembling and disassembling only adequate tools, should be used. With makeshift tools, damage will be caused and successful repairs will not be ensured.

For dismantling a telescopic unit, it is to be clamped at the spindle bush but not at the guide tube (Fig. 102).

After removing the protective cap or protective bush, the threaded ring can be loosened by means of the combined assembling spanner and the guide tube together with the lower slide bush and the damping valve withdrawn from the sliding tube. After loosening the circlip (Fig. 103), the telescopic unit can be dismantled into its parts.

The D 32 \times 45 \times 7 packing ring will be destroyed when being pressed out of the threaded ring.

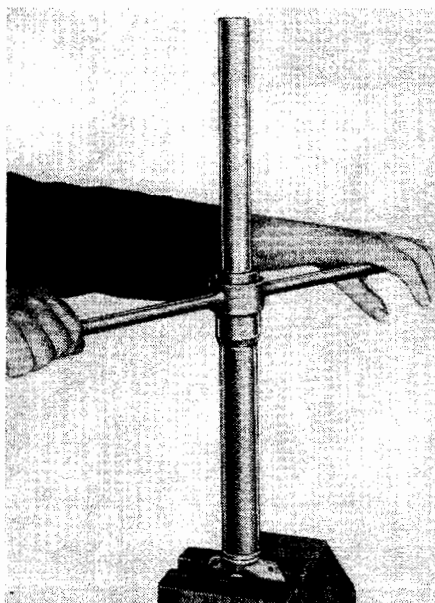


Fig. 102
Loosening and tightening the threaded ring by means of the combined assembling spanner

When inspecting and repairing the parts, the following should be observed:

Guide tube

The tubes must be replaced by new ones if they are distorted by unusual outer influences (do not straighten them, experience has shown that guide tubes after straightening assume their original position of the distorted condition; permissible out-of-true error 0.05 mm) or the chromium plating is worn away.

The portion of the guide tube subjected to the highest rate of wear is at the front end, about 150 mm above the lower edge, i. e. where the most intense sliding takes place of sliding bush and packing ring. Wear of the chromium coat is indicated by dark spots and grooves. If a telescopic unit is to be re-assembled with a new packing ring and a used guide tube, which still is in perfect working order, it is advisable to mount the guide tube in such a manner that it is displaced through 180° with respect to its former assembled position.

When re-assembling telescopic units which were not disassembled into their component parts, it is advisable, however, to fit the guide tube in their original position in the assembly. Over its entire length, the guide tube must be free from impact marks, grooves and other surface irregularities to ensure that the packing ring will not be damaged when it is slipped on the assembly. Surface irregularities must be removed by a fine-grained oilstone moved longitudinally.



Fig. 103
Loosening the
lower circlip

Upper sliding bush

The required measure of the hole is 31.850 to 31.889 mm. Experience has shown that limited wear occurs so that replacement practically is not necessary.

The inner surface of the hole partly exhibits a non-uniform appearance caused by a small eccentricity in the position of the assembled component parts due to manufacture; this is not associated with any drawback, however.

Lower sliding bush

The outer diameter is 37.875 to 37.900 mm.

This part is also subjected to a low wear rate so that replacement will become necessary only after 30,000 to 50,000 km of road operation.

The given axial play of the sliding bush between the circlips of the guide tubes can lead to a clicking sound

emitted from the telescopic fork on the move which has no influence on the function. This insignificant flaw can be removed by fitting an adequate spacer between circlip and lower edge of the sliding bush to remove this axial play. This washer must exactly fit on the guide tube (diameter 31.7 mm) and its external diameter must not exceed 35.5 mm to prevent these washers from rubbing against the inner surfaces of the sliding tubes at any rate.

Sliding tube

The surface of the hole exerts a great influence on the ease of motion and wear of the interior of the telescopic fork. The drilled hole is not mechanically finished because by emery grinding or similar processes the extremely smooth surface obtained in drilling would be destroyed and lead to an unusual wear of the lower sliding bush.

If, by extraordinary conditions (foreign particles or similar things), the interior surface of the sliding tube is damaged, the surface may be restored to proper working order by honing (in a manner similar to that used in finishing the cylinder bore). The required dimension of the diameter of the sliding tube hole is 38.00 to 38.05 mm.

Damping valve

In this part, only an insignificant amount of wear is involved so that a replacement of the components is practically not necessary.

The sealing ring for the damping valve, made of piston ring material, must be free to move easily, free from burr and absolutely clean. Small decontaminations may easily lead to jamming of the sealing ring or to leaks in the valve.

Threaded ring with packing ring

In order that the packing ring is not damaged when pressed into the threaded ring, the combined assembling spanner (Figs. 104 and 105) should be used for this purpose.

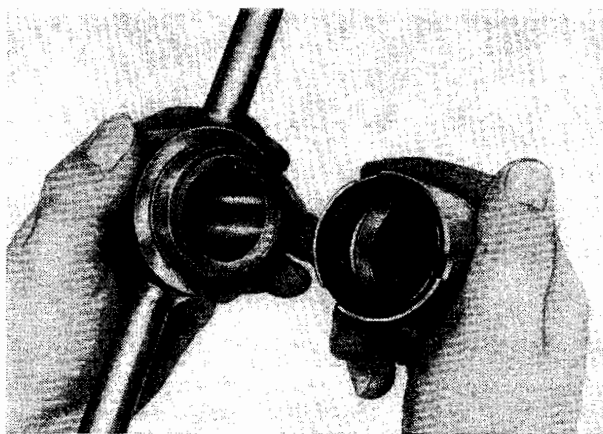


Fig. 104. Combined assembling spanner for driving the packing ring into the threaded ring

This special tool is designed in such a way that the packing ring is not placed on the lower face and the fitting tool does not press on the upper face where damage to the rubber lining of the packing ring would be caused.

After pressing the packing ring in place, back-up washer, felt ring and felt-ring holder must be fitted. Then the complete threaded ring is slipped over the guide tube from top by means of the 22-51.403 fitting sleeve (Fig. 106).

To provide a proper seal between sliding tube and threaded ring, apply a thin film of adhesive lacquer "Chemisol 1405" to the thread of the sliding tube before

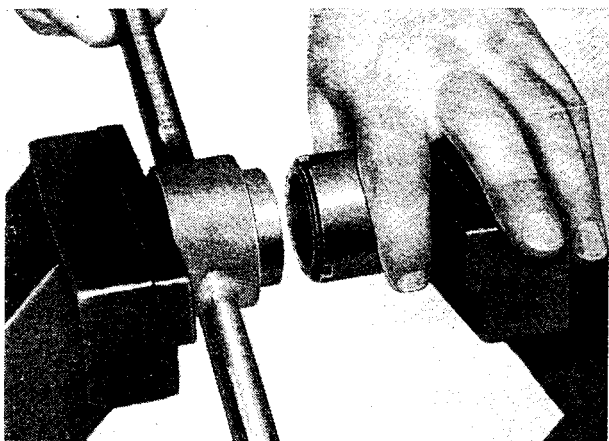


Fig. 105. Pressing the packing ring into threaded ring by means of the combined assembling spanner

assembling. On no account should adhesive be applied to the thread of the threaded ring because the excessive supply of adhesive lacquer would be squeezed upwards to the packing ring. The required torque for tightening the threaded ring is 196 Nm (20 kp-m).

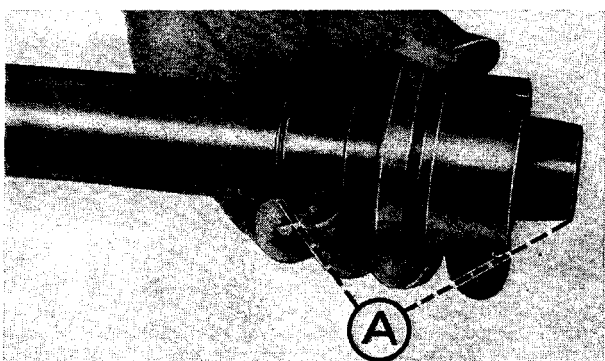


Fig. 106. Slipping the threaded ring (with the packing ring already pressed in place) on the guide tube by means of an assembling sleeve „A“

Functional test

After assembling, the telescopic units must be subjected to a functional test for tightness and damping power. For this purpose, an amount of 220 cm³ of shock-absorber fluid must be poured in each unit. If possible, the telescopic units should be clamped in a test equipment (at the top, at the screw plug and at the bottom, at the spindle receiving bush) and sprung, i.e. moved through a travel of 80 mm of the spring, up and down, at a frequency of 100/min. The damping power required for the rebound motion under these test conditions is 157 ± 39 N (16 ± 4 kp).

If a suitable test equipment is not available, the test must be carried out by hand by compressing and expanding the unit. The damping effect must be clearly perceptible in expanding.

After the completion of the functional test, the telescopic units are completely assembled; for this purpose, the unit is clamped at the spindle bush.

The telescopic units are also mounted in the vehicle by means of the combined assembling spanner (cf. Fig. 101). Sequence of tightening the screws according to Fig. 100.

The correct oil level in assembled condition is checked according to the manner shown in Fig. 107.

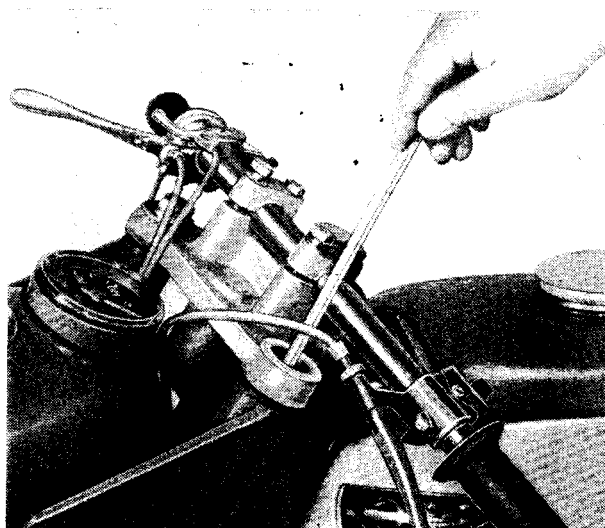


Fig. 107. Oil level checking by dipstick: Insert the dipstick through the interior of the compression spring down to the stop; required oil level is 210 mm above lower edge of dipstick

5.6. Fuel Tank

Because of the danger of explosion, repairs at the fuel tank should only be carried out in a special workshop. Repairs of the mounting for fuel tanks and the fuel shut-off cock can be done by the rider himself. The fuel tank is, at its rear and front ends, elastically mounted on the frame (Figs. 108 and 109).

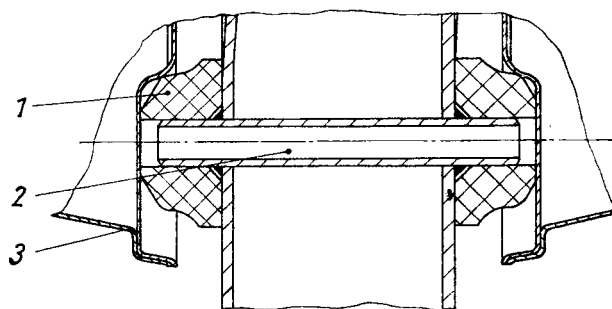


Fig. 108. Front suspension for fuel tank (sectional view)
(1) Rubber pad
(2) Frame with carrying tube welded in place, 10 mm in diameter
(3) Fuel tank

In this way, a transmission of vibrations from the frame to the fuel tank is efficiently damped.

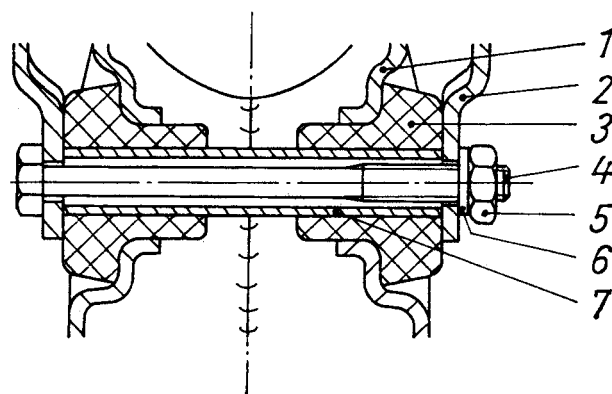


Fig. 109. Rear fuel tank suspension at the frame (sectional view)

- | | |
|----------------------------------|------------------------|
| (1) Frame | (5) Hexagon nut M 6 |
| (2) Fastening angle at fuel tank | (6) Spring lock washer |
| (3) Rubber pad | (7) Spacer |
| (4) Hexagon head bolt M 6 × 70 | |

After removing the fuel tank (Fig. 110), the rubber parts can be subjected to inspection.

When the front rubber parts are worn, they should be turned through 90°. The rear rubber parts are practically not subject to wear. On no account should the elastic mounting be changed into a rigid one.

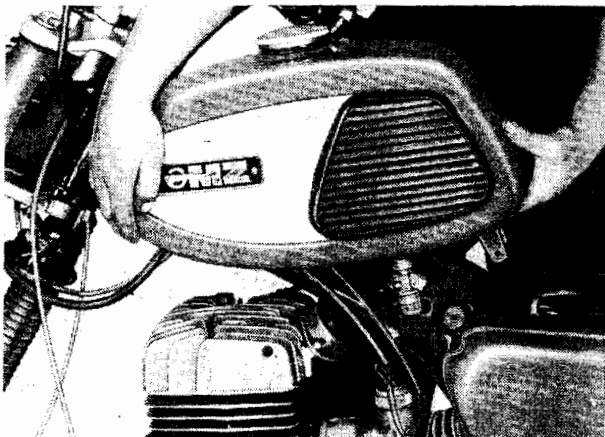


Fig. 110. Removing the fuel tank

Fuel shut-off cock (Fig. 111)

The condition of the fuel shut-off cock effects a significant influence on the proper function of the engine. Insufficient fuel supply may also lead to piston seizing.

The fuel passes through two strainers in the cock. The first one becomes accessible after unscrewing the fuel shut-off cock from the fuel tank, the second one after loosening the lower plastics screw joint and the fastening screw beneath it. It is advisable, to clean the strainers thoroughly after every 5,000 km of road operation or once a year.

Another source of troubles may be the rubber packing under the actuating lever of the fuel shut-off cock; the holes in the rubber may be clogged or closed by swelling or by too tightly fitting fastening screws.

Actuating lever and rubber packing can be removed after loosening the two fastening screws arranged laterally to the actuating lever.

On the occasion of repairs at the fuel shut-off cock, the fuel feed hose leading to the carburettor should also be inspected. If this hose has become brittle, leaks may occur in the connections. Then the fitting of a new fuel supply hose having a size of 5 × 8.2 is required.

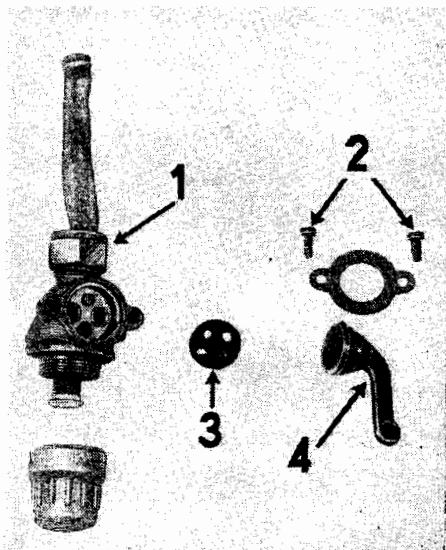


Fig. 111
Fuel shut-off
cock dismantled
(1) Union nut
(2) Fastening screws
(3) Rubber packing
(4) Actuation lever

5.7. Rear Wheel Drive and Rear Wheel Hub (Fig. 112)

The flange bolts, the chain cover and the chain tightener are axially fastened to the right-hand swing arm by means of the fastening nut for the flange bolt. Taking the chain cover of plastics into consideration, the torque required for this nut is 68 Nm (7 kp-m).

After fitting the rear wheel, the following parts are axially drawn to the flange bolt by tightening the knock-out spindle:

- chain tightener, left-hand side
- swing arm, left-hand side
- distance piece
- brake backing plate
- ball bearing and distance sleeve.

Dismantling the rear wheel drive

After loosening the nut for flange bolt, the complete drive including chain cover can be removed towards the interior. The circlip must be loosened by means of a tapered-nose pliers (Fig. 113) and the flange bolt together with the ball bearing driven out of the damping body (Fig. 114).

(For Fig. 112 see page 43)

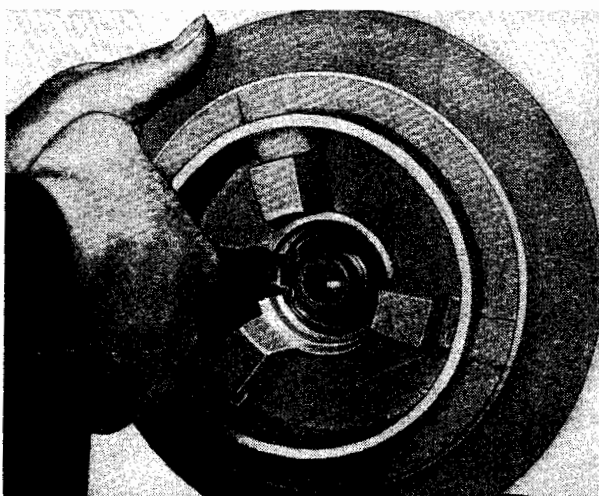


Fig. 113. Loosening the locking ring for ball bearing in damping body

In this operation, the nut of the flange bolts should be screwed or the bolt so as to be flush with the bolt end in order that the thread cannot be damaged.

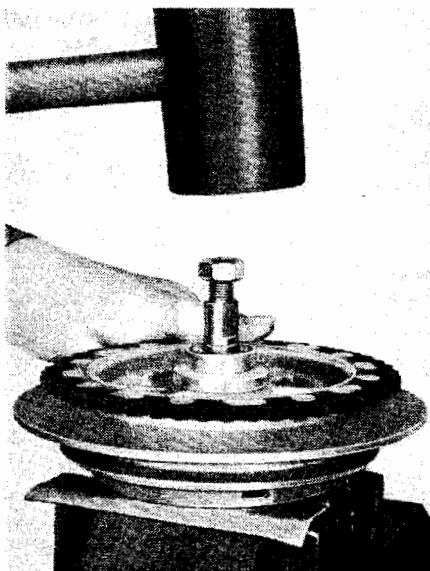


Fig. 114
Driving out the
flange bolt from
the damping body

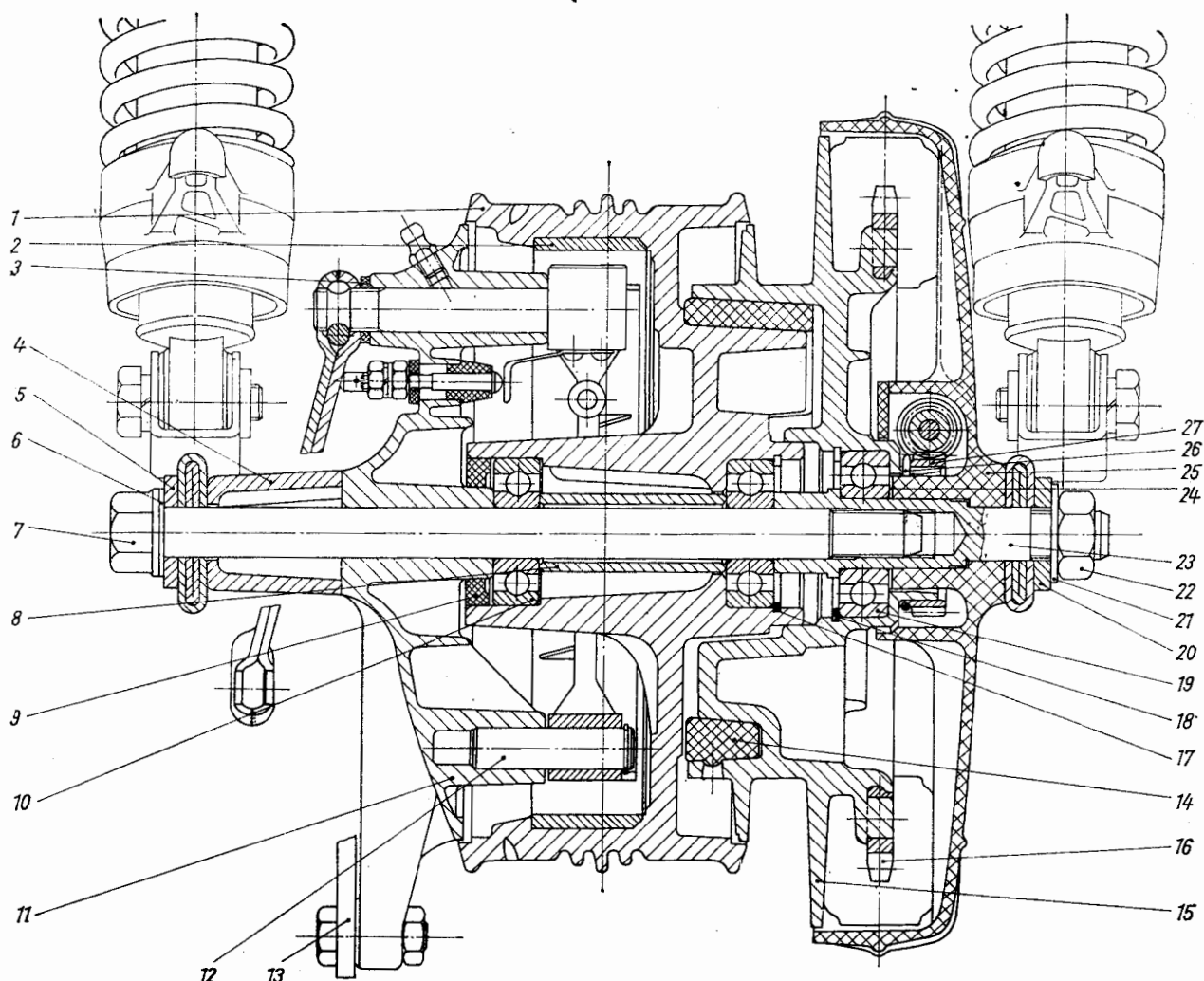


Fig. 112. Rear wheel bearing, drive and brake (sectional view)

- | | |
|---|--|
| (1) Wheel body | (15) Damping body |
| (2) Brake ring with cast-on wheel body | (16) Gear ring with cast-on damping body |
| (3) Rubber packing ring for brake cam spindle | (17) not applicable |
| (4) Spacing sleeve | (18) Circlip 47 |
| (5) Chain tightener, left-hand side | (19) 6204 ball bearing |
| (6) Washer | (20) Chain tightener, right-hand side |
| (7) Knockout wheel spindle | (21) Washer |
| (8) Spacing sleeve | (22) Hexagon nut M 14 × 1.5 |
| (9) Rubber packing | (23) Flange bolt |
| (10) 6302 ball bearing | (24) Intermediate washer |
| (11) Brake holder | (25) Chain cover |
| (12) Anchor bolt | (26) Hooked circlip |
| (13) Diagonal tie for brake | (27) Helical gear for speedometer |
| (14) Damping rubber | |

Replacement of wheel bearing

The speedometer drive is shown in Fig. 115 in a sectional view.

During repairs, the pinion shaft and the gears of the speedometer drive should be lubricated with antifriction bearing grease grade Ceritol (self-lubricating).

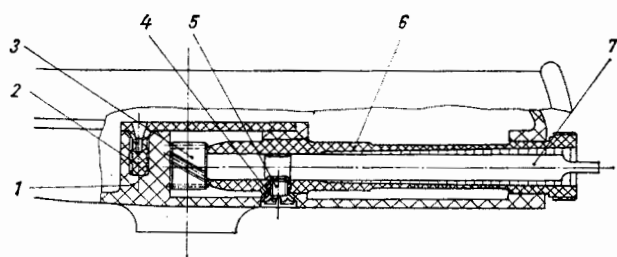


Fig. 115. Speedometer drive (sectional view)

- | | |
|--------------------|----------------------------------|
| (1) Chain cover | (5) Hexagon head screw B M 6 × 8 |
| (2) Packing | (6) Bearing bushing |
| (3) Pinion body | (7) Pinion shank |
| (4) not applicable | |

For dismantling the wheel bearings, the wheel body must be heated on a boiling plate. When the wheel body has reached a temperature which is such that water sprinkled on it evaporates while hissing, the wheel with the wheel bearing pointing downwards should be allowed to fall on an elastic support so that the wheel bearing falls out without any other assistance.

The wheel body should not be heated to an excessive temperature otherwise the wire spokes may be distorted. The removal of the wheel bearings is facilitated by the help of the expanding mandrel (special tool H 8-820-3); in this case, the wheel body should only be heated slightly. After driving the expanding mandrel in place, the wheel bearings are driven out towards the outside (Fig. 116).

The wheel body must also be heated when mounting the wheel bearings. On no account should the distance sleeve be omitted but fitted between the bearings; 6302 ball bearings with sheet metal cage should only be used (heating in braking).

When refitting the complete wheel to the motorcycle, take care that the rubber seal ring adjacent to the wheel bearing at the brake side is not omitted. This sealing ring is incorporated to prevent lubricant from the wheel bearings being thrown into the brake.

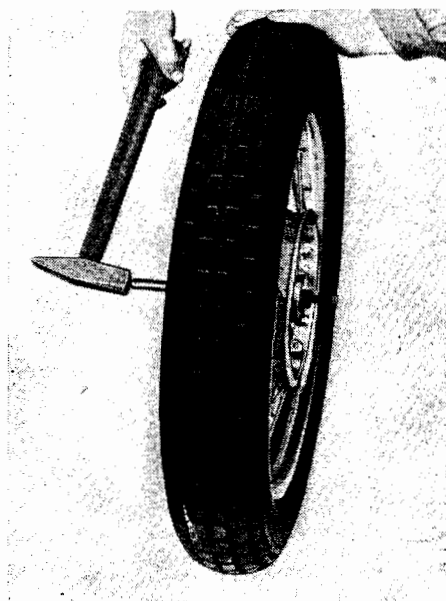


Fig. 116
Driving the wheel bearing out of their place by means of an expanding mandrel

A tight fit is specified for the mounting of the brake anchor pins in the brake backing plate. The brake shoes are pivoted on the anchor pins and the brake cam spindle is pivoted in the brake anchor plate.

Experience has shown that the bearing points of the brake shoes are subjected to minimum wear. It is necessary, however, to clean and grease the bearing points with Ceritol about every 10,000 km or once a year. This also applies to the mounting of the cam spindle in the brake anchor plate.

Before removing the brake shoes, mark them for identification so that they can be re-fitted to their original place.

When exchanging the brake shoes (that are capable of being restored to proper working condition) it should be noted that brake shoes that have already been re-worked are ready to fitted (provided they were machined in a special device at their circumference), whereas brake shoes that are non-reworked at their outside have to be returned in a lathe. For this purpose, they are mounted on the brake backing plate by means of the return spring, the brake backing plate is centred in its bore and the shoes turned down to such a degree that the difference between the diameter of the brake ring and the diameter of the brake shoes is at least 0.6 mm.

5.8. Brakes (Fig. 117)

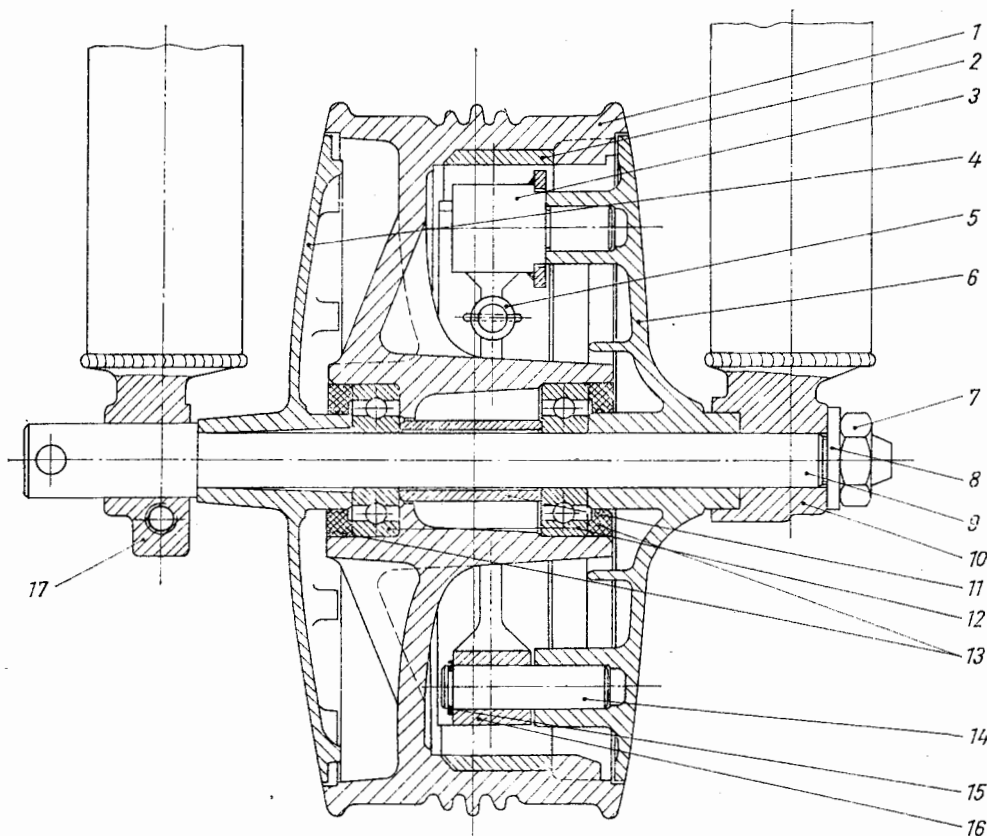


Fig. 117. Front wheel hub (sectional view)

- | | |
|--|------------------------------------|
| (1) Wheel body | (10) Spindle bush, right-hand side |
| (2) Brake ring with cast-on wheel body | (11) Spacer |
| (3) Brake lever | (12) 6302 ball bearing |
| (4) Wheel body cover | (13) Rubber packing ring |
| (5) Return spring for brake shoe | (14) Anchor bolt |
| (6) Brake holder | (15) Locking ring 12 |
| (7) Hexagon nut M 14 × 1.5 | (16) Brake shoe |
| (8) Washer | (17) Spindle bush, left-hand side |
| (9) Spindle | |

5.9. Secondary Chain

Fitting of a new chain is demonstrated in Figs. 118 to 120.

At first the two chain protection hoses are pushed on the engine casing. When placing the chain on the rear sprocket, it is to be drawn through from top to bottom. The upper end is fixed by means of a spoke put through the link (Fig. 118). Then, using a wire hook, the chain is drawn through the lower chain protection hose from the rear to the front and placed around the front sprocket wheel.

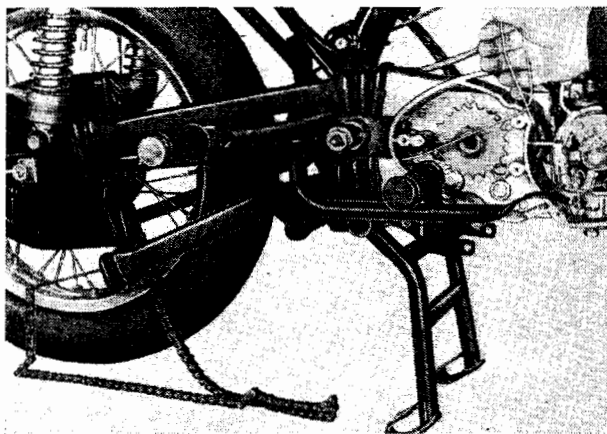


Fig. 118. Fitting a chain — 1st stage

Finally — again using a wire hook — the chain is drawn through the upper chain protection hose from the front towards the rear (Fig. 119) and at the rear end on top connected by the chain connecting links.

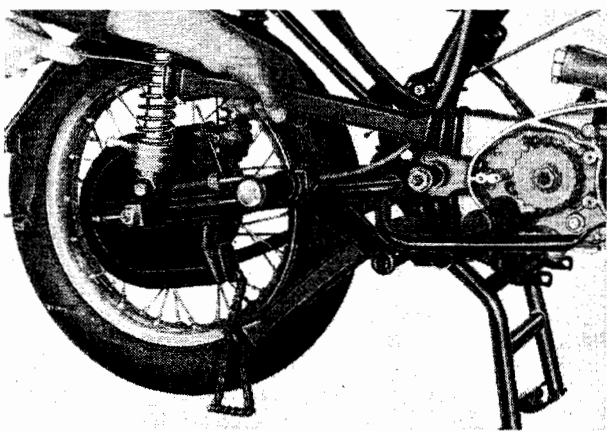


Fig. 119. Fitting a chain — 2nd stage

For this purpose, the upper chain protection hose should be pushed somewhat in the forward direction and retained by a spoke (Fig. 120).

