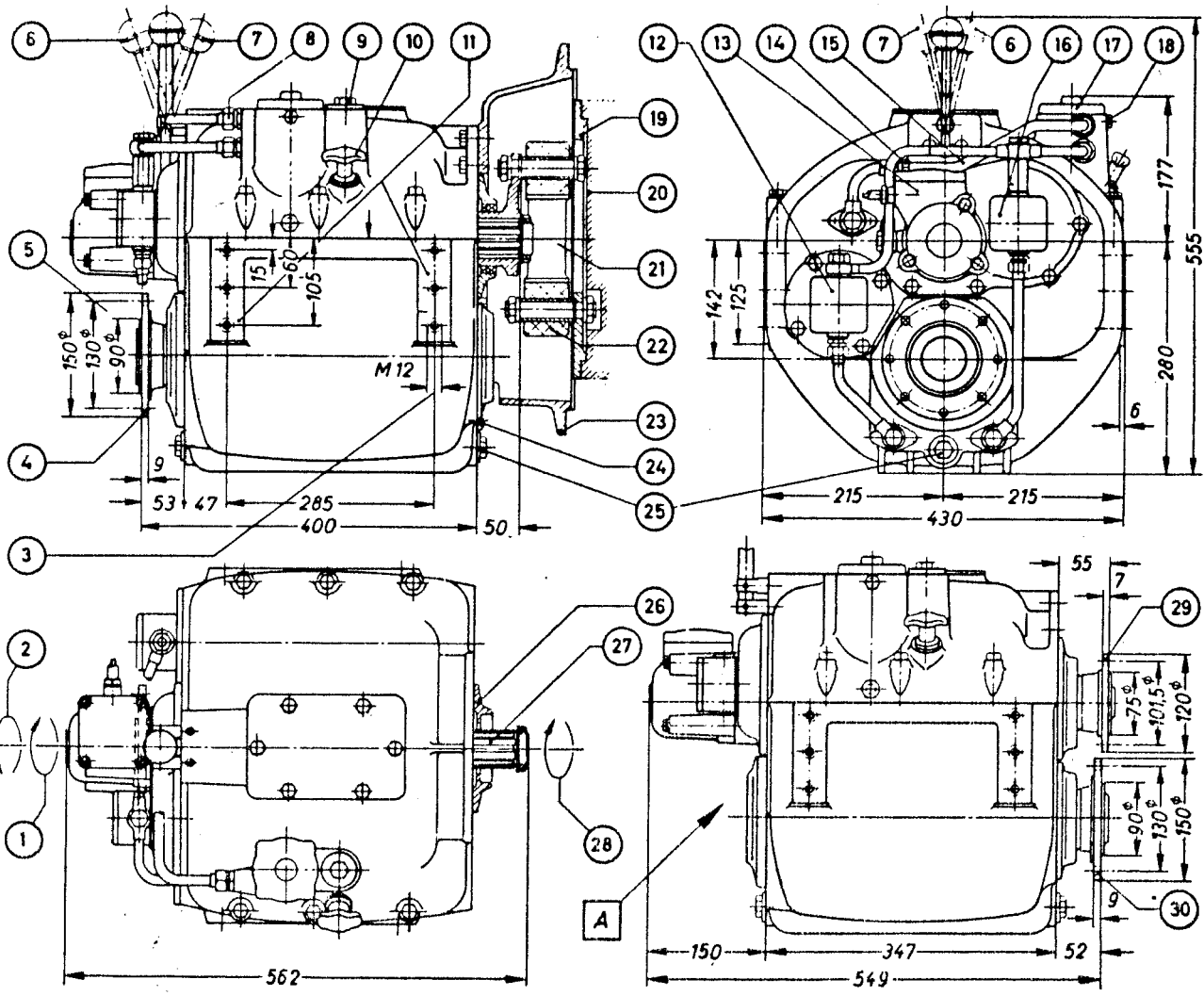
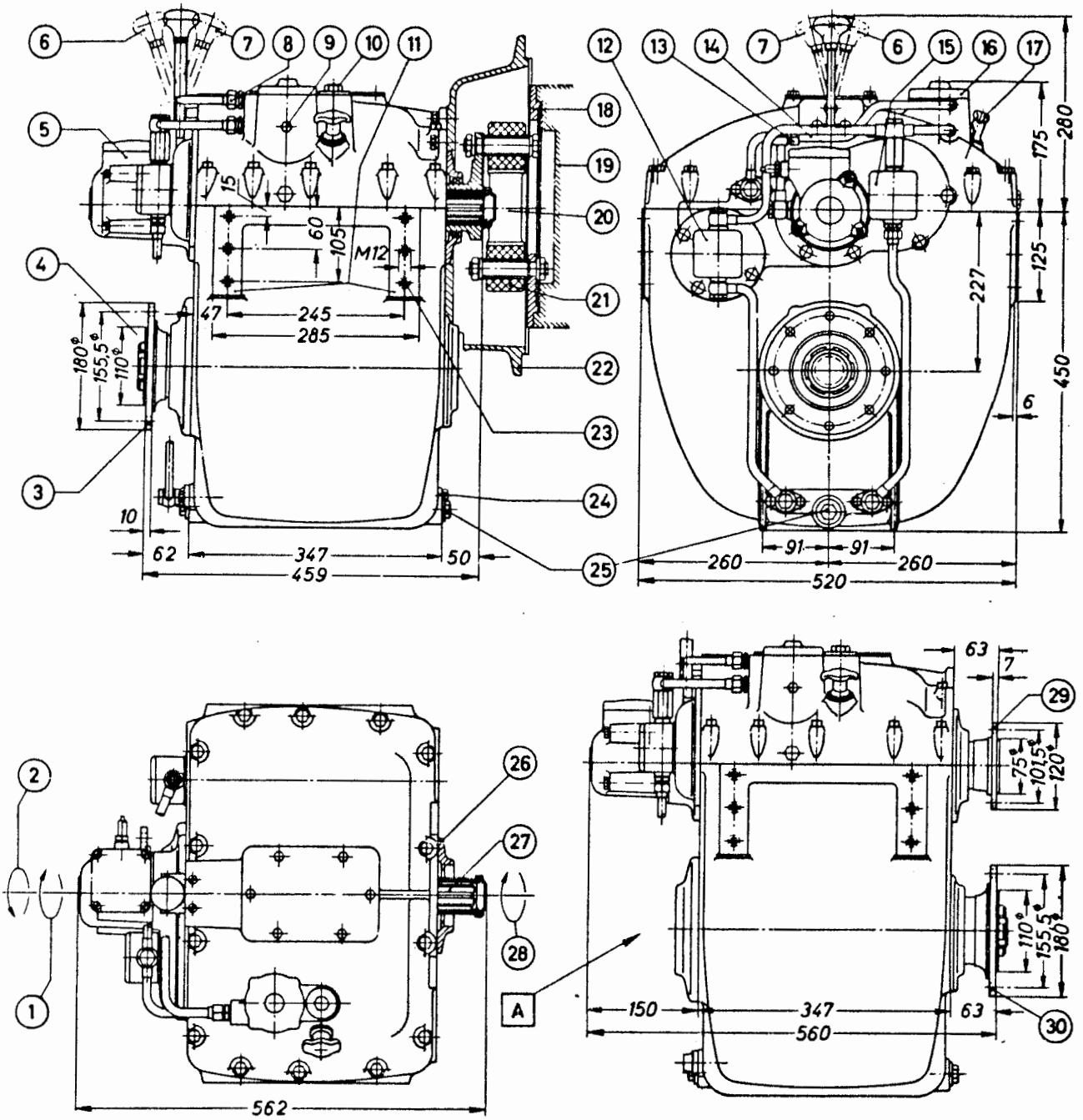

6
7
8
9
10
11
19
20
21
22
23
24
25
5
4
3
15
62
105
150°
130°
90°
M 12
9
53
47
285
400
50
12
13
14
15
7
6
16
17
18
177
555
142
125
280
6
215
215
430
2
1
26
27
28
55
7
29
75°
101,5°
120°
90°
130°
150°
9
30
A
562
150
347
52
549

