



P U C H - M O P E D

Technische Mitteilung

Technical Information

KD/6/64

KD/Ve/K

July 1964

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I. Ignition Timing

The continual advance in the development of vehicles with swept volumes under 100 c.c. has led to specific engine outputs which until recently were only possible in out-right racing engines. Not the least important reason for this increased efficiency will be found in the compression ratios offered by these small engines. Thus it is by no means rare today for a 50 or 60 c.c. engine to have a compression ratio of 1 : 11. High compression values produce high output efficiencies at maximum fuel utilization. They create a number of problems, however, which affect the maintenance and repair of the engines. This also applies to our moped engines, although here the output in the upper speed ranges is throttled down as regards vibration by an anti-resonance unit. The traditional manner of ignition adjustment is no longer practicable for these engines, as frequently even a shifting of the timing advance by no more than 0.1 mm (0.004 in.) results in a noticeable drop in output. For this reason the timing of the ignition can now only be carried out with the aid of a dial gauge and an ignition timing appliance which indicates the opening of the contact breaker points optically or acoustically. In the following we should like, therefore, to offer some advice that will enable you to obtain an absolutely accurate ignition timing.

1.) General Instructions Regarding Ignition Timing

Flywheel dynamo magnetos are employed in all our moped- and light motor-cycle models. The following should be observed as regards the ignition timing:

A) The Break Gap

The break gap is the distance of the trailing edge of the magneto pole shoe from the nearest edge of the ignition armature at the moment the contact breaker opens. The break gap has nothing to do with the firing point itself. It does, however, have an important bearing on the sparking power and must under all circumstances have the specified value, even if the contact gap does not exactly correspond to the theoretical size of 0.4 mm (0.016 in.). If

the break gap is inaccurate it is absolutely essential to readjust it. This is done by changing the contact clearance. In special cases the gap clearance can be adjusted to be smaller or larger by 0.1 mm (0.004 in.) than the specified 0.4 mm (0.015 in.).

A smaller gap clearance results in a larger break gap. A larger gap clearance results in a smaller break gap.

Following an alteration of the gap clearance the break gap should be checked anew. The break gap must be adjusted with due consideration to the firing point timing.

B) The Firing Point

The firing point has been determined for each model by the manufacturer on the basis of test drives and test bench results. It is the correct firing point on which the performance of the engine depends. If the ignition begins too early the engine will tend to knock, whereas overly delayed firing results in a drop in performance. In either case the engine will become unduly hot. The firing point is adjusted by rotating the armature plate at the correct piston position, i.e. after the break gap has been set and the mounting screws of the armature plate loosened, the plate is turned until the contact breaker points begin to open. The armature plate is then tightened and the firing point checked once again. In view of the fact that the firing point is already properly adjusted at the time of fitting the flywheel dynamo magneto to the engine, a later readjustment of the firing point is theoretically unnecessary. In practice, however, a change occurs during service which is caused by the wear of the breaker points and of the sliding shoe. This change equally affects the firing point and the break gap, more particularly, on account of the previously described wear of the contact breaker points in the course of operation.

- 1.) the contact breaker point gap increases
- 2.) the firing point moves away from TDC - the spark advance becomes greater
- 3.) the break gap becomes smaller

As is clear from this there exists a causal inter-connection of the three points mentioned above. If, therefore, the flywheel dynamo magneto is correctly adjusted the first time, any subsequent resetting of the firing point that may become necessary automatically also produces in the majority of cases the correct break gap position. If, nevertheless, a difference should result it will be caused by the following points:

- a) The contact breaker gap is too large or the sliding contact is excessively worn.
When new breaker points are fitted the ignition can be readjusted correctly.
- b) Twisting of the flywheel magneto on the crankshaft. This fault is caused by insufficient tightening of the mounting nuts (For tightening torque values cf. the Technical Information Pamphlet KD/1/64).
- c) The stator plate is incorrectly fitted. This can only be the result of incompetent workmanship.

