

TEST STAND

AMERICAN BOSCH CORPORATION SPRINGFIELD MASS U S A

THESE PAGES SUPERSEDE MANUAL PAGES
D 4000 to 4000 N - ISSUED APRIL,
1949

AMERICAN BOSCH

OPERATING AND MAINTENANCE INSTRUCTIONS

FOR

MOTOR DRIVEN FUEL INJECTION PUMP CALIBRATING STAND TSE 7664D



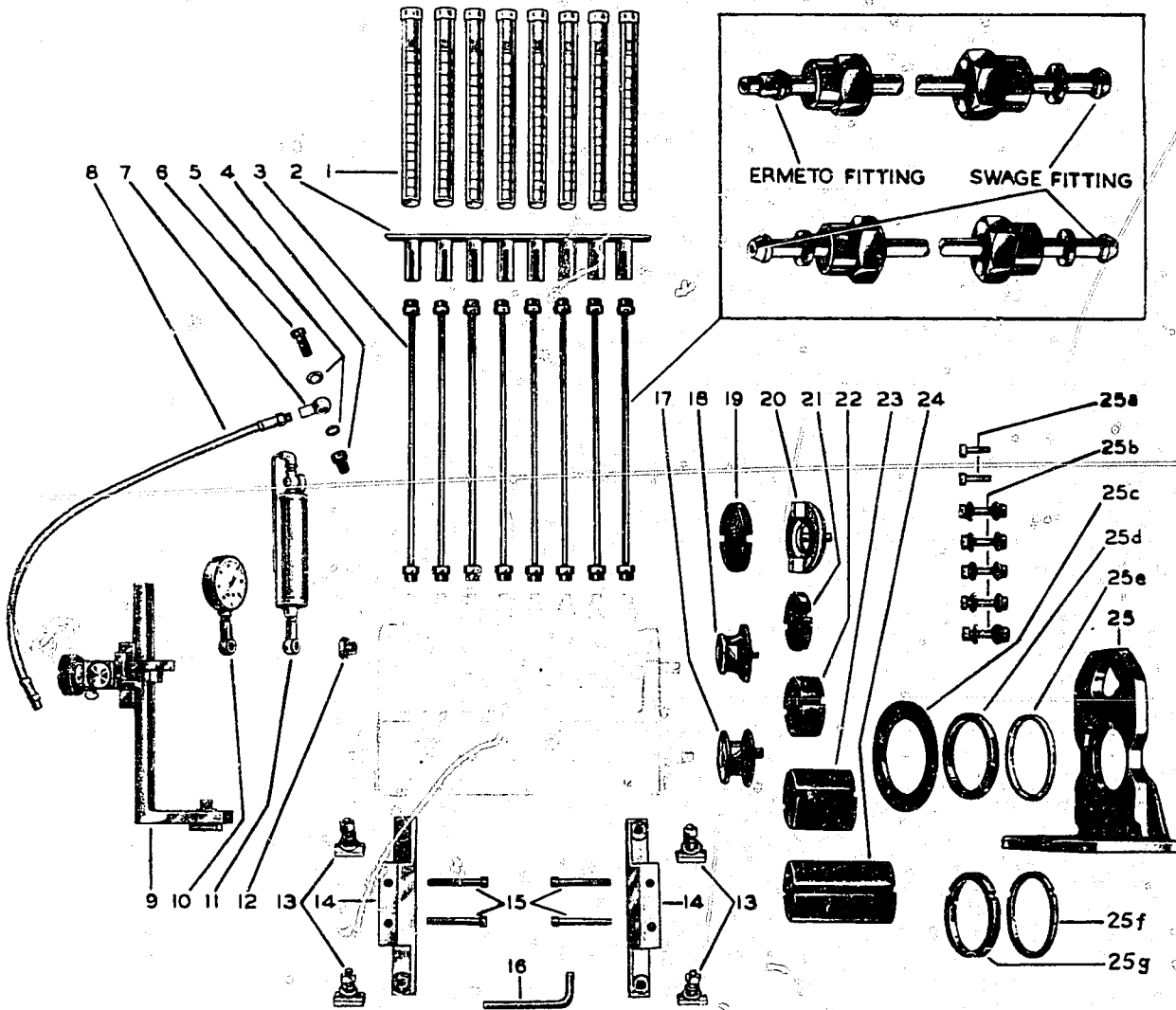


Figure 1

**ACCESSORIES SUPPLIED WITH
TSE 7664 D**

FOR ILLUSTRATIONS SEE FIGURE ONE

Illustration Number	Item Number	Quantity Used	Description of Item
1	TSE 76123	8	TUBES, test—graduated—32 cc
1	TSE 76124	8	TUBES, test—graduated—75 cc
2	TSE 7664B-27A	1	HOLDER, graduated test tube—32 cc
2	TSE 7664B-28A	1	HOLDER, graduated test tube—75 cc
3	TSE 7664-22	6	TUBING, high pressure—swaged — $\frac{5}{16}$ " #13 BWG x 20" long for use with "Z" size pumps (18 x 1.5mm thread)
3	TSE 7664-23	6	TUBING, high pressure — swaged — $\frac{1}{4}$ " #14 BWG x 14" long — special nipple nut ($\frac{5}{8}$ " x 18 thread) one end — for use with "A" size pump — International Harvester
3	TSE 7664-24	6	TUBING, high pressure — swaged — $\frac{1}{4}$ " #14 BWG x 14" long special nipple nut ($\frac{5}{8}$ " x 18 thread) one end — for use with "B" size pump — International Harvester