Take care to position the locking spring correctly:
opening towards the rear.

When replacing a chain, the new chain should be attached to the old one for being drawn through. A chain must be replaced if more than 5 rollers are broken (or more than two rollers adjacent to each other) or when the chain bolts and/or side bars are worn to an impermissible degree.

If a chain of a different make is used, the appropriate chain connecting links must be used because the bolt diameters may also be different.

When replacing the chain by a new one, also check the sprocket wheels.

If the are worn, they must also be replaced.

Correct chain tension and proper lubrication exert a great influence on the chain life.

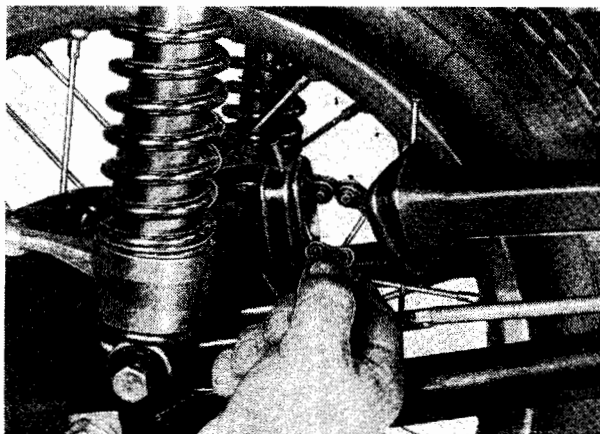


Fig. 120. Fitting a chain — 3rd stage

A correct chain tension is ensured if the force exerted by two fingers pressing on the upper chain protection hose with chain is just sufficient to move the chain down to the cross tube of the rear wheel swing fork (Fig. 121).

In this operation, the rear wheel suspension system must be fully expanded (place motor-cycle on prop stand). If you think the chain is too slack you should take into consideration that the chain is tightened when the rear wheel is loaded or exposed to bumps and the like.

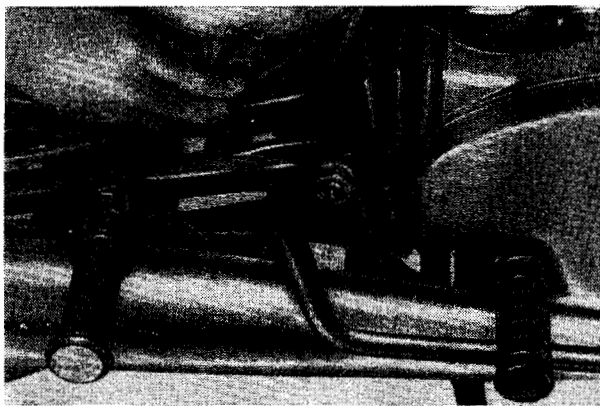


Fig. 121. Checking the chain tension:
Press the upper protective chain hose down to the transverse tube of the rear wheel swing

The chain must be lubricated about every 2,500 km of road operation. With the dynamo cover removed and by means of a screw-driver, antifriction bearing grease grades Ceritol + k2 or k3 is applied to the lower run of the chain (Fig. 122) while the rear wheel is slowly

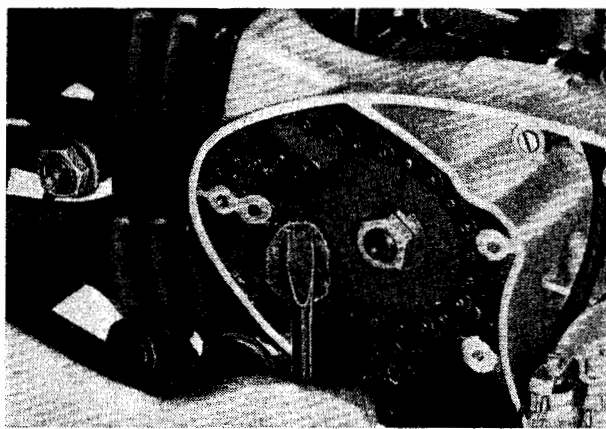


Fig. 122. Application of antifriction bearing grease to the lower run of the chain by means of a screw-driver while slowly turning the rear wheel in travel direction at the same time

rotated in travel direction through one full revolution of the chain.

If there is no time or opportunity for removing the dynamo cover a makeshift (!) is lubricating the chain according to Fig. 123 by means of an oil squirt and GL 60 gear oil.

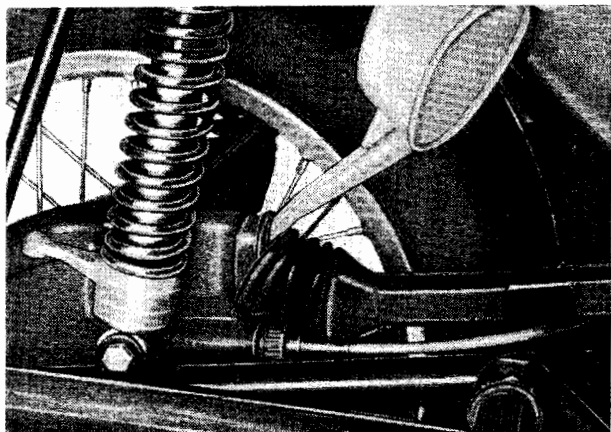


Fig. 123. Provisionally lubricating a chain with the help of an oil squirt

5.10. Exhaust System

The exhaust system is so properly matched with the engine that, firstly, the desired performance characteristics are reached and, secondly, the permissible noise limit is observed. It should be noted that the exhaust system should not be subjected to any changes.

The new exhaust muffler (Fig. 124) is welded and no longer of the detachable design.

The exhaust pipe is attached to the cylinder by a union nut which presses the tapered and knurled edge against the cylinder (without packing).

In a new condition, the union nut should be tightened with a torque of 147 to 196 Nm (15 to 20 kp-m) and must be re-tightened after having covered a distance of about 500 km, using the same torque value because the taper of the exhaust pipe will require this period of operation for properly matching with the jointing face at the cylinder and thrust point of the union nut.

For re-tightening, a hook spanner of type B TGL 39-422 (order No. 00-04.215) with a plugged-in extension tube (Fig. 125) should be used.

If, after repeated disassembling and assembling operations, the joints between silencer and exhaust pipe has become leaky, a strip of sheet metal having a thickness of 0.2 to 0.3 mm and a width of 35 mm should be fitted between exhaust pipe and silencer.

In mounting the exhaust pipe, care should be taken that all three suspension points (cylinder, lower connection, rear brace) are firmly and fastened. If one of these points is defective, the other two will be subjected to excessive stresses.

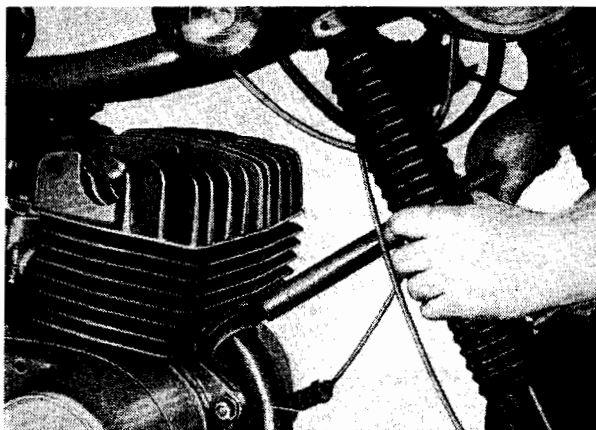


Fig. 125. Retightening the union nut for exhaust pipe

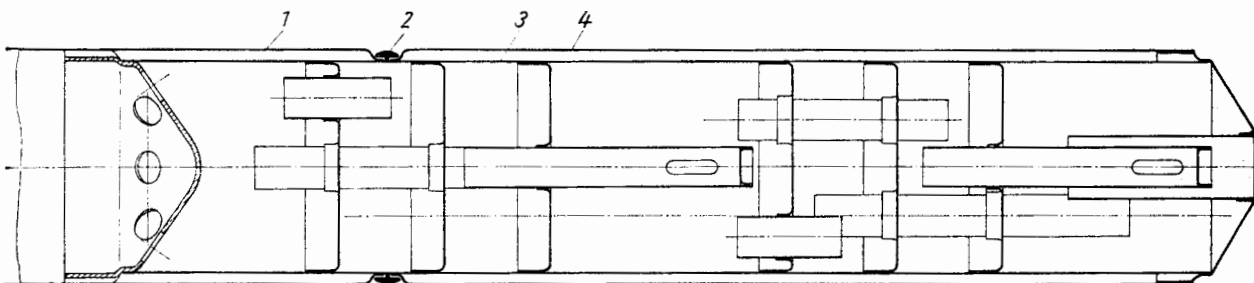


Fig. 124. Sectional view of a new exhaust muffler

(1) Exhaust jacket

(2) Weld seam

(3) Damping insert

(4) Exhaust pipe tail piece

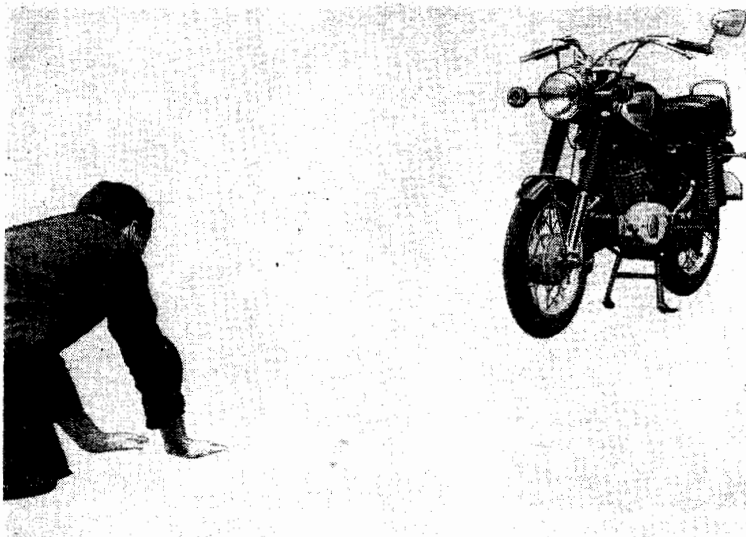


Fig. 126. Aligning the rear wheel: the wheels must be sighted from the front

The rubber bearings of the brace should not be replaced by a rigid joint (the elastic engine mounting should be borne in mind).

5.11. Align the Rear Wheel. Balance the Front Wheel

A correctly adjusted track is a precondition of good road-holding and manoeuvrability.

Since the front tyre is not so wide as the rear tyre, the wheels must be sighted from the front to align them properly (Fig. 126).

To improve the roadability, the front wheel of the TS 250 is balanced by the manufacturer as a part of the series production. In the case of tyre troubles, the tyre must be fitted in the same position with respect to the rim, that is to say, pay attention to the red point on the valve.

Unbalance may change due to irregular wear after a longer period of operation; therefore, balance the wheel again after about 10,000 km of operation. When fitting a new tyre, the wheel must also be balanced.

Balancing is effected by allowing the wheel to come to rest on its spindle and applying counterweights (in the form of lead or copper wire) to the spoke nipples at that point of the wheel which is on top when the wheel has come to rest.

5.12. Cable Controls

The cable controls of a motor-cycle are frequently exposed to external influences such as rain, dirt and lye. In the case of motor-cycles which are ridden every day and frequently parked in the open, the interior of the cable controls is subjected to great frictional stresses so that, eventually, the control lever offers resistance to pulling and control efforts are increased.

Service life of cable controls can be improved and ease of control ensured by protecting the cable controls from water and dirt and lubricating them.

The simplest manner of sealing is by applying a film of water-repellent grease such as Ceritol to the projecting end of the cable and to the slot in the adjusting screw at the control lever.

Fitting a rubber gaiter, as a means of protection, is another possibility of extending the service life of cable controls. The interior of the gaiter must be filled with a water-repellent grease.

For lubricating the cable controls, use the device shown in Fig. 127.

As lubricant, either a mixture of gear oil and gear grease, prepared in the mixing ratio of 1 : 3, or a mixture of Ceritol + k 3 antifriction bearing grease and fuel, mixing ratio of 1 : 1, should be used.

The cable controls are clamped at one end of their sheaths in the tapered rubber cap and, together with this rubber cap, screwed to the lubricating device by means of a union nut (Fig. 128).

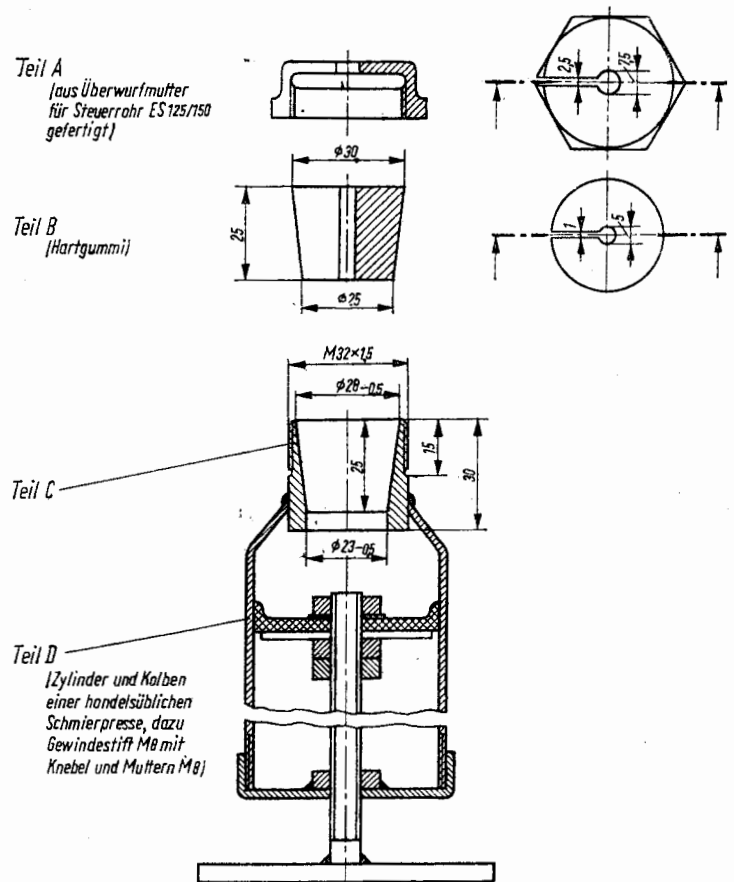


Fig. 127. Device for lubricating cable controls

Teil A (aus Überwurfmutter für Steuerrohr ES 125/150 gefertigt)	= Part A (made of cap nut for steering tube ES 125/150)
Teil B (Hartgummi)	= Part B (hard rubber)
Teil C (Zylinder und Kolben einer handelsüblichen Schmierpresse, dazu Gewindestift M 8 mit Knebel und Mutter M 8)	= Part C (Cylinder and piston of a commercial grease gun, added are threaded stud M 8 with grip and nuts M 8)

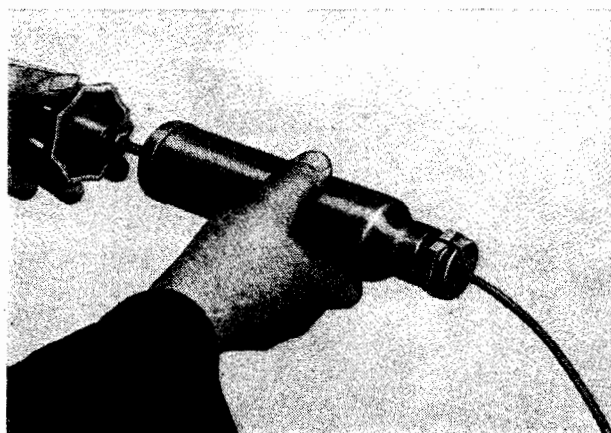


Fig. 128. Cable control clamped in the lubricating device

6. Electrical Equipment

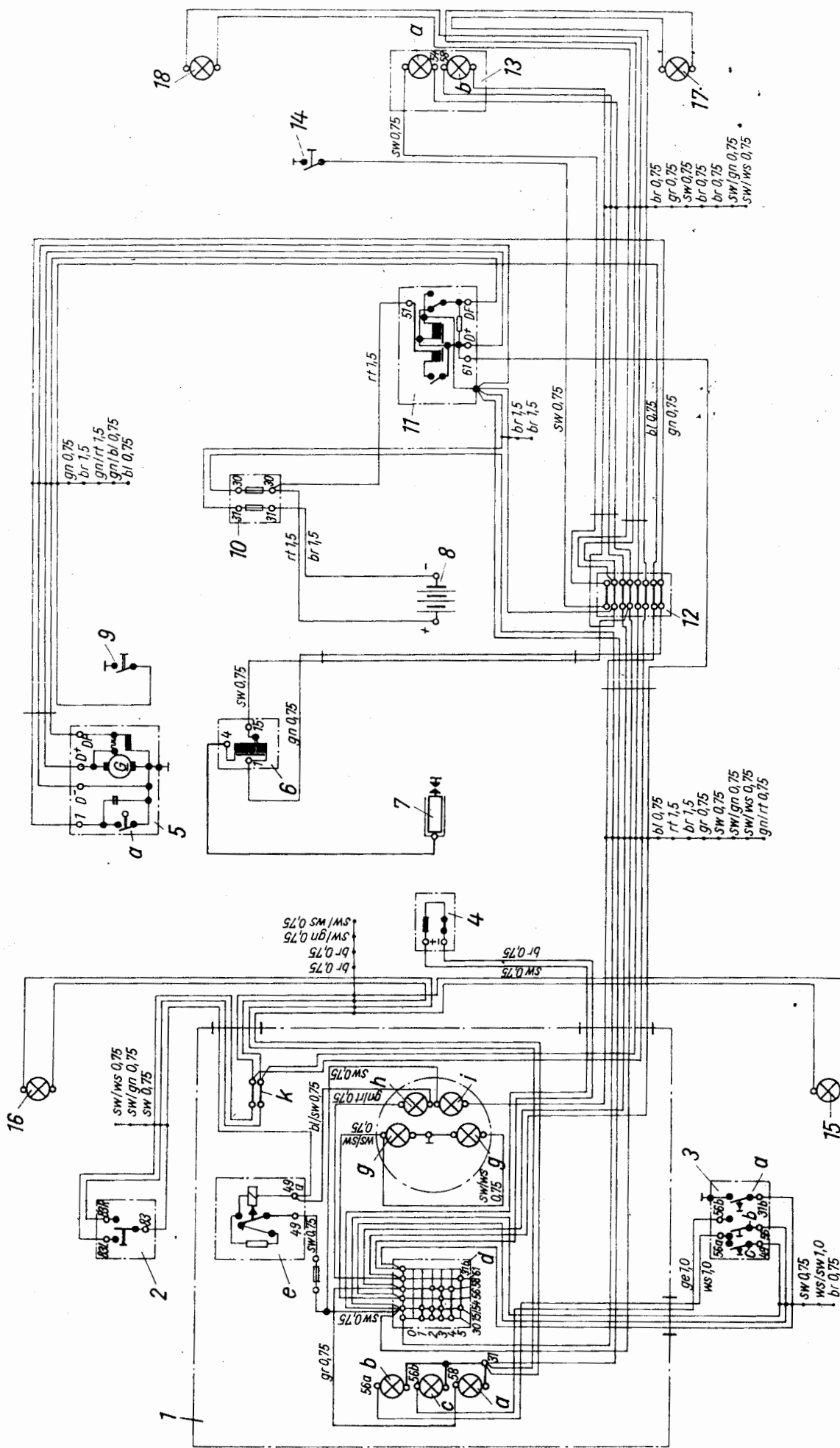


Fig. 129. Wiring diagram with flashing-light direction indicators

- (1) Headlamp
- (a) Parking light
- (b) Full headlight beam
- (c) Passing beam
- (d) Ignition-light switch
- (e) Flasher unit
- (g) Speedometer illumination
- (h) Flashing/charging control light fitting
- (1) Idling control light fitting
- (k) Contact-tube terminal strip, 2-pole
- (2) Flasher-light switch
- (3) Combined dimmer switch
- (a) Horn push button
- (b) Dimmer switch
- (c) By-pass light push button
- (4) Horn
- (5) Dynamo
- (a) Contact breaker
- (6) Ignition coil
- (7) Sparking-plug
- (8) Battery
- (9) Idling switch
- (10) Fuse box
- (11) Regulator cut-out
- (12) Line connector
- (13) Combined stop, tail and number plate illumination light fitting
- (a) Stop light fitting
- (b) Tail and number plate illumination light fitting
- (14) Stop light switch
- (15) Flashing-light direction indicator, front, left
- (16) Flashing-light direction indicator, front, right
- (17) Flashing-light direction indicator, rear, left
- (18) Flashing-light direction indicator, rear, right

Repairs in the entire electrical equipment of the TS 250, especially in individual devices, should only be carried out by Service Shops hereinafter called Workshop – (to obtain the benefit of Guarantee).

In the case of other repairs requiring greater skills and expert knowledge, but where no claims for guarantee can be raised, it is also advisable to apply to an AKA Service Shop.

All designations of connections for devices, terminals and wires referred to in the following text are illustrated in the Wiring Diagram (Fig. 129).

6.1. Dynamo

6.1.1. Checking the Armature for Accidental Ground

When checking the armature for accidental ground, a continuity tester, also known by the name of "Prüf-Fix", should be used.

Checking by means of an incandescent lamp and mains voltage (110/220 V) is forbidden

The tapping terminal of the continuity tester is applied to ground (armature lamination) of the armature removed from the assembly and then the probe tip is consecutively applied to the individual lamellas.

If the insulations of armature winding and commutator are in order, the festoon bulb in the tester will not light during testing. If the festoon bulb flashes up, dark or bright, a weak or a considerable ground leakage is present. In this case, the armature must be replaced or repaired in a Workshop.

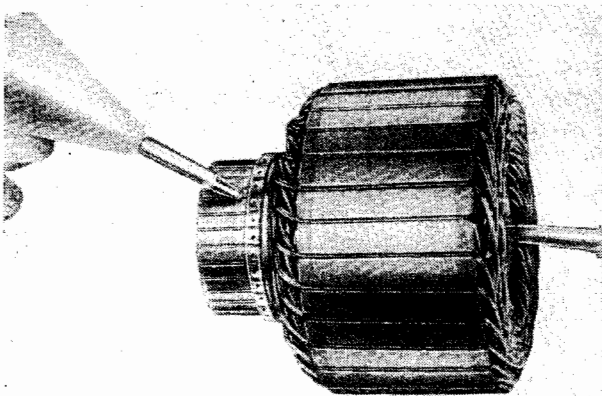


Fig. 130. Checking the armature for accidental ground

6.1.2. Checking the Armature for Shorted Turns

Before testing the armature for faults between turns, the commutator must be cleaned and then compressed air blown through it. Thus, it will be avoided that two copper lamellas are in contact with each other, thus causing a short-circuit.

The armature, removed from the assembly, is tested by means of a shorted-turn tester (220 V alternating current). For this job, in any case apply to a Workshop and have it carried out there.

6.1.3. Checking the Field Coil for Accidental Ground

Before testing the field coil removed from the assembly for accidental ground, disconnect the end of the field coil from ground and the adjustable resistor. For testing, a continuity tester – similar to that used for checking the armature – should be used.

In this case, use of an incandescent lamp and mains voltage (110/220 V) are not allowed.

If the festoon lamp lights when the tapping terminal is applied to DF and the probe tip to ground, accidental ground is given. As a consequence, the coil connections must be loosened and each field coil must be tested separately once more. Defective coils must be replaced by new ones.

Before removing them, the position of the coils and poles relative to the pole casing must be marked for identification. Replacement of the coils should also be done by a competent Workshop.

If, however, the festoon lamp fails to light when the two poles of the tester are applied to DF and ground, all coils are in good repair with respect to ground leakage.

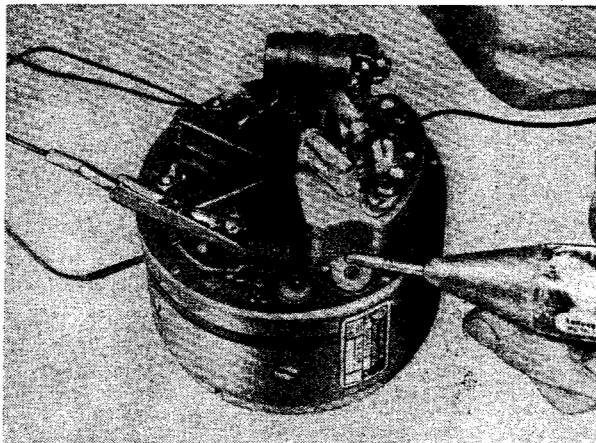


Fig. 131. Checking the field coil for accidental ground

6.1.4. Checking the Field Coil for Shorted Turns

For this test an ohmmeter is used. The two tapping terminals connected with the measuring instrument are applied to the negative and positive sides of the field coil.

If there is no shorted turn in the field coil, the measuring instrument will indicate a value between 1.7 and 2.1 Ω . If the reading is below 1.7 Ω , a shorted turn is given.

If the pointer of the measuring instrument fails to deflect, the field coil is interrupted. For replacing defective coils, the same as has been said with respect to accidental ground in Section 6.1.3. applies.

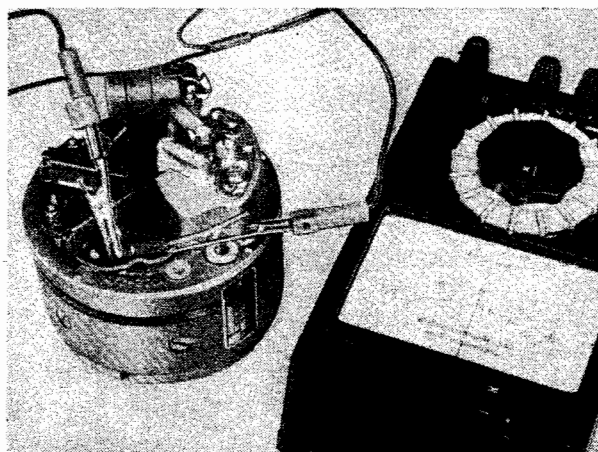


Fig. 132. Checking the field coil for shorted turns

6.1.5. Carbon Brush Servicing

Due to the high electrical loads (2×21 W for flashing-light direction indicators and 21 W for stop light), the carbon brushes must be checked for their condition after every 5,000 km.

The brushes can be drawn out, after disconnecting the connections and slackening the springs clips.

On the occasion of this test, carbon brushes, brush holders and the adjacent surfaces should be cleaned (use a clean cloth soaked in pure benzine).

For re-fitting the carbon brushes, observe the following:

1. The brush must be free to move easily to and fro in the holder. The copper braid at the brush must also be capable of being moved freely.
2. Brushes shorter than 9 mm must be replaced by new ones (use brushes, of the same original dimension).
3. The spring must engage with the lugs of the brush and spring clip, otherwise the spring may be trapped in the brush holder.
4. See to it that springs and spring clips that are in perfect order are used.
5. Check the cable (copper braid) embedded in the brush for tight fit. If the cable is slack, the brush must not be installed. Due to the high contact resistance, the temperature of brush and collector will rise considerably and, consequently, the dynamo be destroyed.

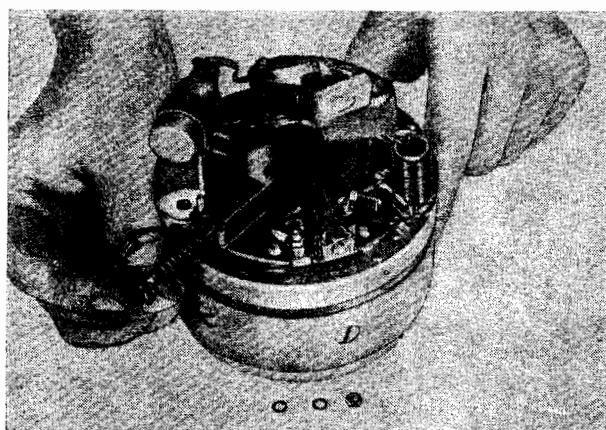


Fig. 133. Replacing the carbon brushes

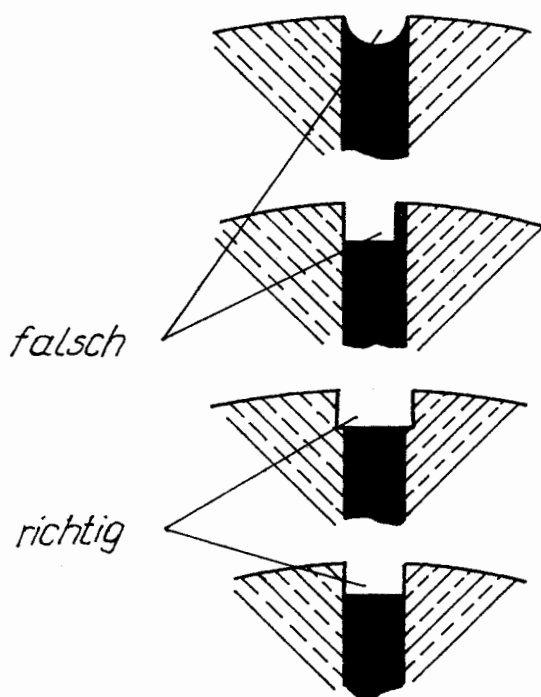


Fig. 134. Milling out the mica lamellas
falsch = wrong richtig = correct

6.1.6. Commutator Servicing

The commutator surface, used as track for the carbon brush must be smooth and clean. A uniform brown to greyish-black colour may be neglected.

If, however, ridges are visible on the brush track, the commutator must be re-finished in a lathe in a Workshop (maximum permissible out-of-true error 0.03 mm). A larger amount out of true causes the carbon brushes to jump, impairing reliability of operation of the dynamo.

Crankshaft bearing having an excessive play in radial direction may cause the brushes to jump.

After having the commutator re-finished in a lathe, the mica segments must be sawn out or milled out (about $0.4 + 0.2$ mm deep and maximum 0.7 mm wide).

The burr formed in this operation should be removed by means of very fine emery paper while the armature is rotating. The mica dust produced is blown off by compressed air and the commutator wiped by means of a non-fluffy and grease-free cloth.

6.1.7. Fault Indication by Charging-control Light

If the charging-control light fails to go out at higher rotational speeds, the lines D +, 61 or the field coil have accidental ground or the regulator fails to work properly.

If, with the engine stationary, the control light does not light, the following troubles may be involved:

1. Battery discharged.
2. Fuse in fuse box blown.
3. The line 30 from battery "positive" to the ignition lock terminal 30 is interrupted or the line 31 from battery "negative" to the earth point is interrupted.
4. Line from dynamo D + to regulator D + and from regulator 61 to ignition lock 61 and charging-control light is interrupted.
5. Charging-control light blown.
6. Regulator cutout defective.

6.1.8. Adjustable Resistor

Together with the regulator cutout, the adjustable resistor is designed to maintain the required voltage. The adjustable resistor is energised at the instant when the regulating armature is in a suspended position because, in this position, the adjustable resistor and the exciting windings are connected in series.

In the lower position, the adjustable resistor is bridged by the regulating armature and, thus, is of no importance to voltage regulation.

In the upper position, it also has to fulfil no function because the exciting winding is shorted so that the voltage breaks down.

If the adjustable resistor is blown, this can be identified by an irregular firing order. Charred insulation varnish on the turns of the adjustable resistor coil and charred regulator contacts will then confirm this trouble.

If the charging-control lamp lights, the adjustable resistor may have accidental ground. If a blown adjustable resistor is replaced by a new one, first find the cause of the trouble otherwise the new resistor will share the fate of its predecessor.

voltage	6 V
wattage	60 W
type of regulation	positive regulation! three-contact regulation

Care should be taken that the connection of D — is not applied to that part of the regulator switch base which projects into the foam-plastic pocket of the elastic suspension (in this case the permissible value of acceleration of 5 g ($g = 9.81 \text{ m/s}^2$) would be exceeded).

6.2.1. Adjustment

It should be noted that a proper adjustment of the regulator cutout can only be effected by means of a dynamo of the mating type in a test equipment which is continuously variable within a speed range from 0 to about 3,000 rpm.