ZF MARINE GEARBOXES BW 30 E 25 BW 30 ES 25

1. Direction of rotation as engine.
2. Direction of rotation counter engine.
3. Bore 14 mm deep
4. 8 holes 8.16
5. Output
6. Auxiliary gearbox control (change position at engine speed)
7. Auxiliary gearbox control (change position at counter engine speed)
8. Connection to oil heat exchanger (M 16 x 1.5)
9. Pressure relief valve
10. Oil filler hole with dipstick
11. Mounting strips
12. Idling speed oil lubrication pump
13. Clutch brush cap
14. Connection from oil heat exchanger (M16 x 1.5)
15. Distributor line (unnecessary for models with heat exchanger)
16. Main oil lubrication pump
17. Oil filter screen
18. Connection for oil pressure gauge
19. Guide plate (according to engine)
20. Engine flywheel disc
21. Input
22. Flexible intermediate drive coupling
23. Model with suspended bell housing
24. Connection for remote thermometer (M14 x 1.5)
25. Oil drain plug with magnetic plugs (M30 x 1.5)
26. Free standing model (suspension bell housing not needed)
27. Spline profile B 8 x 42 x 48 DIN 5463 (usable spline length 55 mm)
28. Turning direction of engine
29. 8 holes 8.16
30. 8 holes 10.16

A Peak angle - special model (BW 30 ES 25)

ZF MARINE GEARBOX BW 30 E 45 BW 30 ES 45



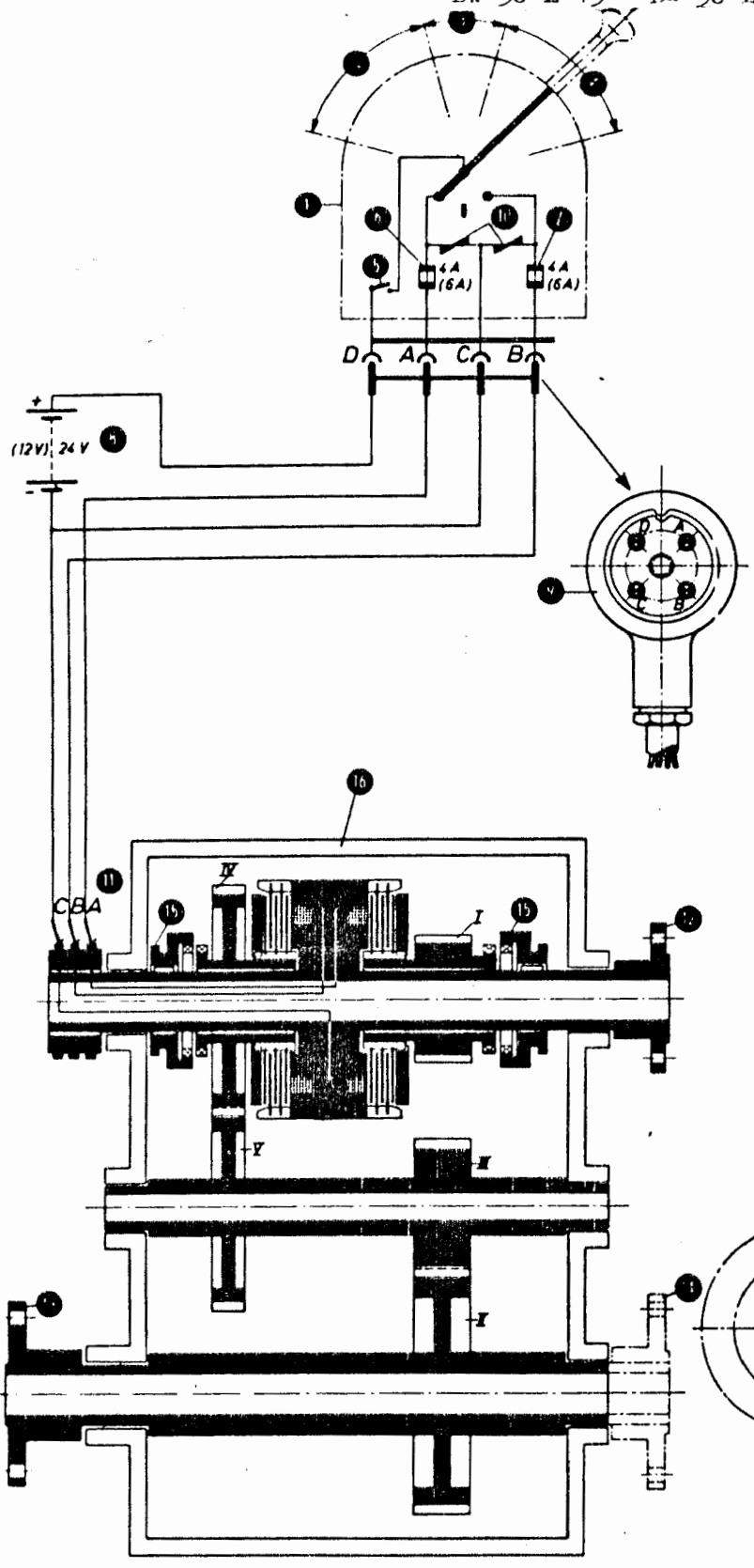
ZF MARINE GEARBOXES BW 30 E 45 BW 30 ES 45

1. Direction of rotation as engine.
2. Direction of rotation counter engine.
3. 8 holes 12.1 mmØ
4. Output
5. Clutch brush cap
6. Auxiliary gearbox control (change position at engine speed)
7. Auxiliary gearbox control (change position at counter engine speed)
8. Connection to oil heat exchanger (M16 x 1.5)
9. Connection for oil pressure gauge
10. Pressure relief valve
11. Mounting strips
12. Idling speed oil lubrication pump
13. Connection from oil heat exchanger (M16 x 1.5)
14. Distributor line (unnecessary for models with heat exchanger)
15. Main oil lubrication pump
16. Oil filter screen
17. Oil filler with dipstick
18. Guide plate (according to engine)
19. Engine flywheel disc
20. Input
21. Flexible intermediate drive coupling
22. Model with suspended bell housing
23. Bores 14 mm deep
24. Connection for remote thermometer (M14 x 1.5)
25. Oil drain plug with magnetic plugs (M30 x 1.5)
26. Free standing model (suspension bell housing not needed)
27. Spline profile B 8 x 42 x 48 DIN 5463 (usable spline length 55 mm)
28. Turning direction of engine
29. 8 holes 8.1Ø
30. 8 holes 12.1 mmØ

A Bank angle - special model (BW 30 ES 45)

SELECTOR PLAN AND SCHEMATIC GEARBOX CONSTRUCTION

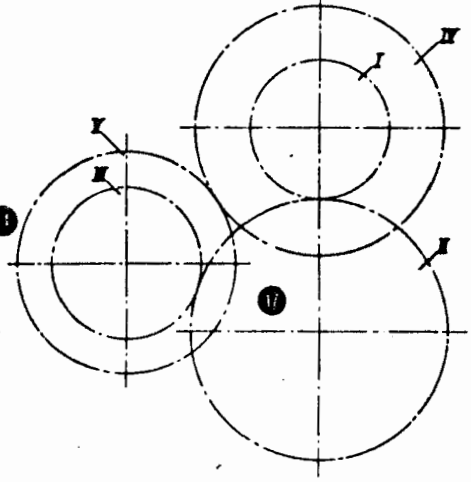
ZF MARINE GEARBOXES BW 30 E 25 BW 30 ES 25
BW 30 E 45 BW 30 ES 45



NOTE

1. The circuits for engine and gearbox must be fitted separately from each other.
2. Auxiliary control may only be used when power supply switch is disengaged.
3. The line cross-sections shoul have an area of 2.5 mm^2Cu at 12 V or 1.5 mm^2Cu at 24 V.