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Illustration Number	Item Number	Quantity Used	Description of Item
3	TSE 7664-109	6	TUBING, high pressure - swaged - 5/16" #13 BWG x 21" long - Ermeto fitting one end (5/8" x 18" thread) for use with Waukesha B and BB and Packard BB pumps
3	TSE 7664-112	6	TUBING, high pressure - swaged - 5/16" #13 BWG x 20" long - swaged both ends (14 x 1.5 mm thread) for Mack "BB"
3	TSE 7664-25	6	TUBING, high pressure - swaged - 1/4" #14 BWG x 14" long - for use with "A" size pump (12 x 1.5 mm thread)
3	TSE 7664-26	8	TUBING, high pressure - swaged - 1/4" #14 BWG x 14" long - for use with "B" size pump (14 x 1.5 mm thread)
3	TSE 7664-66	6	TUBING, high pressure - swaged - 1/4" #14 BWG x 14" long - special nipple nut (12 x 1.5 mm thread) and Ermeto fitting one end - for use with "A" size pump - Hercules
3	TSE 7664-67	8	TUBING, high pressure - swaged - 1/4" #14 BWG x 14" long - special nipple nut (14 x 1.5 mm thread) and Ermeto fitting one end - for use with "B" size pump - Hercules
3	TSE 7664-68	6	TUBING, high pressure - swaged - 1/4" #14 BWG x 14" long - for use with "A" size pump having angular discharge (12 x 1.5 mm thread)
3	TSE 7664-69	8	TUBING, high pressure - swaged - 1/4" #14 BWG x 14" long - for use with "B" size pump having angular discharge (14 x 1.5 mm thread)
3	TSE 7664-80	6	TUBING, high pressure - swaged - 1/4" #14 BWG x 14" long - Ermeto fitting one end (9/16" x 18 thread) - Hercules
3	TSE 7664-108	8	TUBING, high pressure - swaged - 1/4" #16 BWG x 20" long - for use with "BB" size pumps (14 x 1.5 mm thread) special nipple nut
4	TSE 7664-30	1	NIPPLE, reduction - 1/8" x 27 NPT (outside) and 14 x 1.5 mm thread (inside) American Bosch Part Number - WRV 5A1X
4	TSE 7664-32	1	NIPPLE, reduction - 1/4" x 18 NPT (outside) and 14 x 1.5 mm thread (inside) American Bosch Part Number - FI 798
5	TSE 7664-35	6	GASKET, copper - angular union - American Bosch Part Number WMR 2041/7X
6	TSE 7664-34	3	SCREW, retaining - angular union - American Bosch Part Number NRV 11/1X
7	TSE 7664-36	3	UNION, angular - American Bosch Part Number - NRV 3A1X
8	TSE 7664-39	1	TUBING, transparent - 36" long
8	TSE 7664-40	3	TUBING, transparent - 30" long
8	TSE 7664-41	1	TUBING, transparent - 24" long
9	TSE 7664-29A	1	CONTROL RACK SECURING DEVICE - complete
10	TSE 7664-37	1	GAUGE, pressure, with angular union for testing overflow valves and fuel supply pumps - 60# maximum pressure reading
11	TSE 7664-38	1	TANK, surge - used when operating with gravity fuel supply
12	TSE 7664-33	1	NUT, reduction union - 18 x 1.5 mm thread (outside) and 14 x 1.5 mm thread (inside) American Bosch Part Number WRV 2105/1X
13	TSE 7664-56	6	STUD, mounting block and angle mounting bracket, with washers and nuts
14	TSE 7664-49	2	BLOCK, mounting - "A" size pump
14	TSE 7664-50	2	BLOCK, mounting - "1B-P" size pump
14	TSE 7664-51	2	BLOCK, mounting - "B" size pump
14	TSE 7664-52	2	BLOCK, mounting - "Z" size pump
14	TSE 7664-106	2	BLOCK, mounting - "BB" size pump
15	TSE 7664-53	4	SCREW, fastening - Allen Head - for use with "A" size mounting block
15	TSE 7664-54	4	SCREW, fastening - Allen Head - for use with "B" and "1B-P" size mounting block
15	TSE 7664-55	4	SCREW, fastening - Allen Head - for use with "Z" size mounting block

- continued -

<u>Illustration Number</u>	<u>Item Number</u>	<u>Quantity Used</u>	<u>Description of Item</u>
15	TSE 7664-107	4	SCREW, fastening - Allen Head - for use with "BB" size mounting block
16	TSE 7664-58	1	WRENCH, Allen - 5/16"
16	TSE 7664-59	1	WRENCH, Allen - 3/8"
16	TSE 7664-65	1	WRENCH, Allen - 5/32"
17	TSE 7664-47	1	STANDARD DRIVEN COUPLING MEMBER - for use with "B" size pump - American Bosch Part Number - ZKH 74A2X
18	TSE 7664-48	1	STANDARD DRIVEN COUPLING MEMBER - for use with "A" size pump - American Bosch Part Number - ZKH 74A400X
19	TSE 7664-42	1	DISC, intermediate - standard - for use with "Z" size pump - American Bosch Part Number ZKH 75/2X
20	TSE 7664-46	1	FLANGE, adapter - special - with tongues for use with "Z" size pump
21	TSE 7664-44	1	DISC, intermediate - standard - for use with "B" size pump - American Bosch Part Number - ZKH 75/LX
22	TSE 7664-43	1	DISC, intermediate - 1 1/4" long - special - for use with "B" size pump with timing device
23	TSE 7664-45	1	DISC, intermediate - 3" long - special - for use with "A" size pump
24	TSE 7664-64	1	DISC, intermediate - 5" long - special - for use with "A" size flange mounted pumps having flange drive housing
25	TSE 7664-90	1	BRACKET, angle - flange mounting - includes parts 25A to 25G and two of illustration number 13

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**INSTALLATION AND OPERATION OF
MOTOR DRIVEN FUEL INJECTION PUMP CALIBRATING STAND—TSE 7664 D**

PURPOSE:

The American Bosch Fuel Injection Test Stand has been designed for Testing and Calibrating American Bosch Diesel Fuel Injection Equipment. It enables the operator to duplicate actual installation conditions as closely as possible.

