CANCELLED DO NOT DESTROY

Chapter 30

PUMP, FUEL, CH.4 AND CHA.4 SERIES

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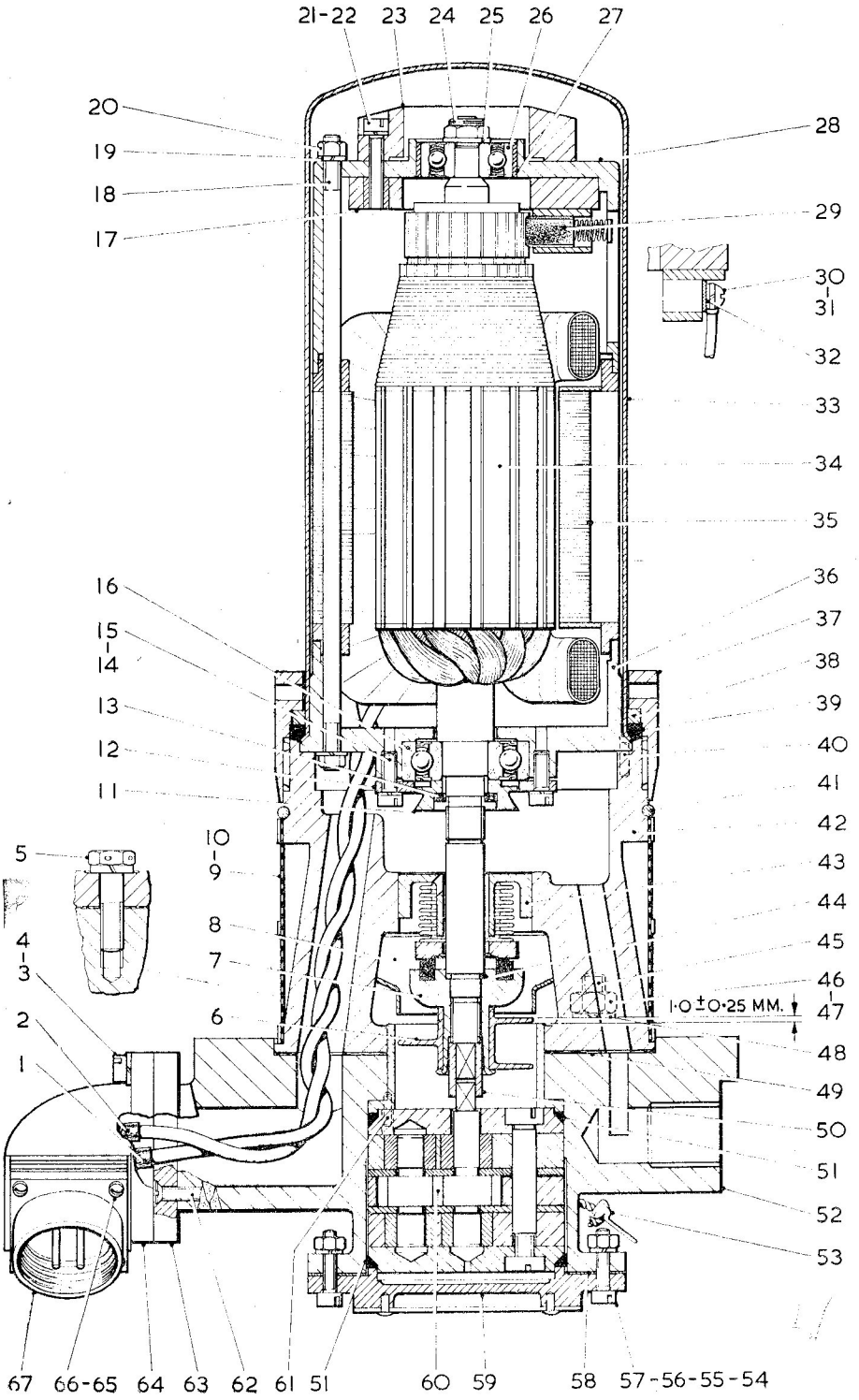


Fig. 1. Sectional view, Fuel pump CHA. Mk. 4

Introduction

1. Reconditioning instructions are given in this chapter for CH.4 Mk. 4 fuel pumps, and appendices, at the end of the chapter, cover the differences in procedure for other pumps in the series. A general description of the type CH.4, fuel supply pumps will be given in A.P.4343D, Vol. 1, Book 2, Sect. 7, Chap. 30 and details of the variations between the different mark numbers will be given as appendices to the chapter.

2. The complete unit comprises a 28V motor unit with a drive shaft extended at one end. This shaft carries an impeller helix, revolving in a chamber in the pump body casting to which the motor unit is attached. A gear pump unit, also housed in the pump body casting, is driven by a sleeve coupling from the end of the motor shaft, and is held in position by a cover plate. A mechanical seal, above the impeller, prevents ingress of fuel from the pump casting to the motor unit. The pump inlet is fitted with a filter, and a relief valve is fitted to the pump casting. Dismantling is effected in three stages. (1) The separation of the pump from the motor unit. (2) The dismantling of the pump. (3) The dismantling of the motor. Conversely, when assembling, the pump and the motor unit are assembled as separate units and are fitted together at a third stage.

RECONDITIONING

Tools and test equipment

3. In addition to the standard bench tools, the special tools listed in Table 1, or their equivalents, are required to overhaul CH.4 pumps. The universal fuel pump test rig (Ref. No. 5G/3494) should be used to test these pumps, and details of this rig are given in A.P.4343S, Vol. 1, Book 2, Sect. 10.

Key to Fig. 2

3	CH. HD. SCREW	ELECTRICAL CONNECTION
4	SPRING WASHER	
5	SPECIAL BOLT	
6	IMPELLER	
7	VAPOUR ASSISTER	
8	VAPOUR GUIDE CONE	
9	FILTER ASSEMBLY	
10	CSK. HD. SCREW (FILTER)	
33	MOTOR COVER	
37	LOCKING RING	
38	PRESSURE RING	
39	SEALING RING	
40	DOWEL PIN	
41	FILTER RETAINING RING	
42	UPPER PUMP BASE	
43	BELLOWS ASSEMBLY	
44	VAPOUR ASSISTER JOINTING WASHER	
45	STUD	
46	NUT	
47	SPECIAL NUT	
48	SPRING WASHER	
49	JOINT WASHER	
50	SQUARED SLEEVE	
51	JOINT RING	
52	LOWER PUMP BASE	
53	SEAL	
54	CH. HD. SCREW	BASE COVER
55	SPECIAL CH. HD. SCREW	
56	NUT	
57	SPRING WASHER	
58	LAMINATED SHIM	
59	BASE COVER	
60	GEAR PUMP UNIT	
61	DOWEL PIN	
62	CSK. HD. SCREW	ELECTRICAL CONNECTION
63	ELBOW ATTACHMENT PLATE	
64	ELBOW	
65	RD. HD. SCREW	
66	SHAKEPROOF WASHER	
67	ELECTRICAL CONNECTION	
90	RELIEF VALVE	
101	SEALING WASHER	

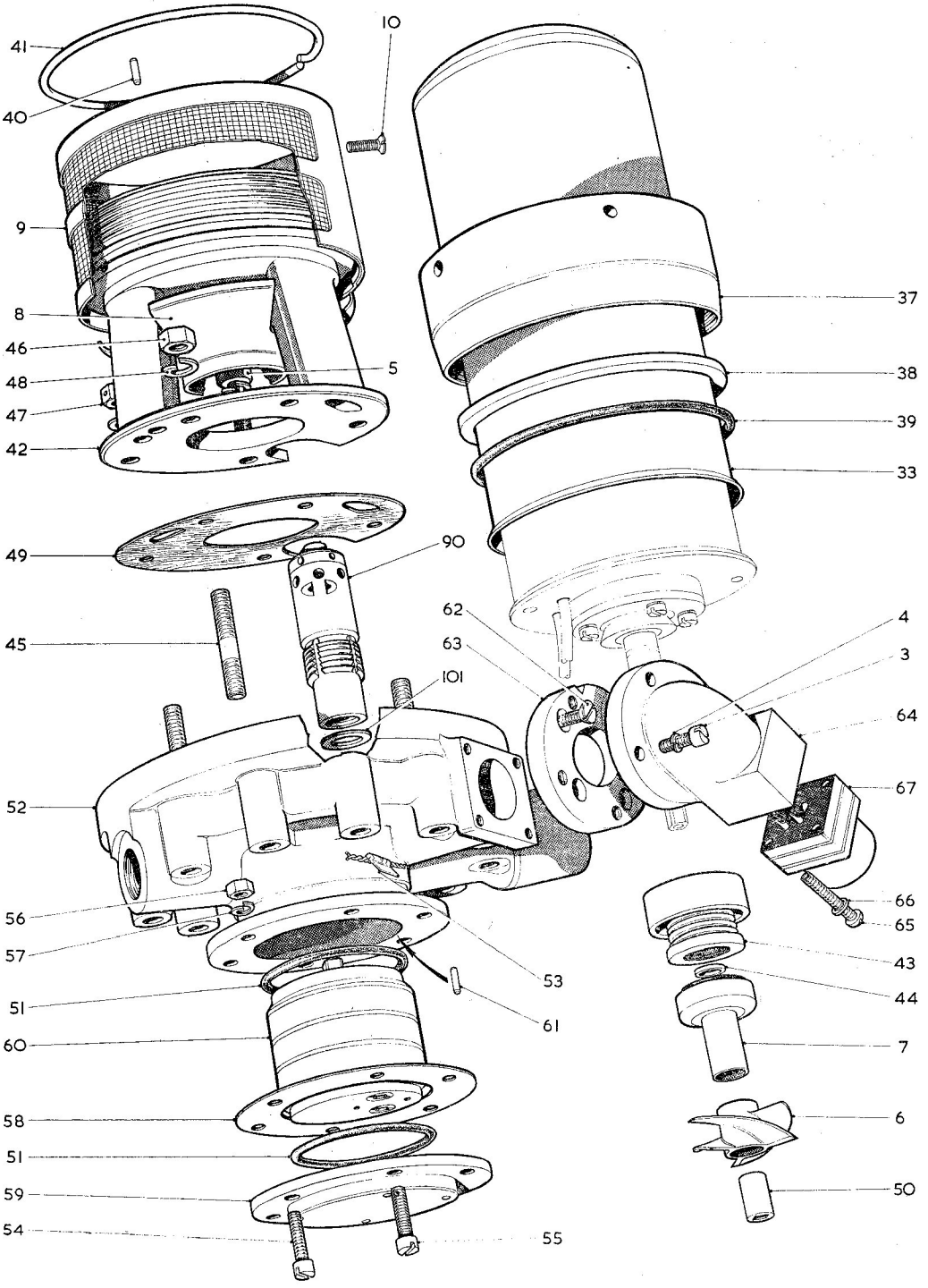


Fig. 2. Exploded view of pump unit

TABLE 1

Special tools and equipment

Nomenclature	Part No.	Fig. No.	Purpose
Handpress	SPE.10143	—	
Peening tool	SPE.11984	17	Assembling the impeller to the vapour assister
Locating block	SPE.11983		
Ring clamp spanner	SPE.20218	3	Removing and assembling the motor to the base casting
Pump holding fixture	SPE.20219		
Armature spindle box spanner	SPE.11973	9	
Vapour assister C. spanner	SPE.11976		
Relief valve double C. spanner	SPE.20220	8	
Relief valve C. spanner (large)	SPE.13116		
Drift	SPE.11996	10	Extracting the bellows unit
Bush	SPE.11995		
Locating plate	SPE.11994		
Punch	SPE.11990	12, 14	
Guide bush	SPE.11989	12	Removing the bearing from the lower motor casing
Punch adaptor	SPE.11988		
Register	SPE.11987		
Base plate	SPE.10766	12, 13, 14	
Pad	SPE.10763	13	Re-sleeving the upper motor bearing
Collar	SPE.10762		
Spigot	SPE.10761		
Spigot	SPE.11991	14	Assembling the bearing to the lower motor casing
Spigot	SPE.11992		
Plate	SPE.11594	15	Fitting the bellows unit
Pillar	SPE.11593		
Locating plate	SPE.11592		
Spring	SPE.11999		
Base	SPE.11591		
Calibrated fan	SPE.17618	—	
Dial gauge	Baty Model B	16	
Weight	SPE.11997	16	Loading the bellows unit
Stem	SPE.11599		
Bracket	SPE.11998		
Guide bush	SPE.11598		
Base plate	SPE.11596		
Support	SPE.11597		
Clamping ring key	SPE.20234	8	Relief valve

TABLE 1—(contd.)

