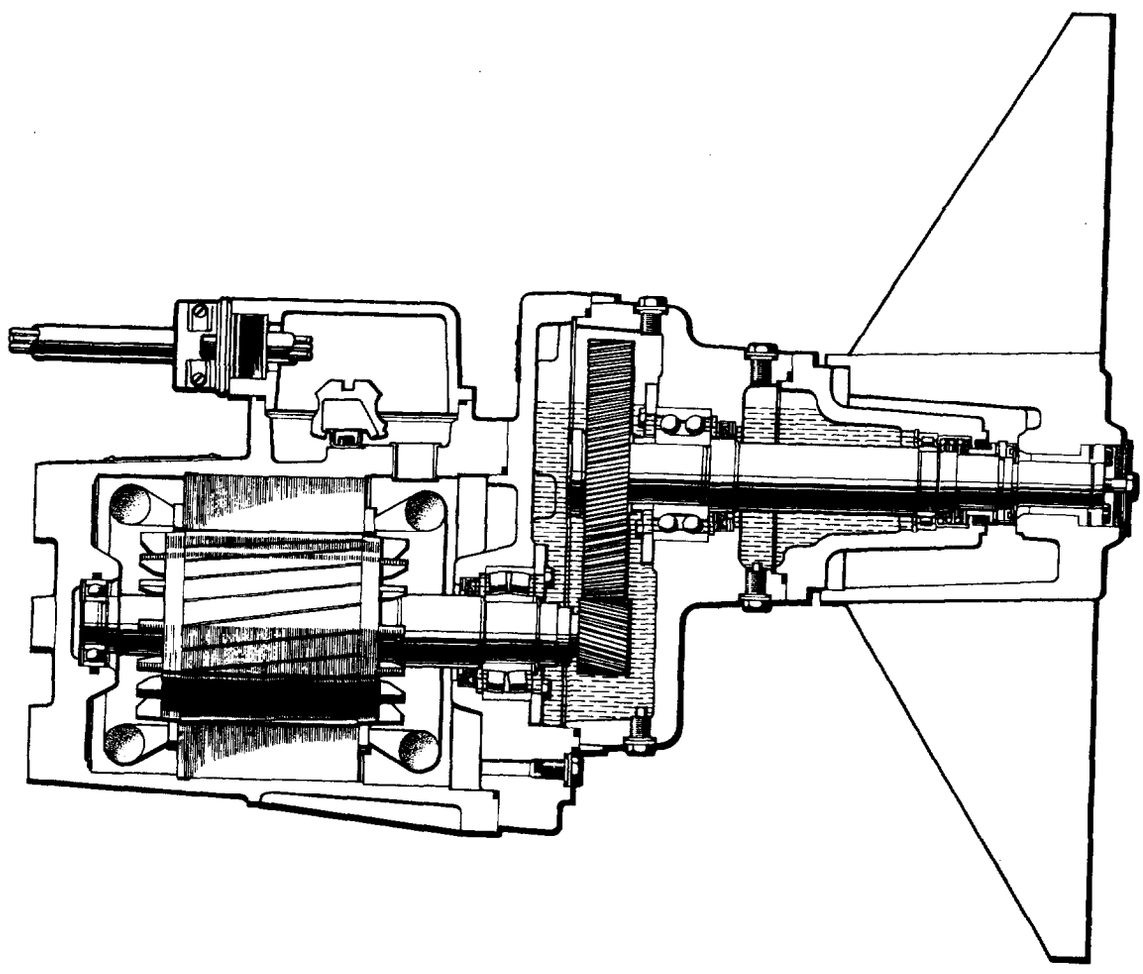
4451.010/090
4501.010/090

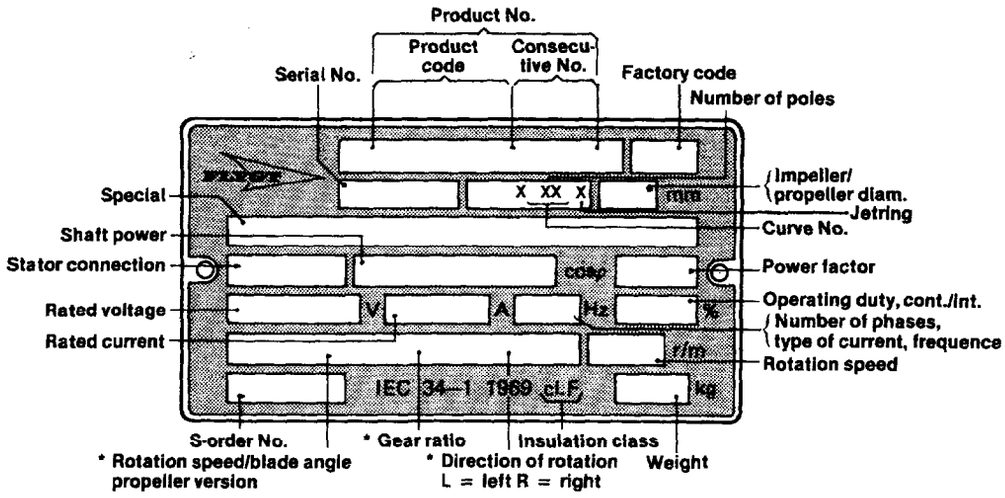
FLYGT

Workshop manual



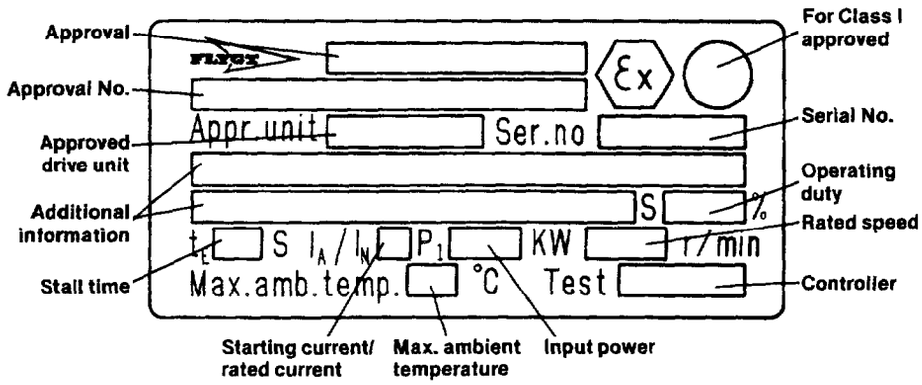
DATA PLATE INTERPRETATION

General data plate



Approval plates

EN-data plate*



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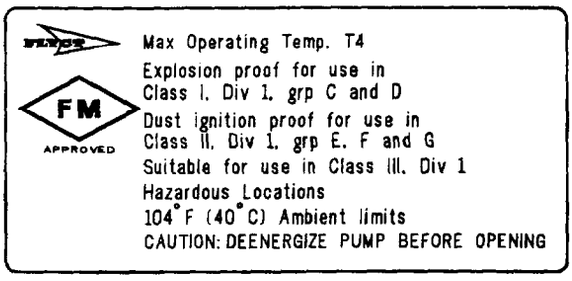


*** Always together with the general data plate.**

How to use the workshop manual

This workshop manual describes how to dismantle and assemble mixers 4451.010/090 and 4501.010/090 in connection with repair and reconditioning work. The manual is divided into three main parts: MOTOR, GEAR CASING/ BEARING HOUSING and PROPELLER. As a result, repairs to different parts of the mixer can be carried out with a minimum of operations.

The operative part of the manual begins with numbered illustrations of different work operations. At the end of the manual are fold-out sheets with a description of the operations.

Details are also provided of the special tools which not only facilitate repair work but which are sometimes necessary in order to carry out a particular operation.

We would also point out that the practical work involved in compiling this manual has been performed under extremely favourable conditions. We have dismantled and assembled a brand new mixer. A mixer which has been in use for a lengthier period of time will have acquired a "patina" and other working methods besides those recommended here will sometimes have to be used.

Safety rules

- **Make sure that the lifting equipment can handle the weight you want to lift and that it is in good condition.**
- **Carry out the work on a sturdy workbench.**
- **Don't forget the danger of electrical accidents.**
- **Don't ignore health hazards. Be meticulous about cleanliness.**
- **Check that tools and other equipment are in good condition.**
- **Make sure you have a first-aid box near at hand.**

Contents

Technical data

For weights, amperages, voltages, power ratings and propeller speed, please refer to the data plate on the mixer.

Tightening torque

	4451	4501
Gear wheel	90 Nm	90 Nm
Locking assembly	14 Nm	9 Nm

Lubricants

Order No	Description
90 17 78	Oil Mobil SHC 626 at temperatures —20°C to + 10°C (—4°F to + 50°F)
90 17 81	Oil Mobil SHC 630 at temperatures ± 0°C to + 40°C (+ 32°F to + 104°F),
90 17 83	Oil Mobil SHC 639 at temperatures + 25°C to + 90°C (+ 77°F to + 195°F).
90 20 54	Bearing grease (Esso Unirex N3)

Tools

Order No	Description	Range of uses
84 15 14	"C" hook wrench	Nut main shaft, 4451
436 97 00	Assembling tool	Mechanical seal, 4451
497 01 00	Puller screw unit	Gear wheel
504 01 00	Lock plate	Gear wheel
405 66 00	Assembling tool	Mechanical seal, 4501
84 13 63	Puller	Bearing
84 13 62	Puller	Removing the propeller, 4451
82 32 86	Hose clamp	Removing the propeller 4451
84 14 89	Allen keys set	
84 08 10	Circlip plier	

Winding resistances at 20°C (68°F)

4451

50 Hz				60 Hz			
Stator 2-pole	Resistance Ohm/phase	Stator 4-pole	Resistance Ohm/phase	Stator 2-pole	Resistance Ohm/phase	Stator 4-pole	Resistance Ohm/phase
309 49 28	0.30	309 44 28	0.46	309 49 12	0.27*	309 44 12	0.41*
32	0.38	32	0.60	28	0.30	28	0.46
34	0.46	34	0.70	29	0.36	29	0.55
35	1.2	35	1.7	30	1.0	30	1.6
38	1.4	38	2.1	32	0.38	32	0.60
40	1.2	40	1.8	34	0.46	34	0.70
44	1.7	44	2.6	38	1.4	38	2.1
50	2.3	50	3.4	40	1.2	40	1.8
52	2.6	52	4.2	44	1.7	44	2.6
55	2.9	55	4.4	50	2.3	50	3.4
58	4.0	58	6.6	52	2.6	52	4.2
		426 63 28	0.62			426 63 12	0.54*
		32	0.83			28	0.62
		34	0.95			29	0.71
		35	2.2			30	2.1
		38	2.8			32	0.83
		40	2.5			34	0.95
		44	3.4			38	2.8
		50	4.5			40	2.5
		55	5.8			44	3.4
		58	8.0			50	4.5
						52	5.4
491 62 26	0.42	491 62 26	0.42	491 62 27	0.30	491 62 27	0.30
27	0.30	27	0.30	32	1.1	32	1.1
32	1.1	32	1.1	34	1.3	34	1.3
34	1.3	34	1.3	43	1.6	43	1.6
38	4.0	38	4.0	51	2.5	51	2.5
43	1.6	43	1.6				
51	2.5	51	2.5				
						1-phase	
						309 44 12	0.42/0.84**

* Per half phase

** Main phase/auxiliary phase

4501

50 Hz				60 Hz			
Stator 4-pole	Resistance Ohm/phase	Stator 6-pole	Resistance Ohm/phase	Stator 4-pole	Resistance Ohm/phase	Stator 6-pole	Resistance Ohm/phase
381 26 27	0.06	381 33 27	0.51	381 26 12	0.16	381 33 27	0.51
28	0.20	28	0.34	27	0.06	28	0.34
32	0.24	32	0.44	28	0.20	29	0.39
34	0.29	34	0.51	29	0.22	30	1.2
35	0.74	35	1.4	30	0.64	32	0.44
38	0.86	38	1.6	32	0.24	34	0.51
40	0.78	40	1.5	34	0.29	37	0.26*
44	1.1	44	1.9	38	0.86	38	1.6
50	1.4	50	2.6	40	0.78	40	1.5
52	1.6	52	2.9	44	1.1	44	1.9
55	1.8	55	3.3	50	1.4	50	2.6
58	2.6	58	4.7	52	1.6	52	2.9
426 53 26	0.35	426 53 26	0.80	426 53 27	0.28	426 53 27	0.52
27	0.28	27	0.52	32	1.0	32	2.0
32	1.0	32	2.0	34	1.1	34	2.3
34	1.1	34	2.3	43	1.4	43	2.9
38	3.4	38	7.2	51	2.2	51	4.6
43	1.4	43	2.9				
51	2.2	51	4.6			1-phase	
530 22 44	1.1	530 24 44	1.9			381 26 12	0.16/0.32**

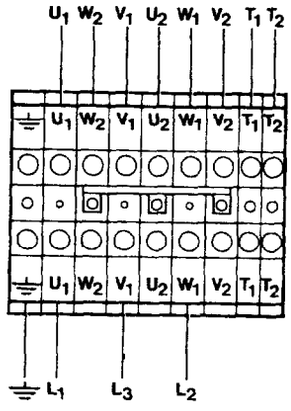
* Per half phase

** Main phase/auxiliary phase

Electrical connections 4501

6-lead stator

Y



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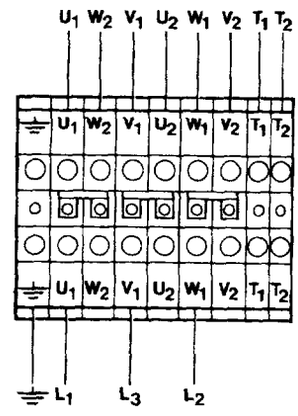

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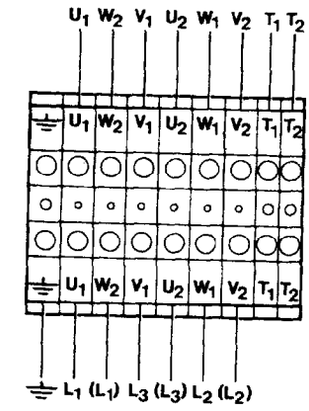
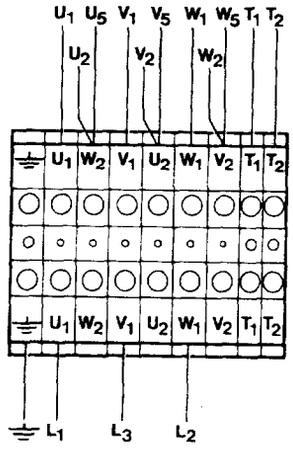
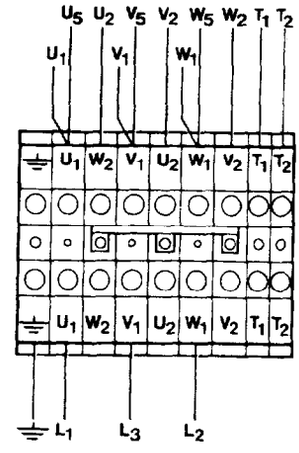