The capability of being mechanically adjusted of regulator and reverse-current cutout is the precondition for the following electrical adjustment. It can also be used as a temporary setting. It is to be effected according to the following setting scheme:

The following voltages must be provided by the reverse-current-cutout:

Make voltage	6.5 to 6.9 V
Break voltage	5.4 to 6.2 V
Rated load voltage	6.2 to 6.8 V
(at 1,800 to 2,200 rpm)	

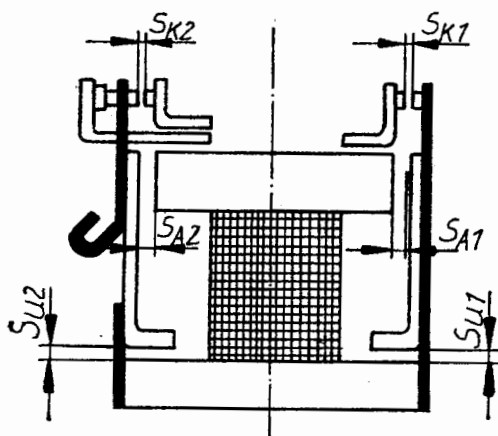


Fig. 139. Mechanical adjustment of the regulator cutout

Contact gap between switch contacts	0.4 mm
Contact gap between control contacts	0.3 to 0.4 mm
lower air gap at switch armature	0.5 mm
lower air gap at control armature	0.5 mm
Working air gap at switch armature	0.8 to 1.0 mm
Working air gap at control armature	0.9 to 1.1 mm

6.2.2. Mounting

To guarantee a proper mode of operation of the regulator cutout, it is necessary to mount it in such a manner that it is not exposed to vibrations (under 5 g; $g = 9.81 \text{ m/s}^2$).

This was fully achieved in the TS 250 by an elastic suspension of the regulator cutout in two foam-plastic pockets.

Therefore, take care in mounting that the regulator cutout is properly inserted into the holders provided for this purpose.

The foam-plastics pockets (1) must fully enclose the base of the regulator cutout. There is no firm connection between regulator cutout (2) and frame.

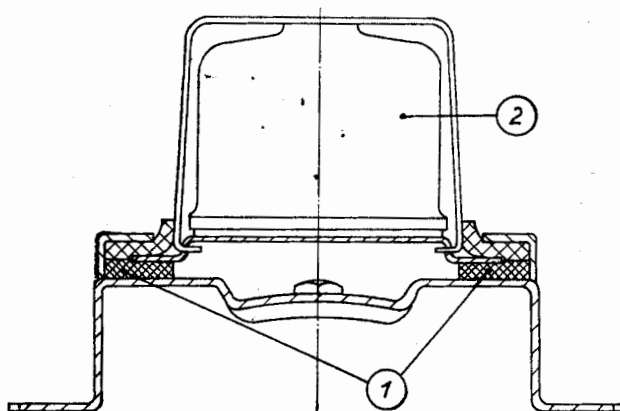


Fig. 140. Elastic regulator cutout mounting

6.2.3. Maintenance

In general maintenance of the regulator cutout is limited to the cleaning of the connections. If the light emitted by the headlamp is subdued, in the event of starting troubles or the like, do not immediately blame the regulator cutout for the fault and do not try to remove an assumed fault by some unqualified action but first check the lines and their connectors for proper fit and contact and for corrosion.

On the occasion of a general overhaul of the motor-cycle, have the regulator cutout checked by an expert and replaced by a new one, if required.

6.2.4. Defects and Their Causes

Carbonised switch contacts may be a consequence of too high continuous loads (heated handlebar grips, additional headlamps, etc.), looser or broken D + line at dynamo or regulator.

Riding without shifting gears as required, excessive slow running speed setting, battery connected in the wrong way (positive and negative cables interchanged), a broken regulator resistor, accidental ground of the adjustable resistor or considerable field coil leakage may lead to the same symptoms.

If the protective cap of the regulator cutout is not properly fitted, ground leakage will be inevitable when the cap will contact the core or the contact angle of the regulator cutout. The lugs arranged at the side of the cap must be properly plugged into the recess provided in the regulator socket. The wire clip must be tight enough to press the cap down.

6.3. Battery

6.3.1. Putting a New Battery into Operation

The equipment of the TS 250 includes a flat lead battery with a rated voltage of 6 V and a rated capacity of 12 Ah, a battery of the same type as incorporated in the MZ types built last.

When putting the battery into operation, sulphuric acid for accumulators (in the following text called electrolyte) of a density of $1.28 \pm 0.01 \text{ g/cm}^3$ (in the tropics $1.22 \pm 0.01 \text{ g/cm}^3$), measured at a temperature of $20 \pm 2^\circ\text{C}$, is poured in the battery.

In the filled state, the liquid should be 5 mm on top of the separator plates or reach up to the given level mark. When pouring in, the temperature of the electrolyte should not exceed 25°C .

After 2 to 3 hours plates and separators have soaked in enough electrolyte so that the electrolyte level has dropped.

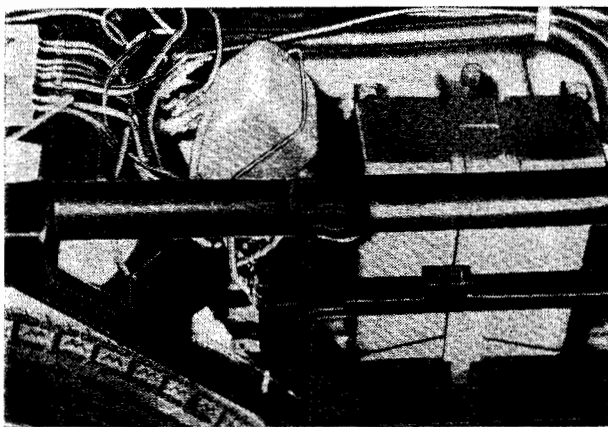


Fig. 141. Battery arrangement

Top up with electrolyte of the same density and temperature to reach the original level. Then charge the battery with direct current of 0.6 A.

During charging, the screw plugs must be unscrewed!

Charging must be continued until all cells uniformly and briskly evolve gas and the desired voltage is reached (about 2.5 to 2.7 V/cell).

Two to three measurements taken at an interval of one hour must show a constant electrolyte density ($1.28 \pm 0.01 \text{ g/cm}^3$) and cell voltage. The specified current of 0.6 A must be maintained at any rate.

During charging, the temperature of the electrolyte must not exceed 50°C .

Please note: Do not subject the battery to a rapid charging process! As a consequence, the battery would become useless before long and you would lose the right to raise guarantee claims.

Before connecting the battery to the vehicle, connect the two battery cables to the poles (red cable to the positive pole — brown cable to the negative pole) and apply a thin film of grease for battery terminals or acid-free Vaseline to the poles.

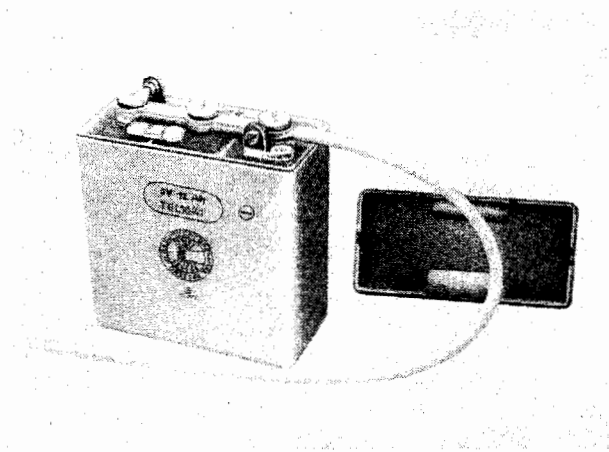


Fig. 142. Battery 6 V, 12 Ah

After fitting the protective cap in place, the battery can be installed and the two battery cables connected to the fuse box.

Again pay attention to the following correct way of connection:

- red cable to the red cable,
- brown cable to the brown cable.

The vent hose must be placed in such a way that acid that may be spilled through this hose cannot damage lacquered or other metal parts.

6.3.2. Servicing the Battery

The average life of a battery is about two years. This time can be extended or shortened by a good servicing or by neglecting it. In the main, servicing operations are restricted to the cleaning of the terminals — a thin film of grease for battery terminals must always be applied — and the checking of the acid level at regular intervals (every four weeks during the cold season of the year, every two weeks during the warm season of the year).

When greasing the terminals take care that no grease enters the cells. If the acid level has fallen below the desired level, only top up with distilled water.

Do not use so-called improving agents!

If, nevertheless, acid is spilled from the battery, the density of the acid used for topping up should be so selected that the density of the complete amount of acid in the battery in fully charged condition will be $1.28 \pm 0.01 \text{ g/cm}^3$.

If the battery is not used or if less than 50 km are covered daily, the battery must be re-charged once every month.

6.4. Ignition System

6.4.1. Ignition Coil

The ignition coil may be compared with a transformer which transforms a low voltage into a high one. As only alternating current can be transformed, the vehicle electrical system, however, is supplied with direct current, a continuous voltage change must be caused, and this is effected by the contact breaker in conjunction with the capacitor.

The normal voltage of the electrical system of the motorcycle of 6 V is stepped up to an ignition voltage of about 12,000 V.

The two terminal pins of the ignition coil are marked. Terminal 1 is connected with the contact breaker and terminal 15 with the terminal 15/54 at the ignition lock.

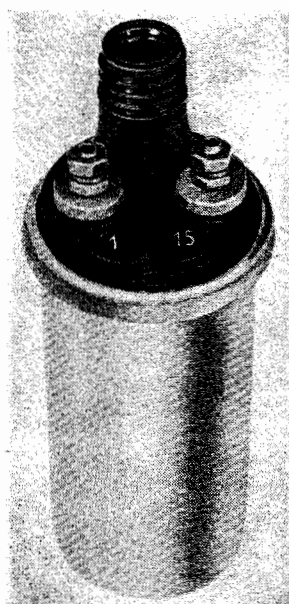


Fig. 143. Ignition coil

Please note: With the engine stationary, the ignition system switched on and the contact breaker closed, the ignition coil will be energised; if this condition is maintained for a longer period, the current passing through the coil cause the temperature of the coil to rise. As a consequence, the insulating material will be destroyed. The ignition coil will burn down and thus become useless.

When using ignition coils of Polish origin, the corresponding terminal designations should be taken into consideration.

Terminal 1 = 22
Terminal 15 = 21

6.4.2. Contact Breaker

The design of the contact breaker is shown in Fig. 144. The adjusting plate (4) is used as a carrier of the plate (3) and of the felt lubrication pad (11) and for adjusting the firing point (through oblong holes). The bearing pin (5) where the lever (1) is pivoted is mounted on the plate (3) with fixed contact (2 b). The contact (2 a) rivetted to the right end of the lever (1) is pressed against the fixed contact (2 b) by the return spring (6) which also serves as current conductor and one end of which is supported by the connecting screw (7). The contact-breaker-points gap can be finely adjusted by the eccentric screw (9) after loosening the fastening screw (8). The felt lubrication pad (11) which is slightly soaked with Hypoid oil should be approached to the cam just far enough for the lobe of the cam to be touched.

If this is neglected and the felt pad is arranged too close by the cam, the oil will be pressed out of the pad and, consequently, lubrication of the cam track will no longer be ensured (lobe subjected to increased wear – contact – breaker points gap is changed).

Please note!

Lubricant for contact breaker:

"Unterbröl" – special oil for contact breaker, viscosity 535 cSt at 50 °C

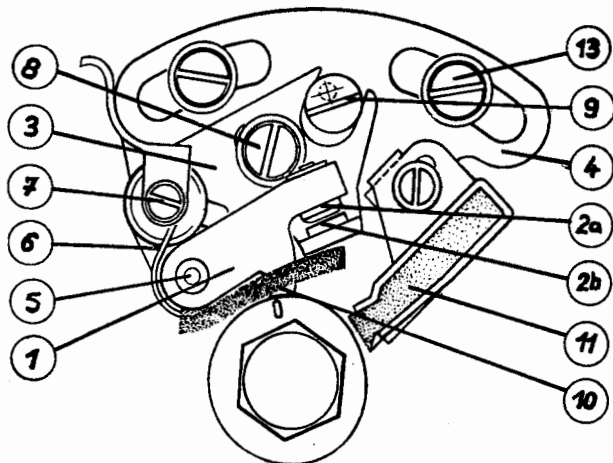


Fig. 144. Contact breaker

6.4.3. Ignition Timing

Before starting ignition timing operations, it is necessary to inspect the contact-breaker points thoroughly (see Fig. 144).

Loosen the terminal screw (7) and remove the contact lever (1). If the contact faces show signs of burning, they must be cleaned by means of an emery stick. In the case of severe pitting, the parts involved must be replaced by new ones.

In mounting take care that the contacts make contact with their full flat face. The remains of old lubricant must be removed from bearing pin (5); then apply a small amount of B-2 or Hypoid oil.

In foreign countries: Use E.P. gear oil having a pour point of -15°C (almost similar to SAE 90).

To adjust the contact breaker points gap of 0.3 ± 0.1 mm, turn the crankshaft until the high-level portion of the cam contacts the contact lever nose (10) (see Fig. 144).

Loosen the fastening screw (8) and adjust the contact gap – using the eccentric screw (9) – in such a way that the feeler gauge can just be drawn through the gap. Then tighten the fastening screw. Once more check with the feeler gauge that the gap between the contacts is correct (the gap may have been changed inadvertently when tightening the fastening screw).

For setting the firing point, there are different methods. Below two variants are described.

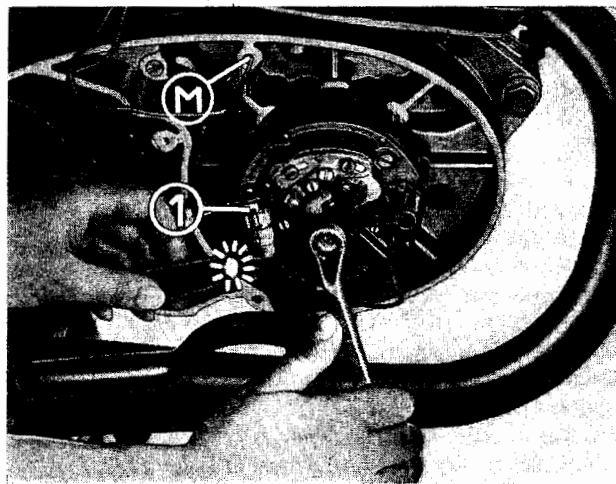


Fig. 145a. Ignition timing by means of a test lamp

1. Variant

Setting by means of the ignition timing gauge H 8-2104-3 and test lamp

While turning the crankshaft in the sense of rotation of the engine, find the top dead centre (T.D.C.) by means of the timing gauge and mark it on the scale. Then apply the second mark, i.e. the marking of the firing point $3.0_{-0.5}^{\text{mm}}$ before T.D.C., to the scale.

Then further turn the crankshaft through almost 360° in the sense of rotation of the engine to reach the marking of the firing point on the scale.

Note:

Do not try to reach the marking of the firing point by turning the crankshaft forward or backward but always turn the crankshaft in the direction of the sense of rotation of the engine. In this way, any influence of the dimensional variations (permissible tolerances) of the crank assembly on the ignition timing will be eliminated.

If the ignition is correctly timed, the contacts will be opened at the instant when the marking is reached. This can be checked by means of a test lamp; its leads are connected to the capacitor or to the conductor rail terminal "1" and to ground.

If the ignition timing is checked with the motor-cycle supply (battery connected to the wiring of the electrical system of the motor-cycle), the test lamp will light, when the contacts open.

If a supply outside the vehicle is used for checking, the test lamp will almost go out when the contacts open.

If the contacts open at an instant different from the specified time, the two screws (denoted 13 in Fig. 144) must be loosened and the adjusting plate (4) moved in the direction of the sense of rotation of the engine in the event of advanced opening of the contacts or against the sense of rotation of the engine in the event of retarded opening of the contacts.

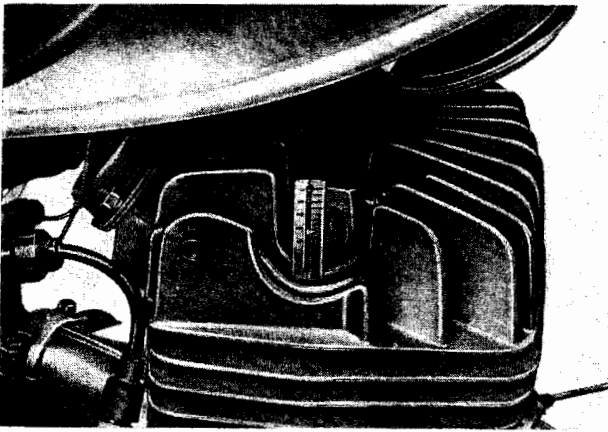


Fig. 145b. Timing gauge in cylinder cover

This procedure must be repeated so many times as required to establish the firing point at $3.0_{-0.5}^{+0.5}$ mm before T.D.C. or, expressed in crankshaft angular degrees ($^{\circ}$), 20 to 22° 15' before T.D.C.

2. Variant

Setting by means of graduated dial (angular degrees) and test lamp

If the timing gauge H 8-2104-3 is not available for ignition timing, a graduated dial may be used which is available from any stationer.

In order to be in a position to check the contact gap while timing the ignition, three or four windows are cut into the dial. A pointer is made of wire, about 3 mm thick, and fastened to the engine casing by means of a screw.

To determine T.D.C. properly, a stop is screwed into the tapped hole for the sparking-plug.

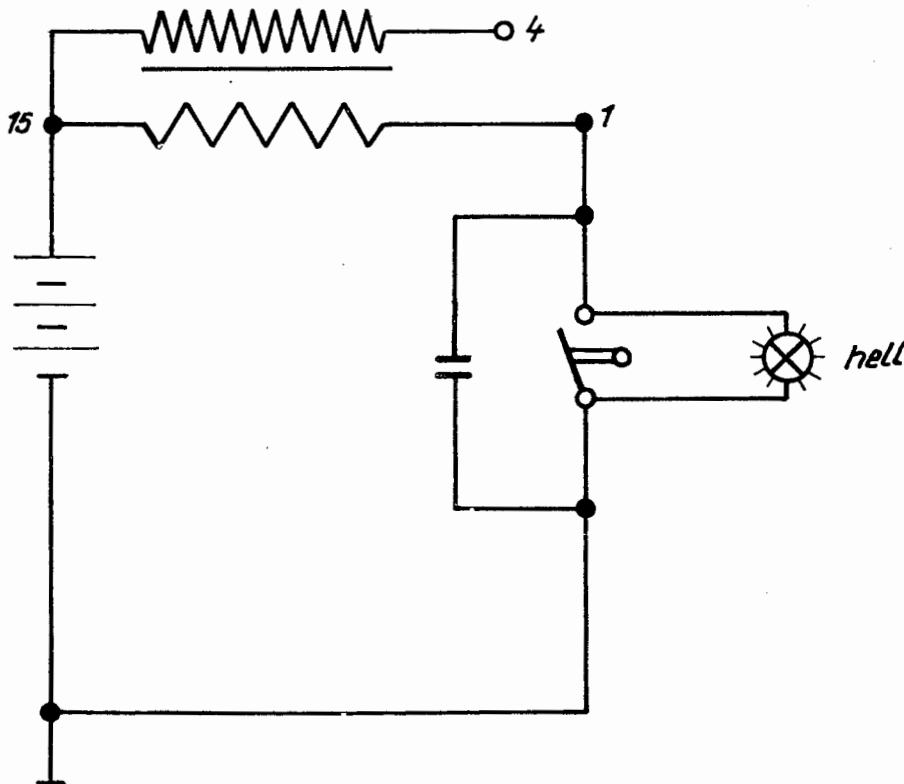


Fig. 146. Checking the time of opening — with supply source in the vehicle

(4) High voltage connection
(15) Lead from ignition-light cable
hell = bright

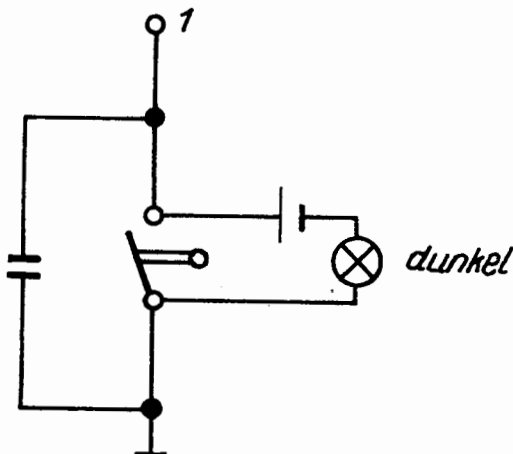


Fig. 147. Checking the time of opening — with supply from outside the vehicle

(1) Line ignition coil — contact breaker
dunkel = dark

By means of the dynamo armature screw turn the crankshaft anticlockwise until the piston touches the stop. Then record the degrees indicated by the pointer. Then turn the crankshaft clockwise until the piston again contacts the stop.

The degrees indicated at that instant must also be recorded.

It follows that the T.D.C. is exactly in the centre of the section through which the pointer did not pass. The marking at the bisecting point of this section is the top dead centre. Then the stop is unscrewed to be in a position to check and/or adjust the contact points gap.

Then the test lamp is connected to line "1" and ground and the crankshaft turned from T.D.C. through to 22° 15' before T.D.C. in the direction of the sense of rotation of the engine. If the firing point is correctly set, the test lamp will flash up at this angular value (according to Fig. 146). If the lamp flashes up too early or too late, the firing point must be corrected (see 1st Variant, last two paragraphs).

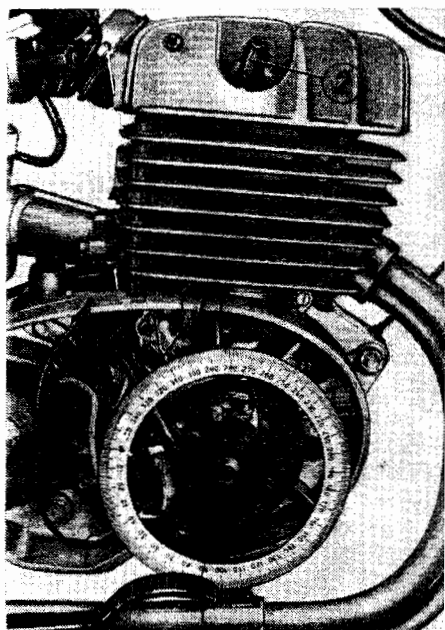


Fig. 148. Ignition adjustment by means of graduated dial and test lamp

The stop is made of a useless sparking-plug by removing the insulator and fitting a bolt in its place. A hole is drilled in the side to allow the air or the fuel-air mixture to escape when the piston moves upwards. In the front part of the hole an M-4 thread is cut so that a setting screw can be screwed in place. Thus, the stop can also be used for other engines.

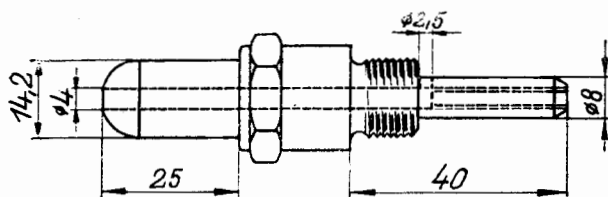


Fig. 149. Stop for piston

6.4.4. Sparking-plug

The sparking-plug in essence consists of three parts. These are the central electrode and the carrier which also acts as the earth electrode. The spark jumps over between these two electrodes, igniting the fuel-air mixture.

The third part of the plug is the insulating body or insulator. It must have a high dielectric strength. To ensure this dielectric strength at all times, the sparking-plug must be treated gently. By improper handling (impact and the like), almost invisible hair cracks may be brought about which render the plug useless.

The average service life of a sparking-plug in twostroke engines is equal to about 10,000 km of road covered. When this mileage has been reached, it is advisable to replace the sparking-plug by a new one. The TS 250 is provided with a M 14-240 sparking-plug. It is advisable to use always the same type of plug (the specified thermal value should be observed). The use of a plug of a lower thermal value in winter or of a higher thermal value in summer will not offer additional advantages but disadvantages.

If difficulties are presented (poor startability in winter or overheating in summer), they should not be attributed to the thermal value of the sparking-plug.

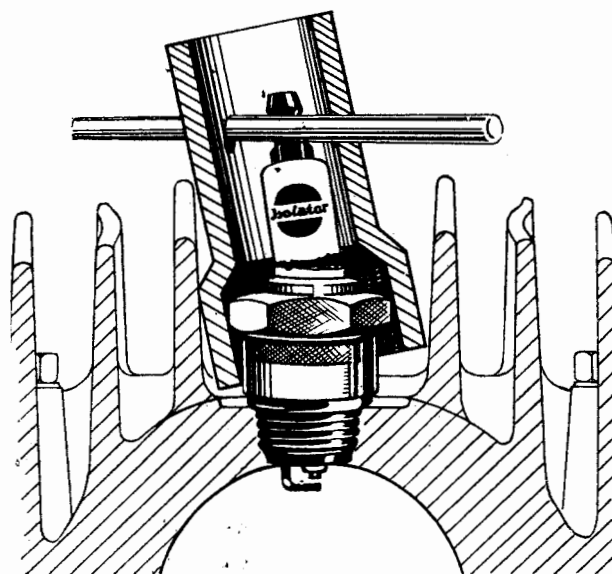


Fig. 150. Improper screwing in place or unscrewing of the sparking-plug

The correct seat of the sparking-plug must also be taken into consideration. The thread of the plug must be flush with the thread in the cylinder head. If the plug projects too far into the chamber of combustion (packing ring under the plug missing or pressed flat) or if the plug is not properly down on its seat (two packing rings placed under the plug), heat will accumulate and symptoms of overheating will appear.

The servicing requirements of the plug are relatively small. The spark gap must be checked from time to time (0.6 mm).

For changing sparking-plugs, a properly fitting plug spanner should be used to avoid breaking of the insulator. In any case, pay particular attention to the appearance of the plug. After a longer period of operation of the plug the appearance is indicative of the action of the engine: the formation of fuel-air mixture, of the petrol used, of the carburettor tuning and suitability of the plug for the engine.

6.4.5. Plug Cable Connector

The function of the plug cable connector is to establish connection between sparking-plug and ignition cable and to screen the electric field of the sparking-plug from the environment.

To ensure a proper radio-shielding of the sparking-plug take care that the sheet-metal shell fastened to the plug cable connector is properly fitted on the hexagon of the plug.

In the case of ignition failures and difficulties in starting, especially in wet weather, thoroughly clean the plug cable connector with clean petrol and dry it. If this does not improve the condition, preplace the connector by a new one.

On no account should the sheet-metal shell be removed because this will lead to interferences with VHF and television reception.

The plug cable connector must be handled as gently as the sparking-plug. Hair cracks in the insulating body which lead to the formation of leakage paths render it useless.

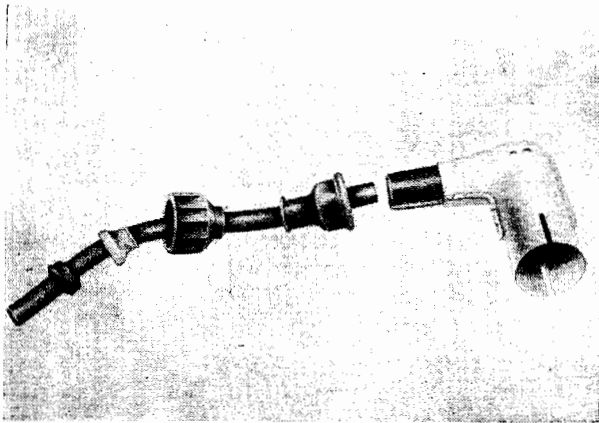


Fig. 151. Ignition cable connector with ignition cable, complete

6.4.6. Troubles

Faults in the ignition system may be caused by wear and ageing of the individual devices and components. Below follow brief descriptions of main causes and their effects.

1. Cam track insufficiently lubricated
Wear of the lobe,
no contact-breaker points gap or is too small =
difficulties in starting; irregular running;
loss of power
2. Capacitor broken down due to
a high rate of wear on the contacts =
ignition failure at higher engine speeds
3. Variations of the contact-breaker points gap in the
case of intense pitting on the contact surfaces, as a
consequence, the true gap is too large =
ignition failure at higher engine speeds;
weak spark; loss of power
4. Crankshaft bearing worn down
crankshaft and thus cam out of true by an amount
that exceeds the permissible limit
carbon brushes "jam" =
ignition failures
5. Contact pressure exerted by contact spring too low
Contact arm has no exact guide on the cam track =
Ignition failures at higher engine speeds

Plug cable connector:

1. Dust and water between insulating body and sheet-metal shell =
Difficulties in starting; ignition failures
2. Fissures (hair cracks) in insulating body due to improper handling
Leakage path to ground formed =
Difficulties in starting; weak ignition spark;
loss of power

Lines:

1. Defective insulation of high-voltage line (ignition cable)
Spark flashing over to ground (cylinder head) =
Difficulties in starting especially in wet weather;
ignition failures at high engine speeds
2. Broken wires
Short-circuit =
Blown fuses;
when D + line is interrupted, the adjustable resistor frequently is blown

3. Flat connectors heavily corroded

Very high contact resistance =

The voltage applied to the various devices is too low

6.5. Lighting and Signal Equipment

6.5.1. Headlamp

The headlamp is opened by loosening the fillister head screw and removing the front part of the headlamp shell. The front part consists of the chromium-plated front ring, the reflector with diffusing screen, the twin-filament and parking lamps and their holders.

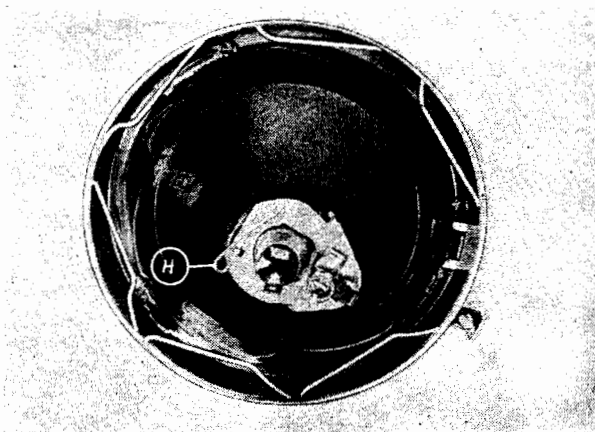


Fig. 152. Front part of headlamp with lamp holder

To replace the twin-filament bulb, observe the following: The clamping piece (made of thermosetting plastics) which establishes electric contact with the lamp must be withdrawn in a straight manner, i. e. must not be canted otherwise the contact blades will be destroyed. As a consequence, current passage may be interrupted. The cables leading to the terminals 31, 56 a and 56 b need not be loosened. However, it is advisable to check them for tight fit.

The holding device for twin-filament and parking lamps is removed from the upper sheet-metal nose of the reflector by lifting the holding spring (H in Fig. 152). Then the twin-filament bulb can be removed from the reflector. The glass bulb of the lamp must not be touched with bare fingers; clean fingers also will leave grease traces on the glass.

When fitting the bulb, take care that the nose of the lamp socket exactly engages with the notch in the reflector.

A spare lamp is accommodated in a foamed plastic pocket inside the headlamp fitting.

If the road illumination is insufficient, the contact points in the lead of the twin-filament bulb must be checked and thoroughly cleaned, if required. The fuse box should be inspected with particular care.

Contaminated contacts lead to a considerable drop in voltage!

The combined dimmer switch at the left-hand side of the handlebars should be treated with particular care, too. The contact screws must be properly tightened, but care must be taken not to pinch off the cable, and then they must be protected against loosening by a dot of paint.

It is advisable to protect the contact blades from corrosion by the application of contact grease. When installing the switch, care should be taken to see that the rubber backing is properly placed between switch and holder at the handlebars, otherwise there is the risk of accidental ground.

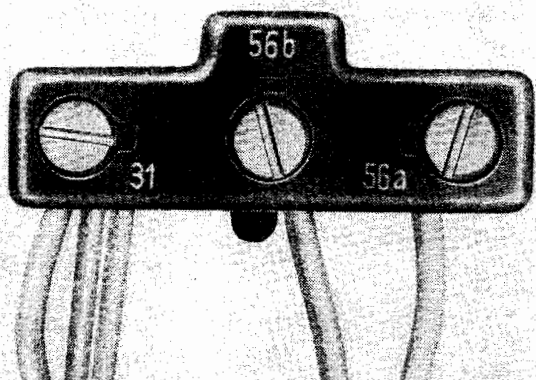


Fig. 153. Clamping piece for twin-filament bulb

In older vehicles, the reflector may have become dull. In the interest of your own safety it is required to replace it by a new one. Diffusing screen and reflector are glued together.