Nomenclature	Part No.	Fig. No.	Purpose
Dowel nut key	SPE.20233	18	Gear pump unit. Repair and assembling
Special top cover plate	SPE.20229		
Gear blank (2-off)	SPE.20230		
Alignment collar	SPE.20232		
Alignment jig body	SPE.20221	19	Gear pump unit. Repair and assembling
Location block	SPE.20222		
Clamping ring	SPE.20223		
Special tool	SPE.20224		
Bush	SPE.20225		
Alignment dowel (undersize)	SPE.20226		
Alignment dowel	SPE.20227		
Special reamer	SPE.20228		
Tank and fulcrum plate assembly	SPE.20235	20	Running-in the gear pump
Fulcrum pin	SPE.20236		
Pivot plate and pillar assembly	SPE.20237		
Pump unit cage	SPE.20238		
Clamping screw	SPE.20239		
Clamping pad	SPE.20240		
Slave motor	SPE.20241		
Motor clamping ring	SPE.20242		
Motor shaft coupling	SPE.20243		

DISMANTLING

Disconnecting the electrical connection (fig. 2)

4. (1) Remove the four 6 BA screws (65) and shakeproof washers (66) securing the 'Breeze' electrical connection (67).

(2) Unsolder the leads from the two contact pins.

Dismantling the lower base assembly (fig. 2)

5. (1) The motor locking ring (37) is peened to the upper base casting (42) in four positions. Prise the peened metal on the locking ring clear of the surface of the castings, and using the ring clamp spanner SPE.20218 and the pump holding fixture SPE.20219 (fig. 3) unscrew and remove the locking ring.

(2) Remove the filter retaining ring (41) and the two 6 BA screws (10) and withdraw the composite filter (9) to provide access to the upper base assembly securing nuts and bolts. Refit the locking ring and screw up tight enough to hold the motor unit rigidly in place in the upper base during the initial stages of dismantling.

(3) Cut the locking wires between the relief valve body (90) and the adjacent

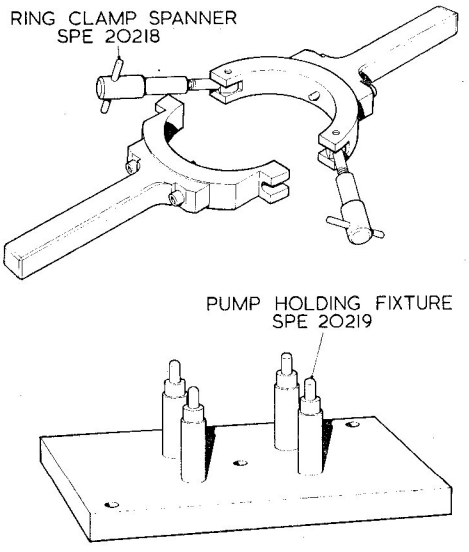
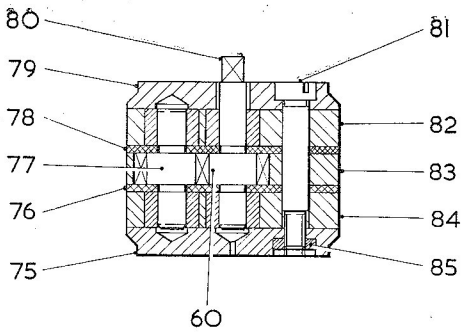


Fig. 3. Locking ring tools



75 LOWER COVER PLATE
76 LOWER GEAR END BEARING PLATE
77 SHORT GEAR
78 UPPER GEAR END BEARING PLATE
79 UPPER COVER PLATE
80 LONG GEAR
81 SCREWED DOWEL PIN
82 UPPER BEARING BLOCK SUB-ASSEMBLY
83 PUMP CHAMBER
84 LOWER BEARING BLOCK SUB-ASSEMBLY
85 SLOTTED NUT

Fig. 4. Sectional view of gear pump unit

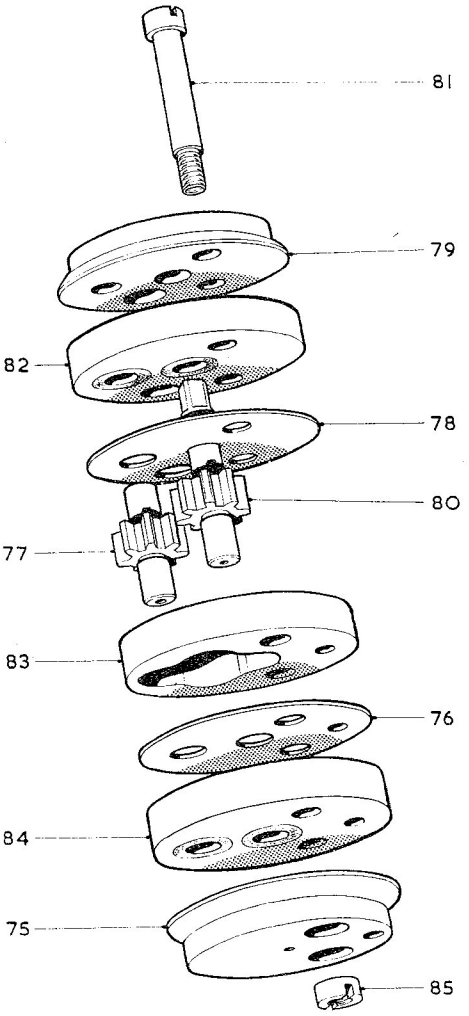
upper base securing nut (47) and remove the two 2 BA upper base securing nuts (47), two nuts (46), the bolt (5) and spring washers (48). Break the upper/lower base joint free by applying light blows, with a hide faced mallet, and remove the lower base assembly, together with the lower base sealing washer (49).

(4) Cut the locking wires on the pump unit cover retaining screws (55), and remove the tag. Remove the four 6 BA screws (54), two screws (55), spring washers (57) and nuts (56) securing the pump unit cover (59) then withdraw the cover and remove any shims (58) that may be fitted. (Earlier pumps are fitted with a paper gasket in place of the shim).

Removing and dismantling the gear pump unit (figs. 5 and 2)

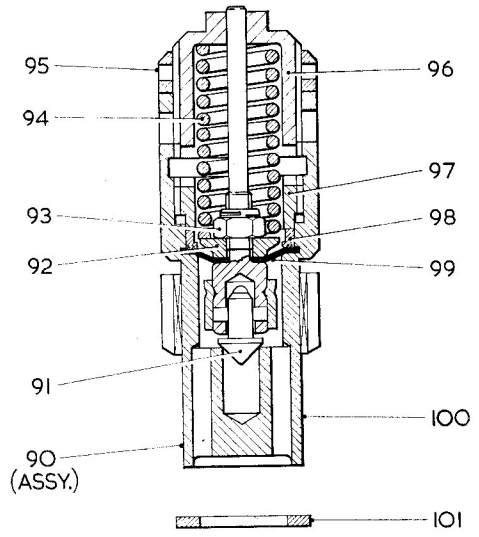
6. (1) Remove the squared sleeve (50) from the end of the pump unit gear spindle and press the pump unit (60) from the lower base casting.

(2) Remove the two synthetic rubber seal rings (51) from each end of the gear pump unit. The pump unit is located in the lower base casting on a $^{1}/_{16}$" dia. dowel (61) which need only be removed if damaged. It is recommended that a new gear pump unit be fitted at each servicing period and that no attempt be made to repair a dismantled unit. Fig. 5 illustrates the component parts of a complete gear pump unit.



75 LOWER COVER PLATE
76 LOWER GEAR END BEARING PLATE
77 SHORT GEAR
78 UPPER GEAR END BEARING PLATE
79 UPPER COVER PLATE
80 LONG GEAR
81 SCREWED DOWEL PIN
82 UPPER BEARING BLOCK
83 GEAR CHAMBER
84 LOWER BEARING BLOCK
85 SLOTTED NUT

Fig. 5. Exploded view of gear pump unit



90 RELIEF VALVE ASSEMBLY
91 SPINDLE SUB-ASSEMBLY
92 INNER CLAMPING RING
93 SELF LOCKING THIN NUT
94 SPRING
95 LOCKING RING
96 ADJUSTING PLUG
97 SCREWED OUTER CLAMPING RING
98 OUTER CLAMPING RING
99 DIAPHRAGM
100 RELIEF VALVE BODY
101 SEALING WASHER

Fig. 6. Sectional view of relief valve

(3) Using the special tool SPE.20233, hold the end nuts (85) and use a screwdriver to remove the screwed dowels (81).

(4) Pull off top cover plate (79), upper bearing block (82) and gear end bearing plate (78), then remove the lower cover plate (75) and lower bearing block (84). Remove the gears (77 and 80). The pump chamber (83) and gear end bearing plate (76) can then be separated.

Removing and dismantling the relief valve (fig. 7)

7. (1) Hold the relief valve body (100) with the C-spanner SPE.13116 (fig. 8) and unscrew the locking ring (95) using the double-C-spanner SPE.20220. Remove the relief valve adjuster (96) using a suitable spanner and release the valve spring (94). Using the special key SPE.20234 unscrew the clamping ring (97), remove the outer clamping ring (98) and withdraw the valve spindle assembly. Remove the 6 BA self-locking thin nut (93), the inner clamping ring (92) and the diaphragm (99) from the valve spindle sub-assembly. Unscrew and remove the relief valve body (100) and remove the sealing washer (101). Do not extract the helix bush from the lower base casting.

Removing the 'Breeze' plug elbow (fig. 2)

8. The breeze elbow should not be removed unless damage is obvious, where damage is observed remove as follows:—

(1) Remove the three 6 BA cheese head screws (3) and spring washers (4) securing the elbow (64) to the plate (63).

(2) Remove the three 6 BA c'sk head screws (62) securing the plate (63) to the lower base casting (52).

Dismantling the upper base assembly/motor unit (fig. 2)

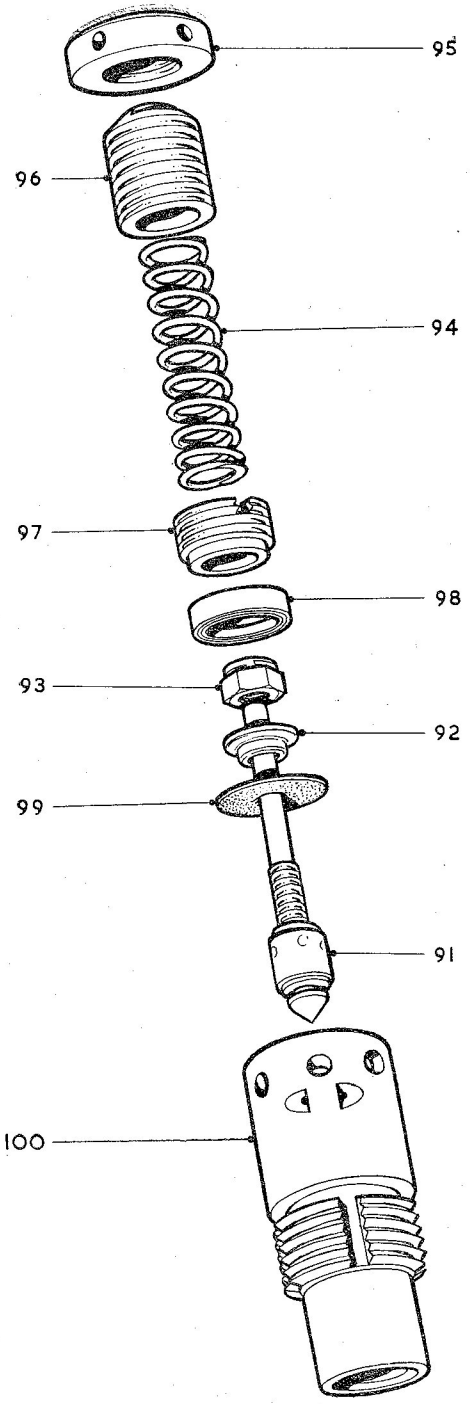
9. (1) Hold the end of the armature shaft (34) with the box spanner SPE. 11973 (fig. 9) and use the C-spanner SPE.11976 (fig. 9) to unscrew and remove the vapour assister assembly (7) complete with the impeller helix (6). These last two components are held together by peening of the vapour assister assembly; further dismantling is not necessary as both parts should be renewed if external damage is observed.

