

OPERATING/MAINTENANCE/PARTS MANUAL
DE-30B/20B, DE-50B & DE-70B/50B
MKT DIESEL PILE HAMMERS

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WARRANTY

MKT CORPORATION STANDARD WARRANTY

WARRANTY — MKT Corporation warrants new Products sold by it to be free from defects in material or workmanship for a period of 90 days after date of delivery to the first user and subject to the following conditions:

MKT Corporation's obligation and liability under this Warranty is expressly limited to repairing or replacing at MKT Corporation's option, any parts which appear to MKT Corporation upon inspection to have been defective in material or workmanship. Such parts shall be provided at no cost to the user, at the business establishment of the authorized MKT Corporation distributor of the Product during regular working hours. This Warranty shall not apply to component parts or accessories of Products not manufactured by MKT Corporation and which carry the warranty of the manufacturer thereof, or to normal maintenance (such as oil filters). MKT CORPORATION MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND MAKES NO WARRANTY FOR MERCHANTABILITY OF FITNESS FOR ANY PARTICULAR PURPOSE.

MKT Corporation's obligation under this Warranty shall not include any transportation charges, costs of installation, duty, taxes or any other charges whatsoever, or any liability for direct, indirect, incidental, or consequential damage or delay. If requested by MKT Corporation, Products or parts for which a warranty claim is made are to be returned transportation prepaid to MKT Corporation, Dover, N.J. Any improper use, including operation after discovery of defective or worn parts, operation beyond rated capacity, substitution of parts not approved by MKT Corporation, or any alteration or repair by others in such manner as in MKT Corporation's judgment affects the Product materially and adversely, shall void this Warranty.

NO EMPLOYEE OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY UNLESS SUCH CHANGE IS MADE IN WRITING AND SIGNED BY AN OFFICER OF MKT CORPORATION AT DOVER, N.J.

CAUTION DO NOT WELD

ANY WELDING ON THE HAMMER MUST BE APPROVED BY THE FACTORY. NOTE WARNING PLATE ON HAMMERS. WELDING ON HAMMER MAY VOID WARRANTY. CONSULT FACTORY.



LOCATION OF SERIAL NUMBERS

The location of the Serial Number on our equipment is as follows:

Steam/Air Pile Hammers - Located on the left front on each part (top head, cylinder, etc.)

Steam/Air Extractors - Located on the left side front and each sidestrap.

Diesel Pile Hammers - Located on the instruction plate above the travel plug on the front of the hammer.

Vibratory - Located on the center post of the control side of the power pack. Located on the left side or motor side of the exciter housing.

Earth Boring Units - Located on the front of the roller base and the top of the motor housing.

WHEN ORDERING PARTS, MENTION THE MODEL AND SERIAL NUMBER OF YOUR HAMMER.

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Phone: 31546
Telex: 306

NOTES :

I. INTRODUCTION

The MKT Diesel Pile Hammers are self-contained needing neither auxiliary power supply nor power accessories. The simple operation of this two-cycle diesel effectively drives piles by combining the preloading force of compression, the impact force of the falling ram and the explosive force. The three-part blow composed of the preloading force, impact energy and explosive force extends the time duration of the effort to move pile, keeping the Anvil and the Drive Cap pressed against the pile head to reduce pile head deformation and subjecting the pile to an extended downward force.

II. PRINCIPLE OF OPERATION: (SEE FIG. 1, PAGE 2)

A. SINGLE ACTING HAMMER

Operation of the MKT Diesel Pile Hammer is simple. The hammer is worked by a tripping pendent attached to the crane load-line (A) and top flange of the hammer (See Page 13). It is started merely by lifting the Ram-Piston (B) with the load-line until the trip mechanism (C) automatically releases the Ram-Piston. The Ram-Piston falls, actuating the cam of the fuel pump (D) that delivers a measured amount of liquid fuel which falls into a cup formed in the top of the Anvil (E). Continuing in its downward gravity fall, the Ram-Piston blocks the exhaust ports (F) and begins compression of the air trapped between the Ram-Piston and the Anvil. The compression of the trapped air creates a preloading force upon the Anvil, Drive Cap and the pile. The gravity-propelled Ram-Piston strikes the Anvil, delivering its impact energy to the pile.

The ball pointed Ram-Piston mates perfectly with the cup in the Anvil, displacing the liquid fuel at the precise moment of impact to achieve perfect timing. The fuel is splattered into the annular zone around the ram point and the anvil. Upon entering the high-pressure, hot air, it ignites.

II. PRINCIPLE OF OPERATION: (SEE FIG. 1)

A. SINGLE ACTING HAMMER - Continued

The resultant explosive force drives the Ram-Piston upward and the pile downward, adding a push to the pile to extend the time duration of the total effort to move the pile.

HAMMER OPERATION

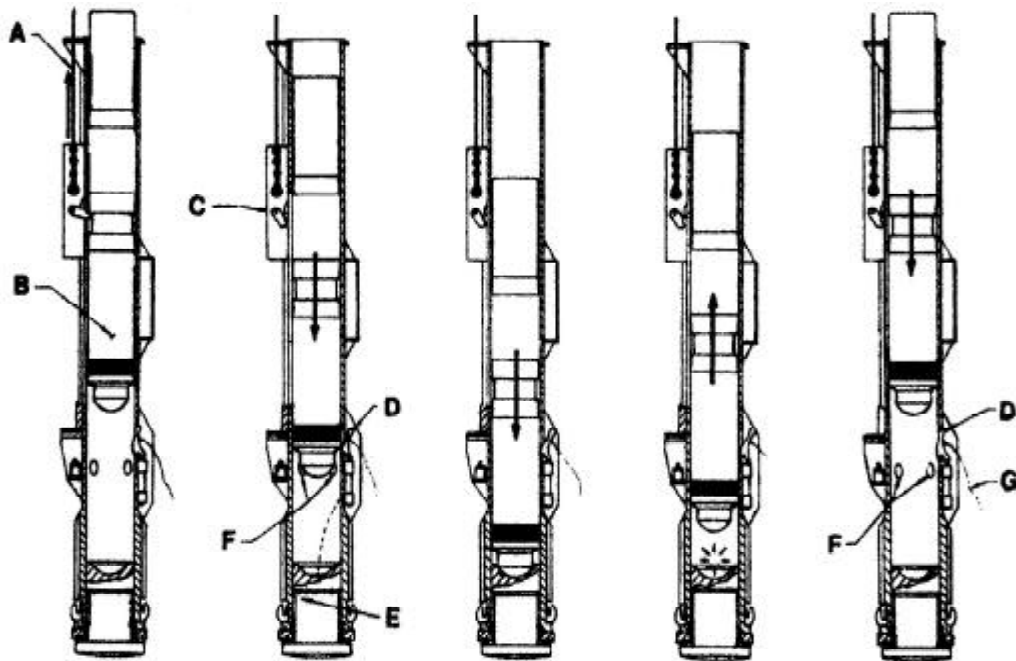


FIG. 1

On the upstroke, the Ram-Piston continues freely upward until arrested by gravity. The length of the stroke varies with the resistance offered by the pile.

Having reached the top of its stroke, the Ram-Piston falls again, repeating the cycle. The hammer is stopped by pulling a rope (G), disengaging the fuel pump cam (D).

III. SPECIFICATIONS

A. DE-30B/20B DIESEL PILE HAMMER

	DE-20B	DE-30B
Mfr's applicable energy rating (ft.lbs.)*	12,000 to 17,000	16,800 to 23,800
Speed, (Strokes/min. average)	40-50	40-50
Fuel consumption (gals./hr.)	2.0	2.0
Weight of ram-piston (lbs.)	2,000	2,800
Fuel tank capacity (gals.)	13	13
Lube tank capacity (gals.)	3.5	3.5
Length over-all with drive cap	15'3 3/4"	15'3 3/4"
Net weight (lbs.)	6,450	7,250
Net weight w/Univ. D.C.	7,400	8,200
Ship.wt. with Univ. D.C.(lbs.)	7,750	8,550

*For explanation of energy ratings of diesel hammers, see Page 5.

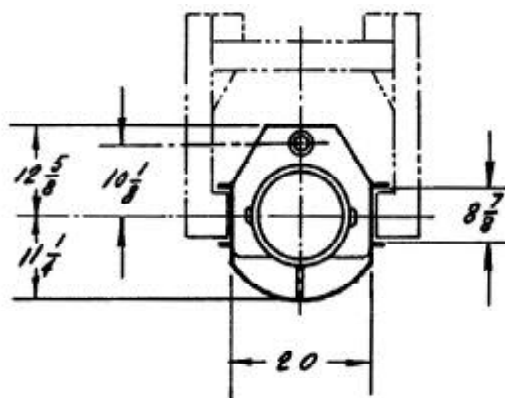


FIG. 2

III. SPECIFICATIONS

B. DE-50B & DE-70B/50B DIESEL PILE HAMMER

	DE-50B	DE-70B/50B	
		DE-50B	DE-70B
Mfr's. applicable energy rating (ft. lbs.)*	30,000 to 42,500	30,000 to 42,500	42,000 to 59,500
Speed (strokes/min. average)	40-50	40-50	40-50
Fuel consumption (gals./hr.)	3.0	3.3	3.3
Weight of ram-piston (lbs.)	5,000	5,000	7,000
Fuel tank capacity (gals.)	13.5	22	22
Lube tank capacity (gals.)	4.5	10	10
Length over-all with drive cap	14'9"	15'10"	15'10"
Net weight (lbs.)	12,000	12,700	14,700
Net weight w/Univ. D.C.	13,335	14,035	16,035
Ship.wt. with Univ.D.C. (lbs.)	13,850	14,550	16,550

*For explanation of energy rating of diesel hammers,
see Page 5

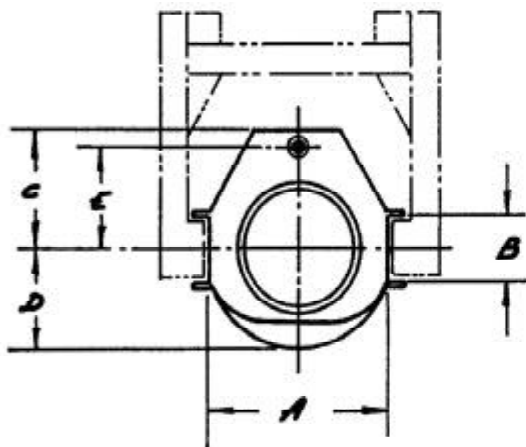


FIG.3

CLEARANCE DIMENSION IN INCHES

	DE-50B	DE-70B
A	26	26
B	8 1/2	8 1/2
C	15 1/2	16 1/2
D	13 5/8	14
E	12 3/8	13 1/2

IV. ENERGY RATINGS AND PILE STATIC LOAD BEARING DETERMINATION

A. ENERGY RATINGS OF DIESEL HAMMERS

MKT has long maintained that the height of Ram travel in a single-acting diesel times the weight of the Ram reflects less than the amount of energy which has been delivered to the system by the exploding diesel fuel. Even with a pile at complete refusal, additional energy is spent in pressure losses, material displacement, heat and resistance to upward Ram travel. MKT appreciates, however, that the peak force loading on a pile driven by a diesel hammer is less than the peak force loading on the same pile driven by a steam/air hammer of equivalent energy rating, since the time increment of the applied force is longer for the diesel. The foregoing, however, is complex information to be practically applied in field application of diesel hammers.

Since there is no question that a diesel hammer operator can vary the amount of energy delivered by a diesel hammer by varying the fuel input; for field-use simplicity, MKT has recommended that geotechnical engineers include observation of the average diesel hammer stroke (or pressure gauge on "double-acting" diesels) at specified pile refusal as a guide to determining the energy being delivered by the hammer. It is assumed, in making this recommendation, that the geotechnical engineering authority has already specified a size diesel hammer to be used which has been field-compared against the authority's empirical standards (hammer comparisons, test loads, etc.) to establish that size hammer's applicable energy rating. It is further assumed that other normal empirical pile driving practice is being followed: that the specified diesel hammer size has a Ram weight to pile weight ratio of no more than 1 to 4, and that the specified pile load bearing sought falls within the normal bearing range of from eight to fourteen blows of the hammer per inch of pile penetration. In most instances, the result will be a diesel hammer for which the applied energy rating is equivalent to the Ram weight times a 6 to 9 foot stroke.

IV. ENERGY RATINGS AND PILE STATIC LOAD BEARING DETERMINATION

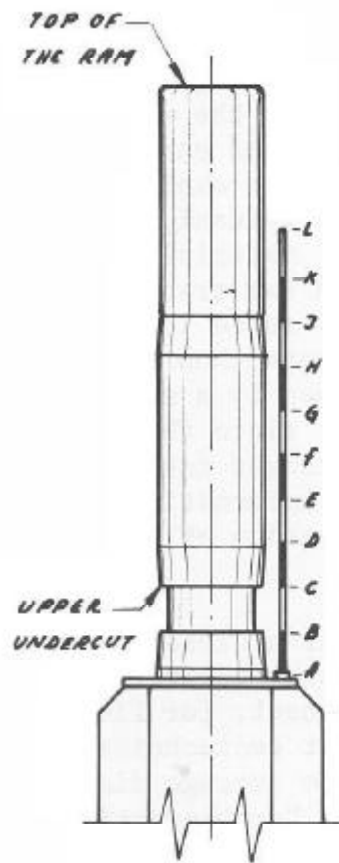


FIG. 4

STROKE INDICATOR ROD
DE-30B, DE-50B, DE-70B

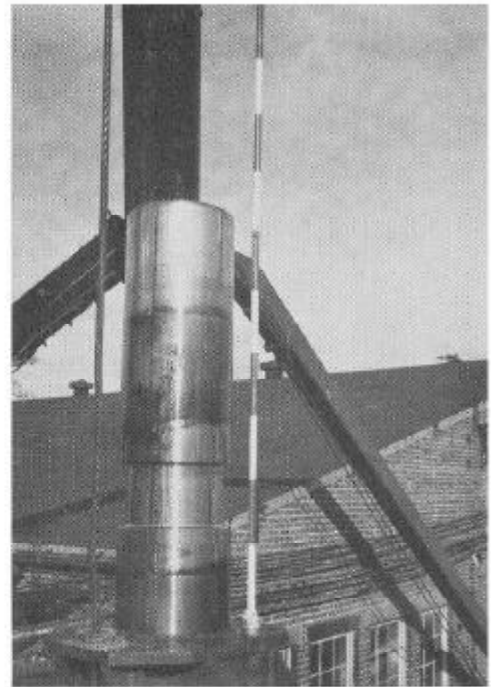


FIG. 5

DE-70B AT 9.5 FT. STROKE

IV. ENERGY RATINGS AND PILE STATIC LOAD BEARING DETERMINATION

RAM STROKE IN FT.

	DE-30/20B		DE-50B		DE-70/50B						
	2,800#		2,000#		5,000#		7,000#		5,000#		
	STEEL RAM	D.I. RAM	STEEL OR D.I. RAM	STEEL RAM	D.I. RAM	STEEL RAM	D.I. RAM	UPPER UNDERCUT STL. RAM	UPPER UNDERCUT D.I. RAM	STEEL RAM	D.I. RAM
A	5	4	6	4.5	4	3	2	8.5	7.5	5.75	5.25
B	5.5	4.5	6.5	5	4.5	3.5	2.5	9	8	6.25	5.75
C	6	5	7	5.5	5	4	3	9.5	8.5	6.75	6.25
D	6.5	5.5	7.5	6	5.5	4.5	3.5	10	9	7.25	6.75
E	7	6	8	6.5	6	5	4	10.5	9.5	7.75	7.25
F	7.5	6.5	8.5	7	6.5	5.5	4.5	11	10	8.25	7.75
G	8	7	9	7.5	7	6	5	11.5	10.5	8.75	8.25
H	8.5	7.5	9.5	8	7.5	6.5	5.5	STOP THE HAMMER		9.25	8.75
J	9	8	10	8.5	8	7	6			9.75	9.25
K	9.5	8.5	10.5	9	8.5	7.5	6.5			10.25	9.75
L	10	9	STOP HAMMER	9.5	9	8	7			10.75	10.25

IV. ENERGY RATINGS AND PILE STATIC LOAD BEARING DETERMINATION

D. PILE STATIC LOAD BEARING DETERMINATION

MKT "DE" SERIES PILE HAMMERS

NOTE: MKT DOES NOT GUARANTEE ITS PRODUCTS AGAINST BREAKAGE DUE TO ABUSIVE USE. GENERALLY, DRIVING AT 10 BLOWS PER INCH PENETRATION IS CONSIDERED PRACTICAL REFUSAL FOR ANY SIZE HAMMER.

"ENGINEERING NEWS" FORMULA

$$R = \frac{2E}{(S + 0.1) 2000}$$

R Pile Bearing (Tons)

E Energy Ft.Lb. (Rated Energy)

S Pile Set Per Blow (In.)

EXAMPLE: USING DE-30B DIESEL PILE HAMMER
WITH 7' STROKE

E = 19,600 Ft.Lbs.; 8 Blows Per Inch (S = 1/8)

$$R = \frac{2 \times 19,600}{(.125 + 0.1) \times 2000} = 87 \text{ Tons}$$

Refer to Appendix, Page 73, for other useful forms of the "Engineering News" Formula.

As an example, if the top of the Ram-Piston of a 30B travels on its upward stroke to the top of the second white section, the piston-ram stroke (H) for the DE-30B will be 7 ft.

Referencing the DE-30B graph, Fig. 9, Page 9, the pile bearing for 7 foot stroke and 8 blows per inch will be about 87 tons.

D. PILE STATIC LOAD BEARING CURVES FOR DE-30/20B, DE-50B and DE-70B

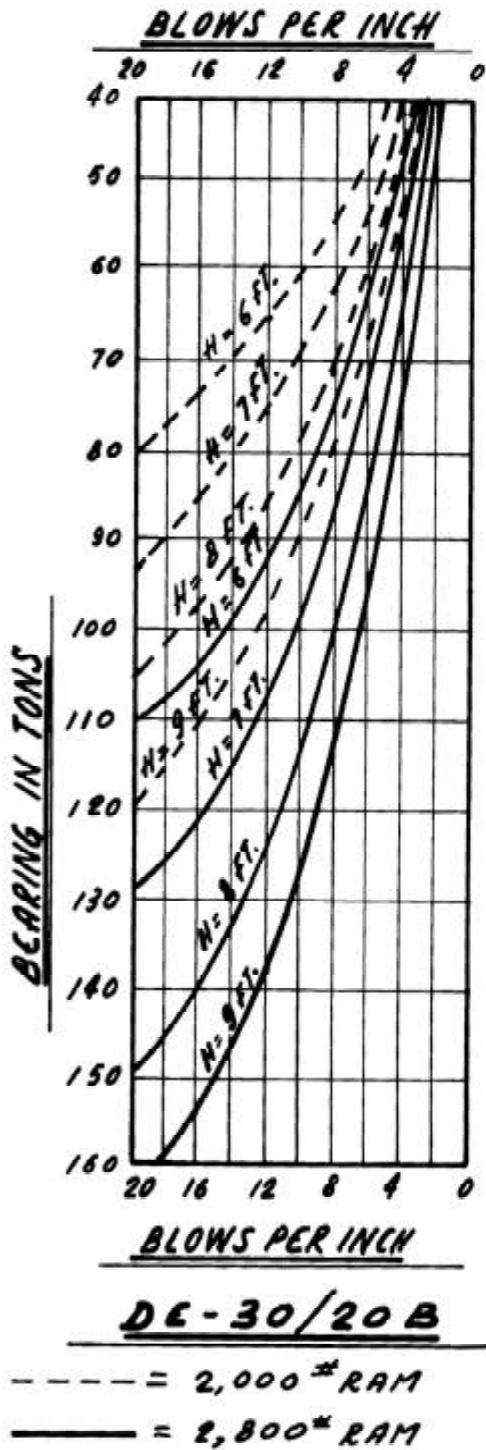


Fig. 9

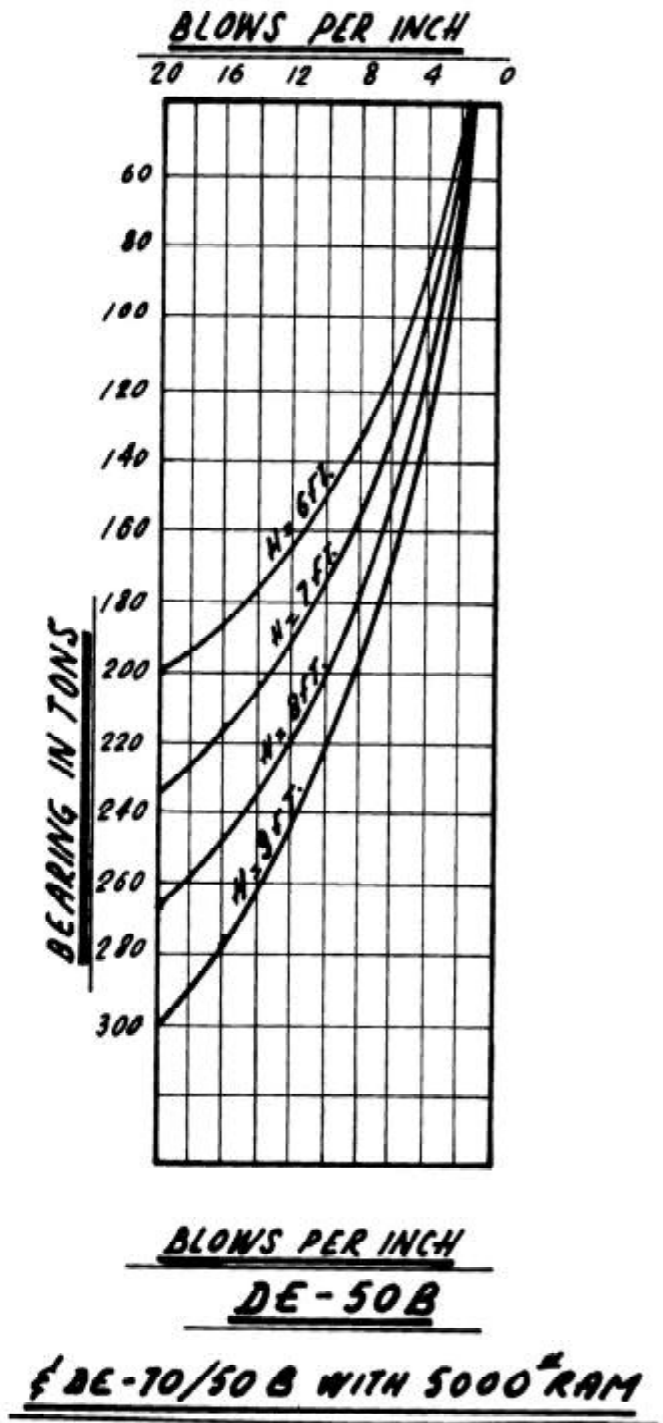
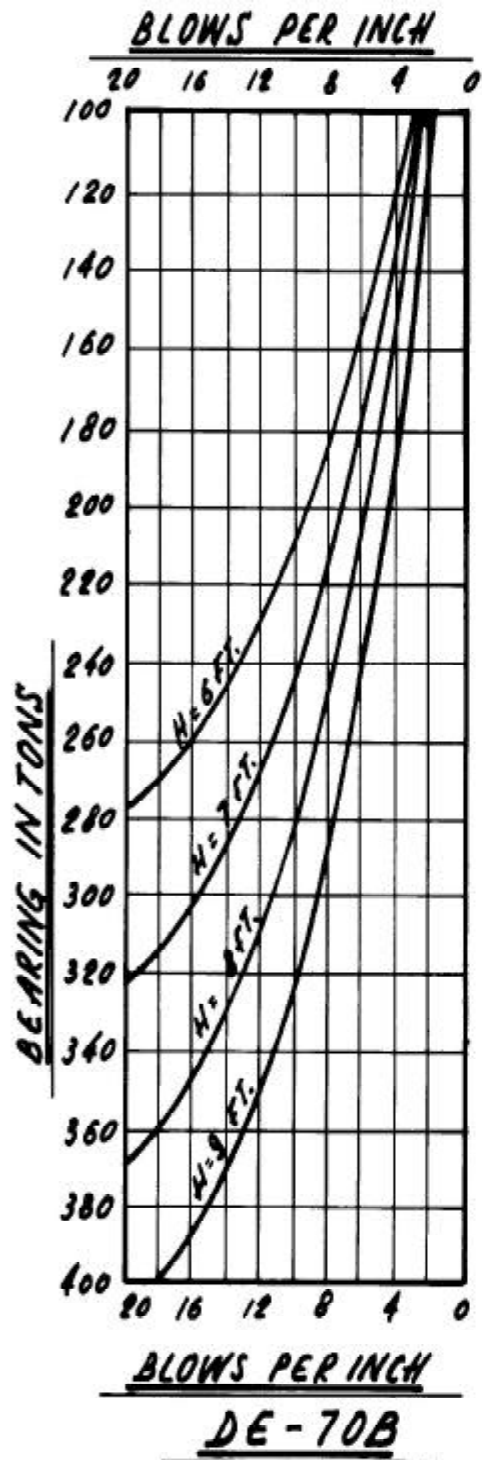


Fig. 10



Load Bearing (L) is determined from the following:

$$(L) = \frac{2 WH.}{S + .1}$$

W is 2,800 Lbs. for DE-30B

W is 5,000 Lbs. for DE-50B

W is 7,000 Lbs. for DE-70B

S = PILE SET PER BLOW

Effective Energy of Hammer = Ram Stroke (H) observed in pile refusal (empirically = 10 blows per inch)

Fig. 11

KEY PART LOCATIONS - MKT SINGLE ACTING DIESEL HAMMERS

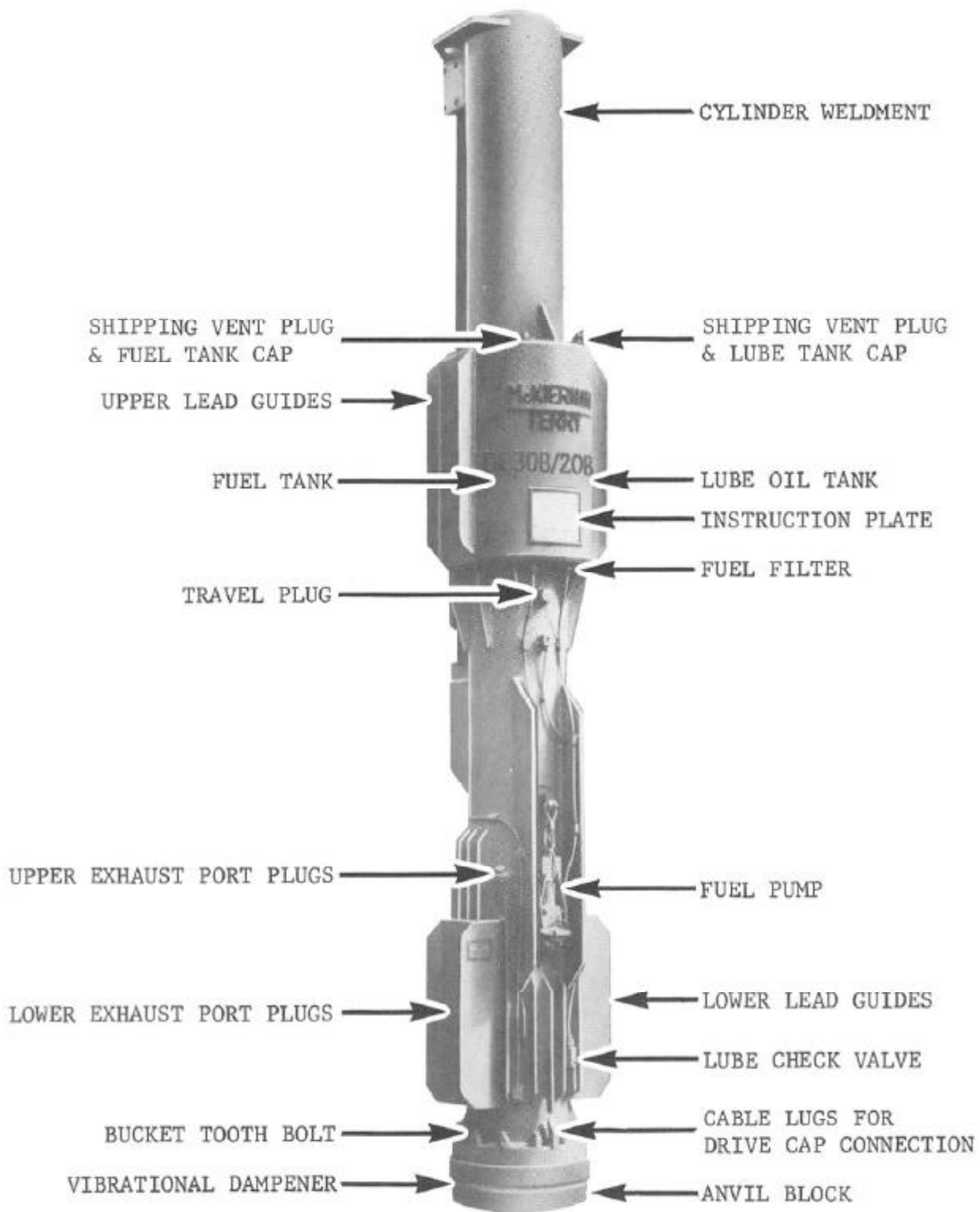


FIG. 12

V. OPERATION AND HANDLING

A. RIGGING INSTRUCTIONS

1. To unload and move the hammer, see Fig. 13 below:

Check the weight specification on Pages 3 or 4 for the hammer model to be lifted.