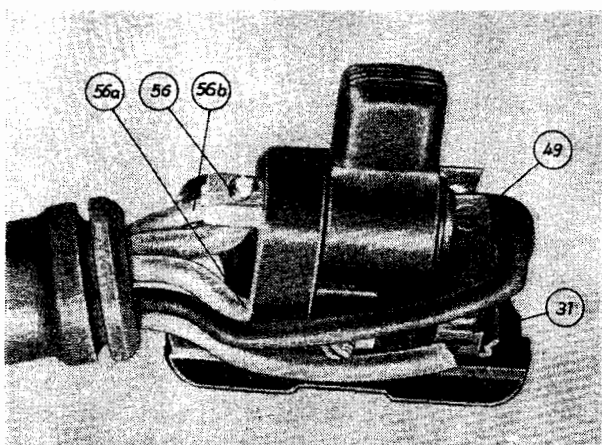


Fig. 154. Connections at the dimmer switch (see wiring diagram)

An important work is the focusing of the headlamp. It is necessary in the interest of the safety of other road users and of yourself.

After loosening the two fastening screws (without flashing-light indicators) or the holders for the front flashing-light direction indicators (with 4-lamp flashing system), the headlamp can be adjusted vertically and horizontally in oblong holes.

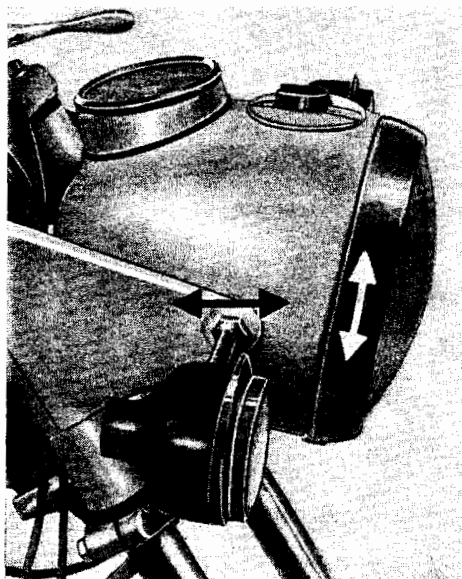


Fig. 155. Adjustment of the headlamp

If the horizontal deflection is very large, the headlamp holders must be turned accordingly.

For properly focusing the headlamp, observe the scheme given in Fig. 156.

The vehicle is placed according to the scheme and loaded with the rider. The suspension units of the rear wheel are to be set to "soft". The light/dark-boundary must coincide with the Z-line, and the angular deflection must lie between the lines V-V and W-W. When the headlamp is focused according to this specification, the light/dark-boundary will be between the upper and the lower limits for all operating and load conditions.

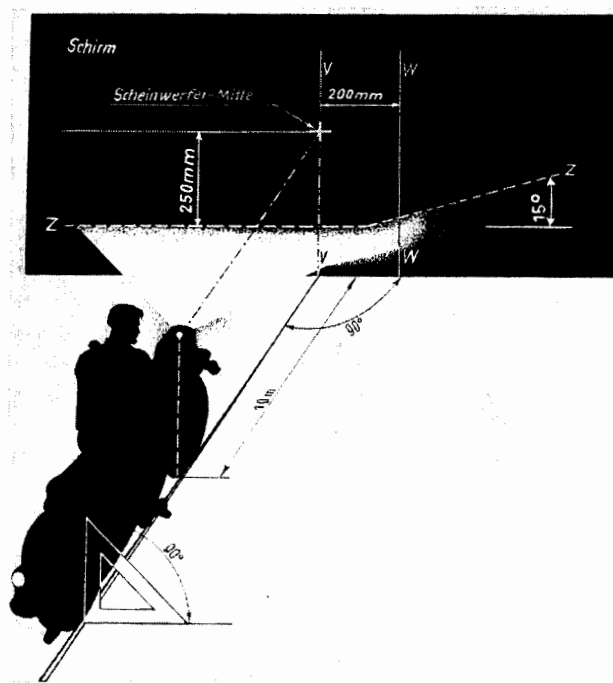


Fig. 156. Headlamp focusing scheme

Scheinwerfer-Mitte = Headlamp centre
Schirm = Screen

6.5.2. Ignition-light Switch

Dismantling the ignition-light switch is very simple. Only one screw must be loosened which is arranged in the front part of the headlamp in the centre, and then the ignition-light switch can be drawn out of its guide together with the insulating foil and the fastener.

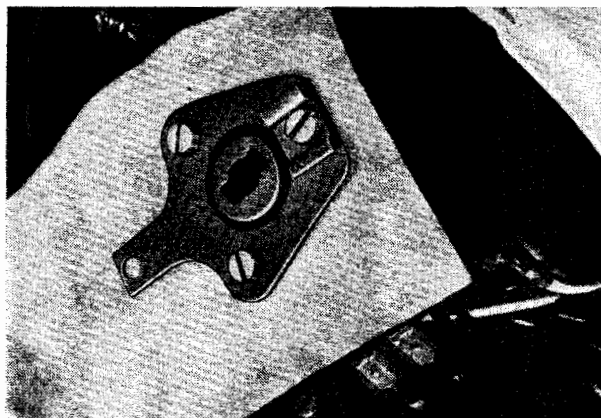


Fig. 157. Ignition-light switch with insulating foil and holder

Now the ignition-light switch and the cable connections can be easily inspected.

To be in a position to plug the cables to the correct lugs after a replacement of the ignition-light switch, the various connections are once more clearly identified in Fig. 158.

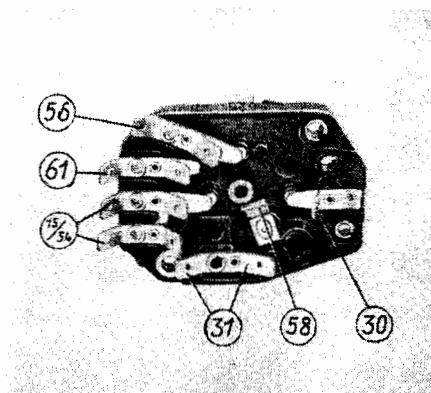


Fig. 158
Connections of
the ignition-light
switch

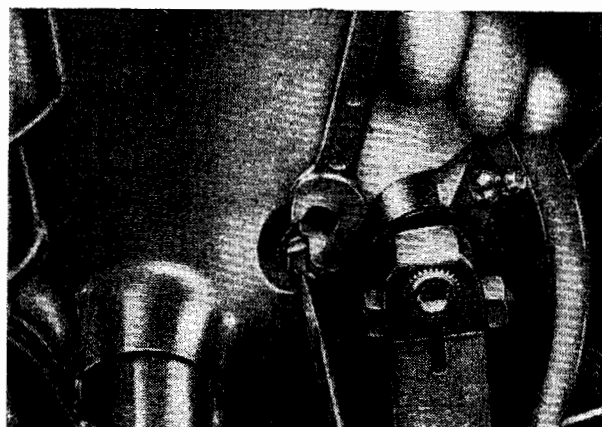


Fig. 160. Adjustment of the stock-light switch

6.5.3. Combined Stop, Tail and Number-plate Lighting Fitting and Stop-light Switch

For the TS 250, a newly developed combined stop, tail and number-plate lighting fitting is used in order to guarantee the high luminous intensities required by statutory regulations. Festoon lamps are no longer used but ball-shaped lamps.

The input to the stop lamp was increased from 18 W to 21 W and that to the tail and number-plate lamp was left unchanged at 5 W (10 W for the Federal Republic of Germany). The connections of the two lamps are shown in Fig. 159.

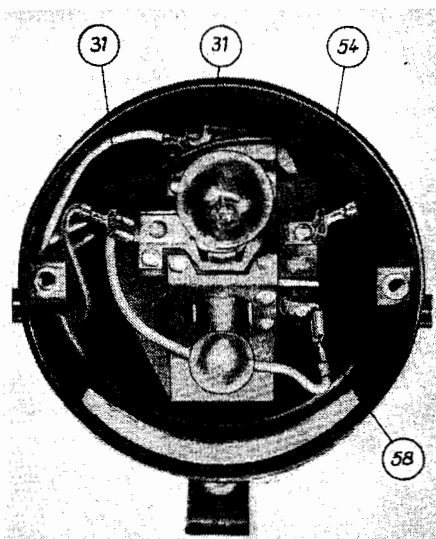


Fig. 159
Combined stop,
tail and number-
plate lighting fitting,
interior

- (54) Brake-light cable black
- (31) Centre of earth brake light cable brown
- (31) Left-hand earth brake-light cable black
- (58) Tail-light cable grey

For adjusting the stop-light switch, the connector is loosened and the front nut slackened back until the rear nut can be easily operated by an open-end wrench. The latter nut is slackened through 1/4 of a revolution.

Now an assistant steps on the brake pedal, pressing it down until the brake shoes just start sliding on the brake drum while the rear wheel is being turned. In this position the brake pedal must be retained while the adjusting screw is turned until the stop light flashes up. For this work, the ignition system must be switched on.

Finally, the two nuts must be tightened. The rear nut should be tightened with every care because the insulating bushing is made of plastics and should be carefully handled. During this operation, the adjusting screw must be prevented from turning by means of a screwdriver. If the range of adjustment is insufficient, the brake backing plate must be disassembled and the contact spring at the cam spindle be re-set.

6.5.4. Flashing-light Direction Indicator System

The TS 250 is provided with a new 4-lamp flashing-light direction indicating system. In the place of the 18-W festoon lamps, 21-W ball type lamps are used.

When replacing the flashing lamps, only use 21-W lamps. Other lamps, e.g. 15-W lamps, will change the specified flashing frequency of 90 ± 30 cycles per minute.

Control of the flashing function is effected by the rim (R in Fig. 162) and by the combined flasher-charging control light (2 in Fig. 165).

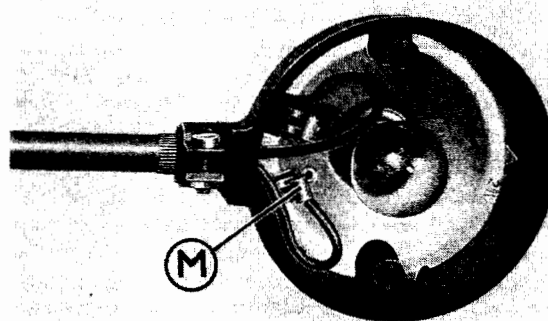


Fig. 161. Flashing-light direction indicator, interior
(M) Earth connection cable, brown

Function of the Flasher-charging control light fitting

Ignition switched on	Control light burns
Engine is stationary	
Flashing lights switched off	
Ignition switched on	Control light flashes
Engine is stationary	in the same phase as the
Flashing lights switched on	flashers
Engine runs	Control light goes out
Flashing lights switched off	
Dynamo charges	
Engine runs	Control light flashes
Flashers switched on	in the dark phase of the
Dynamo charges	flashers
Engine runs	Control light burns
Flashers switched on	
Dynamo does not charge	
Engine runs	Control light flashes
Flashers switched on	in the same phase as
Dynamo does not charge	the flashers

The two front diffusing screens of the flashing direction indicators are provided with a larger rim (R) than the two rear ones. This rim serves for checking the flashing-light system.

A failure of one of the rear flashing-light direction indicators is indicated by an increased flashing frequency (> 150 cycles per minute) of the front indicators.

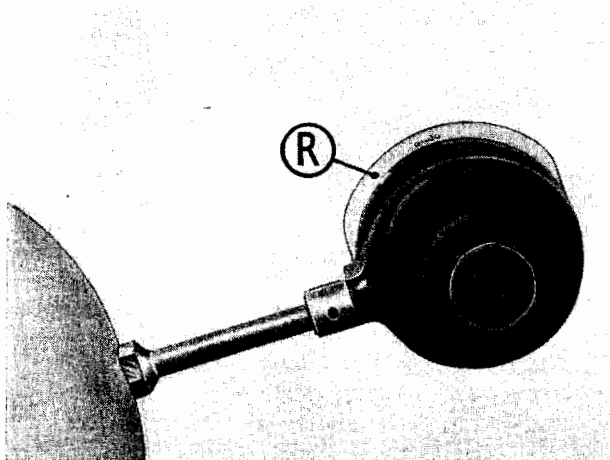


Fig. 162. Rim of diffusing screen for checking the flashing-light direction indicating system

The entire flashing-light direction indicating system is provided with an 8-A fuse which is enclosed in a fuse cartridge. The fuse can be replaced by pushing the soft plastics cartridge from the fuse holder. Then the fuse is pressed against the resilient end of the holder and withdrawn sideways from the holder.

The flasher unit is arranged in a foamed plastic pocket in the headlamp shell behind the speedometer. The unit must be put carefully into the pocket and the pocket with the unit contained in it must be placed at the space just mentioned because it is very sensitive to impacts, shocks and vibrations.

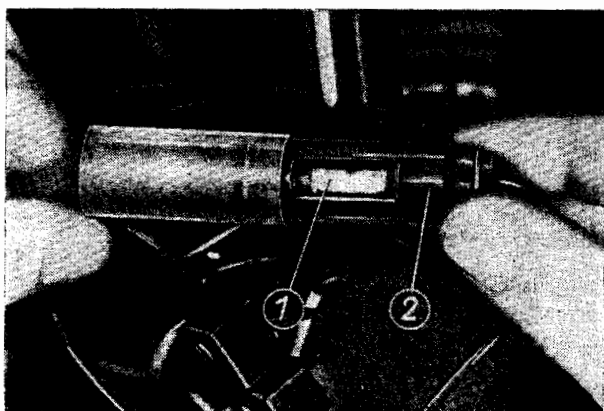


Fig. 163. Fuse cartridge for flasher unit

6.5.5. Electric Horn

The electric horn is fastened to the lower clamping head of the telescopic fork by means of a distance sleeve and a hexagon head screw.

If, on actuation of the push-button switch, the electric horn fails to produce the desired sound level, the feed cables, their connections and the push-button switch

must be checked for dirty contacts. In this case, the voltage applied would be too low.

If this is not the cause, by way of trial turn the screw clockwise or anti-clockwise until the sound is loud enough.

Before cylinder cover or cylinder can be dismantled, the electric horn (fastened below the fuel tank) must be unscrewed.

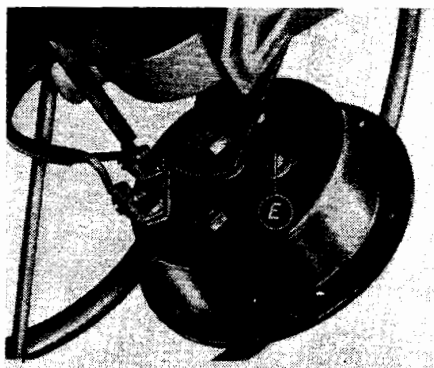


Fig. 164
Arrangement of
electric horn

6.5.6. Speedometer

In the speedometer — mounted in the headlamp by means of a metal strap and a plastic nut — four lamps with plug-socket holder are arranged which have the following functions:

Two lamps (1) and (1) serve for illuminating the speed indicator and the odometer during night operation.

One lamp (3) is a tell-tale light indicating whether or not the neutral is engaged in the gearbox. With the ignition system switched on and the neutral engaged, the lamp will emit a green light.

Another lamp (2) is the charging-control light. With the ignition system switched on and the engine running the lamp must go out (see also Section 6.4.6.).

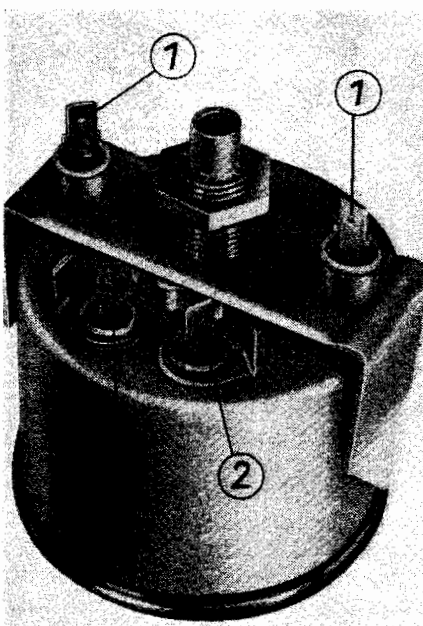
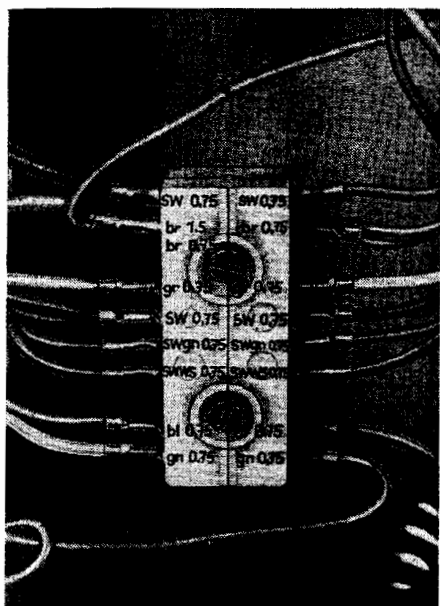


Fig. 165. Speedometer with holder and lamps



sw = black
br = brown
gr = grey
gn = green
ws = white
bl = blue

Fig. 166. Arrangement of cables at line connector

6.5.7. Cable Connector

The cable connector largely facilitates assembling and repair operations.

It is arranged at the frame under the twinseat and fastened by two fillister head screws.

The cables are attached to the cable connector as shown in Fig. 166.

7. Induction System

7.1. Description and Function of the System

The entire induction equipment is an integrated system which is matched with the engine to an optimum degree. Any change in this system will impair output, fuel consumption, rate of wear, etc.

The induction system starts with bore-holes in the sides of the lower frame tube and ends with the inlet port of the cylinder. There should be no point in the whole system where air can be drawn in, additionally to the holes provided for this purpose.

The air from the carburettor the fuel-air mixture must pass through the following path in order to get into the crankcase:

Air is sucked up from the zone under the fuel tank where the least amount of dust occurs, through the holes (1) in the lower frame tube and then passes through the frame tube to the air filter (2) which is arranged in the lower part of the intake muffler casing (3). When passing through the air filter, the air is cleaned. The dust particles contained in the air adhere to the filter. The pressure differences caused by intake vibrations are neutralised to a high degree in the intake muffler compartment (6). Then the air is drawn through the connecting piece to the carburettor. In the carburettor (5), the incoming air is mixed with the atomised fuel in a certain ratio.

This fuel-air mixture then passes through the intake port into the crankcase of the engine casing.

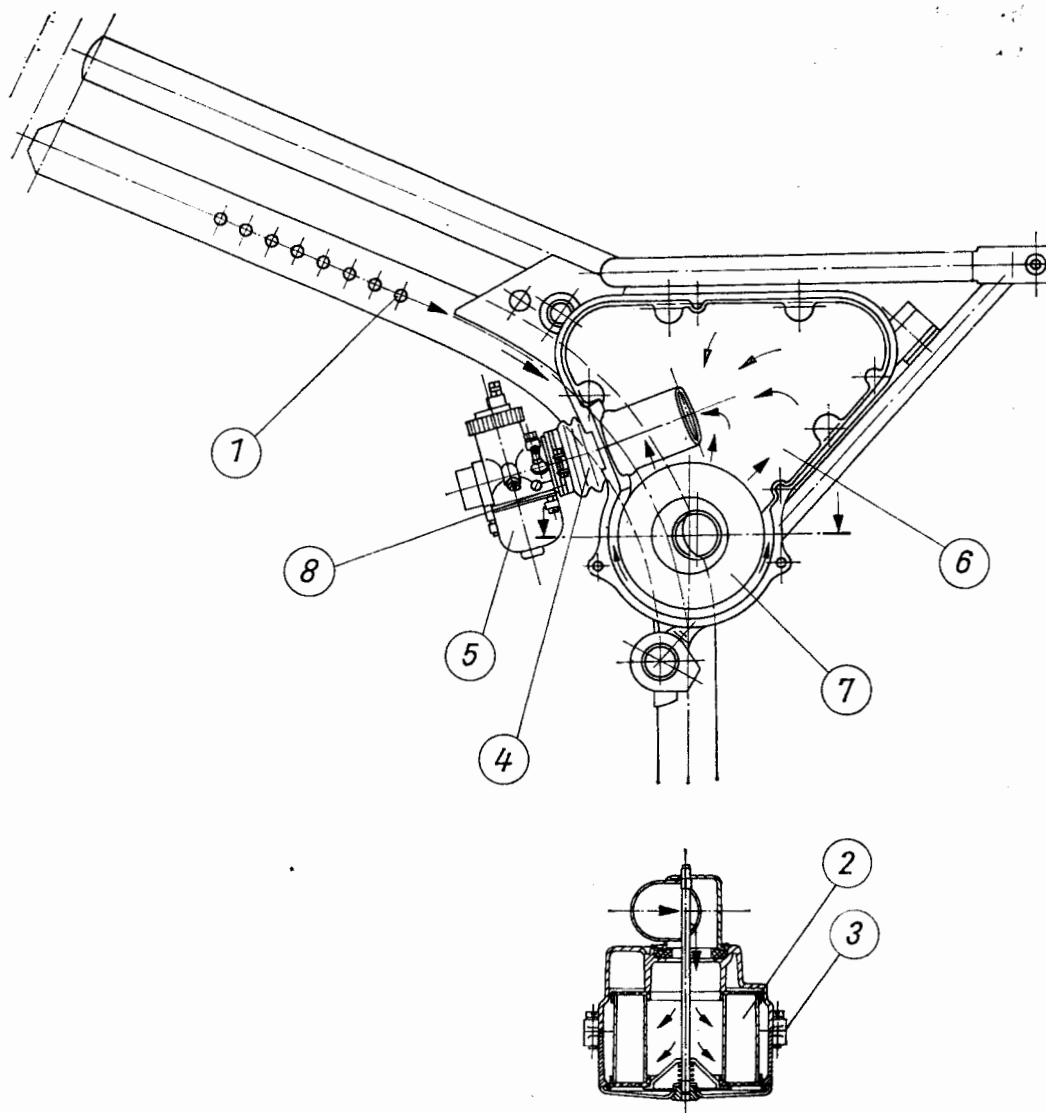


Fig. 167. Induction system

7.1.1. Air Filter

For the TS 250, almost exclusively a dry air filter is used. Only in regions where a damp and warm climate prevails, a wet air filter is installed.

The air filter (1) is arranged in the lower part of the intake muffler casing. It is centred at one face in the engine casing and the other face by a cup (2) which is mounted on a threaded bolt.

In order that the filter is properly sealed at its two faces,

a helical spring (3) supported on the cover presses on the cup. The cover is fastened by a slotted nut.

For sealing this compartment, a foam rubber gasket placed between frame and intake muffler casing, a rubber ring (4) between cover and intake muffler casing, and a small rubber washer under the slotted nut are used. The air passes from the lower frame tube into the interior of the filter, through the filter into the noise suppression compartment. In this way, the dust settles on the interior surface of the filter.

This should be observed in cleaning. The *dry air filter* should be carefully tapped for cleaning or brushed with a dry and clean hair brush.
The *wet air filter* is washed with pure benzine and then slightly sprayed with engine oil.

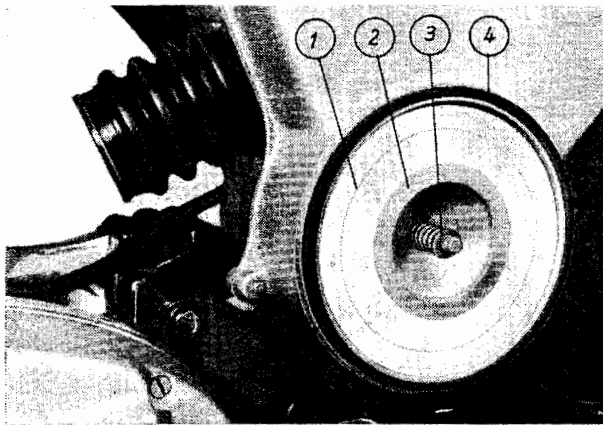


Fig. 168. Intake muffler with air filter assembly

7.1.2. Intake Muffler

The intake muffler consists of two light-alloy castings which are screwed together.

This casing comprises the noise suppression compartment and the compartment for the air filter.

The noise suppression compartment, arranged above the air filter compartment, serves for reducing the intake noise to the permissible level and also as a reservoir for the air required by the engine for combustion.

The intake muffler casing is connected to the frame at three points.

7.1.3. Connecting Piece to Carburettor

The connecting piece is a rubber moulding which establishes the connection between intake muffler and carburettor. Care should be taken to see to it that the wall of the hole in the intake muffler casing properly fits in the groove in the connecting piece provided for this purpose, and that the other end of the connecting piece is properly connected with the carburettor by means of a clamping ring.

The connecting piece must be inspected, from time to time, for porous parts especially within the portion of the folds.

(For Fig. 169 see page 64)

7.1.4. Carburettor

In the TS 250, a BVF carburettor of Type 30 N 2-3 is used. Like its predecessor (BVF-carburettor 28 N 1-1), it is a carburettor with cold starting device.

7.1.4.1. Design and Function

The starting carburettor consists of two systems. To familiarise oneself properly with their designs and functions, it is thought to be helpful to explain each system separately.

1. Cold starting device

As the name of this device already implies, it is incorporated to enable an engine to start readily from cold. The cold starting device is shown in Fig. 170 (driving position) and in Fig. 171 (starting from cold). It is actuated by

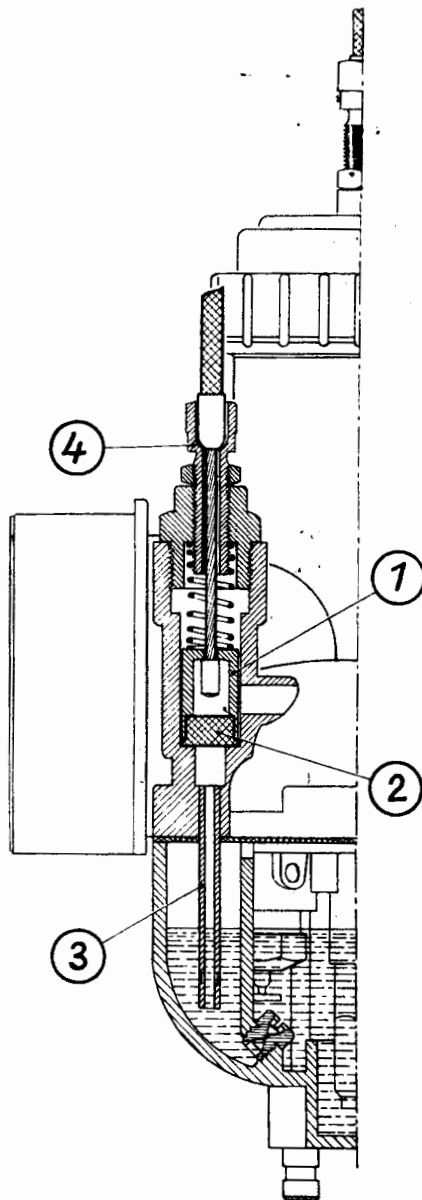


Fig. 170. Starter piston closed (driving position)

adjusting the starter lever which is connected with the device by means of a cable control.

Position for riding = Starter lever in the initial position (it contacts the stop)

Position for starting from cold = Starter lever turned clockwise from initial position

In the initial position of the starter lever, the packing (2) at the starter piston (1) must completely seal the starter mixing tube (3). The cable control adjusting screw (4) must, therefore, always be so set that a clearance of about 2 mm is present between cable control sheath and adjusting screw.

If the starter lever is turned into the position for starting from cold, the starter piston with packing is lifted so that the upper opening of the starter mixing tube (A) is released. When starting the engine, the fuel present in the starter mixing tube is sucked up and conducted through the starter mixture-delivery duct (5) which discharges towards the throttle valve in the induction port.

In order that the vacuum required for cold starting is present in the starter system, the throttle valve must be in idling position.

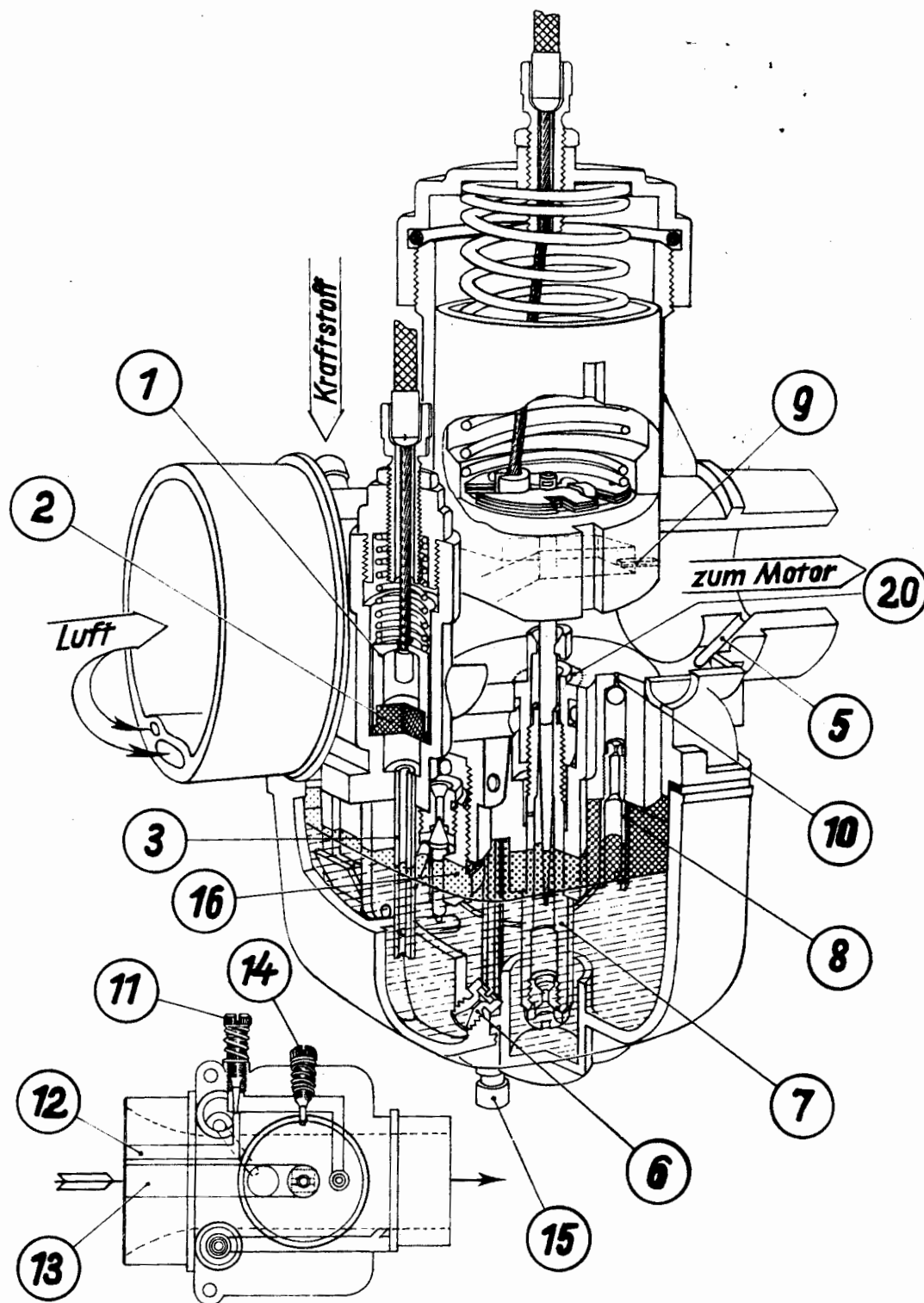


Fig. 169. Sectional view of the BVF 30 N 2-3 carburetter (The schematic representation shows the ducts in horizontal section)

- | | | | |
|---------------------------------------|--|----------------------------------|-----------------------|
| (1) Starter piston | (9) Idling duct | (13) Mixing air duct | Kraftstoff = Fuel |
| (2) Sealing disk | (10) Slow-running bore | (14) Throttle stop screw | zum Motor = to engine |
| (3) Starting mixer | (11) Slow-running air screw slackened back for better view | (15) Vent tube for float chamber | Luft = Air |
| (5) Starting duct | (12) Slow running air duct | (16) Float valve | |
| (6) Starter jet | | (20) Spraying insert | |
| (7) Needle jet with main jet (bottom) | | | |
| (8) Slow-running jet | | | |

The starting device is of no effect if in starting the throttle valve is opened, that is to say, in starting you must not accelerate.

The lower opening of the starter mixing tube leads to a separate compartment, the starter passage which is connected with the compartment for the central float only through the starter jet (6). The hole of the starter jet is such that, after sucking off the quantity of fuel present in the starter mixing tube, just such an amount of fuel is allowed to be fed that — if the starter lever is actuated for too long a time — the engine just can consume the too rich mixture.

The fuel required for starting is pre-mixed already in the starter passage. The air required for this purpose is sucked up from the compartment for the central float through a recess provided in the upper edge of the partition wall. The float compartment is vented by an overflow pipe (15) arranged in the centre of the float chamber casing.