1. ZF deck control
2. Engine speed regulator, gearbox engaged.
3. Engine idling; gearbox neutra
4. Gearbox engages opposite direction.
5. Power supply switch.
6. Fuse for clutch in direction
7. Fuse for clutch in direction
8. Power supply.
9. View of socket removed.
10. Parking*
11. Clutch carbon brushes.
12. Input
13. Output on model E 25 and E 45
14. Output on model ES25 and ES45
15. Auxiliary gear change sleeve
16. Exploded view
17. Normal position of gear wheel

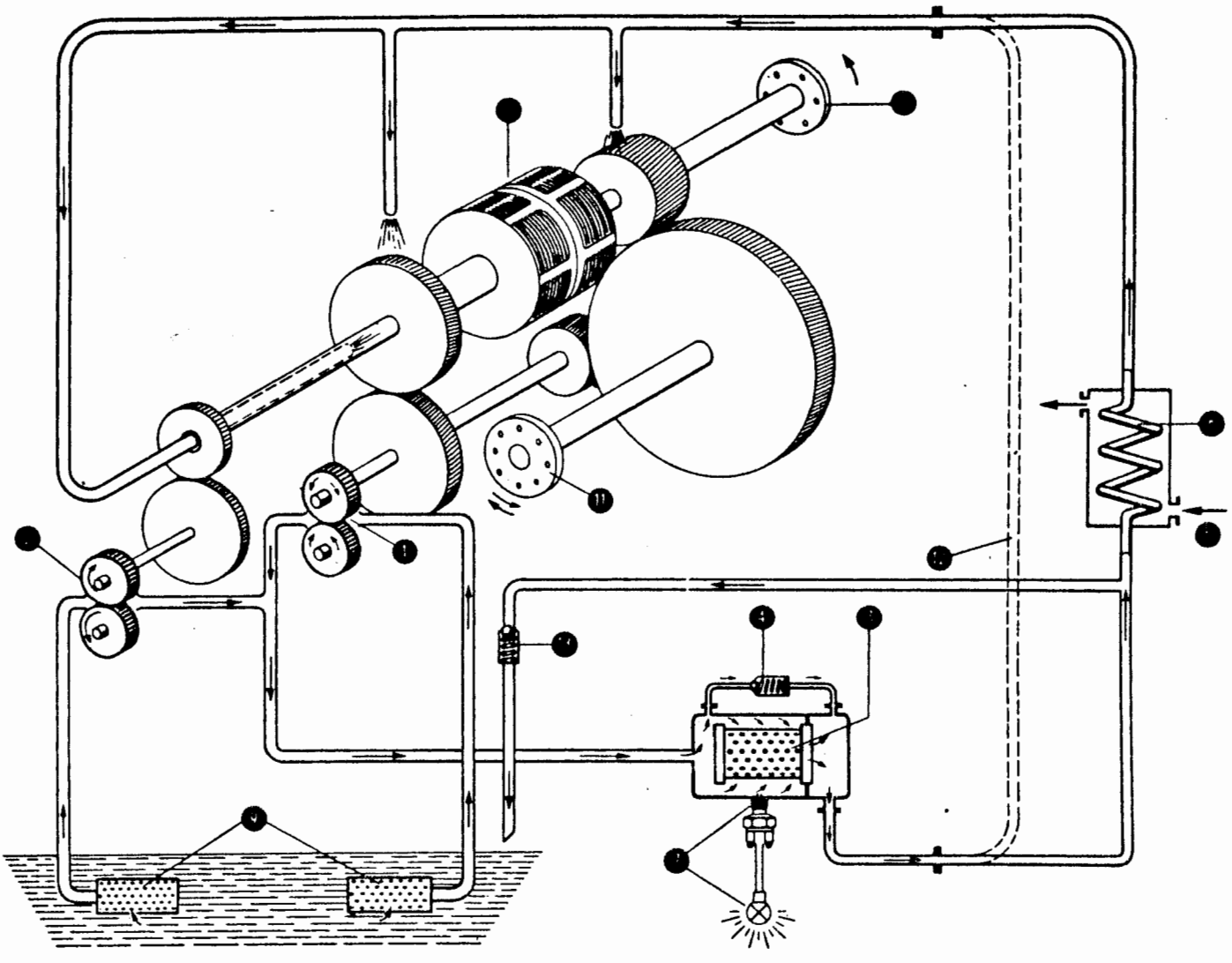


* allows engine RPM to be increased without gearbox engagement.

When using ZF deck control BZ-2 and BZ-3 or another model like the one drawn,

OIL SYSTEM

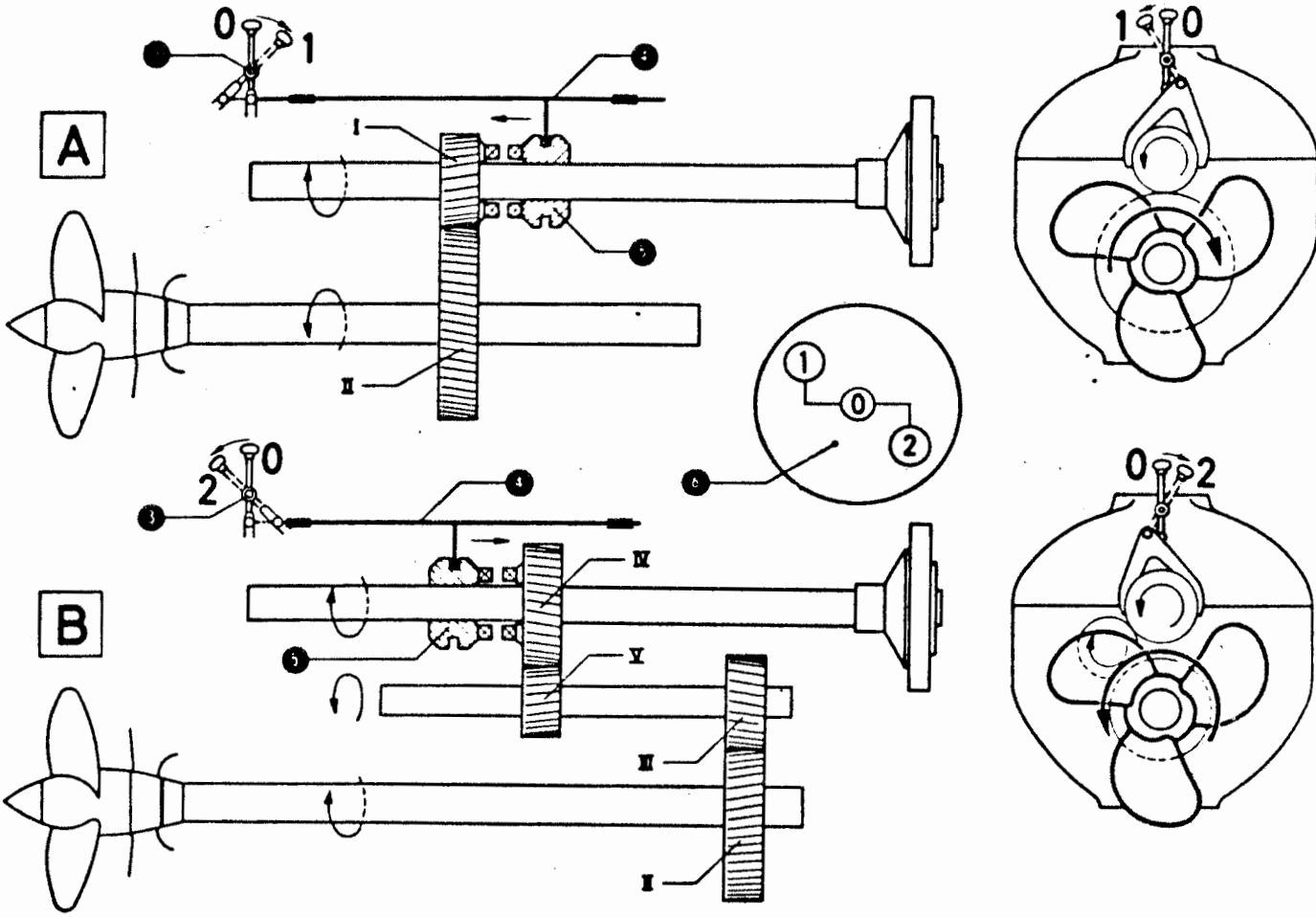
ZF MARINE GEARBOXES BW 30 E 25 BW 30 ES 25
BW 30 E 45 BW 30 ES 45



1. The gear pump, feeding in both turning directions, guaranties the supply of oil when engine is stationary and the propellor is turning.
2. The gear pump ensures supply of oil when engine is running.
3. Oil filter.
4. By-pass valve (fitted in oil filter).
5. Cooling water pipe connection.
6. Heat exchanger.
7. Connection for personal oil pressure control (control light or oil pressure gauge).
8. Electro-magnetic double clutch.
9. Strainer.
10. Input.
11. Output.
12. Oil pipe on model without heat exchanger.
13. High pressure relief valve.