***LIFTING CHAIN SHOULD BE CHECKED RELATIVE TO ANGLE FOR ACTUAL SAFE LOADING CAPACITY.**

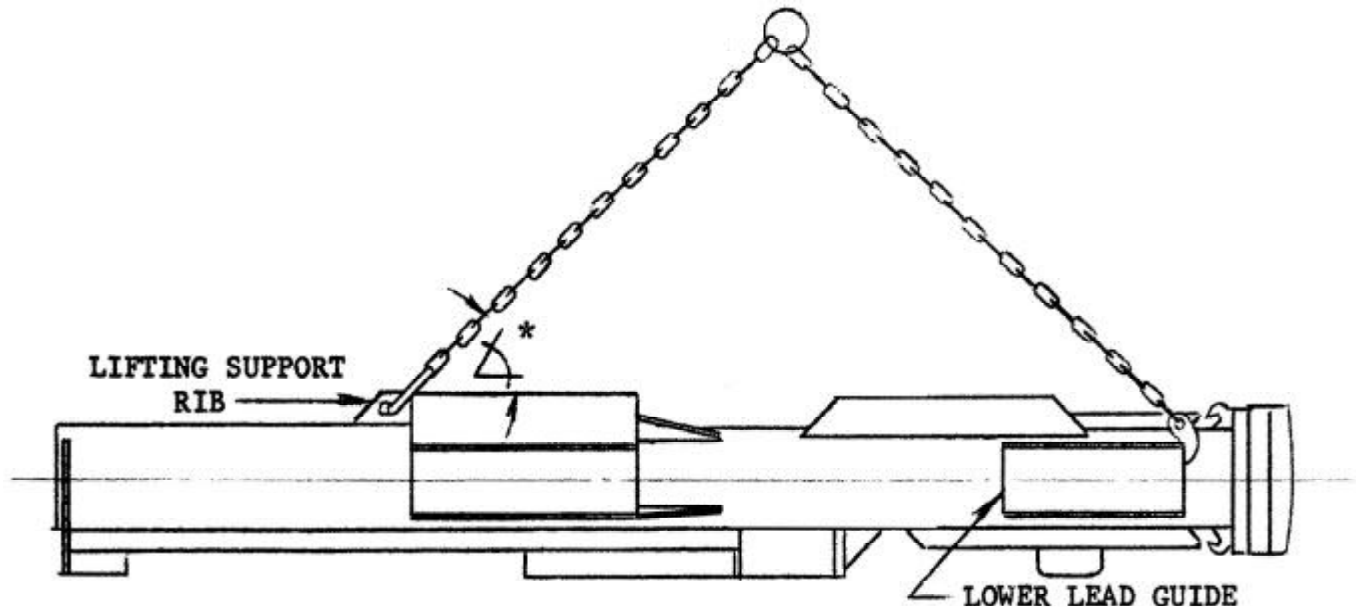


FIG. 13

2. Lay the hammer horizontally fuel pump down (front down).
3. Thread the crane cable line through cable guide bushing at top of hammer, and around trip pin from the outer side. The free end of the cable should be even with the trip body ears. Close the cable loop with three cable clamps placed so the nuts are toward the outer side of the trip. Be certain clamps are same size as cable and are screwed down tight. The yoke of the clamp should be around the free end of the cable. Cut the clamp yoke off flush with the nuts. (Ref. Pages 67 and 68 for Trip Mechanisms).

V. OPERATION AND HANDLING

A. RIGGING INSTRUCTIONS - Continued

4. Free the trip if it is in the engaged position by pressing down the back of the trip lever and pulling up on the trip cable at the same time. The trip should be in the disengage position to lift hammer.
5. The OSHA Standards for wire ropes used for hoisting construction equipment specify using a safety factor of five (5). The lifting procedure for MKT Diesel Hammers must meet the standards.

In the past, it has been the custom when using diesel hammers in leads to avoid using a pendent line to permit running the hammer to the top of the leads and, thus, provide space for the longest possible pile under the hammer. OSHA regulations require that blocks be placed on lead rails to prevent the hammer, or the ram of an open end diesel hammer, from ever being able to strike the sheave head. Thus, the previous objections to a pendent line have been superseded by the regulations prohibiting running the hammer as high in the leads as the absence of a pendent previously allowed.

Hammer Models DE-30B/20B, DE-50B, DE-70B/50B must be fitted with adequate sized and fitted wire rope slings to lift the hammer between which must be fastened a pendent to lift and trip the ram as shown in Fig. 15.

V. OPERATION AND HANDLING

A. RIGGING INSTRUCTIONS - Continued

ALL DE-30B/20B, DE-40, DE-50B and DE-70B/50B Hammers produced after April 10, 1975 are fabricated with lifting holes to receive an adequate shackle at each end of the lifting sling as shown in Fig. 15.

Older DE-30B Hammers produced before April 10, 1975, can be modified by drilling holes in the top flange as shown in Fig. 14 and fitting them with adequate shoulder nut eye bolts to receive the properly clipped cable, shackle or other adequate fittings at each end of the lifting sling.

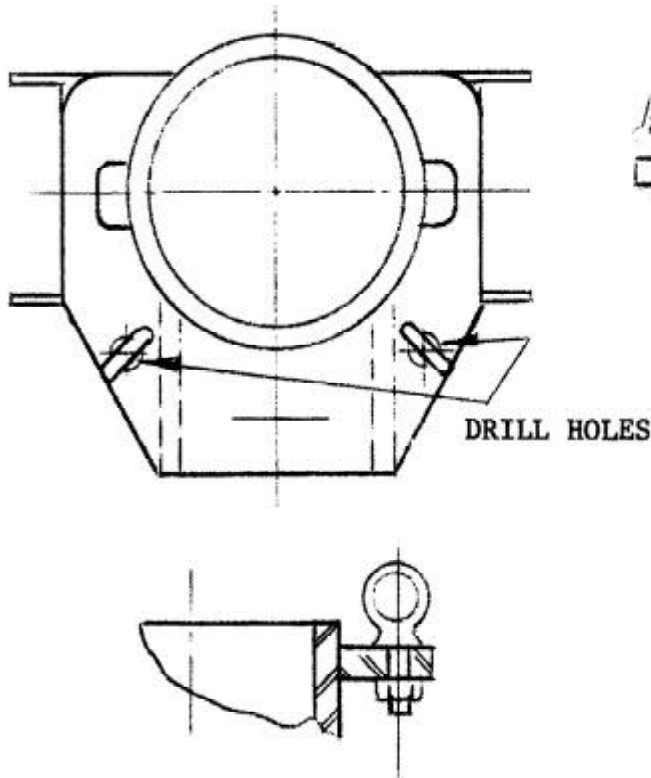


FIG. 14

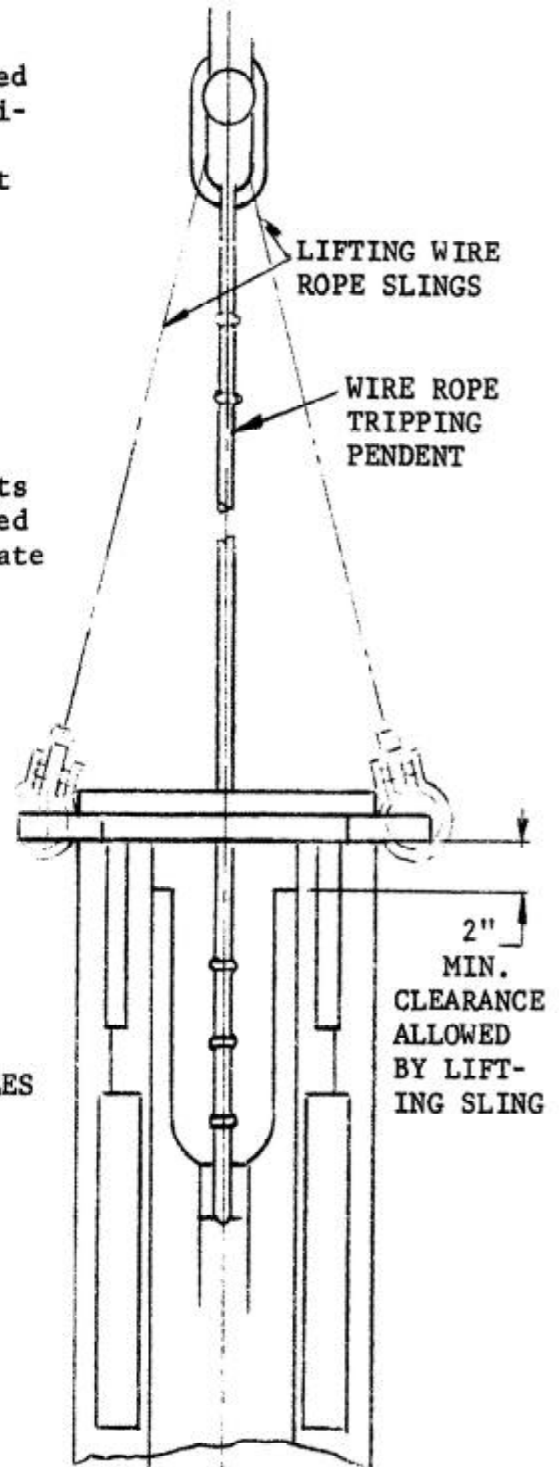


FIG. 15

V. OPERATION AND HANDLING

A. RIGGING INSTRUCTIONS - Continued

The wire rope tripping pendants shown in Fig. 15, Page 12, with corresponding sized rope clips fastened at prescribed intervals must meet the specifications shown in Table 16.

TABLE 16

MODEL	WIRE ROPE PENDENT DIA.	MIN. PENDENT BREAKING STRENGTH IN TONS	TRIP ASSEMBLY MAX. TRAVEL (LESS 2" MIN. CLEARANCE)
DE-30B	5/8	8	60"
DE-40	5/8	12	69"
DE-50B	5/8	14	69"
DE-70B	5/8	19	80"

6. The hammer is now ready for threading into leads. The crane operator should lift the hammer with the pile line hooked to the lower lead guide on the hammer. The hammer should be hung plumb and partially resting on the ground. The crane leads should be boomed up high enough to clear the hammer. Align the hammer brackets with the bottom of the lead guides and slowly boom the leads down over the hammer one or two feet. Take up on the hammer line to complete pulling the hammer into the leads. Disconnect the pile line.

NOTE: In case leads cannot be boomed up high enough to clear hammer, a hole or embankment can be utilized.

7. Place one 2" cushion block in the drive cap and lash it to the hammer front and back with the two 1/2" cables and clamps provided (See Pages 25, Paragraph C, and 32, Paragraph C). Allow 3" to 4" of slack in cable, or with hammer lifted, anvil should not extend beyond drive cap cavity.

V. OPERATION AND HANDLING

B. FUELING AND OILING INSTRUCTIONS

1. Fill the fuel oil tank with #1 diesel fuel or kerosene. (The hammer runs best on kerosene during winter months.) Be certain it is free of water and foreign material.
2. Fill the Lube Oil reservoir. The lube oil specification is important for lubrication qualities and cleaner exhaust to prevent air pollution. The oils recommended must have a high flash point, high viscosity index, low pour point and an ashless dispersant. Recommended lube oils are as follows or equivalent:

Below 32° F.

Texaco Aircraft Engine Oil Premium AD-65
Humble Aviation Oil AD-65 or equivalent

From 32° F. to 75° F.

Texaco Aircraft Engine Oil Premium AD-80
Humble Aviation Oil AD-80 or equivalent

From 75° F. and up

Texaco Aircraft Engine Oil Premium AD-120
Humble Aviation Oil AD-120 or equivalent

3. Remove shipping vent plugs from both fuel and oil tank caps. (See Fig. 12, Page 10).
4. When starting a new hammer or after long periods of storage, pour a small (approximately 1/16 pint) amount of oil down over the piston through the top of the cylinder immediately after it has been started.
5. High Altitude Operation: Due to the high volatility of diesel fuel in high altitudes, it is found best to dampen it by adding lubricating oil. About 1 quart of oil to 5 gallons of fuel should be added.
6. Periodic observations should be made to ascertain the proper flow of oil. After 20 minutes of operation, the ram should be moist with oil and some weeping over the anvil flange should be evident. A closer check can be made by removing an oil line at the terminal. When the hammer is running, the oil should drop off the end of the line. The flow should not exceed one drop every one to two blows. Too much oil will cause the hammer to fire erratically. About 1/2 to 3/4 gallons of oil should be consumed per day.

V. OPERATION AND HANDLING

C. FIRE PRECAUTIONS

A fire hazard is caused from a hot hammer in the presence of diesel fuel and oil; therefore, it is highly recommended that a large carbon dioxide (CO₂) type fire extinguisher be kept in the cab of the pile driving crane.

D. STARTING HAMMER FOR THE FIRST TIME

In order to allow the crane operator to familiarize himself with the trip function, it is best to start the hammer on the ground. Set the drive cap on some wood blocking or timbers so that it won't be driven into the ground and follow this procedure:

1. Remove cylinder weather cover.
2. Remove exhaust port plugs and travel plug.
(See Fig. 12, Page 10).
3. Fill fuel tank with diesel fuel and lube tank with lube oil. The inline shut-off valves are always open when the feed lines from the tanks are connected.
4. Engage the trip by having a worker on the ground pull the trip stop control rope and by lowering the trip to the bottom of the trip housing. See Figs. 44 and 45, Pages 67 and 68.
5. Slowly pick up the Ram-Piston and at the same time have a worker hold out on the fuel pump cam control cable which inactivates the pump and keeps fuel from being injected into the chamber. When the piston has been lifted about 4 feet with the hammer line, the trip lever fingers will contact the upper stops and free the ram (disengage position). The crane operator should stop lifting the trip and apply a light breaking force sufficient to keep the trip from falling back to its lower position. The Ram-Piston on its down stroke will compress the air in the combustion chamber, bounce three or four times and then come to rest in its down position. The hammer should not fire unless there is an excess of

V. OPERATION AND HANDLING

D. STARTING HAMMER FOR THE FIRST TIME - Continued

lube oil or diesel fuel in the combustion chamber. Should it fire, just continue to hold out on the control cable until it stops. The tripping action can be repeated three or four times or until the crane operator is familiar with the action and can feel the load of the ram.

After the crane operator is familiar with the tripping action, slack up on the pump control cable and again lift the Ram-Piston and trip it as in Fig. 1, Page 2. The hammer should start. Whenever the trip safety has been aborted (see Page 31, Par. B), do not lower the trip while hammer is running.

7. After four or five blows, pull the control cable and stop the hammer.
8. Unscrew the fuel pump check valve nut (Item 26, Fig. 41, Page 64) and ascertain that there are no steel shavings or debris on the rubber tip or in the sediment cup. Particles on the rubber tip will prevent the valve from closing, thus causing the check valve to leak fuel down the wall of the cylinder or form a bad spurt pattern. This will in turn cause early or late firing, overheating and loss of stroke. Erratic firing is also a symptom of this ailment.
9. Lift the Ram-Piston about 2 1/2 feet with the trip, to a point where the pump cam is uncovered and is allowed to rotate inward. With the check valve nut out, fuel should flow out the bottom of the pump, assuming that there is no stoppage in the inlet line. To stop the fuel flow, pull the cam out.
10. Hold or block the fuel pump cam out and replace the check valve nut (Caution: Wrench up lightly on this nut). Lift the trip until it trips the ram free and proceed to lift the hammer on a pile. The trip will be in the lift position, Fig. 1, Page 2.

V. OPERATION AND HANDLING

E. STARTING THE HAMMER ON A PILE

1. If the trip is in the lift position, the hammer is ready to be set on a pile. If the trip is engaged with the ram, pull out on the fuel pump control cable and lift the trip until it disengages the ram.
2. Continue lifting the hammer with the trip line until the drive cap clears the top of the pile.
3. Center and align the pile under the hammer.
4. Have a worker pull the trip stop control rope and lower the trip to engage position. Lift the ram and trip it free in the same manner as when the hammer was started on the ground.
5. If the trip safety has been aborted, the crane operator should continue to hold the trip line taut (about a 500 pound pull) by applying a drag on the cable drum. Care should be taken not to apply too much line tension, as it will hold the hammer cylinder up off the pile.
6. Have a worker on the ground in front of the hammer hold the control rope slack ready to stop the hammer whenever it is in operation.

F. HELPFUL HINTS FOR DRIVING WITH A DIESEL HAMMER

1. Dynamic Resistance: The philosophy of driving with a diesel hammer is slightly different than with a conventional steam hammer. To ignite a diesel hammer some resistance to the downward movement of the anvil must be present to cause impact atomization. This resistance can be present in the form of pile resistance, the dynamic weight of the pile, or added dynamic weight between the anvil and the drive cap. Lightweight tube piles and soft spongy ground strata offer low resistance, while on the other hand, concrete pile and hard ground offer high resistance. Therefore, it has been found that in the case of the low resistance, a dynamic weight casting can be added. If the crane lifting capacity is not enough to permit the added weight, the next size smaller hammer should be used.

V. OPERATION AND HANDLING

F. HELPFUL HINTS FOR DRIVING WITH A DIESEL HAMMER - Continued

2. Hammer Alignment: Hammer to pile alignment is important for any hammer, but it is extremely so for diesel hammers. The whipping or side lashing due to misalignment causes a springy condition for the hammer to strike against which makes it lose power as well as deliver a damaging side thrust to the thrust bearing. Driving in short swinging leads tends to accentuate this damage. Driving a diesel hammer unsupported out of the bottom of any type of leads should never be permitted.
3. Cushion: MKT plastic, end grain hard wood or plywood drive cap cushion is generally used. When driving concrete pile use the minimum thickness of wood cushion between the cap and the pile. Generally 1 to 2 layers of 3/4" plywood is sufficient for this purpose. Cured wood should be used in every case. (Refer also to Section VI, Page 25 and Page 32, Par. H).

G. COLD WEATHER STARTING

If it is not extremely cold, the hammer may be started without ether. Set the hammer on dunnage or something reasonably solid. Pull taut on the control rope and trip the ram to warm hammer five to six times.

Slack up on the control rope and trip the ram again. If the hammer does not start, proceed with ether. Lift the ram with the trip until it clears the ports (about 2 feet) and with the spout of a flexible spout pump can pointed into the exhaust port, pump in one or two squirts of ether into the combustion chamber. Finish tripping the ram. Continue to hold the ether can spout in the exhaust port and when the hammer fires, again pump in one more squirt of ether. Repeat the procedure until the hammer runs continuously on diesel fuel. Do not exceed two squirts of ether without an intermittent firing. An overloaded chamber will overstroke the ram.

V. OPERATION AND HANDLING

H. RAM OVERTRAVEL OR OVERSTROKE

The length of free travel (maximum stroke) of the ram from the bottom of the stroke to the safety catch lip at the top is 138 1/4" for the DE-30B, 134 3/4" for the DE-50B and 147 1/2" for the DE-70B. When the ram is recoiled high enough, the ram rings will engage the safety catch lip and prevent it from going out the top. If the upward force of the ram is too great, the whole hammer will be lifted off the pile and the rings may shear. To prevent this danger, watch the projection of the ram above the hammer. When it is averaging about five feet, one should be ready to shut off the hammer and reset the throttle, if necessary (Ref. Section IV, Pages 5 and 6). Sheared rings should be replaced by removing the ram through the bottom of the cylinder, per Section IX, Page 46, or by using a Ram Removal Tool (see Page 23).

I. STOPPING THE HAMMER

To stop the hammer, merely pull out on control rope which inactivates the cam. The hammer can also be stopped by opening the throttle by unscrewing the throttle arm about two to three turns counter-clockwise.

REMOTE CONTROL SYSTEM

A remote control for the DE-30B, DE-50B and DE-70B is a device that is connected to the diesel hammer and provides a means of adjusting the fuel flow for varying the energy output and stopping the hammer with a fuel cut-off. The diesel hammer, equipped with remote control, requires a special fuel pump. The system consists of a special fuel pump with hydraulic piston as an actuator, a long connecting hydraulic hose and a remotely positioned transmitter. (Ref. Fig. 43, Page 66).

The purpose of the transmitter is to control the amount of fuel by-passed in the fuel pump. This is accomplished by developing a hydraulic pressure in the oil filled line and moving the remote control plunger on the Fuel Pump, Fig. 43, Page 66. By partially closing the by-pass hole, more fuel is injected into the hammers' combustion chamber. If the transmitter handle

V. OPERATION AND HANDLING

J. REMOTE CONTROL SYSTEM - Continued

is relaxed, the pressure returns to 40 psi, the by-pass holes are open and all the fuel is returned to the tank. Therefore, the hammer will stop. If the handle is set between 120 and 130 PSI, the plunger is moved its full stroke which completely closes the by-pass holes, causing the full amount of fuel to be injected into the combustion chamber and causes the hammer to give its maximum output.

To start the hammer, set the transmitter at 70 PSI and follow the normal starting procedure, Section V, Page 13. After the hammer has started, reset the transmitter handle to obtain desired ram stroke. To stop hammer, return handle so pressure reads 40 PSI.

ASSEMBLY PROCEDURE

1. Attach the hose to the transmitter assembly leaving the loose end of the hose open (not attached to the pump).
2. Fill the transmitter reservoir with diesel fuel and start to pump the diesel fuel into the hose by moving the lever to the extreme back position. Hold for a few seconds, then move it forward. Repeat this procedure until the fuel begins to flow out of the open end of the hose.
3. Attach the hose to the fuel pump and bleed the air from the receiver by opening the bleed valve Item 12, Fig. 13, Page 66 and moving the transmitter lever from the extreme back position slowly forward. At the end of the stroke lock the bleed valve, then move the transmitter lever back and repeat the procedure above until the fuel from the bleed valve is free of air. Lock the bleed valve on the receiver.

V. OPERATION AND HANDLING

K. OPERATING THE DE-30B/20B WITH A 2,000-LB. RAM AND THE DE-70B/50B WITH A 5,000-LB. RAM.

To determine which ram is assembled into a DE-30B/20B or DE-70B/50B Convertible Diesel Pile Hammer Cylinder, be sure that the anvil block flange is seated against the vibration dampener and that the ram is down against the anvil block. Then, measure at the back of the hammer, from the top of the trip slot to the top of the ram.