9-lead stator

Y Series

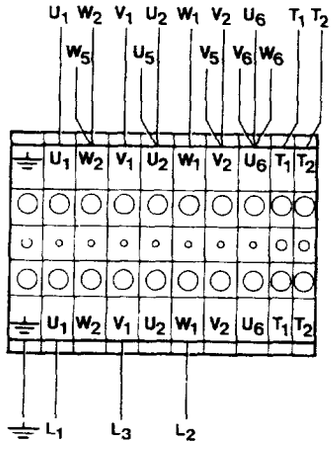


Y Parallel



12-lead stator

Y Series



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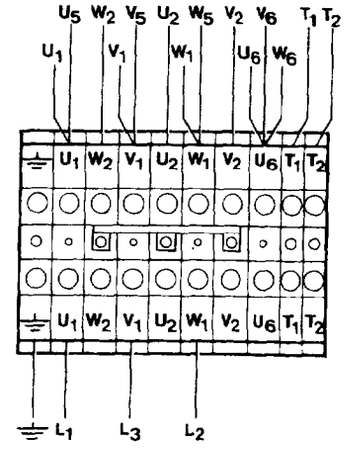
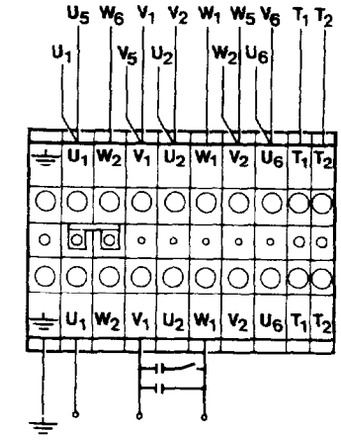


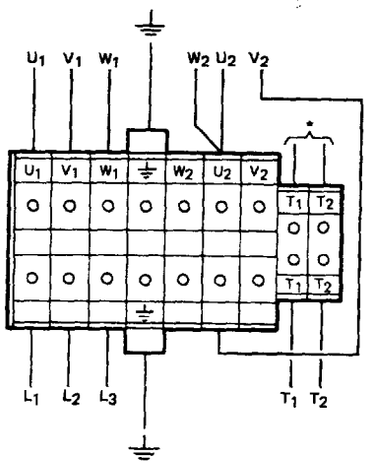
1 phase



Electrical connections 4451

6-lead stator

Y



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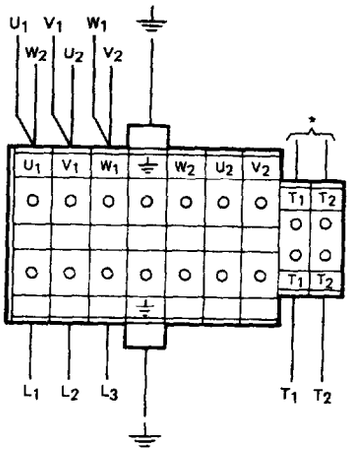

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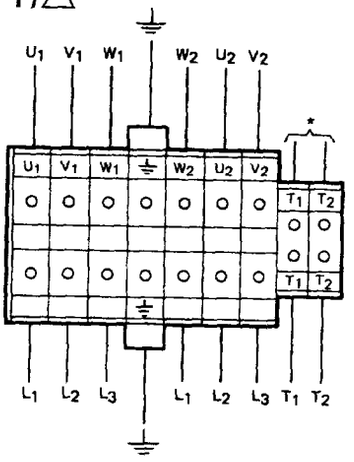
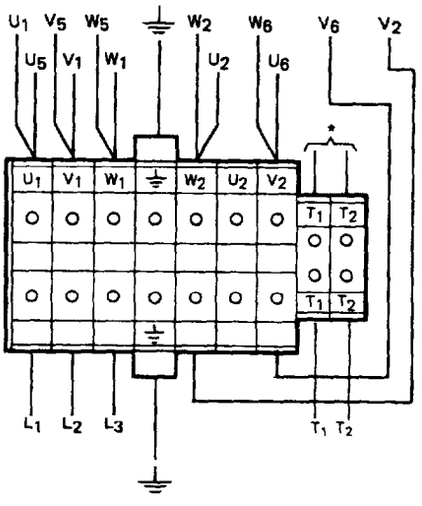
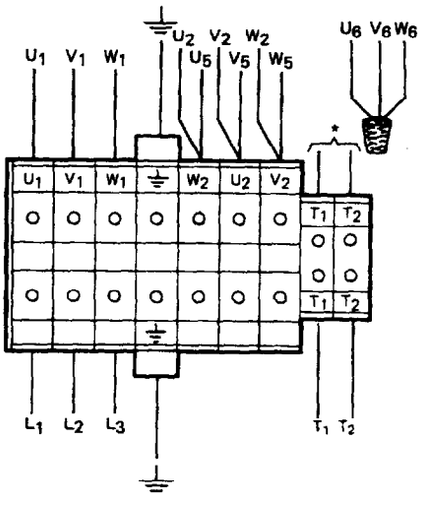


12-lead stator

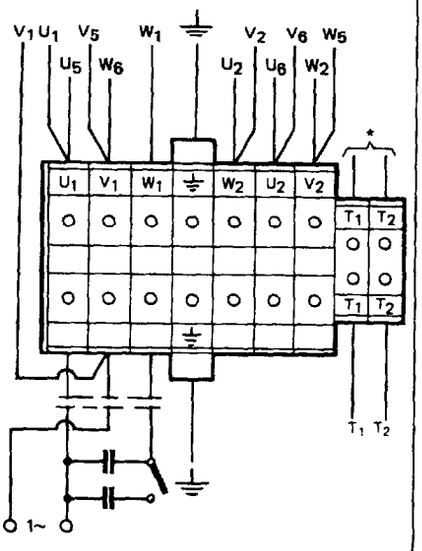
Y parallel



Y series



1-phase 60 Hz



* Thermal switches.

Stator connection

The stator leads are connected to the terminal board as illustrated in the figures.

The stator leads are colour-marked as follows:

U1	— red	**U5**	— red
V1	— brown	**V5**	— brown
W1	— yellow	**W5**	— yellow
U2	— green	**U6**	— green
V2	— blue	**V6**	— blue
W2	— black	**W6**	— black

Motor cable

The motor cable has seven conductors.

One of the conductors, the earth, is Yellow/Green and marked ⏚ and the others are black and marked U1, V1, W1, U2, V2, W2.

(The motor cable for USA: Green = Ground, Yellow/Green = Ground check).

Leads not in use must be isolated.

Specially approved mixer

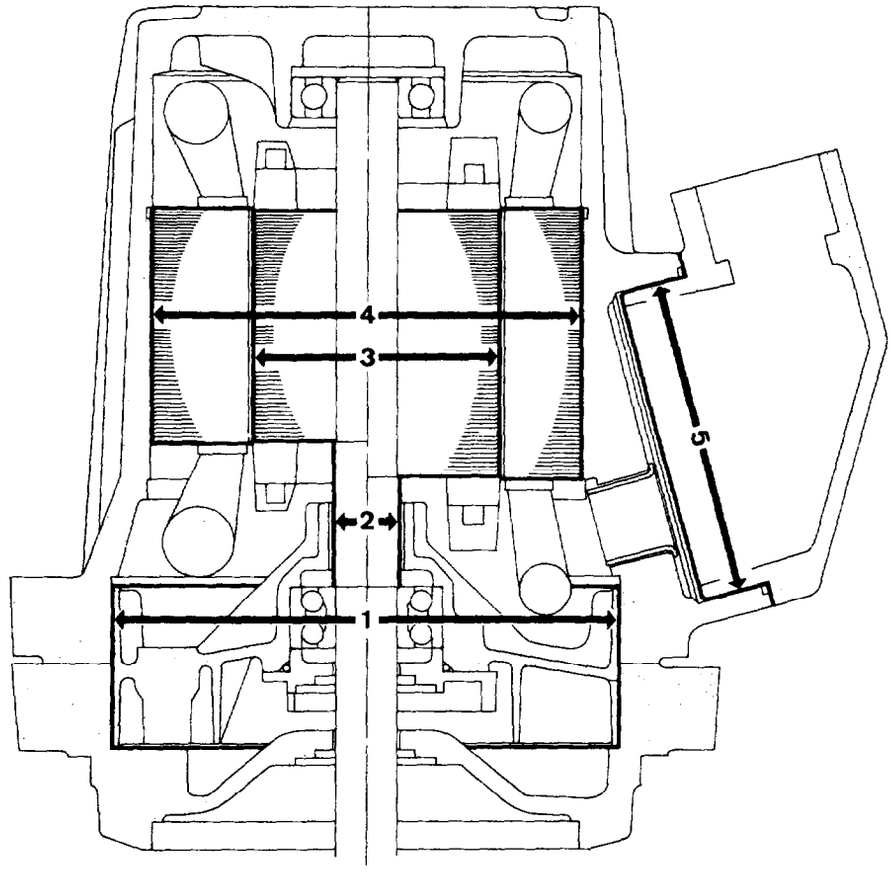
NOTE: This workshop manual also describes the specially approved mixer versions. For identification, see the mixer data plate and approval plate.

To ensure that the mixer complies with the regulations and approval of the authorities, use only genuine Flygt spare parts when carrying out repairs.

Specially approved mixers may only be repaired and adjusted by Flygt or workshops and/or workshop personnel authorized by Flygt.

Always check the dimensions of vital parts before assembly, see Fig.

Always carry out insulation tests on assembled mixers and run them on test before delivery.



4451.090

4501.090

	Width of joint mm EExd	Diameter mm	Gap of joint mm min.	max.	Width of joint mm EExd	FM	Diameter mm	Gap of joint mm min.	max.
1	≥25	244	0.050	0.194	≥25	31.7	260	0.056	0.189
2	≥25	55 $^{+0.281}_{-0.250}$	0.250	0.300	≥25	43.0	60 $^{+0.281}_{-0.250}$	0.250	0.300
3		114.1 133.0 115.0 134.0	≥0.87 ≥1.03 ≥0.97 ≥1.13				158.2 ±0.05 160.0 ±0.05	1.700	1.900
4		210 $^{+0.052}_{-0.020}$	Shrinkfit				250	Shrinkfit	
5	≥25	130	0.043	0.169	≥25	27	160	0.043	0.169

General rules

Wash the outside of the mixer thoroughly and blow it dry.

Clean all parts thoroughly — particularly O-ring grooves — before assembly.

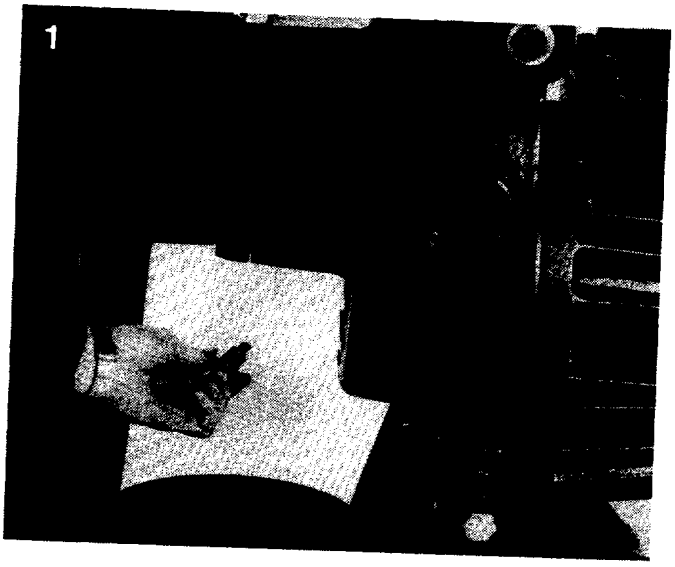
Always change all O-rings, other seals and gaskets and — when changing bearings — tab washers and round knurled nuts.

Oil moving parts, O-rings and threads — do not touch seal ring surfaces.

Across-flats widths are given in brackets.

NOTES

1



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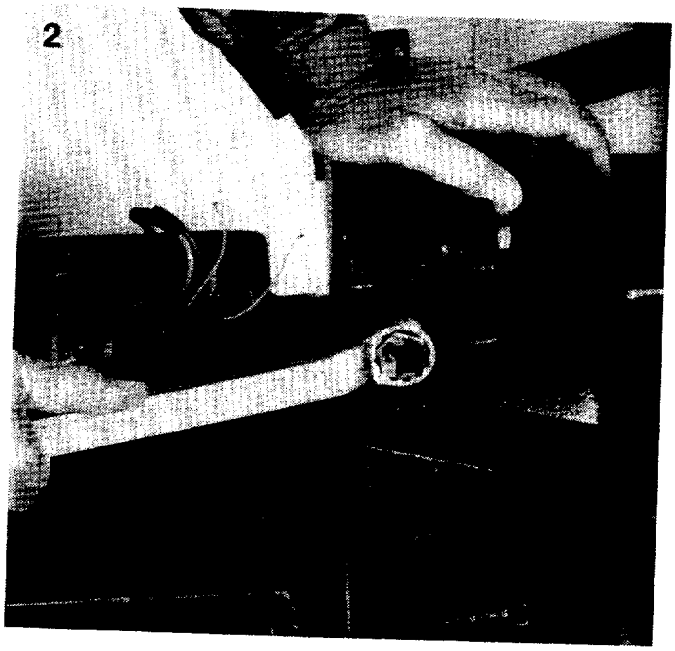

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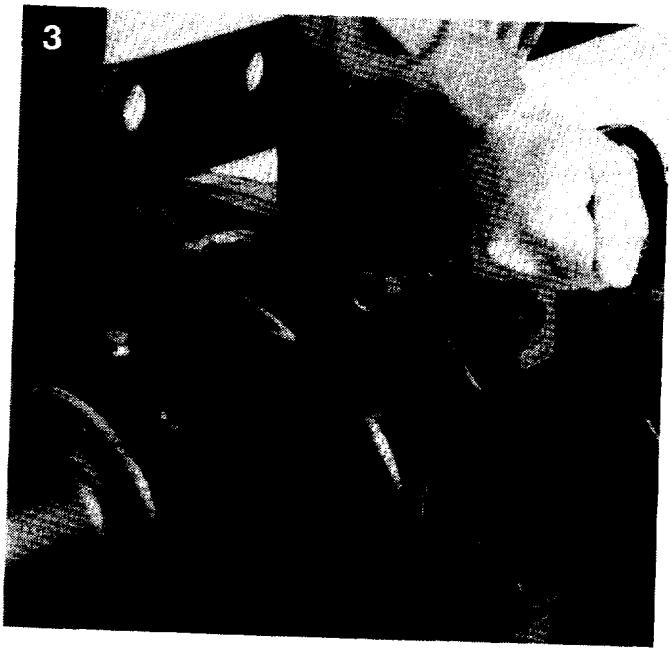

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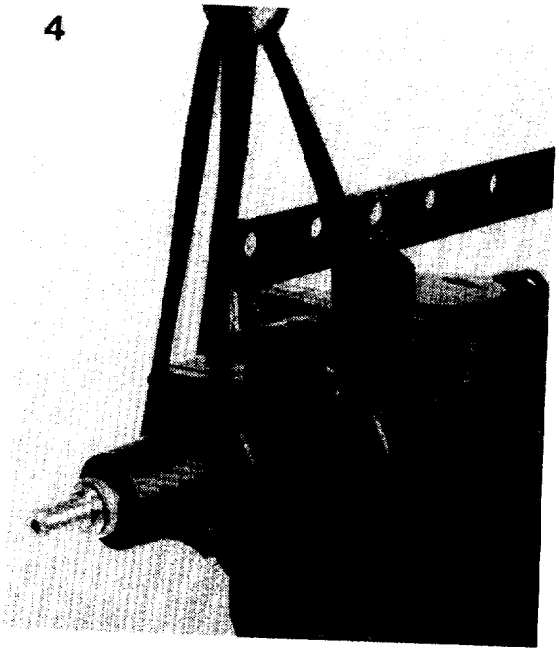