2.) Checking or Timing the Firing Points with the Aid of the Dial Gauge and the BOSCH - EFAW 87 Ignition Timing Appliance

Required equipment: 1 dial gauge of the customary type
(see Fig. 1)

1 measuring device that can be screwed into the spark plug threads in the cylinder head (you can make this yourself, see Fig. 3)

1 EFAW 87 Ignition Timing Device
(see Fig. 2). The timing device consists of a buzzer and a control lamp with the aid of which one is able to ascertain exactly the correct firing point. (This instrument is available from every BOSCH-agency, standard price: AS 381.-)

A) Checking or Adjusting the Break Gap

- a) Unscrew spark plug.
- b) Connect 1 lead of the EFAW 87 Ignition Timing Instrument (see Fig. 2) to the grounding lead or to the contact lever, the second one being clamped to earth.
- c) Switch on the instrument. The instrument produces a weak buzzing sound and the control light glows faintly. By turning the magneto disk in the sense of rotation of the engine, the buzzing sound becomes stronger and the control light begins to glow brighter at the moment the contact breaker points begin to open. In this position the break gap must have the specified value.

On the basis of the latest findings an explicit warning is herewith given to determine the opening of the contacts by using an electric bulb with an outside voltage source, as in this way one runs the risk of demagnetizing the flywheel magneto with a resultant reduction of its efficiency.

- d) Readjusting the break gap with due consideration given to Point 1.) A) B).

B) Checking or Timing the Firing Point

- a) Unscrew spark plug.
- b) Screw the measuring appliance with the dial gauge into the spark plug threads in the cylinder head.
- c) Connect one lead of the EFAW 87 Ignition Timing Instrument to the short-circuit cable or to the contact breaker cable, the other cable being connected to earth.
- d) Switch on the instrument (see Fig. 2). By twisting the magneto wheel in the direction of engine rotation the buzzing sound becomes louder or the control lamp glows brighter the moment the breaker contacts open. In this position the firing point is now determined with the aid of the dial gauge. In order to do this the dial gauge is set to 0 (see Fig. 1). The magneto wheel is then further

tuned in the direction of engine rotation until the piston is at TDC. The result can be read off with an accuracy of hundredths of a millimeter and indicates the actual firing point.

- e) If the measured value coincides with the specified one no correction is required. If a readjustment should be necessary it is to be remembered that this also changes the break gap. The adjustment should always be carried out with due consideration given to Point 1.) A) B).

3.) Setting Values

A) Firing Point in Advance of TDC (in mm piston travel)

MS - Models 1.8 ± 0.2 mm
with the exception of:

MS 50 V Denmark $2.0 - 2.5$ mm
MS 50 V Sweden $2.0 - 2.5$ mm
MS 50 VK Sweden $2.0 - 2.5$ mm

VS - Models 1.8 ± 0.2 mm
with the exception of:

VS 50 L Denmark $2.0 - 2.5$ mm
VS 50 DS Denmark $2.0 - 2.5$ mm
VS 50 L Sweden $2.0 - 2.5$ mm
VS 50 K Sweden $2.0 - 2.5$ mm

VSR - Models (50/60 c.c.) 1.1 ± 0.2 mm

DS - Models $1.8 - 0.2$ mm
with the exception of:

DS 50 Denmark $2.0 - 2.5$ mm
DS 50 K Sweden $2.0 - 2.5$ mm

DSR - Models (50/60 c.c.) 1.1 ± 0.2 mm
with the exception of:

DS 50 R Germany, throttled down
to 40 km/h (25 mph) 1.8 ± 0.2 mm

VZ - Models 1.8 ± 0.2 mm
with the exception of:

VZ 50 Sweden 2.0 ± 0.2 mm

VZR - Models (50/60 c.c.) 1.1 ± 0.2 mm

MC - Models (50/60 c.c.) $0.5 - 0.8$ mm
with the exception of:

MC 50 Sweden, throttled down
to 30 km/h (19 mph) $2.0 - 2.5$ mm

X 30 -Models 1.5 ± 0.2 mm

B) Break Gap (given in mm of distance between the edge of the magnet pole shoe and the nearest edge of the ignition armature).

Here the values do not refer to the vehicle model but to the flywheel dynamo magneto installation. - What is given is the designation of thy type of the installation in question. This designation is stamped into each magneto flywheel.