(2) Remove any vapour assister jointing washers (44) that may be fitted.

(3) Remove the locking ring holding the motor unit to the upper casting (para. 5(1)). Remove the pressure ring (38) and take off the outer casing (33) with the synthetic rubber seal (39) still in position.

Note . . .

Ensure that the motor unit re-



91 SPINDLE
92 INNER CLAMPING RING
93 SELF-LOCKING THIN NUT
94 SPRING
95 LOCKING RING
96 ADJUSTING PLUG
97 SCREWED OUTER CLAMPING RING
98 OUTER CLAMPING RING
99 DIAPHRAGM
100 RELIEF VALVE BODY

Fig. 7. Exploded view of relief valve

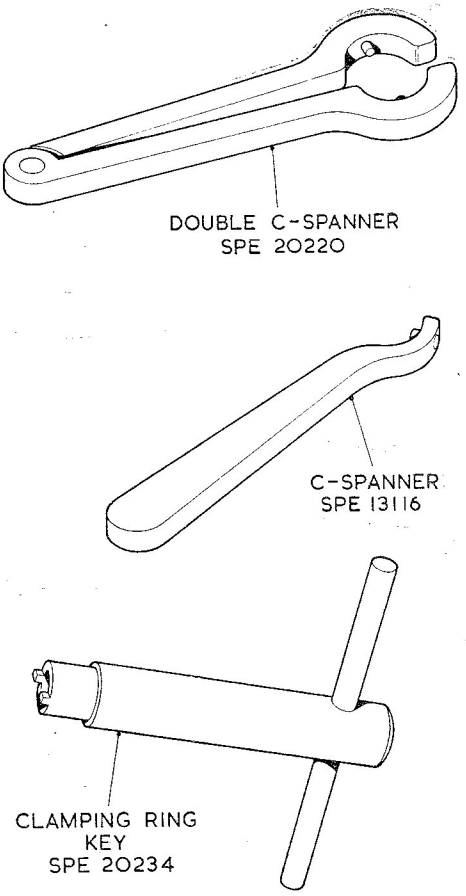


Fig. 8. Relief valve dismantling and assembling tools

mains firmly seated in the upper base casting, as any displacement will cause the armature shaft to foul and damage the bellows unit (43).

(4) Separate the seal ring from the outer motor casing.

(5) Separate the motor unit from the upper base casting taking care not to damage the bellows unit as the armature shaft is being withdrawn. Remove the vapour guide cone (8) which is now free, from between the legs of the upper

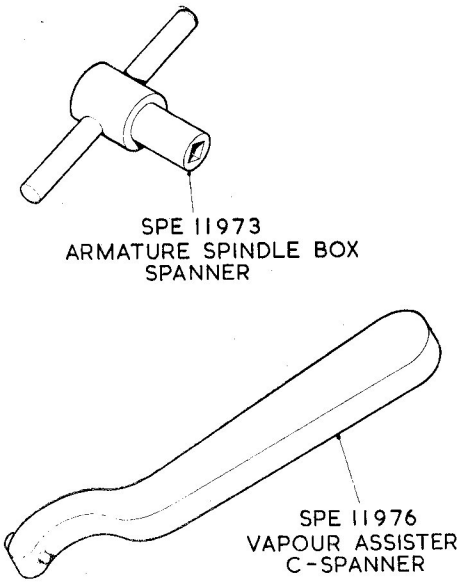


Fig. 9. Vapour assister dismantling and assembling tools

base casting assembly (42). The motor unit is located on a $^{1}/_{16}$" dia. dowel (40) which need only be removed if damaged.

Extracting the bellows unit from the upper base casting

10. If the bellows seal face shows score marks or is damaged in any way, or if there are signs of fuel leakage past the seal (43) place the upper base casting assembly in the hand press SPE.10143 and using the tools shown in fig. 10, press out the bellows unit.

Dismantling the motor unit (fig. 11)

11. (1) Disconnect the leads from the brush tags by removing the two 6 BA round head screws (30) and shakeproof washers (31).

(2) Withdraw the carbon brushes complete with spring and tag (29) marking each brush so that it may be returned to its original box.

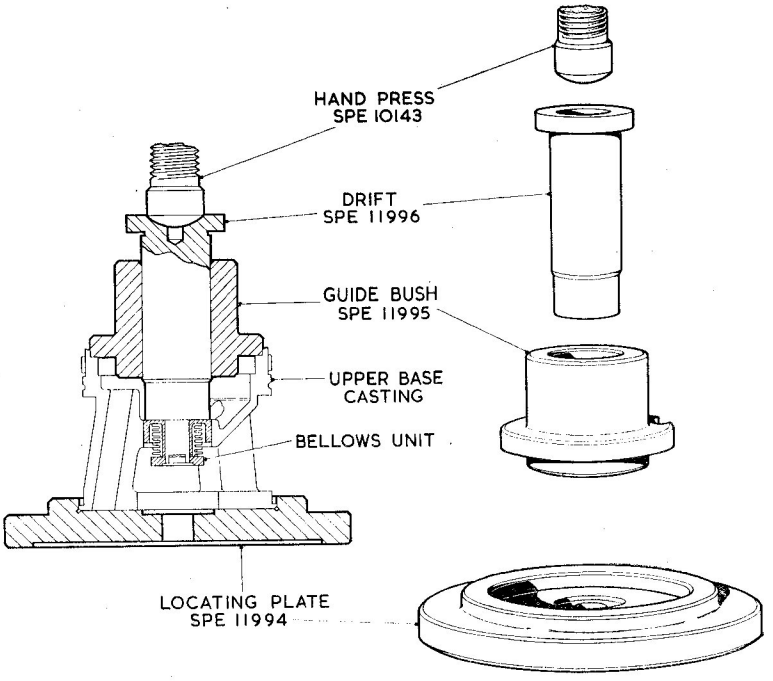
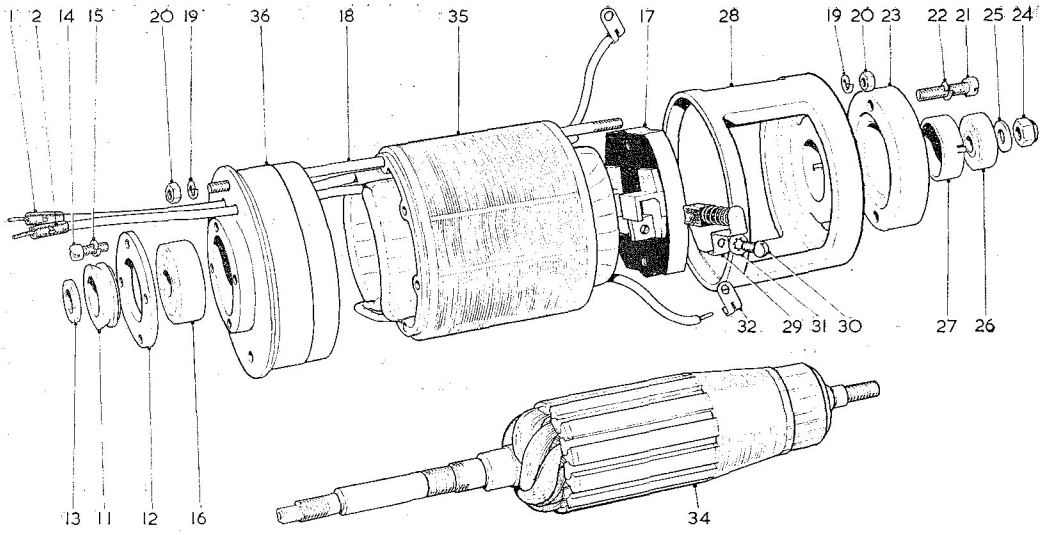


Fig. 10. Extracting the bellows unit



1 IDENTIFICATION SLEEVE 'B'
2 IDENTIFICATION SLEEVE 'A'
11 THROWER NUT
12 LOWER BEARING COVER
13 THROWER FELT
14 CH. HD. SCREW } LOWER BEARING COVER
15 SPRING WASHER }
16 LOWER BEARING
17 BRUSH BOX ASSEMBLY
18 TIE ROD
19 SPRING WASHER } TIE ROD
20 NUT }
21 CH. HD. SCREW } BRUSH BOX
22 SPRING WASHER }
23 BRUSH BOX RETAINER
24 SELF-LOCKING THIN NUT
25 CLAMP WASHER
26 UPPER BEARING
27 MOTOR CASING BEARING BUSH
28 UPPER MOTOR CASING
29 BRUSH AND TAG ASSEMBLY
30 RD. HD. SCREW } BRUSH TAG
31 SPRING WASHER }
32 TERMINAL TAG
34 ARMATURE ASSEMBLY
35 YOKE ASSEMBLY
36 LOWER MOTOR CASING

Fig. 11. Exploded view of motor unit

Note . . .

Renew the brushes... if they are worn below the permissible dimensions (Table 2).

(3) Carefully mark the position of the brush box assembly (17) in relation to the upper motor casing (28). Remove the two 4 BA brush box securing screws (21) with spring washers (22) and remove the brush box retainer (23) leaving the brush box free on the commutator.

(4) Hold the square section of the armature shaft with the special box spanner SPE.11973 (fig. 9). Remove the commutator-end shaft nut (24) together with the 2 BA plain washer (25). Carefully mark the positions of the upper and lower motor casings, relative to the motor casing and yoke assembly.

(5) Remove the four 4 BA tie rod nuts (20) together with the spring washers (19) and withdraw the tie rods (18). Ease off the upper motor casing (28) complete with the bushed bearing, and, using a hide faced mallet, tap the armature (34) free from the commutator end bearing (26).

(6) Remove the brush box assembly (17).

(7) Ease the lower motor casing (36) from the motor casing/yoke assembly (35) and gently withdraw the armature assembly complete with the motor end casing. Take care not to damage the armature during the operation.

(8) Hold the square end of the armature assembly with the special box spanner SPE.11973 (fig. 9), then remove the thrower assembly (11 and 13), using a $\frac{3}{8}$" B.S.W. spanner on the two machined flats. Tap the driving end of the armature shaft until it is free from the bearing and lower motor casing.

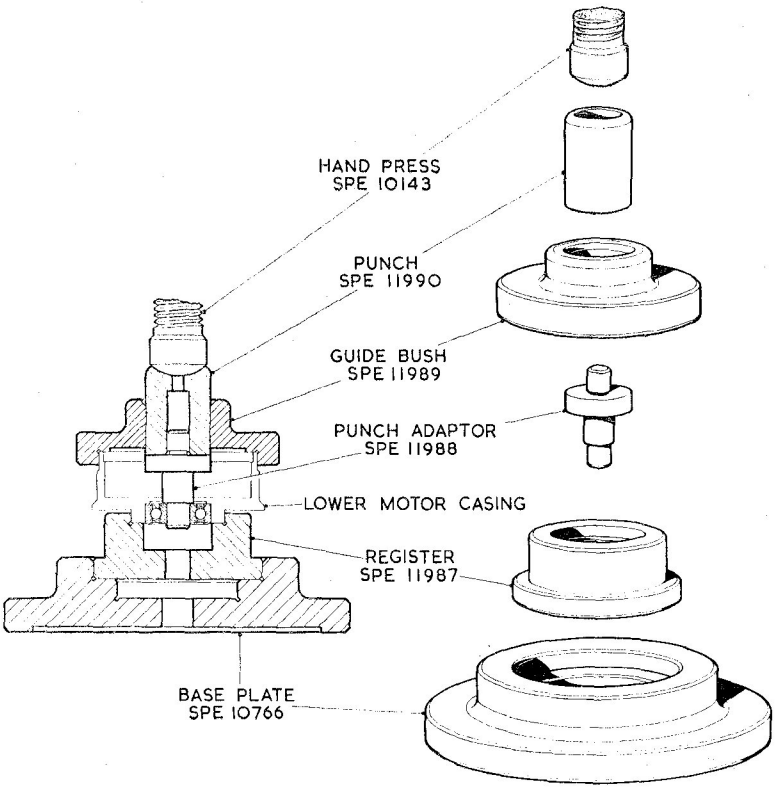


Fig. 12. Removing the lower motor casing bearing

Note . . .