DIAGRAM 5

AUXILIARY GEAR CHANGE WITH SHIFT POSITION FOR BOTH DIRECTIONS



NOTE: The auxiliary gear change may only be used when power source switch is OFF.

Those gear wheels marked I, II, III, IV and V correspond to those in diagram 3.

A Fitting of auxiliary gear change for counter engine direction

B Fitting of auxiliary gear change for engine direction

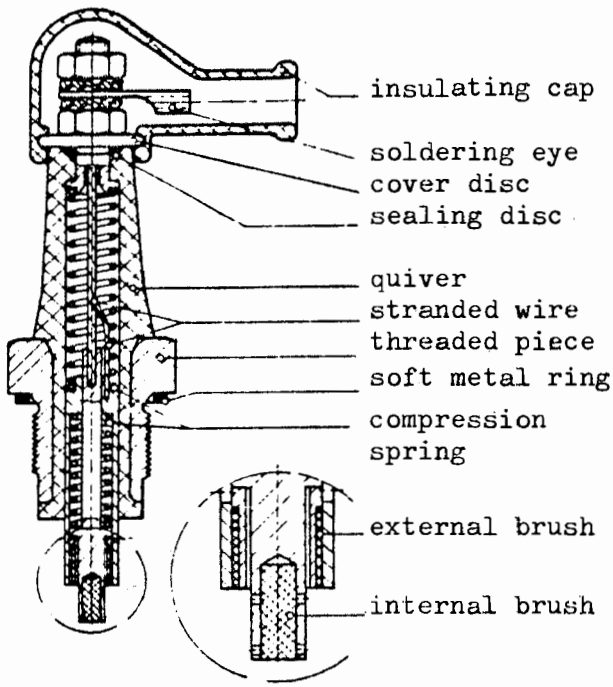
3 Shift fork in positions 1-0-2

4 Selector bar with shift fork

5 Gear change sleeve

6 View of shift lever grip (changing system is engraved on knob)

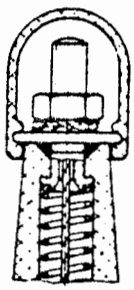
DIAGRAM 3



supply TSN 8. 2 concentric brushes are each joined over a stranded wire with a connection. Each brush has its own spring for the production of the necessary contact pressure. The plastic quiver is cast with the threaded piece. An insulating cap covers the connection.

After loosening the nuts the brush set can be removed with a light tap and replaced with a new one. A seal ring is provided to seal the brush set when a new type of power supply is used. To seal the old type, some sealing cement is put between quiver and cover disc.

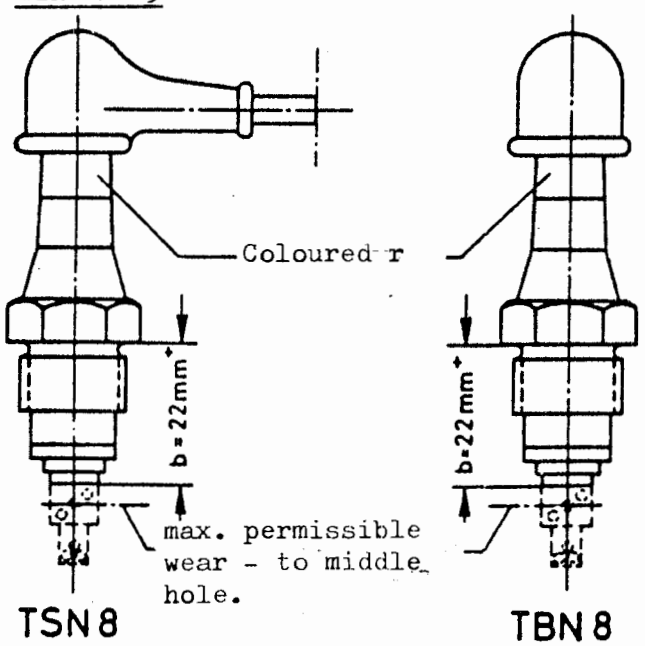
DIAGRAM 4



Dummy brush with closed insulating cap

In construction, the cleaning brushes correspond to the telescopic power supply. On the upper end only of the threaded piece the soldering eye for the wire connection and the pertinent second hexagonal nut with the toothed disc for clamping the soldering eye are not applicable. The dummy brush has a closed insulating cap. The cleaning brush cleans the slip ring without using power and is therefore without a cable connection.

DIAGRAM 5

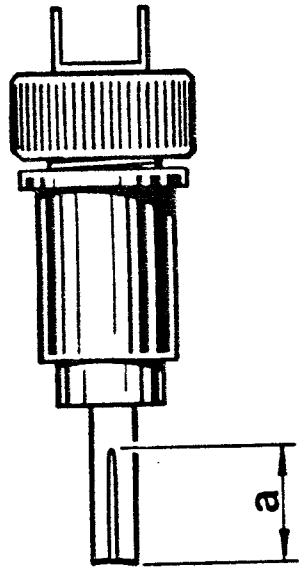


TSN 8 = power supply with cably supply cap
TBN 8 = cleaning brush with plug cap

The part of the power supplies and cleaning brushes indicated with a dotted line is only visible when disassembled.

Letter 'b' indicates stretched installation length.

DIAGRAM 6a



a = max. wear of carbon brush

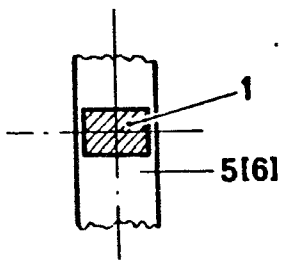
ASSEMBLY AND DISMANTLING OF DRY POWER SUPPLIES

1. Press in quiver (2) (plastic coat with Messing application) into the end cover so that the long guide side runs in the direction of the axle towards the input shaft.
2. Screw end cover onto the housing (sealing compound).
3. Put brush into quiver guide, put soldering cap in guide and hold down.
4. Screw down caps (4) tightly by hand (tapered thread).

The marking on the brush indicates maximum wear (diagram 6a). When this is reached, exchange brush as follows:

Unscrew dry power supply cap, remove soldering cap with used brush and replace with a new one. Screw cap back on.

Slip rings (5 = minus and 6 = plus) with serious scoring and scratch marks can be re-used after re-grinding (precision grinding 4), but the values given (Ø 85 - 2,0 mm) must not be exceeded.