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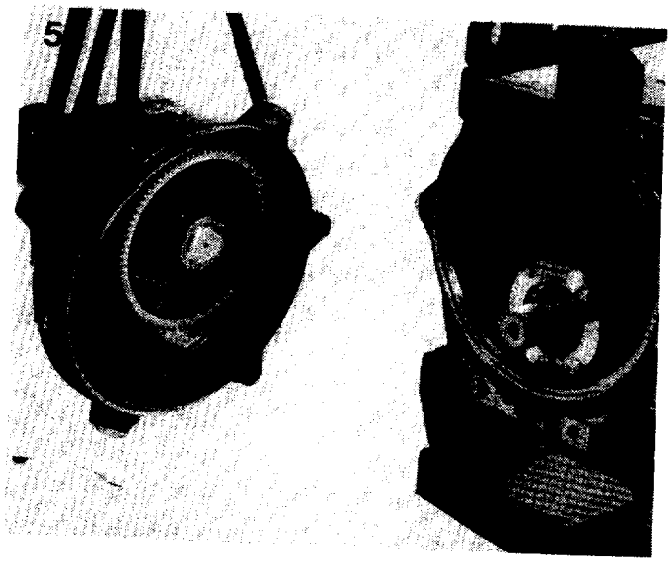

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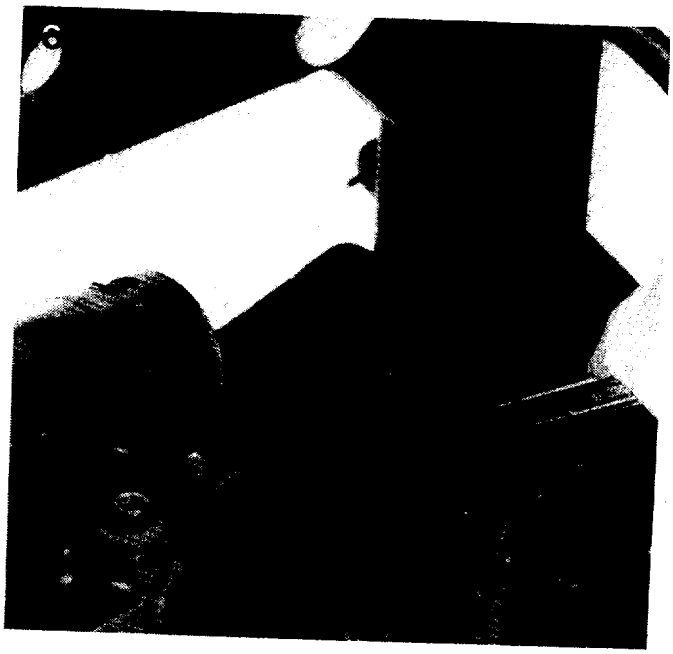

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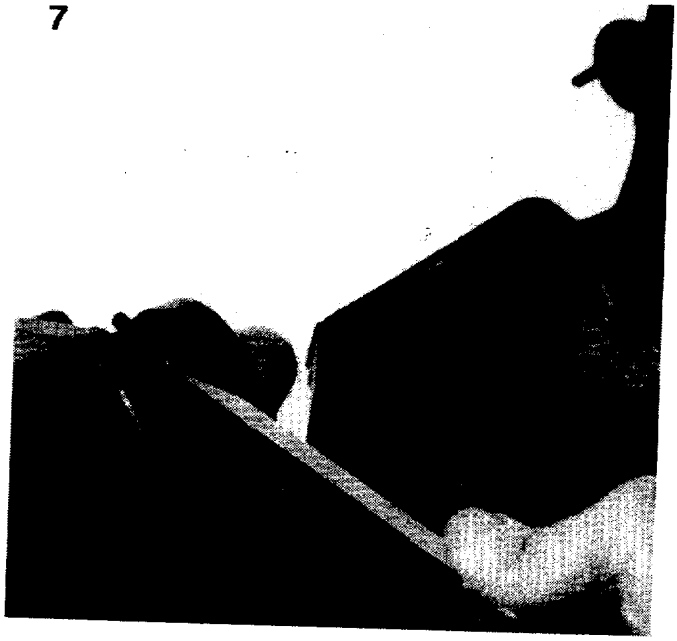

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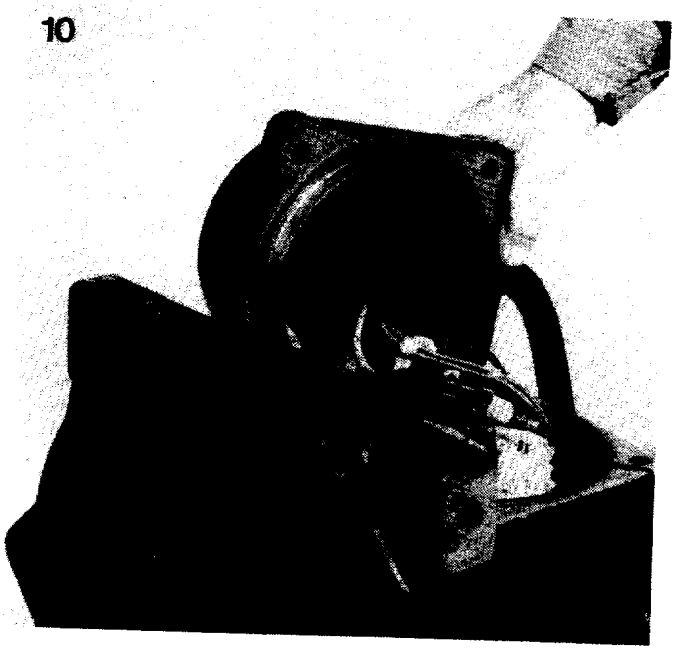

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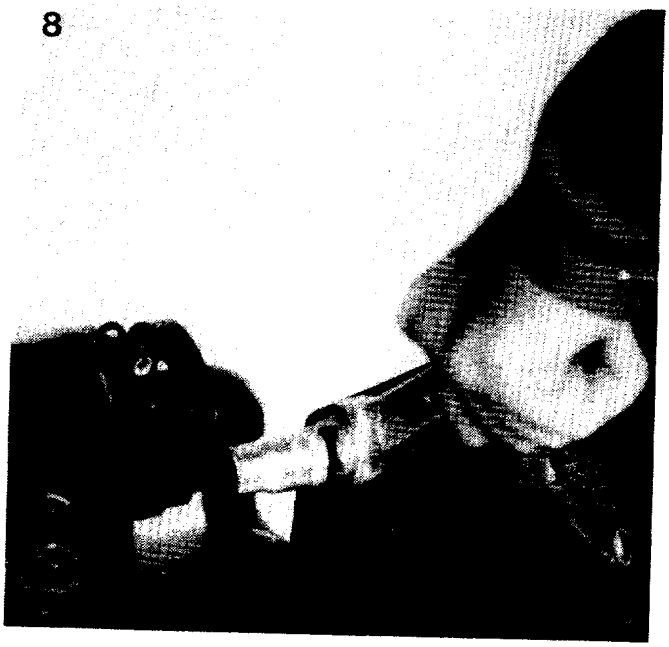

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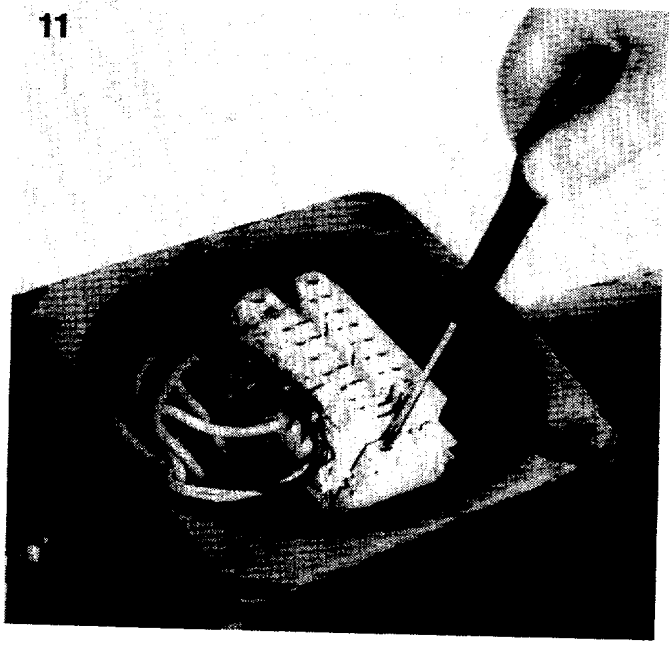

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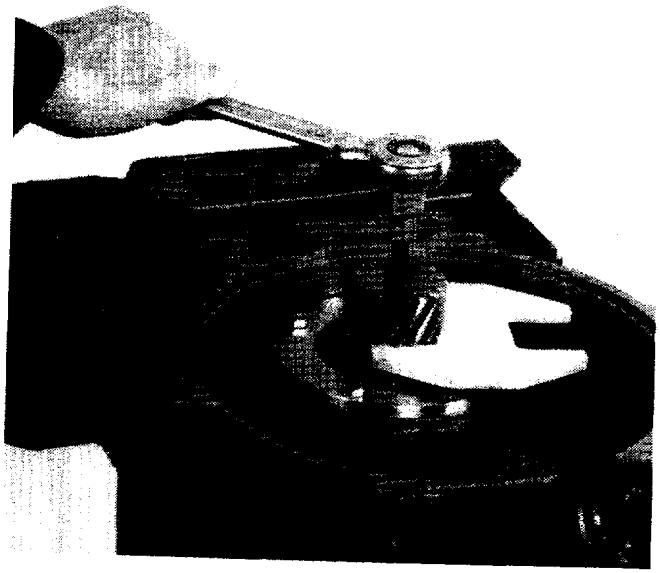

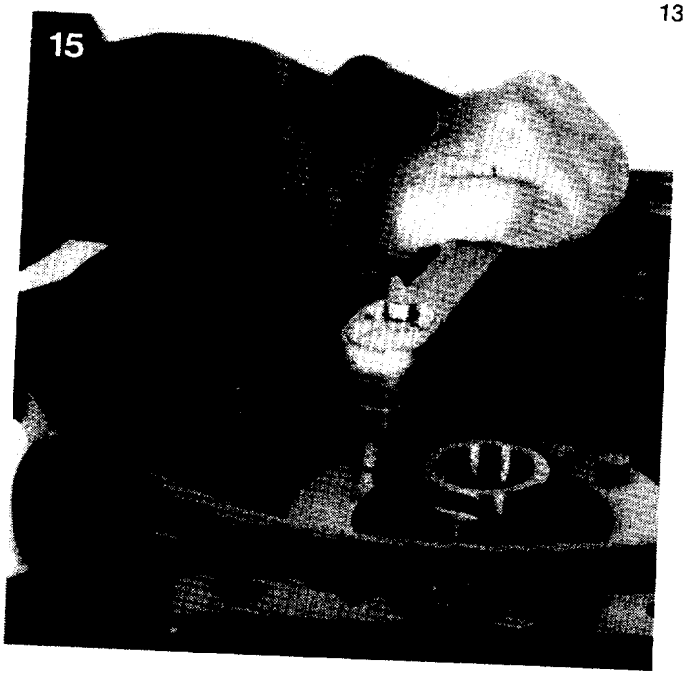

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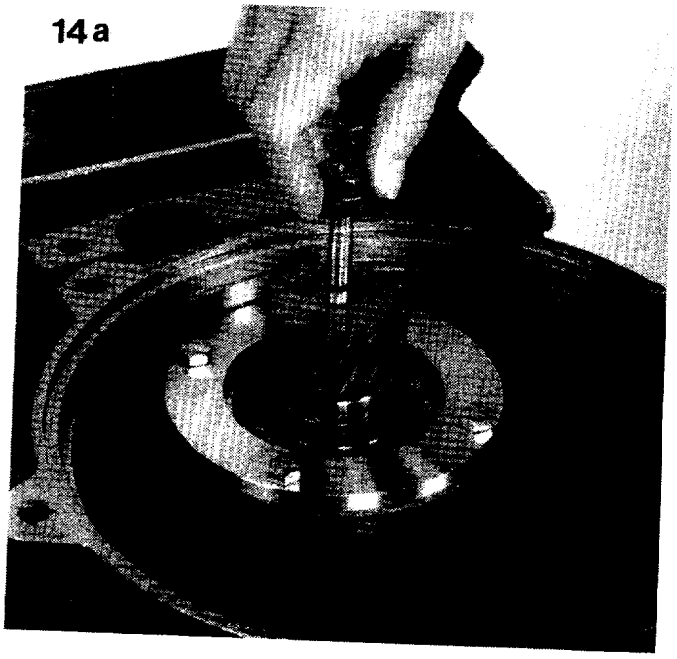

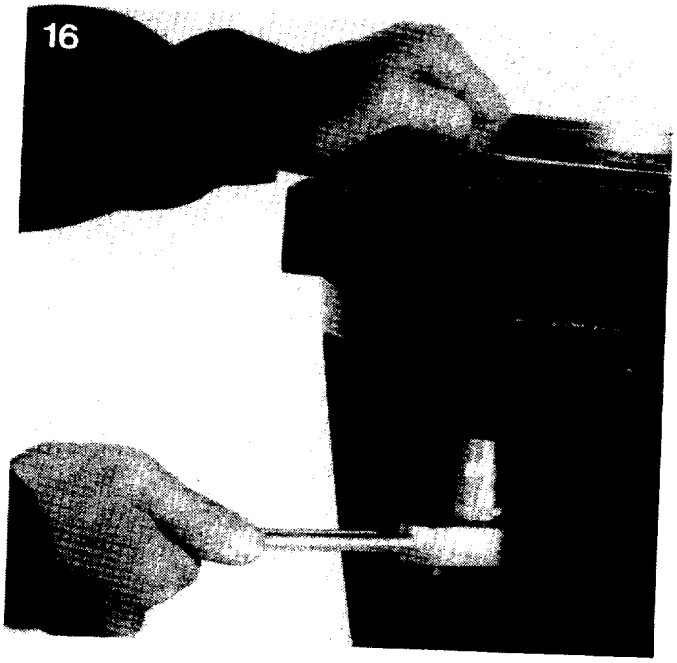

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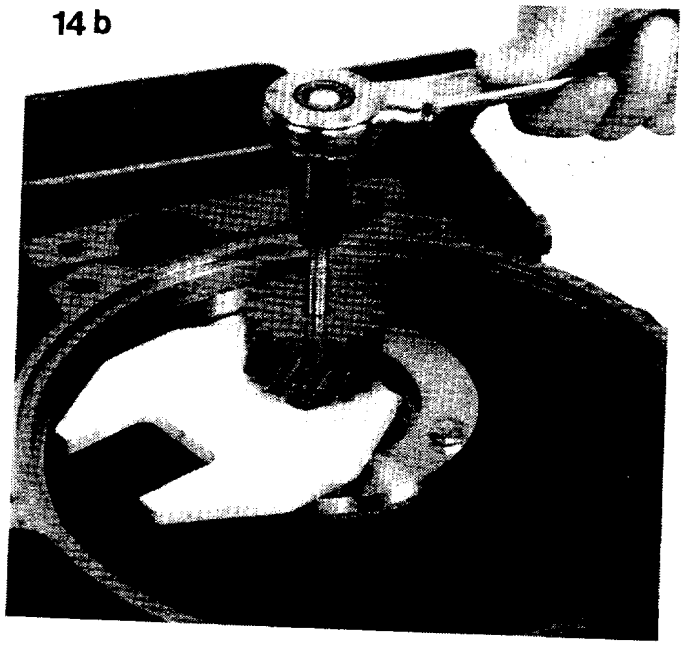