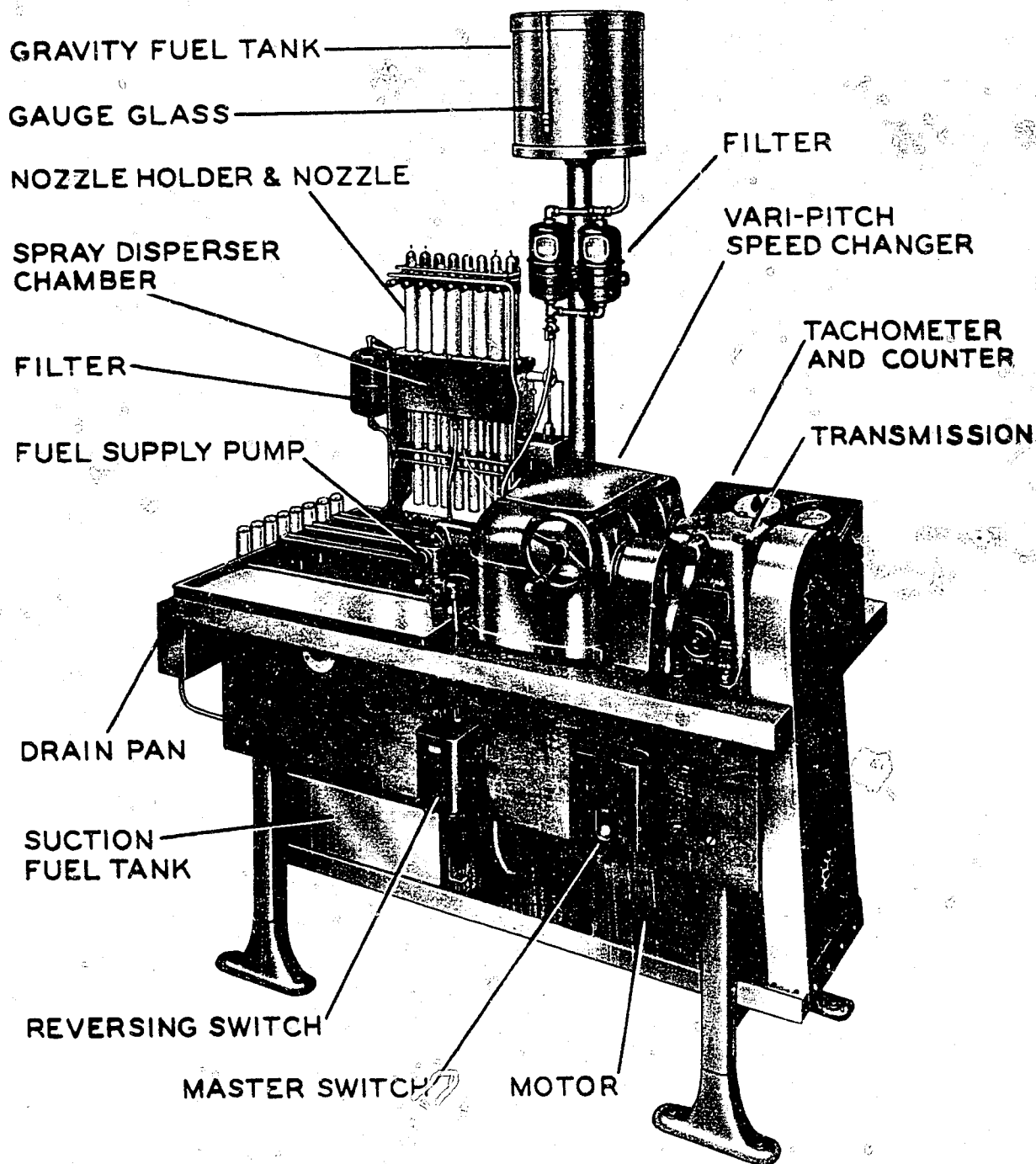


Figure 2

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MOTOR The stand is furnished without motor which must be procured by the purchaser according to the following specifications:

5 H. P. — 1800 RPM — REVERSIBLE — #254 MOTOR FRAME

(VOLTAGE, PHASE AND CYCLE ACCORDING TO POWER SUPPLY AVAILABLE)

WIRING The stand will be wired in accordance with purchaser's requirements. When ordering do not fail to specify voltage and whether AC or DC current will be used. If AC indicate also Phase and Cycle.

MOTOR CONTROLS Motor switch equipped with "START" and "STOP" push buttons and thermal overload breakers. Reversing switch makes it possible to rotate pump driving shaft in either direction. Always stop motor before changing rotation with reversing switch.

ELECTRIC CONTROLS (Tachometer and Counter) A 110 volt current supply is required for the Tachometer and Counter mechanism. Specify on order whether AC or DC will be used.

BELTS Two type "B" matched either "BROWNING B 64" or equivalent are supplied.

PULLEYS Double groove pulleys are used, one is attached to the transmission shaft and the other supplied separately for fastening to the motor shaft. Caution Exercise care to obtain proper pulley alignment when securing electric motor.

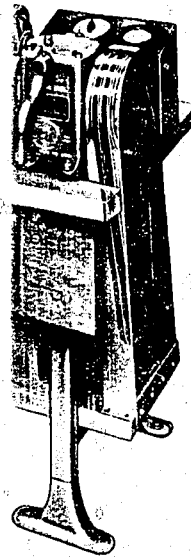


Figure 2A

TANK AND FILTERS A gravity oil tank is mounted on a pedestal, and a suction oil tank is located on the lower shelf. Adequate filters are provided to filter the oil from both tanks. A fuel supply pump driven directly by a shaft of the speed changer unit maintains a proper head in the gravity tank.

SPRAY DISPERSER, TACHOMETER AND COUNTER A set of eight nozzle holders and nozzles is mounted on the spray disperser chamber. A combined tachometer and counter is driven by the speed changer. It indicates the speed of the pump camshaft and also operates the tumbler tripping device in the spray disperser chamber. By means of the dial the tumbler device may be set to react upon a specific number of pump camshaft revolutions.

INSTALLATION: (see Figure 2)

The complete unit has been carefully tested and inspected at the factory prior to shipping. To facilitate shipping the stand, it has been partially dismantled.

The stand should be carefully removed from the shipping crate and inspected for possible damage during shipment. It is highly recommended that the stand be securely fastened to the floor. The stand should be so located as to allow the operator to work from either the front or the rear.

Gravity supply tank and supporting pipe must be attached to the table. The gauge glass is installed by using packing washer and union nut. The oil inlet line is connected to the elbow, and overflow line to the straight connection found at the base of the supporting pipe. These connections are clearly illustrated in Figure 2 B.

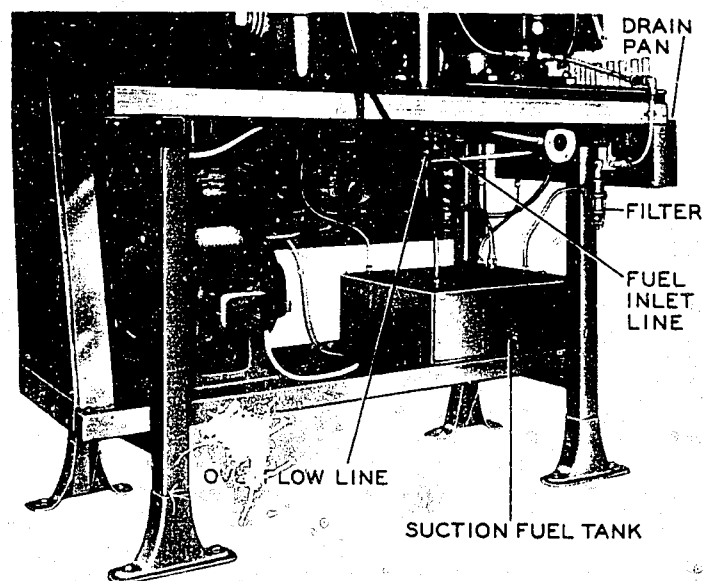


Figure 2B

The wiring of the stand proper is complete and the cables from the master switch to the motor will be found tagged. A source of 110 volt current is required for the counter and tachometer device. It is complete with male plug connection.