The top of the standard DE-30B Ram (Pt. No.0310100) should be about 25" from the top of the trip slot.

The top of the DE-20 Ram (Pt. No. 0310102) should be about 42" from the top of the trip slot.

The top of the ductile iron DE-30B Ram (Pt. No. 0310104) should be about 18" from the top of the trip slot.

The top of the standard DE-70 Ram (Part No. 50700100) should be above the top of the trip slot.

The top of the DE-50 Ram (Part No. 50500100) should be about 25 1/2" below the top of the trip slot.

When operating in the DE-30B Mode, the two (2) lower horizontal Exhaust Ports are to be plugged with two (2) 1 1/2" NPT steel pipe plugs (Part No. 0930425).

When operating in the DE-70 Mode, the two (2) lower horizontal exhaust ports are to be plugged with two (2) 2" steel pipe plugs: (Part No. 09300404).

When operating the DE-20/30B Pile Hammer in the DE-20 Mode, (with 2,000-lb. ram), make sure all six (6) Exhaust Ports are open to the atmosphere.

When operating the DE-50/70B pile Hammer in the DE-50 Mode, (with 5,000 lb. ram), make sure all six (6) exhaust ports are open to the atmosphere.

NOTICE: DO NOT OPERATE A DE-30B/20B HAMMER IN THE DE-20B MODE OR A DE-70B/50B IN THE DE-50B MODE UNLESS THE TWO DE-30B/20B 1 1/2-INCH NPT STEEL PIPE PLUGS (PART NO. 0930425) OR THE TWO DE-70B/50B, 2-INCH STEEL PIPE PLUGS (PART NO. 09300404) HAVE BEEN REMOVED FROM THE TWO LOWER EXHAUST PORTS!

V. OPERATION AND HANDLING

L. CHANGING RAM SIZES IN CONVERTIBLE DE-30B/20B AND DE-70B/50B HAMMERS

The ram in either a DE-30B/20B or DE-70B/50B can be removed from either the top or bottom end of the cylinder. To remove a ram from the bottom of a cylinder, see Section IX Service Instructions, Paragraph C, and Removal of Ram and Anvil for Replacement of Rings, Page 46. To remove a ram from the top of a cylinder, follow the procedure below:

1. Insert a 1" eye bolt (Part #9320001) or a 1-1/2" eye bolt (Part #9320003) in the threaded hole in the top surface of the DE-30B/20B or DE-70B/50B Ram.
2. Insert a Ram Removal Tool (DE-30B/20B Part #0960143 or DE-70B/50B Part #0960146) into the safety catch lip machined into the cylinder bore about 2" to 3" from the top of the bore opening. The Ram Removal Tool is a machined tapered split ring, inserted into the top of the hammer I.D. and pushed into the cylinder until it snaps into the machined catch groove (See Figure 17). The tool should be inserted with the chamfered end down. When in the catch groove, the Ram Removal Tool affords a tapered surface which allows the rings to ride along, compress into their ram grooves and by-pass the catch

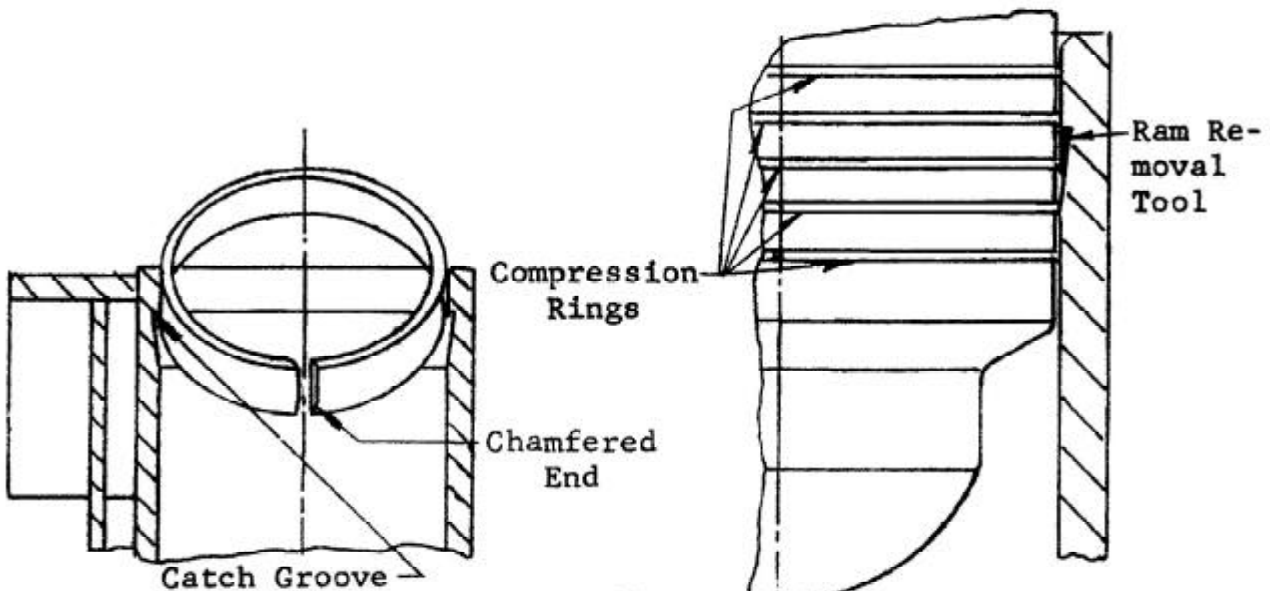


FIG. 17

V. OPERATION AND HANDLING

L. CHANGING RAM SIZES IN CONVERTIBLE DE-30B/20B AND DE-70B/50B HAMMERS - Continued

diameter machined into the cylinder I.D. The force of the ram moving against the captive tool retains the tool securely in the groove. The ram must be kept moving upwards and removed entirely from the cylinder.

3. Using proper rigging to lift a 2,800 or 7,000-lb. load, hoist the ram up through and out of the cylinder.
4. Lower the removed ram and lay it down on clean wood blocks.
5. CAUTION: Remove the Ram Removal Tool from the cylinder before a replacement ram is reinstalled, or it will be pushed down into the cylinder and cause damage to the hammer!
6. Transfer the eye bolt to the replacement ram, raise it and lower it into the cylinder, carefully working each compression ring into the cylinder bore.
7. Remove the eye bolt from the replacement ram.
8. Plug or unplug the appropriate exhaust ports as explained in the preceding Paragraph "K". Operating the DE-30B/20B with a 2,000-lb. Ram and the DE-70B/50B with a 5,000-lb. ram".

M. TRANSPORTING AND STORAGE

1. When transporting the hammer a short distance, say 5 to 10 miles by truck, simply lay the hammer on the bed with the anvil nearest the cab. Be certain the transport plug and exhaust plugs are in the hammer. To keep from warping the cylinder, place blocking under the hammer directly opposite the load binder. Do not bind the hammer tighter than absolutely necessary.
2. For normal yard storage, the hammer should be laid horizontally, on its side (lead guides) spaced off the ground by dunnage blocks. Oil should be spurted in the cylinder before it is laid down. The hammer should be covered (with at least a tarpaulin).

VI. MAINTENANCE

A. GENERAL

From visual observation and by the sound of its blow, one can check the general running conditions of the hammer. A film of oil should show on the ram and small amounts of oil should weep from under the vibration dampener and down over the anvil flange. To prevent the hammer from catching on fire, it is important to correct any fuel or oil leakage. Drive Cap lashing cables should be checked for breakage or excessive wear.

B. DAILY

1. Cylinder Weather Cover and exhaust plugs should be removed at the beginning and replaced after each operation or finish of day's work.
2. Check oil and fuel levels daily.
3. Check all bolts for tightness, especially if difficult driving is encountered.
4. Before each day of operation, apply 1/2 pint of oil to the top of the cylinder, using a squirrel type oil can. The oil should cover the entire circumference of the cylinder wall.
5. Clean out fuel pump check valve by unscrewing nut, Item 26, Fig. 41, Page 64, and wiping off the rubber tip. If the check valve is constantly clean, this operation may be reduced to once per week.

C. CUSHION

Cushion material, Ref. Pages 14 and 32, used in the 4" deep pocket of the drive cap, is about 2" thick. The anvil ring base on the DE-30B is 3 1/2" thick or on initial driving with a full 2" thick cushion, the top of the anvil ring will protrude above the pile cap about 1 1/2". When about 1/2" minimum of anvil ring base is exposed, additional wood cushion material is recommended. The anvil ring base on the DE-50B and DE-70/50B is 4" thick or on initial driving with a full 2" thick cushion, the top of the anvil ring will protrude above the pile

VI. MAINTENANCE

C. CUSHION - Continued

cap about 2". When about 1" minimum of anvil ring base is exposed, additional wood cushion material is recommended. Plastic cushion blocks need not be replaced when they initially show signs of cracking (See Pages 32 and 33).

D. VIBRATION DAMPENER

The vibration dampener is installed in the bottom of the thrust bearing in the DE-30B/20B and the bottom of the thrust bearing retainer in the DE-50B and DE-70B/50B. The bottom part of the vibration dampener is located on the top surface of the anvil ring, and separates the cylinder-thrust bearing assembly from the anvil by 11/16". When this clearance is worn to 3/8", the lower cylinder edge will be damaged if the vibration dampener is not replaced. Also, without the benefit of the dampener, or if only 1/3 of the original area of the bottom of the dampener is touching the anvil flange, a metal to metal shock between the cylinder and anvil could cause structural damage.

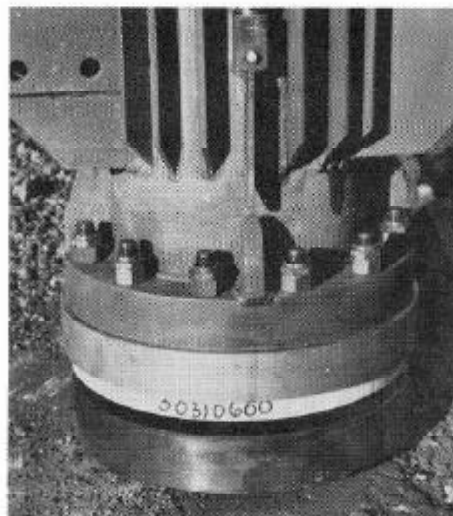


FIG. 18

VI. MAINTENANCE

D. VIBRATION DAMPENERS - Continued

A new vibration dampener is sent from the factory as a (1) piece solid plastic ring for DE-30/20B Pile Hammer or (1) piece plastic ring with (6) equally spaced holes for the DE-50B and DE-70/50B Pile Hammers.

The first preparation of the dampener for installation is to part it into (2) equal pieces. Use the grooves provided in the DE-30/20B or between any (2) of the (6) holes in the DE-50B, DE-70/50B size.

With a crane, lift the hammer cylinder up from the anvil block, resting on the ground, until there is approximately 5" or 6" between the bottom flange of the cylinder and the top face of the anvil block.

To remove the old dampener from the recess in the retaining ring, loosen and back off the nuts from a few of the bottom flange bolts until the top nut extends above the end of the bolt. Then, place a piece of wood over the nut and striking the top of the wood, drive the bolt head down against the damaged dampener and out of the recess. Selecting a few random bolts can usually remove all of the old dampener remnants.

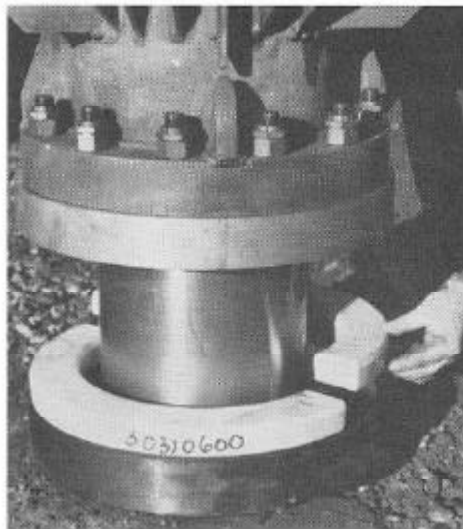


FIG. 19



FIG. 20

VI. MAINTENANCE

D. VIBRATION DAMPENER - Continued

Retighten bolt nuts making sure each bolt head is recessed into the countersink and slot provided.

CAUTION! BLOCK HAMMER CYLINDER OVER THE ANVIL BEFORE PLACING HANDS BETWEEN THE PARTS! Check dampener recess for loose particles and wipe clean.

Place the (2) half rings of the vibrating dampener on the top face of the anvil (remove safety blocking) and lower the cylinder to just above the dampener. Align the recess in the retaining ring with the I.D. and O.D. of the new split dampener. CAUTION! USE A TOOL, NOT HANDS, FOR ALIGNING! Then, free drop the cylinder onto the dampener starting them into the recess. Continue raising and dropping the hammer until the vibration dampener is driven home up into the recess.

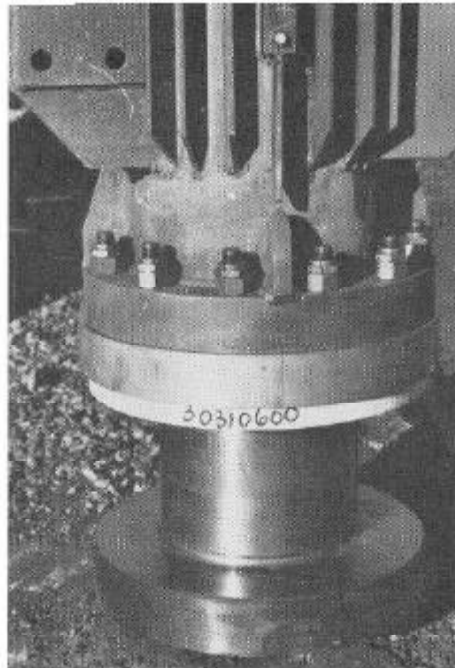


FIG. 21

VII. THE FUNCTION OF SOME MAJOR COMPONENTS

A. FUEL SYSTEM (Refer to Fig. 34 and 35, Pages 58 and 59)

No. 1 Diesel Fuel or kerosene gravity feeds from the main fuel tank, through the filter cartridge and inline shut-off valve and down the inlet line to the pump. Air bubbles are released through the vent line. The teflon inlet and vent lines are connected to the adapter fittings with special tube connectors. The adapter fittings are fastened to the pump by a cone seated adapter nut.

The pump cam rides on the surface of the Ram-Piston, forces the push rod and piston downward, which closes ports in the cylinder and pushes the entrapped fuel past the rubber check valve tip, through the discharge nozzle and into the cup of the anvil in the form of a condensed spurt. The needle valve set on the throttle shaft, when opened (turned counter-clockwise), allows the fuel to escape or by-pass from under the piston and flow back to the small fuel reservoir around pump cylinder. For all normal driving, the throttle should be closed all the way (turned clockwise) so that no fuel is by-passed. A packing gland nut and gland seals the throttle shaft from leaking. The packing nut and top nut are held by locking down on the sleeve which seals the end of the pump cylinder, with the aid of copper gaskets and an "O" Ring. When the Ram-Piston clears the cam on the upstroke, a spring lifts the push rod and wear cap and returns the cam to the "in" position, thus permitting the pump cylinder cavity to recharge with fuel. The cam axle is held captive by shoulders on the main cylinder. Six studs and nylon lock nuts hold the pump on the machined mounting flat. A spring loaded rubber check valve tip controls the discharge from the pump nozzle.

Any foreign material in the fuel, such as water, dirt or steel chips will accumulate on top of the check valve tip or at the bottom of the counterbore in the check valve nut. To stop the hammer, pull the control cable which inactivates the fuel pump.

VII. THE FUNCTION OF SOME MAJOR COMPONENTS

B. TRIP MECHANISM

(Refer to Pages 67 and 68 - For DE-30B/20B,
DE-50B and DE-70B/50B)

The trip mechanism has a dual function: It is used to start the hammer and forms an anchor for the hammer line when lifting the hammer. The finger of the trip lever, when it contacts the upper and lower stops, operates the toggle linkage consisting of the trip lever, safety link and lifting hook. In Figs. 44 and 45, Pages 67 and 68, the trip is shown locked in the engaged position by the lower stop as it rests on the rubber cushion. When the crane lifts the trip and Ram-Piston past the upper stops, the finger of the trip lever is rotated clockwise around the trip lever pin, thus freeing the Ram-Piston (see disengage position). The trip is held in the up position (lifting position) while the hammer is in operation.

Due to proven safety and economical features, all current MKT Diesel Pile Hammers have a safety trip mechanism incorporated as standard hardware.

To actuate the trip stop, the trip mechanism must be raised a minimum of 2 feet high. The trip stop control rope must be pulled holding it taut, as the trip mechanism is lowered to rest.

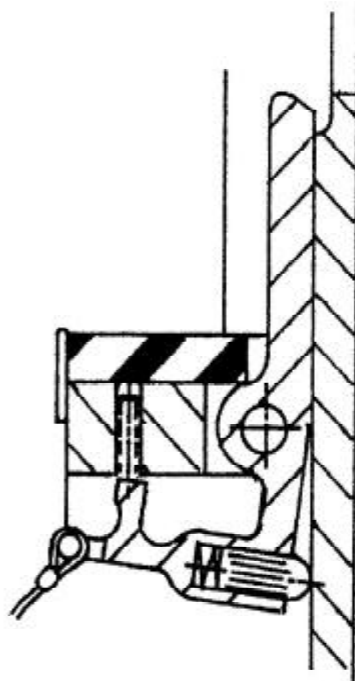
To lift the hammer when the trip is in the engaged position, the ram must first be freed from the trip. This is done by lifting the trip through the disengage position to the lifting position and at the same time pulling on the fuel pump control rope to inactivate it so the hammer won't start.

An escape slot and spring in the lifting hook of the trip allows the hook to free itself when the trip is in the engage position and the ram is moving upward. Thus, breakage of the safety link in the trip will only occur when the ram falls on the hook. If the safety link is broken, the trip will have to be removed and the link replaced before the hammer can be started. All linkage axles are held captive by the trip mechanism guide. These axles are freed upon removal of the Trip Mechanism from these guides.

VII. THE FUNCTION OF SOME MAJOR COMPONENTS

B. TRIP MECHANISM - Continued

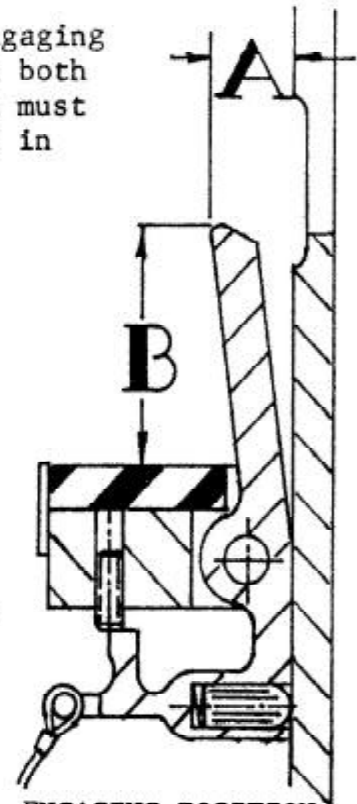
For proper operation, the engaging position of the trip stop in both the safety or fixed position must conform to dimensions listed in the chart below.



NORMAL POSITION

PILE HAMMER	A	B
DE-30/20B	2"	5 5/16"
DE-70/50B	2 1/2"	10"
DE-50B	1 3/4"	10 13/16"
DA-35C	1 1/4"	5 1/4"

FIG. 22



ENGAGING POSITION

If it is desired to abort the trip safety condition and have a permanent engagement, remove the trip cushion and screw in the set screw shown in Fig. 22. The advanced set screw will compress the spring, pivoting the trip stop to the engaging position and hold it there. The control rope can then be removed.

C. LUBRICATION SYSTEM

To automatically lubricate the DE-30B/20B, DE-50B and DE-70B/50B hammers, oil drains by gravity from the lube oil tank, through the wiremesh filter and inline shut-off valve, down the inlet line to the reservoir in the pump base plate. From the reservoir oil feeds up through passages in the pump to small plungers. A weighted piston rests on these plungers. A jar of the hammer while in operation forces the piston and plungers down and thus drives a small amount of oil past the ball

VII. THE FUNCTION OF SOME MAJOR COMPONENTS

C. LUBRICATION SYSTEM - Continued

check valves and into the feed lines. Two of the feed lines of the DE-30B/20B and three of the DE-50B and DE-70B/50B have terminal checks which hold back the high pressure of the combustion chamber. A small 1/8" pipe plug is provided at each terminal to observe the flow of oil. The pump body is mounted by three bolts which screw into the base--a gasket provides a seal between the surfaces.

In the center of the pump top cover plate is an adjusting screw, which controls the movement of the piston and in turn the discharge volume. This screw is factory set. Closely follow maintenance instructions if a change in setting is necessary.

D. DRIVE CAPS AND ACCESSORIES

All caps are provided with an anvil pocket deep enough to receive a 2" to 2-1/2" thick cushion. Cushion materials recommended are as follows: 1. Plastic; 2. Grain oak or plywood. Loosely lash the cap to bottom of the hammer with two 1/2" x 6' wire ropes that are provided with the hammer.

E. MKT PLASTIC CUSHION BLOCKS

MKT plastic cushion blocks are made of nylon and come in two sizes to fit the two different sizes of standard MKT drive caps: 20" wide and 26" wide.

These cushion blocks have two operating specifications:

Coefficient of restitution - - - - .76
Modulus of elasticity - - - - - 350,000 psi

The first gives its ability to bounce back into the same shape after a hard blow. The second is a measure of its hardness.

VII. THE FUNCTION OF SOME MAJOR COMPONENTS

E. MKT PLASTIC CUSHION BLOCKS - Continued

Because of these two units of measurement, under a hard impact blow, the block develops surface cracks. This condition is not a cause for concern. Once this happens, the block will mold itself into the well of the drive cap and does not need to be replaced until it has been pounded so low that the bottom of the vibration dampener is beneath the top lip of the well of the drive cap. This should be subsequent to over 200 hours driving time.

If, however, the block fragments, or breaks up completely, it is advisable to put a piece of plywood on top of the cushion block to keep the pieces in place. The block will, through heat generated during operation, fuse together in a mold at the bottom of the drive cap well. The plywood is used to keep the pieces in place until fusion takes place.

F. SPUD MOUNTING ADAPTERS

All MKT Diesel Pile Hammers are manufactured with (4) sets of (4) total (16) 1"-8 tapped holes. Two sets (or) (8) holes near each end of the hammer are used to attach (2) guide clips as shown in Fig. 32 with mounting instructions.

Spud Clip Part Numbers are as follows:

<u>PART NO.</u>	<u>DESCRIPTION</u>
099 0538	12" Spud Clips and Hardware
096 0118	14" Spud Clips and Hardware

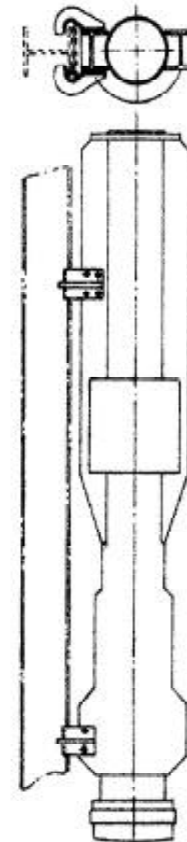


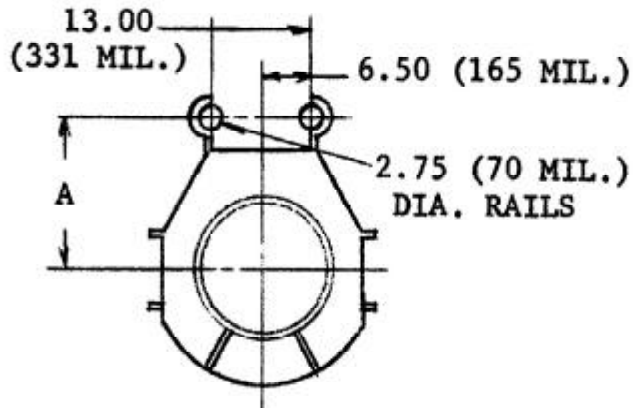
FIG. 23

VII. THE FUNCTION OF SOME MAJOR COMPONENTS

G. EUROPEAN LEAD ADAPTERS

MKT offers claw type adapters which allow the use of European Leads having 2 3/4" diameter pipe guide rails spaced 13" center to center.

Part numbers and mounting illustrations of the pile hammers to be adapted are shown in Fig. 24 below.



Pile Hammer	A	Part Number
DE-30B/20B	16.38 (416 MIL)	0990640
DE-50B	19.38 (492 MIL)	0990642
DE-70/50B	19.38 (492 MIL)	0990642

FIG. 24

VIII. TROUBLE SHOOTING CHART

TROUBLE	DIAGNOSIS
A. <u>Failure to start</u>	<ol style="list-style-type: none">1. Lack of fuel.2. Water in fuel.3. Lines clogged.4. Dirty fuel pump check valve.5. Water condensation frozen over filter or in lines.6. Loss of compression caused from worn rings.7. Overloaded combustion chamber caused from excess fuel, oil or rain water.8. Low driving resistance:<ol style="list-style-type: none">a. Due to soft groundb. Due to lightweight pilec. Spongy ground9. Extreme cold weather.
B. <u>Pre-ignition or misfiring while running</u>	<ol style="list-style-type: none">1. Dirty fuel pump check valve.2. Low on fuel.3. Serrated check valve rubber tip.4. Water in fuel.5. Excess fuel.6. Excess oil.7. Penetration into spongy soil.8. Fuel pump sticking.
C. <u>Loss of stroke</u>	<ol style="list-style-type: none">1. Throttle partially open.2. Worn out rings.3. Leaking pump gaskets or worn out pump plunger.4. Lack of lubrication.5. Spongy soil condition.6. Hammer not aligned with pile.7. Worn out vibration dampener.8. Blow by terminal oil check valves.9. Check complete fuel system.10. Worn cam wear cap, improper lube oil.11. Check top nut tightness on fuel pump.
D. <u>Too much oil</u>	<ol style="list-style-type: none">1. Lubrication pump not mounted tight.2. Pump check valves dirty.3. 3/8 flat washers under pump body, missing. (DE-30B with cam operated lube pump).4. Faulty mounting gasket.5. Adjusting screw open too far.