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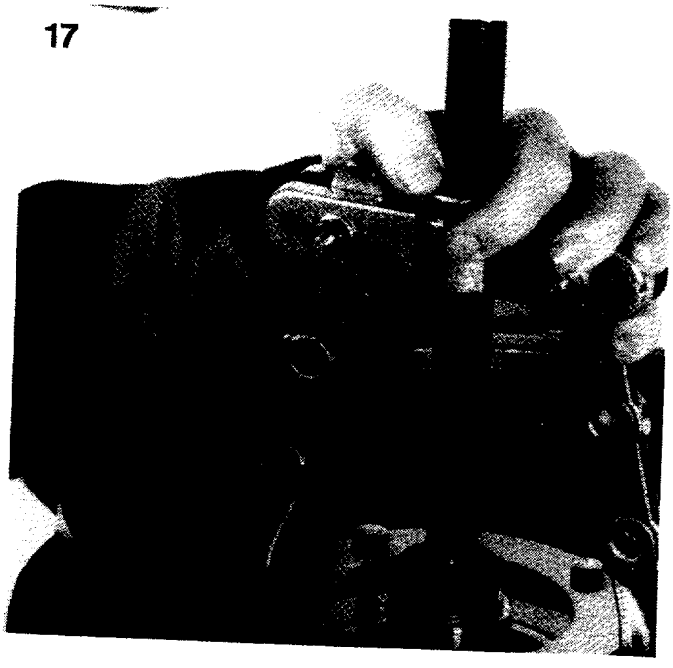

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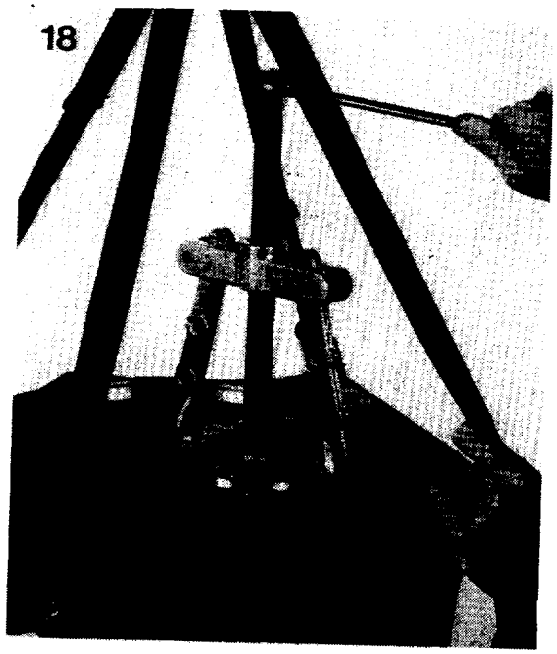

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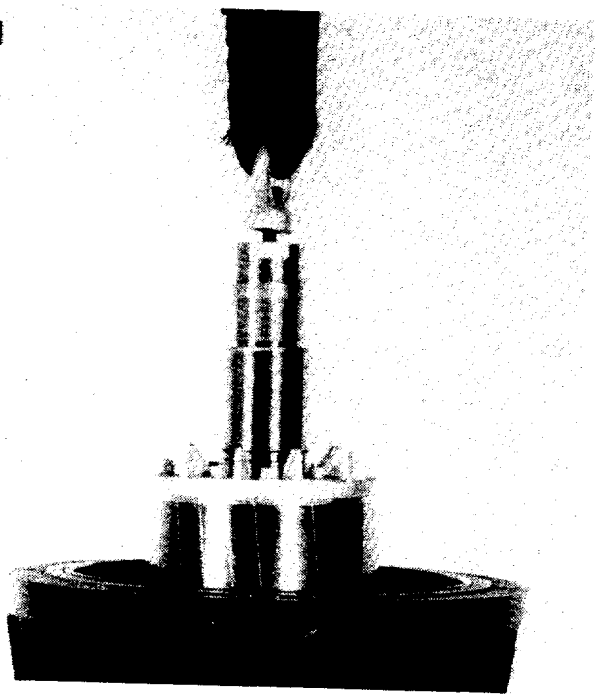

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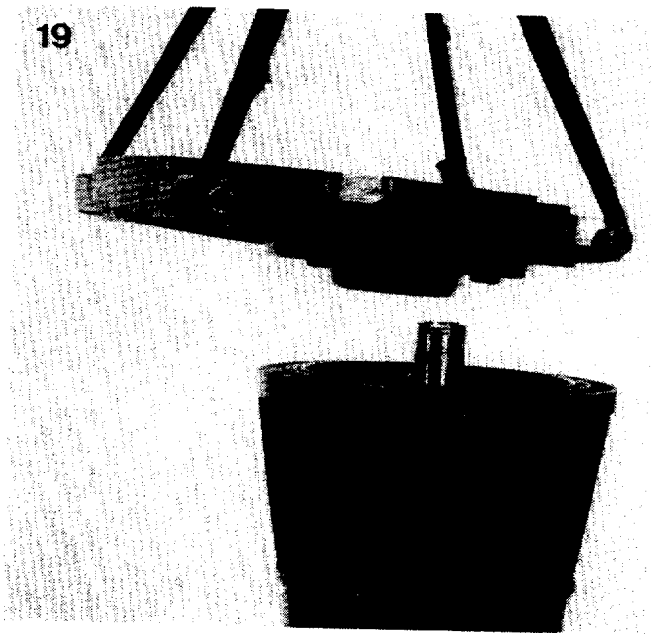

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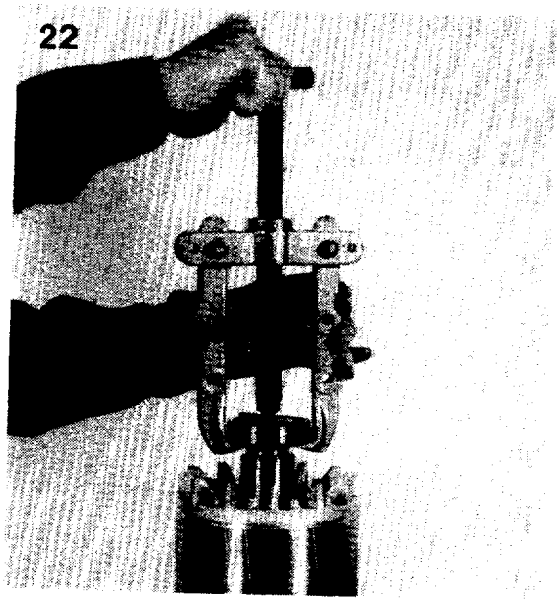

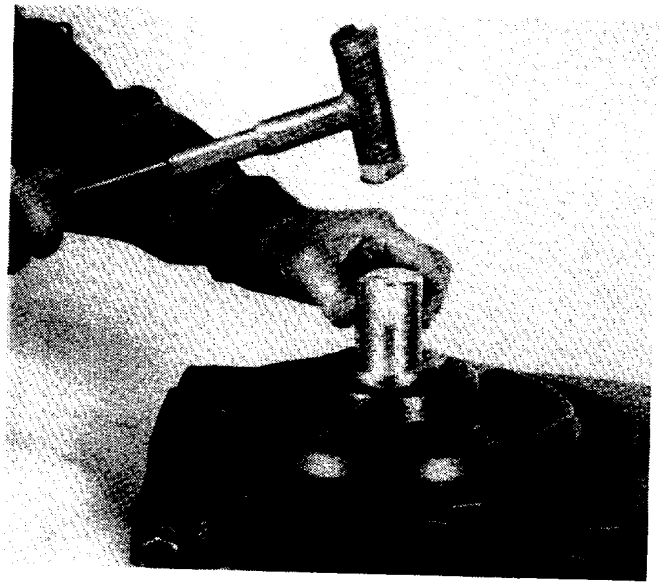

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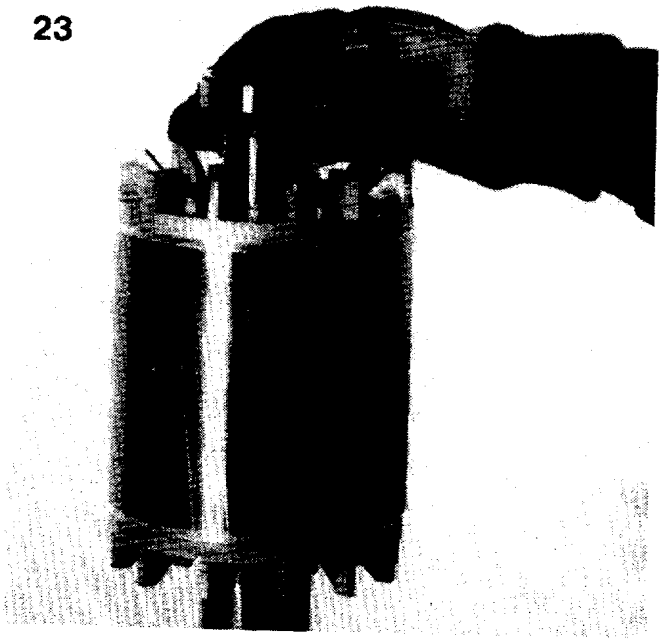

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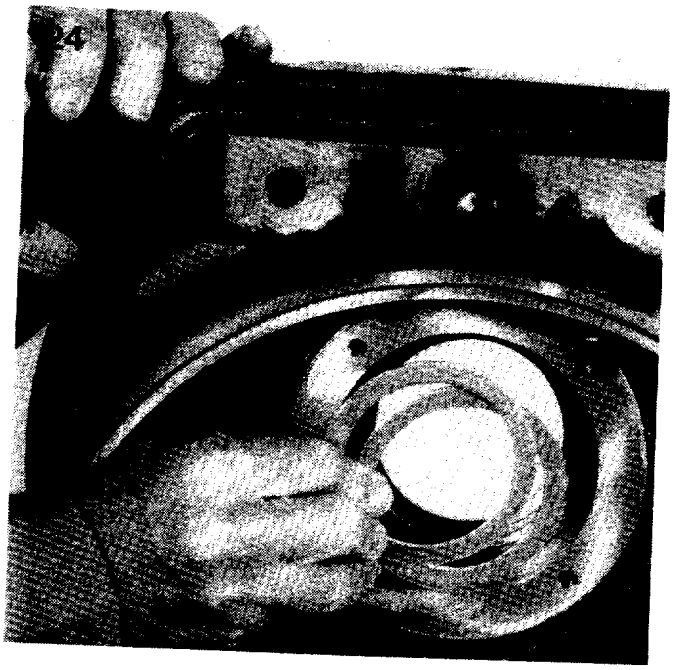

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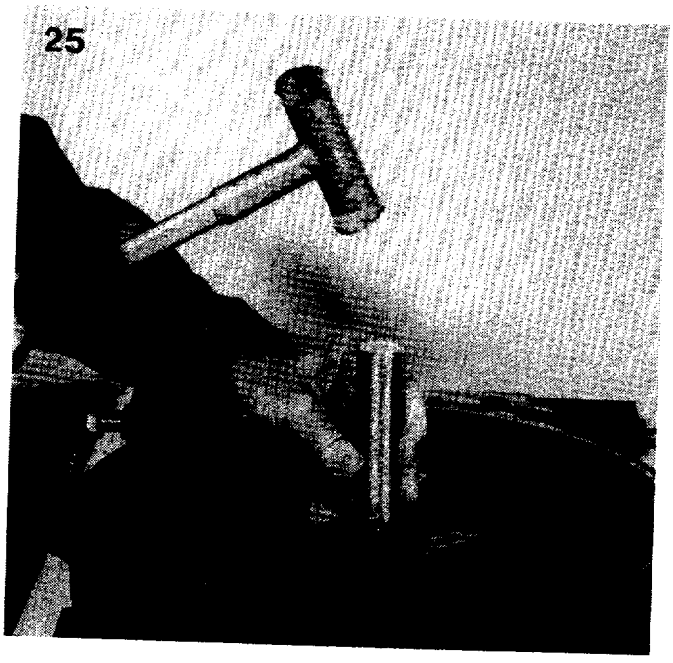

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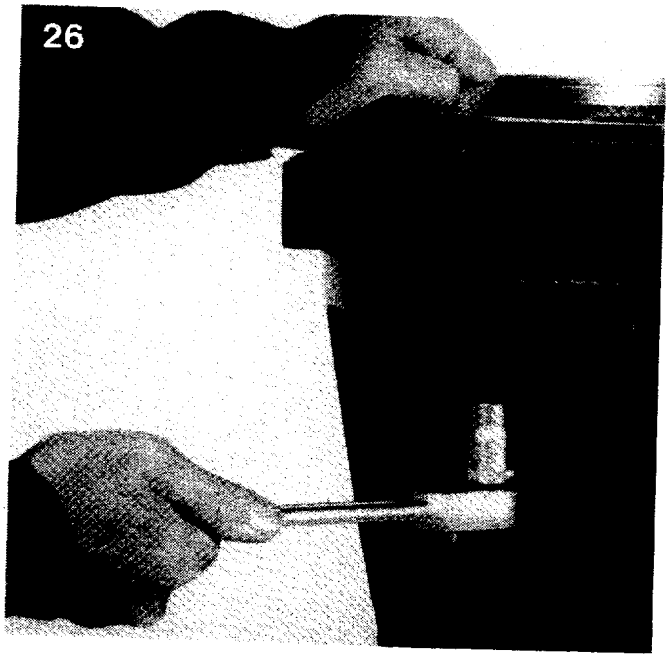

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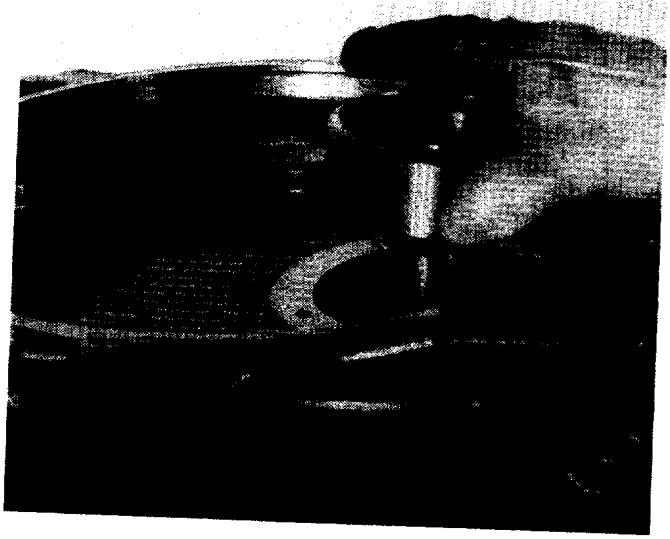

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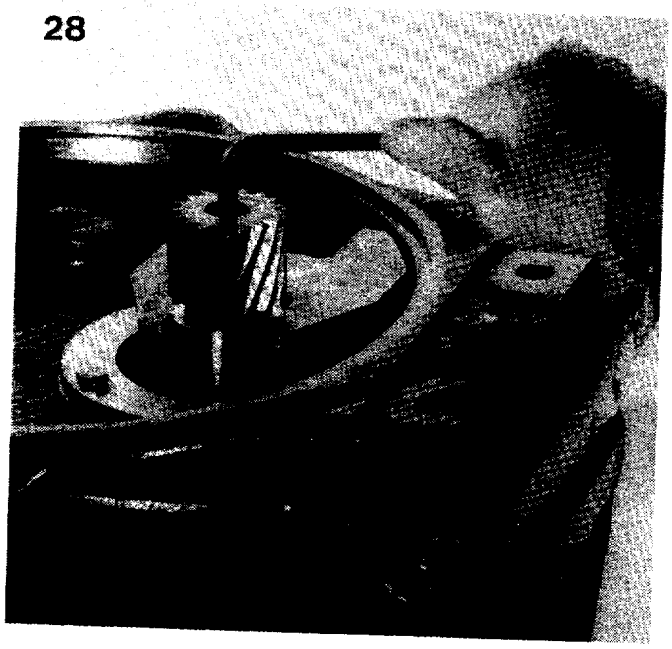