Type Designation	mm	in.
Bosch LM/UR1/115/17 L 15	7 - 11	0.28 - 0.43
Bosch LM/UR1/115/17 L 17	7 - 11	0.28 - 0.43
Bosch LM/UR1/115/17 L 18	9 - 12	0.35 - 0.47
Bosch LM/UR1/115/17 L 22	7 - 11	0.28 - 0.43
Bosch LM/UR1/115/17 L 23	9 - 12	0.35 - 0.47
Bosch LM/UR1/115/18/5 L 2	7 - 11	0.28 - 0.43
Bosch LM/URB1/116/17 L 5	7 - 11	0.28 - 0.43
Bosch LM/URB1/116/17/5 L 8	7 - 11	0.28 - 0.43
Bosch LM/URB1/116/17 L 25	7 - 11	0.28 - 0.43
Bosch LM/URB1/116/17 L 25/1	7 - 11	0.28 - 0.43
Bosch LM/URB1/116/18/10 L	7 - 11	0.28 - 0.43
Bosch LM/URB1/116/18/5 L 5	7 - 11	0.28 - 0.43
Bosch LM/URC1/116/27/5 L 1	7 - 11	0.28 - 0.43
Bosch LM/URCP1/116/29018 L 1	22 - 25	0.87 - 0.98
Bosch LM/URCP1/116/35 L	22 - 25	0.87 - 0.98
Bosch LM/URP1/115/27 L 1	9 - 12	0.35 - 0.47
Bosch LM/URP1/116/29/18 L 1	21 - 24	0.83 - 0.94
A.E.I. Au 115 - Pa 81/5/45	1 - 5	0.04 - 0.20
Stefa E 1 / 75 - 02	9 - 12	0.35 - 0.47

II. Adjustment of Crankshaft Bearing Clearance with the Aid of the Dial Gauge

On account of the small dimensions of the bearings, the performance which is demanded today, and above all because of the high speeds of the engines, the bearings are subject to powerful stresses. Any improper fitting of the bearings may therefore lead to bearing damage. Damage of this kind can be prevented, however, if the bearings are accurately adjusted (see below).

The following are required for the adjustment of the bearings:

- 1 Dial Gauge of the commercially available type (see Figs. 4 and 5) (Scale graduation 0.01 mm)
- 1 Measuring Bar for mounting the dial gauge. The bar can be made in accordance with the sketch given below (Fig. 6)

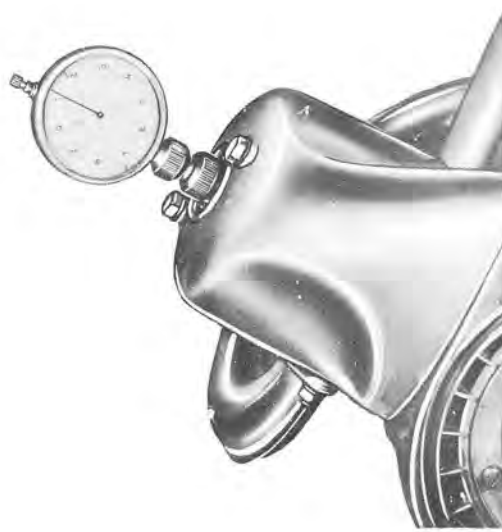


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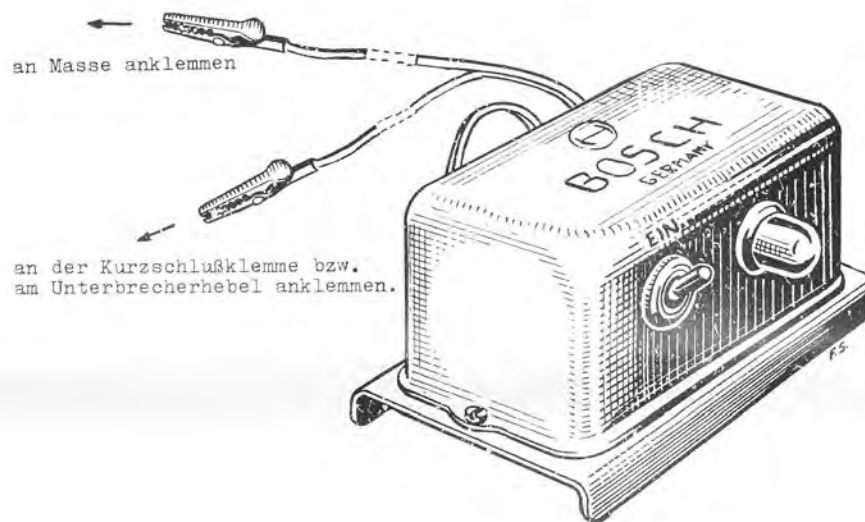