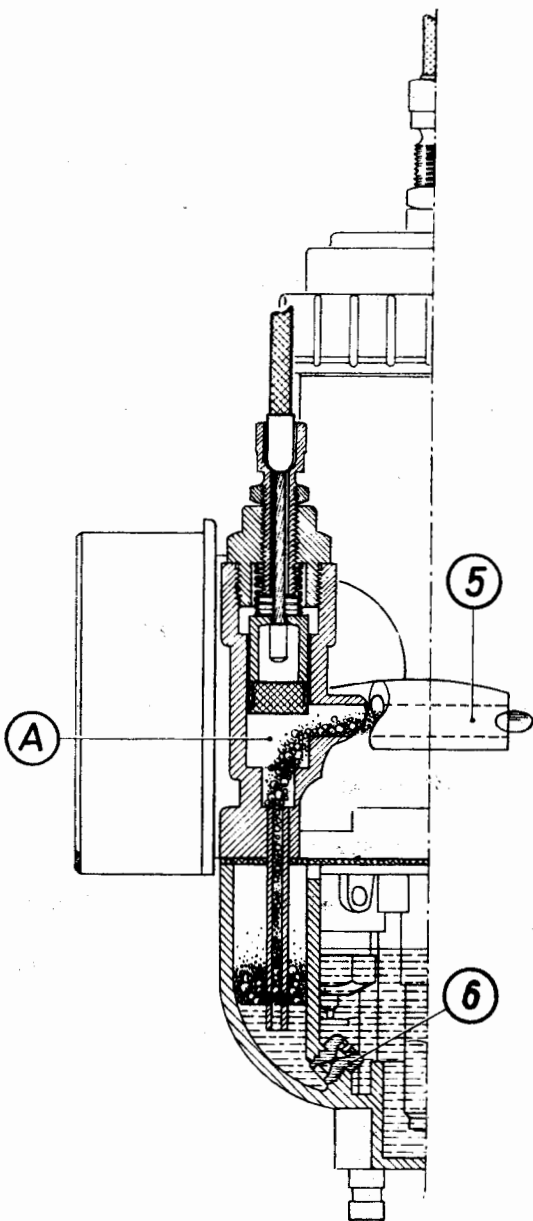


Fig. 171. Starter piston lifted (cold starting)

2. Main carburetter

The fuel passes through the float valve (16) into the float chamber. When the fuel level has reached a certain height, the float valve is closed by a sheet-metal nose (17) arranged at the holder of the float.

When the engine is running and you accelerate, the partial load needle is more or less withdrawn from the needle valve (18) and the throttle valve lifted for the same distance. The air drawn in by the engine passes through the intake port of the carburetter and thus also past the spraying insert. In this way, the fuel is sucked up to the induction port through the main jet (19) and needle jet. The fuel is atomised by the spraying insert (20) and mixed with the passing air. This ignitable fuel-air mixture is conducted to the engine.

An ignitable mixture in idling or slow running is provided by the slow running jet (8) and the specified setting of the slow running air screw (11).

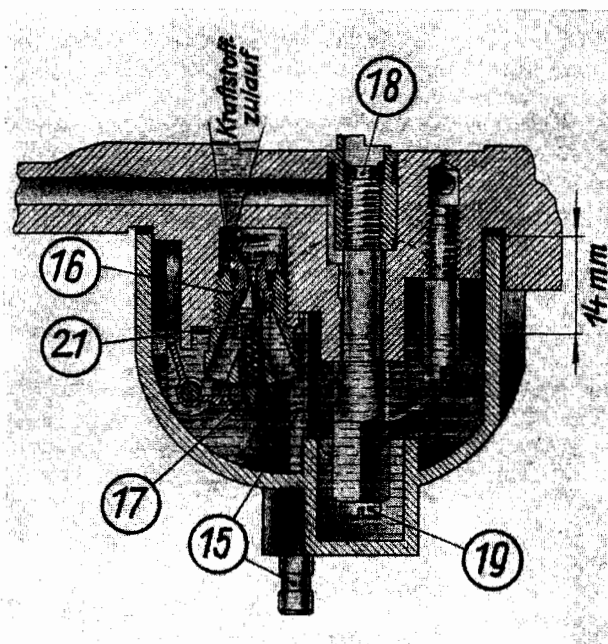


Fig. 172. Float valve, sectional view

- (15) Vent tube for float chamber
 - (16) Float valve
 - (17) Closing plate for float valve
 - (18) Needle jet with jet holder
 - (19) Main jet
 - (21) Spring-loaded float needle
- Kraftstoffzulauf = Fuel supply

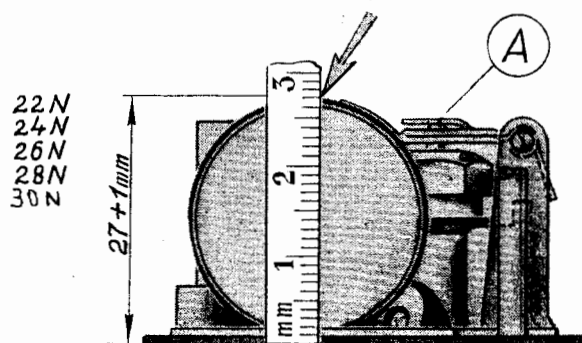


Fig. 173. Float valve closed

(A) Closing plate

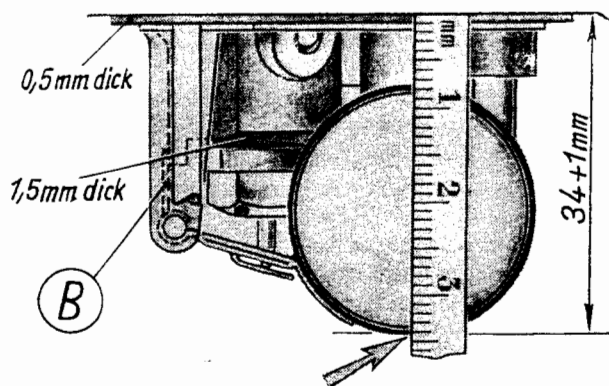


Fig. 174. Float valve open

(B) Stop blade

0,5 mm dick = 0.5 mm thick

1,5 mm dick = 1.5 mm thick

The decisive factor for the correct ratio of mixing of fuel and air in the partial load range is the needle position, that is to say, the notch in the needle holder at which the partial load needle is suspended.

The needle holder not only has the function of fixing the partial load needle but also of guiding the needle (upper plate of the needle holder).

For setting the needle, the lower plate (A) of the needle holder is to be used.

Example: The needle is to be suspended at the third notch from top. For this purpose, the third notch of the needle from its top is engaged with the lower plate of the needle holder and the second notch from top of the needle is engaged with the upper plate of the needle holder.

The needle holder lies flat on the bottom of the throttle valve. The latter — which can be removed axially in its guide — is retained in its initial position (idling position) by a spring supported by the cover. The spring power offers resistance to the force actuating the cable control (see Fig. 169).

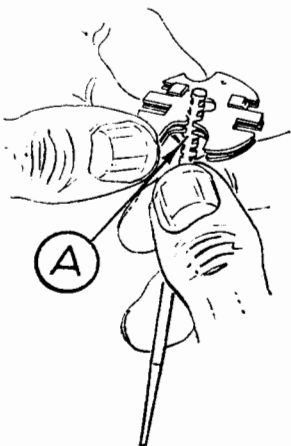


Fig. 175. Partial load needle with needle holder

7.1.4.2. Tuning

The basic tuning of the carburetter is given in Section 1. "Technical Data".

As a rule, any change in this basic carburetter tuning will not improve the operating conditions. If, nevertheless, re-tuning is necessary, the required adjustments should be made as follows:

The stop screw (14) for the throttle valve is so adjusted that the engine runs smoothly. Then the slow running air screw (11) is fully screwed down and then slackened back through $1\frac{1}{2}$ revolutions. Then, by way of trial, slowly

screw the slow running air screw down and slacken it back to find the maximum engine speed. When having found the maximum engine speed, the stop screw for the throttle valve must be so adjusted that the engine again reaches idling speed.

This procedure must be repeated so many times until the engine speed will not change when the slow running air screw is moved in any direction.

If, at the beginning of the adjusting operations, the engine speed does not change when the slow running air screw is regulated, then the slow running jet is choked.

If this adjustment is correctly performed, a smooth changeover from idling to the partial load range of the main carburetter will be ensured for the engine.

Please note!

1. Adjustment of the carburetter should only be made with the engine at operating temperature and the vehicle must stand on plane ground.
2. The idling position of the throttle valve must not be adjusted by the setting screw for the cable control but by the stop screw for the throttle valve.

7.1.5. Intake Socket

The function of the intake socket is to fix the position of the carburetter and to retain it in this position and to serve as connecting member between carburetter and inlet port of the cylinder. It is fastened to the cylinder by means of two hexagon nuts.

In order that the heat from the cylinder is not transmitted to the carburetter, a plastics flange (compression moulding material) and two packings (at the two ends of the plastics flange) are provided between intake socket and cylinder.

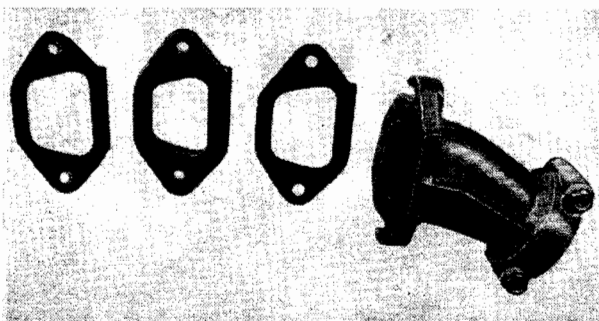


Fig. 176. Intake socket with gaskets and insulating flange

7.2. Trouble Shooting

7.2.1. Too Lean a Mixture

Symptoms for faults associated with too lean a fuel-air mixture are as follows:

- Heavy consumption of the electrodes of the sparking-plug.
- Welding beads appear at the sparking-plug.
- When riding in the half or full load ranges, the operating temperature rises to abnormal values.
- For a longer period after starting, the engine can only be operated with more or less drawn starter lever.
- In the half or full load ranges the engine delivers an insufficient output.
- The engine tends to stall.

Faults or damages which lead to the supply of too lean a mixture and their remedy:

1. Air filter not seated properly on the centring edge of the intake muffler casing
 - Remove air filter and properly fit into the centring edge.
2. Air filter damaged due to negligence
 - Replace air filter by a new one.
3. Compression spring between cover and cup missing
 - Remove cover — fit compression spring and fasten cover by means of slotted nut.
4. Rubber ring between casing and cover missing or damaged
 - Replace rubber ring by a new one.
5. Connecting piece to carburettor defective or porous or not properly seated in the hole of the intake muffler casing
 - If the connecting piece is defective or porous, then it must be replaced by a new one.
6. Intake socket porous
 - Replace the intake socket by a new one or — if possible — seal it with artificial resin.
7. Insulating flange cracked or porous; packings defective
 - The parts involved must be replaced by new ones.
8. Insufficient fuel supply —
 - due to contaminated fuel shut-off cock,
 - due to compressed rubber packing,
 - due to hardened or defective fuel feed pipe,
 - due to choked vent hole in tank cap
 - remove the fuel shut-off cock and carefully clean each component separately.
 - replace defective or hardened fuel feed pipe and the defective rubber packing by new ones,
 - blow compressed air through the hole in the tank cap.

The normal rate of flow through the fuel shut-off cock is 12 litres/hour.
9. Partial load needle is suspended too deep
 - Suspend the partial load needle at a higher level, for one or several notches as required to obtain a normal mixing ratio.
10. Central float deformed — float valve is insufficiently opened
 - Restore central float to proper condition according to the information given in Figs. 173 and 174.
11. Float needle sticking
 - polish shaft of float needle and the through bore of the valve body,
 - check the valve for foreign particles,
 - replace float needle and valve seat by new parts.
12. Burr at main jet
 - remove the burrs by means of a jet reamer,
 - replace the main jet by a new one.

7.2.2. Too Rich a Mixture

Symptoms for faults associated with too rich a fuel/air mixture are as follows:

- Engine fails to start readily,
- Engine output drops with increasing temperature of the engine,
- High fuel consumption,
- Inclination to "four-stroking",
- Sparking-plug of specified thermal value fouled,
- Emission of heavy smoke visible with the engine at operating temperature.

Faults or damages which lead to the supply of too rich a mixture and their remedy:

1. Dry air filter too old (more than 10,000 km of road operation)
 - replace the filter by a new one.
2. Dry air filter is wet
 - Cause: Rubber ring under slotted nut missing or defective
 - place a new rubber ring under the slotted nut,
 - replace the air filter by a new one.
3. Partial load needle suspended at-too high a level
 - suspend the partial load needle at a lower level, one or several notches to obtain a normal ratio of mixing.
4. Wear of needle jet and partial load needle (over 20,000 km of distance covered)
 - the two parts must be replaced by new ones.
5. Float valve leaky
 - Cause: 1. Valve contaminated
 - 2. Float needle worn
 - clean float valve
 - mount a new flat needle.
6. Central float distorted — float valve remains open in an excessive position
 - Restore central float to proper condition in accordance with the dimensions given in Figs. 173 and 174.
7. Main jet too large
 - use another main jet with the same dimension marked on it (jets with the same nominal dimension differ by their tolerances),
 - if this is no remedy, mount a jet of the next smaller size.
8. Packing at starter piston defective
 - replace the packing by a new one.
9. Spring for starter piston has insufficient pre-stress
 - replace the spring by a new one.
10. Cable control for starting device mounted without play; as a consequence, the starter piston cannot properly seal the starter mixing tube
 - Mount the cable control with a free play of 2 mm.

8. List of Special Tools

8.1. Engine

Drawing

1. 22-50.014	Engine assembling fixture	none
2. 02-MW 39-4	Armature puller	9.1.
3. 05-MW 45-3	Holder for gearbox sprocket wheel	9.2.
4. 05-MV 45-3	Puller for gearbox sprocket wheel and driving gear (68 teeth)	9.3.
5. 22-50.413	Locking plate for driving gear (68 teeth)	9.4.
6. 05-MW 20-4	Clutch extractor	9.5.
7. 22-50.010	Gudgeon pin ejecting device	9.6.
8. 22-50.012	Separating screw with ancillary ring and bushing	9.7.
9. 22-50.013	Pusher for crankshaft	9.8.
10. 22-50.414	Drift (6305 crankshaft bearing)	9.9.
11. 22-50.415	Drift (6305 crankshaft bearing and oil seal ring 30 × 62 × 10)	9.10.
12. 11-MW 7-4	Drift (6204 driven shaft bearing, 6203 driving shaft bearing)	9.11.
13. 02-MW 60-3	Profiled socket wrench for gear-shift drum	9.12.
14. 22-50.412	Piston support (assembly tool)	9.13.
15. 05-MW 141-4	Piston ring pliers	9.14.
16. 05-MW 147-4	Piston ring clamp (69 mm in diameter)	9.15.
17. 05-MW 19-4	Guide mandrel for gudgeon pin	9.16.
18. 05-ML 13-4	Instrument for measuring the end play at the 28-teeth driving gear	9.17.
19. 05-MV 150-2	Clutch assembling fixture	9.18.
20. 11 MW 3-4	Drift (fitting sleeve)	9.19.

8.2. Chassis

1. H 8-820-3	Wheel bearing expanding mandrel	9.20.
2. 19-MW 22-1	Wrench for telescopic fork	9.21.
3. 22-51.403	Fitting sleeve	9.22.
4. 22-51.006	Extractor	9.23.

8.3. Electrical Equipment

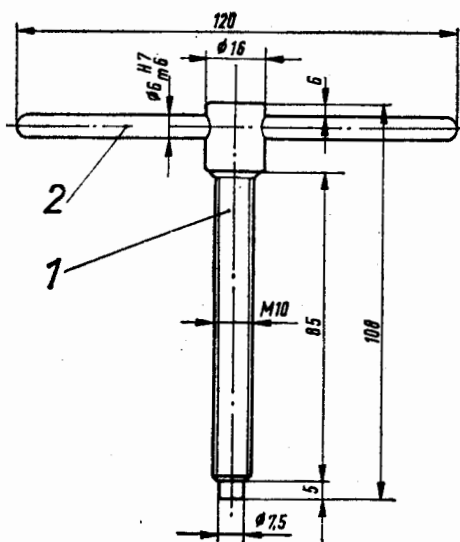
H 8-2104-3	Ignition adjusting gauge	none
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9. Drawings of Special Tools

All dimensions in mm

9.1. Armature puller

02-MW 39-4

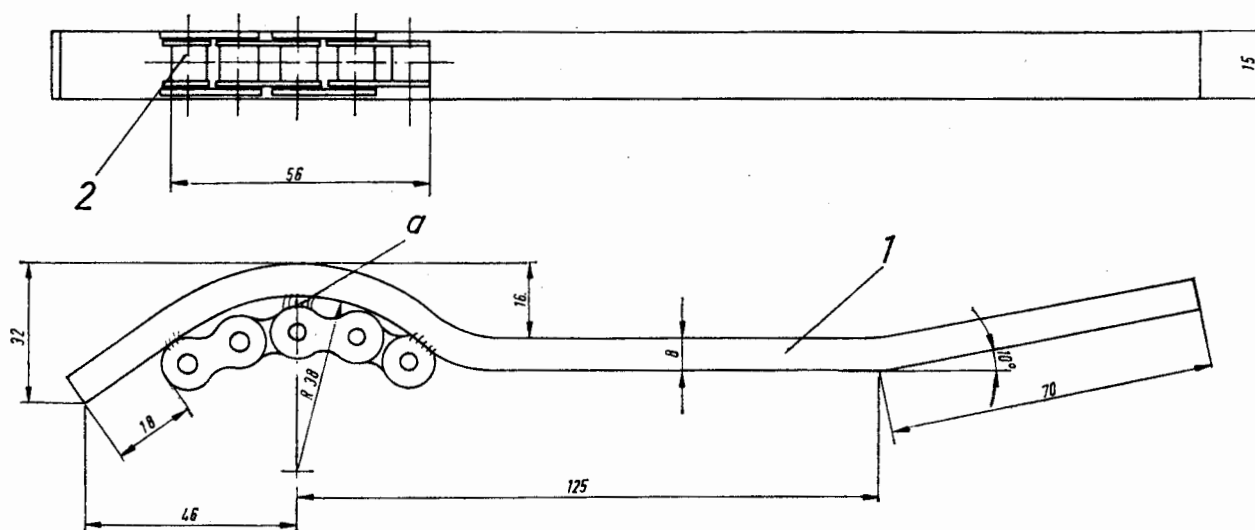


Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Screw	St 50 K	$\varnothing 16 \times 112$	
2	1	Cylindrical pin 6 m 6 $\times 120$	St 50 K	$\varnothing 6 \times 120$	

9.2. Holder for gearbox sprocket wheel

05-MW 45-3

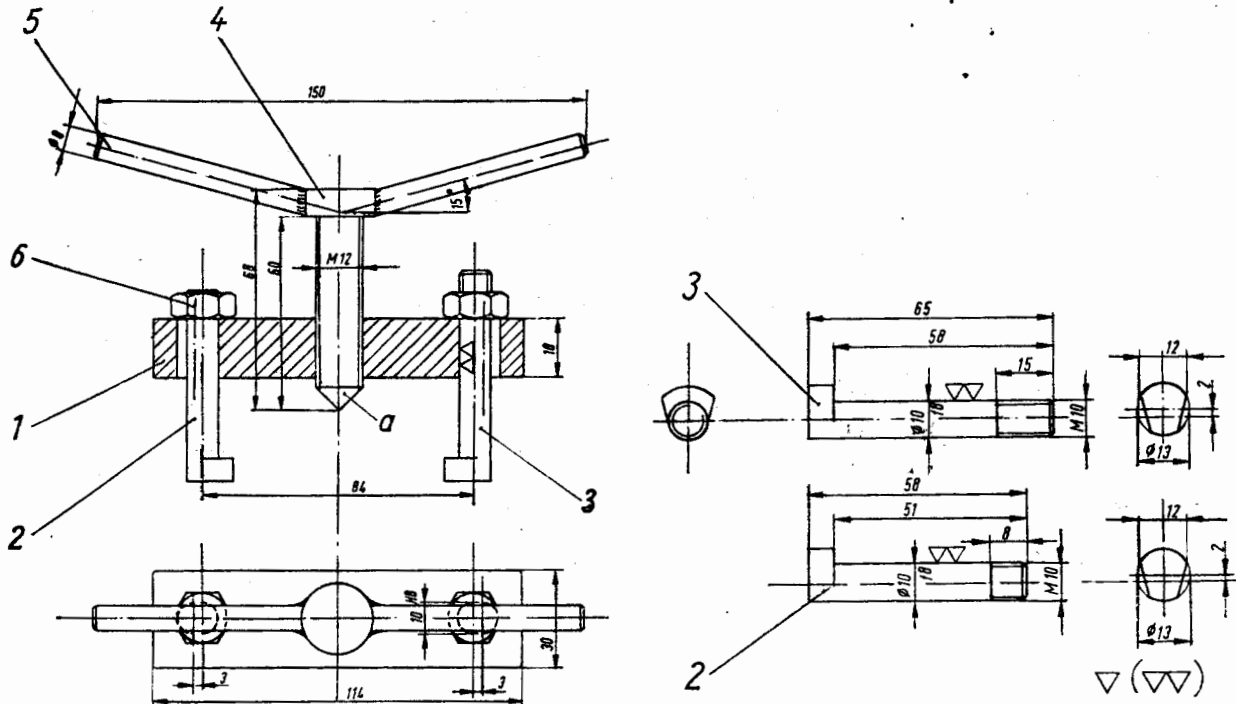
(a) Electrically tacking and welding at three points on either side degreased, phosphate-treated



Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Spanner	St 3 b	15 × 8 × 270	TGL 0-8180
2	1	Roller chain 12.7 × 8.51			

9.3.

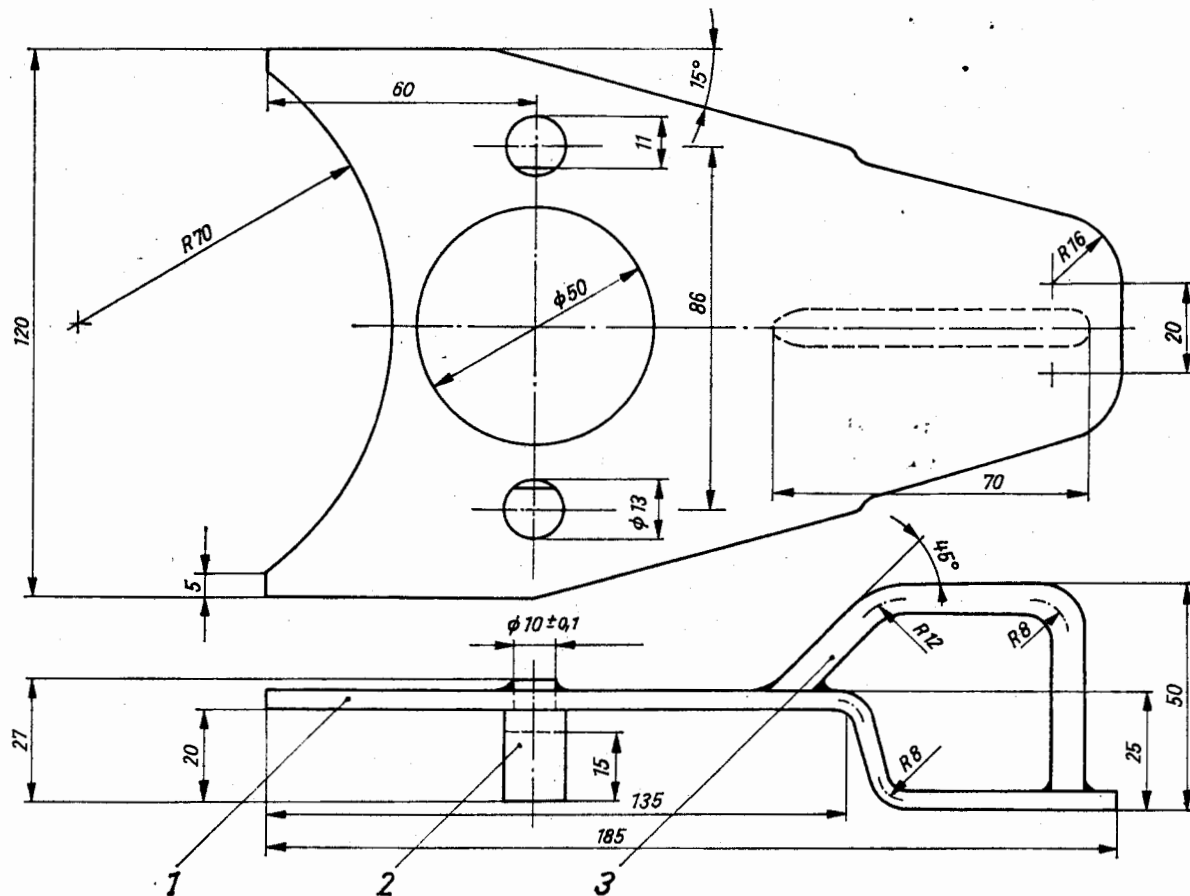
05-MV 45-3



Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Plate	MSt 3	$30 \times 20 \times 118$	degreased, phosphated
2	1	Puller pin	C 45	$\varnothing 18 \times 62$	if possible, hexagon head
3	1	Puller pin	C 45	$\varnothing 18 \times 70$	screw modified TGL 0-561
4	1	Tightening screw	— 4 D	$M 12 \times 60$	point to be turned and
5	1	Handle	MSt 3	$\varnothing 8 \times 70$	hardened TGL 0-934
6	2	Hexagon nut M 10	— 5 D		thread to be caulked

9.4. Locking plate for driving gear (68 teeth)

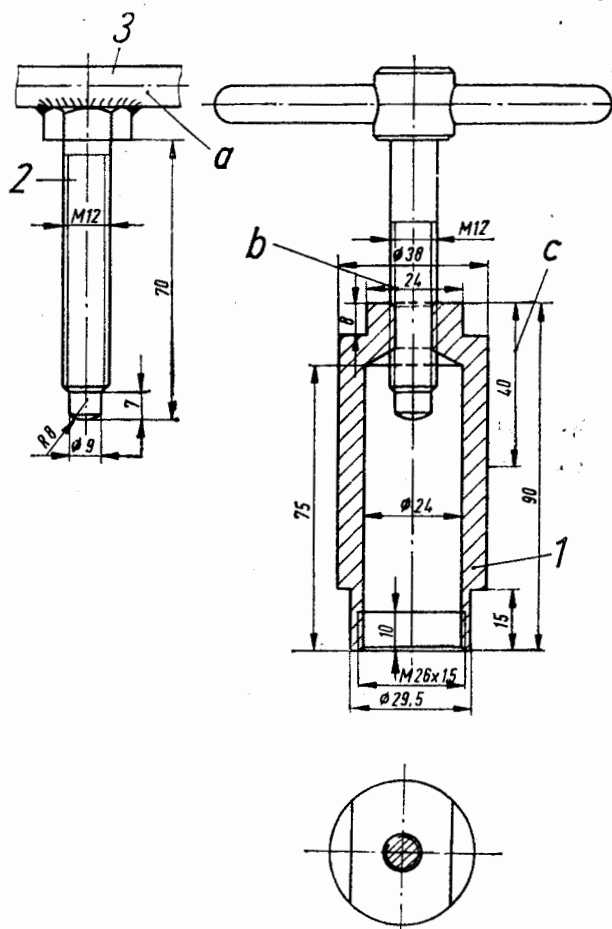
22-50.413



degreased, phosphate-treated

Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Holder-on	St 38 b-2	210 × 125 × 5	welded parts
2	2	Bolt	St 38 b-2	Ø 14 × 30	
3	1	Handle	St 38 K	Ø 8 × 115	

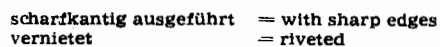
9.5. Clutch puller
05-MW 20-4



- a) Alternative solution
b) Width over flats 24
c) to be knurled

Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Clutch puller	C 45	$\varnothing 40 \times 95$	75 kg/mm ² annealed, degreased, phosphated TGL 0-933
2	1	Hexagon head screw M 12 \times 70	alternative solution		TGL 0-1
3	1	Cylindrical pin 10 m 6 \times 100			

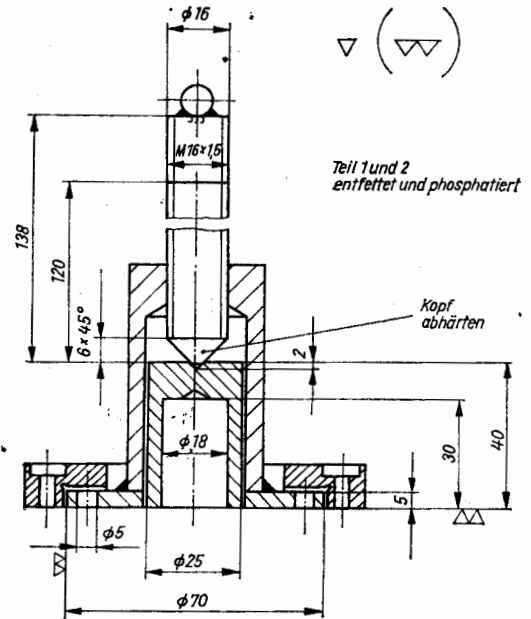
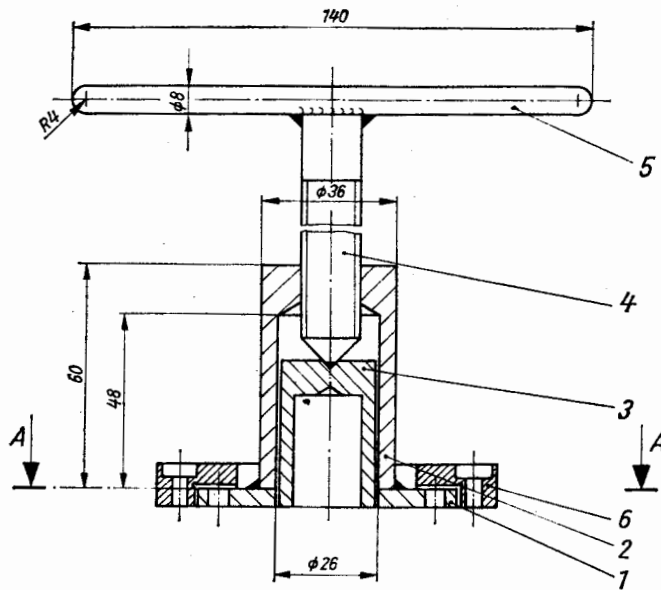
22-50.010



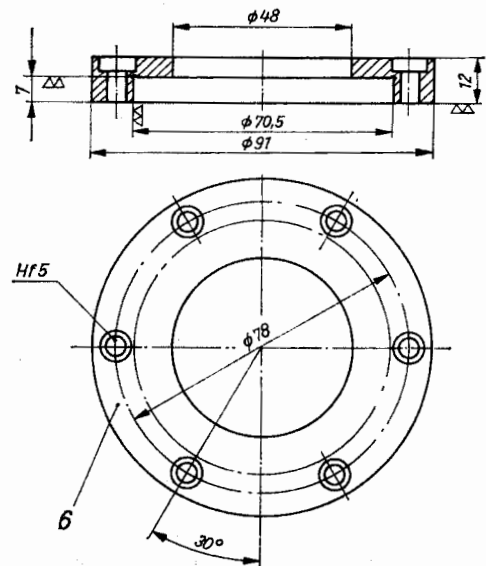
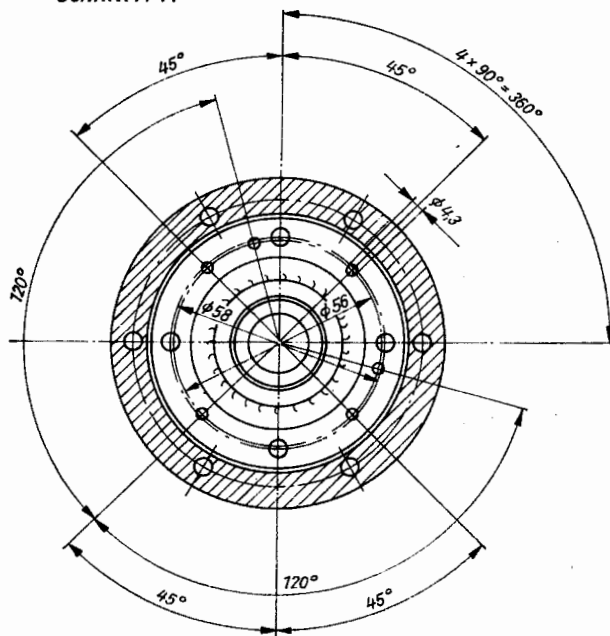
10 RH TS 250, englisch, 2. Auflage