The spray disperser chamber assembly is secured to the table by means of four wing nuts. This assembly may be moved from the rear to the front of the stand. The male plug of the 110 volt, cable may be inserted in the outlet at the rear or in front depending on the position of the spray disperser chamber. The test tube drain pan is fastened to the table at the left side and its tubing is connected to the suction tank.

Both suction and gravity tanks should be filled with a total of approximately six gallons of calibrating oil. To guarantee a uniformity in testing pumps, we supply a special calibrating oil TSE 76141. It is properly prepared and ready for use. This oil is supplied in fourteen gallon drums. It is recommended because of its low pour point and viscosity, high resistance to gumming, oxidation, and polymerization together with freedom from acids, asphalts, resins, tar, and water. The following oils are offered as alternates provided they are mixed three parts to one part of water white kerosene.

OIL

- #301 Oil
- Latus Oil 22
- Alwether Oil
- Formula 11326 Oil
- Capella Oil AA
- #8504 Oil
- EF 382 Oil

SUPPLIER

- Gulf Oil Corporation
- Shell Oil Company
- Sinclair Refining Company
- Standard Oil Company of Indiana
- The Texas Company
- Socony Vacuum Oil Company
- Socony Vacuum Oil Company

OPERATING INSTRUCTIONS (See Figure 3)

The Transmission provides two, (high and low) input speeds for the Vari-Pitch Speed Changer. With the motor stopped the low speed position is obtained by **pulling the lever out and to the right**. The high speed position is selected by **pushing the lever in and also to the Right**. In either case if the Transmission gears fail to mesh easily, move the pulley on the Transmission shaft slightly by hand.

The Vari-Pitch Speed Changer is regulated by its handwheel. Turning it clockwise or counter clockwise decreases or increases the RPM as indicated on the Tachometer. It is important that the handwheel of the Speed Changer is rotated only when the Test Stand motor is running and connected to the Speed Changer through the Transmission.

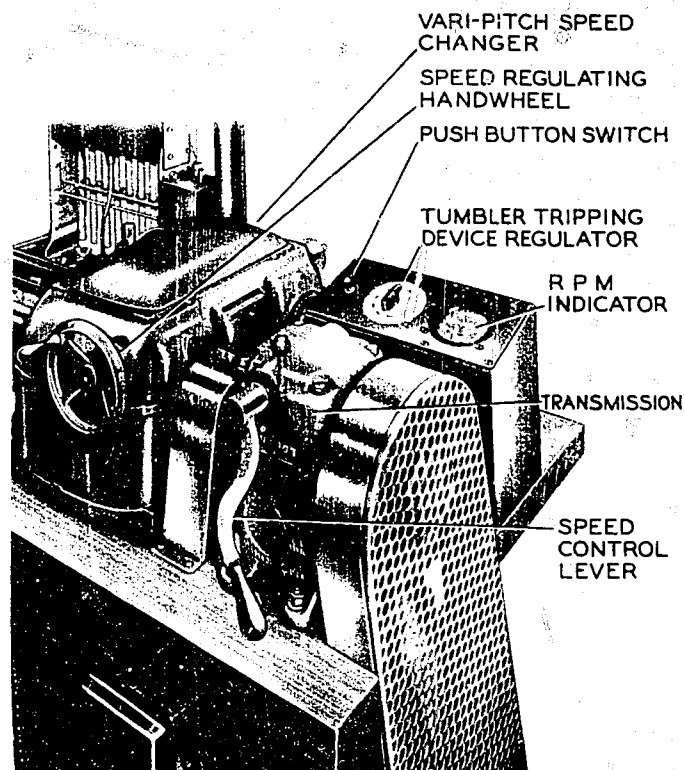


Figure 3

It is also important that the handwheel is used to bring the Vari-Pitch Speed Changer down to its lowest speed before stopping the Electric motor. This will prevent starting later at a high speed ratio which would place undesirable strain on the drive mechanism.

With the ratios provided in the Transmission, the Vari-Pitch Speed Changer and the speed of the electric motor, pumps being calibrated on the stand can be operated from 200 to 2000 RPM.

The counter and tumbler operating mechanism is incorporated in the Tachometer unit, shown in Figure 3. The required number of strokes, (in multiples of 100) is set by turning the dial pointer counter clockwise to the desired number. The counter is fully automatic in action and needs only to be properly set. It is started by pressing the push button switch which simultaneously energizes the solenoid controlled spray collector tripping device. After the set number of strokes has been automatically counted the electric contacts break the circuit releasing the solenoid. It is important to realize that once the pointer has been set and the counting device actuated by means of the push button, that the pointer must return to zero through the action of its internal mechanism. In other words the dial must not be forced back to zero. To re-engage the counter for the next reading repeat the above procedure.

The counter and tumbler mechanism is actuated by the 110 volt circuit. Two receptacles carrying this voltage are provided on the stand — one on the front control panel, and the other at the back of the stand. Plug the armored cable, attached to the spray disperser unit, into the receptacle most convenient.

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This illustrates a set up for pump timing and calibration by means of gravity feed. Note, that a single fuel/oil connection exists between the gravity tank via the filters to the pump sump by means of a transparent tubing.