VIII. TROUBLE SHOOTING CHART

TROUBLE	DIAGNOSIS
E. <u>Trip failure to lift ram</u>	<ol style="list-style-type: none">1. Safety link broken in trip linkage.2. Spring cap in trip frozen down, thus not locking the linkage.3. Worn out trip hook.
F. <u>Loaded combustion chamber. (Dead sound when ram strikes. Hammer will not run.)</u>	<ol style="list-style-type: none">1. Leaky fuel pump check valve.2. Leaky check valves in lubrication pump.3. Weather cover left off hammer during rainstorm.
G. <u>Broken Rings</u>	<ol style="list-style-type: none">1. Not enough tip gap.2. Ram over-stroking.
H. <u>Lack of compression or Lack of stroke.</u>	<ol style="list-style-type: none">1. Worn Rings.
I. <u>Excessively hot running hammer causing loss of stroke</u>	<ol style="list-style-type: none">1. Check lubrication system for proper oil supply at each of the six points of lubrication.2. Stop hammer and check lube inlet holes from terminal block to cylinder by removing 1/8" pipe plug and inserting 1/8" wire. Carbon deposits can clog cylinder lube ports at lube terminal check valve locations. CAUTION! DO NOT REMOVE PIPE PLUGS WHILE HAMMER IS RUNNING.3. Check that the recommended oil and proper viscosity is being used in accordance with ambient operating temperatures. See Page 15.

IX. SERVICE INSTRUCTIONS

A. FUEL SYSTEM DIAGNOSIS AND REPAIR

1. Recognition of Trouble

Operation of the fuel pump is described in Paragraph A, Page 29. Evidence of fuel pump trouble can be recognized from the way the hammer sounds when it is running. Some of these symptoms are:

- a. Early firing with a soft impact blow: Generally this trouble is due to a bad spurt pattern caused from a faulty pump orifice or one that is partially clogged. A dirty check valve tip will cause this condition as well.
- b. Erratic firing or misfiring: Malfunction of the rubber tipped check valve due to dirt or steel chips lodged on it is the most common source of trouble. Water in the fuel or a partially clogged inlet line will also cause this trouble. (This trouble is not to be confused with misfiring caused by starting on a soft pile). To check the fuel flow and for foreign particles, follow instructions given in Paragraph B, Section V, Page 15. Serrations in the rubber tip will also cause trouble.
- c. Pump leaking fuel around the top nut: This trouble can be traced to three things:
 - (1) Top nut loose and not causing the "O" ring between the sleeve and cylinder to seal.
 - (2) "O" ring defective.
 - (3) The pump cylinder and piston is worn out, allowing sufficient clearance to permit fuel to leak past the piston. Lack of ram stroke is also a symptom of this trouble.

IX. SERVICE INSTRUCTIONS

A. FUEL SYSTEM DIAGNOSIS AND REPAIR - Continued

- d. Pump leaking around the throttle shaft: To prevent leakage, tighten down on the teflon packing gland. Unscrew the throttle shaft two or three turns before tightening gland nut. Tighten down on the packing just enough to stop the leak. Replace the lock plate and wire the cap screws.
- e. Short stroke--regular firing: Assuming the throttle is firmly closed clockwise, the only other by-pass for the fuel would be past the bottom gasket under the pump cylinder. Generally, this can be corrected by tightening the top nut. If the gasket is defective, the pump must be disassembled to replace it.
- f. Pump sticking: This trouble will cause intermittent firing. If the push rod stays down when the ram clears the pump cam, it is evident that the pump is sticking in the closed position. First, be sure the pump has diesel oil. Second, disassemble the pump and look at each moving part for interference. Dirt in the pump may cause this binding.
- g. Broken parts: This will cause erratic firing. Disassemble pump and look for broken parts.

2. Disassembly of Fuel Pump

- a. Remove the pump from the hammer.
- b. Slip out the cam axle and remove the cam and wear cap.
- c. Place pump in vise. Remove locking plate and unscrew top nut. (Caution: Nut is spring loaded, so hold down).
- d. Lift out the push rod spring and piston.

IX. SERVICE INSTRUCTIONS

A. FUEL SYSTEM DIAGNOSIS AND REPAIR - Continued

- e. Replace the cam axle and jar the body upside down on a block of wood. The sleeve, cylinder, "O" ring and gaskets should fall out.
- f. Remove the check valve nut and throttle shaft.

3. Reassemble Pump

To reassemble the pump, set body upright in a vise. Be certain the bottom gasket is in place and then drop in the cylinder. Insert the top gasket into bottom counterbore of sleeve. If the gasket fits loosely, apply a dab of grease or permatex to the underside to hold it in place while the sleeve is pushed in with "O" ring ahead of it. Place spring on the piston - push rod. Slip the top nut on the push rod and insert the assembly in the sleeve and cylinder. Partially compress the spring by pressing down on the push rod and at the same time search out the piston hole in the cylinder by making small jabbing strokes. When the piston is in place continue to hold down on the nut and screw it in place. Tighten it firmly with a socket wrench and assemble the lock plate. Replace the throttle and check valve. Be certain all cap screws are wired. Reference torque data, Page 56.

4. Mounting Pump

Assemble the cam and cam axle onto the body and then slide the entire assembly over the mounting studs. Tighten the stud nuts equally, being careful not to overstress the studs. Overstressing will cause stud failure. Reference torque data, Page 56.

Apply machine oil around the push rod periodically until oil weeps down from the cam.

CAUTION: Check valve nut, Item 26, Page 64, should be wrenched slightly tight. Over wrenching will distort the cone seat and lock the check valve.

IX. SERVICE INSTRUCTIONS

A. FUEL SYSTEM DIAGNOSIS AND REPAIR - Continued

5. Correction of Damaged Fuel Pump Mounting Hole

If the mounting hole for the Fuel Pump becomes enlarged, allowing the pump nozzle to protrude into the cylinder bore, damage will occur when the ram passes the nozzle (Fig. 25). To correct this condition, it will be necessary to add a gasket as shown, and assemble as shown on Fig. 26. This gasket should be $1/8$ " thick. (It may also be 2 of $1/16$ " thicknesses of material). The recommended material is copper or annealed aluminum.

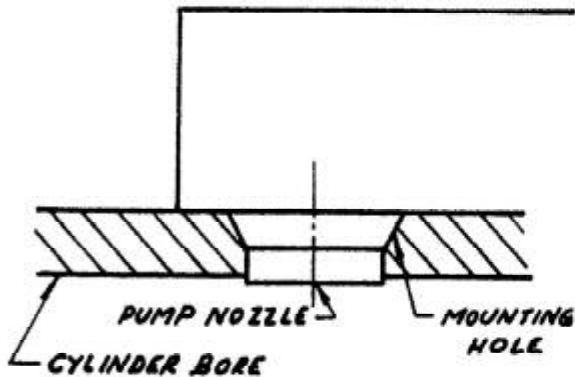


FIG. 25

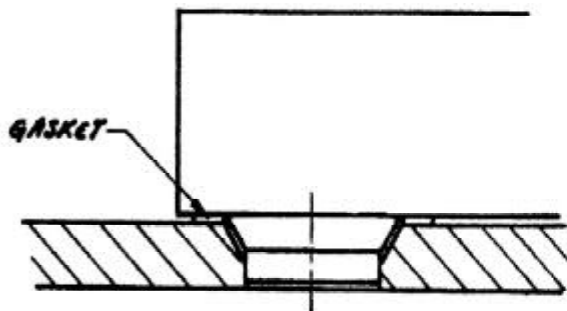
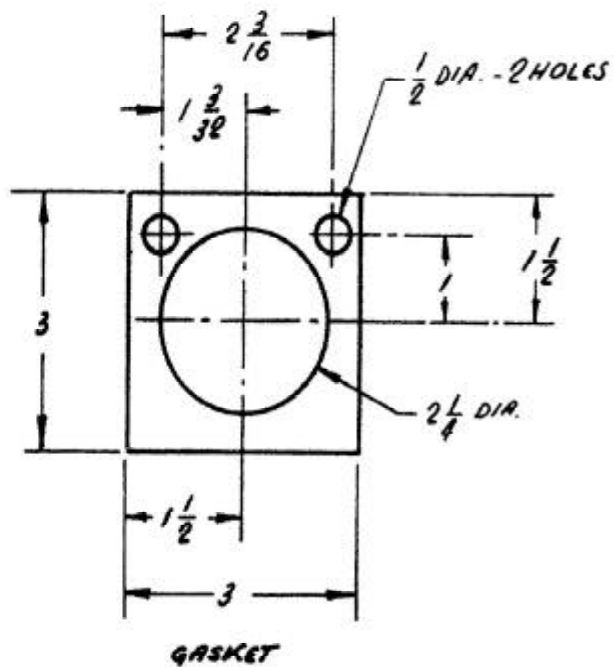


FIG. 26



IX. SERVICE INSTRUCTIONS

A. FUEL SYSTEM DIAGNOSIS AND REPAIR - Continued

6. Installation of Throttle Insert

This repair is required when the throttle shaft, Item 22, Fig. 41, Page 64. has worn a depression or an irregular seat in the Fuel Pump Body, Item 30, Page 64, and a constant leakage of fuel is being allowed to pass into the cylinder chamber.

Below are dimensions for the counter bore machining of the pump body for the installation of a special Throttle Insert (0990228).

After drilling the pump body, press in throttle insert with "Loctite" Screw Lock.

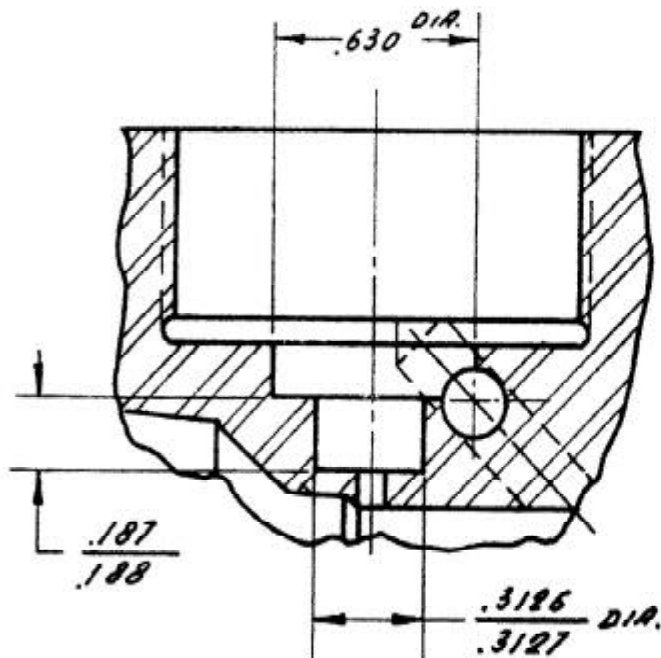


FIG. 27

SECTION OF FUEL PUMP BODY

7. Fuel Line Repair

The two fuel lines attached to the fuel pump are made of teflon. Follow procedure described in Section IX, Page 45, to replace fittings.

IX. SERVICE INSTRUCTIONS

B. LUBE OIL SYSTEM DIAGNOSIS AND REPAIR

1. Recognition of Trouble

Operation of the oil system is described in Section VII, Page 31. Evidence of oil pump trouble can be observed visually while the hammer is in operation. The ram should have a light film of oil on it as it projects out the top of the cylinder. After about 20 to 30 minutes of continuous operation, a small amount of black, used oil should be seeping out over the anvil flange and into the drive cap cup. On average jobs where the hammer is in operation about 50 per cent of the time, the oil consumption should be about 1/2 to 3/4 of a gallon per day.

2. Excess Oil Consumption

Excess oil on the exposed ram, new oil running out over the anvil, and possible erratic firing are symptoms of excess oil discharge from the pump. The cause of this trouble can be traced to:

- a. Use of lubricating oil that is too light.
- b. A restriction of the check valves or a damaged check valve and plunger. This may be caused by particles of dirt or steel chips becoming lodged on the check valve seats. This occasionally happens on a new hammer. To remedy this trouble, remove the pump from the hammer. Disassemble the pump and wash out the passages thoroughly. See disassembly instructions, Paragraph No. 4.
- c. For all current DE-30B/20B, DE-50B and DE-70B/50B models equipped with jar pump - the adjustment screw on the pump may be open too far. This adjustment is very critical and should be turned not more than a 1/4 turn at a time (See Fig. 28). After adjusting the cap screw, tighten the jam nut and observe the hammer running for at least 30 minutes before attempting re-adjustment. Turn

IX. SERVICE INSTRUCTIONS

B. LUBE OIL SYSTEM DIAGNOSIS AND REPAIR - Continued

2. Excess oil consumption - Continued

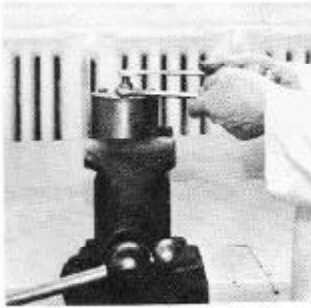


FIG. 28

the cap screw to the right (clockwise) to reduce the oil flow and to the left (counter-clockwise) to increase it. See Fig. 39, Page 62. In case the adjustment setting is unknown, remove the cap screw and nut. Set the nut back five turns from the end of the screw and screw it back into the cover until the nut touches. The cap screw should then be in a position to start making your final adjustment.

- d. It is possible that the four flat washers on the underside of a cam operated lubricating pump on earlier DE-30B Hammers are missing. These flat washers are originally added to provide a means of compensating for a worn cam by their removal.

3. Lack of Lube Oil

If no lube oil is pumped and this can be checked by removing the pipe plug on the side of the lube pump and lube oil head should flush out restricting dirt or air blockages.

Remove the inspection pipe plug on the check valve block. CAUTION: DO NOT REMOVE THIS PIPE PLUG WHILE HAMMER IS IN OPERATION. Stop the hammer, remove the pipe plug, and then restart hammer to check oil flow.

4. Jar Lube Oil Pump Disassembly - DE-50B, DE-70B and early 1975 DE-30B

- a. Remove the cap screws and cover.
- b. Lift out the weight, piston and plungers.

IX. SERVICE INSTRUCTIONS

B. LUBE OIL SYSTEM DIAGNOSIS AND REPAIR - Continued

4. Jar Lube Oil Pump Disassembly - Continued

- c. Insert a small punch (5/32" or less in diameter) through the plunger holes and drive out the brass check valve plug, spring and ball. See Fig. 29.

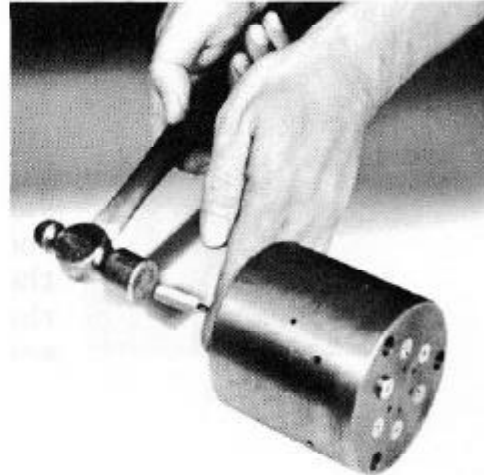


FIG. 29

5. Cam Operated Lube Oil Pump Disassembly - DE-30B

To disassemble for cleaning, remove from the hammer and lightly clamp in a vise:

- a. Remove cam by slipping out cam pin.
- b. Remove keeper plate that holds in plungers.
- c. Remove plungers and spring and then replace the plungers without the spring.
- d. Tap on the plungers lightly to drive out the ball check, spring and check valve body. HOLD YOUR HAND UNDER THE PUMP BODY TO CATCH THE SMALL PIECES.
- e. Remove the 1/8" pipe plug on the side of the body.
- f. The body should be cleaned by solvent and air and reassembled in the reverse procedure. Use a light oil on the plungers when they are replaced. Excess oil over the plungers and pump body will indicate that the pump is worn out. The pump may be rebuilt at the factory.

IX. SERVICE INSTRUCTIONS

B. LUBE OIL SYSTEM DIAGNOSIS AND REPAIR - Continued

6. Lube Oil Line Repair

Clogged lines can be blown out when the hammer is stopped by removing the lines at the pump base and the 1/8" pipe plugs at the terminals. Blow air in the line toward the terminal. **CAUTION: DO NOT REMOVE THE 1/8" PIPE PLUGS WHEN THE HAMMER IS RUNNING.**

To assemble fuel and lube line fittings, use genuine MKT replacement parts #9290011, Teflon Tubing (sold per ft.); 0103400, Teflon Tube Nut (4/pkg.); 0103500, Teflon Tube nut Ferrule (4/pkg.) and 0103600, Teflon Tube Nut Insert (4/pkg.):

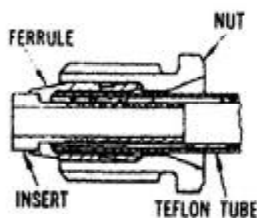
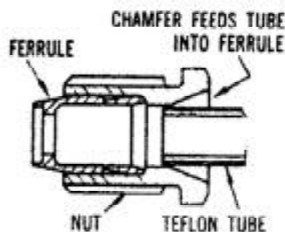


FIG. 30

- wrap the tube with friction tape and saw through tape to make a clean, square cut;
- remove the friction tape, place the ferrule in the nut and push the Teflon tube through the nut into the ferrule;
- press the insert into the Teflon tube;
- slide the nut back from the ferrule, and using a propane or acetelene torch, heat the ferrule, tube and insert (use LOW TEMPERATURE end of the flame, and heat until steam is seen rising from the assembly. Hold the assembly in the air for one (1) minute. Quench the assembly in water.); and
- slide the nut back on the ferrule, thread the nut into the mating terminal, and wrench the nut tight. Continue turning the nut and it will loosen. This is evidence that the ferrule has crimped. Continue to turn the nut one or two more turns. Do not over-tighten by screwing the nut down all the way.

IX. SERVICE INSTRUCTIONS

B. LUBE OIL SYSTEM DIAGNOSIS AND REPAIR - Continued

6. Terminal Lube Oil Check Valves

These (2) DE-30B/20B and (4) DE-50B and DE-70B/50B checks hold back the high combustion pressure and allow oil to pass around the rings of the anvil. High pressure blow-by will occur if these valves are not screwed down tight against their seats and wired. Carbon will form on these valves and clog if high detergent oil is not used.

C. REPLACEMENT OF COMPRESSION RINGS

1. Symptoms of Worn Out Rings

- a. Lack of compression and hard starting especially in cold weather.
- b. Failure of the ram to bounce three or four times when the hammer is tripped without fuel.
- c. Broken rings can be detected by pressing on them with a screwdriver through the fuel pump cam slot. A good ring will have spring tension against the cylinder wall.

2. Removal of Ram and Anvil for Replacement of Rings

There are two methods of removing the anvil block assembly from the cylinder:

- a. In a shop, with an overhead crane available, the travel plug is installed in the cylinder engaging the ram slot and the trip mechanism assembly is pulled back to the top end of the hammer with the lifting lug disengaged. The hammer is placed in a horizontal position on two sawhorse supports under the spud clip brackets on the cylinder top and bottom ends. Remove all the bucket tooth bolt nuts (24) on the DE-30B and (36) on the DE-50B and DE-70B.

IX. SERVICE INSTRUCTIONS

C. REPLACEMENT OF COMPRESSION RINGS - Continued

2. Removal of Ram and Anvil for Replacement of Rings-Cont.

Using a rope sling and crane, place the sling around the largest diameter of the anvil block end and taking up the weight with the crane, work the anvil block out by manually rocking and pulling. When the anvil block slides out of the cylinder, approximately 8" to 10", relocate the rope sling to the neck or smaller diameter of the anvil block to find the approximate center of gravity (C.G.). Then, with the crane taking up the weight, work the anvil block out until contact is made with the thrust bearing in the cylinder. Then, manually, use a rocking motion back and forth until the force and weight of the anvil block pushes the thrust bearing out of the cylinder. The anvil block and thrust bearing, vibration dampener assembly then can be removed. Great care must be taken when removing the anvil block to prevent it becoming unbalanced as it is removed and falling out of the crane sling.

- b. Another method to remove the anvil block assembly is, after being sure the travel plug is installed engaging the ram, to attach the crane to the top of the cylinder and raise the pile hammer up into a vertical position with the anvil block resting on the ground. Remove all the bucket tooth bolt nuts, (24) on the DE-30B/20B and (36) on the DE-50B and DE-70B/50B. Raise the cylinder and ram up until the anvil block makes contact with the thrust bearing and the weight of the anvil block forces the thrust bearing out of the cylinder.
- c. The cylinder and ram can be taken and placed down in a horizontal position with the spud clip brackets down on a 4 x 4 or larger wooden block or other means of support.

IX. SERVICE INSTRUCTIONS

C. REPLACEMENT OF COMPRESSION RINGS - Continued

2. Removal of Ram and Anvil for Replacement of Rings-Cont.

- d. Remove the travel plug from the cylinder. Using a wooden post, 4" x 4" or a similar diameter, long enough that when placed into the top end of the cylinder and making contact with the top of the ram it extends out another 3 to 4 ft., push the ram out of the bottom end of the cylinder by using a fork truck or similar vehicle. If no vehicle is available, using the crane, raise the top end of the hammer and the weight of the ram will allow it to slide out and onto the board to prevent damage to the machined finish.
- e. If the hammer is on a raised support, 8" or more, from the ground, care must be taken not to let the ram slide out too far before supporting the front end with a rope sling and crane, to prevent any damage to the machined finish. Then, the ram can be worked out with the crane. Continue moving the sling along the ram until the center of gravity (C.G.) is located before it comes out of the cylinder. The sling located at the (C.G.) will balance the ram and allow it to be moved with the crane.

3. Installation of New Compression Rings

- a. Remove the worn rings from both the ram and anvil.
- b. Place new rings in the cylinder bore squarely and check the new gap with a feeler gauge. The gap for the DE-30B/20B is .040 to .060 inches and the gap for the DE-50B and DE-70B/50B is .070 to .090 inches.
- c. Slip the new rings on the ram and anvil, stagger the gap and then oil. Ram and anvil rings are interchangeable.
- d. With the rings installed in the ram and the gaps staggered, the ram is ready for installation.

IX. SERVICE INSTRUCTIONS

C. REPLACEMENT OF COMPRESSION RINGS - Continued

4. Reinstallation of Ram

- a. The ram is lifted with a rope sling to not mar the high finish. Positioned at the center of gravity, the rope sling will balance the ram and keep it perfectly level for movement and entry into the cylinder of the hammer.

NOTE: The top or flat end of the ram is installed into the bottom end of the cylinder. Before actually inserting the ram into the cylinder, the top half is coated with a light lubricating oil to reduce friction and provide initial lubrication when the hammer is first operated.

- b. The ram is moved into the cylinder by keeping the ram level on the center line of the bore, while advancing the crane. With half the weight of the ram in the cylinder, the rope sling is relocated to a new pickup point just in front of the compression rings. The lower end of the ram is then coated with lubricating oil as was the upper end of ram. Again, taking the weight of the ram on the sling and crane line, the ram is moved into the cylinder by advancing the crane. Rocking the sling manually aids to move the ram into the cylinder.
- c. For the final movement of the ram, the sling is looped about the nose end of the ram. The remaining part of the ram, including the rings are coated with lubricating oil. Again taking the weight of the ram in the sling loop, manually rocking the sling and advancing the crane the ram is moved into the cylinder until the compression ring area is reached. The bottom end of the cylinder bore is chamfered to provide a beveled entry for the compression rings. No ring compressors are required. As an aid for the compression ring insertions, two blunt screw drivers or pieces of wood can be used to compress the gap slightly as the rings enter

IX. SERVICE INSTRUCTIONS

C. REPLACEMENT OF COMPRESSION RINGS - Continued

4. Reinstallation of Ram - Continued

the cylinder. One man usually hand positions and partially compresses the rings and pushes while the other operates the crane. Once the rings and ram are into the end of the cylinder an approximately 6 ft. long, 2" x 6" timber is used as a lever. One end of a chain is hooked onto the welded structure of the lower end of the cylinder. The chain is looped around the timber and the second end is hooked next to the first. One man pushes against the free end of the timber lever while the other exerts his weight against the lever on the nose of the ram. When the ram nose enters the cylinder, a length of wood is inserted between the lever and the nose of the ram to complete pushing the ram in far enough to engage the travel plug and allow room for the anvil block.

5. Reinstallation of Anvil

- a. Remove the inspection vent plug (1/8 pipe plug) (Part No. 0102500) from the bottom check valve lubrication blocks welded to the cylinder wall to release air and prevent compression when trying to install the anvil block. Clean out all foreign matter from the nose of the ram and cylinder bore.
- b. Install the anvil block similarly to the ram, (See Paragraph 4, Page 50) using the rope sling on the center of gravity. NOTE: Before inserting DE-50B or DE-70B/50B Anvil Block, be sure the thrust bearing retainer (Part #40703100) is in position on the anvil block.
- c. Replace the nuts on the bucket tooth bolts, being sure they are properly torqued. See Page 56 for torque required.

6. Installation of a New Ram

When another ram is to be installed, the cylinder should be cleaned out of all foreign substances. Then the new compression rings should be checked for proper gap size in the cylinder bore as explained on Page 48.