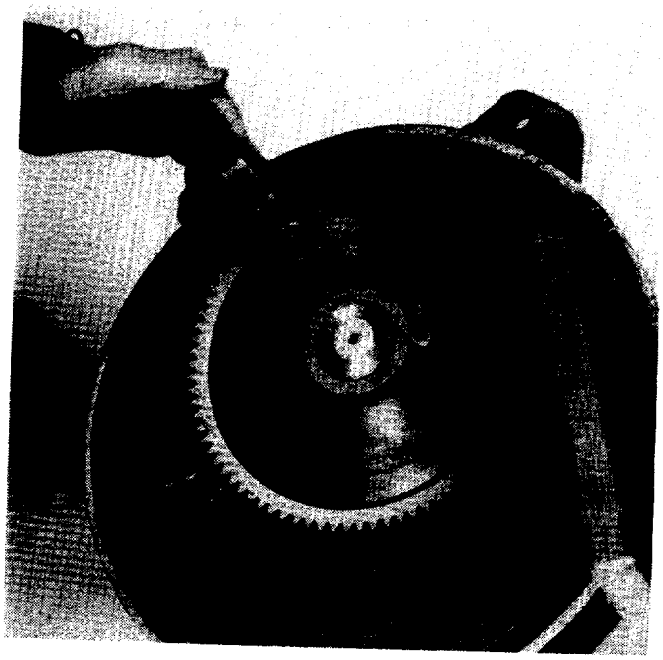

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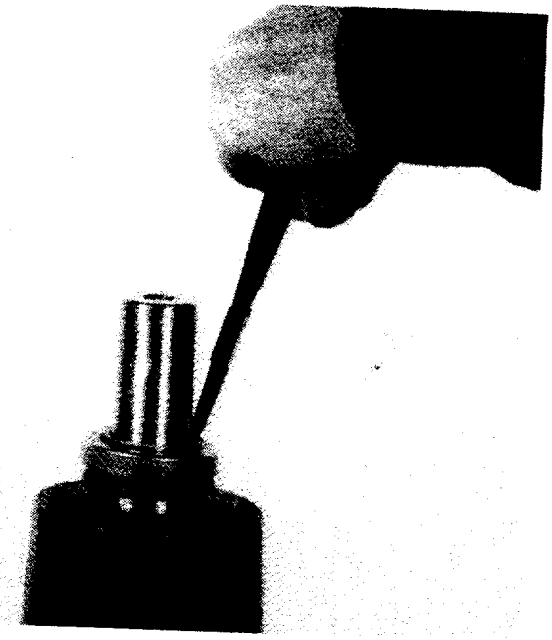

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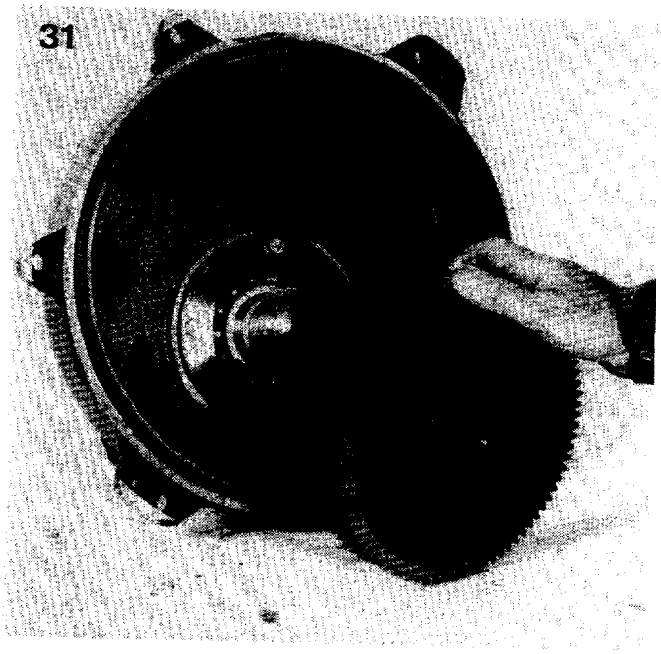

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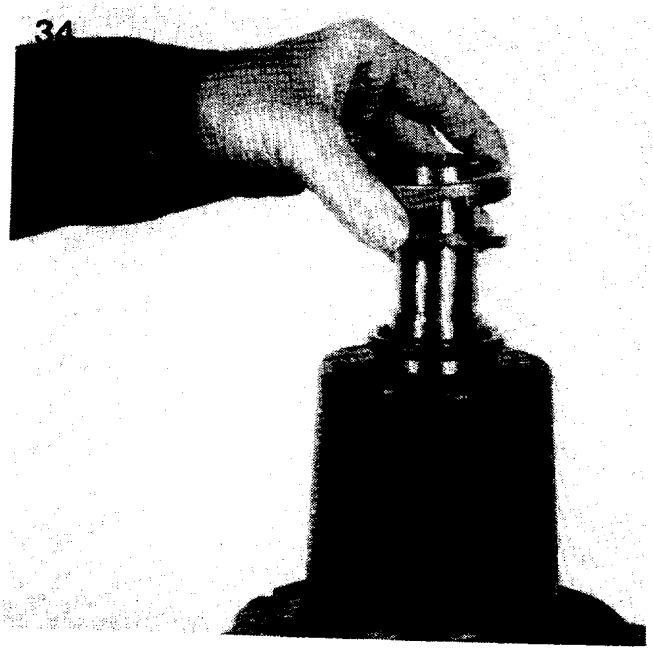

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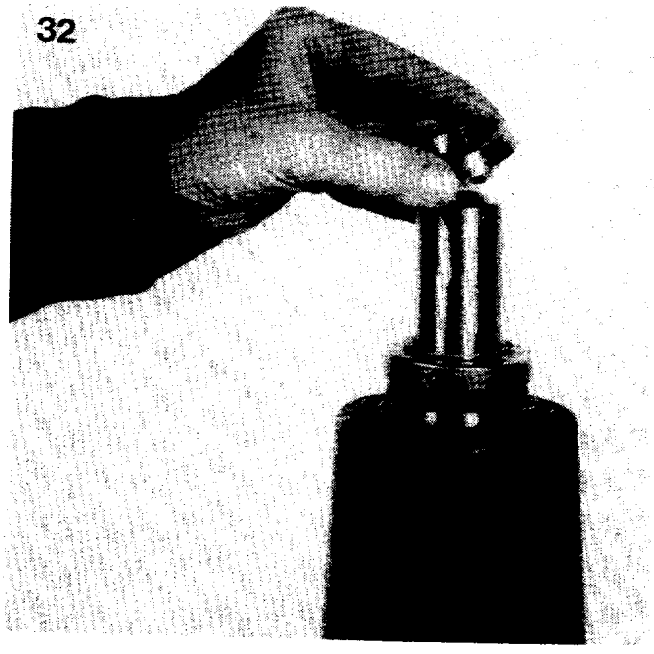

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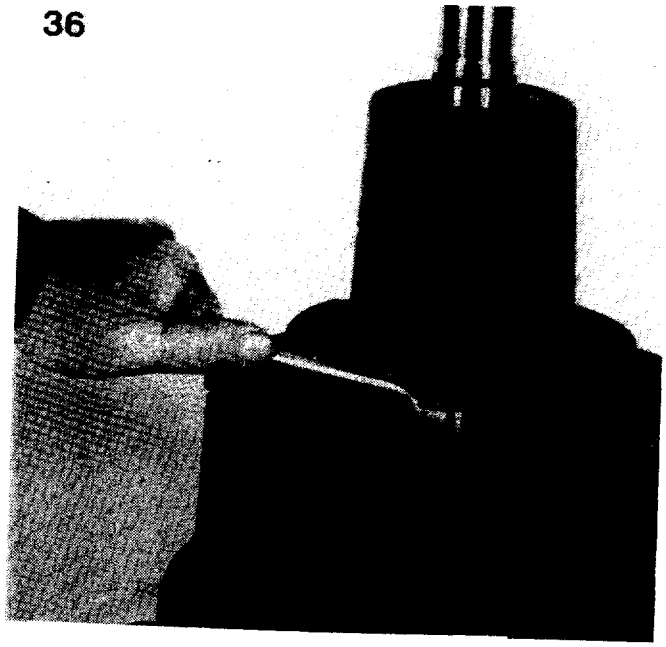

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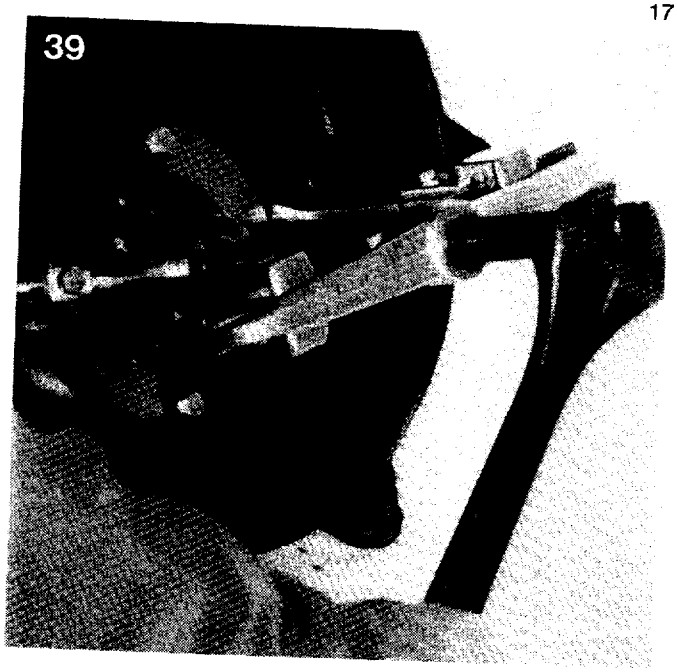

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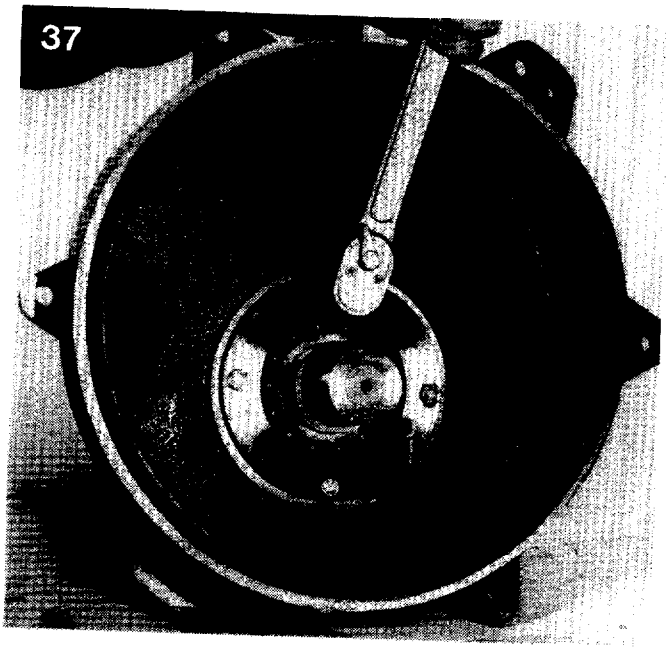

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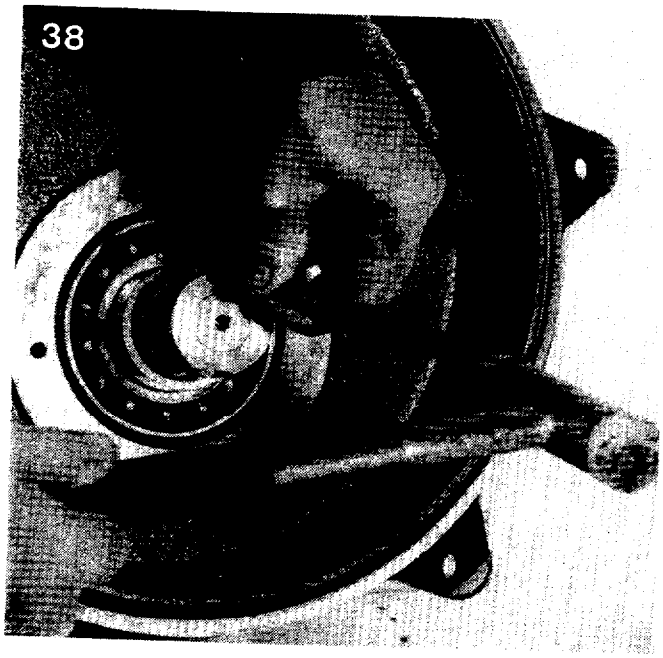

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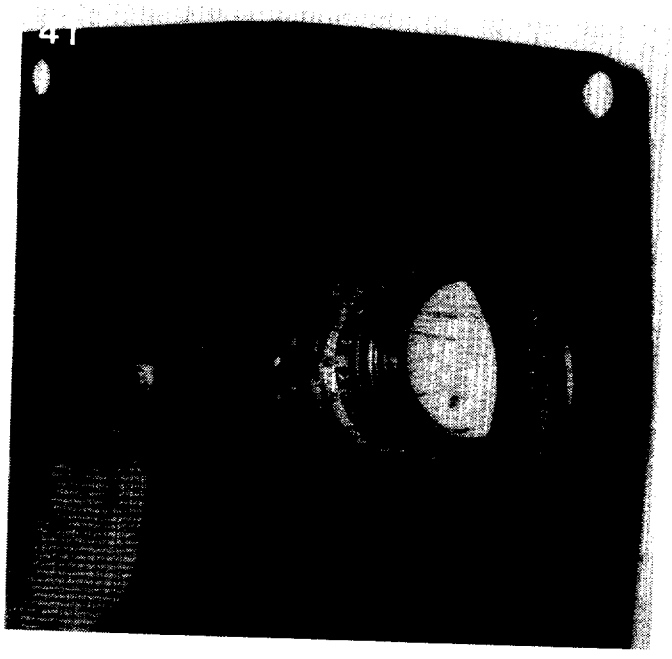

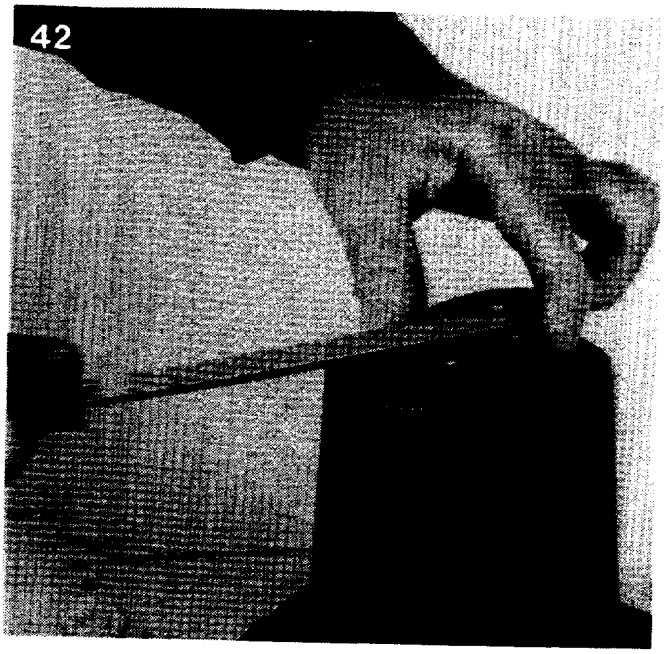
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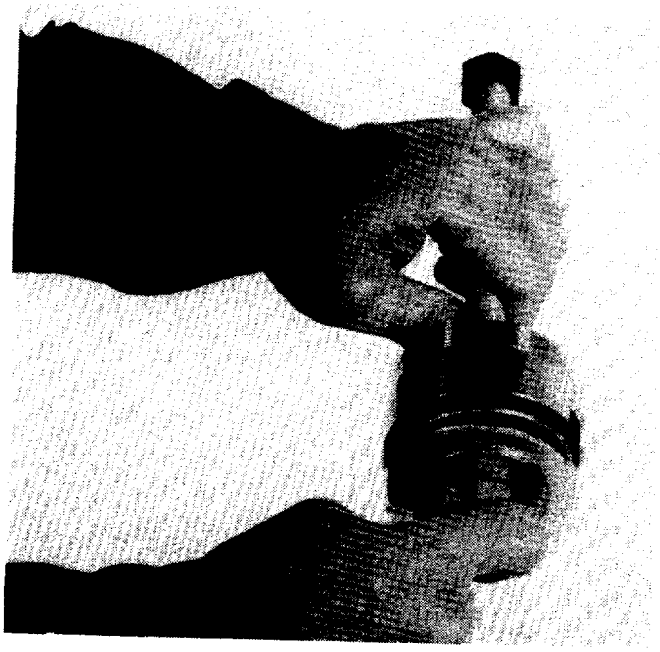