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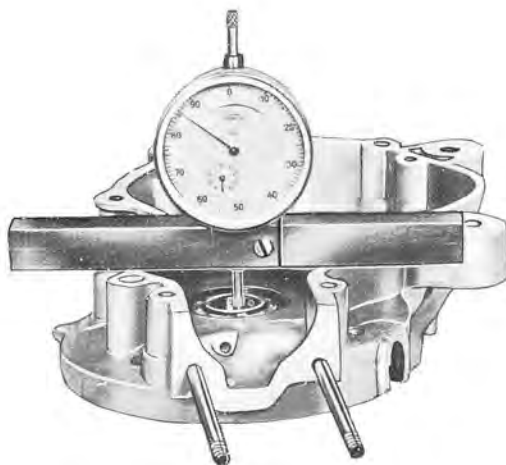


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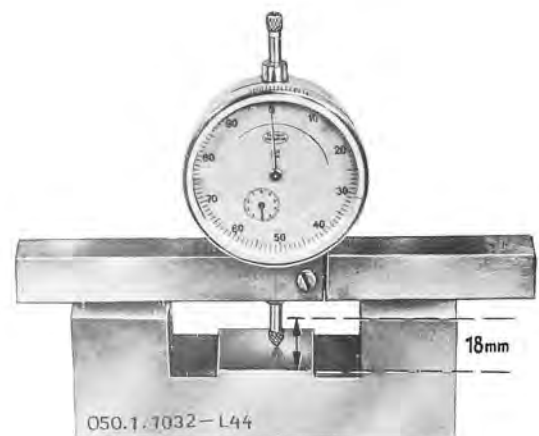