IX. SERVICE INSTRUCTIONS

D. DISASSEMBLY OF DE-50B AND DE-70B RETAINER FROM THRUST BEARING

1. Remove the anvil assembly from the cylinder.
2. Lift the thrust bearing retainer and place the two extracting tools in position as shown on Fig. 31.
3. Then lower the thrust bearing retainer until the thrust bearing rests on the extracting tools and press on the retainer until the thrust bearing comes loose.

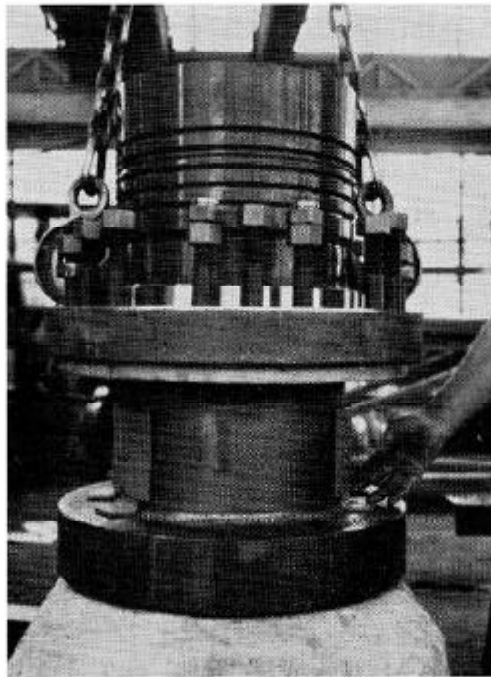


FIG. 31

IX. SERVICE INSTRUCTIONS

E. TRIP MECHANISM

This simple three link toggle system has a safety link that breaks when the trip is engaged while the hammer is running. To replace this link, proceed as follows:

1. Remove the Trip Guides and lift out the trip body.
2. Depress the lifting hook escape spring with a screwdriver through the rear slot in the hook and push out the safety pivot pin, Item 7, on Pages 67 and 68.
3. Push out the trip lever pivot pin and remove the linkage.
4. Insert new safety link and reassemble by putting the safety pivot pin in first.

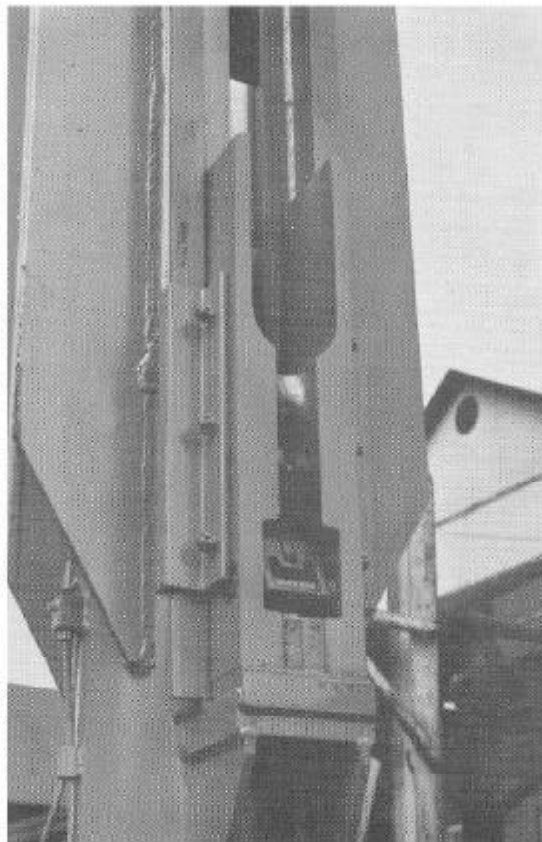


FIG. 32

IX. SERVICE INSTRUCTIONS

F. SAFETY TRIP MECHANISM (FIGS. 44 AND 45, PAGES 67 AND 68)

In order to engage the Safety Trip Mechanism, it is necessary to pull on trip control rope, Item 8. This moves Trip Stop, Item 1 to operating position.

If the Safety Trip Mechanism is in lower position, raise approximately 2 feet, pull rope and hold taut while Trip Mechanism is again brought to lower position.

(Failure to hold rope taut will allow Trip Stop, to move to safety position and fail to engage Trip Mechanism).

To disassemble, proceed as follows:

1. Remove Trip Cushion.
2. Insert 1/2-13 Bolt through hole in the pump bracket into end of Pin, Item 3.
3. Remove Set Screw, Item 2 and pull out pin.
4. Remove Trip Stop, Item 1.
(CAUTION: Be careful not to lose Parts Items 4 and 5.

NOTE: To inactivate Safety Mechanism, tighten Set Screw, Item 6, until Spring, Item 5, is fully compressed. This will locate Trip Stop, in normal operating position and eliminate the necessity of the Rope, Item 8.

IX. SERVICE INSTRUCTIONS

G. REMOTE CONTROL SYSTEM

TESTING FOR LEAKAGE IN THE REMOTE CONTROL SYSTEM

Begin with lever at the extreme back position; move it slowly forward. Lock the lever in position after pressure gauge reads approximately 160 psi. Leave the unit with the lever locked for three (3) hours. If pressure drops not more than 40 psi (to 120 psi on the gauge), the unit is acceptable.

REMOTE CONTROL ABORT INSTRUCTIONS

If remote control is lost or becomes inoperative, the hammer can be successfully operated by aborting the system as per the following instructions:

1. To abort remote control, remove adapter fitting Item 26, Fig. 42, Page 65.
2. Insert a spacer, 1" long, made from a 1/2" dia. rod of a solid material such as steel, brass, aluminum, plastic or wood.
3. Replace adapter fitting.
4. If adapter fitting leaks excessively, plug the orifice with a wood plug.
5. To shut off hammer with the remote control aborted, pull and hold taut control cable, Item 22, Fig. 42, Page 65.

The purpose of this abort spacer is to hold the plunger, Item 24, Fig. 42, Page 65 in the full on position so the by-pass holes are closed allowing the maximum fuel to enter the hammer combustion chamber.

IX. SERVICE INSTRUCTIONS

H. REMOTE CONTROL SYSTEM - Continued

TROUBLE SHOOTING CHART, REMOTE CONTROL TRANSMITTER

Trouble	Probable Cause	Remedy
Transmitter Handle will not move forward. (Pressure Stroke)	<ol style="list-style-type: none"> Expansion due to Temperature Changes. Crushed or Kinked Tubing. Mechanical Damage in Control. 	<ol style="list-style-type: none"> Relieve Pressure. Replace Tubing. Replace Damaged Parts.
Creep at Transmitter Handle.	<ol style="list-style-type: none"> Handle pin not engaging in Latch Segment. 	<ol style="list-style-type: none"> Check for Damage and Replace if necessary.
Creep at Transmitter when Handle held at extreme back position.	<ol style="list-style-type: none"> Expansion or Contraction of Oil due to Temperature Changes. Leak (See Below) 	<ol style="list-style-type: none"> Relieve Pressure. Correct leak as described below.
Creep after Control Line has been Disconnected at Fuel Pump.	<ol style="list-style-type: none"> Leak at Unions or Connections. Tubing Damaged or Broken. Transmitter "O" Ring Damaged or Worn. Mechanical Defects. Scratched Piston or Cylinder Walls. 	<ol style="list-style-type: none"> Tighten all Connections. Check for Damaged Fittings. Replace Tubing. Replace Piston "O" Ring. Replace Piston or Replace Unit if Housing is Damaged.
Oil Leak Around Shaft or Between Cover and Housing.	<ol style="list-style-type: none"> Transmitter Overfilled. 	<ol style="list-style-type: none"> Bleed Reservoir.

IX. SERVICE INSTRUCTIONS

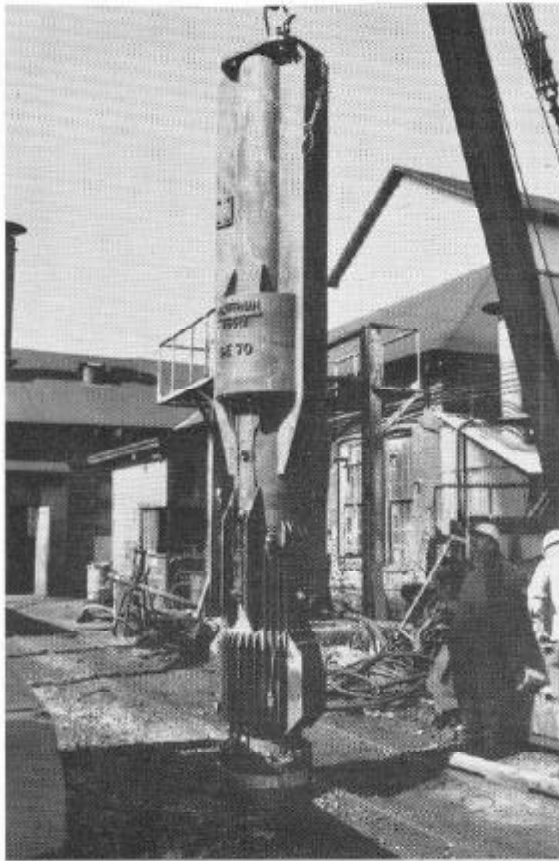
I. NUT AND BOLT TORQUE DATA

The following is a list of the recommended torque values for various nuts and bolts used on the DE-30B/20B, DE-50B and DE-70B/50B Diesel Hammers:

Bottom Flange Bolts.....	500 ft. lb.
Trip Mechanism Guides - DE-70B.....	350 ft. lb.
Trip Mechanism Guides - DE-30B and DE-50B.....	100 ft. lb.
Fuel Pump and Cam Operated Oil Pump DE-30B Mounting Nuts.....	50 ft. lb.
Fuel Pump check valve nut.....	150 ft. lb.
Fuel pump top nut.....	40 ft. lb.
Fuel pump lock plate cap screws.....	40 ft. lb.
Fuel and oil line hex nuts.....	30 ft. lb.
Spud clamp.....	350 ft. lb.

X. PARTS IDENTIFICATION

The component parts of each assembly drawing are identified by a balloon with a number inserted called an item number. When ordering a component part, use only the seven digit number to the right of the vertical line through the part number block.



DE-70B/50B

FIG. 33

X. PARTS IDENTIFICATION

- A. DE-30B/20B WITH JAR LUBRICATING PUMP
- B. DE-30B WITH CAM OPERATED LUBRICATING PUMP

FOR ORDERING INFORMATION ONLY

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>REQ'D.</u>
010 05 05	Lubricating Line Housing	4
010 05 06	Terminal Valve Housing	2

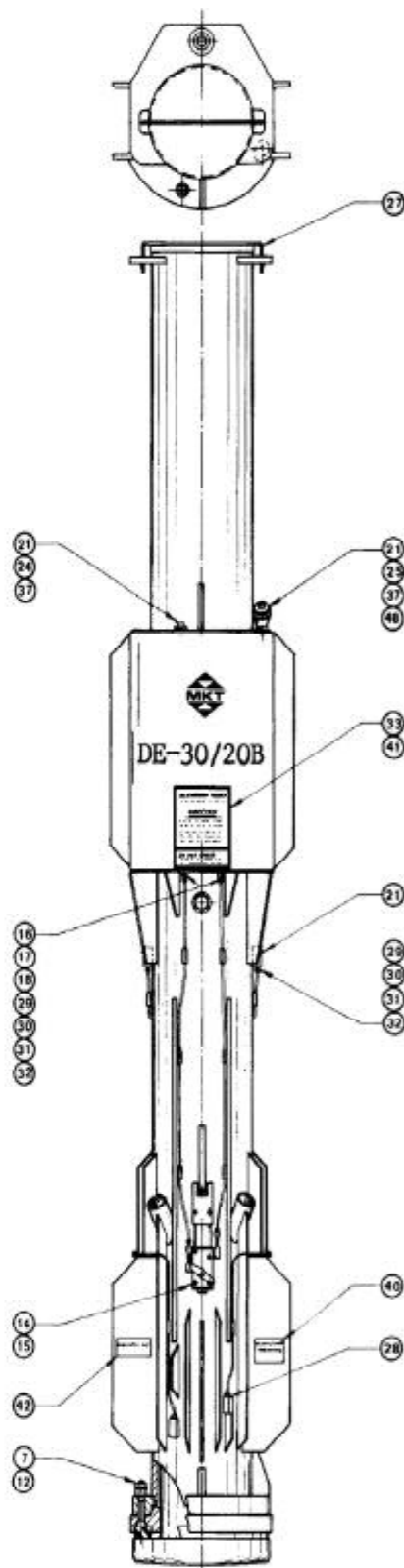
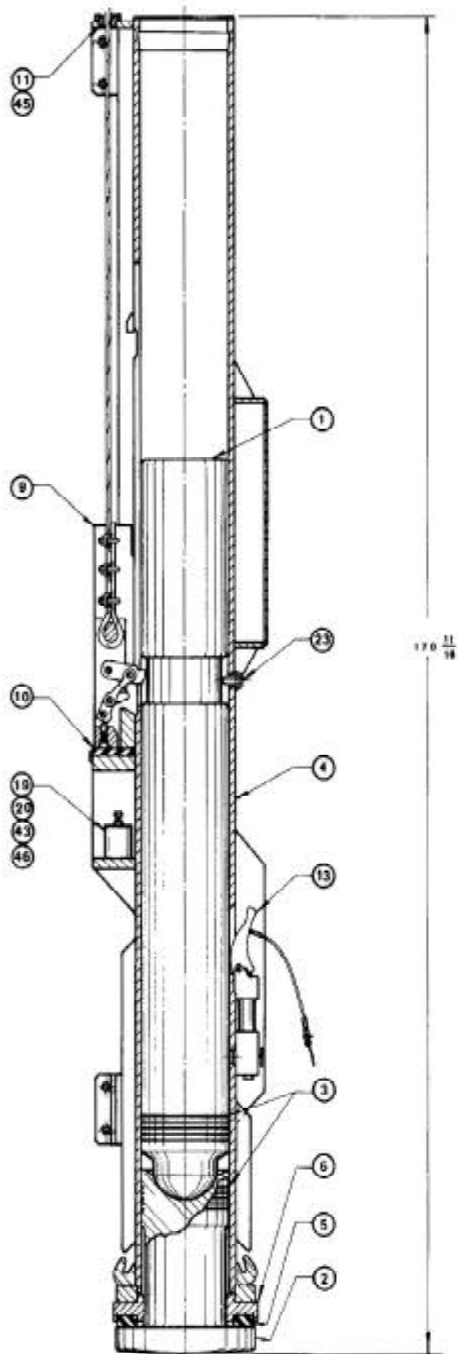


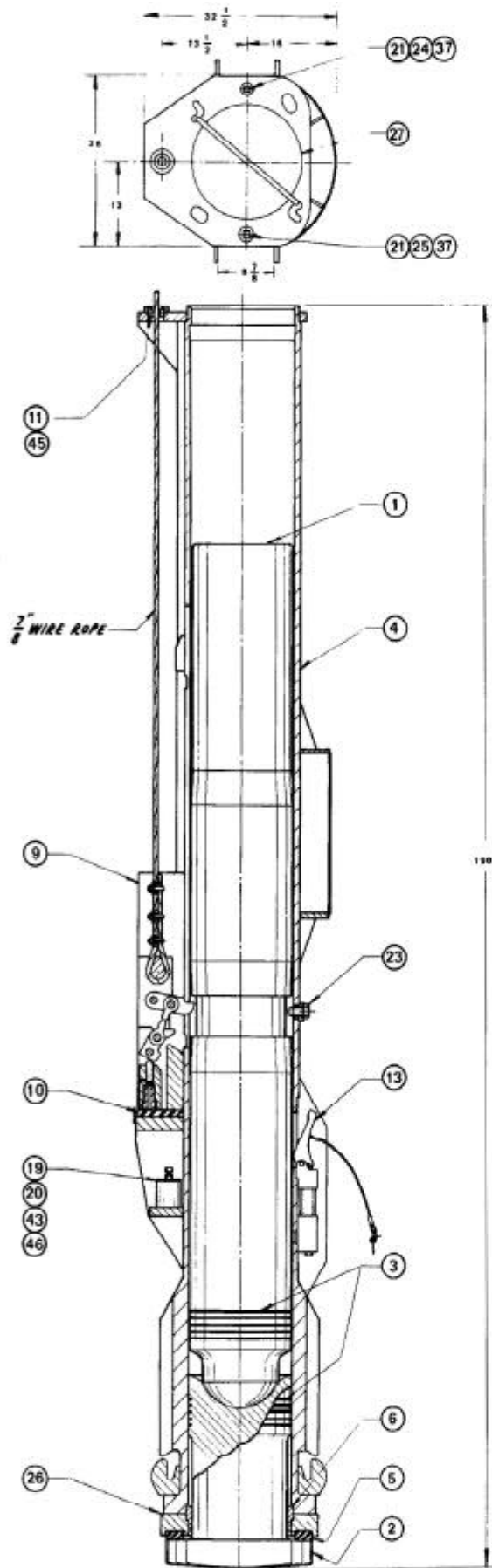
FIG. 34

A. DE-30B/20B - ASSEMBLY - WITH JAR LUBRICATING PUMP

ITEM NO.	PART NO.		DESCRIPTION	QTY. REQ'D.
1	5	030 01 00	Ram - Piston - Steel - 2,800#	1
1	5	099 06 50	Ram - Piston - Steel - 2,000#	1
1	5	031 01 04	Ram - Piston - D.I. - 2,800#	1
1	5	031 01 02	Ram - Piston - D.I. - 2,000#	1
2	4	031 02 00	Anvil Block	1
3	2	030 03 00	Compression Rings	10
4	6	031 04 00	Cylinder	1
5	3	031 06 00	Vibration Dampener	1
6	4	031 07 00	Thrust Bearing	1
7	0	943 02 26	Bucket Tooth Bolt	12
9	5	031 13 02	Trip Mechanism Assembly	1
10	2	031 14 01	Trip Cushion	1
11	1	010 15 00	Cable Guide Bushing	1
12	0	920 00 28	Nut 1"-8 UNC Flexloc	12
13	4	010 17 02	Fuel Pump	1
14	2	010 19 01	Mounting Stud - Fuel Pump	6
15	0	920 00 05	3/8 ESNA Nut	10
16	2	015 20 00	Filter Plug & Shut-Off Valve	3
17	1	010 21 00	Filter Cartridge	3
18	1	010 22 00	Filter Clamp	3
19	3	020 23 00	Lubricating Pump	1
20	2	020 24 00	Gasket - Lub. Pump	1
21	1	010 25 00	Pipe Plug - 1/8" Modified	6
22	2	031 26 00	Piston Stroke Indicator	1
23	1	010 27 00	Travel Plug	1
24	2	010 30 04	Pipe Plug - 2 Modified	1
25	2	010 30 01	Pipe Plug - 1-1/2 Modified	1
27	3	031 32 01	Weather Cover	1
28	2	010 33 00	Check Valve Assembly	2
29	2	010 34 00	Teflon Tube Nut w/Insert	18
30	2	010 35 00	Teflon Tube Ferrule	18
31	1	010 36 00	Teflon Tube Insert	18
32	0	929 00 11	Teflon Tubing	30 FT.
33	3	010 37 02	Model & Ser. # Identification Plate	1
37	0	923 00 44	Ball Check Connector	2
38	0	930 00 27	2" Pipe Plug (For Exhaust Ports)	4
40	1	099 06 00	Ear Protection Decal	1
41	2	010 37 04	Weld Warning Plate	1
42	1	099 06 07	Lubrication Oil Decal	1
43	0	941 00 07	Grommet 5/8	4
44	0	010 42 00	Caution Decal	1
45	2	010 05 54	Retainer Plate, Cable Bushing	1
46	0	901 05 38	Hex Hd. Cap Scr. 3/8-24 x 5" Lg.Lub.Pump	3
48	0	930 03 85	1 1/2"-45° Street Elbow-Mall. Iron	1

B. DE-30B - ASSEMBLY - WITH CAM OPERATED LUBRICATING PUMP

ITEM NO.	PART NO.	DESCRIPTION	QTY. REQ'D.
1	5 030 01 00	Ram - Piston - Steel - 2,800#	1
2	4 031 02 00	Anvil Block	1
3	2 030 03 00	Compression Rings	10
4	6 031 04 00	Cylinder	1
5	3 031 06 00	Vibration Dampener	1
6	4 031 07 00	Thrust Bearing	1
7	0 943 02 26	Bucket Tooth Bolt	12
9	5 031 13 02	Trip Mechanism Assembly	1
10	2 031 14 01	Trip Cushion	1
11	1 010 15 00	Cable Guide Bushing	1
12	0 920 00 28	Nut 1"-8 UNC Flexloc	12
13	4 010 17 02	Fuel Pump	1
14	2 010 19 01	Mounting Stud - Fuel Pump	6
15	0 920 00 05	3/8 ESNA Nut	10
16	2 015 20 00	Filter Plug & Shut-Off Valve	3
17	1 010 21 00	Filter Cartridge	3
18	1 010 22 00	Filter Clamp	3
19	3 015 23 00	Lubricating Pump	1
20	2 010 19 02	Mounting Stud	4
21	1 010 25 00	Pipe Plug - 1/8" Modified	6
22	2 031 26 00	Piston Stroke Indicator	1
23	1 010 27 00	Travel Plug	1
24	2 010 30 01	Pipe Plug - 1-1/2 Modified	1
25	2 010 30 02	Pipe Plug - 1-1/4 Modified	1
27	3 031 32 00	Weather Cover	1
28	2 010 33 00	Check Valve Assembly	2
29	2 010 34 00	Teflon Tube Nut w/Insert	18
30	2 010 35 00	Teflon Tube Ferrule	18
31	1 010 36 00	Teflon Tube Insert	18
32	0 929 00 11	Teflon Tubing	30 FT.
33	3 010 37 02	Model & Ser. # Identification Plate	1
37	0 923 00 44	Ball Check Connector	2
38	0 930 00 27	2" Pipe Plug (For Exhaust Ports)	4
40	1 099 06 00	Ear Protection Decal	1
41	2 010 37 04	Weld Warning Plate	1
42	1 099 06 07	Lubrication Oil Decal	1
43	0 941 00 07	Grommet 5/8	4
44	0 010 42 00	Caution Decal	1
45	2 010 05 54	Retainer Plate, Cable Bushing	1
47	0 943 01 90	3/8 Flat Washer, S.S.	4



X. PARTS IDENTIFICATION

C. DE-70B/50B ASSEMBLY

D. DE-50B ASSEMBLY

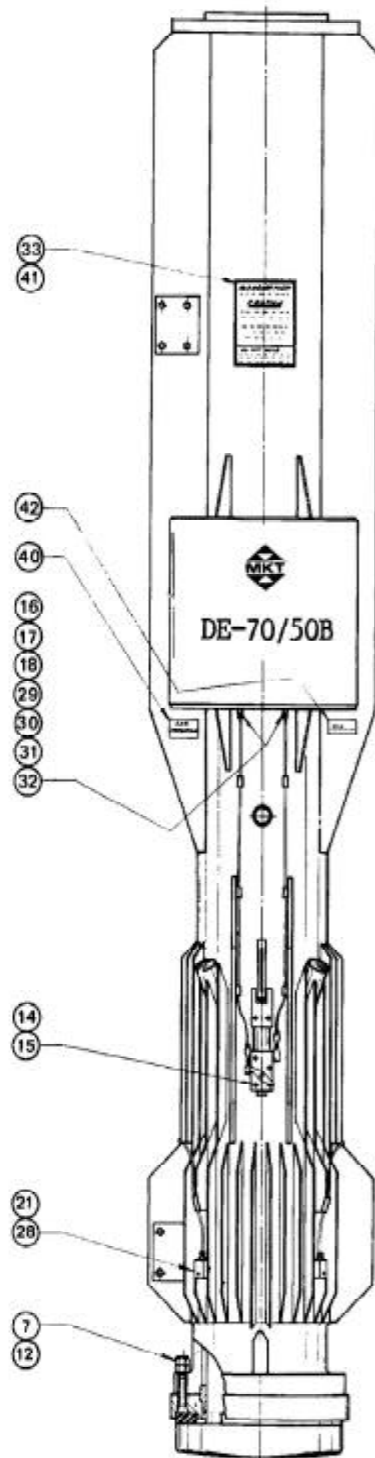


FIG. 35

C. DE-70B/50B ASSEMBLY

ITEM NO.	PART NO.	DESCRIPTION	QTY. REQ'D.
1	5 070 01 00	Ram - Piston - Steel - 7,000#	1
1	5 050 01 00	Ram - Piston - Steel - 5,000#	1
1	5 070 01 04	Ram - Piston - D.I. - 7,000#	1
1	5 050 01 04	Ram - Piston - D.I. - 5,000#	1
2	5 070 02 00	Anvil Block	1
3	2 055 03 00	Compression Rings	10
4	6 070 04 00	Cylinder	1
5	3 055 06 00	Vibration Dampener	1
6	3 070 07 00	Thrust Bearing	1
7	0 943 02 25	Bucket Tooth Bolt	18
9	4 070 13 10	Trip Mechanism (after Serial #750311)*	1
10	2 070 14 01	Trip Cushion	1
11	1 010 15 00	Cable Guide Bushing	1
12	0 920 00 27	Hex Nut-1 1/8-7	18
13	4 010 17 04	Fuel Pump	1
14	2 010 19 01	Mounting Stud - Fuel Pump	6
15	0 920 00 05	Nut 3/8 - 24 ESNA 52 NE-064	6
16	2 015 20 00	Filter Plug & Shut-off Valve	3
17	1 010 21 00	Filter Cartridge	3
18	1 010 22 00	Filter Clamp	3
19	3 020 23 00	Lubricating Pump	1
20	2 020 24 00	Gasket - Lub. Pump	1
21	1 010 25 00	Pipe Plug - 1/8" Modified	6
22	2 031 26 00	Piston Stroke Indicator	1
23	1 010 27 00	Travel Plug	1
24	2 010 30 01	Pipe Plug - 1-1/2 Modified	1
25	2 010 30 04	Pipe Plug - 2 Modified	1
26	4 070 31 00	Thrust Bearing Retainer	1
27	3 070 32 00	Weather Cover	1
28	2 010 33 00	Check Valve Assembly	4
29	2 010 34 00	Teflon Tube Nut w/Insert	18
30	2 010 35 00	Teflon Tube Ferrule	18
31	1 010 36 00	Teflon Tube Insert	18
32	0 929 00 11	Teflon Tubing	30 FT.
33	3 010 37 02	Model & Ser. # Identification Plate	1
37	0 923 00 44	Ball Check Connector	2
38	0 930 00 31	2 1/2 Pipe Plug (For Exhaust Ports)	4
40	1 099 06 00	Ear Protection Decal	1
41	2 010 37 04	Weld Warning Plate	1
42	1 099 06 07	Lubrication Oil Decal	1
43	0 941 00 03	Grommet 1"	3
44	0 010 42 00	Caution Decal	1
45	2 010 05 54	Retainer Plate, Cable Bushing	1
46	0 901 05 38	Hex Hd.Cap Scr. 3/8-24 x 5" Lg.Lub.Pump	3