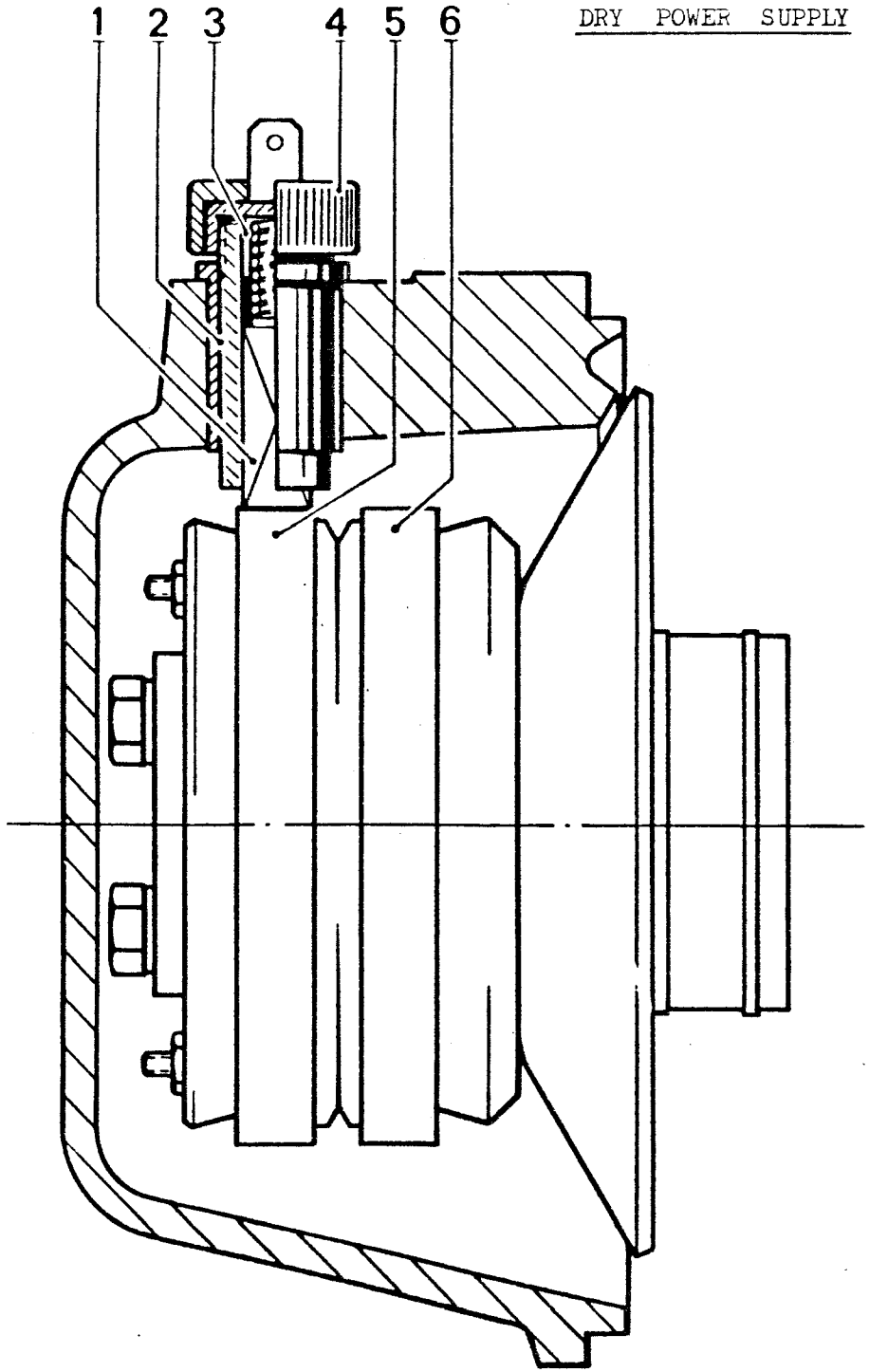
Installation point of brush to slip ring