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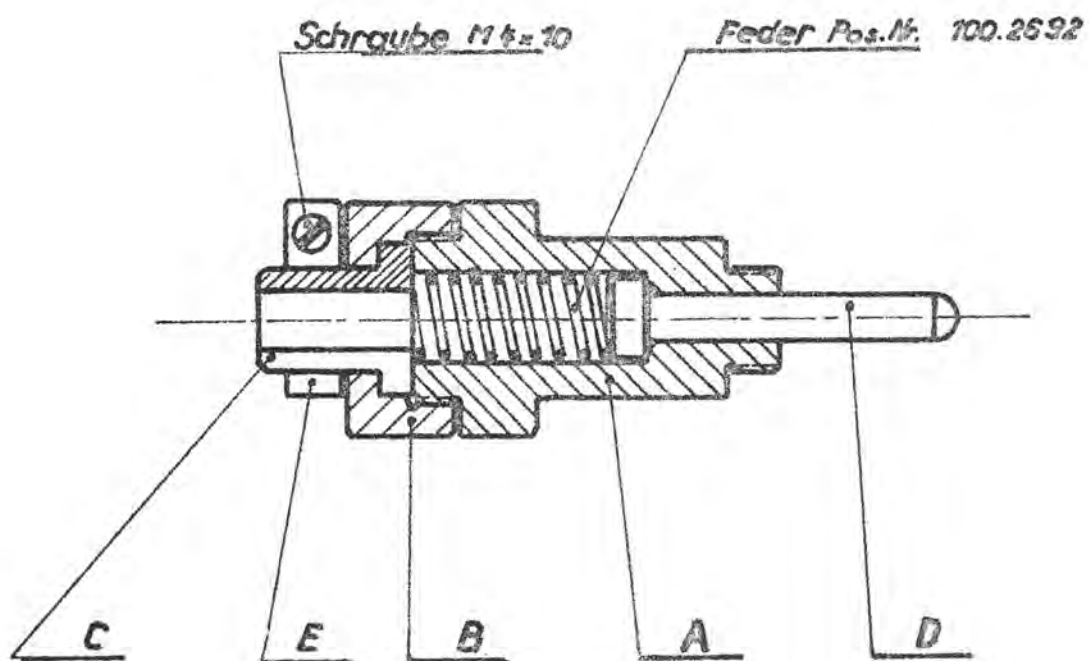
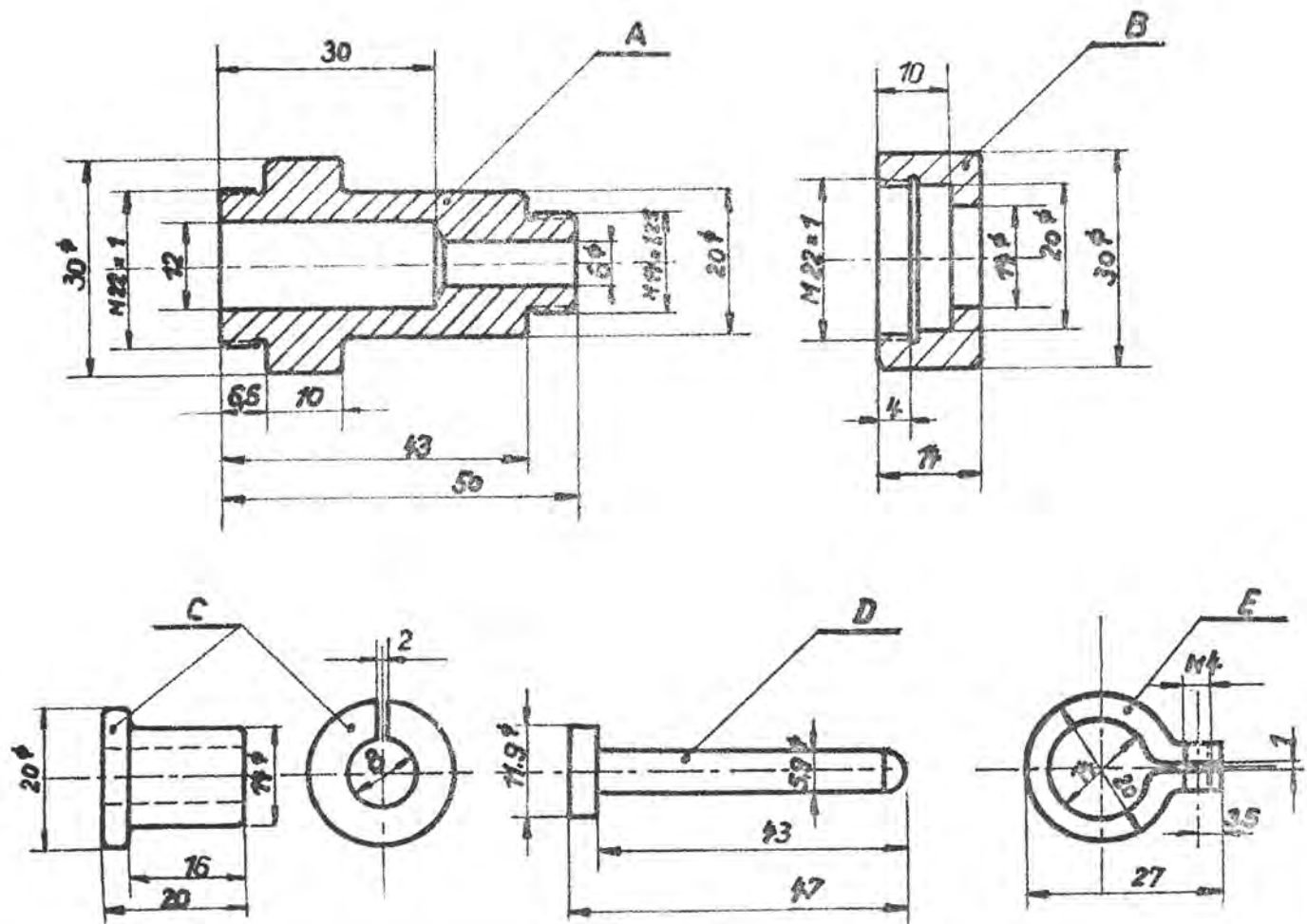


Abb.: 3

3.) The inner races with the ball cages are now placed into the casing halves with the lettering towards the outside. In doing this care must be taken not to interchange the bearing races.

4.) Measuring the bearing distance.

The specified nominal measure of the bearing distance amounts to 36.00 mm (1.42 in.), that is to say 18.00 mm (0.71 in.) for half the casing. The measurement taken is the difference between the nominal measure and the actual bearing distance. The measurement is performed by means of the dial gauge mounted on the measuring bar (see Fig. 4). Before taking the measurement the dial gauge is set to half the nominal value (18.00 mm), the arrow pointing to 0, with the aid of the gauge block No. 050.1.1032-L44 (see Fig. 5).

The measurement for one half of the bearing is taken together with a gasket, whereas the other half is measured without one. The thickness of the bearing casing gaskets ranges between 0.27 and 0.38 mm (0.01 and 0.015 in.). As the gaskets can be compressed for an average of 0.2 mm (0.008 in.) during their fitting, 0.2 mm are subtracted from the determined bearing distance.