Care must be taken to avoid damaging the shaft during this operation.

(9) Remove the 6 BA screws (14) and spring washers (15) holding the bearing cover (12) and remove the bearing cover. Remove the drive end bearing (16) from its housing in the lower motor casing, using the tools illustrated in fig. 12 mounted in the hand press SPE.10143.

(10) Remove the commutator-end bearing (26) together with the steel sleeve, by pushing it outwards through the end casing.

(11) If necessary, remove the bearing (26) from the sleeve (27) using the fixture and tools shown in fig. 13.

Note . . .

Do not remove the field coils from the yoke assembly (35).

CLEANING, EXAMINATION AND REPAIR

Cleaning

12. (1) Immerse the armature and field assemblies in white spirit and use a soft bristle brush to dislodge carbon. Clean thoroughly, blow off surplus spirit and allow to dry out for several hours. Complete the drying in a ventilated oven at approx. 105°C.

(2) Remove all dried jointing compound from the mating pump and motor unit surfaces using an approved solvent if necessary. All parts, except the electrical connection, bearings and synthetic rubber components should be cleaned in a dry cleaning solvent such as carbon tetrachloride and white spirit mixture, or, if excessively dirty, in a heavy degreasant. After cleaning allow to dry out for several hours and complete the drying process in a ventilated oven at 105°C.

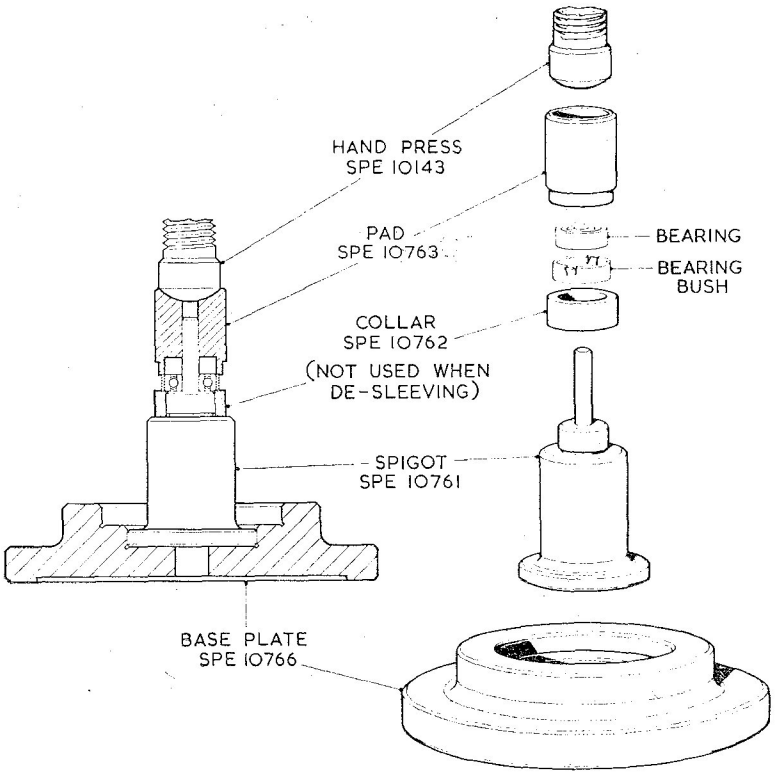


Fig. 13. Tools for re-sleeving the motor upper bearing

(3) The bearings fitted to the pump are of the pre-packed shielded type; they cannot be lubricated during service and should be renewed when the pump is being reconditioned.

(4) Synthetic rubber components should be renewed when the pump is being assembled. If it is absolutely necessary to re-use such a component, it must be cleaned only in lead free gasoline, do not use trichlorethylene or similar degreasant.

Examination

13. Examine all metal components for cleanliness, distortion, scoring, denting, visual wear or cracks, deterioration of the protective finish (corrosion) serviceability of threads, security of sub-assemblies not normally dismantled (e.g. rivetting), and discolouration due to overheating. Examine re-usable rubber components and electric cable insulation for chafing, cracks, cuts, over-heating, fluid soakage and general deterioration. All seal rings must be renewed on assembly.

TABLE 2

Detailed inspection of components

Item	Inspection	Action if faulty
Armature	Insulation resistance to shaft. Use a 500 volt megger.	Prolonged drying at 120°C. when thoroughly clean, until infinity reading is obtained on megger.
	Commutator for loose conductors.	Reject for rewinding.
	Dirty commutator.	Clean with benzine.
	Commutator for scoring and burnt segments.	Skim commutator. The minimum permissible diameter for further use is 24·0 mm. (0·945 in.). Clean out slots with thin blade. Commutator to be true with spindle to within 0·001 in. clock reading.
	Fouling of armature on poles.	Check spindle for concentricity and for side play of bearings.
	Short or open circuited conductors. Use voltage drop testers or Growler.	Clean undercutting on commutator. If still unsatisfactory reject armature.
	Armature spindle for concentricity.	Maximum eccentricity 0·001 in. If excessive, reject armature.
Field	Insulation resistance of coils to frame.	Prolonged drying when thoroughly clean at 120°C, until infinity reading is obtained on megger.
	Continuity of coils. Use a 500 volt megger.	Reject field.
	Condition of field coils.	If coils are damaged, the complete yoke with the field assembly must be renewed.
	Conditions of field coil lead covering.	If damaged, cover with additional sleeving.
	Total resistance of windings 58·32 ohms ± 3 ohms.	Renew complete assembly.
Thrower nut	Conditions of threads.	Renew.
	The felt washer should be renewed at reconditioning.	Smear recess of thrower nut with Hermeticoll jointing compound and fit a new felt washer.

TABLE 2—(contd.)

Item	Inspection	Action if faulty
Brush gear	Condition of each part.	If damaged or corroded, renew.
	Brushes for wear. New length 9·0 mm.	Renew brushes if worn below 7·8 mm. (0·31 in.).
	Fit of brushes in brush boxes.	Brushes should slide freely in brush boxes. Carbon dust collected in the corners of the brush boxes should be removed.
	Spring pressure between 4½ and 5 oz. at length 4·4 to 8·4 mm.	If spring is damaged or broken, renew brush assembly.
Bearings	Bearings should be renewed at reconditioning.	
Gaskets and joint rings	These items should be renewed at reconditioning.	
Metallic bellows gland	Scoring of seal face.	If slight, relap to a mirror finish. If excessive, renew bellows.
	Damage to bellows convolutions.	Renew.
Vapour assister and impeller helix assembly	Scoring of carbon seal face and wear.	If slight, relap to a mirror finish. If excessive, renew assembly.
	Impeller helix loose on vapour assister stem.	Renew assembly.
Filter assembly	Damaged mesh.	Renew.
Electrical connection	Chipped bakelite plates or damaged threads.	Renew.
Gear pump unit	It is recommended that the gear pump unit should be renewed at reconditioning.	Renew.
Relief valve	Damaged valve spring.	Renew.
	Scored seal faces on valve or valve seat.	If slight, relap; if excessive renew.

TABLE 3

Schedule of fits, clearances and repair tolerances

Parts and Description	Dimensions New	Permissible worn Dimension	Clearance New	Permissible worn Clearance	Remarks
MOTOR UNIT Brush length	9·0 mm. (0·354 in.)	7·8 mm. (0·307 in.)	—	—	—
Commutator diameter	24·9 mm. (0·980 in.)	24·0 mm. (0·945 in.)			
Armature end float	—	—	—	0·125 mm. (0·005 in.)	—
Armature spindle in drive-end bearing diameter	8·985 mm. 8·995 mm. (0·3537 in.) (0·3451 in.)	—	—	—	Selective assembly
bore	8·990 mm. 9·000 mm. (0·3539 in.) (0·3543 in.)	—	—	—	

TABLE 3—(contd.)

Parts and Description	Dimensions New	Permissible worn Dimension	Clearance New	Permissible worn Clearance	Remarks
Armature spindle in commutator-end bearing					
diameter	5·985 mm. 5·995 mm. (0·2356 in.) (0·2360 in.)	—	—	—	Selective assembly
bore	5·990 mm. 6·000 mm. (0·2358 in.) (0·2362 in.)	—	—	—	
Commutator-end, bearing sleeve in motor casing					
diameter	20·580 mm. 20·590 mm. (0·8102 in.) (0·8106 in.)	—	—	—	
bore	20·600 mm. 20·610 mm. (0·8110 in.) (0·8114 in.)	—	0·01 mm. 0·03 mm. (0·0004 in.) (0·0012 in.)	0·04 mm. (0·0016 in.)	

TABLE 3—(contd.)

Parts and Description	Dimensions New	Permissible worn Dimension	Clearance New	Permissible worn Clearance	Remarks
PUMP UNIT					
Carbon seal seat, outer face to internal shoulder of vapour assister	5·33 mm. (0·208 in.)	5·13 mm. (0·201 in.)	—	—	Scored surface to be re-faced by lapping
Metallic bellows length	16·9 mm. (0·665 in.)	16·775 mm. (0·660 in.)	—	—	Load of 2 lb. $\pm \frac{1}{2}$ lb. at working length 0·665 in. Slight scoring can be removed by lapping
Gear pump unit	—	—	—	—	It is recommended that this unit is renewed at reconditioning

Detailed procedure

14. (1) Parts should be examined in accordance with Table 2 and checked for conformity with the schedule of fits, clearances and repair tolerances given in Table 3.

Pre-brush bedding

15. New brushes or the original brushes, if they are being refitted, should be pre-bedded in accordance with the method described in A.P.4343, Vol. 1, Sect. 1. To avoid repetition, the method is not detailed in this chapter, but the procedure should be carried out at the appropriate stage of assembling.

Lapping

16. Lapping of rotary and stationary seal rings should be carried out in accordance with the method described in A.P.4343, Vol. 6, Sect. 16.

ASSEMBLING

General

17. Maintain absolute cleanliness of the work-bench and tools when assembling the pump. Retain the bearings in their wrappings until they are required for assembling. Use special tools or their equivalent where specified.

Motor unit

Assembling the drive end assembly (fig. 11)

18. (1) Using the tools shown in fig. 14 insert the drive-end bearing (16) into the lower motor casing (36). Remove the assembly from the fixture and secure the bearing cover (12) with four screws (14) and spring washers (15).

(2) Enter the armature assembly (34) through the bore of the bearing (16) and tap it into position with light blows from a hide faced mallet. Screw the thrower nut assembly (11 and 13) on to the armature shaft after lightly smearing the threads with 'Wellseal' jointing compound, then tighten the thrower nut against the inner bearing race using a $\frac{3}{8}$" B.S.W. spanner on the flats provided.

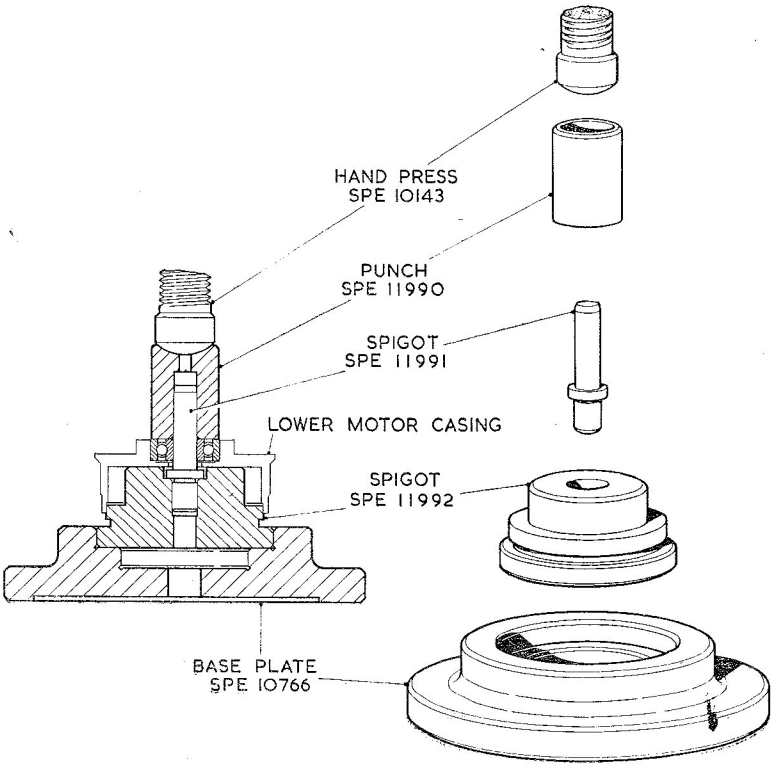


Fig. 14. Tools for assembling the lower motor casing bearing

Assembling the commutator end frame assembly (fig. 11)

19. (1) Assemble the bearing (26) into the steel sleeve (27) using the special tools illustrated in fig. 13 mounted in a hand press.