9.7. Separating screw with ancillary ring and bushing

22-50.012



Schnitt A-A



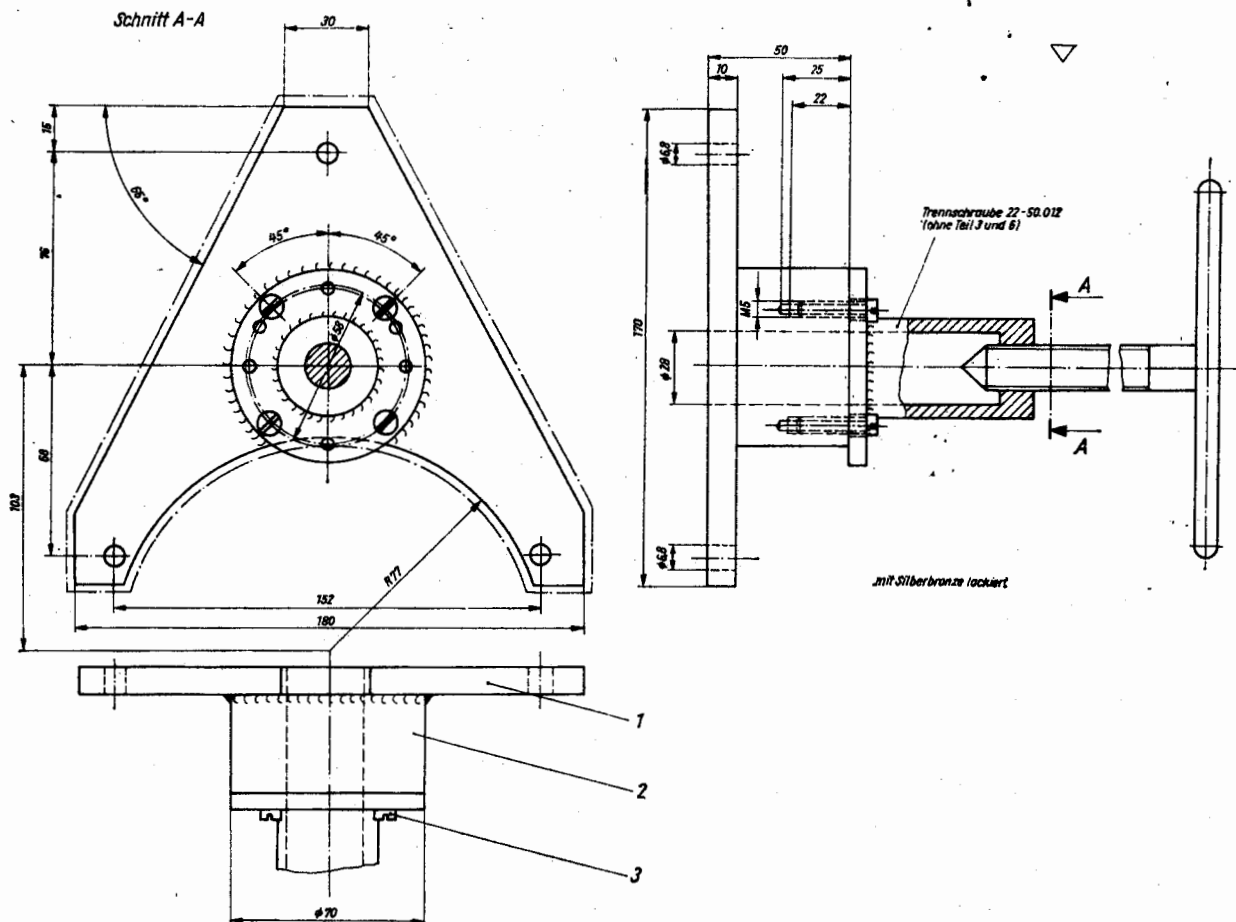
Teil 1 und 2 entfettet und phosphatiert
Kopf abhärten
Schnitt A-A

= part 1 and 2 degreased, subject to phosphate treatment
= tip to be hardened
= section A-A

Part	Quantity	Description	Material	Rough Size	Remarks
1		Washer	St 38 b-2	Ø 75 × 8	annealed
2	1	Bushing	St 38 b-2	Ø 40 × 65	
3	1	Bushing	C 45	Ø 28 × 45	
4	1	Screw	C 45 K	Ø 16 × 126	
5	1	Tommy	St 38 K	Ø 8 × 145	
6	1	Washer	St 38 U-2	Ø 100 × 15	

Pusher for crankshaft

22-50.013

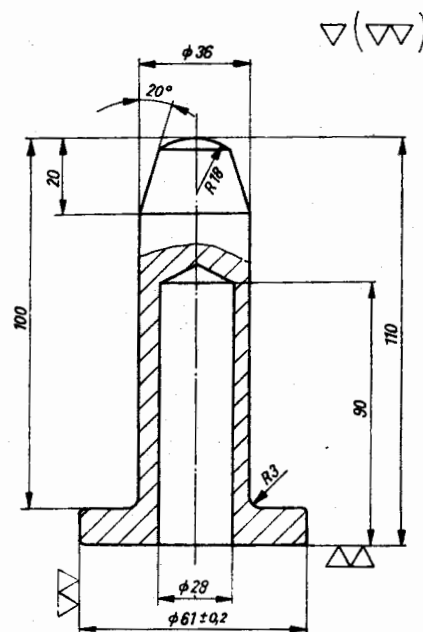


Schnitt A-A = section A-A
Trennschraube = separating screw
ohne Teil 3 und 6 = without part 3 and 6
mit Silberbronze = lacquered with
lackiert silver bronze

Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Steel plate 10 mm TGL 8445	St 38 b-2	190 × 180 × 10	shape burnt out
2	1	Round steel Ø 75 TGL 7970	St 38 b-2	Ø 75 × 45	
3	4	Fillister head screw M 5 × 25 TGL 0-84			

9.9. Drift (6305 crankshaft bearing)

22-50.414

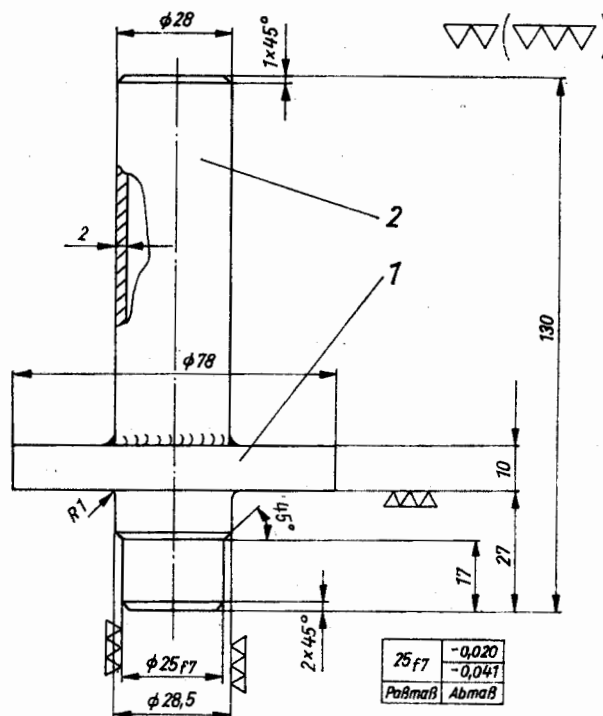


for all radii without dimensions
R = 1 mm fitted and hardened

Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Drift TGL 7970	C 15	Ø 65 × 115	case hardened

9.10. Drift (6305 crankshaft bearing and oil seal ring 30 × 62 × 10)

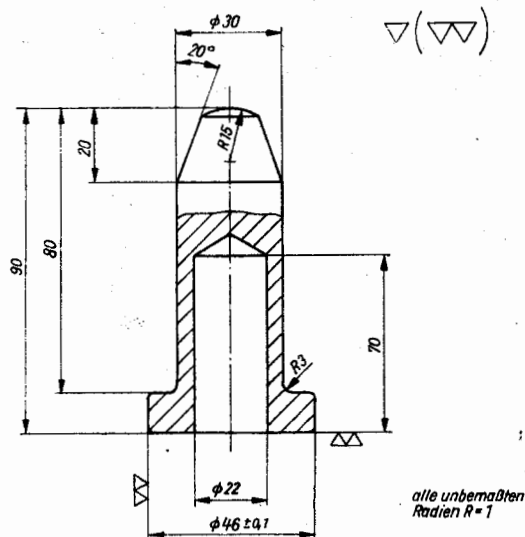
22-50.415



Paßmaß = Fit size
Abmaß = Allowance

Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Thrust washer	C 45	Ø 80 × 40	annealed
2	1	Pipe Ø 28 × 2	St 35 hb	100 long	welded part

9.11. Drift (6204 driven shaft bearing, 6203 driving shaft bearing)
11 MW 7-4

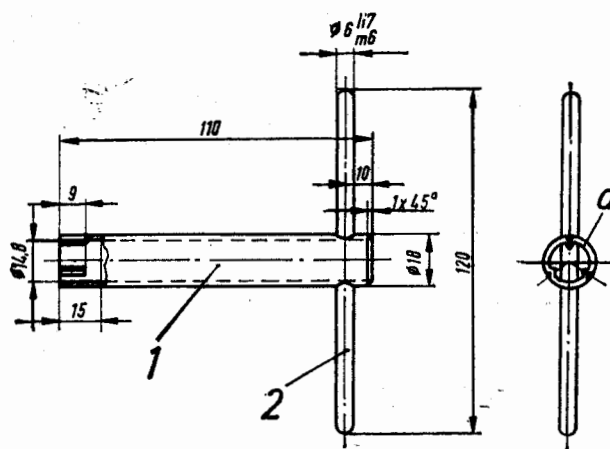


alle unbemaßten Radien $R = 1$ = For all non-dimensioned radii $R = 1$

Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Drift TGL 79 70	C 15	$\varnothing 50 \times 95$	case hardened

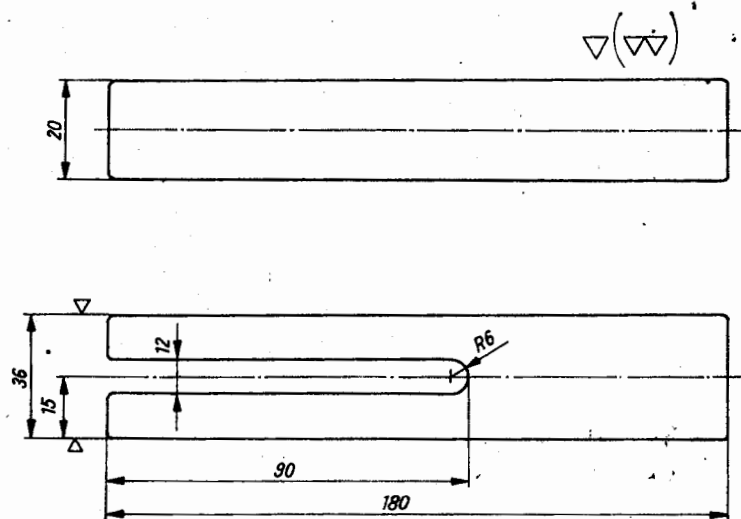
9.12. Profiled socket wrench for gear-shift drum
02-MW 60-3

(a) Profile of wrench according to cam drum degreased, phosphate-treated



Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Pipe	Steel pipe	$18 \times 2 \times 112$	(Gost)
2	1	Handle	St 37 K	$\varnothing 6 \times 125$	

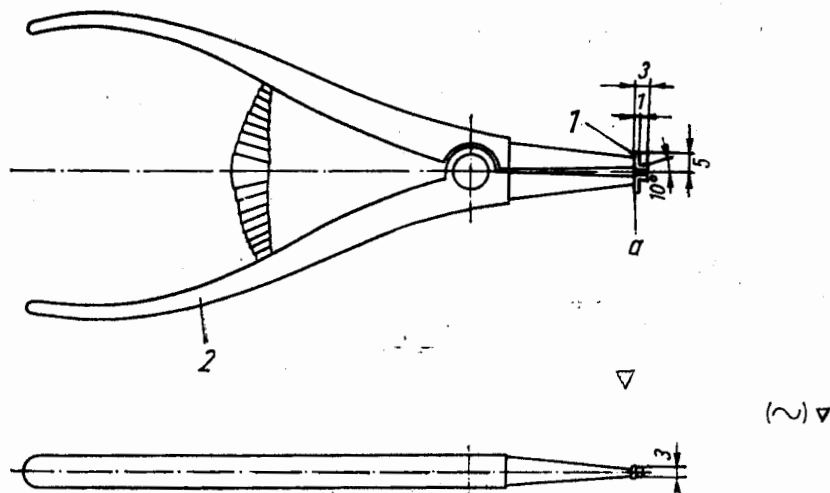
9.13. Piston support (assembly tool)
22-50.412



Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Fork TGL 12243	HGW 2081	180 × 36 × 20	

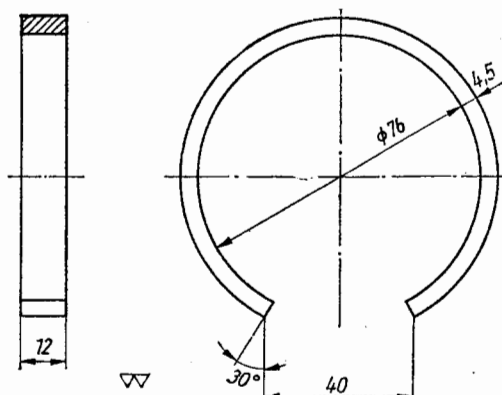
9.14. Piston ring pliers
05-MW 141-4

(a) brazed



Part	Quantity	Description	Material	Rough Size	Remarks
1	2	Sheet-metal angle	15 Cr 3	8 × 3 × 1	
2	1	Circlip pliers A 160 TGL 48-72 503			varnished, polished

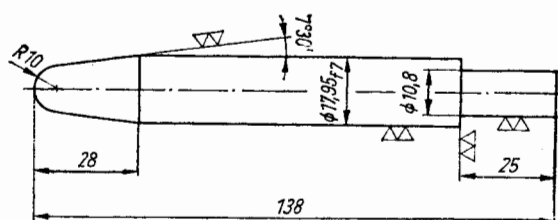
9.15. Piston ring clamp (69 mm in diameter)
05-MW 147-4



To be used together with special pliers 05-MW 141-4!

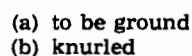
Part	Quantity	Description	Material	Rough Size	Remarks
	1		St 38 u-2	Ø 90 × 15	

9.16. Guide mandrel for gudgeon pin
05-MW 19-4



Part	Quantity	Description	Material	Rough Size	Remarks
	1	Mandrel	MSt 3	Ø 18 × 140	

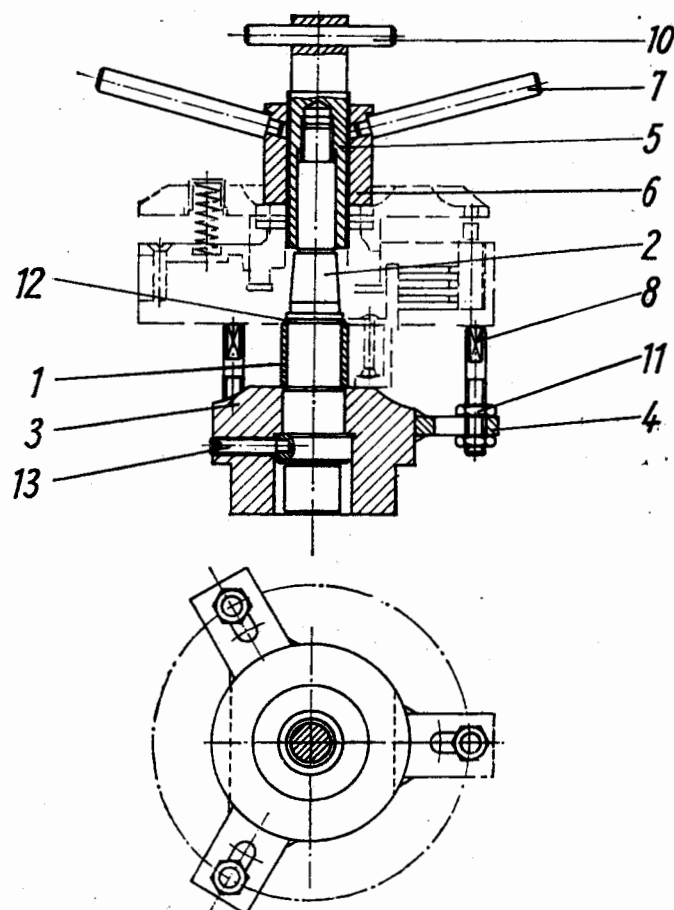
05-ML 13-4



Fits	Allowances
ϕ 15 ^{H 7}	+0.018 0
ϕ 8 ^{H 8}	+0.022 0

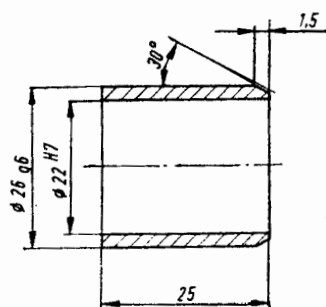
9.18. Clutch assembling fixture

05-MV 150-2



Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Bush	C 15	$\varnothing 30 \times 30$	case hardened
2	1	Retaining pin (crankshaft end 05-43.058)	16 MnCr 5	$\varnothing 32 \times 160$	hardened
3	1	Support	MSt 3	$\varnothing 85 \times 55$	TGL 0-7
4	3	Receptacle	MSt 3	$30 \times 8 \times 35$	
5	1	Thrust piece	C 45	$\varnothing 30 \times 95$	
6	1	Nut	C 45	$\varnothing 45 \times 45$	
7	2	Handle	St 37 K	$\varnothing 10 \times 80$	
8	3	Stud	C 15 K	$\varnothing 10 \times 55$	TGL 0-934 TGL 0-9045 TGL 0-417
10	1	Cylindrical pin $8 \text{ m } 6 \times 60$			
11	6	Hexagon nut M 8			
12	1	Circlip 22×2			
13	1	Stud M 8×25			

Part 1

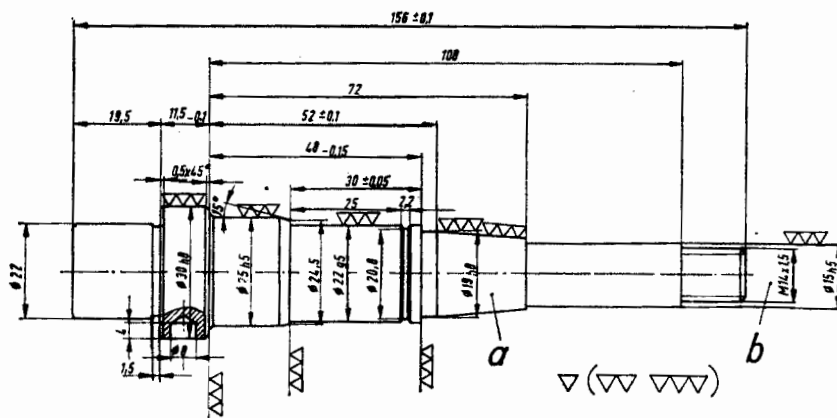


case hardened and ground

Fits Allowances

22_{H7}	+0.021
26_{g6}	0
	-0.027
	-0.020

Part 2

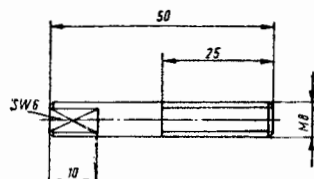
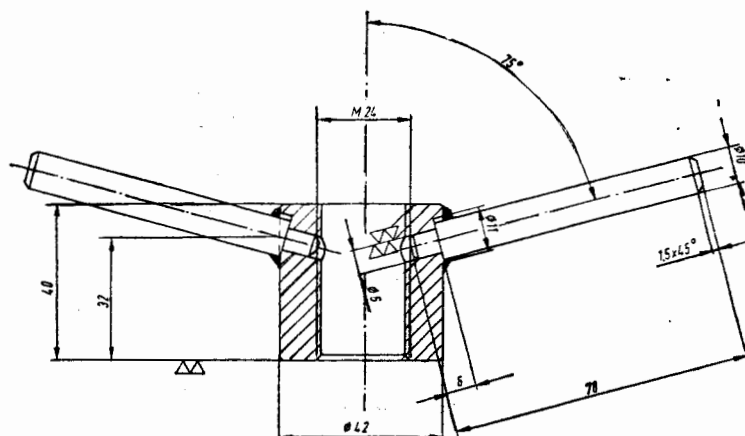


hardened and ground

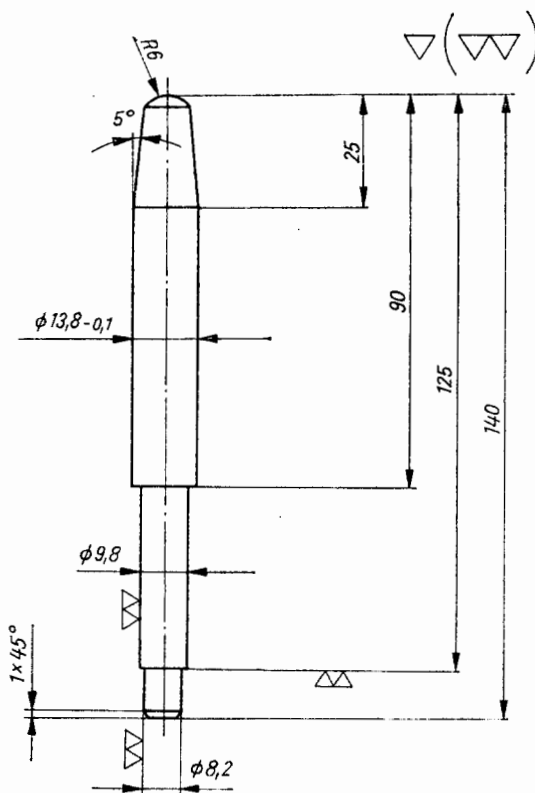
Fits Allowances

(a) taper 1 : 10
(b) soft thread

30_{h8}	0
25_{h5}	-0.033
22_{g5}	0
19_{h8}	-0.009
15_{h5}	-0.007
	-0.006
	0
	-0.033
	0
	-0.008



9.19. Drift (fitting sleeve)
11-MW 3-4

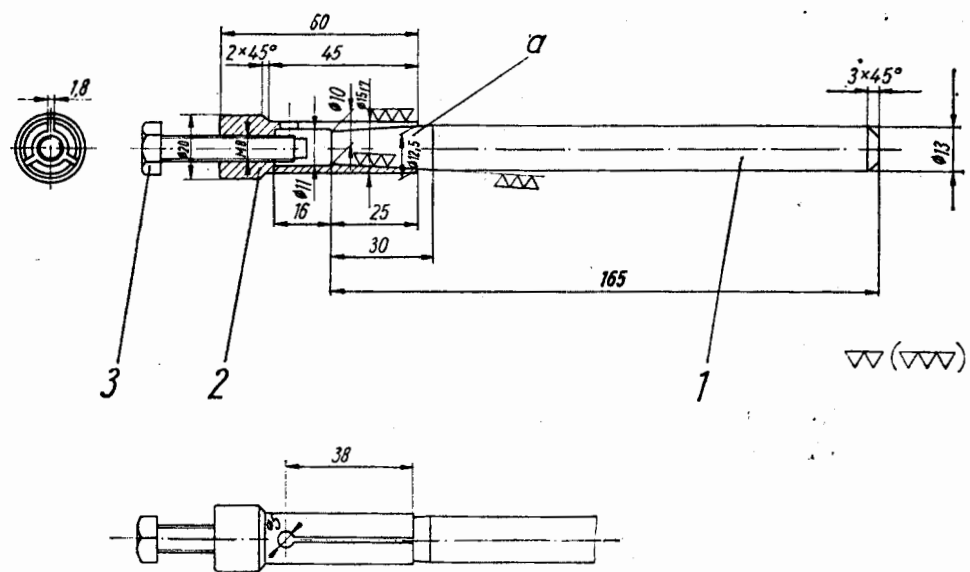


Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Drift	C 15	Ø 15 × 145	case hardened

9.20.

Wheel bearing expanding mandrel

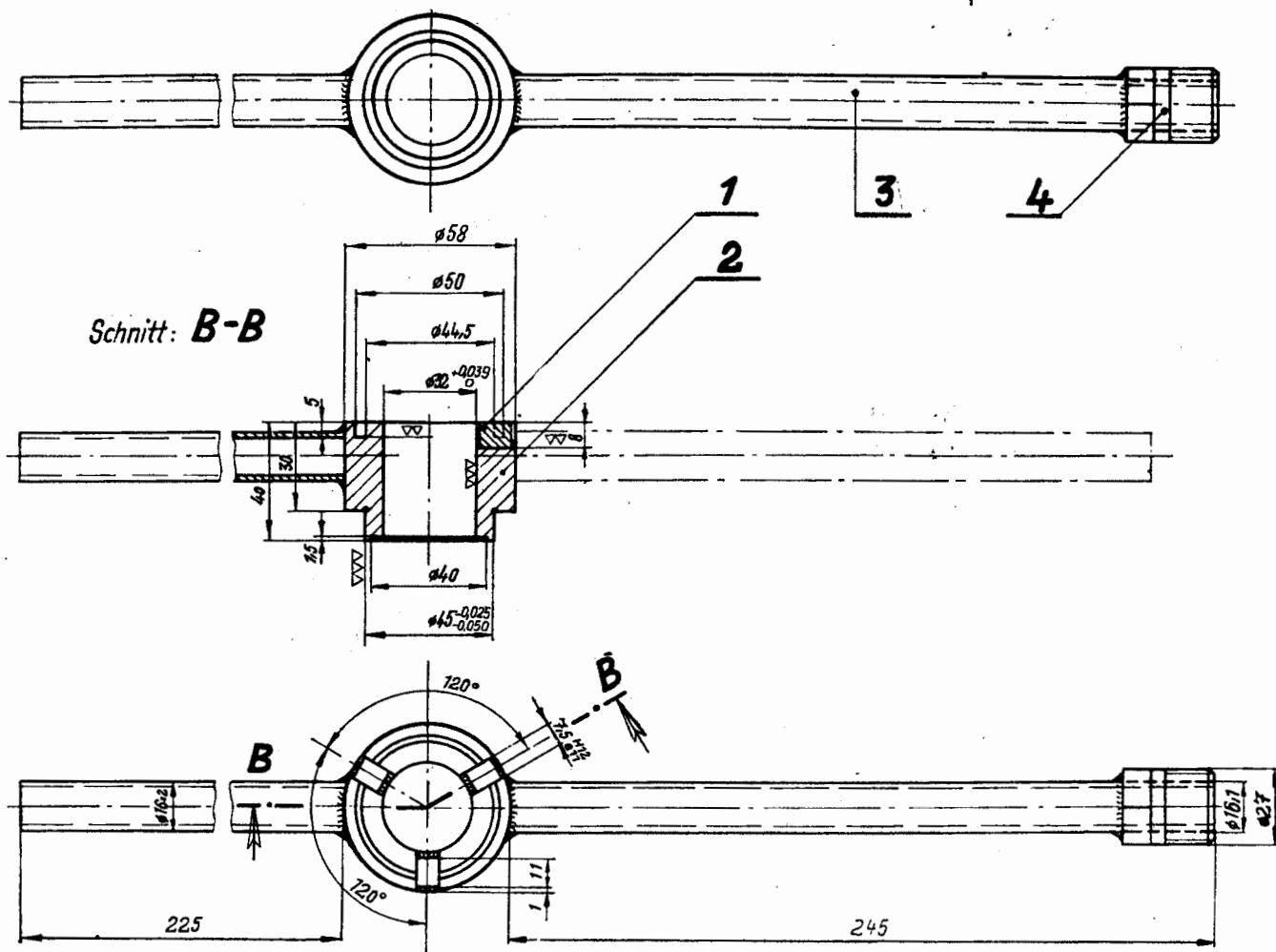
H8-820-3



(a) taper 1 : 10

Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Drift	C 15	Ø 15 × 170	case hardened
2	1	Expanding sleeve	67 SiCr 5	Ø 23 × 65	hardened
3	1	Hexagon head screw M 8 × 45	— 4 D		TGL 0-561

9.21. Wrench for telescopic fork
19-MW 22-1

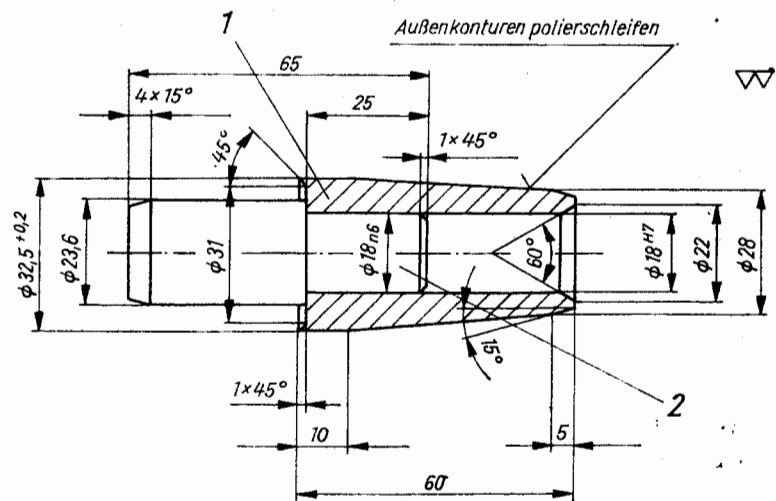


Schnitt B-B = Section B-B

Fits	Allowances
7.5 _e 11	-0.08
	-0.17
7.50 ^H 12	+0.15
	0

Part	Quantity	Description	Material	Rough Size	Remarks
1	3		C 45	8 × 8 × 15	} welded part
2	1		C 45	Ø 60 × 45	
3	2		Pipe St 35		
4	1	Use screw plug 19-22.073 (M 27 × 2)			

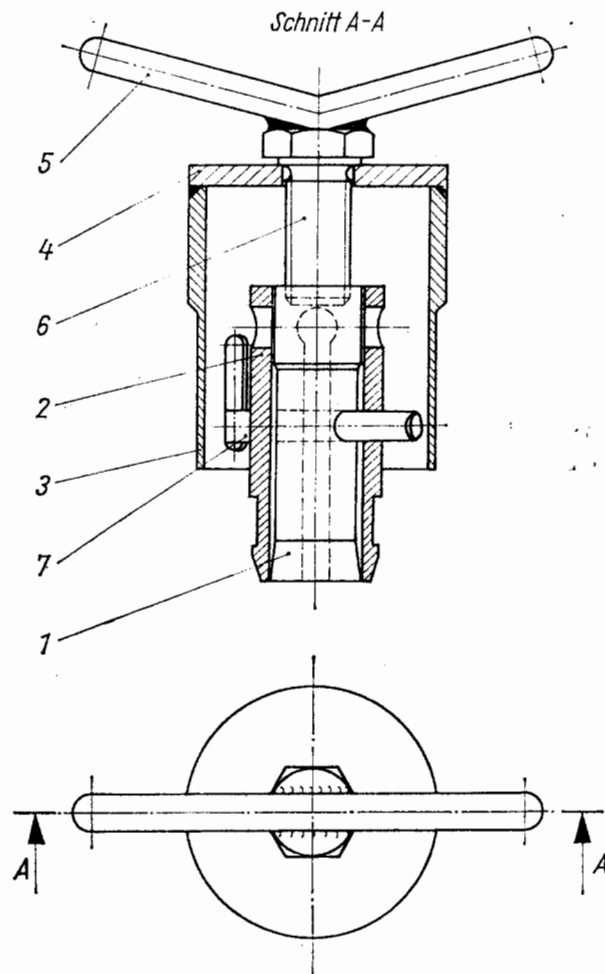
9.22. **Fitting sleeve**
 22-51.403



Außenkonturen polierschleifen = Outer contours to be abrasive belt polished

Part	Quantity	Description	Material	Rough Size	Remarks
1	1	Sleeve	C 45	Ø 36 × 65	annealed
2	1	Mandrel	Al Mg 5 F 24	Ø 28 × 70	80 kg/mm ²