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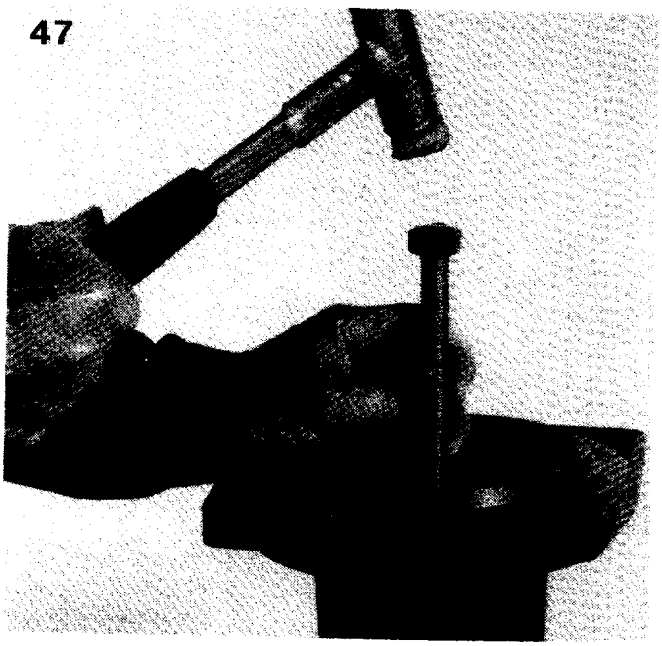
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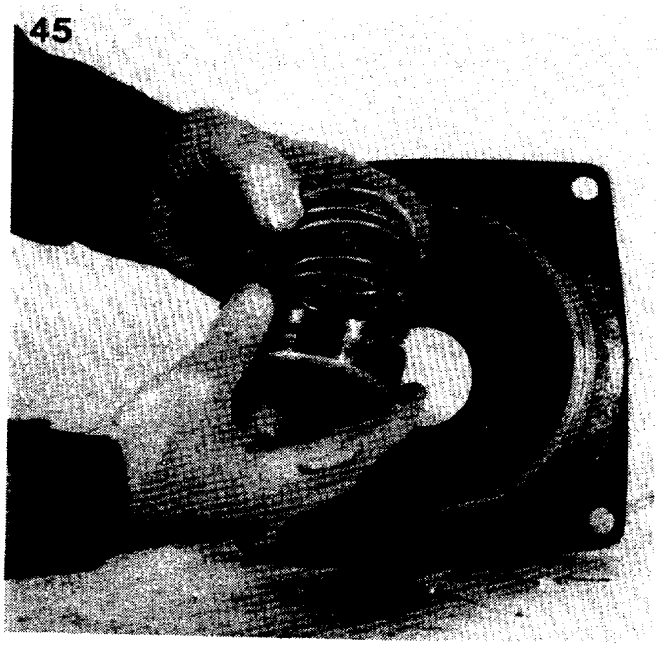
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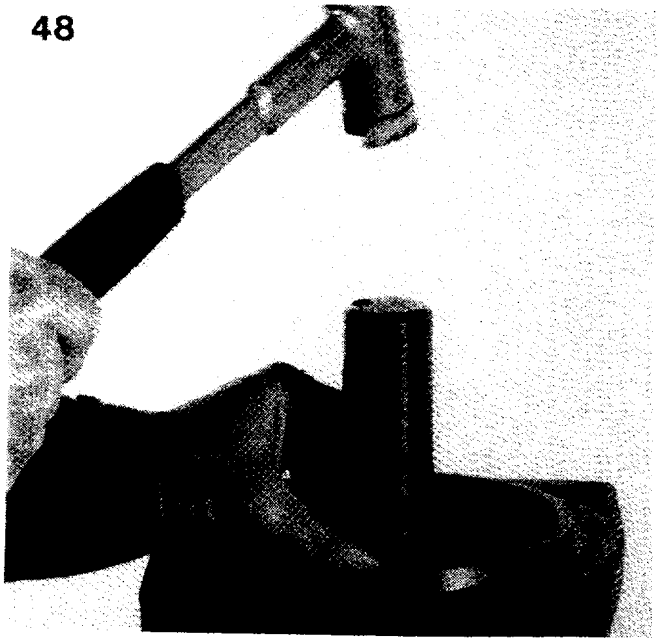
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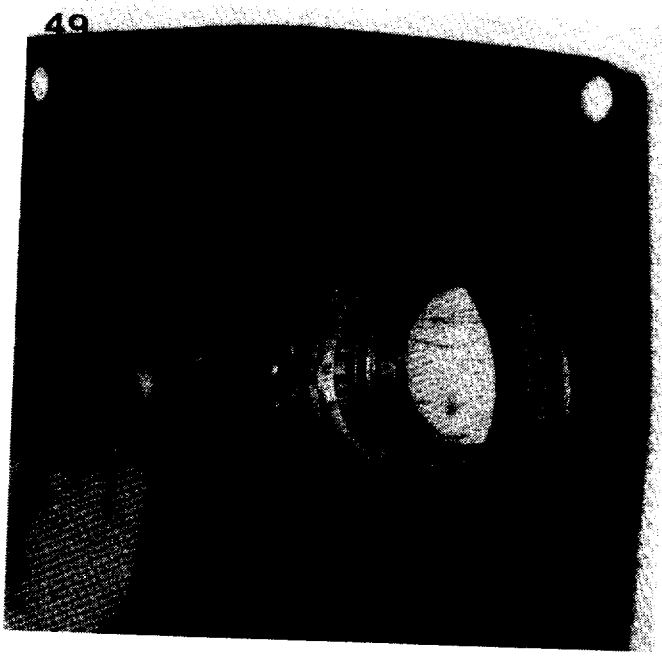

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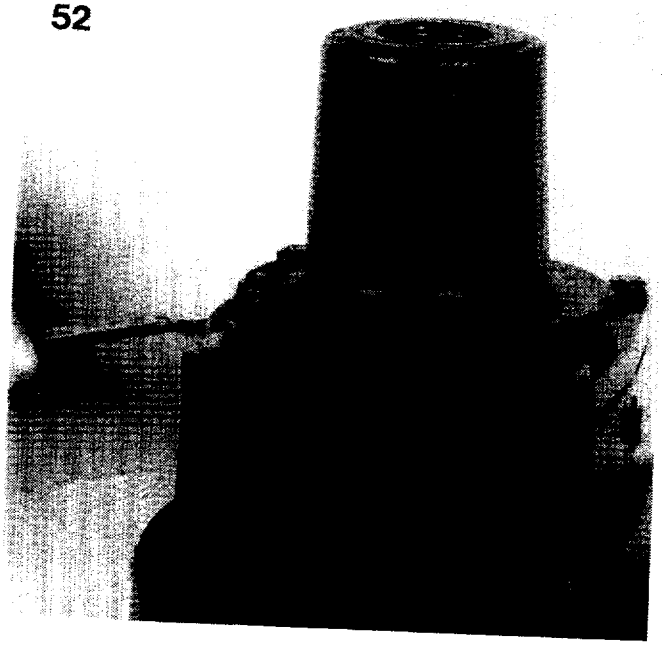

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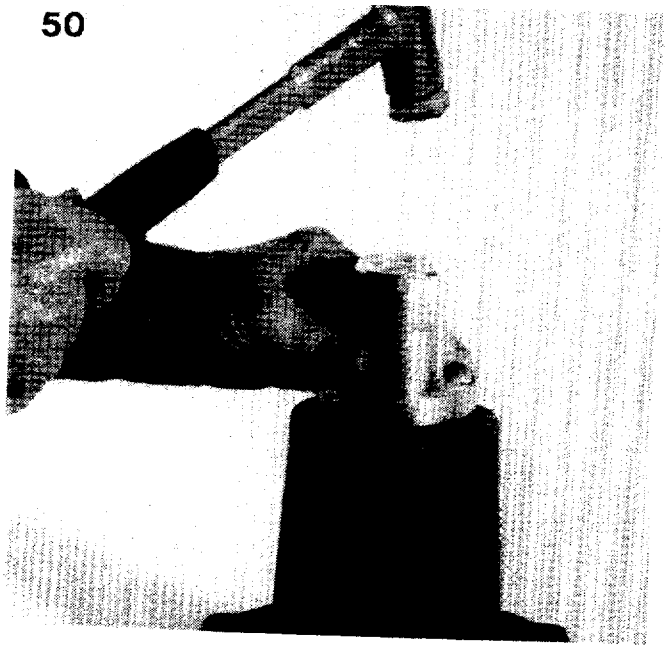

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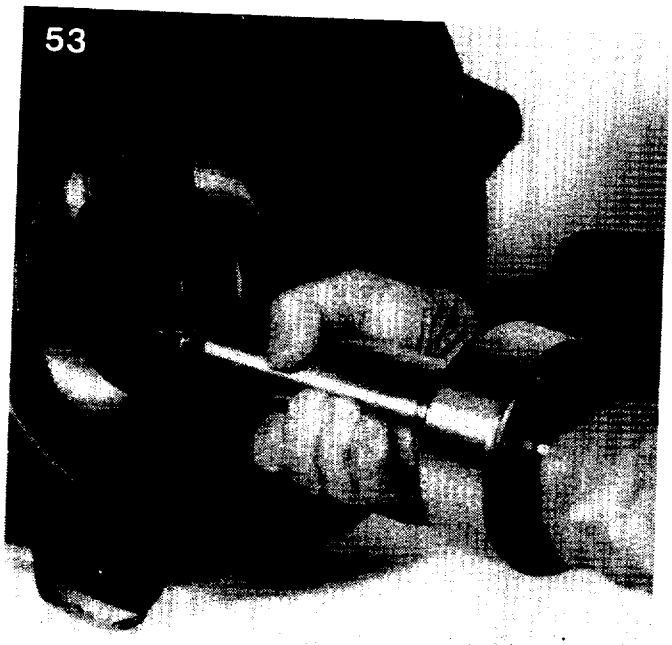

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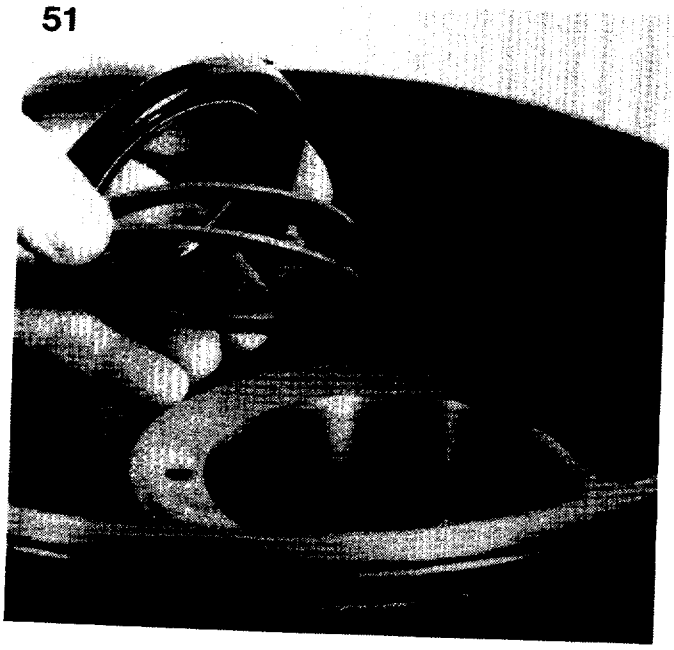

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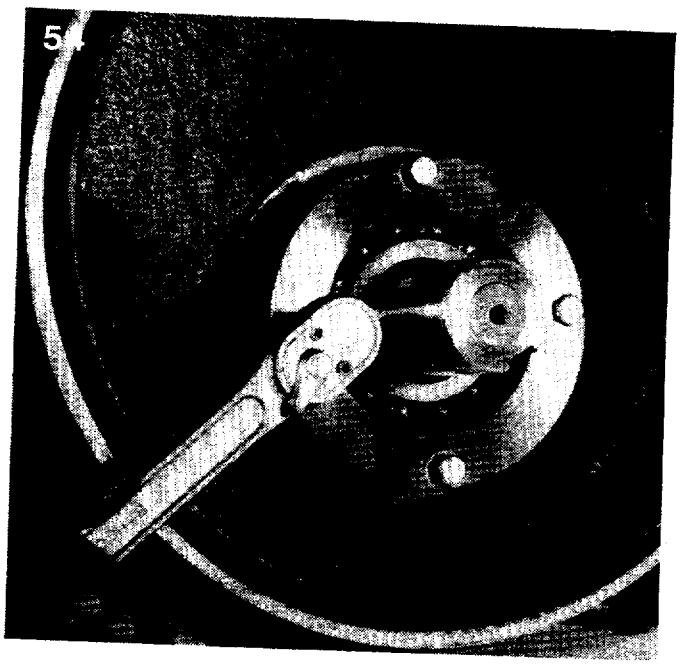

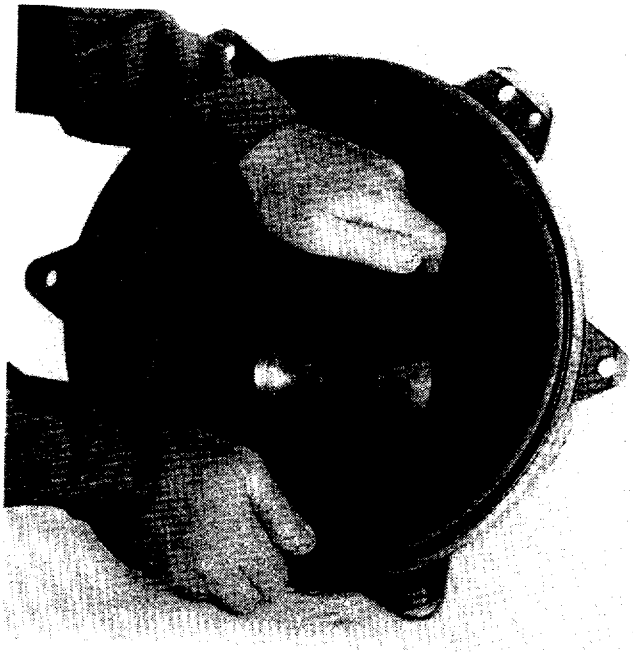

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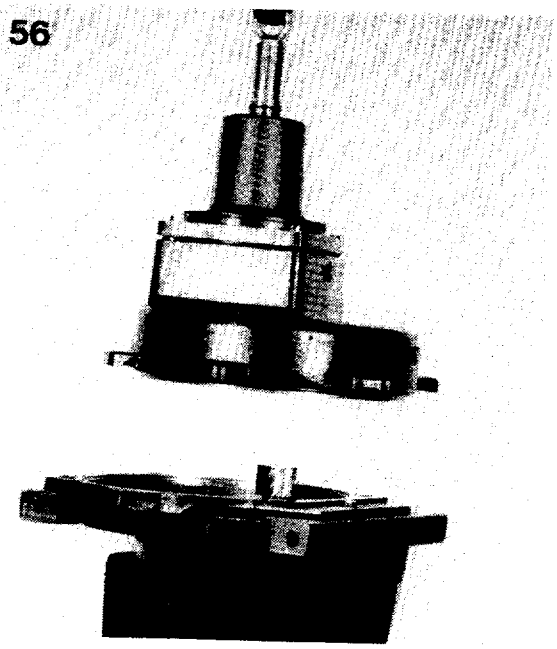