(2) Fit the bearing and sleeve into the upper motor casing (28) ensuring that the lugs on the sleeve locate in the casting slots.

Assembling the end casings to the yoke

20. (1) Enter the assembled armature and lower casing carefully through the bore of the casing and yoke assembly (35) and enter the leads through the aperture in the lower motor casing (36). Align the marks made when dismantling, and locate the lower motor casing on the spigot of the casing and yoke assembly.

(2) Hold the brush box (17) in position inside the upper motor casing (28) guide the commutator end of the armature assembly carefully through the brush box assembly and into the commutator end bearing (26) before inserting the motor studs (18) through the holes in the motor casings. Ensure that the markings made during dismantling are in line. Secure the complete assembly by placing spring washers (19) and nuts (20) on the studs. Tighten the nuts ensuring that the two nuts at the lower motor casing are assembled with their flats at right angles to an imaginary line drawn through the centres of the motor studs.

(3) Hold the square section driving end of the armature shaft with the special box spanner SPE.11973 (fig. 9); assemble the plain washer (25) to the commutator end of the shaft, then fit and tighten the self locking spindle nut (24).

Assembling the brush box assembly to the motor

21. Secure the brush box retainer (23) and the brush box assembly to the motor casing with the two cheese head screws (21) and spring washers (22). Rotate the brush box assembly until the dismantling mark coincides with that on the upper motor casing (28). Tighten the screws securely.

Pre-bedding the brushes

22. At this stage the pre-bedding of the brushes should be carried out, and the motor should be prepared for a final brush bedding run.

Brush bedding

23. Ensure that the brushes are located in their correct boxes, and secure them to the brush box together with the field coil leads, using the two round head screws (30) and shakeproof washers (31). When compressed to a length of between 4·4 mm. and 8·4 mm. the brush springs should exert a pressure of 5-4½ oz. Run the motor without load for 3 hours with a minimum current of 28V d.c. applied at the terminals and, if necessary, continue running until the brushes bed over their full width of arc, with at least 80 per cent of the face area in contact with the commutator.

Motor speed setting

24. Connect the motor to a suitable d.c. power supply and with the input set at 26V d.c. run the motor with an applied torque of 19 oz. in. using the calibrated fan SPE. 17618 or a suitable dynamometer. Check the speed with a stroboflash. The motor should run at 4,100 ± 100 rev./min. with a maximum current consumption of 4·25 amps. Adjust the brush gear to attain the foregoing performance figures. Reject the pump if it does not comply with the quoted figures. Speed 4,100 r.p.m. at 26V d.c. 4·25A (max.). Tighten the brush screws after speed setting, and check for minimum sparking between brushes and commutator. Switch off the power supply, disconnect the motor from the dynamometer and disconnect the supply leads from the motor. Using a standard insulation resistance tester measure the insulation of the motor (while it is still warm) between the motor leads. The reading obtained should not be less than 10 megohms.

Pump unit

Replacing the bellows unit

25. If the bellows unit (43) was removed from the upper base (42) during dismantling, use the special tools shown in fig. 15 with the hand press SPE.10143 to assemble the bellows unit into the upper base.

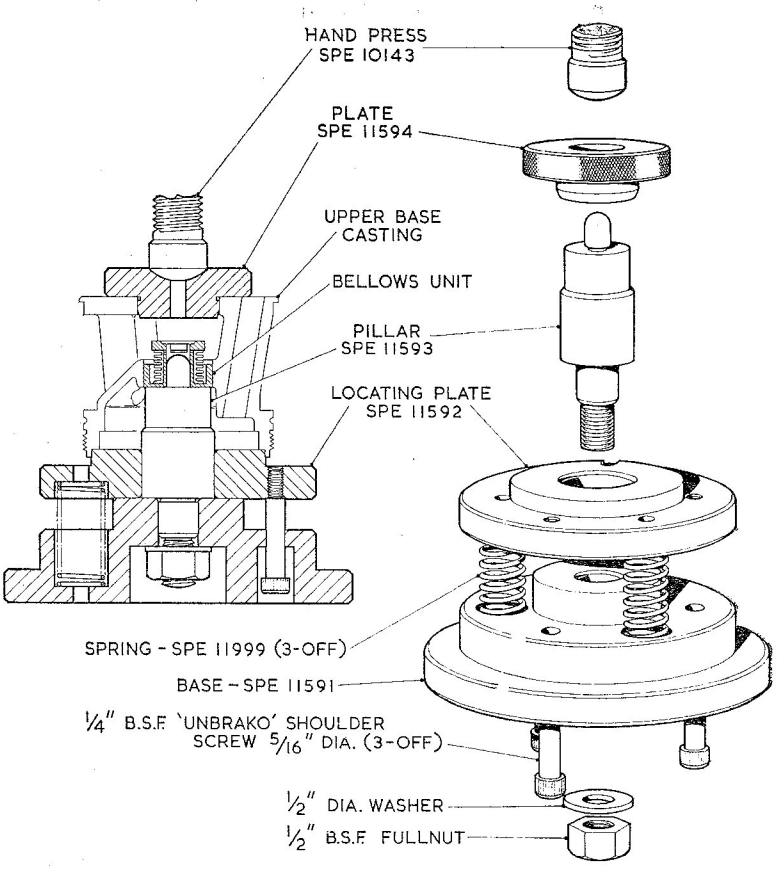


Fig. 15. Replacing the bellows unit

Assembling the motor unit to the pump upper base assembly

26. (1) Position the vapour guide cone (8) between the legs of the upper base (42). Place the motor unit assembly on the upper base, passing the motor leads down the hollow legs of the casting, and locate the motor by registering the dowel (40), in the upper base casting, in the hole in the motor base.

(2) Fit the outer motor casing (33), the joint ring (39) and the pressure ring (38) then screw on the locking ring (37) sufficiently tight to hold the motor/upper base assembly rigid. Ensure that the motor unit is seating correctly.

Assembling the vapour assister to the pump

27. (1) Using the fixture shown in fig. 16 determine the thickness of shims (44) to be fitted between the vapour assister assembly (7) and the shoulder of the armature shaft, to provide a working load on the metallic bellows within the range of 2 lb. $\pm$ $\frac{1}{2}$ lb.

(2) To obtain this figure, set the dial gauge to zero, with the bellows compressed by the stem and weight only. Fully depress the weight under finger pressure so that the face of the counter bore in the stem rests on the shoulder of the armature shaft. The thickness of shims (44) required to give the correct loading on the bellows is indicated by the reading on the dial gauge. (These shims vary in thickness from 0·25 mm. to 1·0 mm.).

(3) Place the shims (44) on the armature shaft. Assemble the impeller/vapour assister assembly to the shaft. If new parts are used, press the impeller helix (6) on to the stem of the vapour assister assembly (7), and peen the end of the vapour assister assembly over

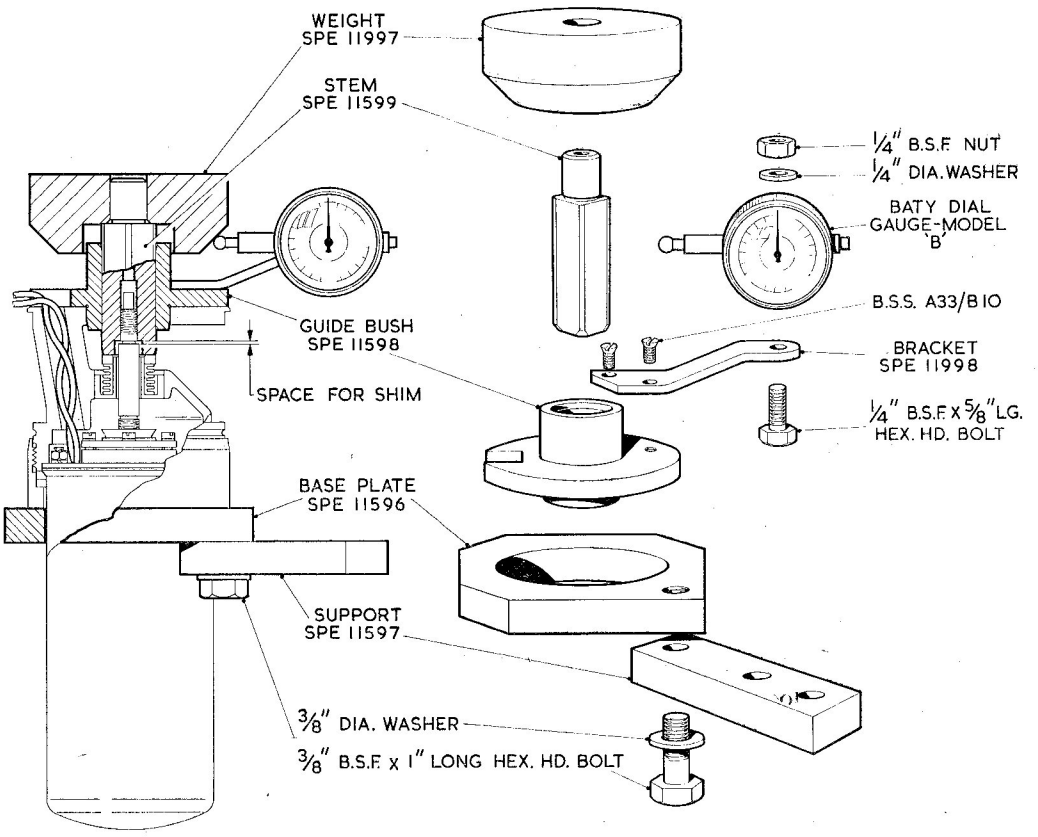


Fig. 16. Fixture for Checking bellows loading

the helix using the locating block SPE.11983 and peen tool SPE.11984 (fig. 17).

Note . . .

The projecting boss on the helix should be against the shoulder of the vapour assister, as shown in fig. 17.

(4) Smear the carbon face of the vapour assister with Avtur and screw the vapour assister/helix assembly on to the armature shaft, ensuring that any shims on the shaft are seating correctly.

(5) Screw the assembly down tight, using the C spanner SPE.11976 (fig. 9), and hold the motor shaft with the box spanner SPE.11973.

(6) Place a paper gasket (49) in the recess in the lower base assembly, and position the motor/upper base assembly over the lower base studs.

Note . . .

Do not use any jointing compound at this stage.

(7) Holding the upper base and lower base in close contact, measure the projection of the top helix blade above the helix bush in the lower base assembly (fig. 1). If the dimension is outside the limits (1·00 mm. ± 0·25 mm.), select another helix/vapour assister assembly (selective assembly). Remove the lower base assembly and gasket.

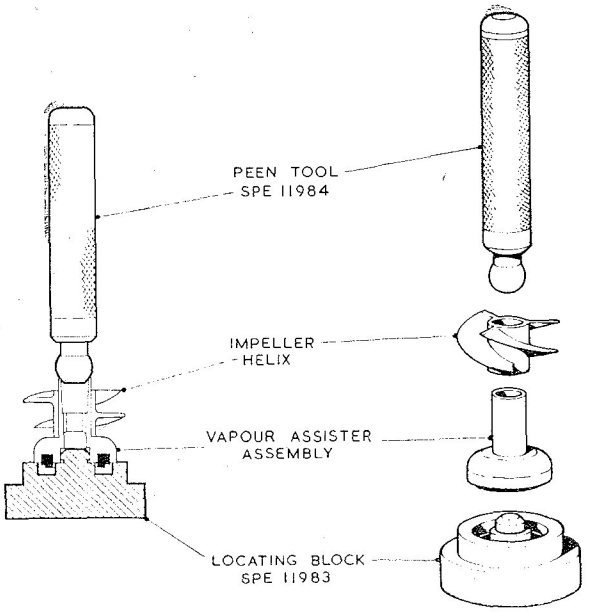


Fig. 17. Impeller assembling tools

Assembling the gear pump unit (figs. 5, 18 and 19).