9.23. Extractor
22-51.006

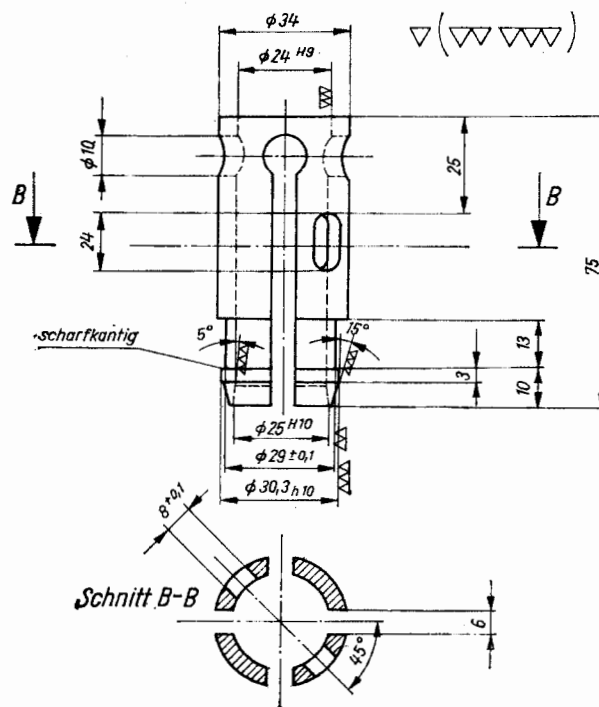
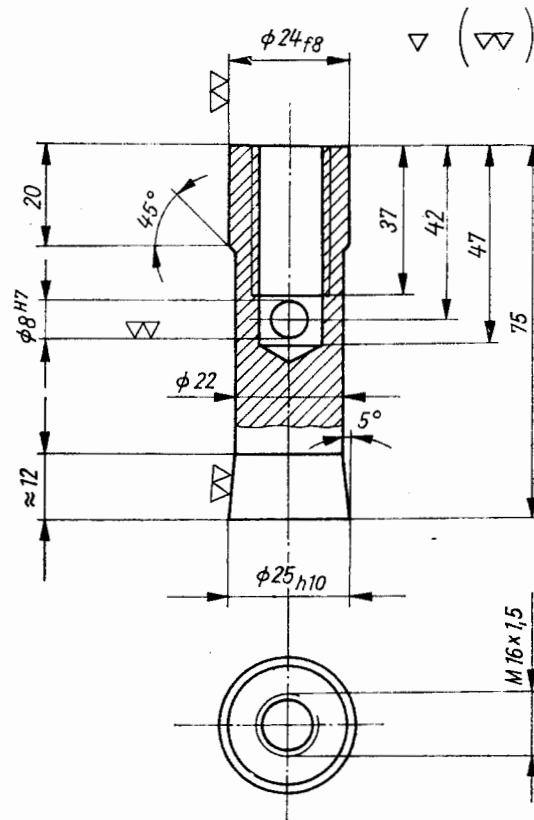


Fits	Allowances
25 ^{H10}	+0.084
25 _{h10}	0
24 ^{H9}	-0.084
24 _{f8}	+0.052
	0
	-0.020
	-0.053

Schnitt A-A = Section A-A

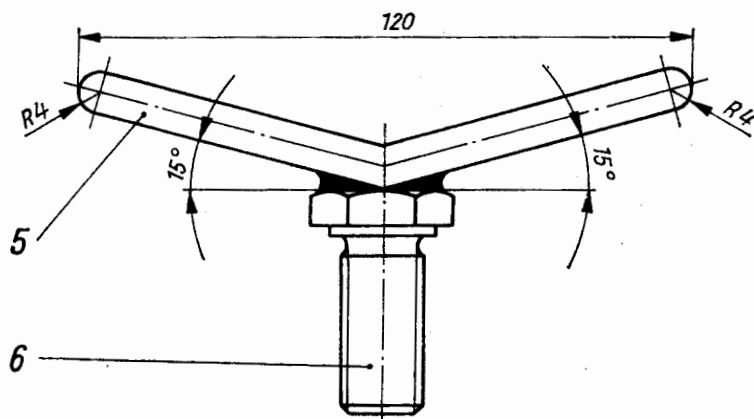
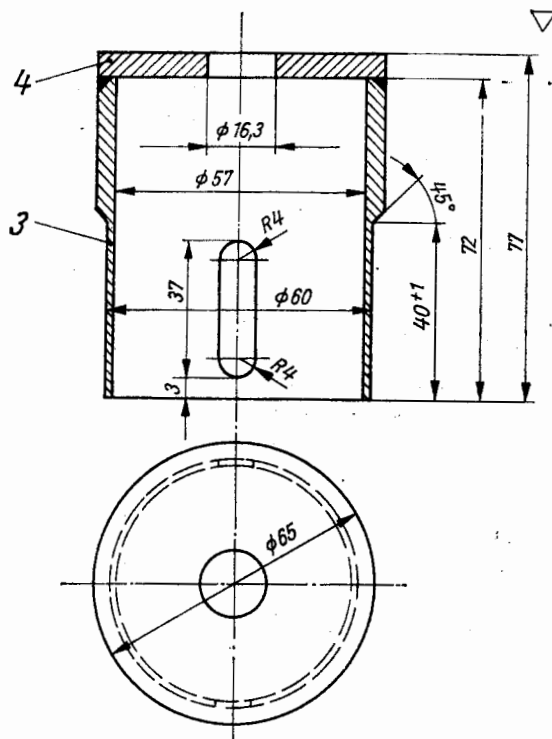
Part	Quantity	Description	Material	Rough Size	Remarks
1	1	TGL 7970	C 45	Ø 30 × 80	annealed
2	1	TGL 7970	67 SiCr 5	Ø 40 × 80	hardened
3	1	TGL 9012	St 35 hb	75 long	
4	1	Pipe Ø 75 × 10	St 38 b-2	Ø 65 × 10	
5	1	TGL 7970	St 38 K	Ø 8 × 130	bent
6	1	Hexagon head screw			
		M 16 × 1.5 × 35 TGL 0-961			
7	1	Cylindrical pin 8 m 6 × 90			
		TGL 0-7			

welded
part



Schnitt B-B = Section B-B
scharfkantig = edges sharp

Fits	Allowances
8_{H7}	$+0.015$
30.3_{h10}	-0.084



10. Conversion Table

1 Inch (") = 25.4 mm

(There has been no difference between the U.S. and Imperial inch for most engineering purposes since July 1st, 1959.)

1 Mile = 1.61 km

a) Conversion of millimetres to inches

1 mm = 0.0394"

0.5 mm = 0.0197"

0.1 mm = 0.0039"

0.01 mm = 0.0004"

b) Conversion of fractional inches to millimetres

1/64" = 0.397 mm

1/32" = 0.794 mm

1/16" = 1.588 mm

1/8 " = 3.175 mm

1/4 " = 6.350 mm

1/2 " = 12.700 mm

c) Conversion of kilometres to miles

1 km = 0.621 miles (1 mile = 1.61 km)

d) Conversion of litres to pints

1 U.S. gallon = 3.785 litres (l)

1 U.S. pint = 0.4732 litres

1 Imperial gallon = 4.546 litres

1 Imperial pint = 0.5682 litres

Annex

Repair Manual for the MZ-Motor-cycle

TS 250/1

and the Telescopic Fork with
Aluminium Sliding Tube

With 39 illustrations

The present Repair Manual is intended for imparting the absolutely necessary knowledge required for repairing the 5-speed gearbox and the new telescopic fork until the comprehensive Repair Manual for the TS 250/1 will be published. Operations and data not included in the instructions below should be looked up in the Repair Manual for the TS 250. The numbering of the Clauses of the present repair instructions corresponds to that of the above-mentioned Repair Manual.

They were written by a team of engineers in the employ of VEB Motorradwerk Zschopau.

1. Technical Data

1.1. Engine MM 250/4

Crankshaft main bearings
Lubrication of main bearings

2 bearings 6304 TNG C 4 f
petroil lubrication

1.2. Carburettor

Main jet
Needle jet
Slow-running air screw

135
70 (without cross bore)
open for one revolution

1.4. Gearbox

1st speed 1 : 3.0
2nd speed 1 : 1.87
3rd speed 1 : 1.33
4th speed 1 : 1.05
5th speed 1 : 0.87

1.5. Power Transmission

Gear ratio gearbox/rear wheel

20 : 47 teeth = 1 : 2.35 solo
16 : 47 teeth = 1 : 2.94 side-car design

1.8. Capacities

Gearbox
Telescopic

900 cm³ of gear oil
fork 230 cm³ of damping fluid per prong
± 280 mm oil level

2. Fuel, lubricants and fluids

2.6. Shock-absorber filling

As damper fluid, a mixture of 45 parts of shock-absorber oil, viscosity 8 to 11 cSt at 50 °C, and 1 part of molybdenum disulphide oil suspension according to the B TGL 10 596, Sheet 3, specifications should be used. In foreign countries similar products should be used.

3.2. Dismantling the Engine

3.2.3. Disassembly of the Primary Drive

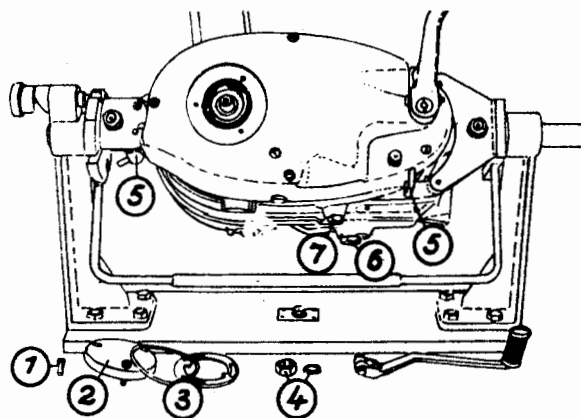


Fig. 1

- (2) Cover — in the deluxe model with incorporated drive for speedometer
- (4) Hexagon nut M 14 × 1.5 with spring washer 14 TGL 0-137 (29-48.102 drive wheel for speedometer of deluxe model)
- (6) Oil drain screw plug
- (7) Gear detent

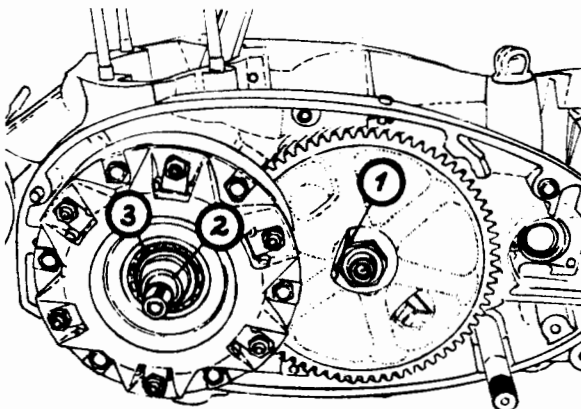


Fig. 2

- (1) Turn down the lock plate
- (2) Apply clutch puller with screw thread M 24 × 1.5 (parts 8 and 25 of tool 22-50.420) to this part. **Notice!** At its threaded end, the crankshaft is provided with a centring collar. Push off the crankshaft only by means of an exactly fitting intermediate piece (part 25 of 22-50.420)
- (3) Clutch thrust bearing 16005 TGL 2981.

3.2.5. Pulling-off the Right-hand Casing Half

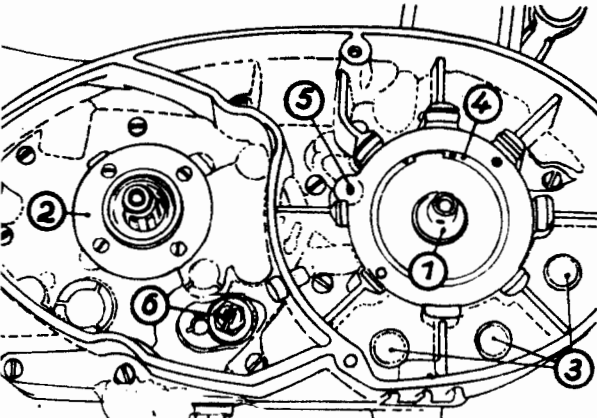


Fig. 3

- (1) Remove the cylindrical roller for fixing the position of the dynamo armature
- (2) Remove the sealing cap
- (3) Remove the rubber plugs
- (4) Remove the circlip for fastening the packing ring
- (6) Idling contact is left in its place

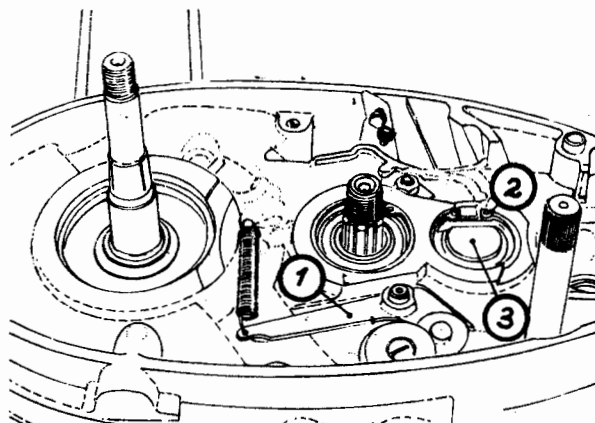


Fig. 4. Before separating the casing halves, remove catch lever (1), circlip (2) and cap for output shaft (3) in order to prevent damage to the gear-shift cylinder.

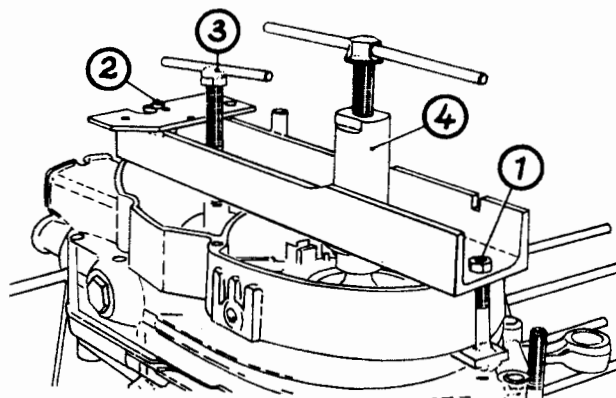


Fig. 5. Pulling off the right-hand casing half by means of tool 22-50.420, parts 1 and 8 (4). Properly tighten fastening screws (1) and (2). Uniformly tighten the separating screws (3) and (4).

3.2.6. Removal of the Gear

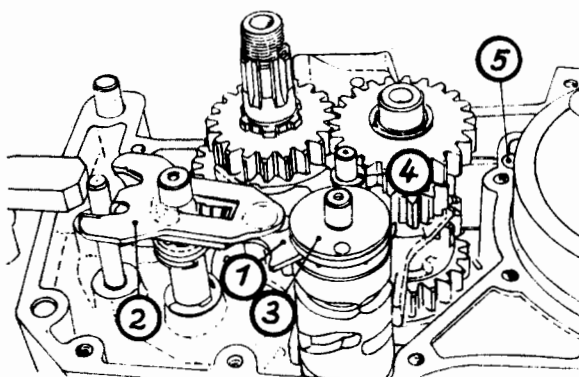


Fig. 6

- (1) Press the gear-shift arm in the direction of the gear-shift shaft
 - (2) Draw out gear-shift shaft with gear-shift member, in this operation
 - (3) do not damage insulating washer for idling switch
 - (4) Remove washer and
 - (5) remove oil guide disk (rubber).
- Then remove the gear detent screw (7 in Fig. 1), draw out the gear-shift cylinder and beat the gear shafts out of their seats.

3.3. Checking for Wear
3.3.1.2. Gear shift mechanism

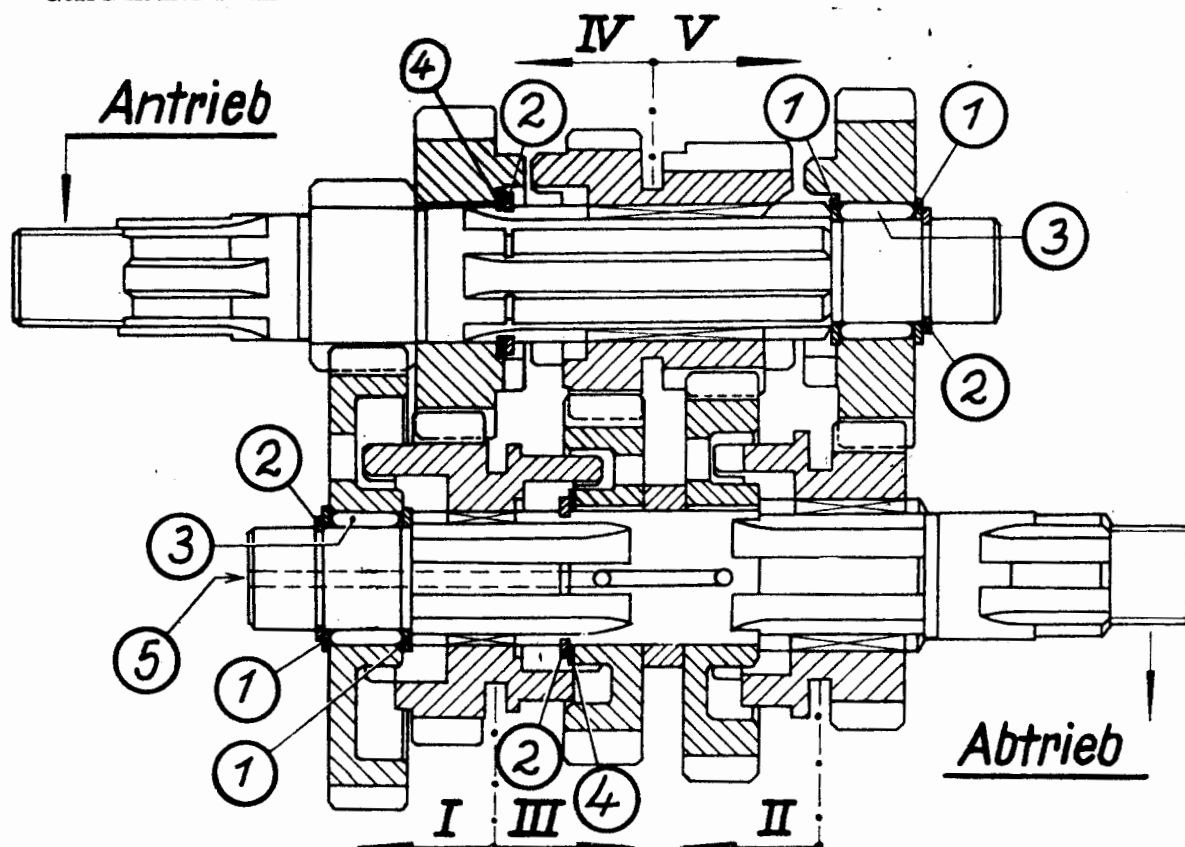


Fig. 7. Gear-shift mechanism

- (1) Spacing washer
- (2) Circlip — check for tight fit
- (3) Bearing needles 2.5×11.181 TGL 15 518 — 24 needles (the same allowance applies to all needles)

- (4) Thrust washer (with grooved section)
- (5) Bore-hole for oil supply to the gears for IInd and IIIrd speeds, check for cleanliness

Antrieb = Drive
Abtrieb = Driven end

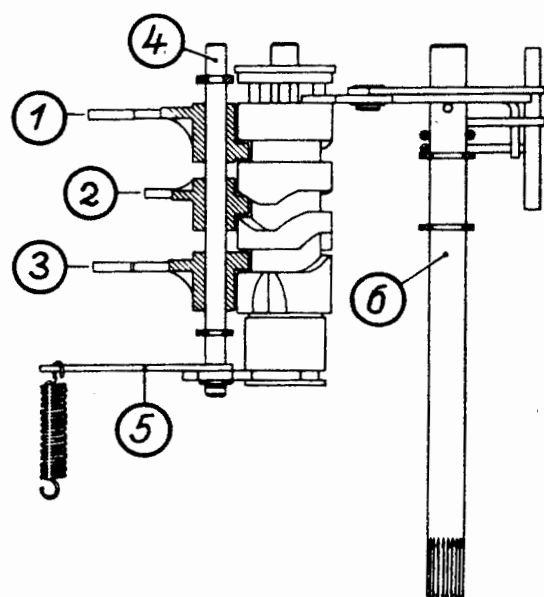


Fig. 8. Gear-shift actuation (cam cylinder, selector forks)

- (1) Selector fork IInd speed (012)
- (2) Selector fork IVth — Vth speeds (011)
- (3) Selector fork Ist to IIIrd speeds (010)
- (4) Guide pin
- (5) Detent lever
- (6) Gear-shift shaft with gear-shift arm and return spring.

4.2. Assembling the Left-hand Casing Half

4.2.1. Mounting the Gearbox and Crankshaft Bearings

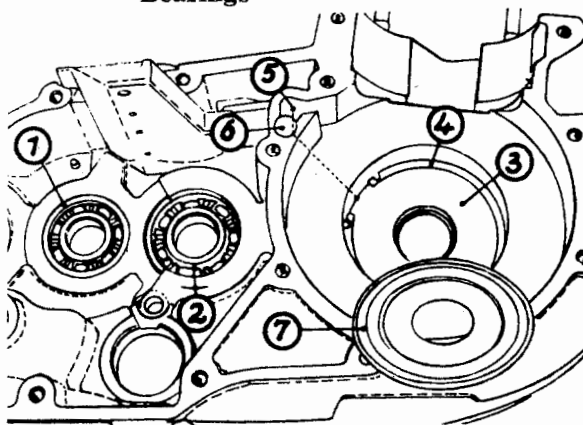


Fig. 9

- Assembling the left-hand casing half (100 °C)
Mount circlip (4), cap for drive shaft (3) and sealing plate (2) (Fig. 17) and
- (1) bearing 6203
 - (2) Force bearing 6204 in place, pressing from outside towards the inside
 - (3) Radial seal ring — lip towards the outside, to be mounted after assembling the engine by means of mandrel and sleeve (29-50.409).
 - (4) Circlip — open side towards oil feed (5)
 - (6) Insert the oil separating disk (rubber) (oil distributor)
 - (7) Oil guide disk — recessed portion towards seal ring, punch mark towards oil feed.

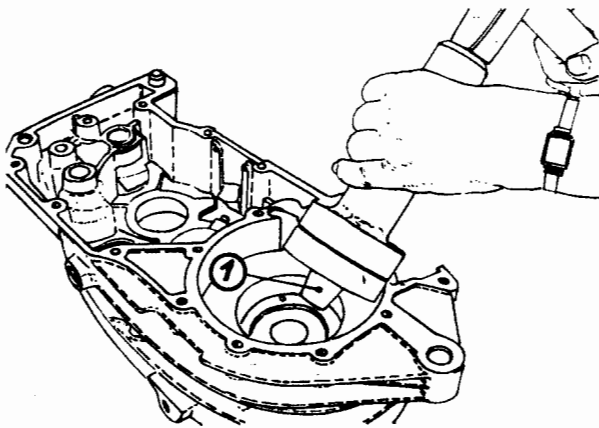


Fig. 10
Mount bearing 6309 C4f by means of fitting mandrel. (1) centring the oil guide disk. Then heat bearing inner ring by means of heating mandrel and mount the crankshaft.
(1) Fitting mandrel 29-50.405

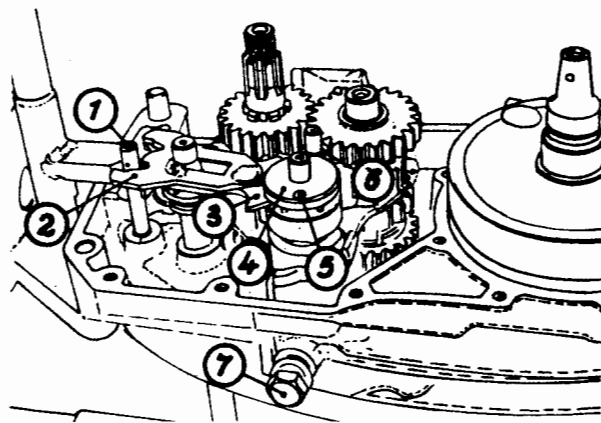


Fig. 13
(1) Gear-shift stop — pressed down to a distance of 57 — 1 mm from separation surface of casing
(2) Inserting the gear-shift shaft, pushing back the gear-shift arm (3)
(4) Insulating washer — do not damage it!
(5) Idling contact
(6) Place washer 8 × 1.5 on guide pin
(7) Gear detent screw with packing ring, spring and ball — acting on neutral position only.

4.2.3. Mounting the Gearbox

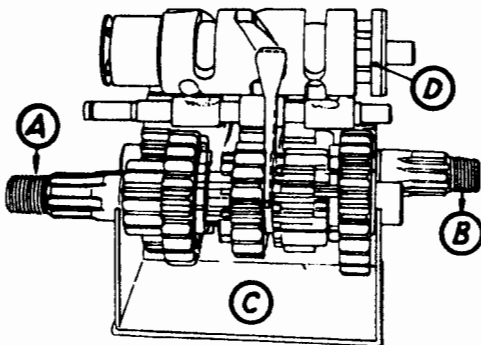


Fig. 11
Pre-assemble the gear set together with gear-shift cylinder
(A) Drive shaft
(B) Driven shaft
(C) Assembling container 29-50.011
(D) Gear-shift cylinder
Take Fig. 7 into consideration! Take care that the circlips fit tightly.

4.3. Mounting the Right-hand Casing Half

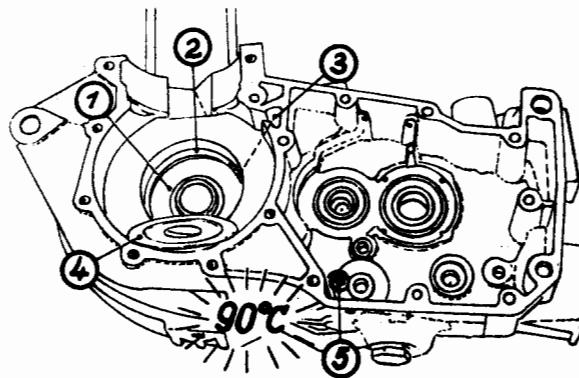


Fig. 14
Heat the casing half about 100 °C
(2) Inserting the circlip — opening points to
(3) oil catch-pocket with oil bore-hole
(4) Place oil guide disk on its seat and press bearing 6306 in place, using the pushing tool 29-50.405.
Mount the casing half.

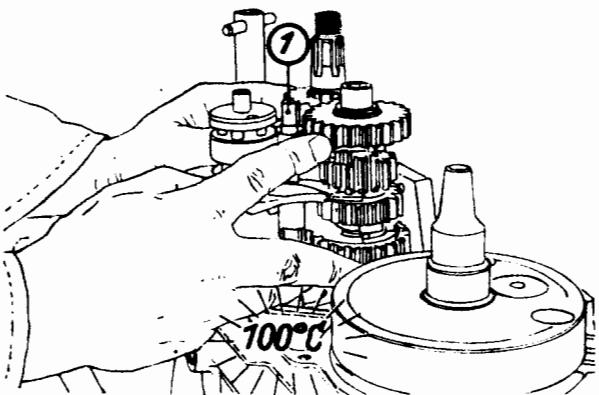


Fig. 12
Place washer 8 × 13 × 1.5 for guide pin (1) in the left-hand half of casing. Place the complete gear set into the casing.

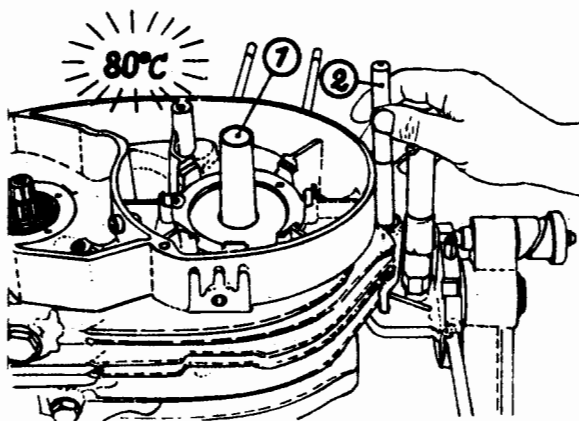


Fig. 15
Drive in the fitting sleeve with mandrel 11 MW 3-4 (2), bolt the casing
Then mount the radial seal ring (Fig. 14/1), using the fitting tool 29-50.406.
(1) Fitting sleeve of tool 29-50.406.

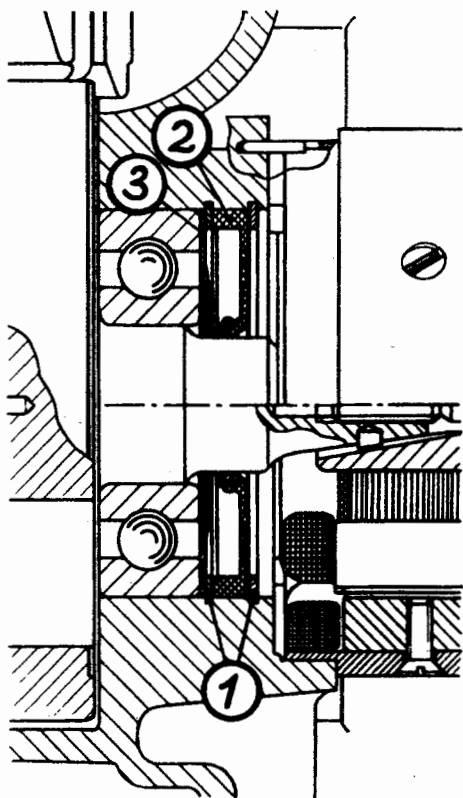


Fig. 16
Mounting the radial seal ring (2) and the oil guide disk (3)
The radial seal ring is retained by the circlip (1). The sealing lips of the radial seal rings at dynamo and clutch side point to the left
The oil guide disk (3) always contacts the outer ring of the bearing.

4.5. Mounting the Primary Drive

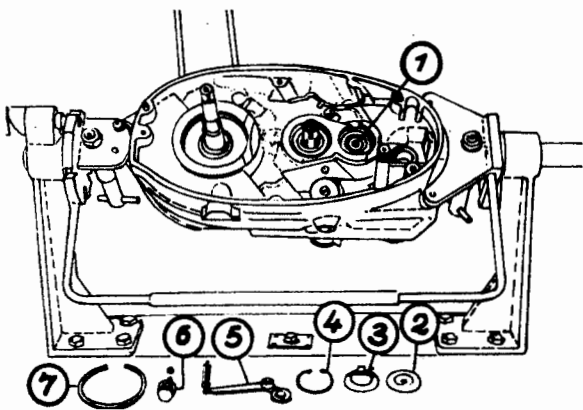


Fig. 17
(1) Oil hole in the output shaft for lubricating the gears of the 2nd and 3rd speeds
(2) Sealing plate for output shaft
(3) Cap for output shaft
(4) Circlip — open side towards the top
(5) Detent lever with spring
(6) Gear detent screw
(7) Circlip for crankshaft bearing and radial seal ring.

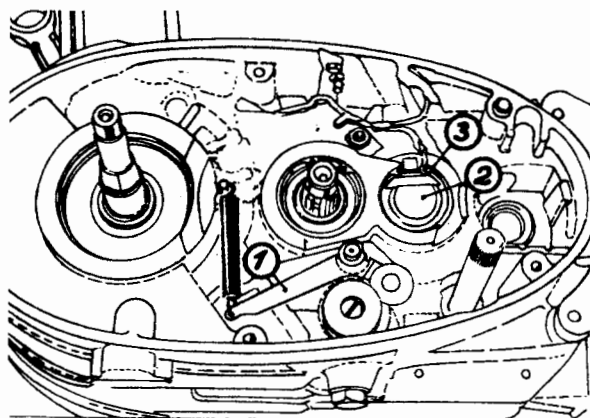


Fig. 18
(1) Gear detent lever in the mounted position
(2) Cap of the drive shaft
(3) The opening of the circlip must point upwards otherwise no oil will flow into the cap (2).

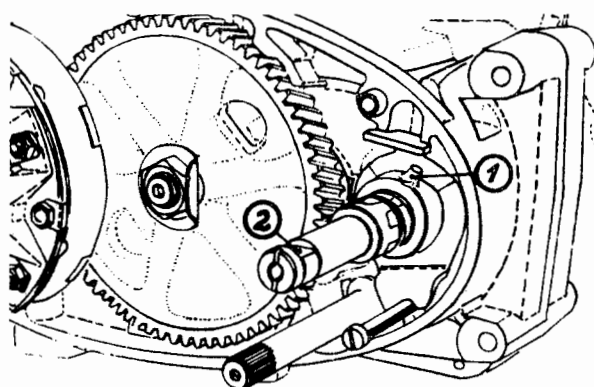


Fig. 19
Mounted position of the kick-starter shaft (2) relative to the dog for the kick-starter gear (1)

Notice! Clutch actuation in the case of the MM 250/4 engine is effected via the inner ring of the 16 005 grooved ball bearing according to the TGL 2981 specifications. The drive gear with internal dog is not exchangeable with the design intended for the MM 250/3

Only mount kick-starter gears with a chamfer of 15° at the face of the teeth.