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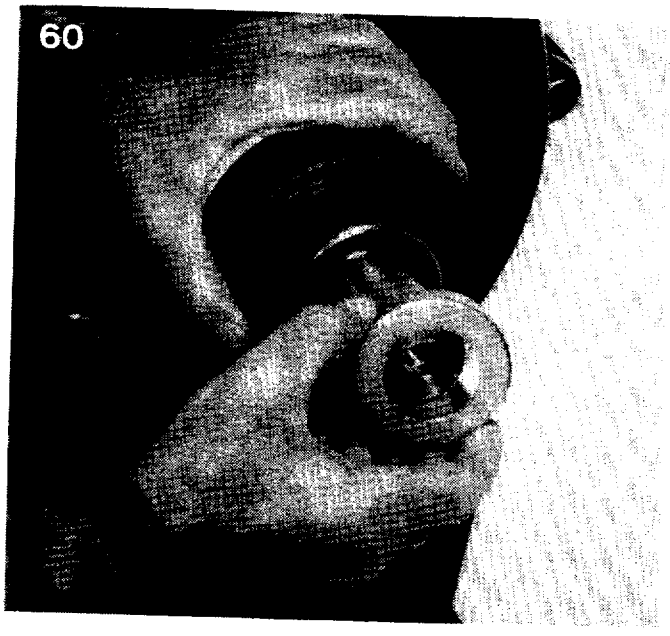

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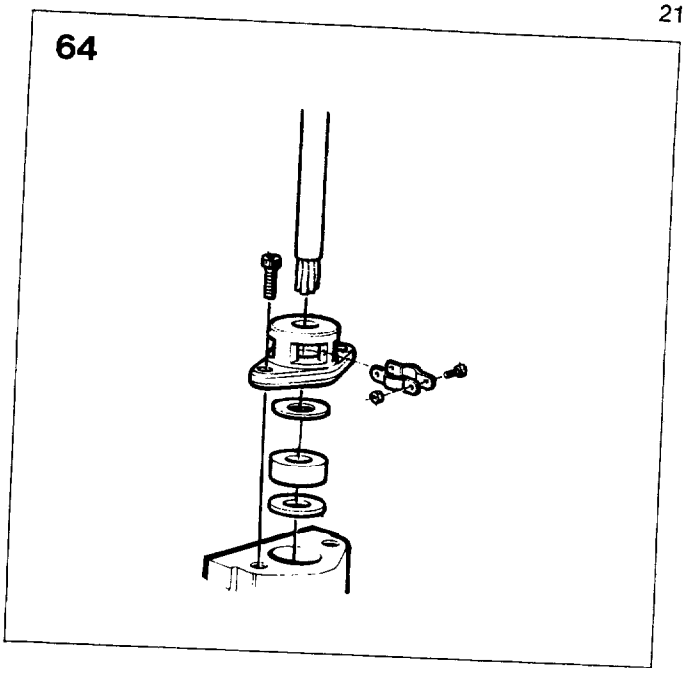

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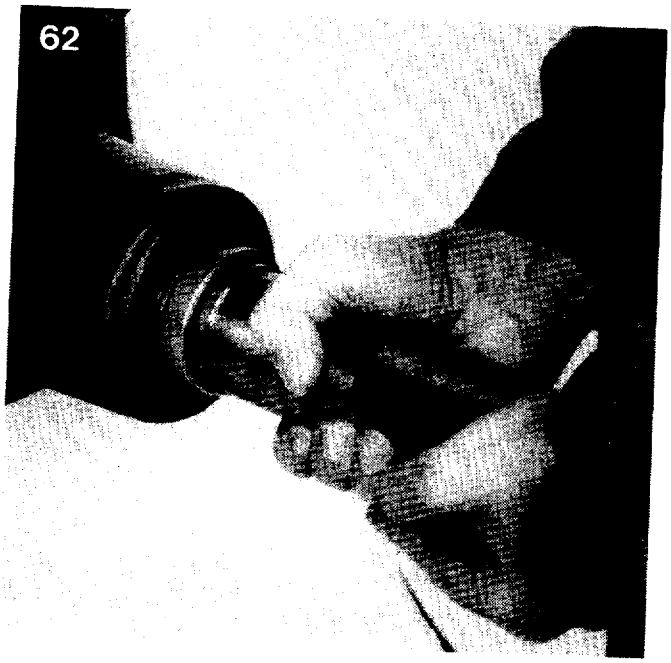

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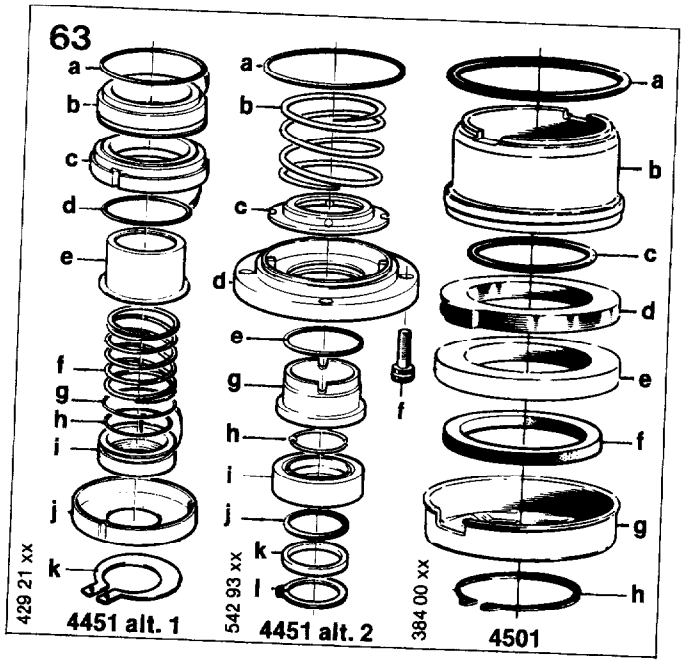
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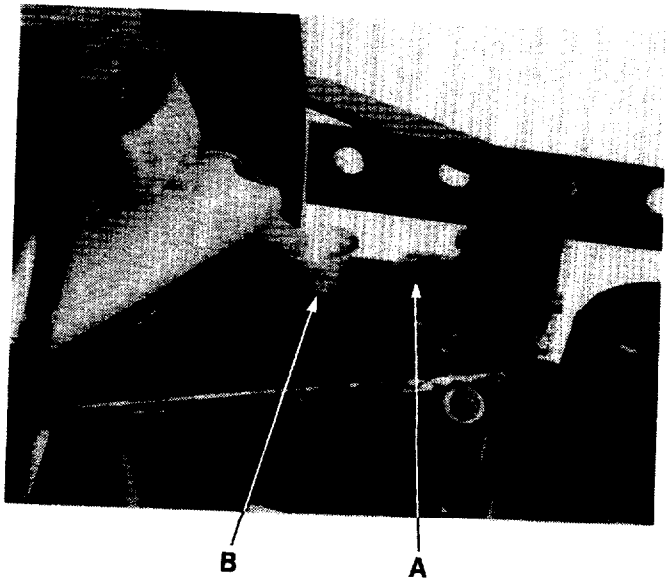
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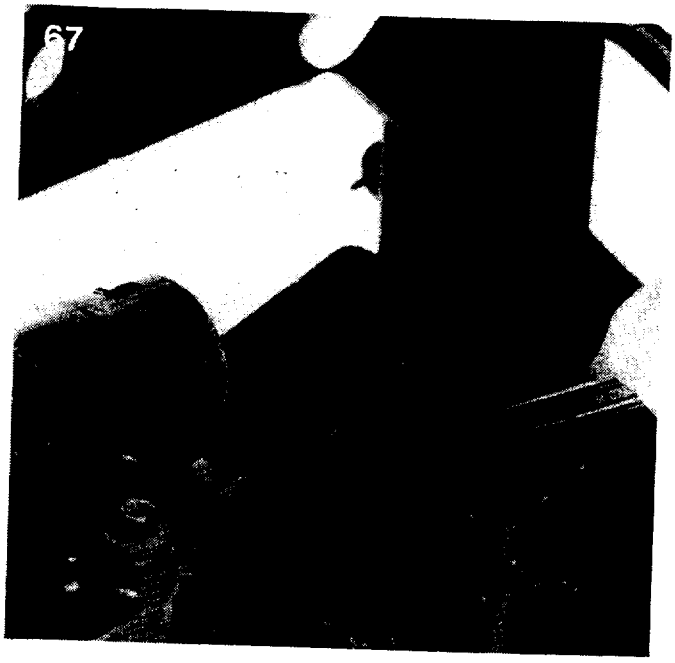

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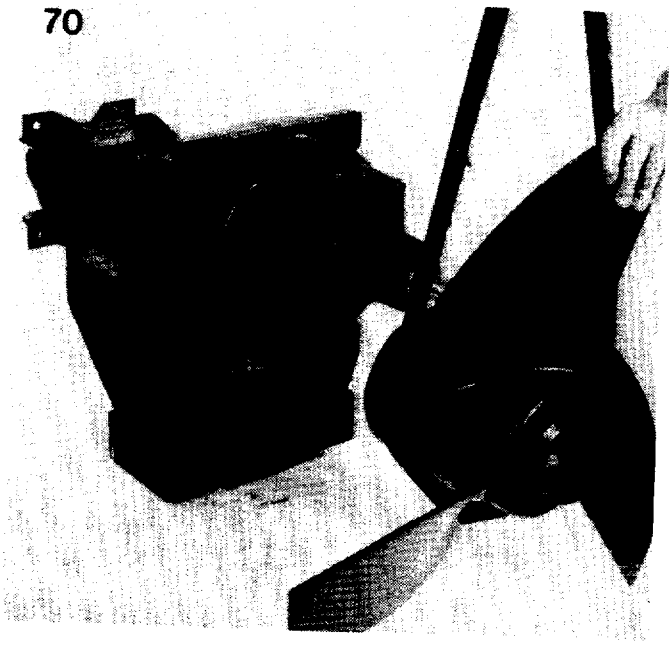

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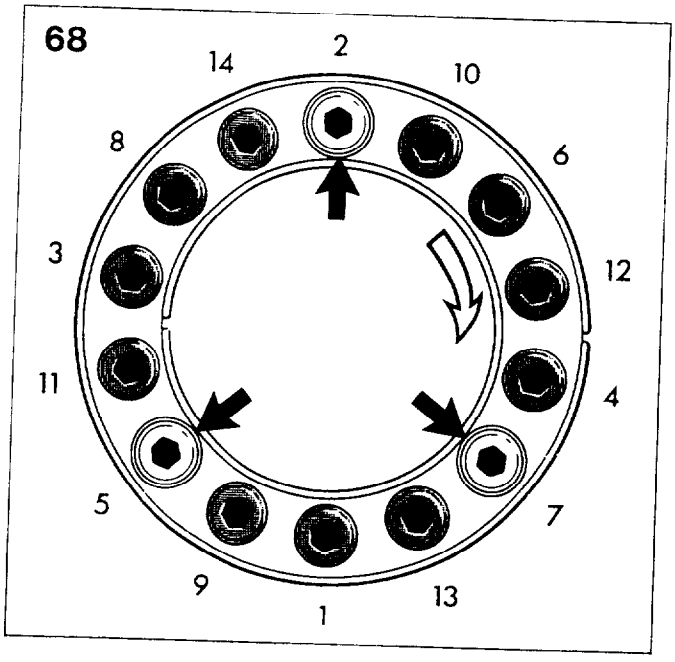

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If the mixer is specially approved the following details should be measured as described in the section "Specially approved mixer" page 8.

1. Stator casing
2. Shaft rotor unit
3. Bearing holder
4. Junction box cover
5. Cable entry flange

MOTOR
Removal

Draining the oil

1 • Place a receptacle under the drain plugs (oil capacity — 4451: 2.9 litres, 4501: 7.2 litres)

• Remove the filler plugs for the gear casing and bearing housing (17 mm).

Caution! If water has leaked into the oil casings, they may be pressurized. It is therefore advisable to hold a cloth over the drain plug when removing it to avoid oil splash.

• Remove the drain plugs (17 mm) and let all the oil drain out.

• Tighten the drain plugs firmly — and then the filler plugs lightly by hand.

Jet ring

2 • Remove the six screws (24 mm) and withdraw the jet ring.

Remove the propeller — see "PROPELLER removal".

Gear casing/Bearing housing

3 • Remove the four lower screws (19 mm) — slacken the two upper screws but leave them in place.

4 • Fit a strap round the unit — relieve the strain.

• Remove the two remaining upper screws.

5 • Whitdraw the housing — suspended from the strap.

Lifting bracket

6 • Remove the two front screws (19 mm) and two rear screws and nuts — remove the lifting bracket.

Cable entry

7 • Back off the two nuts and bolts on the cable clamp.

8 • Remove the screws (10 mm socket cap) from the cable entry and withdraw it.

9 • Remove the cable clamp bracket (19 mm) from the stand.

10 • Remove the four screws (10 mm socket cap) from the cover and remove it.

11 • Back off the cable connections in the terminals of the terminal block.

• Remove the end stops, if necessary.

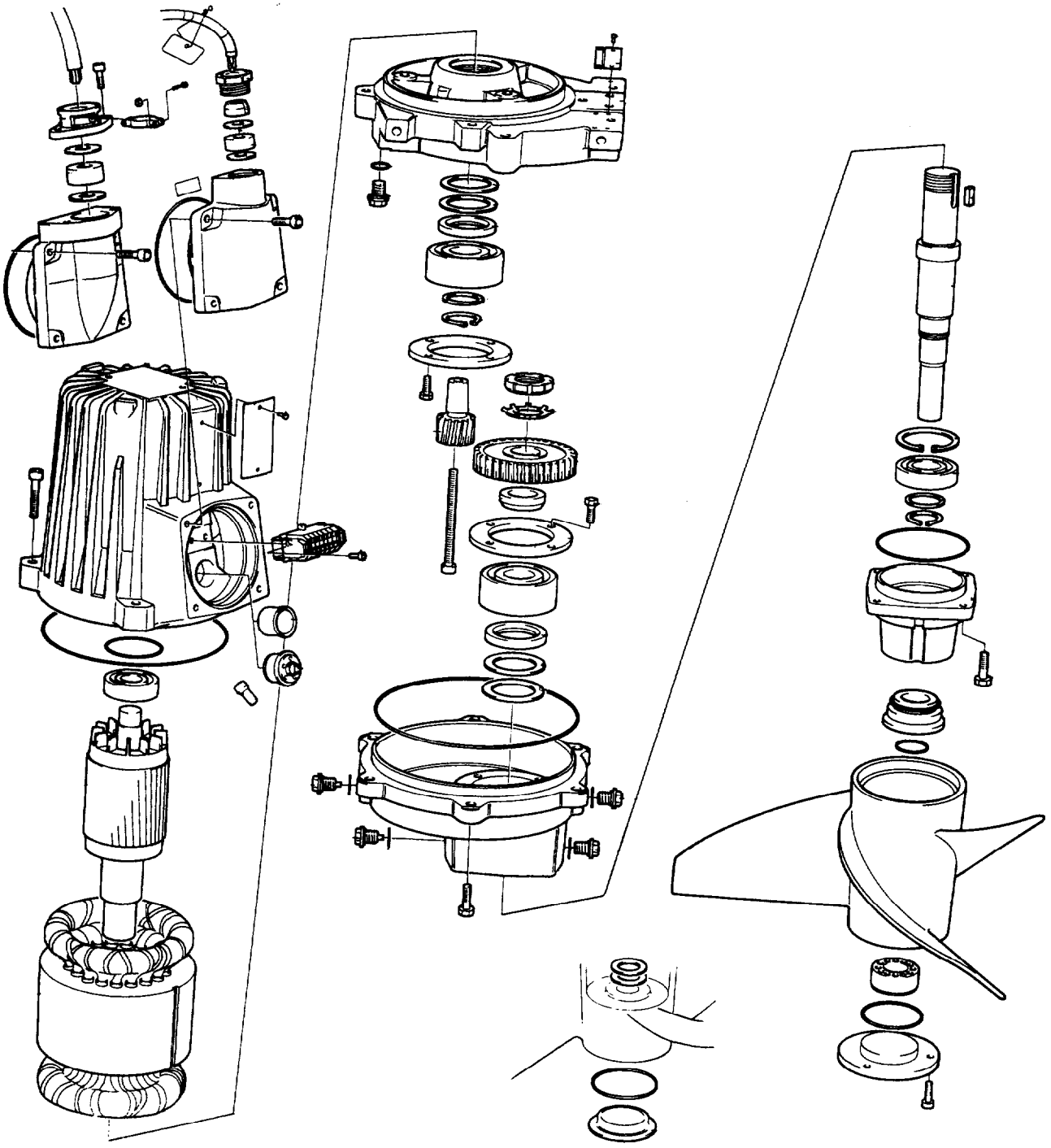
• Dismount the terminals, if necessary from the rail.