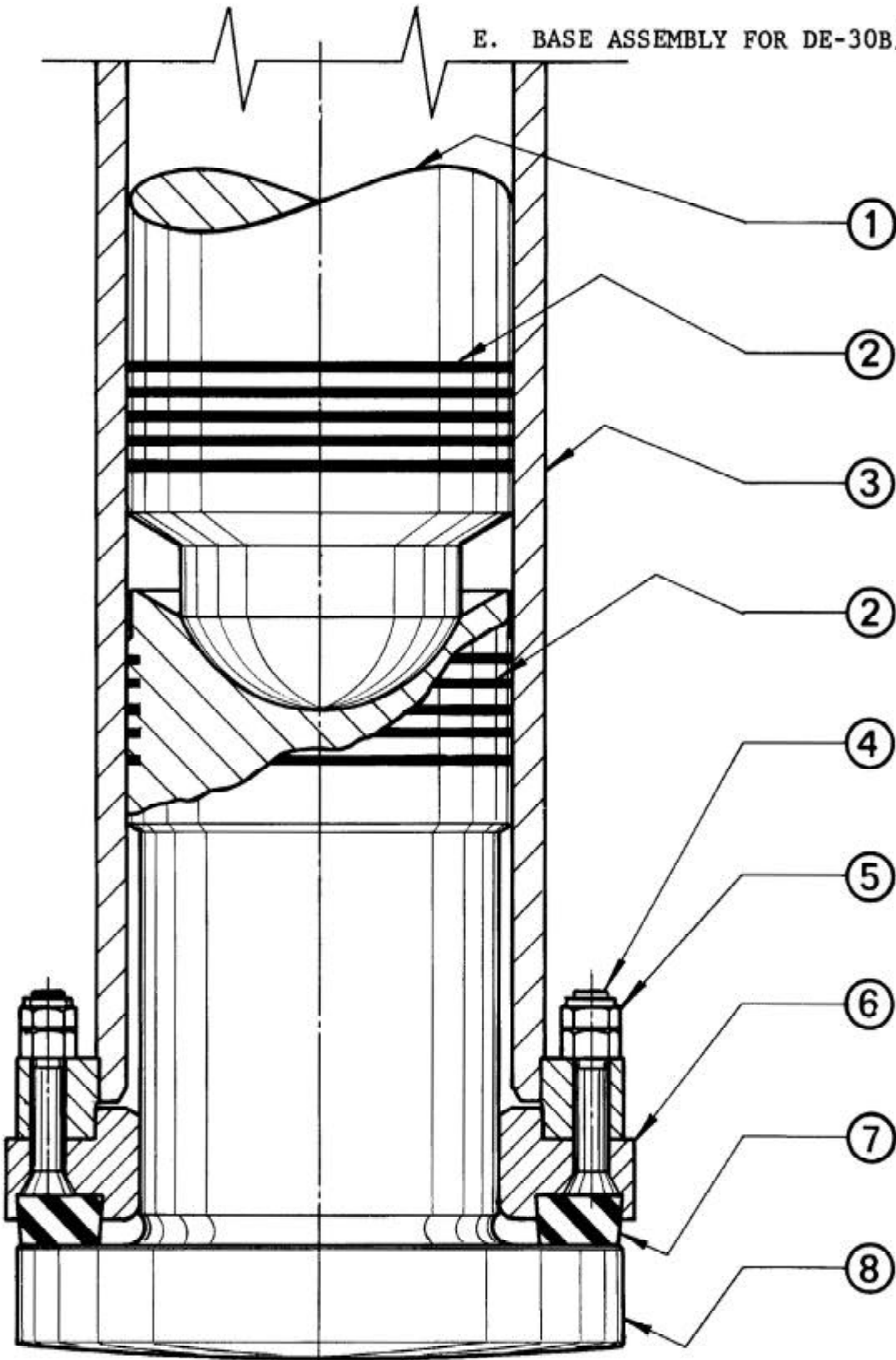
*Before Ser. #750311, Use Part #0701300

D. DE-50B ASSEMBLY

ITEM NO.	PART NO.	DESCRIPTION	QTY. REQ'D.
1	5 050 01 00	Ram - Piston - Steel	1
1	5 050 01 04	Ram - Piston - D.I. or	1
2	5 070 02 00	Anvil Block	1
3	2 055 03 00	Compression Rings	10
4	6 050 04 00	Cylinder	1
5	3 055 06 00	Vibration Dampener	1
6	3 070 07 00	Thrust Bearing	1
7	0 943 02 25	Bucket Tooth Bolt	18
9	0 050 13 00	Trip Mechanism	1
10	2 031 14 01	Trip Cushion	1
11	1 010 15 00	Cable Guide Bushing	1
12	0 920 00 27	Hex Nut-1 1/8-7	18
13	4 010 17 05	Fuel Pump	1
14	2 010 19 01	Mounting Stud - Fuel Pump	6
15	0 920 00 05	Nut 3/8 - 24 ESNA 52 NE-064	6
16	2 015 20 00	Filter Plug & Shut-Off Valve	3
17	1 010 21 00	Filter Cartridge	3
18	1 010 22 00	Filter Clamp	3
19	3 020 23 00	Lubricating Pump	1
20	2 020 24 00	Gasket - Lub. Pump	1
21	1 010 25 00	Pipe Plug - 1/8" Modified	6
22	2 031 26 00	Piston Stroke Indicator	1
23	1 010 27 00	Travel Plug	1
24	2 010 30 01	Pipe Plug - 1-1/2 Modified	1
25	2 010 30 04	Pipe Plug - 2 Modified	1
26	4 070 31 00	Thrust Bearing Retainer	1
27	4 050 32 00	Weather Cover	1
28	2 010 33 00	Check Valve Assembly	4
29	2 010 34 00	Teflon Tube Nut w/Insert	18
30	2 010 35 00	Teflon Tube Ferrule	18
31	1 010 36 00	Teflon Tube Insert	18
32	0 929 00 11	Teflon Tubing	30 FT.
33	3 010 37 02	Model & Ser. # Identification Plate	1
37	0 923 00 44	Ball Check Connector	2
38	0 930 00 31	2 1/2 Pipe Plug (For Exhaust Ports)	4
40	1 099 06 00	Ear Protection Decal	1
41	2 010 37 04	Weld Warning Plate	1
42	1 099 06 07	Lubrication Oil Decal	1
43	0 941 00 03	Grommet 1"	3
44	0 010 42 00	Caution Decal	1
45	4 010 05 54	Retainer Plate, Cable Bushing	1
46	0 901 05 38	Hex Hd. Cap Scr. 3/8-24 x 5" Lg.Lub.Pump	3

X PARTS IDENTIFICATION

E. BASE ASSEMBLY FOR DE-30B/20B



DE-30B/20B

FIG. 37

E. DE-30B/20B - BASE ASSEMBLY

ITEM NO.		PART NO.	DESCRIPTION	QTY. REQ'D.
1	5	030 01 00	Ram - Piston - Steel - 2,800#	1
			or	
1	5	099 06 50	Ram - Piston - Steel - 2,000#	1
			or	
1	5	031 01 04	Ram - Piston - D.I. - 2,800#	1
			or	
1	5	031 01 02	Ram - Piston - D.I. - 2,000#	1
2	2	030 03 00	Compression Rings	10
3	6	031 04 00	Cylinder	1
4	0	943 02 26	Bucket Tooth Bolt	12
5	0	920 00 28	Flexloc Nut	12
6	4	031 07 00	Thrust Bearing	1
7	3	031 06 00	Vibration Dampener	1
8	4	031 02 00	Anvil Block	1

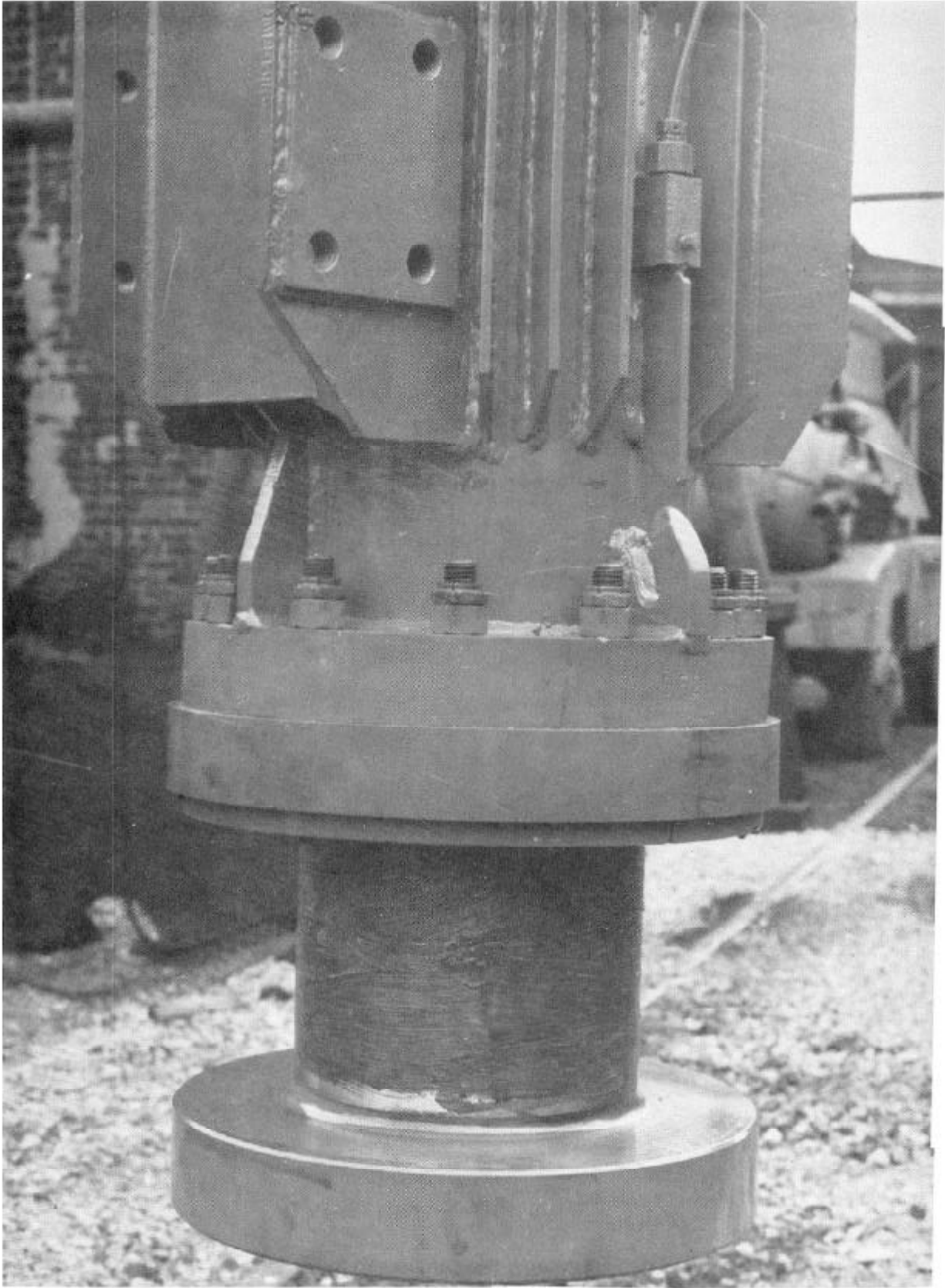
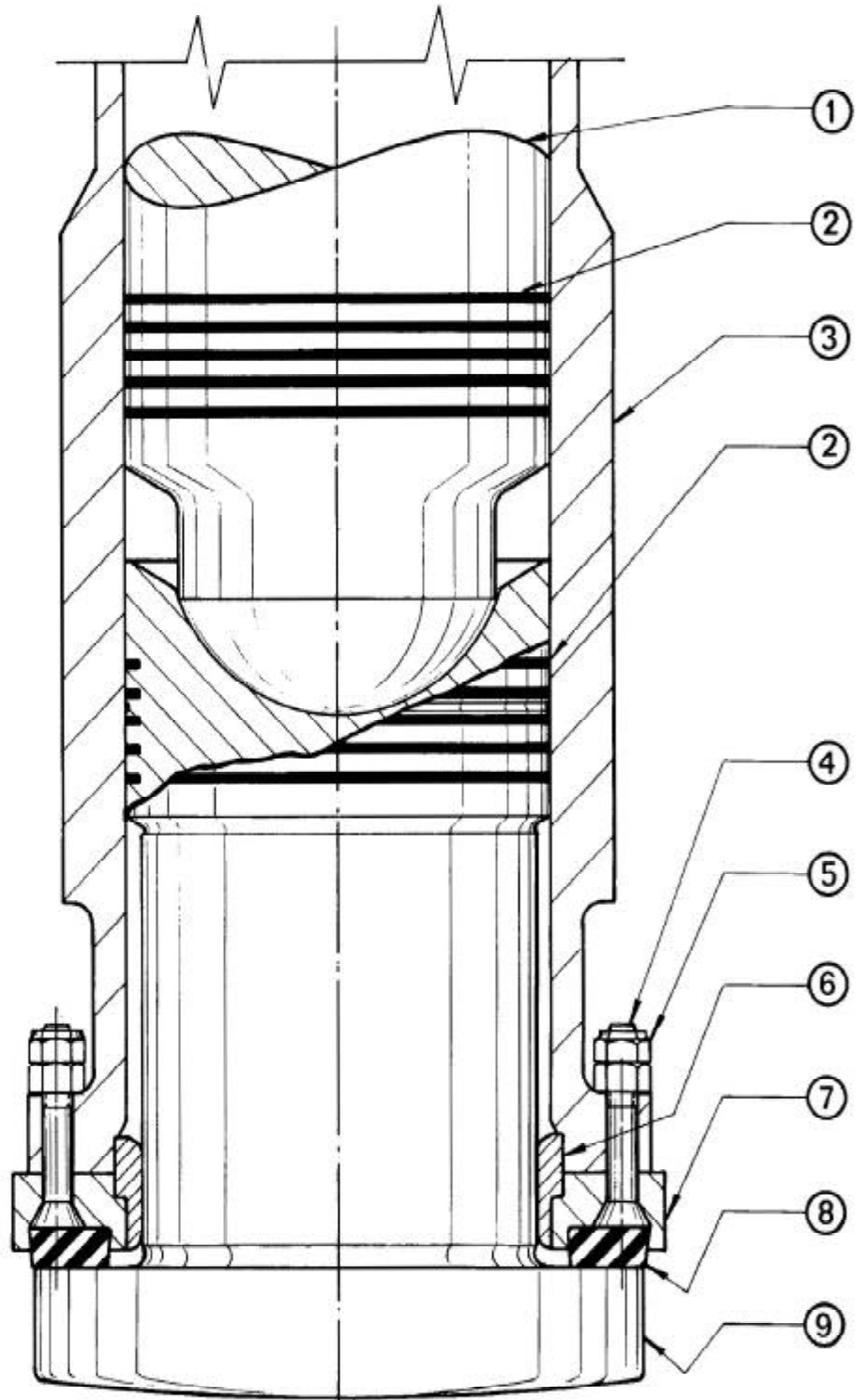


FIG. 36

X. PARTS IDENTIFICATION

- F. BASE ASSEMBLY FOR DE-70B/50B
- G. BASE ASSEMBLY FOR DE-50B



DE-50B AND DE-70B/50B BASE ASSEMBLY

FIG. 38

F. DE-70B/50B - BASE ASSEMBLY

ITEM NO.	PART NO.	DESCRIPTION	QTY. REQ'D.
1	5 070 01 00	Ram - Piston - Steel - 7,000# or	1
1	5 050 01 00	Ram - Piston - Steel - 5,000# or	1
1	5 070 01 04	Ram - Piston - D.I. - 7,000# or	1
1	5 050 01 04	Ram - Piston - D.I. - 5,000#	1
2	2 055 03 00	Compression Rings	10
3	6 070 04 00	Cylinder	1
4	0 943 02 25	Bucket Tooth Bolt	18
5	0 920 00 27	Hex Nut	18
6	3 070 07 00	Thrust Bearing	1
7	4 070 31 00	Thrust Bearing Retainer	1
8	3 055 06 00	Vibration Dampener	1
9	5 070 02 00	Anvil Block	1

G. DE-50B - BASE ASSEMBLY

ITEM NO.	PART NO.		DESCRIPTION	QTY. REQ'D.
1	5	050 01 00	Ram - Piston - Steel	1
			or	
1	5	050 01 04	Ram - Piston - D.I.	1
2	2	055 03 00	Compression Rings	10
3	6	050 04 00	Cylinder	1
4	0	943 02 25	Bucket Tooth Bolt	18
5	0	920 00 27	Hex Nut	18
6	3	070 07 00	Thrust Bearing	1
7	4	070 31 00	Thrust Bearing Retainer	1
8	3	055 06 00	Vibration Dampener	1
9	5	070 02 00	Anvil Block	1

X. PARTS IDENTIFICATION

H. LUBRICATION SYSTEM FOR
DE-30B/20B, DE-50B & DE-70B/50B

H. DE-30B/20B w/JAR PUMP, DE-50B AND DE-70B/50B
LUBRICATION SYSTEM

ITEM NO.	PART NO.	DESCRIPTION	QUAN. REQ'D	
1	1	010 21 00	Filter Cartridge	1
2	1	010 22 00	Filter Clamp	1
3	0	921 00 07	Retaining Ring	1
4	1	010 20 03	Spring	1
5	1	010 20 02	Shut-Off Valve	1
6	2	015 20 01	Filter Plug and Valve Housing	1
7	1	020 23 09	Adjusting Screw	1
8	0	920 00 06	Locknut	1
9	0	901 05 06	Hex Hd. Cap Scr.(3/8-24 x 5/8)	3
10	2	020 23 04	Cover	1
11	3	020 23 01	Body	1
12	1	020 23 08	Piston Weight	1
13	2	020 23 02	Piston	1
14	1	010 23 03	Plunger	6
15	1	010 23 06	Plunger Spring	6
16	0	924 00 09	Pin Plug	6
17	0	937 00 02	Steel Ball	6
18	1	010 23 07	Check Valve Spring	6
19	1	010 23 05	Check Valve Body	6
20	2	010 34 00	Teflon Tube Nut	14
21	2	010 35 00	Teflon Tube Ferrule	14
22	1	010 36 00	Teflon Tube Insert	14
23	0	929 00 11	Teflon Tubing	14
24	2	010 33 01	Body	*
25	1	010 33 05	Tube Fitting Seat	*
26	1	010 33 02	Spring Retainer	*
27	1	010 33 03	Piston	*
28	1	010 33 04	Spring Retainer Pin	*
29	2	010 33 06	Spring	*
30	1	010 25 00	Pipe Plug	6
31	0	901 05 38	Hex Head Cap Screw	3

*NOTE: 2 Check Valves on DE-30/20B
Items 24 thru 29
3 Check Valves on DE-50B
Items 24 thru 29
3 Check Valves on DE-70/50B
Items 24 thru 29

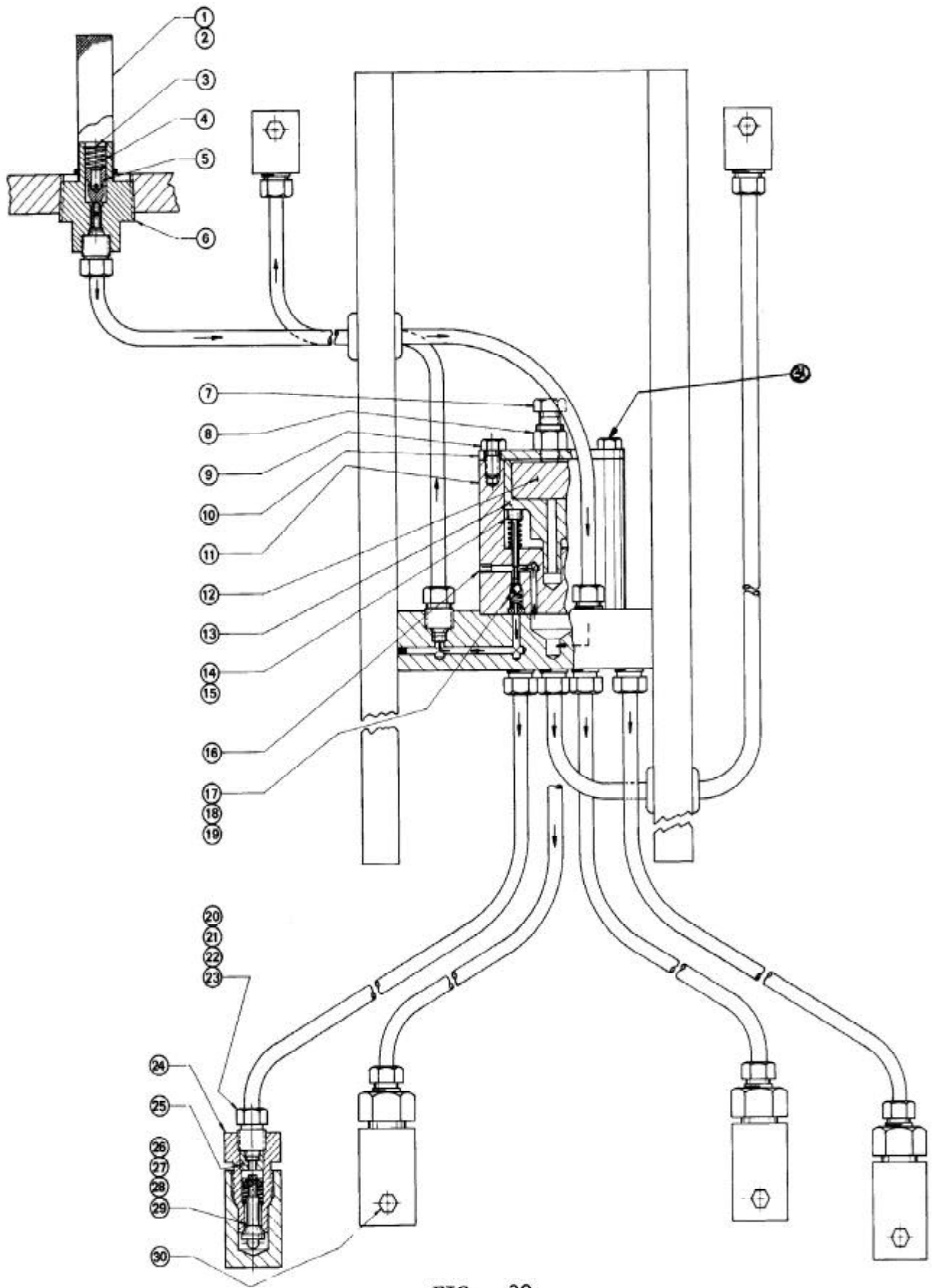
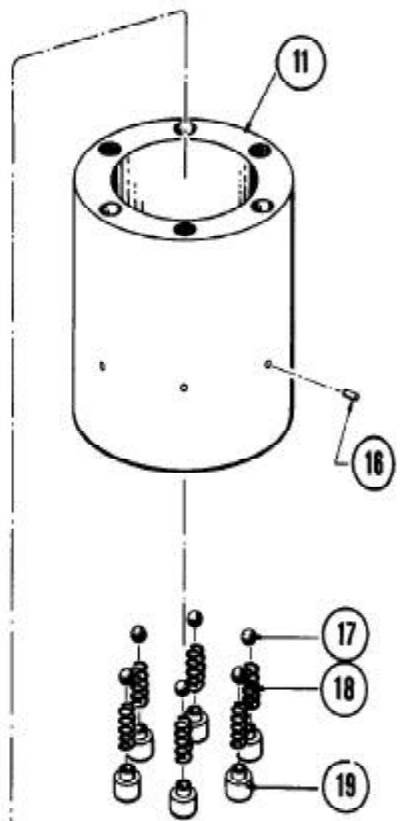
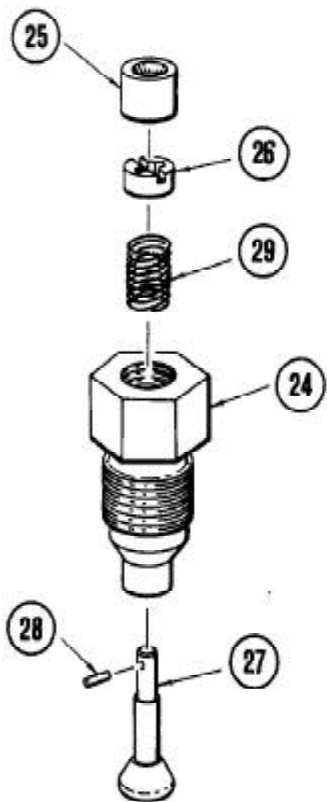
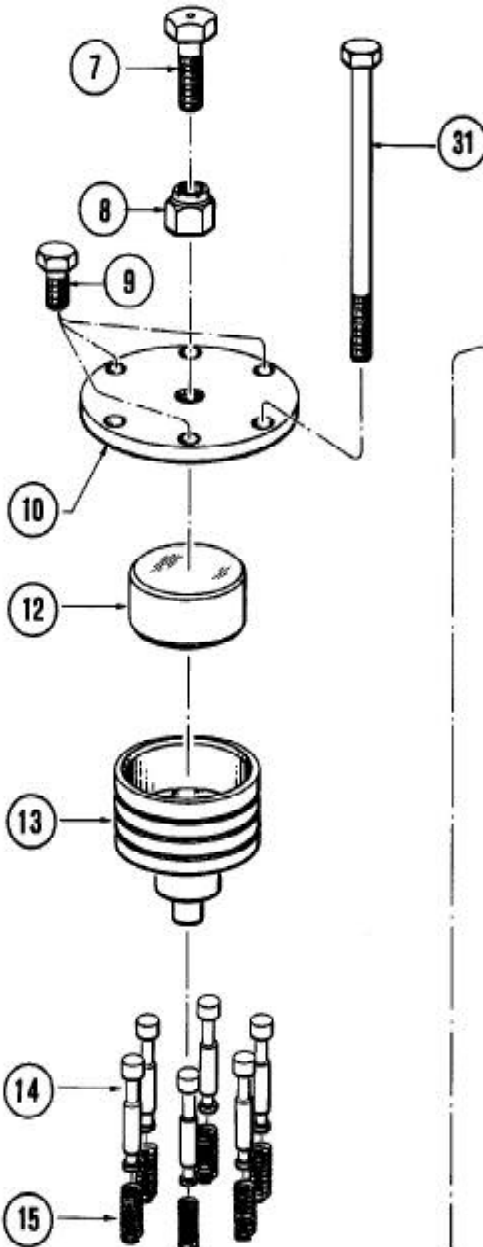
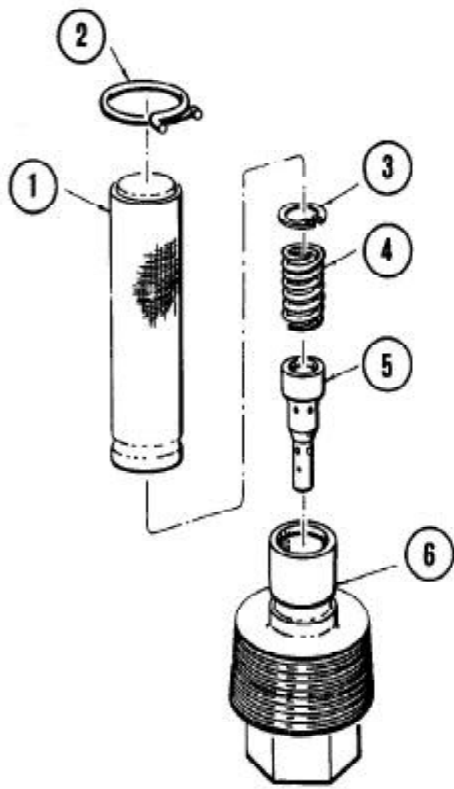