Example:

Measurement taken in the left half of the bearing together with the gasket	18.41 mm
Measurement taken in the right half of the bearing housing (07)	+18.07 mm
of this 0.2 mm are subtracted	<u>- 0.20 mm</u>
Total	<u>36.28 mm</u>

5.) At the shaft (which should be checked for eccentricity prior to assembly) the actual value of the bearing distance has already been measured at the factory and inscribed in the left crank web (in hundredths of a mm).

The range of tolerance of the crankshaft dimensions extends from 35.95 mm to 36.15 mm. In the case of measurements below 36.00 mm the figures 95 to 00 (i.e. 35.95 - 36.00) have been stamped into the crank web, whereas with dimensions over 36 mm the figures 01 to 15 (corresponding to 36.01 - 36.15) have been

stamped in.

6.) Determination of the Bearing Clearance.

The bearing play is now determined from the difference between the previously measured bearing distance (see Point 3) and the value stamped into the crank web (see Point 4).

Example:

Bearing distance of the housing and gasket
(compressed) 36.28 mm
Actual size of the crankshaft (0.5) 36.05 mm
results in a bearing clearance of 00.23 mm

As the specified bearing clearance of 0.04 - 0.09 mm
must be obtained it is necessary prior to pressing the
inner bearing races onto the crankshaft to place a 0.1 mm
spacing washer under one ring and another washer of
0.05 mm thickness under the other, together therefore
0.15 mm. Thereafter the two inner races of the bearings
are pressed onto the crankshaft, which results in a
bearing clearance (cf. example) of

$$\underline{\underline{00.23 - 0.15 = 0.08 \text{ mm}}}$$

The position numbers of the spacing washers are:

900.3992	0.05 mm	900.3923	0.20 mm
900.3922	0.10 mm	900.3924	0.30 mm

Note:

When pressing on the inner races a distance plate must
in each case be placed between the two crank webs. This
distance plate must be large enough to permit it to be
supported on both sides so that the crankshaft is free
to rest in the bearings.

III. Checking the Crankcase Bearing Clearance

In order to enable a completely satisfactory checking of
the crankshaft bearing clearance we have developed an ap-
pliance which permits a proper check to be carried out
following the fitting of the crankshaft bearings described
above. Moreover after removal of the flywheel dynamo mag-
neto this device also permits the bearing clearance to be
checked when the engine is fitted in place. When hunting

for faults a rapid and accurate measurement of the crankshaft bearing clearance can thus be taken.

The following are required for a check of the crankshaft bearing clearance:

- 1 Dial gauge of the commercially available type (see Figs. 7 and 8)
- 1 Measuring appliance No. 350.1.70.013.0 (Figs. 7 and 8).
The latter is available from our spare parts deposits.

a) Checking the Bearing Clearance Following Installation of the Crankshaft

- 1.) Screw the measuring appliance to the crankshaft housing:
The measuring bar is provided with four holes and, by means of the proper screws, is attached to the crankshaft housing, either at the side of the clutch (Fig. 7) by being screwed into the threaded holes provided for the mounting of the clutch cover, or else on the side of the dynamo (Fig. 8) by using the threaded holes provided for the mounting of the armature plate.
- 2.) Attach the dial gauge (see Figs. 7 and 8), which is to be centred exactly at the centre of the crank pin and then clamped in place.
- 3.) Take the measurement - move the crankshaft (cf. Fig. 7, arrow) lightly back and forth and read off the actual bearing clearance on the dial gauge. The bearing clearance amounts to 0.04 - 0.09 mm.

b) Checking the Bearing Clearance with the Engine Installed

- 1.) Remove the blower components, flywheel magneto and armature plate from the crankshaft housing.
- 2.) Screw the measuring appliance to the crankshaft housing at left with the aid of the knurled mounting screws (Fig. 8)
- 3.) Attach the dial gauge (see Fig. 8), which is to be centred exactly at the centre of the crank pin and then clamped in place.
- 4.) Take the measurement - move the crankshaft slightly back and forth in the direction of the arrow (Fig. 8)