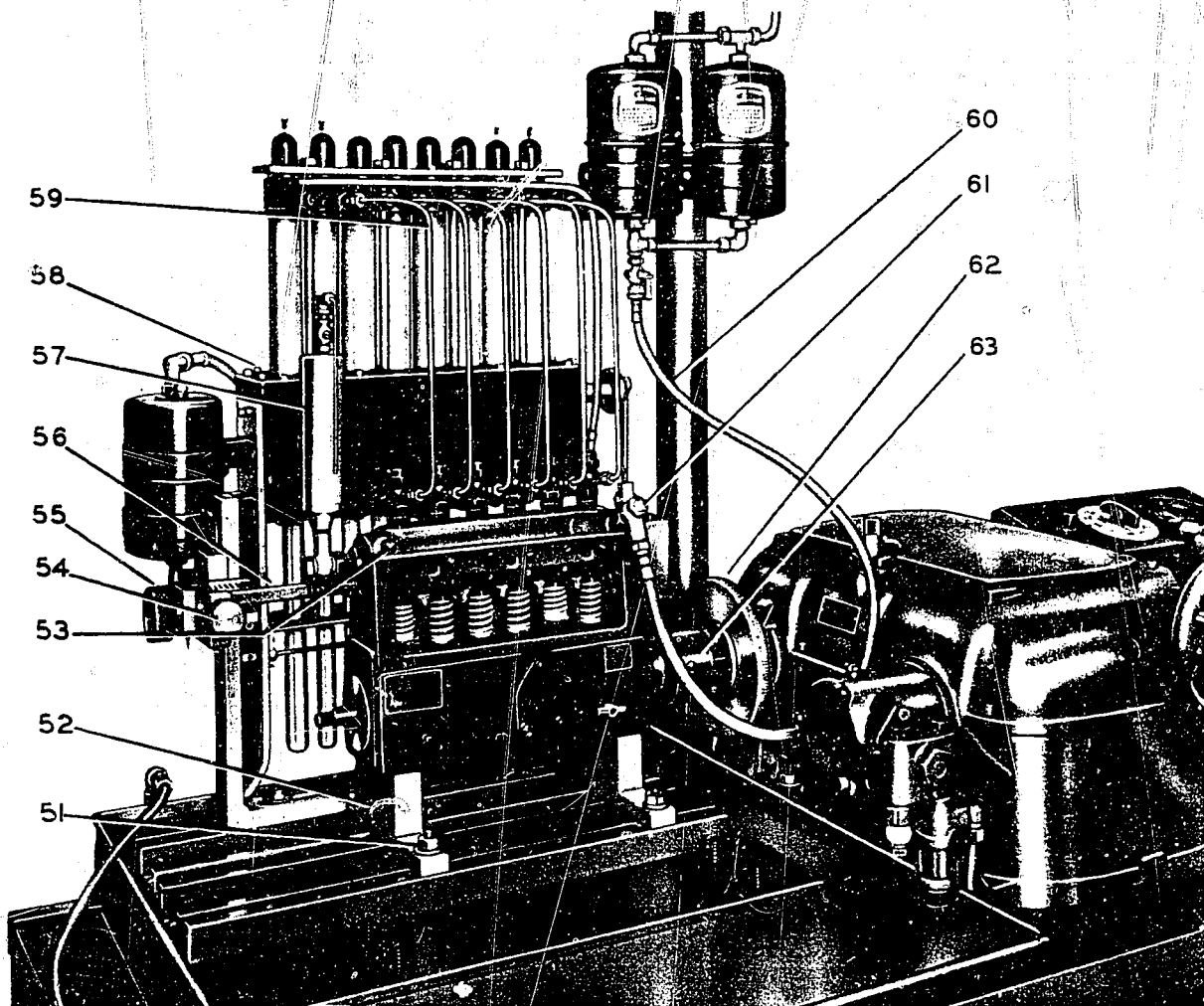


FIGURE 4

Illustration Number	Description	Function
51	STUD	With plain and lock washer together with a hexagon nut — used to fasten the mounting blocks to the channels of the Test Stand — two are used with each mounting block.
52	BLOCK	Mounting — furnished in various sizes to accomodate the type of pump involved — used to mount the pump on the Test Stand — Allen head screws together with wrenches are provided for this installation.
53	SCREW	Bleeder — found in the opposite side from that of the oil inlet — its removal allows the air to be bled from the pump sump.
54	WHEEL	Lock — part of the control rack positioning device — it locks the control rack in the desired position.
55	WHEEL	Knurled — part of the control rack positioning device — it permits the movement of the control rack to the desired position.

Illustration Number	Description	Function
56	BAR	Extension — part of the control rack positioning device— it connects the control rack with the positioning device.
57	TANK	Surge — it is inserted in the opposite side of the pump sump from that of the fuel inlet. It eliminates the surging of oil in the pump sump.
58	CHAMBER	Spray disperser — receives the oil from the nozzles and delivers it to the test tubes. Its internal mechanism operates in conjunction with the counter and tumbler tripping device.
59	TUBING	High pressure — carries the oil from the pump to the individual nozzle holders for injection via the nozzles into the spray disperser chamber.
60	TUBING	Transparent — carries the oil from the gravity tank via the filter to the pump sump.
61	UNION	Angular — connects the transparent tubing to the pump sump.
62	WHEEL	Graduated timing — it has a slip clutch arrangement permitting it to be set at zero when the position of number one plunger has been ascertained, (whether port opening or port closing). The number of degrees between the correct position of each plunger can then be read and proper tappet adjustment made.
63	DISC	Intermediate — mounted between driven coupling of pump and drive coupling of Speed Changer — when using the extended disc always engage the coupling lugs so that the opposite slots are used at the ends.

This illustrates the permanent fuel supply pump, the graduated timing wheel, and the intermediate disc which connects the Speed Changer with the Fuel Injection Pump.