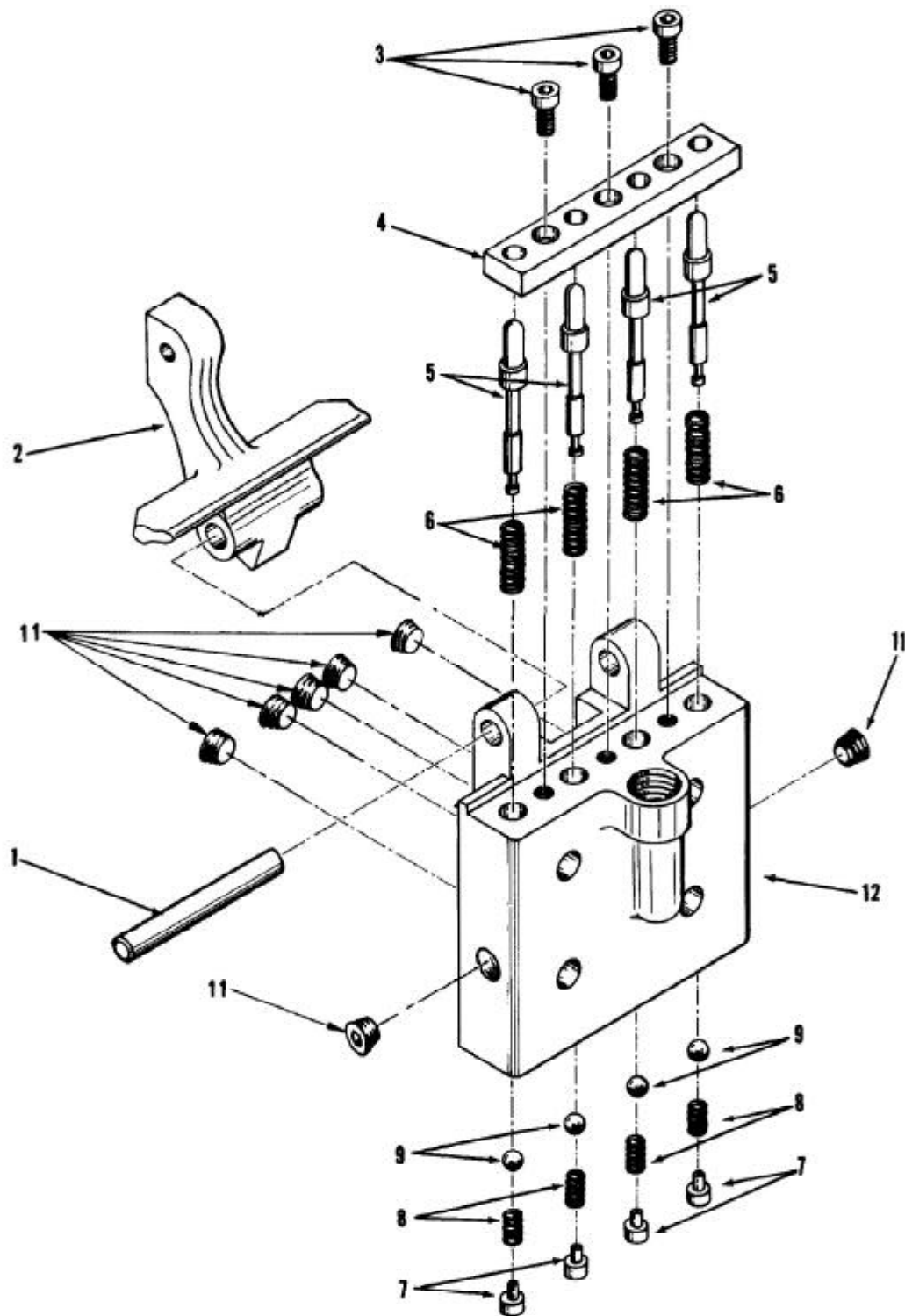
FIG. 39

LUBRICATION SYSTEM
 DE-30B/20B, DE-50B & DE-70B50B



X PARTS IDENTIFICATION

I. CAM OPERATED LUBE PUMP FOR DE-30B

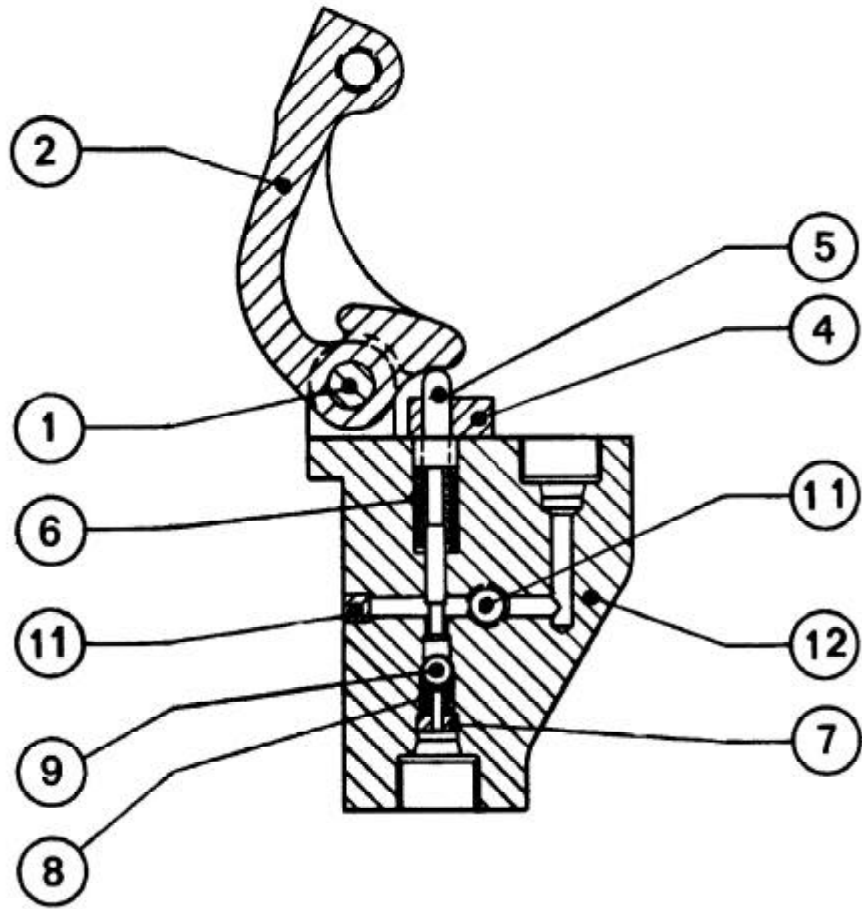


EXPLODED VIEW OF CAM OPERATED LUBE PUMP

FIG. 40

I. DE-30B - CAM OPERATED LUBRICATING PUMP ASSEMBLY

ITEM NO.	PART NO.		DESCRIPTION	QTY. REQ'D.
1	2	015 23 06	Cam Axle	1
2	3	015 23 02	Cam	1
3	0	919 00 17	10-32 x 1/2 Soc. Hd. Cap Screw	3
4	2	015 23 05	Keeper Plate	1
5	2	015 23 03	Plunger	4
6	2	015 23 04	Spring - Plunger	4
7	2	015 23 07	Check Valve Body	4
8	1	010 23 07	Spring - Check Valve	4
9	0	937 00 02	Ball, 9/32 D.	4
11	0	930 00 57	Pipe Plug, 1/8 C'Sunk	7
12	3	015 23 01	Body	1



X. PARTS IDENTIFICATION

J. FUEL PUMP ASSEMBLY

J. #40101702 FOR DE-30B/20B, #40101705 FOR DE-50B, AND
#40101704 FOR DE-70B/50B FUEL PUMP ASSEMBLY

ITEM NO.	PART NO.		DESCRIPTION	QUAN. REQ'D.
1	1	010 17 08	Cam Axle	1
2	3	010 17 07	Cam	1
3	1	010 17 34	Control Cable	1
4	0	901 04 04	Screw	4
5	1	010 17 31	Lock Plate	2
6	1	010 17 09	Wear Cap	1
7	1	010 17 11	Top Nut	1
8	4	010 17 10	Push Rod	1
9	0	924 00 08	Dowel Pin	2
10	4	010 17 17	DE-30B Cylinder Piston Set	As Req'd.
10	4	010 17 20	DE-50B Cylinder Piston Set	As Req'd.
10	4	010 17 19	DE-70B Cylinder Piston Set	As Req'd.
11	1	010 17 13	Main Spring	1
12	1	010 17 12	Sleeve	1
13	1	010 17 21	Top Cylinder Gasket	1
14	0	913 00 28	"O" Ring	1
15	1	010 17 22	Bottom Cylinder Gasket	1
16	2	010 17 32	Adapter Bolt	2
17	3	010 17 33	Adapter Fitting	2
18	0	901 05 08	Screw	1
19	0	902 00 02	Washer	1
20	2	010 17 30	Throttle Arm	1
21	0	921 00 08	Retaining Ring	1
22	1	010 17 29	Throttle Shaft	1
23	1	010 17 27	Packing Gland Nut	1
24	0	902 05 10	Washer	1
25	1	010 17 28	Throttle Packing	1
26	1	010 17 26	Check Valve Nut	1
27	1	010 17 25	Check Valve Spring	1
28	1	010 17 23	Check Valve Tip	1
29	1	010 17 24	Check Spring Sleeve	1
30	5	010 17 06	Body	1

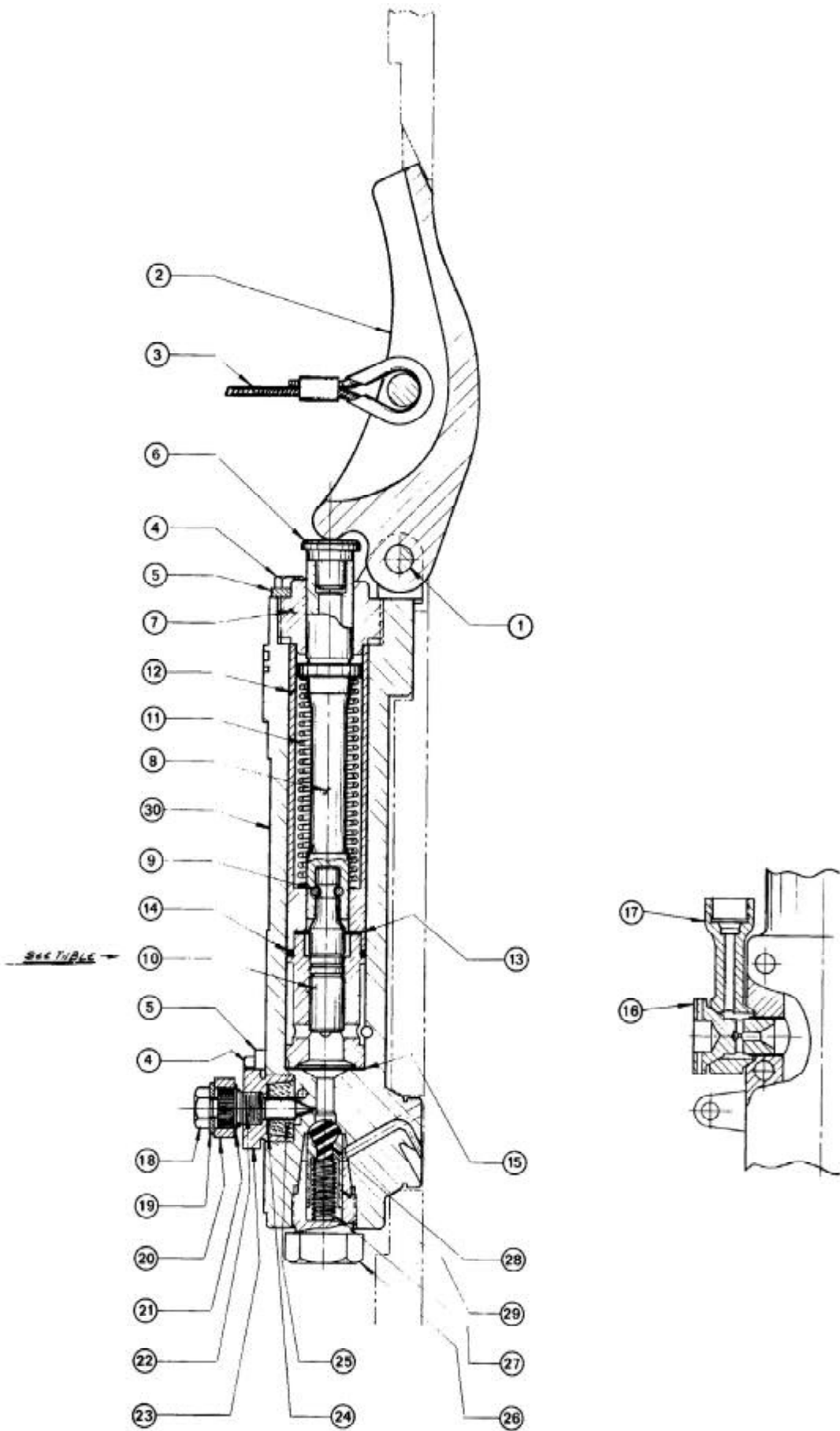
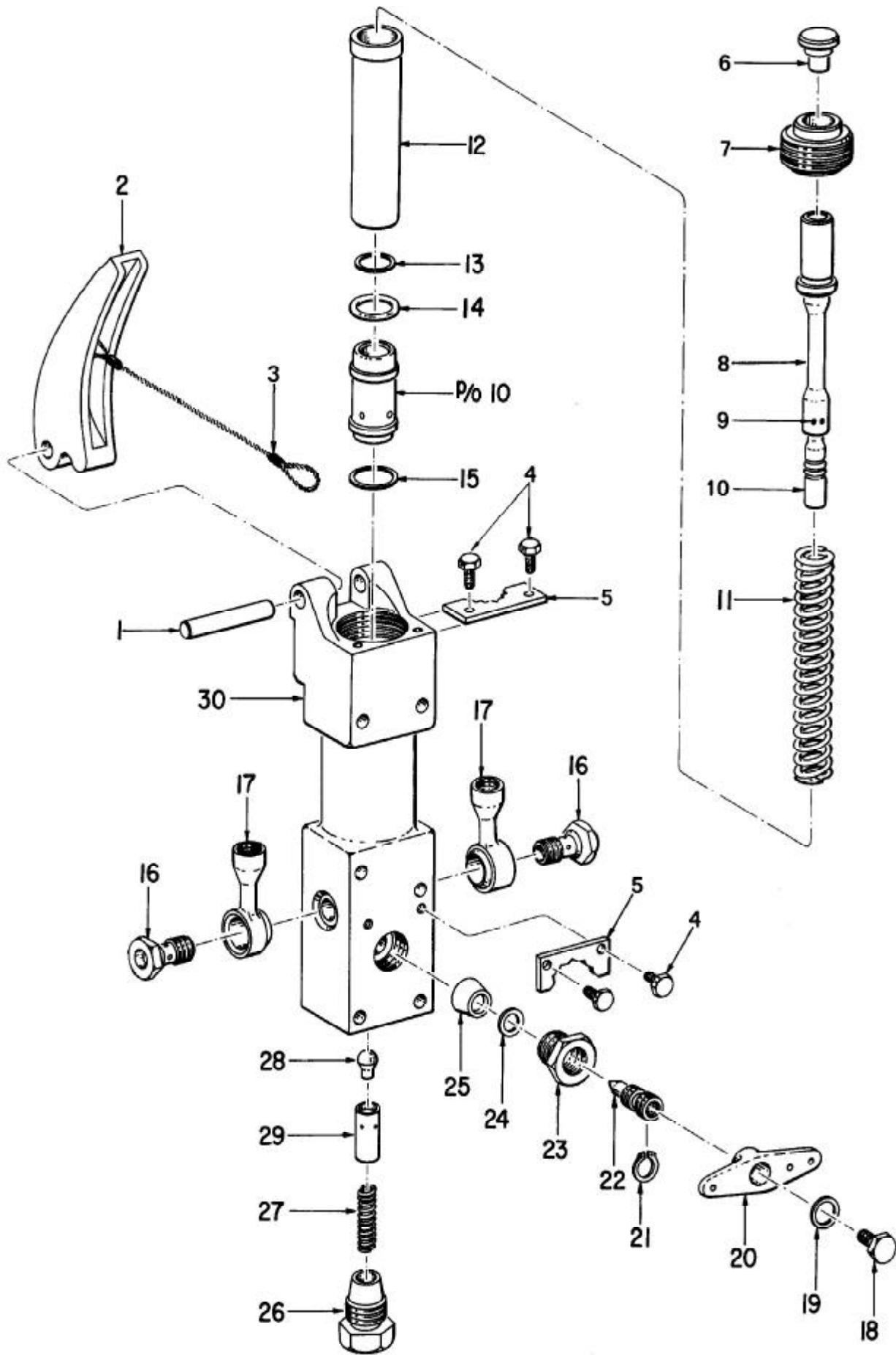


FIG. 41

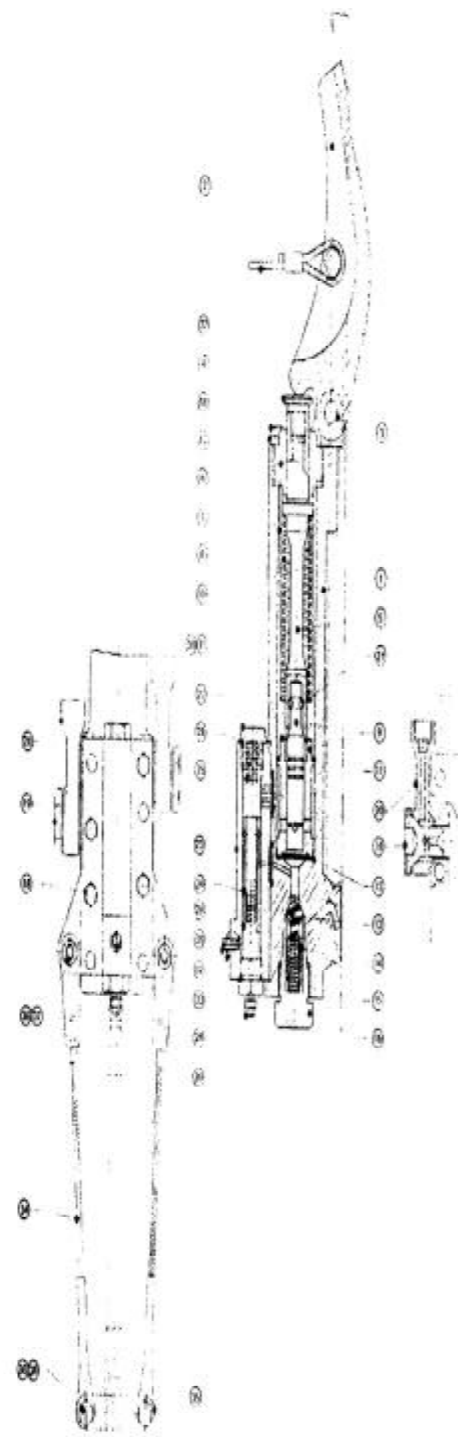
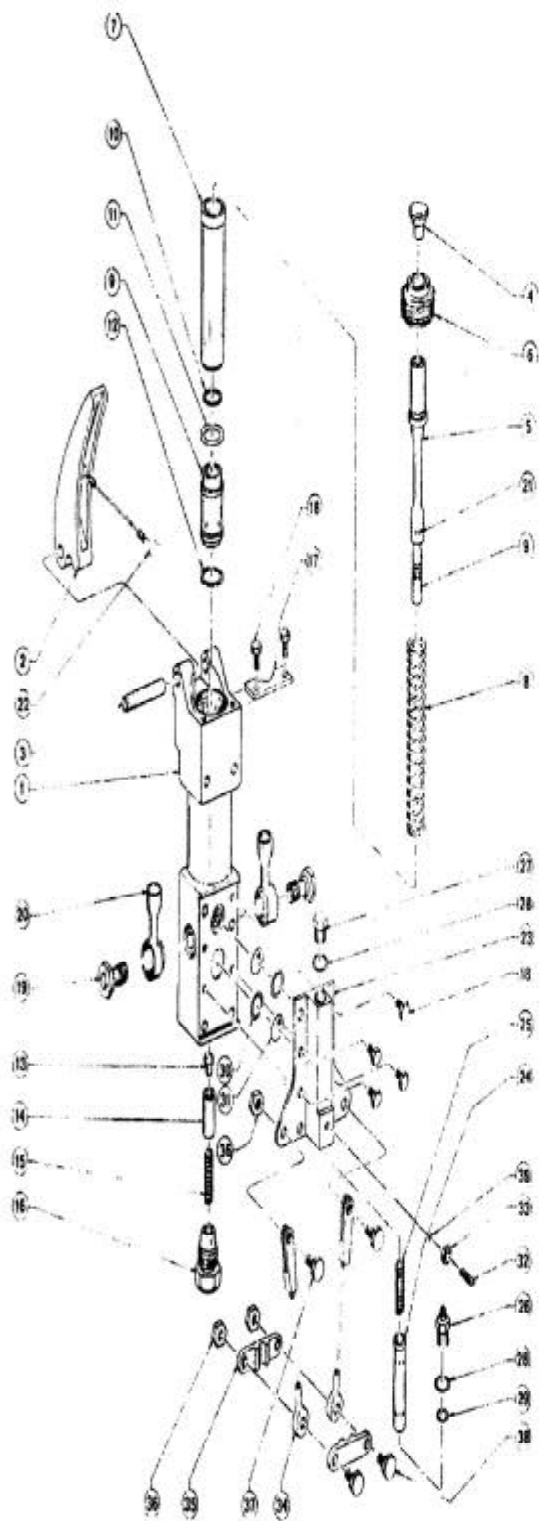