5. Cycle Parts

5.5. Telescopic Fork

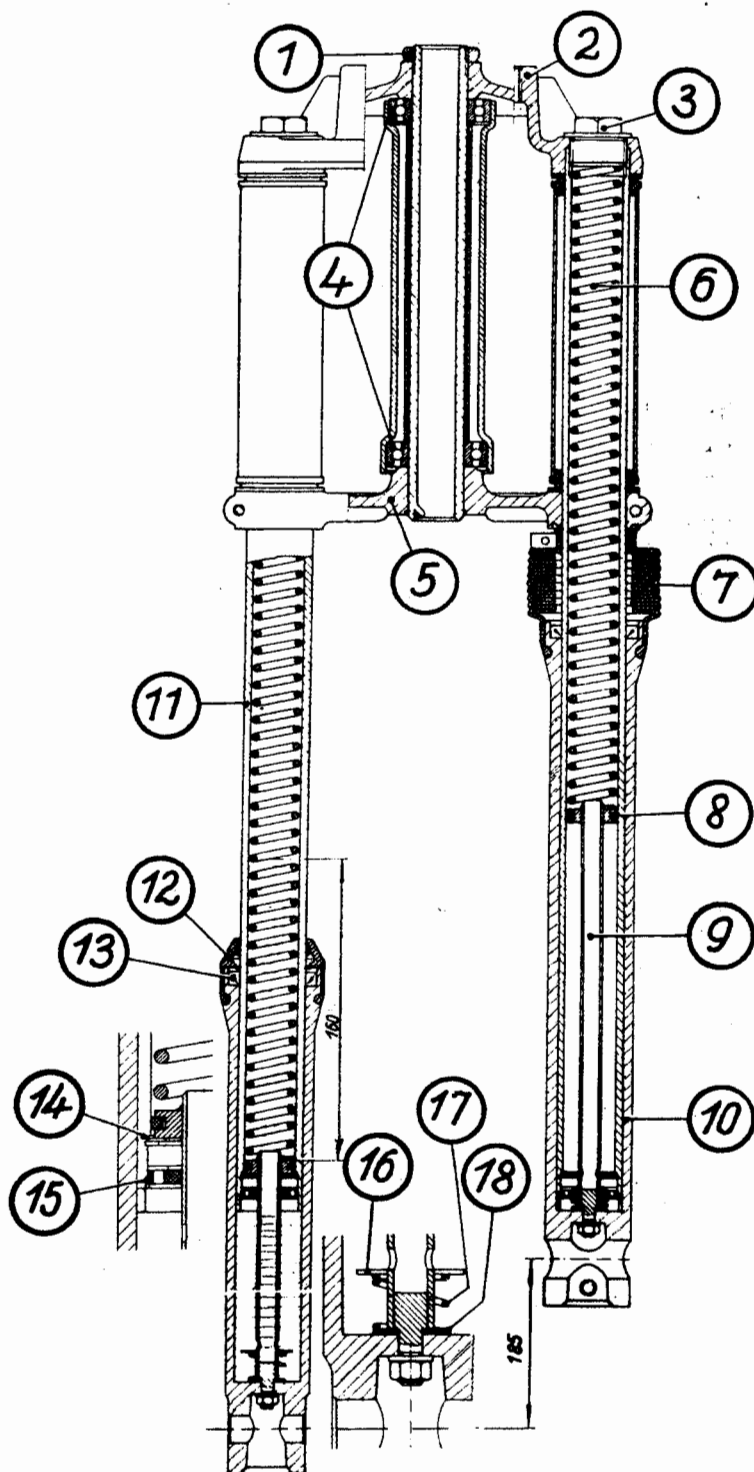


Fig. 20
Sectional view of telescopic fork — Legend in Replacement
Parts Catalogue.

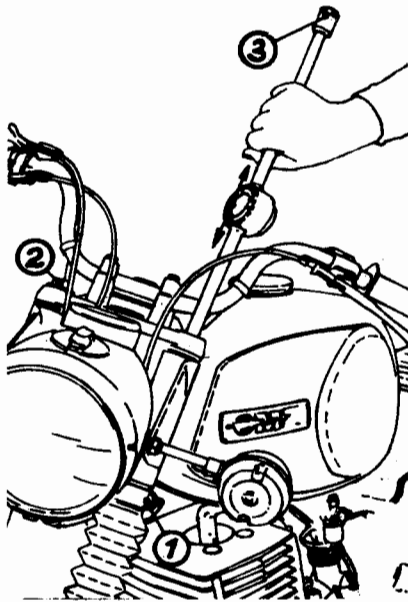


Fig. 21

Remove the guide tube and mount it again. In addition to the 27×2 threaded plug, weld a 30×1.5 threaded plug to the fitting spanner 19 MW 22-1.

(It can be made of the screw plug 22-22.294 (2) by turning off the collar down to the diameter of the screw thread.)

(1) Clamping screw for guide tube

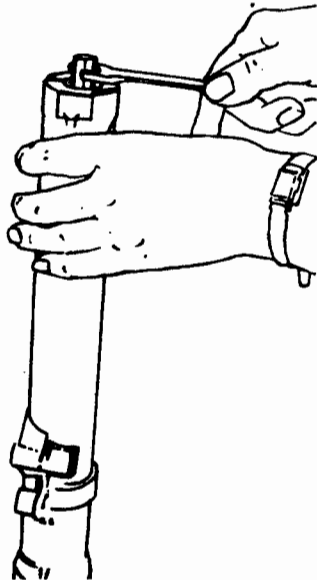


Fig. 22

Using a socket wrench having a width over flats of 10, loosen the nut and remove the nut, the corrugated washer and the annular ring. If, during loosening or tightening the nut, the supporting tube is caused to rotate (Fig. 20/9), retain this tube by means of a screw driver put through the socket wrench.

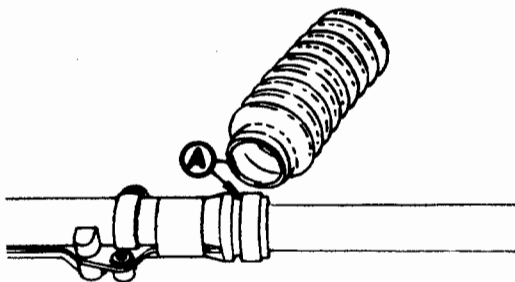


Fig. 23

Pull off the protective bellows — this also applies to the protective cap

Fitting instructions

Wipe groove (A) so that it is perfectly clean in order that protective bellows and cap are properly retained in position. The vent hole in the protective bellows must point to the rear.

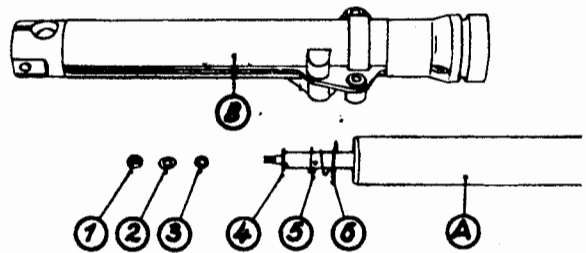


Fig. 24

Pull the guide tube (A) out of the slide tube (B).

(1) Nut M 6

(2) Spring washer 6

(3) Annular ring 6×2 of rubber

(4) Omitted

(5) Compression spring 19 mm in diameter

(6) Washer for end stop

Notice! When clamping in a vice, slide tube (B) should only be clamped at the axle accommodation part, guide tube (A) only between soft protective jaws.

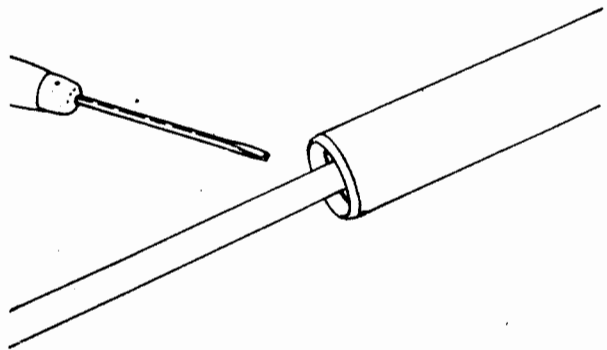


Fig. 25

Lift the annular ring 33×1.8 out of its seat by means of a screw driver.

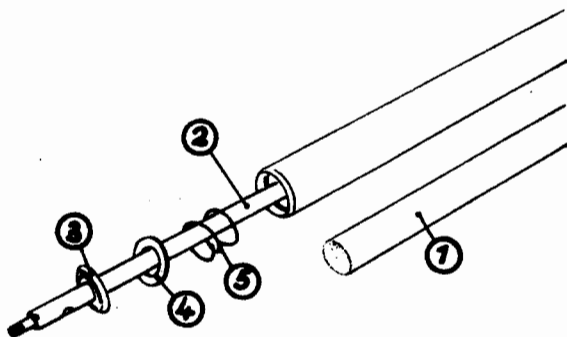


Fig. 26

Using a piece of pipe (1) having a length of about 600 mm, push the supporting tube (2) out of the assembly. Remove the throttle (3) of Miramid, the valve washer (4) and the compression spring (5) having a diameter of 27 mm. Push back the supporting tube.

Fitting instruction

The chamfer of the throttle (3) points to the annular ring 33×1.8 , the face-ground side of the valve washer must contact the throttle. When fitting, these two parts must be free from any scratches and the meeting faces properly plane!



Fig. 28

A detailed line drawing of a fuel nozzle assembly. Label 1 points to the nozzle tip, and label 2 points to the nozzle body. The nozzle is shown in a vertical orientation, with a fuel line connected to the bottom. The nozzle body has a series of horizontal ridges or bands. The nozzle tip is a separate component that fits into the nozzle body.

Fig. 29

9. Drawings of Special Tools

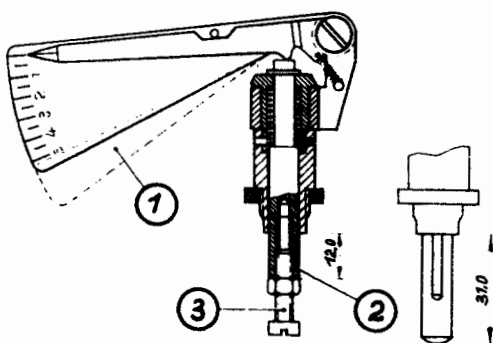


Fig. 29/1

Ignition timing gauge 29-50.801

9.1. Special Tool 22-50.420 (Figs. 31 to 38)

Fig. 30

Fitting container 29-50.011

99

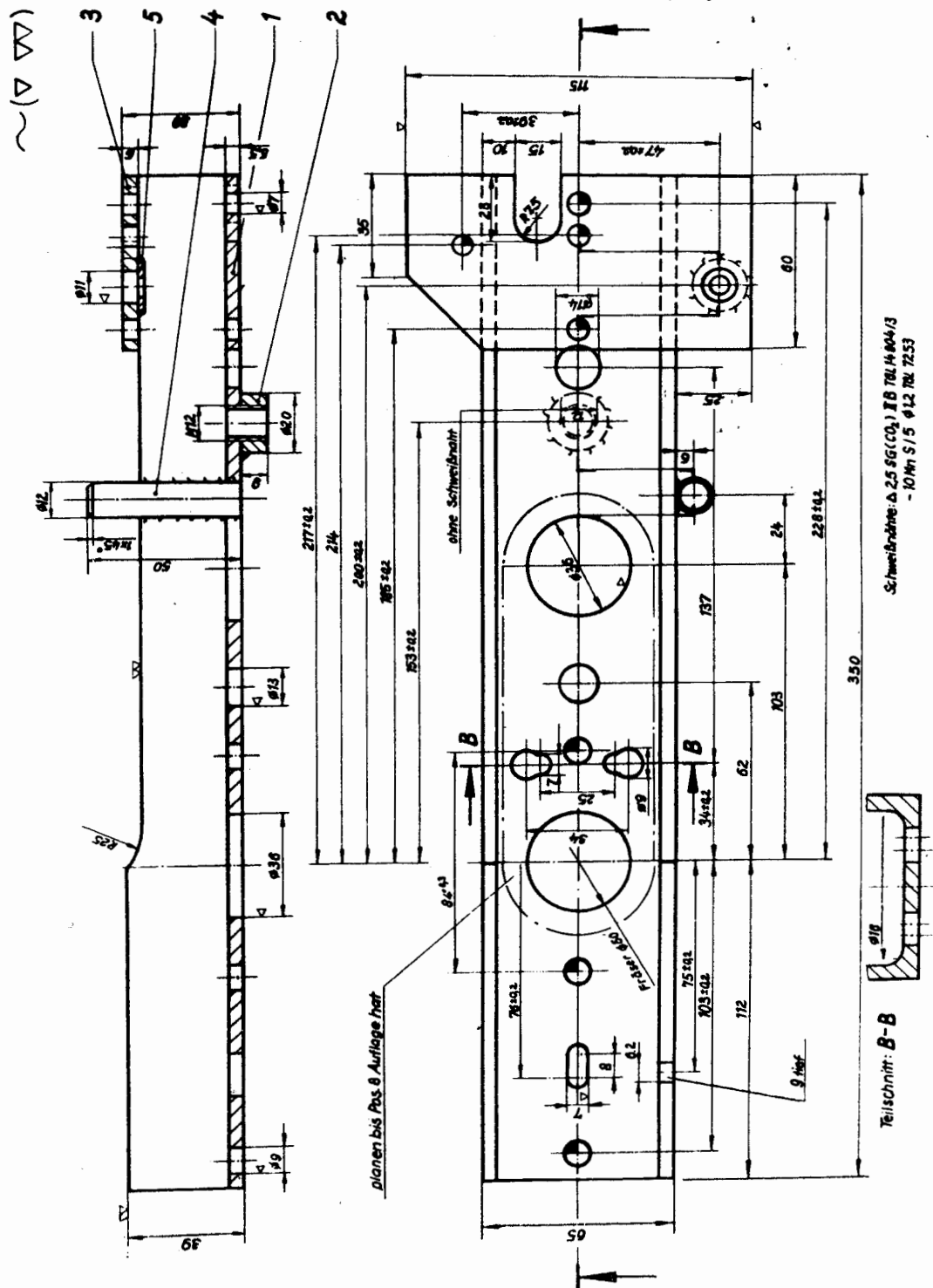


Fig. 31. Basic body of 22-50.420

Bild 31 Werkstoff St 38 u
planen bis Pos. 3
Auflage hat
ohne Schweißnaht

Fig. 31 Material St 38 u to be faced until item 8 makes proper contact without welding seam

Fräser Ø 50
9 tief
Teilschnitt: B-B
Schweißnähte: . . .

milling cutter 50 in dia.
9 deep
Partial section: B-B
Welding seams: . . .

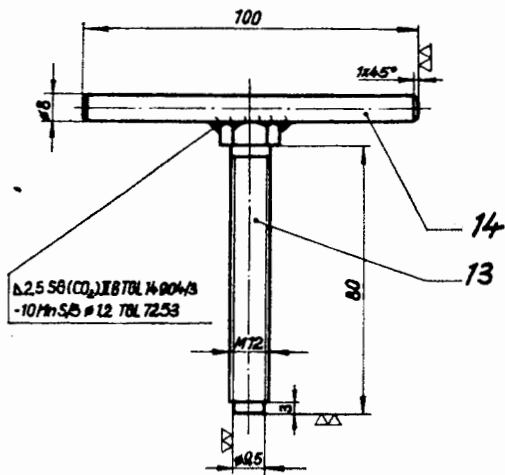


Fig. 32

The M 12 × 80 separating screw is used according to the representation of Fig. 37 or, screwed into the basic body (threaded part item 2), for pressing off the right-hand half of the casing at the drive shaft.

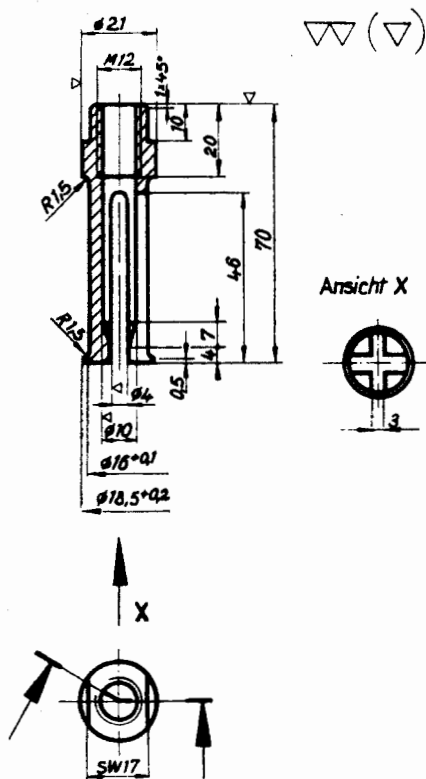


Fig. 33

Part 12 of 22-50.420, use according to Fig. 37

Bild 33 Werkstoff C 60
Ansicht X
SW 17

Fig. 33 Material C 60
View X
Width over flats 17

Bild 34 Werkstoff C 45
vergüten
SW 24

Fig. 34 Material C 45
to be annealed
Width over flats 24

Bild 35
Bund entgraten
Achse 22-25.003 verwenden
Loch bohren
Ø 14 drehen
Ansatz drehen
Gewinde schneiden

Fig. 35
collar to be deburred
Axle 22-25.003 to be used
Hole to be drilled
Ø 14 to be turned
Lug to be turned
Thread to be cut

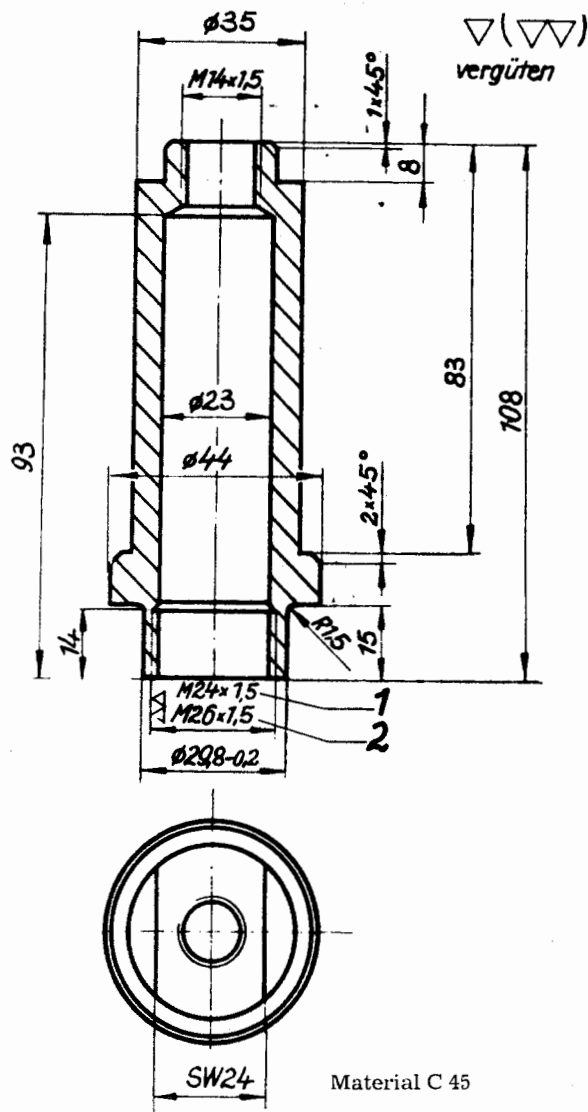


Fig. 34

Part 8 of 22-50.420, used together with part 9 (Fig. 35) for pushing off the right-hand half of the casing at the crankshaft or for pushing off the clutch (in the case of the MM 250/4 with thread M 24 × 1.5)

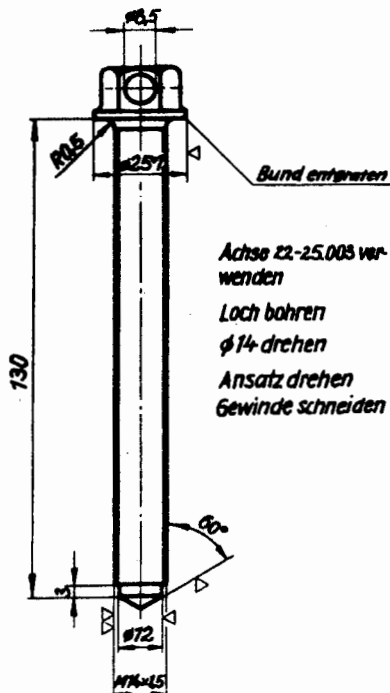


Fig. 35

Part 9 of 22-50.420, for use see text regarding Fig. 34

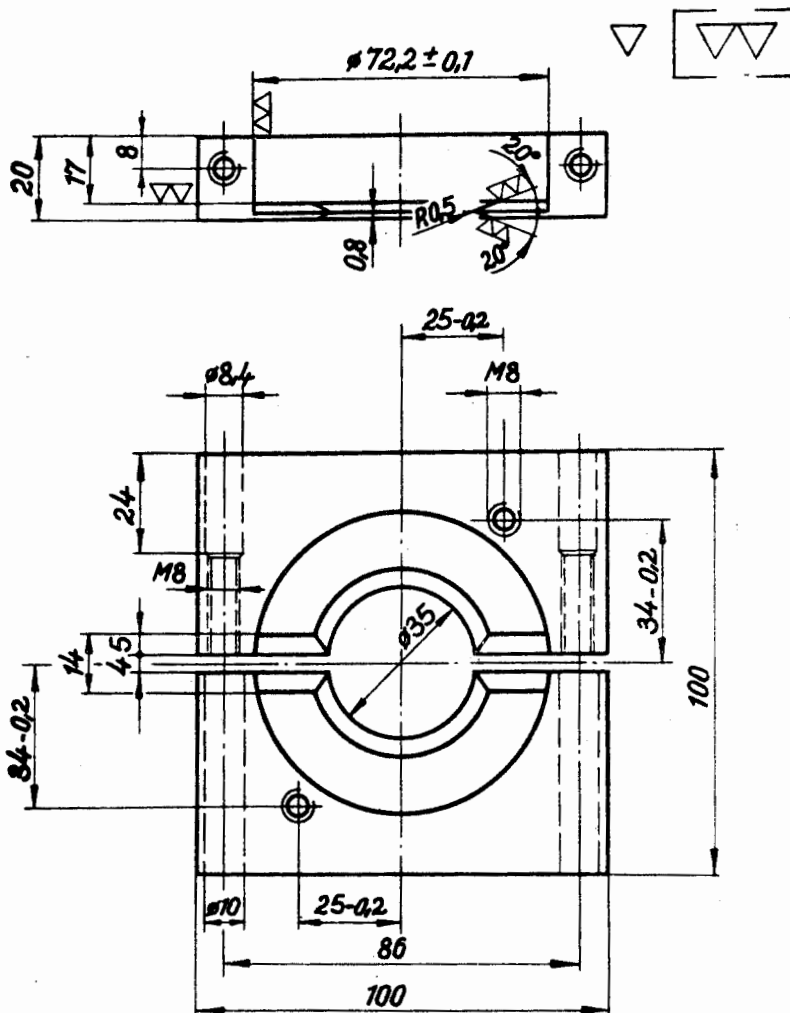


Bild 36
Werkstoff 90 Mn Cr 5

Fig. 36
Material 90 Mn Cr 5

Fig. 36
Part 10 of 22-50.420, used for pushing off the bearing 6306 from the crankshaft. The halves of the tool in the vice must be pressed over and/or behind the bearings; then tighten the two

M8 × 100 screws, thus pre-tensioning the assembly and, by uniformly tightening two M8 × 55 screws (pin at the end of the screw thread), against the crank disks of the crankshaft, press off the bearings.

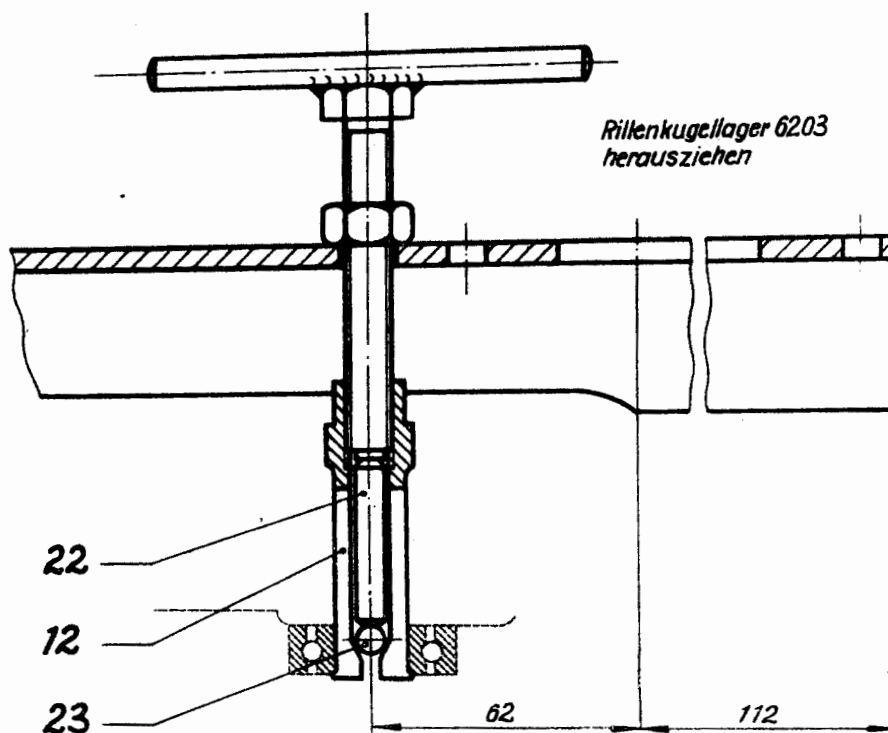


Bild 37
Rillenkugellager 6203
herausziehen

Fig. 37
Grooved ball bearing 6203
to be extracted

Fig. 37
Pull out the 6203 grooved ball bearing

(22) Cylindrical pin 10 m 6 × 40 TGL 0-7
(23) Steel ball 9 IV TGL 15 515

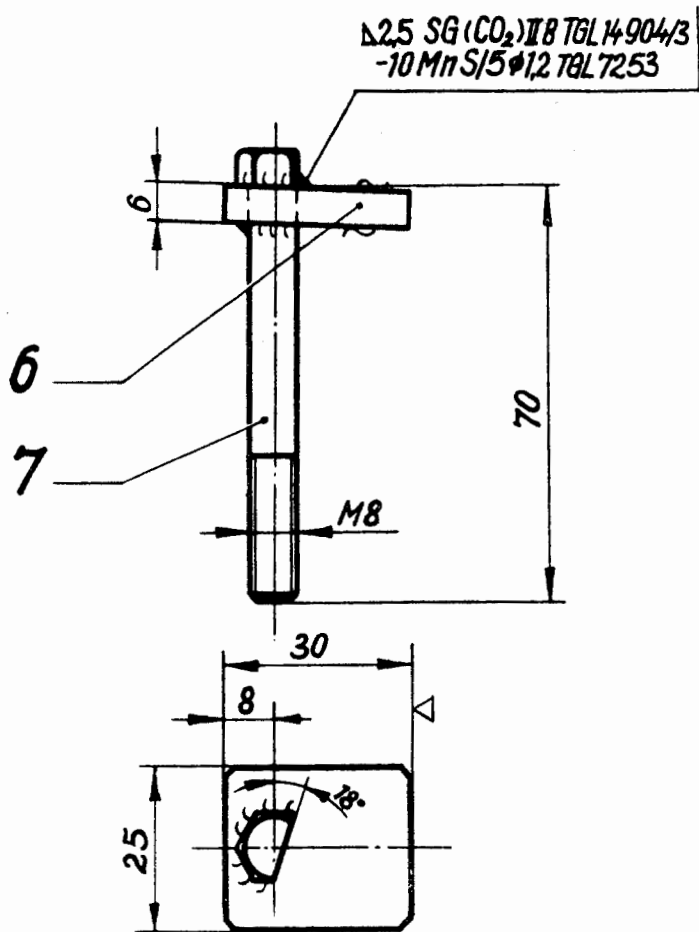


Fig. 38

Tightening element for holding the basic body in position at the engine

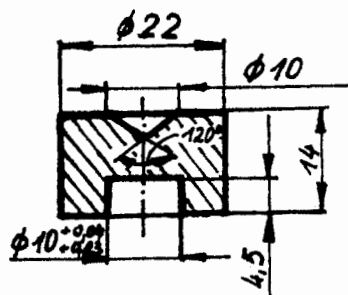


Bild 38

Teil 25 von 22-50.420
 Werkstoff C 45 k,
 gehört zum Teil 8
 Kupplungsabzieher

Fig. 38

Part 25 of 22-50.420
 Material C 45 k,
 belongs to part 8
 clutch puller

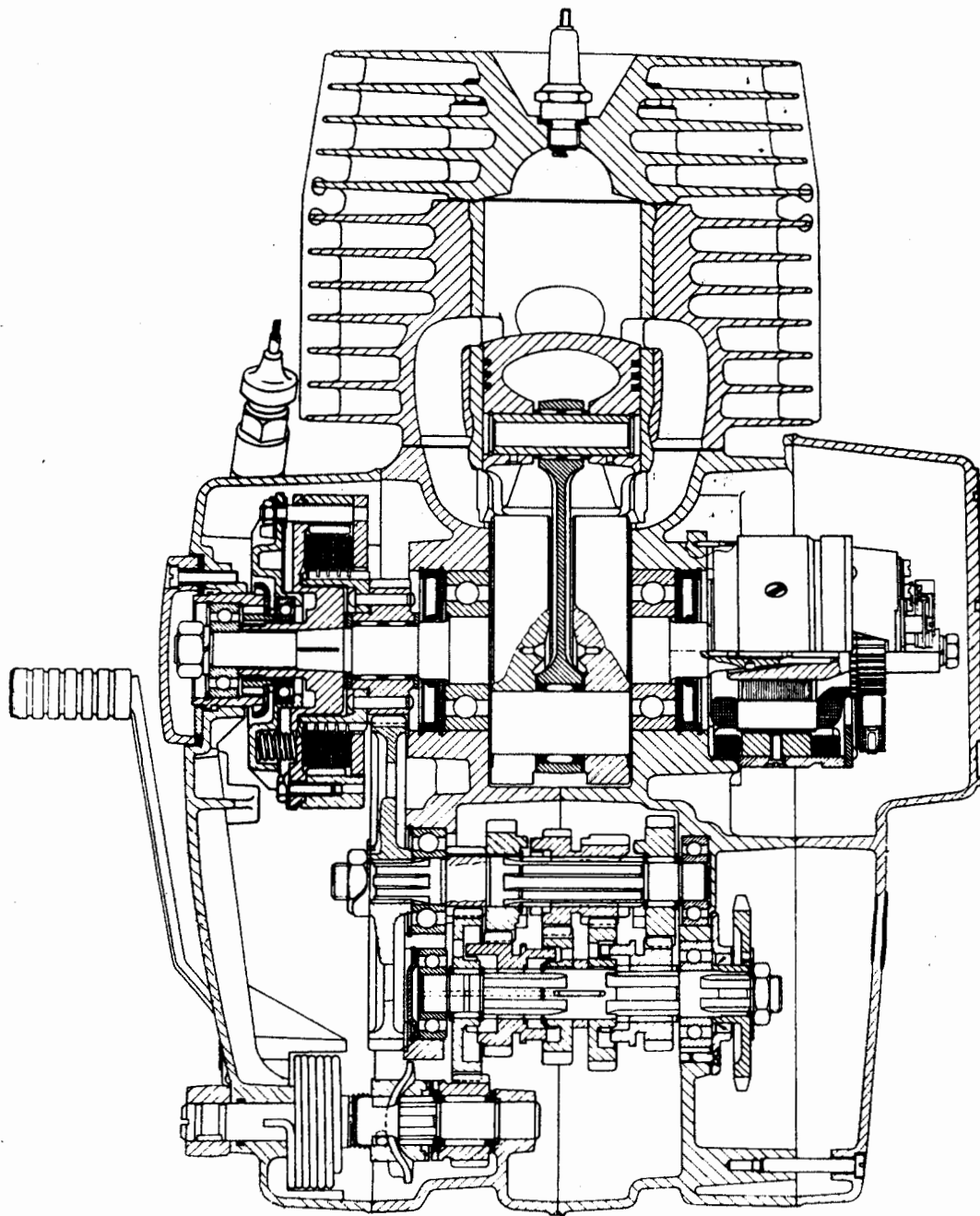


Fig. 39. Sectional view of engine