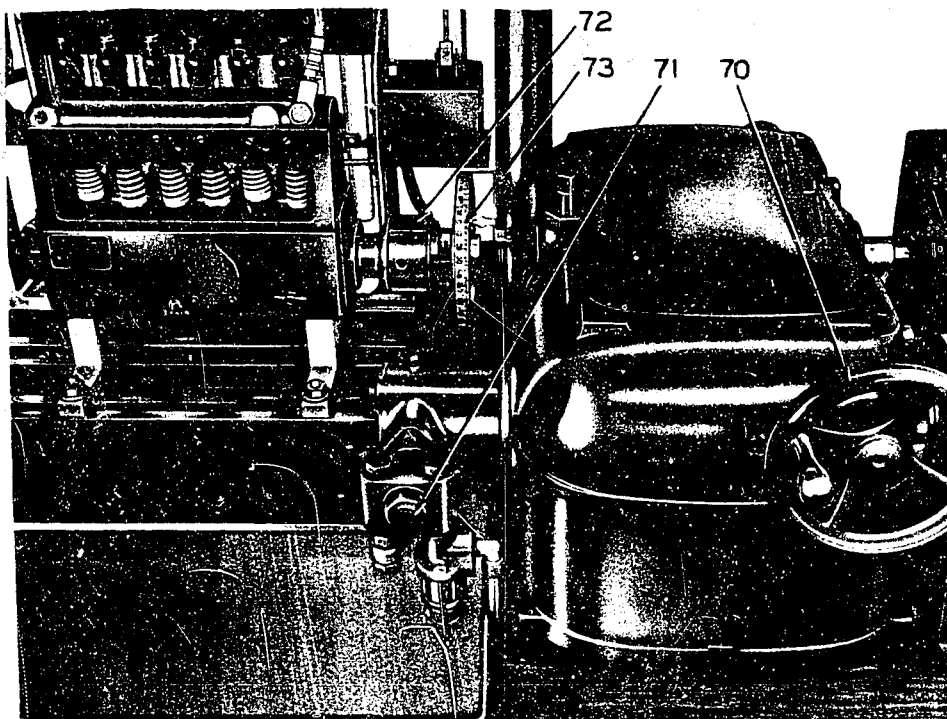


FIGURE 5

Illustration Number	Description	Function
70	HANDWHEEL	Rotating this handwheel either increases or decreases the RPM of the pump camshaft. It must never be turned unless the motor is running and connected to the Speed Changer via the Transmission.
71	PUMP	Fuel supply — this is a permanent installation and is actuated by a cam driven directly by the Speed Changer — it maintains a proper head in the gravity tank.
72	DISC	Intermediate — connects the Speed Changer's drive member with the pump driven member — NOTE, that the tongues are engaged in opposite slots at either end.
73	WHEEL	Graduate timing — used to determine the correct timing between plungers.

This illustrates a set up for calibration in which the fuel is drawn from the lower tank by means of the Supply Pump which is part of the Fuel Injection Pump. Bear in mind that the Fuel Injection Pump is always timed by means of gravity feed, as shown in Figure 5.

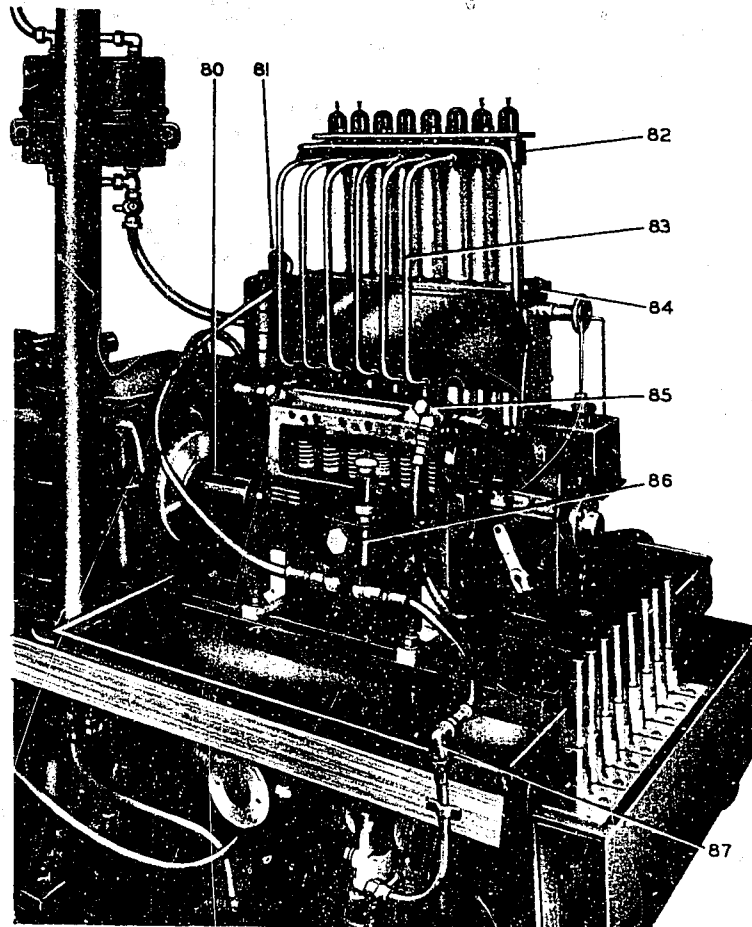


FIGURE 6

80	DISC	Intermediate — it connects the Speed Changer drive member with the Fuel Injection Pump driven member.
81	FILTER	Sealed type — it is mounted on the side of the spray disperser chamber and filters the oil before it enters the Fuel Injection Pump sump.

Illustration Number	Description	Function
82	HOLDERS	Nozzle — they receive the oil under pressure from the Fuel Injection Pump via the high pressure tubing and by means of their nozzles the oil is delivered into the spray disperser chamber.
83	TUBING	High pressure — they deliver the oil from the pump to the nozzle holders.
84	CHAMBER	Spray disperser — receives the oil from the nozzles and delivers it to the test tubes. Its internal mechanism operates in conjunction with the counter, tumbler and tripping device.
85	VALVE	Overflow — inserted in the pump sump at the opposite end from that of the oil inlet — it maintains a certain pressure in the pump sump and also eliminates the possibility of excessive pressure being built up.
86	PUMP	Fuel supply — it draws the oil from the lower tank and delivers it via the filter to the pump sump.
87	PIPE	Suction fuel — oil is drawn through this pipe from the lower fuel tank by means of the fuel supply pump — a transparent tubing connects this pipe with the inlet side of the fuel supply pump. Another transparent tubing is connected from the outlet side to the filter attached to the side of the spray disperser chamber. Still another transparent tubing is connected from the filter to the inlet side of the Fuel Injection Pump.

Note: THE DRAIN TANK ACCOMODATES THE TEST TUBE HOLDER AND TUBES BETWEEN READINGS AND IS A MEANS OF THOROUGHLY DRAINING THE TEST TUBES

TESTING OVERFLOW VALVES

Using the same set up as shown in Figure 6 except attach the pressure gauge in the same position as the surge tank shown in Figure 4, (illustration number 57) the overflow valves may be tested by reading the opening pressure on the gauge.

FLANGE MOUNTED PUMPS

This illustrates a flange mounted pump held by a bracket and set in the channels of the Test Stand.

The bracket is held in place by the same studs that are used to hold the mounting blocks for base mounted pumps.