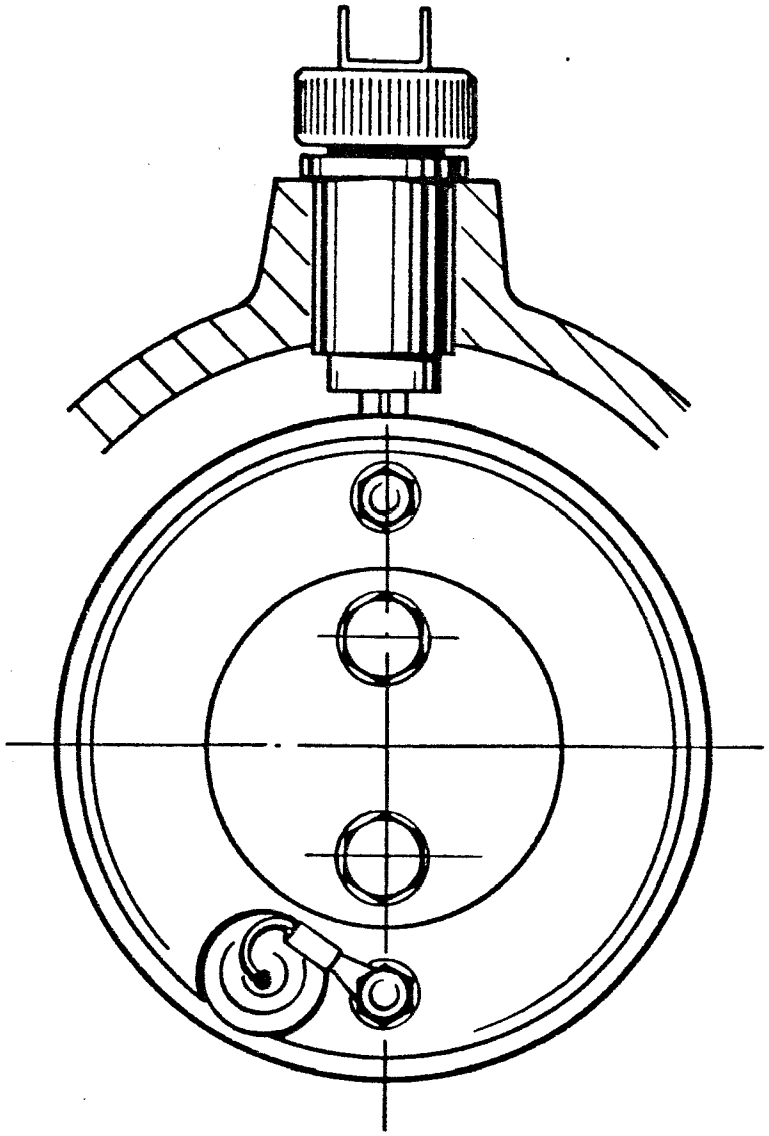
1 = brush

5(6) = slip ring path

DIAGRAM 6b

DRY POWER SUPPLY

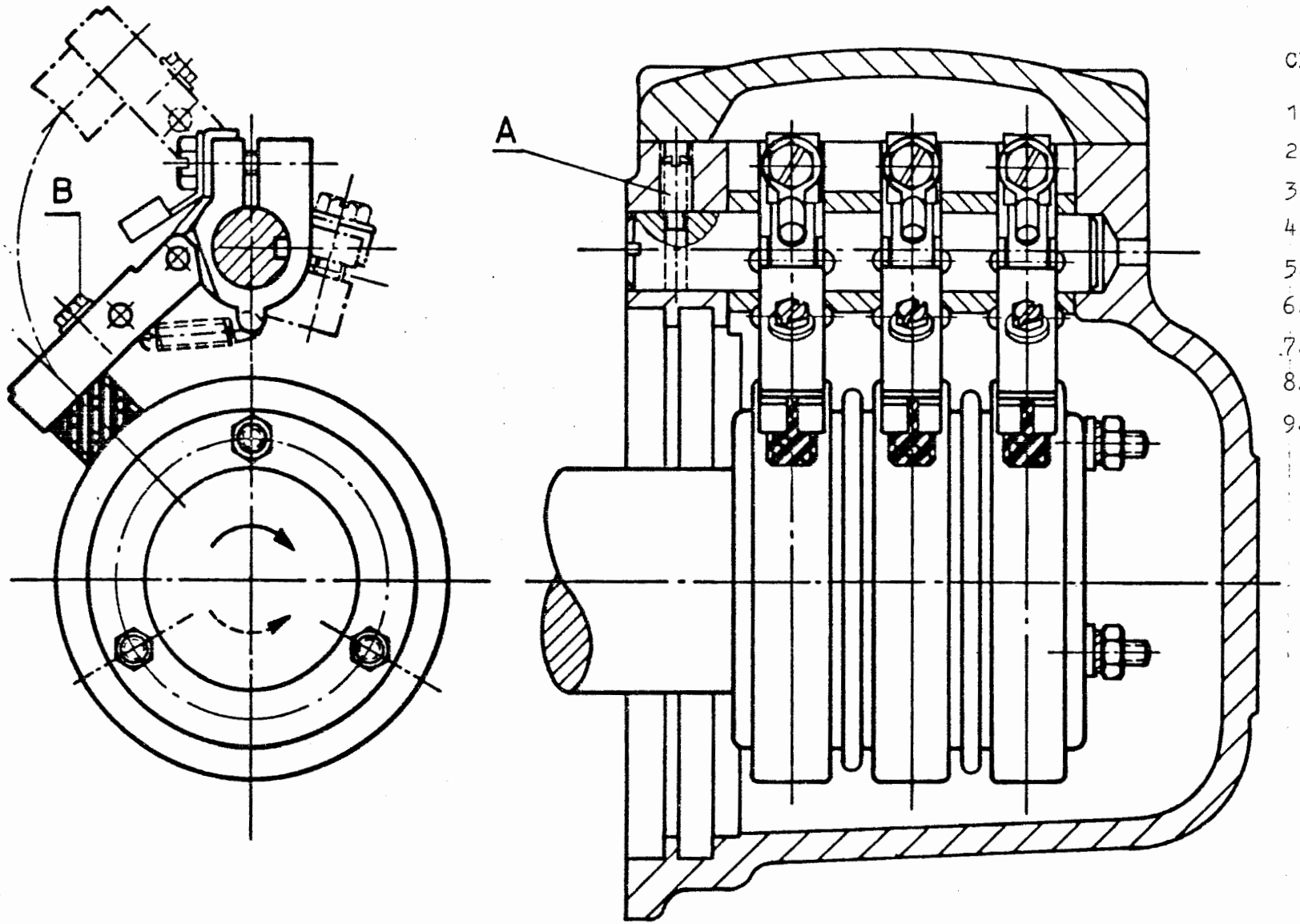




NOTE: Brushes must run dry, any oil will cause damage.

DIAGRAM 6c

BRUSH HOLDER

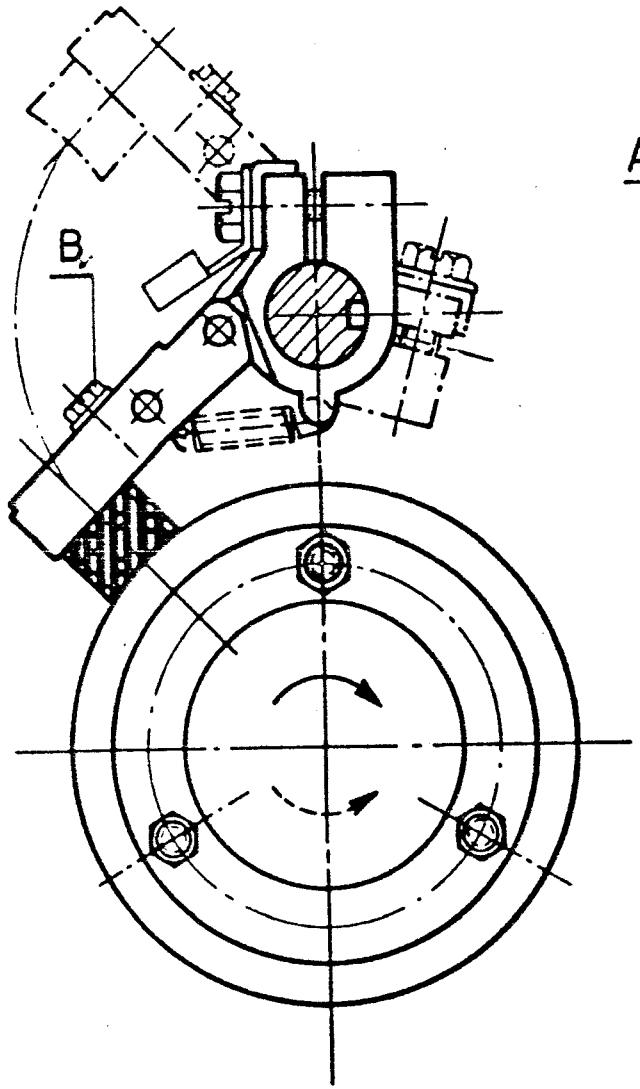


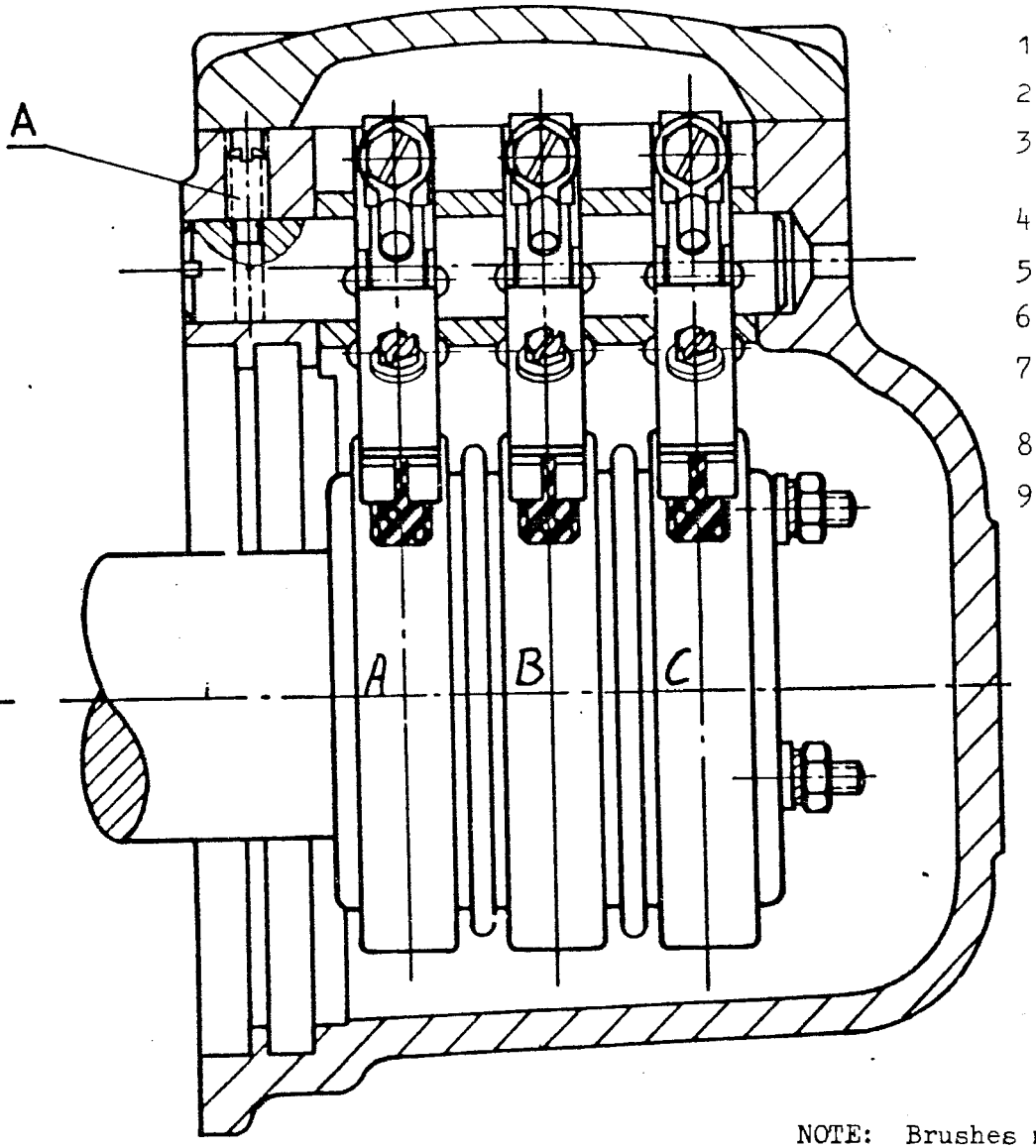
CHANGING THE CARBON BRUSH SETS

1. Unscrew cover.
2. Loosen grub screw 'A'.
3. Push brushes upwards.
4. Loosen screw 'B'.
5. Change brush set.
6. Screw up screw 'B'.
7. Push brushes back down.
8. Tighten up grub screw 'A'.
9. Screw on cover.