Stand

• Fit a strap round the mixer — relieve the strain.

• Remove the stand screws, two front (24 mm) three rear (19 mm).

4451



MOTOR

Dismantling

- Place the motor on a workbench (on the stator casing).

12 • Secure the spur gear with the locking plate 504 01 00 and remove the screw (8 mm socket cap) from the spur gear.

13 • Fill the hole with oil (right up to the edge).

14a • Carefully insert puller screw 497 01 00 (first checking that the O-ring is undamaged) and allow the screw to sink to the bottom by its own weight.

14b • Turn the screw in the threads, making sure that it engages properly.
Drape a cloth over the entry part of the screw and gear (to avoid oil splash).

- Tighten the screw **quickly** until the spur gear releases.

CAUTION!
Owing to the extremely high pressure that builds up in the gear hub, the gear can "shoot up like a projectile" — maintain a safe distance, especially hands and face.

- Remove the circlip (with washer) from the shaft.

15 • Remove the four screws (13 mm) from the washer and remove it.

16 • Remove the six screws (10 mm socket cap) from the stator casing.

- Fit the washer back in place — screw in four new **longer** screws (M8) in the holes so that a space is left for the puller claws between the washer and bearing holder.

17 • Apply a puller without pressing out the shaft.

18 • Screw the four stand screws into the bearing housing and fit a strap round the housing.

- Press the shaft out by means of the puller — raise the bearing holder a centimetre or so at a time.

19 • Lift off the bearing holder.
Note! If a CLS is fitted, disconnect the leads first.

20 • Drive the main bearing out of the bearing holder, using a plastic mallet and suitable mandrel.

- Drive out the lip seal — remove the two washers.

21 • Screw a lifting eyebolt (M12) into the shaft end and lift out the rotor.

STATOR

Dismantling/assembly

- Remove the cable lead-through (5 mm socket cap).

Fit tool 394 69 00 to the stator.

Lift the stator (and casing) a centimetre or so above the workbench surface.

Place three LP gas burners spaced equally apart round the stator casing. Heat rapidly (to about 150°C) until the stator releases — lift out the stator. Fit the new stator in place while the stator casing is still hot.

NOTE: There is a pin that prevents the stator from rotating, make sure that it fits into the groove in the stator casing. IMPORTANT! If the stator has been rewound, voltage testing shall be carried out in accordance with local regulations.

Measure the insulationresistance in the stator with a 1000 V-DC megger. The resistance should be infinity and certainly not less than 1 Megohm.

Rotor

22 • Pull the support bearing off, using a puller.

Assembly

23 • Heat the support bearing and fit it on the rotor shaft — grease the bearing.

21 • Lower the rotor unit into the stator casing — first make sure that the O-ring is fitted in the bearing seat.

24 • Fit the two washers in the bearing holder.

25 • Drive in the lip seal. NOTE: location — the lip against the washers.

19 • Raise the bearing holder. NOTE: location — protruding part against junction box on stator housing.
NOTE: If a CLS is fitted, connect the leads together.

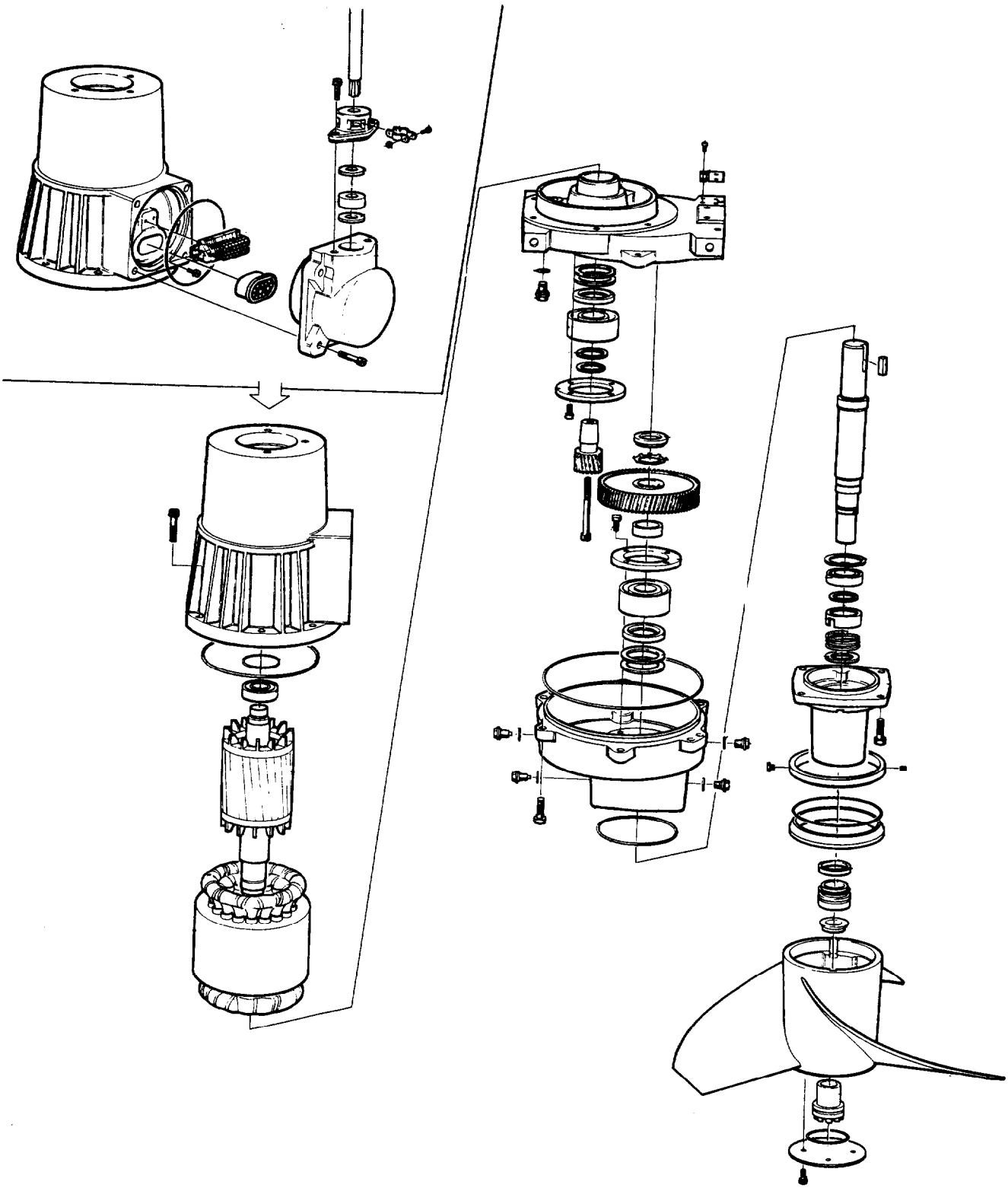
26 • Tighten the screws in the stator casing.

27 • Heat the inner bearing race on the main bearing — press it in place. (NOTE: marking upwards.)
Grease the bearing.

- Place the washer in place — fit the circlip.

28 • Fit the spur gear on the shaft — lock it with plate 504 01 00 and tighten the screw at a torque of 90 Nm,

4501



GEARING CASING/BEARING HOUSING

Dismantling

29 • Knock out the tab on the lock washer.

30 • Remove the shaft nut and lock washer.

31 • Remove the spur gear.

Seal

4451, alternative 1

• Remove the grip ring for the mechanical seal.

• Remove the end washer, seal ring holder, compression spring, sleeve, rotating seal ring and stationary seal ring.

4451, alternative 2

• Remove the grip ring for the mechanical seal.

• Remove the ring, rotating seal and stationary seal ring.

• Remove the screws, the washer, the cover and the compression spring.

4501

32 • Remove the shaft washer.

33 • Remove the circlip for the mechanical seal.

34 • Remove the end washer, washer with rubber ring and rotating seal ring.

35 • Remove the stationary seal ring.

Bearing housing

36 • Remove the four screws (19 mm) from the bearing housing.

37 • Remove the four screws (13 mm) from the washer and remove same.

• Fit the washer back in place and insert four **longer** screws in the holes. Screw them in so that space is left for the puller claws.

38 • Remove the shaft key.

39 • Fit a puller and press out the shaft with hub housing.

• Pull the shaft out of the hub.

• Drive out main bearing.

40 • Drive out lip seal and washers.

• Remove the circlip from the shaft and pull off the bearing race.

41 • Remove the circlip from the bearing housing.

42 • Remove the wear protection and O-ring (4501).

• Drive out the bearing, using a suitable mandrel.

44, 45 • Knock out the spring assembly (4501).

Assembly

46, 47 • Fit the spring assembly on tool 405 66 00 and drive the assembly into the bearing housing (4501)

48 • Drive in the suppport bearing — grease the bearing.

49 • Fit the circlip in place.

50 • Drive in the wear protection.

• Heat the main bearing and press it onto the output shaft (groove upwards) — grease the bearing.

• Heat the bearing race for the support bearing and secure with the circlip.

51 • Insert the two washers in the seat on the gear casing.

• Carefully tap the lip seal into place. NOTE: location (lip against the bearing).
NOTE: the position of the lip seal should be changed after about 2,000 hours of operation owing to shaft wear. To do this, insert more washers.

52 • Mount the bearing housing. NOTE: O-ring.

53 • Insert the output shaft into the housing.

• Fit the washer in place (with longer screws).

54 • Press in the bearing by tightening the screws alternately — change to regular screws and tighten the washer.

• Fit the spacer ring in place.

• Fit the key in place.

55 • Fit the large spur gear on the shaft (longer hub part inwards) (4501) — heat to 150°C, if necessary.

• Fit the lock washer in place.

• Tighten the spur gear with the shaft nut and tap in a suitable locking tab.

56 • Raise the gear casing and tighten the six screws.

57 • Lower the mixer into the stand. Insert two screws at front and three at rear — tighten.

Seal 4501

63 **384 00 xx**

• Fit the O-ring (c) onto the shaft.

• Oil the wear protection and drive it into the bearing housing.

• Fit the O-ring (a) into the wear protection.

58 • Fit the stationary seal ring (b) in place. NOTE: the two grooves must joint the two lugs of the washer in the spring assembly.

59 • Oil the rotating seal ring (d) and fit it in place.

• Fit the washer (e) with the rubber ring (f) nearest to the end washer (g).

60 • Fit the end washer (g) in place — Note the groove.

61, 62 • Place the circlip (h) onto the shaft. Take a mandrel and press the circlip against the seal until the circlip takes place in the groove.

• Fit the shaft ring in place (not for stainless steel propeller) — tapered end outwards.

Seal 4451, Alternative 1

63 **429 21 xx**

• Fit O-ring (a) on the stationary seal ring (b) and mount this in the bearing holder.

• Fit O-ring (d) on the rotating seal ring (c) and mount this on the sleeve (e).

• Press in the rotating seal ring with sleeve against the stationary seal ring.

• Fit the compression spring (f) into the sleeve.

• Fit O-ring (g) onto and O-ring (h) into the seal ring holder (i). Mount the unit on the shaft.

• Fit the end washer (j).

• Press together and secure with the grip ring (k).

• Fit both washers on the shaft.

Seal 4451, Alternative 2

63 **542 93 xx,**

• Fit the O-ring (e) in the washer (d).

• Place the cover (c) in the washer (d).

• Place the compression spring (b) on the cover (c).

• Fit the O-ring (a) on the washer (d).

• Mount the unit on the shaft and tighten the screws (f) in the bearing housing.

• Press the stationary seal ring (g) in place.
When the ring is in right position it is impossible to turn it.

• Fit the spring with ball (h) onto the shaft and slide it up until the ball grips into the groove of the shaft. Slide the rotating seal ring (i) up on the shaft against the stationary seal ring.
Note! The ball on the spring (h) must fit into the groove on the inside of the rotating seal ring.

• Fit the O-ring (j) and the ring (k).

• Secure the seal unit with the circlip (l).

Mount the propeller — See "PROPELLER mounting"

Cable entry

- Fit the terminals and the end stops in the junction box.
- Pull the cable through entry gland, steel washer, rubber bushing, steel washer and junction box cover.

64 • Press the entry gland with the two screws until the flange abuts against the cover.

NOTE: for safety reasons, the ground lead should be approx. 70 mm (2.7") longer than the phase leads.

- Connect the leads.
- Fit the cover in place. NOTE: O-ring.

65 • Tighten the cable strain relief in the stand.

Filling up with oil

66 • Remove the oil filler plugs and fill up with fresh oil.
Capacity: **4451:** Oil casing (A) 2.2 litres, bearing housing (B) 0,4 litres,
4501: Oil casing (A) 5.4 litres, bearing housing (B) 1.1 litres.

67 • Fit the lifting bracket.

PROPELLER

Removal, 4451

- Remove the protective cover.

68 • Back off the screws on the locking assembly equally, diagonally.

- Replace the three light screws with three M 8 screws.
- Carefully tap the dark screw heads and withdraw the locking assembly.
- Fit a hose clip 82 32 86 on the propeller hub (as a holding tool for the puller claws).
- Fit puller 84 13 62 and pull off the propeller. Alternatively, the propeller can sometimes be prised off (carefully), using two large screwdrivers in the housing grooves.

Mounting 4451

- Check that the two washers are in place on the shaft.
- Check that the O-ring in the propeller hub is in good condition.
- Slide the propeller on.
- Fit the locking assembly in the propeller hub.

68 • Tighten the screws diagonally, first by hand and then at a torque of 10 Nm.

- Then tighten the screws in sequential order at a torque of 14 Nm.
- Pack the housing with grease (without molybdenum disulphide)
- Fit the protective cover in place.

Removal, 4501

- Remove the protective cover.

69 • Remove the locking assembly by backing off the eight screws (5 mm socket cap) diagonally — remove the ring.

- Fit four of the screws in the threaded holes in the tensioners (check that the threads in the holes are in good condition — if not, rethread the holes with a thread tap and then use new screws.
- Tighten the screws little by little diagonally until the locking assembly half releases.

70 • Withdraw the propeller.

Mounting, 4501

- Check that the shaft ring is in place.

70 • Slide the propeller on.

71 • Press the locking assembly (in one piece) into the hub as far as possible.

72 • Tighten the screws diagonally. Tightening torque 9 Nm.

- Fit the protective cover in place.

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