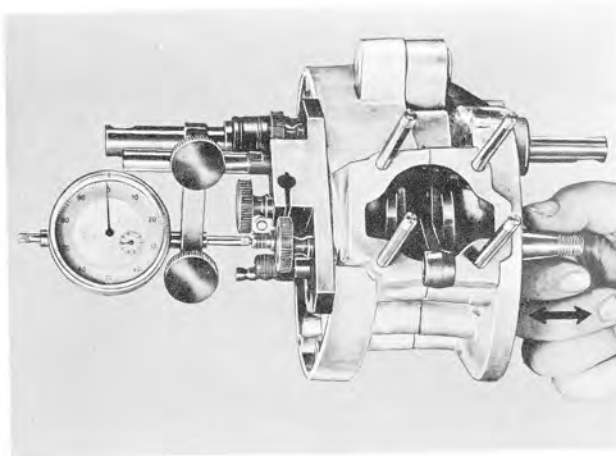


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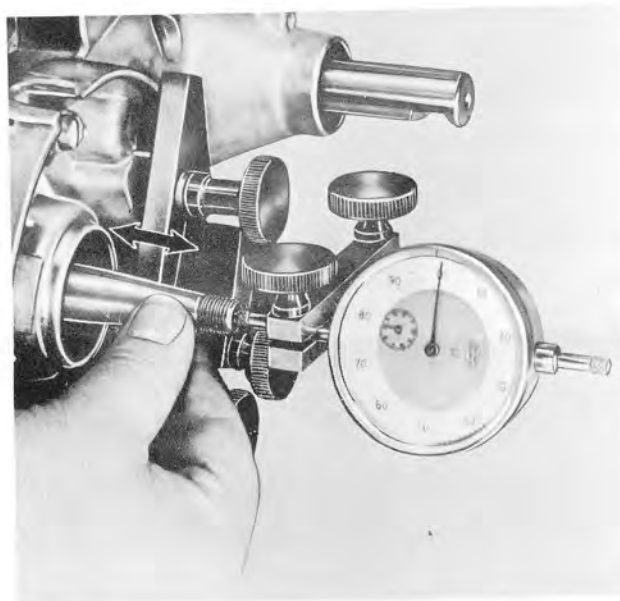


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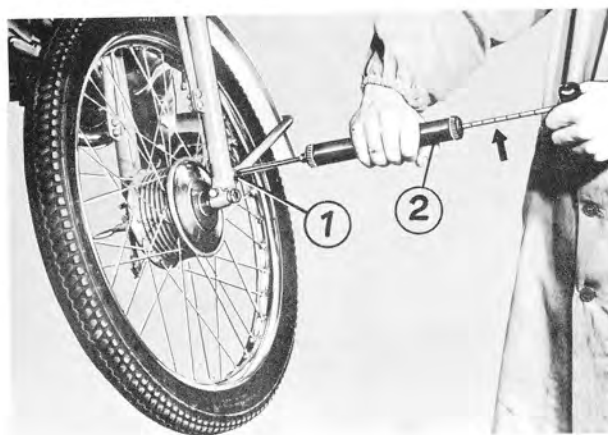


Abb. 9.

and read off the actual bearing clearance on the dial gauge.

Limit of wear 0.15 mm

When the measurement taken shows a bearing clearance in excess of 0.15 mm (0.006 in.) the engine should be removed, dismantled and the crankshaft bearings renewed.

IV. Oil change in the front-wheel fork in VZ- and MC-models

Until now the oil had to be filled into the front fork of our moped- and light motor-cycle models after removal of the plug. In order to do this the headlamp cowl had to be unscrewed and raised. To change the oil in the new version for VZ- and MC-models a separate oil filler- or oil drain plug No. 1426 (see Fig. 9/1) has been provided. Here the oil is drained at the plug mentioned above and filled in via the same plug by means of an oil gun. On no account must the oil in these forks be filled in above through the screw plug, as in this way no oil would get into the damping space with the result that the shock absorption would no longer function and the lubrication be jeopardized. The oil filling in the case of the VZ-models is 50 c.c. motor oil for each side of the front fork or 60 c.c. in the MC-models, in summer SAE 40 - 50 and in winter SAE 20 - 30.

To fill in the oil one may use a commercially available oil gun. One can also readily make an oil gun like this oneself. Our illustration shows oil being filled in with the aid of a No. 521 Wanner-oil gun with a capacity of 150 c.c. (see Fig. 9/2). This oil gun is available from the appropriate trade suppliers (Price in Austria: AS 75.-).

To facilitate the filling in of the oil it is recommended to use the pump rod with a 14-mm graduation (see Fig. 9, arrow). This corresponds to a quantity of 10 c.c. from one graduation mark to the next. (This applies only in the case of the Wanner-oil gun mentioned above.)