DIAGRAM 6

PROP BRUSH HOLDER





CHANGING THE BRUSH INSERT

1. Unscrew cover.
2. Loosen grub screw 'A'.
3. Rotate prop brushes upwards.
4. Loosen screw 'B'.
5. Exchange brush insert.
6. Tighten up screw 'B'.
7. Rotate prop brushes downwards.
8. Tighten up grub screw 'A'.
9. Screw on the cover.

NOTE: Brushes must run dry; any use of oil will cause damage.

FAULT FINDING

NOTE: Any possible electrical faults should be rectified according to the following fault finding process. The particular tests outlined below are the same for all BW 30 types.

If there is an electrical failure of the multi-disc clutch it must first be established, in order to prevent unnecessary dismantling of the input shaft and synchro shaft from the gearbox, whether the rated voltage in the main power system is 12 V or 24 V. If this is the case, the rated voltage of 12 V or 24 V must be tested between the main power supply (C) and the corresponding power supplies (A and B) in the engaged position.

If the main rated voltage is not available, the electric shifting system (deck control and lines from deck control to gearbox) must be examined (wiring diagrams BW 30 according to model).

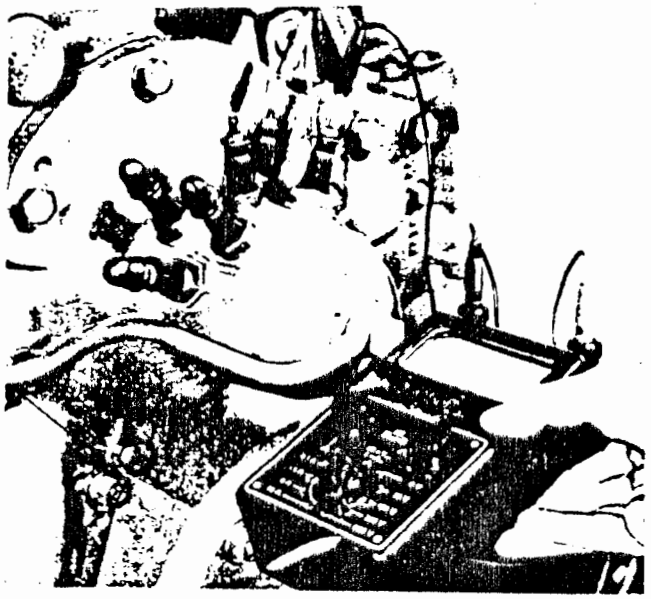
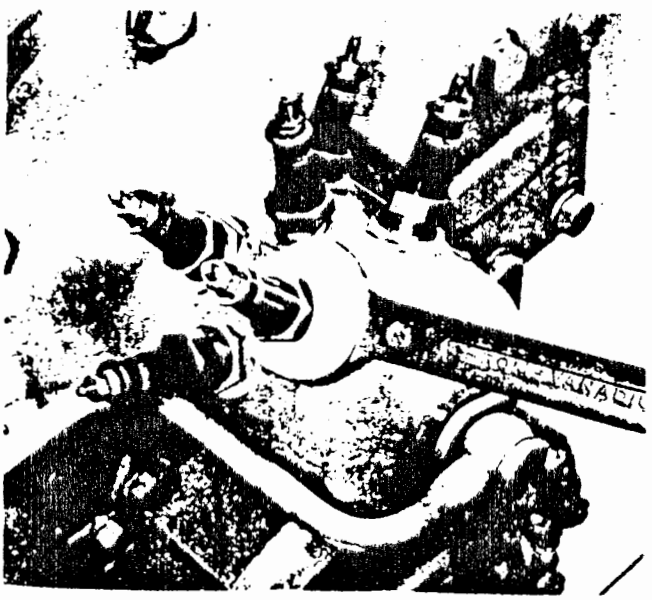


DIAGRAM 1

Remove the main rated voltage from 12 V or 24 V power supply from the gearbox. The clutch coil resistance can now be measured by means of an Ohm meter. The Ohm meter should be connected accross the power supply terminals in the follow-in sequence: A and C, then B and C. When the gearbox is cold - at 20°C - resistance must be:

6.9 - 7.9 (24 V), or
2.05 - 2.35 (12 V).



To Replace Power Supplies

DIAGRAM 2

If there are variations, carry out fault finding according to diagram 7.

Remove power supplies and cleaning brushes and test for wear.

NOTE: Defective power supplies can be repaired by renewing the inserts (diagrams 3 and 6).

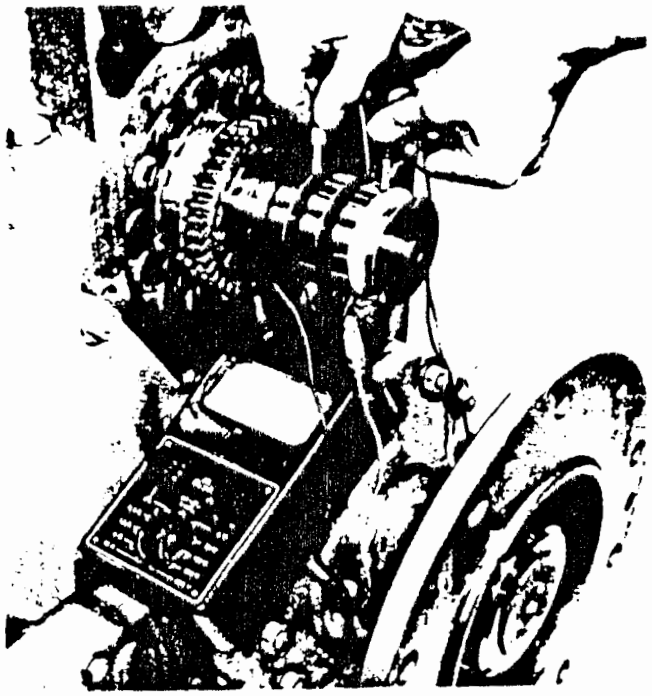


DIAGRAM 7

Measure resistance between main slip ring (C) and corresponding plus-slip ring with an Ohm meter. When gearbox is cold (20°C), resistance must be 6.9 - 7.9Ω (24 V); 2.05 - 2.35Ω (12 V). If variations occur, the slip ring holder must be moved back.

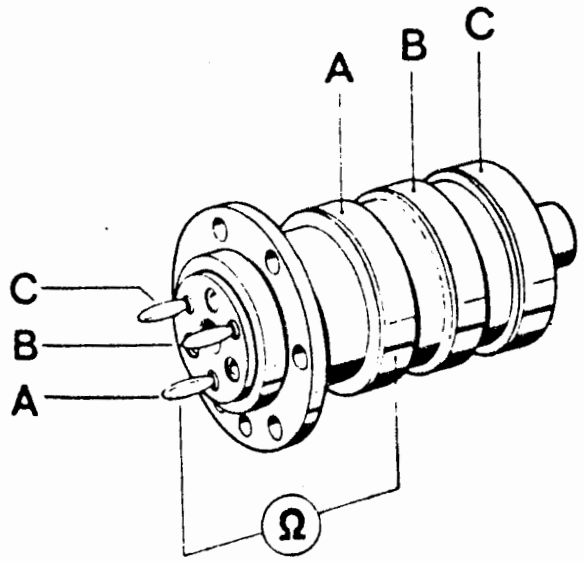


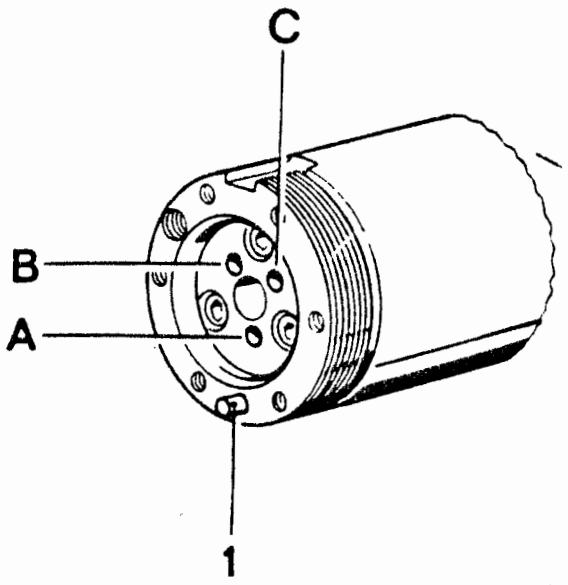
DIAGRAM 8

Test slip ring holder on connecting passage.