28. (1) Insert the special tool SPE.20226 into one of the location holes in the upper cover plate (79) and assemble the upper bearing block (82) to the upper cover plate, locating both parts on the special tool. Assemble the upper gear end bearing plate (78) ensuring that the coated face is facing towards the gear chamber, then assemble the gear chamber (83) ensuring that the outlet holes on its periphery are positioned radially away from the inlet hole in the upper cover plate. Insert the special gear blanks SPE.20230 (2-off) into the gear chamber. Assemble the lower end bearing plate (76) ensuring that the coated face is facing towards the gears. Assemble the lower bearing block (84) and lower cover plate (75).

(2) Insert the special tool SPE.20224 into the underside of the alignment jig body SPE.20221. Insert the assembled pump unit into the alignment jig, pushing out the special tool SPE.20224 as the pump unit enters.

Note . . .

Ensure that the small diameter on the end of the special tool SPE. 20226 enters the bush on the base of the alignment jig.

(3) Remove the special tool SPE. 20226, and assemble the locating block SPE.20222 over the six socket head screws on the top of the alignment jig. Place the clamping ring SPE.20223 over the screws and turn it to the left to engage the keyhole slots with the shanks of the socket head screws. Re-

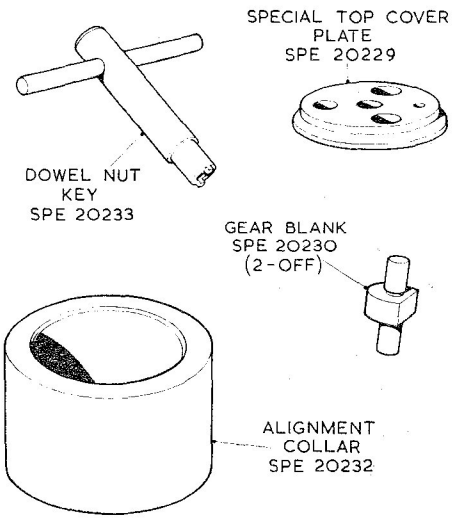


Fig. 18. Gear pump unit, special tools

place the special tool SPE.20226 and tighten the socket head screws evenly.

Note . . .

Ensure that the special tool SPE.20226 is entered fully into the bush at the bottom of the alignment jig.

(4) Place the bush SPE.20225 into the bush hole provided in the location block, and ream through to the lower cover plate using a 5 mm. reamer. Remove the reamer and the bush. Remove the special tool SPE.20226 and insert SPE.20227 into the hole already reamed. Place the bush SPE.20225 into the remaining hole and ream through to the lower cover plate using a 5 mm. reamer. Remove the reamer and bush. Remove the special tool SPE.20227. Unscrew the six socket head screws in the location block far enough to release the clamping ring. Remove the clamping ring and location block, replace the special tool SPE.20227. Insert the special tool SPE.20224 into the base of

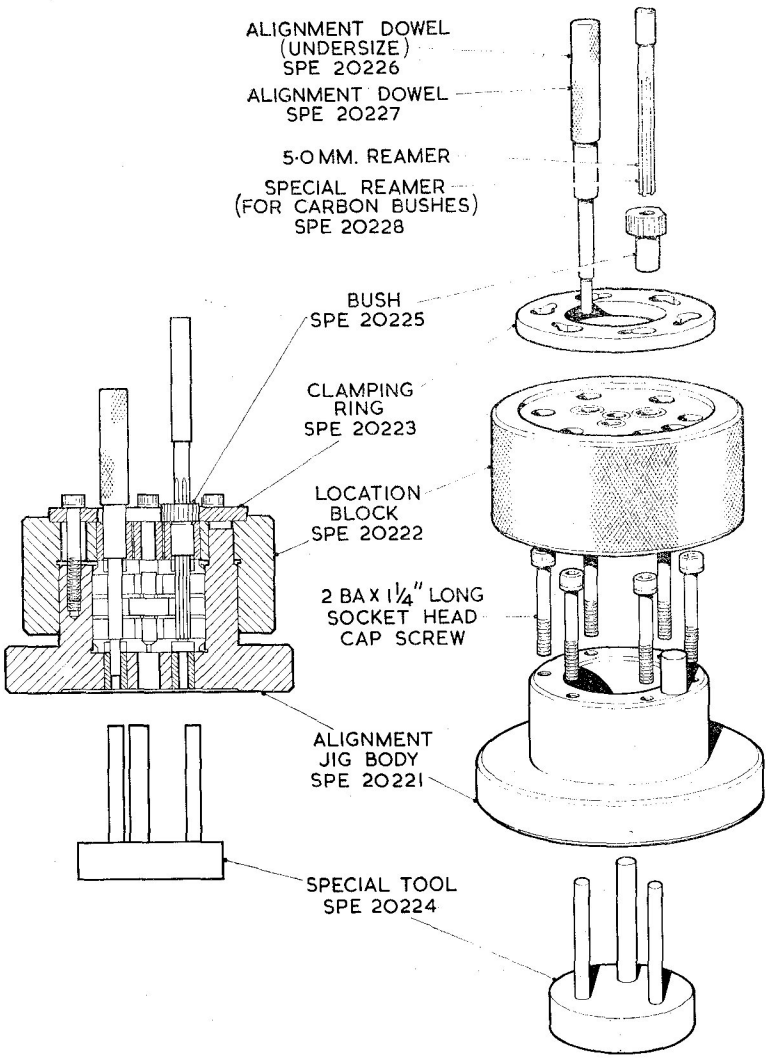


Fig. 19. Gear pump unit, alingment jig

the alignment jig, from the underside, and push out the pump unit.

(5) Withdraw all the components from the special tool SPE.20227 and re-assemble using the special top cover plate SPE.20229 (fig. 18). Do not assemble any gears at this stage. Insert one dowel screw (81) using selective assembly to ensure a push fit in the location hole. Screw the nut (85) on to the end of the dowel screw. Remove the special tool SPE.20227 and insert a second dowel screw and nut.

(6) Place the assembly into the alignment jig, tighten the two dowel screws and place the location block SPE.20222 over the alignment jig, as in para. 28(2) and (3). Place the clamping ring SPE.20223 over the socket head screws and turn the ring to the left to engage the keyhole slots with the shanks of the socket head screws. Tighten the socket head screws evenly.

(7) Using a tipped reamer SPE.20228, ream through the two small bush holes. The hole size in the carbon bushes should be between 5·5 mm. and 5·413 mm. Remove the reamer, the clamping ring and the location block, then withdraw the pump assembly from the alignment jig.

(8) Using a screw driver, in the dowel screw slots, and the special key SPE. 20233, unscrew the nuts and withdraw the dowel screws.

(9) Starting with the top cover plate (79), assemble the upper bearing block (82) and the upper gear end bearing plate (78), ensuring that the coated face is towards the gear chamber, then assemble the gear chamber (83) and the gears (60 and 77). Ensure that the extended shaft protrudes from the top cover plate; the outlet holes in the gear chamber periphery should be positioned radially away from the inlet in the top cover plate. Assemble the lower gear end bearing plate (76) with the coated face towards the gears, then assemble the lower gear bearing block (84), and the lower gear end plate (75). Insert one dowel screw (81) from the upper end, and screw on the slotted nut (85). Remove the special tool SPE.20227 from the location hole and insert the second dowel screw. Fit the second slotted nut, and ensure that the gears turn freely.

(10) Using the special key SPE.20233 and a screw driver, tighten the slotted nuts (85). Place the collar SPE.20232 over the assembly, and tap the collar over all assembled components, then tighten the nuts further.

(11) Remove the collar and place the assembled pump into the alignment jig. Tighten the dowel screws fully, and check that the gears turn freely.

Running-in the gear pump unit (fig. 20)

29. Insert the gear pump unit into the cage of the rig shown in fig. 20 ensuring that the squared end of the central gear engages the squared hole on the slave motor shaft coupling.

Note . . .

Before commencing running-in, check that the outlet is correctly positioned relative to the inlet and that the outlet holes on the periphery of the gear pump unit are aligned with a window of the cage.

Clamp the pump unit in position and lower the rig through 90° so that the pump unit is fully immersed in the running-in oil. Run in as follows:—

(1) 30 minutes using molybdenum disulphide in light oil. (Esso Spinesso or equivalent).

(2) 30 minutes using light oil.

(3) 15 minutes using AVTUR.

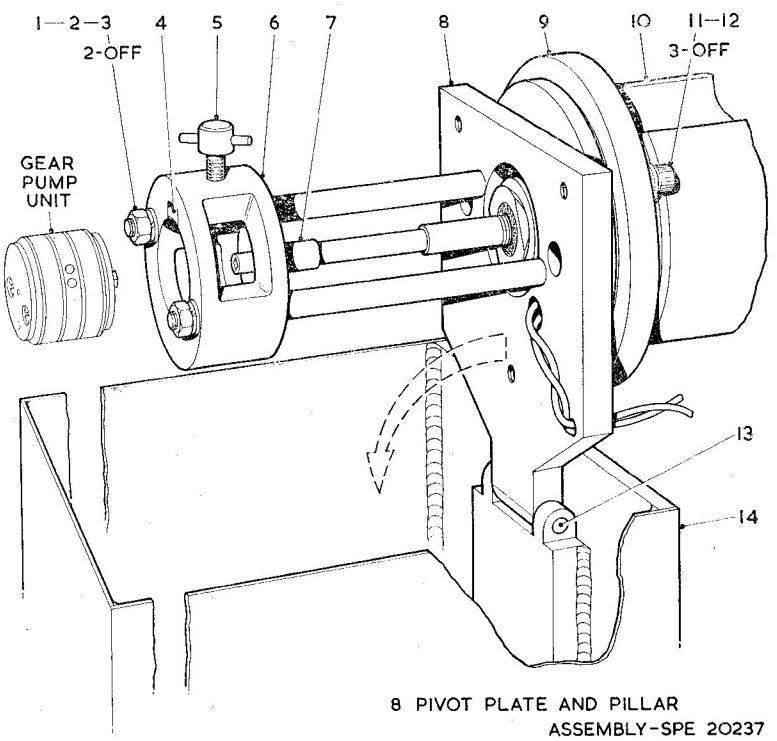
(4) 5 minutes dry.

Assembling the gear pump unit into the lower base assembly

30. (1) Place a rubber joint ring (51) in position in the lower base casting assembly (52) and press the gear pump unit carefully home, ensuring that the dowel hole in the pump top cover plate engages the dowel in the lower base casting assembly.

(2) Assemble the second joint ring (51).

(3) Place the base cover plate (59) in position, and insert the four screws



1 ¼" B.S.F. NUT
2 ¼" SPRING WASHER
3 ¼" PLAIN WASHER
4 CLAMPING PAD – SPE 20240
5 CLAMPING SCREW – SPE 20239
6 PUMP UNIT CAGE – SPE 20238
7 MOTOR SHAFT COUPLING – SPE 20243
8 PIVOT PLATE AND PILLAR ASSEMBLY – SPE 20237
9 MOTOR CLAMPING RING – SPE 20242
10 SLAVE MOTOR – SPE 20241
11 ¼" B.S.F. x 1¼" LONG CAP SCREW
12 ¼" PLAIN WASHER
13 FULCRUM PIN – SPE 20236
14 TANK AND FULCRUM PLATE ASSEMBLY – SPE 20235

Fig. 20. Gear pump unit, running-in- rig

(54) and the two screws (55) through the cover plate into the six holes in the lower pump body. Assemble the spring washers (57) and nuts (56) on to the ends of the screws. Tighten the nuts using a torque screwdriver set to 8 lb. in. Check the gap between the lower pump body and the cover plate, and deduct 0·004″/0·005″. Remove the cover plate and fit shims (58) to the thickness required (gap 0·004″/0·005″). Refit the cover plate, screws, nuts and washers, and finally tighten the screws using even pressure.

Assembling the relief valve (fig. 6)

31. (1) If the valve seat face of the spindle sub-assembly (91) is pitted, renew the sub-assembly and also the valve body (100). Lap the valve seat into the body (without any lapping medium).

(2) Remove the spindle sub-assembly from the valve body, smear the diaphragm (99) lightly with Silicone grease, then assemble the diaphragm, and the inner clamping ring (92) to the spindle; securing them with the self-locking nut (93).