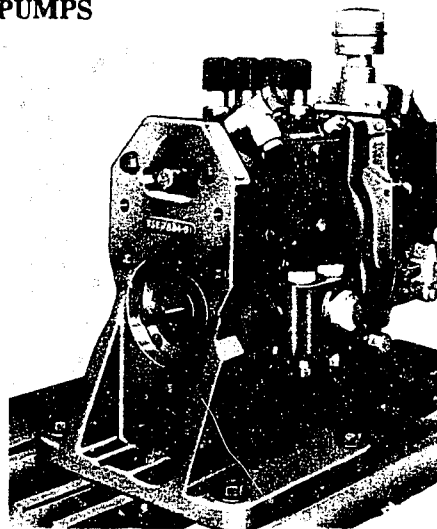


FIGURE 7

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This illustrates a flange mounted pump using a special adapter flange and coupling (95). Both of these must be used in testing the pump. A timing pointer is built into the drive housing and can be seen through the housing inspection window. A timing line marked "FBI" is stamped on the outside of the coupling. When this line coincides with the pointer, the number one plunger at that end of the pump must be in port closing position.

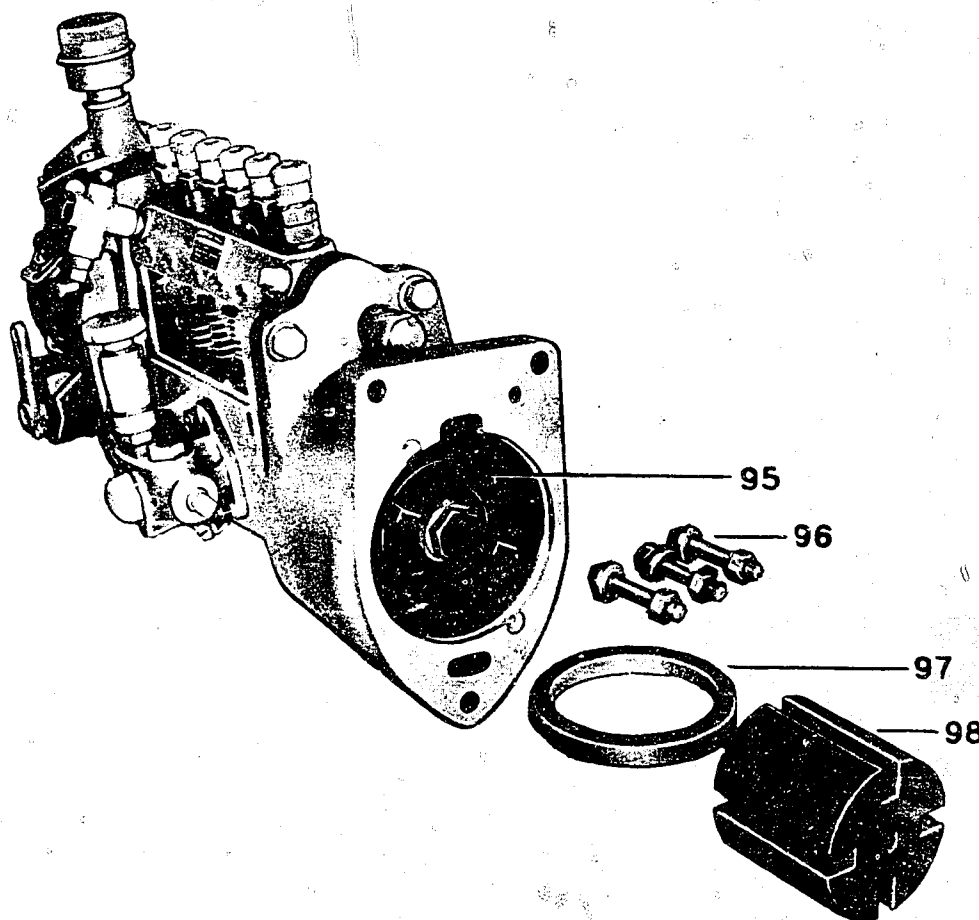


FIGURE 8

Illustration Number	Description	Function
95	COUPLING	Special — part of pump assembly.
96	SCREW	Securing with washer and hexagon nut — used to mount the pump on the bracket.
97	RING	Locating — used to locate the pump adapter flange to the bracket.
98	DISC	Intermediate — three inches long.

Note: WHEN FLANGE MOUNTED SIX CYLINDER CAST IRON PUMPS ARE USED, PLACE A MOUNTING BLOCK ON THE OPPOSITE END FROM THE MOUNTING BRACKET TO RELIEVE THE STRAIN.

This illustrates the same type of pump as in Figure 8, except this uses an automatic timing device (Not of American Bosch Manufacture) in the drive housing. A timing mark "FBI" is stamped on the outside rim of the timing device. When this line coincides with the pointer, the number one plunger at that end of the pump must be in "Port Closing" position. The automatic timing device is then removed and by means of the parts illustrated, the pump is calibrated in the usual manner.