The test should proceed via the same notations as shown on diagram 8. The measuring apparatus must show value from 0Ω on all three or two measurements.

Test slip ring holder on main closed circuit.

Test slip ring holder at all three and two plugs against mass. We advise taking this measurement with a crank inductor. Resistance must be at least 1.5 MΩ .



TEST OUTPUT SHAFT AND MAGNET BODY

DIAGRAM 9

The diagram shows the shaft's electrical plug connections.

A = plus for counter revolutionary clutch

B = plus for clutch in engine direction

C - minus (common to both)

1 = fixing bolts for radial position of t slip ring holder.

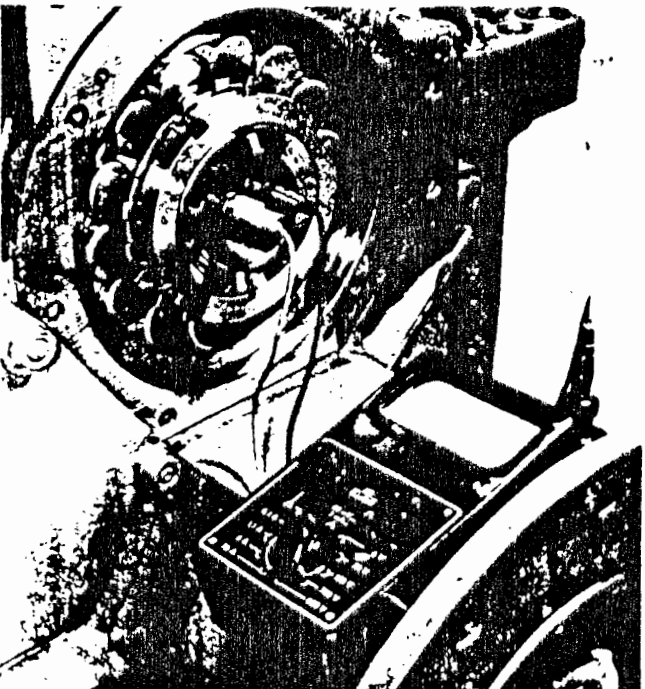


DIAGRAM 10

Test the relevant clutch with an Ohm meter.

When the gearbox is cold (20°C) it should show a value of 6.9 - 7.9 Ω (24 V); 2.05 2.35 Ω (12 V).

If there are variations, please proceed as shown in diagrams 11 and 13.

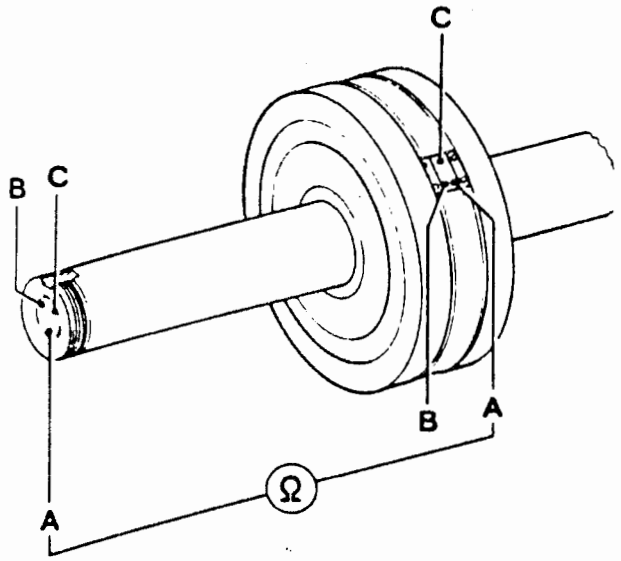


DIAGRAM 11

Test shaft on connecting passage.

Proceed as shown at measuring points on diagram 11. The measuring apparatus should show a value of 0 Ω on all three and two measurements.

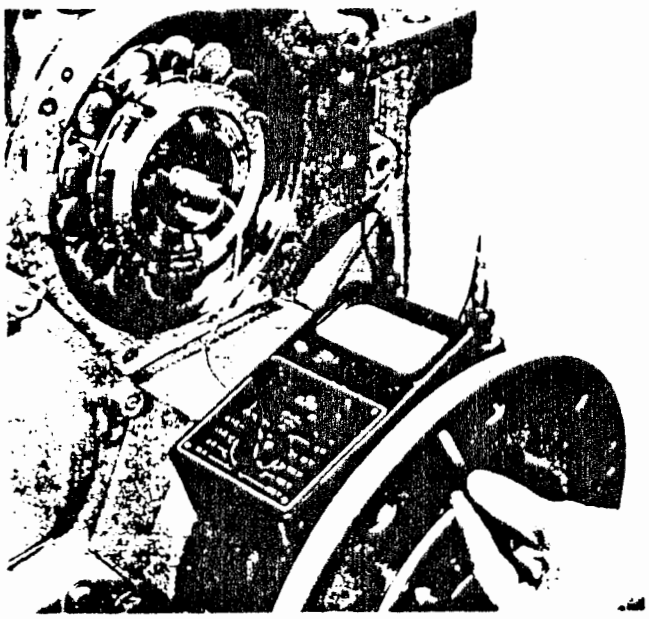


DIAGRAM 12

Test shaft on main closed circuit.

Test all three and two measuring points on shaft (according to diagram 12) against mass.

We advise you to take these measurements with a crank inductor.

Measured resistance should be at least 1.5 M Ω .

Variations damage the shaft and it must be changed.

If, however, there are no variations, failure should be shought in the magnet body.

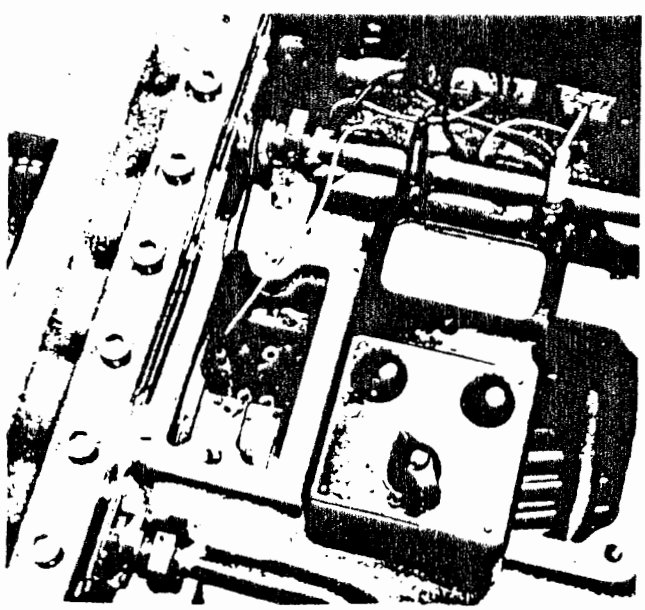


DIAGRAM 13

Test magnet body with Ohm meter. This should show a value of 6.9 - 7.9 Ω (24 V) 2.05 - 2.35 Ω (12 V) when gearbox is cold (20°C). If there are variations, the magnet body/bodies must be changed.