(3) Insert the spindle and diaphragm assembly into the valve body, making sure that the diaphragm takes up the

correct position in the undercut groove in the body.

(4) Fit the outer clamping ring (98) into the valve body and lock in position with the clamping ring (97), using tool SPE.20234.

(5) Insert the spring (94) and compress it slightly by screwing in the adjusting plug (96) to a nominal position; lock the plug in position with the locking ring (95), using special spanners SPE.13116 and SPE.20220 (fig. 8).

Note . . .

The valve spring pressure will be correctly adjusted during the Proof test (para. 43).

Assembling the relief valve to the lower base casting assembly (fig. 2)

32. Place a valve seat washer (101) into the base casting and screw in the relief valve assembly, using the special spanner SPE.13116 on the body. Tighten the relief valve assembly down hard.

Assembling the lower base casting assembly to the upper base assembly (fig. 2)

33. (1) Fit the squared sleeve (50) to the end of the extended gear pump shaft. Pass the filter retaining ring (41) over the upper base casting, open it sufficiently to engage the turned-in end into the hole provided in the upper pump casting. Release the ring into the groove in the casting.

(2) Smear the mating faces of upper and lower base castings with Wellseal and place a new paper gasket (49) into the recess in the lower base casting. Enter the motor leads into the base casting conduit and ease them through the conduit. Assemble the upper base casting, passing it over the studs in the lower base casting, ensuring that the squared sleeve on the gear pump unit engages on the squared end of the motor shaft.

Note . . .

It is absolutely essential that the paper gasket does not become wrinkled or damaged in any other way, as leakage of fuel into the legs of the upper base casting may result.

(3) Secure the upper base casting and vapour guide cone (8) with one bolt (5), two nuts (46), two nuts (47), and spring washers (48). One of the special nuts (47) should be assembled to the stud securing one leg of the vapour guide cone, adjacent to the relief valve assembly. Do not wire lock at this stage.

Assembling the breeze plug to the pump (fig. 2)

34. If the elbow and attachment plate were removed during dismantling, secure the attachment plate (63) to the pump with four countersunk screws (62), ensuring that the notch in the plate is positioned on the uppermost side (towards the motor unit). Secure the elbow (64) to the attachment plate with three screws (3) and washers (4). Connect the motor leads to the breeze plug pins (67) and secure the plug to the elbow with the round head screws (65) and shakeproof washers (66).

Final assembly of pump

35. (1) Wrap the filter assembly (9) round the upper base casting, with the small mesh filter towards the base of the pump, so that the joint falls between the two legs of the casting, enter the two screws (10) through the filter and screw into the nuts soldered to the inside of the filter ring.

(2) Finally tighten the locking ring (37) using the special spanner SPE. 20218 (fig. 3) with the pump resting on the stand SPE.20219. Do not peen the locking ring at this stage.

Note . . .

The filter assembly (9) should not be locked until after the completion of the Proof Test and Calibration Test (paras. 43 and 44) as adjustment of the relief valve will necessitate the removal of the filter.

TESTING

General

36. The complete pump must be tested in accordance with the schedule of tests as detailed in paras. 37-48. The pump should be rejected if it fails to comply with any of these tests in any detail.

Test equipment

37. The universal fuel pump test rig (Ref. No. 5G/3494) should be used to test the pump, and should contain 100/130 AVGAS fuel, maintained at 20°-25°C. Detailed information on this test rig will be found in A.P.4343S, Vol. 1, Book 2, Section 10.

Insulation resistance test

38. Using a 250V standard insulation resistance tester check the insulation resistance of the complete pump between the plug pins and frame. The reading obtained should not be less than 2 megohms.

Bonding check

39. The electrical resistance measured between any two points of bond must not exceed 0·05 ohms. Any point where the anodic film has been broken during electrical testing must be locally treated with a chromic acid solution.

Preparation

40. A detailed procedure for mounting the pump to the test tank will be found in the chapter dealing with the test rig.

Pressure tests

41. Prime the pump fully under a 1 foot head of fuel over which is applied a superimposed air pressure of 16 lb/sq.in. for 15 minutes. Under these conditions run the pump at a voltage of 29V d.c. with no fuel flow for 15 minutes. During the running of the pump and also when stationary, observations are to be made for:

(a) External leakage of fuel

(b) Gland leakage of fuel.

The permissible leakage past the gland is $\frac{1}{2}$ cc when running and $\frac{1}{4}$ cc when stationary. No other leakage is permissible.

Starting test

42. Adjust the power supply to the pump to 18·7V d.c. and with a 6″ head of fuel over the pump inlet, switch on the power supply. The pump should start immediately. Interrupt the supply several times to check starting operation. If the pump fails to start it should be removed for examination to ascertain the cause of the fault.

Proof test

43. With a 6″ head of fuel over the pump inlet, run the pump for one hour for each set of conditions given in Table 4. The relief valve is to be adjusted at the beginning of the first run to give the required output. (Remove the filter assembly to obtain access). Record the performance at the beginning and end of each test run. Reject the pump if any appreciable change in performance is observed other than that caused by initial warming up. The relief valve should prevent the no-delivery pressure at the pump outlet from exceeding 120 lbs/sq.in. when running on a voltage of 29V d.c.

Calibration test

44. Run the pump under a 6″ head of fuel above the pump inlet and adjust the flow to 0, 10, 17·5, 20 and 30 gallons per hour. Measure the delivery pressure and the motor current at each stage. These measurements must be within the limits shown in Table 5.

Dry test

45. Mount the pump clear of fuel (by draining the test tank) and run dry for at least 5 minutes with a voltage of 29·0V d.c. applied. Observe the current consumption during this test; at no time should it exceed 1·75A.

Note . . .

The dry test should be carried out immediately after the calibration test.

Insulation resistance test

46. After completion of the foregoing tests, the insulation resistance should be measured. At no time should the resistance be less than 2 megohms using a 250V standard insulation resistance tester.

Dismantling for inspection

47. Dismantling for inspection should be reduced to an absolute minimum in the case of a pump which has satisfactorily completed the foregoing tests. Normally no attempt should be made to break joints already thoroughly tested. Should the authorized inspector however feel that a major strip for examination is necessary, then the pump on rebuild must be subjected to a repeat of the acceptance tests as detailed (para. 37-46).

Locking

48. After final test and inspection remove the filter and wire-lock the relief valve to the pump assembly, then replace the filter. Lock the edge of the locking ring (37) by peening it into the four equally spaced holes in the upper base casting (42). This completes the assembling of the complete unit, which should be placed in a polythene bag or other suitable packing until required.

Appendix 1

PUMP, FUEL CHA.4 MK. 4

General

1. The CHA.4, Mk. 4 fuel pump is identical to the CH.4, Mk. 4 fuel pump with the exception of the electrical connection. The connection elbow (64) and the attachment plate (63) shown in the basic chapter (fig. 2) are not fitted to the CHA.4, Mk. 4.

Dismantling

2. All the tools detailed in Table 1 of the basic chapter will be required for servicing the CHA.4, Mk. 4 pump. The dismantling procedure will be identical to that given in the basic chapter.

Assembling (Basic chapter, fig. 2)

3. The assembling procedure will be identical to the procedure detailed in the basic chapter with the exception that the elbow (64) and attachment plate (63) are not fitted (para. 34). Connect the motor leads to the Breeze plug pins and secure the plug (67) to the square mounting face on the lower base casting, using round-headed screws (65) and shakeproof washers (66).

Testing

4. The pump is tested according to the procedure given in the basic chapter (para. 37 to 48).

Appendix 2

PUMP, FUEL CH.4 MK. 3

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

General (App. 2, fig. 1)

1. The CH.4, Mk. 3 pump is generally similar to the Mk. 4 pump, given in the basic chapter. A different type of relief valve is fitted to the Mk. 3 pump, and a paper gasket (69) is used between the pump base and the base cover instead of the laminated shim (58) used on the later mark. All the tools detailed in Table 1 of the basic chapter will be required for reconditioning Mk. 3 pumps.

Dismantling (App. 2, fig. 3)

2. The dismantling procedure will be identical to the procedure given in the basic chapter except for removing and dismantling the relief valve (para. 7). The valve adjuster (113) has a screwdriver slot instead of flats, and a different type of valve body is fitted; the valve seat (111) is pressed into the body (115) and is not removable. It is recommended that Mk. 4 type relief valves should be fitted in place of Mk, 3 valves when reconditioning a pump.

Assembling

3. The following procedure should be used, when assembling Mk. 3 pumps, for the particular operations detailed; the remainder of the assembling procedure will be identical to the procedure given in the basic chapter.

Gear pump unit (App. 2, fig. 1)

4. The procedure for assembling the gear pump unit to the lower base assembly is generally similar to the procedure given in the basic chapter (para. 30) except for the following:—

(1) After fitting the second joint ring (51), smear the joint flange of the pump base lower sub-assembly (52) and the cover plate (59) with Wellseal jointing compound.

(2) Place a new paper gasket (69) into position on the joint flange, and assemble the cover plate (59), securing

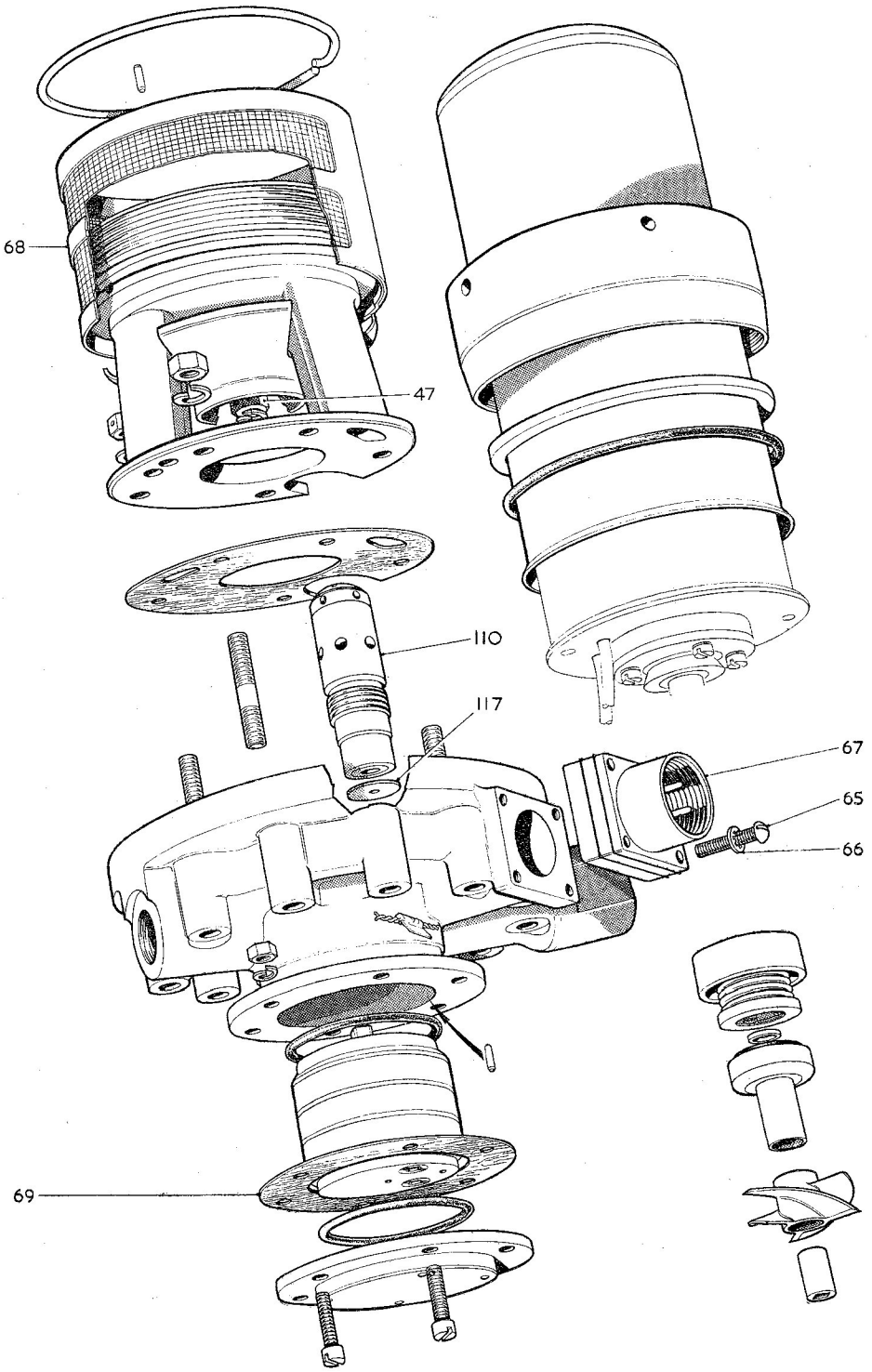


Fig. 1. Exploded view of pump unit

Key to Fig. 1.