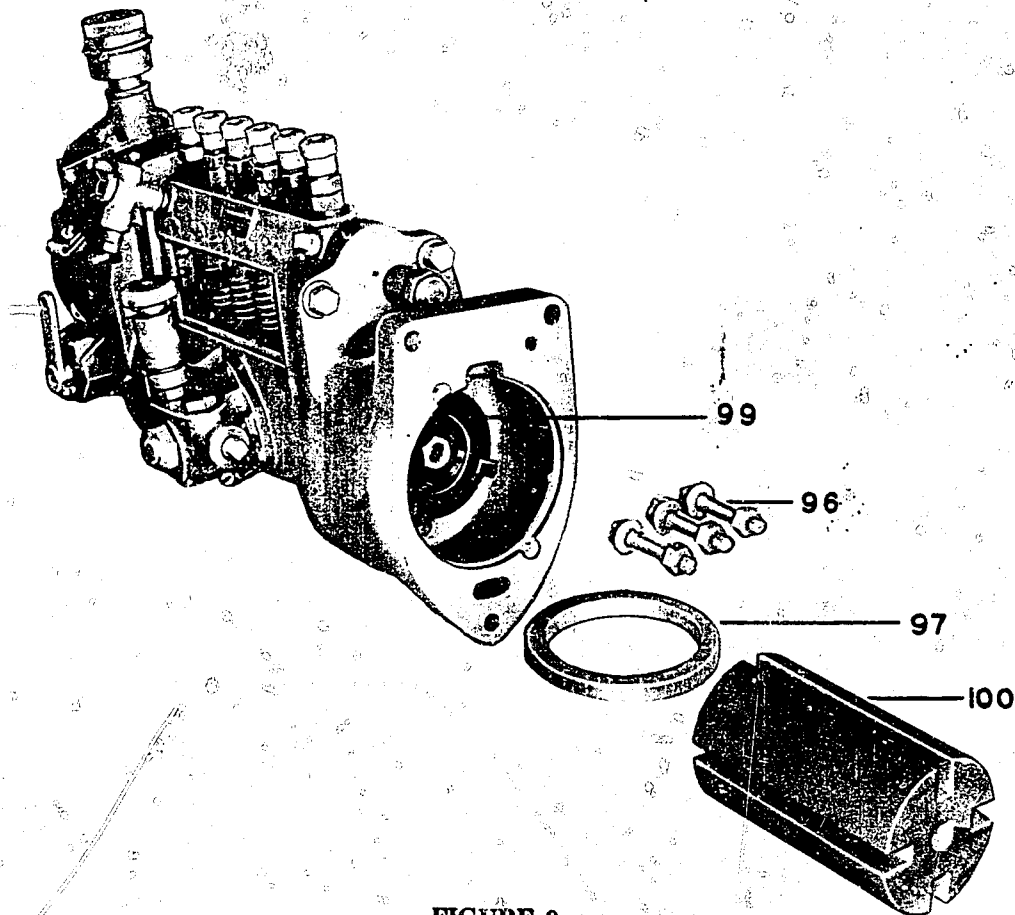


FIGURE 9

Illustration Number	Description	Function
96	SCREW	Securing with washer and hexagon nut — used to mount the pump on the bracket.
97	RING	Locating — used to locate the pump adapter flange to the bracket.
99	COUPLING	Standard — attached to the pump camshaft.
100	DISC	Intermediate — five inches long.

Note: WHEN FLANGE MOUNTED SIX CYLINDER CAST IRON PUMPS ARE USED, PLACE A MOUNTING BLOCK ON THE OPPOSITE END FROM THE MOUNTING BRACKET TO RELIEVE THE STRAIN.

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CARE AND MAINTENANCE

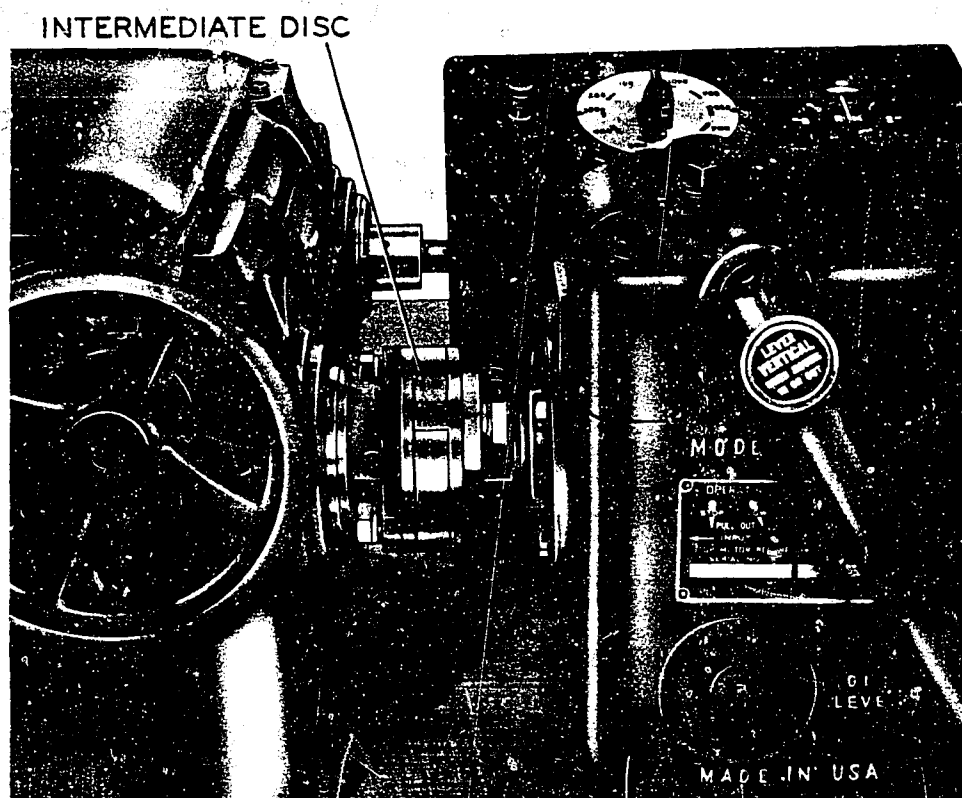


FIGURE 10

The Test Stand proper requires no special attention other than the occasional lubrication of moving parts. During periodic check, the oil plug found on the housing which encloses the cam, that actuates the permanent Fuel Supply Pump, (shown in Figure 5 — Illustration 71) should be removed and a few drops of oil placed on the cam.

The proper oil level of the Transmission should be maintained. Remove the oil level plug and add oil until it reaches this point. The proper oil to be used in this assembly is 600 W Heavy oil.

At least twice a year the back plate of the Tachometer and Counter unit should be removed and the two fibre gears, (Bevel and Worm) together with the three brass gears should be lubricated by means of a small quantity of either extra heavy oil or light grease. Care should be exercised to see that only a small quantity is placed on these gears. AVOID EXCESSIVE LUBRICATION.

The intermediate disc which is part of the coupling that connects the Transmission to the Speed Changer is subject to wear. Should replacement be required it may be ordered as American Bosch Part Number ZKH 75/2X.

Nozzle holder opening pressure should be checked periodically, and pressure set at 2500 pounds per square inch. This can be accomplished by removing the individual nozzle holder and nozzle from the spray disperser chamber, and rechecking and adjusting by means of a Nozzle Test Stand.

The nozzles and holders furnished with the test stand are of the following type:

4 - AKB 50 SD 150F Nozzle Holder
With ADN 12 SD 12 Nozzle

4 - AKB 50 SD 150 Nozzle Holder
With ADN 12 SD 12 Nozzle

They constitute a matched set which is uniform in delivery within close limits. Each nozzle must always remain with its original nozzle holder.

This set is to be used in testing and calibrating the following type pumps:

PSB Type

APE Type - "A" and "B" size

In order to calibrate the APE type "BB" and "Z" size pumps, it is necessary to order a complete matched set of uniform nozzles and holders of the following type:-

4 - AKB 50 SD 150F Nozzle Holder
With ADN 6 S 2 Nozzle

4 - AKB 50 SD 150 Nozzle Holder
With ADN 6 S 2 Nozzle

The complete set must be returned when it is found that repetitive fuel draws do not result in repeat fuel delivery quantities. This condition is generally caused by impurities in the calibrating oil which is permitted to pass through the nozzle.