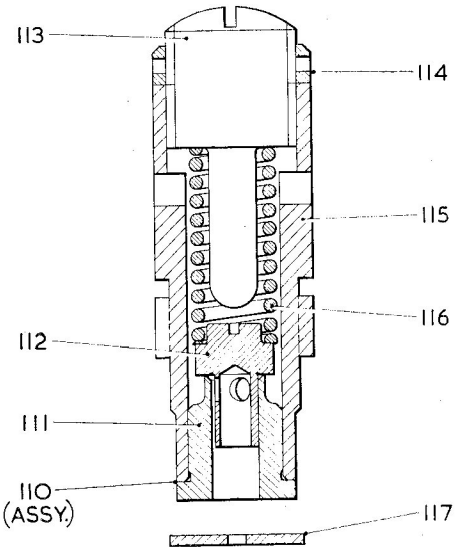
47 SPECIAL NUT
65 RD. HD. SCREW
66 SHAKEPROOF WASHER
67 ELECTRICAL CONNECTION
68 FILTER ASSEMBLY
69 BASE COVER GASKET
110 RELIEF VALVE
117 SEAL WASHER

it with the screws (54) and (55), spring washers (57) and nuts (56).

Relief valve (App. 2, fig. 3)

5. If a Mk. 4 type valve is not being fitted as a replacement, assemble the Mk. 3 valve as follows:—

(1) If the valve seat (111) or the valve body (115) are damaged or worn, renew both parts; the parts are pressed together and cannot be separated.



110 RELIEF VALVE ASSEMBLY
111 VALVE SEAT
112 VALVE
113 VALVE ADJUSTER
114 LOCKING RING
115 VALVE BODY
116 SPRING
117 SEALING WASHER

Fig. 2. Sectional view of relief valve

(2) Place the valve (112) on the valve seat, in the valve body, and lap the valve, without any lapping medium, to the valve seat. A screwdriver slot is provided in the valve head to facilitate lapping. Ensure that the pressure is applied vertically and evenly; do not remove the valve from the seat after lapping.

(3) Place the valve spring (116) into position, screw in the valve adjuster (113) and fit the locking ring (114) using the same locking ring tools as used for Mk. 4 relief valves.

Relief valve adjusting rig

6. The relief valve cannot be adjusted on a pump fitted with a Mk. 3 type filter, and it is necessary therefore to use an adjusting rig to preset the valve before it is fitted to the pump.

Note . . .

It is recommended that, whenever possible, Mk. 4 filters are fitted as replacement to Mk. 3 pumps to facilitate relief valve adjustment. The pump can then be assembled completely and the valve can be adjusted, similarly to a Mk. 4 pump, during testing; the adjusting rig and procedure given below applies only to pumps having Mk. 3 filters.

7. The adjusting rig comprises a tank of approximately two gallons capacity with a fuel pump, capable of delivering fuel at a minimum pressure of 140 lb/in^2, mounted in the bottom. A mounting block, for the relief valve, is mounted above the tank so that fuel, escaping from a relief valve under test, will flow back into the tank. An inlet connection on the valve mounting block is connected by a $\frac{3}{8}$ in. flexible hose to the pump delivery outlet, and an outlet from the mounting block is connected to a pressure control valve; a 0-200 lb/in^2 pressure gauge is mounted between the control valve and the mounting block, and the outlet from the control valve is fitted with a fine filter and $\frac{1}{2}$ in. dia. flexible hose to return fuel to the test tank. The relief valve mounting bore in the block is tapped $\frac{5}{8}$ in. B.S.F. The tank should be filled with AVGAS fuel.

Adjusting the relief valve

8. (1) Blank off the relief valve mounting bore in the mounting block, using a $\frac{5}{8}$ in. B.S.F. plug, connect a 26-30V d.c. supply to the slave pump motor, open the pressure control valve fully and check that a minimum flow of 140 lb/in² is obtained.

(2) Switch off the power supply, remove the plug from the relief valve mounting bore, fit a seal washer (117) into the bore, and fit the relief valve (110) to the mounting block, using the special C-spanner SPE.13116 (fig. 8).

(3) Switch on the power supply to the slave pump, and adjust the control valve to give a pressure gauge reading of 110 ± 2 lb/in².

(4) Using a screwdriver in the slot provided on the adjuster (113), adjust the relief valve until it just commences to operate, then using the double C-spanner SPE.20220 (fig. 8) tighten the locking ring (114) against the relief valve body (115) to lock the adjuster.

(5) Close the pressure control valve and check the reading on the pressure gauge. The reading should not exceed 120 lb/in² with a supply of 29V d.c.

(6) Remove the relief valve from the adjusting rig but do not assemble it to the pump at this stage.

Assembling the lower base casting to the motor unit (App. 2, fig. 1)

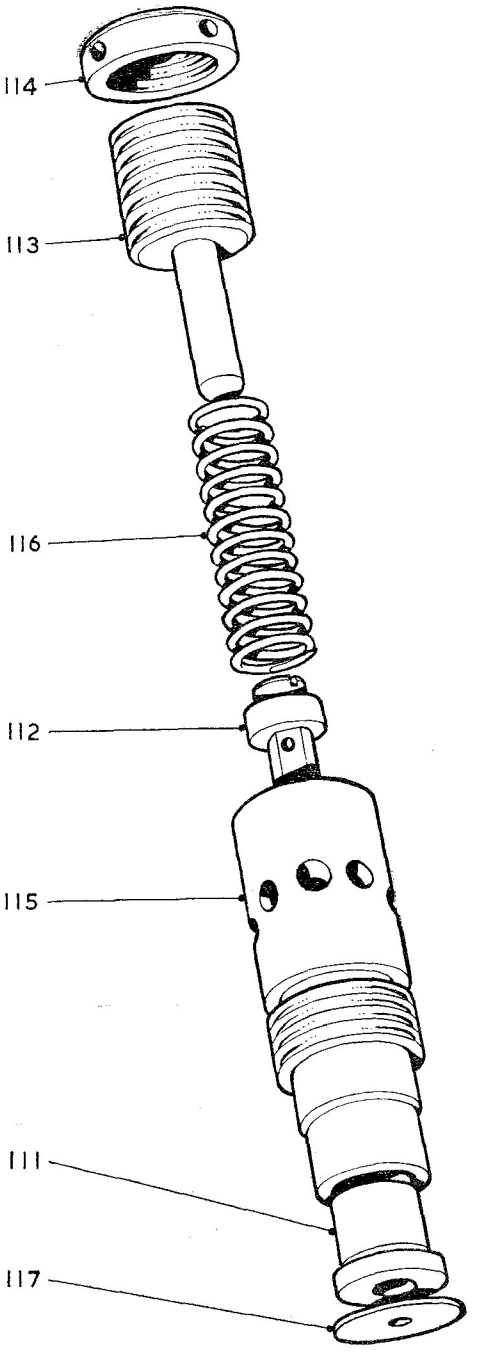
9. The lower base casting is assembled to the pump/motor unit in a similar manner to that described in the basic chapter (para. 33) for a Mk. 4 pump except that a nut (47), spring washer (48) and stud (45) are used in place of the bolt (5).

(1) Using a $\frac{5}{8}$ in. B.S.F. plug with a seal washer (117) blank off the relief valve mounting bore.

(2) Assemble the breeze plug to the pump.

(3) Assemble the filter to the pump (see para. 10 to this appendix).

(4) Carry out a preliminary test on the universal test rig in accordance with the procedure detailed for the proof test in para. 12.



111 VALVE SEAT
112 VALVE
113 VALVE ADJUSTER
114 LOCKING RING
115 VALVE BODY
116 SPRING
117 SEALING WASHER

Fig. 3. Exploded view of relief valve

Final assembling (App. 2, fig. 1)

10. After the preliminary test, remove the locking ring (37), the filter retaining ring (41), the filter assembly (68), the $\frac{5}{8}$ in. B.S.F. blanking plug, and the seal washer (117). Place a new seal washer in position, then fit the relief valve (110) using the C-spanner SPE.13116 (fig. 8) to tighten down the valve body, and complete the assembling as follows:—

(1) Fit the filter (68) over the pump body with the small mesh end towards the base of the pump.

(2) Open the filter retaining ring (41) sufficiently to pass the ring over the top of the upper pump casting, then locate the end of the ring in the hole in the casting and locate the ring in the groove.

Note . . .

Ensure that the motor unit remains seated firmly in the upper base assembly, otherwise damage may occur resulting in the necessity to dismantle the whole unit.

(3) Fit the locking ring (37) and with the pump located on the holding fixture SPE.20219 (fig. 3) use the ring clamp spanner SPE.20218 to tighten the locking ring.

TESTING

11. The complete pump should be tested in accordance with the procedure given in the basic chapter (para. 37 to 42 and 45 to 48); the Proof test and Calibration test should be carried out as detailed below.

Proof test

12. With a 6 in. head of fuel over the inlet, run the pump for one hour under the conditions given in (a) and (b) of App. 2, Table 1. These conditions constitute the rated performance for all reconditioned pumps. Pumps to which new gear units have been fitted should have a higher rate of flow in order that the pumps will conform to the rated performance after they have completed 500 hr. running; such pumps should be within the limits given at condition (c) of the Proof test (Table 1). Record the performance figures at the beginning and end of each test run and reject a pump if there is any appreciable change in performance, other than that caused by the initial warming up.

Calibration test

13. With the pump running on a voltage of 29V d.c., and with no delivery, the pressure and current consumption must be between the limits given in condition (a), App. 2, Table 2. With a 6 in. head of fuel over the inlet, adjust the flow to provide 0, 5, 10, 17, 20, 25 and 30 gal./hr. for each of the voltages given in Table 2. Measure the delivery pressure and current consumption at each stage. Plot graphs of the flow in gal./hr. against the delivery pressure in lb/in^2 for each voltage and check the graphs for conformity with the data given in Table 2.

TABLE 1

Proof test

Supply voltage		Delivery pressure	Flow (minimum)	Current consumption
(a)	26V d.c.	100 lb/in^2	10 gal./hr.	4·25 amps. (max.)
(b)	29V d.c.	100 lb/in^2	10 gal./hr.	4·25 amps. (max.)
(c)	26V d.c.	100 lb/in^2	20 gal./hr.	4·25 amps. (max.)

TABLE 2

Calibration test

Supply voltage		Flow	Delivery pressure	Current consumption
(a)	29V d.c.	0 gal./hr.	120 lb/in² (max.)	4·25 amps. (max.)
(b)	29V d.c.	17 gal./hr.	100 lb/in² (min.)	4·25 amps. (max.)
(c)	26V d.c.	17 gal./hr.	100 lb/in² (min.)	4·25 amps. (max.)
(d)	25V d.c.	17 gal./hr.	90 lb/in² (min.)	4·25 amps. (max.)

Appendix 3

PUMP, FUEL CHA.4 MK. 3

General

1. The CHA. 4, Mk. 3 fuel pump differs from the CH.4, Mk. 4 pump given in the basic chapter in respect to the electrical connection, and also in the design of the pressure relief valve. The electrical connection is identical to the CHA.4, Mk. 4 given in App. 1 and the pressure relief valve is the same as the CH.4, Mk. 3 given in App. 2.

2. The procedure detailed in the basic chapter will apply to all parts of the CHA.4, Mk. 3 pumps except for the operations given below.

Dismantling

3. There is no elbow or attachment plate on the electrical connection, but the procedure is similar to that given in the basic chapter (para. 4). The procedure for dismantling the pressure relief valve will be the same as given in Appendix 2 (para. 2).

Assembling

4. The assembling procedure will be identical to that given for CH.4, Mk. 3 pumps in Appendix 2 except for assembling the breeze plug. The assembling of the breeze plug and electrical connection will be identical to the procedure given in Appendix 1.

Testing

5. The pump must be tested in accordance with the procedure given in Appendix 2 (para. 11 to 13).

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