X. PARTS IDENTIFICATION

K. REMOTE CONTROL FUEL PUMP

K. #00960123 FOR DE-30B/20B, #00960130 FOR DE-50B AND
#00960125 FOR DE-70B/50B REMOTE CONTROL FUEL PUMP ASSEMBLY

ITEM NO.	PART NO.	DESCRIPTION	QUAN. REQ'D.
1	5 010 18 06	Body	1
2	3 010 17 07	Cam	1
3	1 010 17 08	Cam Axle	1
4	1 010 17 09	Wear Cap	1
5	4 010 17 10	Push Rod	1
6	1 010 17 11	Top Nut	1
7	1 010 17 12	Sleeve	1
8	1 010 17 13	Main Spring	1
9	4 010 17 17	Cylinder Piston Set DE-30B	As Req'd.
9	4 010 17 20	Cylinder Piston Set DE-50B	As Req'd.
9	4 010 17 19	Cylinder Piston Set DE-70B	As Req'd.
10	1 010 17 21	Top Cylinder Gasket	1
11	0 913 00 28	O-Ring - AN6227B-24	1
12	1 010 17 22	Bottom Cylinder Gasket	1
13	1 010 17 23	Check Valve Tip	1
14	1 010 17 24	Check Spring Sleeve	1
15	1 010 17 25	Check Valve Spring	1
16	1 010 17 26	Check Valve Nut	1
17	1 010 17 31	Lock Plate	1
18	0 901 04 04	5/16-24 x 1/2 Hex Hd.Cap Scr.	6
19	2 010 17 32	Adapter Bolt	2
20	3 010 17 33	Adapter Fitting	2
21	0 924 00 08	Dowel Pin, 3/16 D. x 1/2	2
22	1 010 17 34	Control Cable	1
23	3 010 18 35	Housing	1
24	3 010 18 36	Plunger	1
25	2 010 18 37	Spring	1
26	2 010 18 38	Adapter Fitting	1
27	2 010 18 39	Hex Head Plug	1
28	0 913 00 31	O-Ring MS28778-10	2
29	0 913 00 32	Parker "U" Seal	1
30	0 913 00 33	Parker O-Ring 2-20	2
31	2 010 18 40	Plunger Screen	2
32	2 010 18 41	Bleed Valve	1
33	0 920 00 07	Elastic Stop Nut 21NTE-040	1
34	2 010 18 42	Wire Rope Assembly	2
35	2 010 18 43	Hose Clamp	1
36	0 920 00 08	Elastic Stop Nut 42NE-058	4
37	0 901 04 11	5/16-18 x 1 Hex Head Cap Scr.	2
38	0 901 04 15	5/16-18 x 1 1/2 Hex Hd. Cap Scr.	2
39	1 010 18 44	Drain Valve Seat	1



REMOVE CONTROL FUEL PUMP

FIG. 42

X. PARTS IDENTIFICATION

1. REMOTE CONTROL TRANSMITTER ASSEMBLY

REMOTE CONTROL TRANSMITTER AND HOSE ASSEMBLY

1 096 0147

ITEM NO.	PART NO.		DESCRIPTION	QTY. REQ'D.
3	0	927 00 07	Coupling - Aeroquip 5100-4B	1
4	2	010 31 06	Control Hose - 25 Ft.	4
5	0	931 03 18	Link-Belt Transmitter Assembly	1
6	0	930 04 56	Bushing	1
7	0	930 00 85	Nipple	1
8	0	923 00 47	Cross	1
9	0	931 00 46	Pressure Gauge	1
10	0	923 00 45	Air Vent	1
12	0	927 00 35	Coupling - Aeroquip 5111-4	3

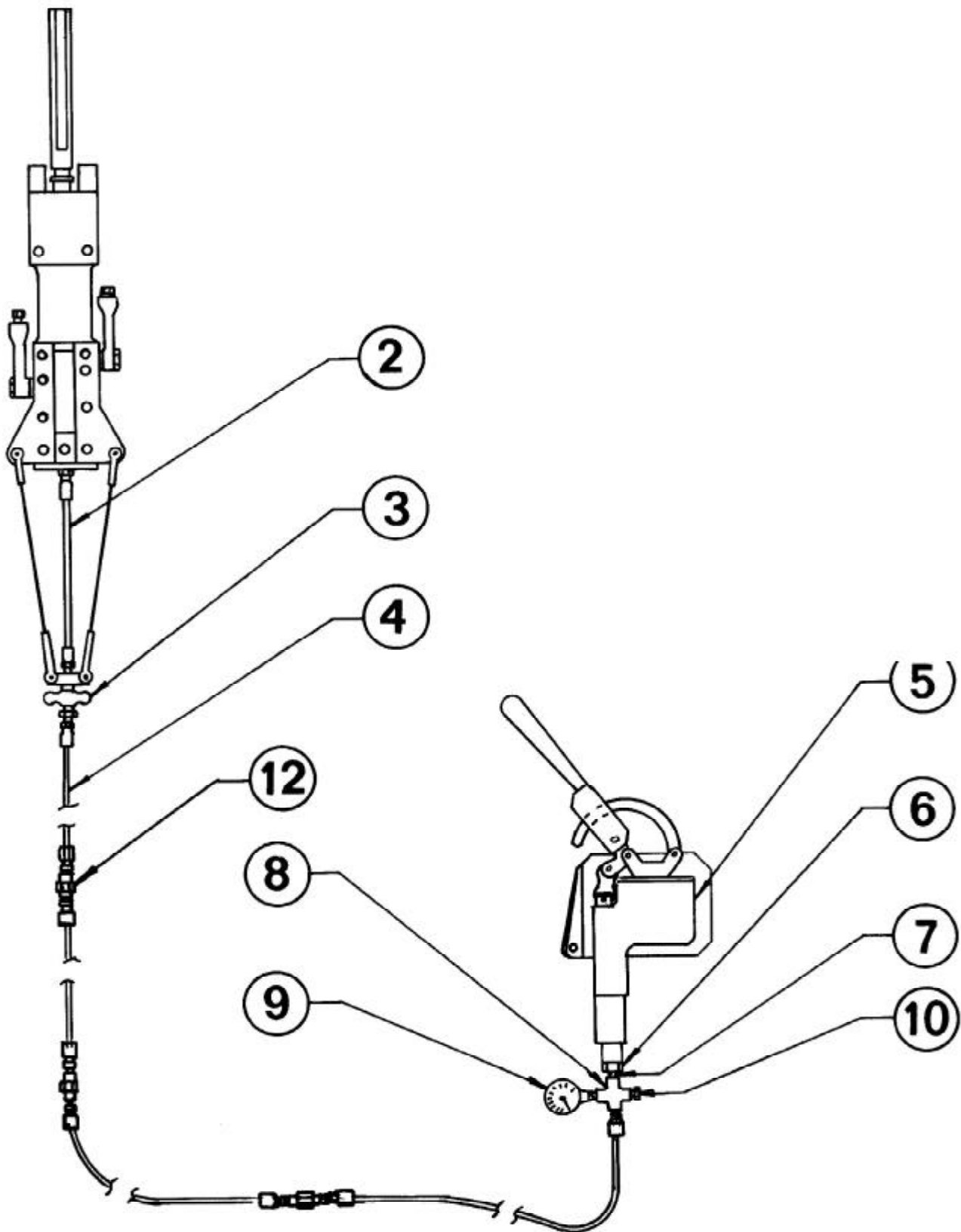
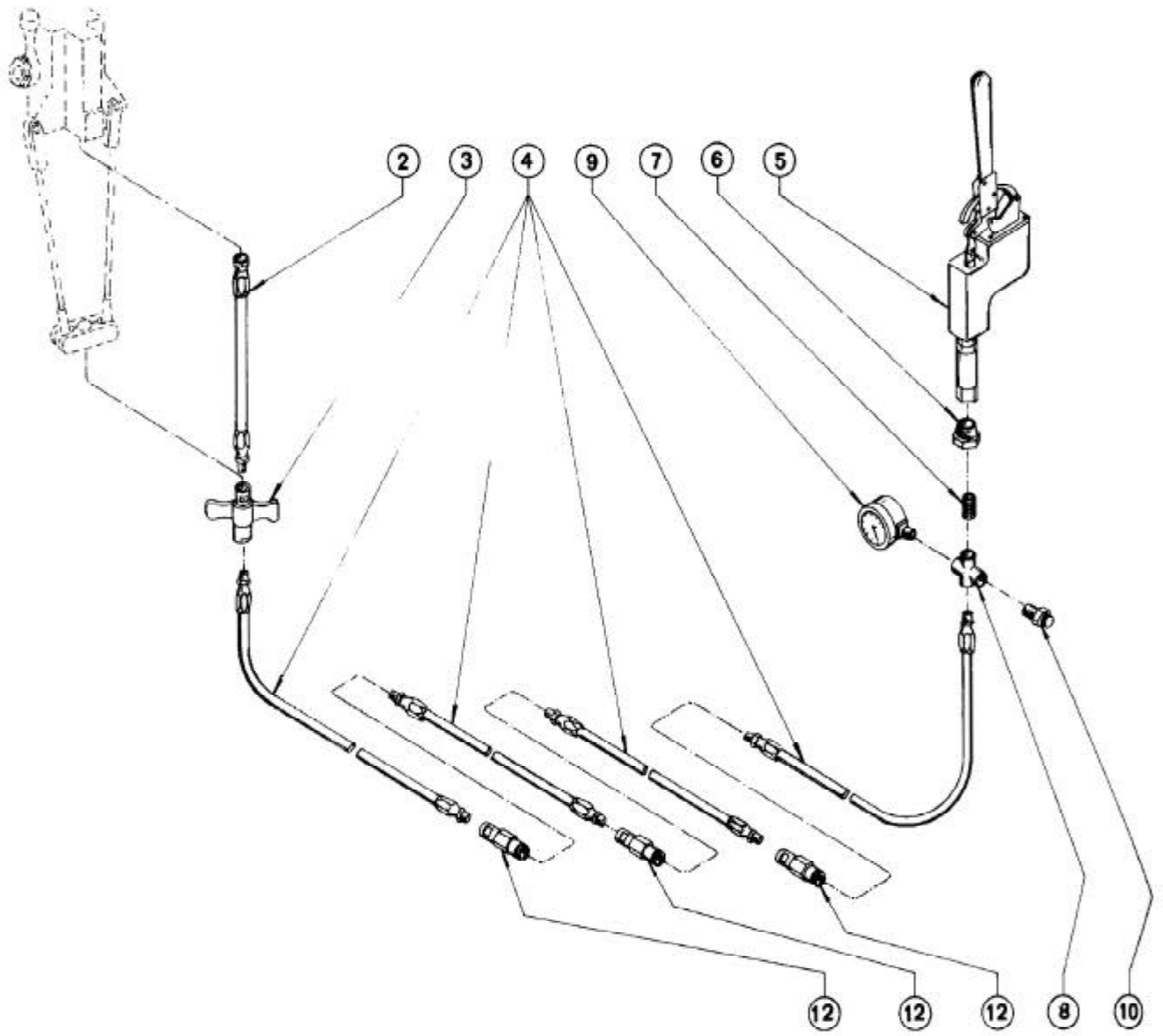
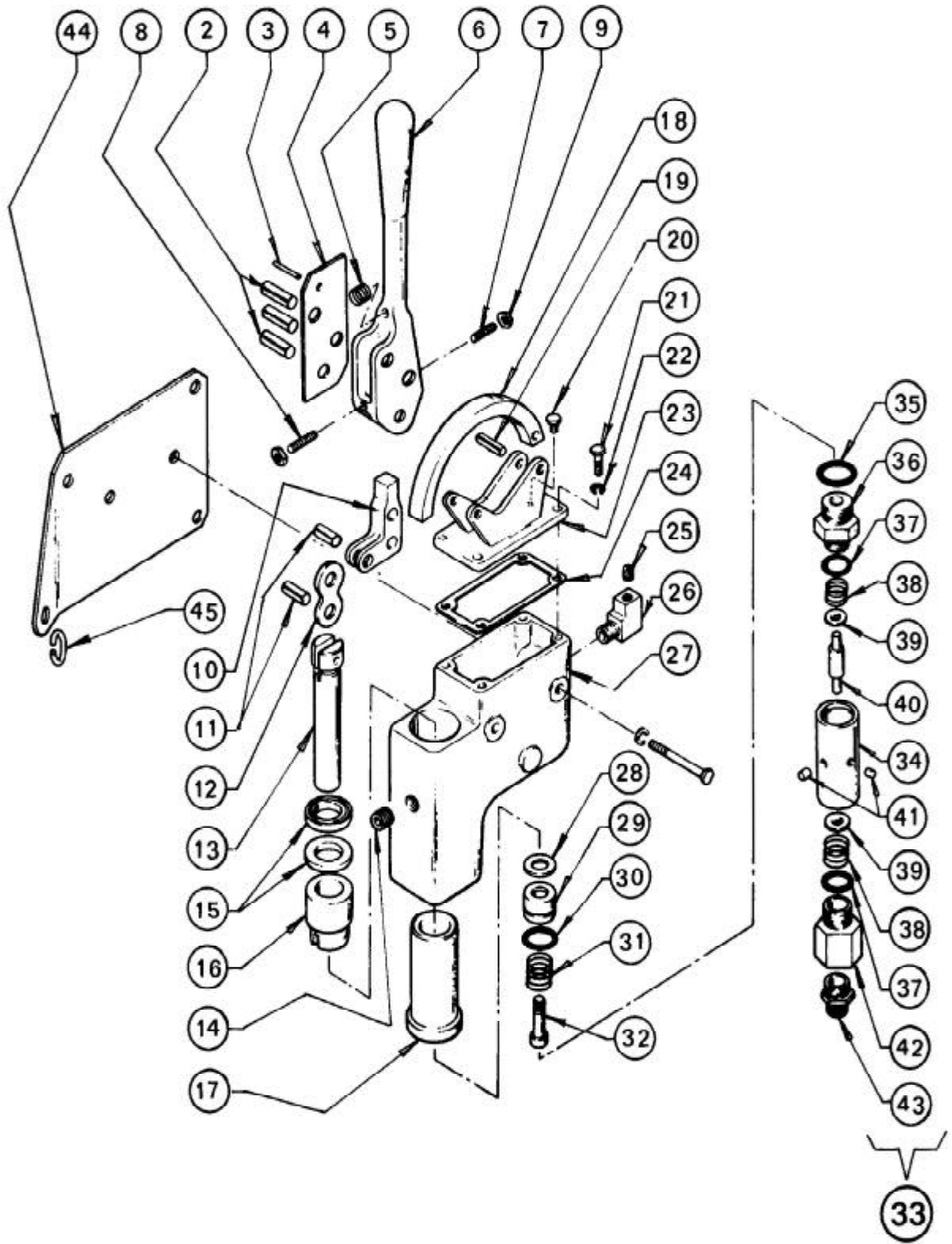


FIG. 43



LINK-BELT TRANSMITTER ASSEMBLY
WITH DOUBLE RELIEF VALVE
REF: S2087-B

ITEM NO.	PART NO.	DESCRIPTION	QTY. REQ'D.
1	13J45	Transmitter Assembly	1
2	1X2437	Rollpin	3
3	1X2346	Rollpin	1
4	5Z916	Lock, Lever	2
5	1H174	Spring	1
6	5Z1040	Lever	1
7	1X2345	Screw, Set, 1/4" x 3/4"	1
8	1X2381	Screw, Set, 1/4" x 1"	1
9	1X180	Nut, Jam	2
10	5Z1039	Lever	1
11	1X1965	Rollpin	2
12	5Z520	Bar, Side	1
13	13J48	Piston	1
14	1X823	Plug, Pipe	1
15	1X2527	Seal	2
16	*	Liner	1
17	*	Liner	1
18	5Z1209	Quadrant	1
19	1X2413	Rollpin	2
20	5Z911	Cover, Oil	1
21	1X512	Capscrew, 1/4" x 3/4" NC	4
22	1X26	Lockwasher, 1/4"	4
23	13J49	Plate, Cover	1
24	5Z550	Gasket	1
25	1X824	Plug, Pipe	1
26	JR895	Elbow	1
27	*	Body	1
28	5Z1376	Washer	1
29	5Z759	Piston	1
30	JU23	"O" Ring	1
31	1H174	Spring	1
32	1X2242	Bolt	1
33	13J50	Valve Assembly	1
34	*	Body Assembly	1
35	JM2599	"O" Ring	1
36	5Z990	Cap	1
37	5Z556	"O" Ring	2
38	5Z555	Spring	2
39	1X1776	Washer	2
40	*	Piston	1
41	5Z795	Dowel	2
42	5Z835	Cap	1
43	1X1151	Connector	1



X. PARTS IDENTIFICATION

M. TRIP MECHANISM ASSEMBLY FOR DE-50B

N. TRIP MECHANISM ASSEMBLY FOR DE-30B/20B

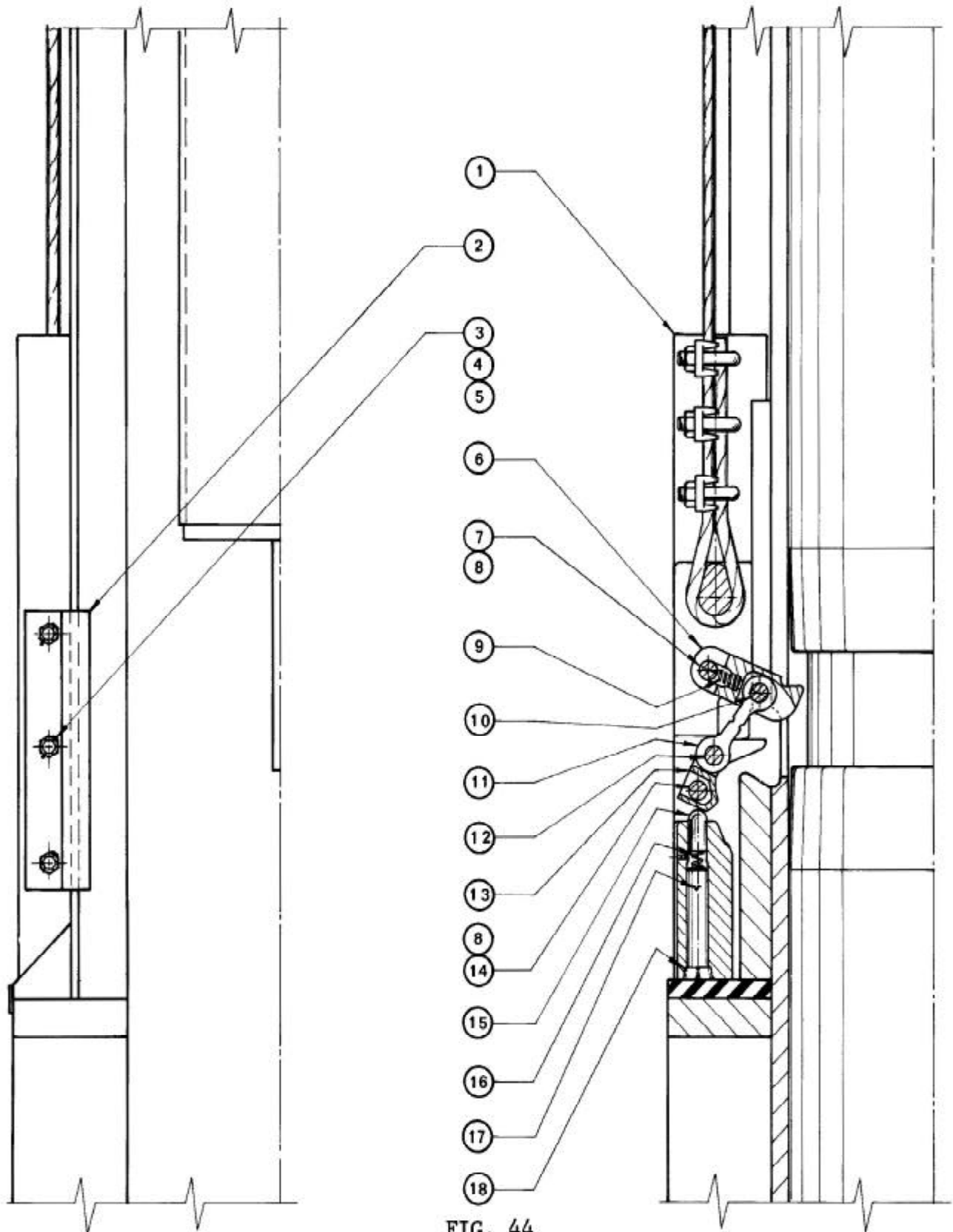


FIG. 44

M. DE-50B - TRIP MECHANISM ASSEMBLY

ITEM NO.	PART NO.		DESCRIPTION	QTY. REQ'D.
1	5	050 50 01	Trip Block Body	1
2	2	033 13 05	Trip Guides	2
3	1	031 13 16	Stud	6
4	0	900 20 17	Nut 5/8-11 Slotted Hex	6
5	0	904 00 24	Cotter Pin 1/8 x 1 3/4 Long	6
6	3	020 13 06	Lifting Hook	1
7	2	020 13 11	Safety Pivot Pin	1
8	0	913 00 30	"O" Ring AN62278-17	4
9	1	020 13 12	Spring (Lifting Hook)	1
10	1	020 13 09	Lifting Hook Pin	1
11	2	020 13 05	Link	1
12	1	020 13 08	Trip Lever Pin	1
13	3	020 13 07	Trip Lever	1
14	2	020 13 10	Pivot Pin	1
15	1	020 13 13	Spring Cap	1
16	1	020 13 15	Spring Trip Lever	1
17	2	035 13 16	Rod	1
18	1	020 13 14	Plug	1

N. DE-30B/20B - TRIP MECHANISM ASSEMBLY

ITEM NO.	PART NO.		DESCRIPTION	QTY. REQ'D.
1	6	031 13 03	Trip Block Body	1
2	2	033 13 05	Trip Guides	2
3	1	031 13 16	Stud	6
4	0	900 20 17	Hex Slotted Nut 5/8-11	6
5	0	904 00 24	Cotter Pin 1/8 x 1 3/4 Lg.	6
6	3	020 13 06	Lifting Hook	1
7	2	020 13 11	Safety Pivot Pin	1
8	0	913 00 30	"O" Ring AN 62278-17	4
9	1	020 13 12	Spring (Lifting Hook)	1
10	1	020 13 09	Lifting Hook Pin	1
11	2	020 13 05	Link	1
12	1	020 13 08	Trip Lever Pin	1
13	3	020 13 07	Trip Lever	1
14	2	020 13 10	Pivot Pin	1
15	1	020 13 13	Spring Cap	1
16	1	020 13 15	Spring Trip Lever	1
18	1	020 13 14	Plug	1

X. PARTS IDENTIFICATION

O. TRIP MECHANISM ASSEMBLY FOR DE-70B/50B

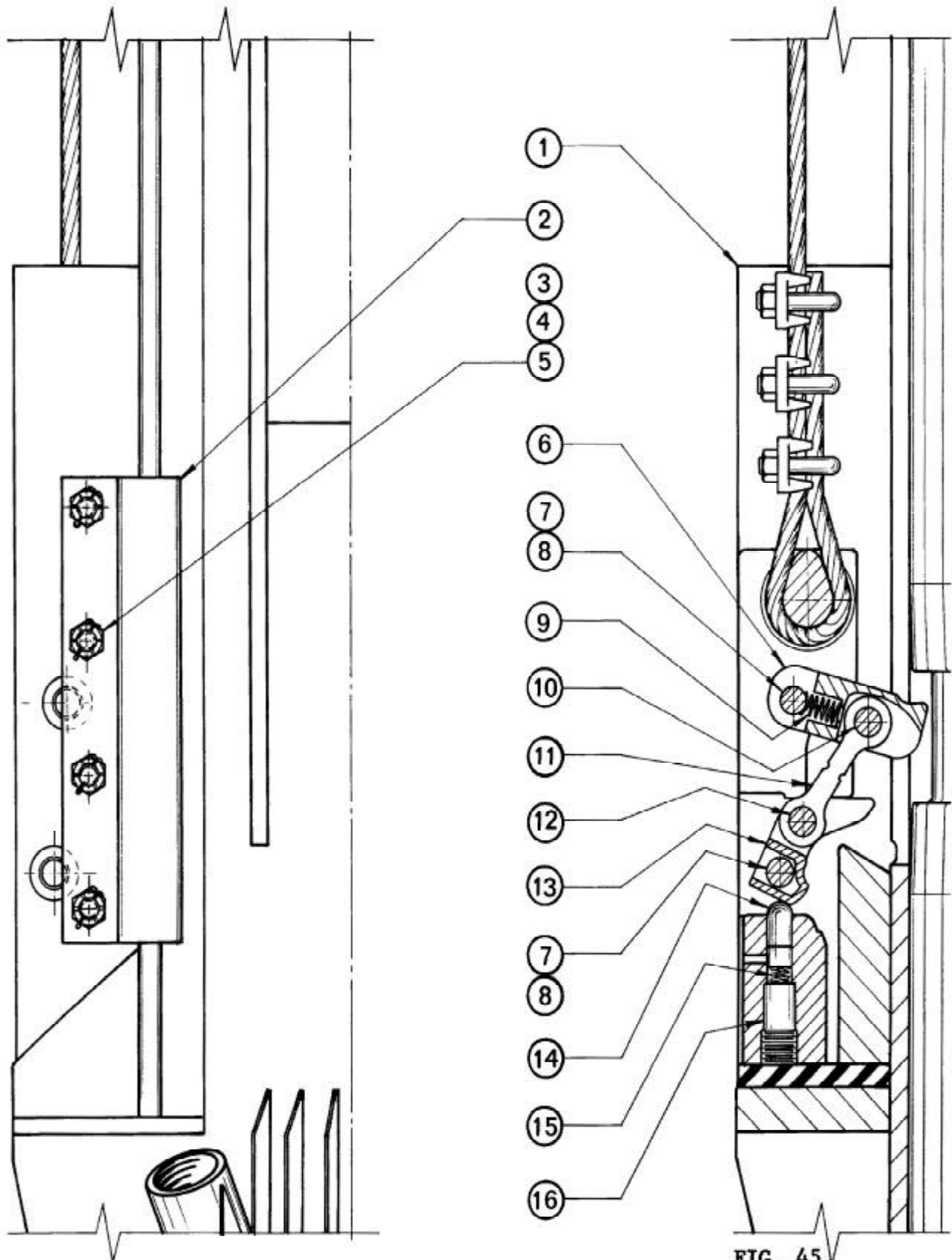


FIG. 45

0. DE-70B/50B - TRIP MECHANISM ASSEMBLY

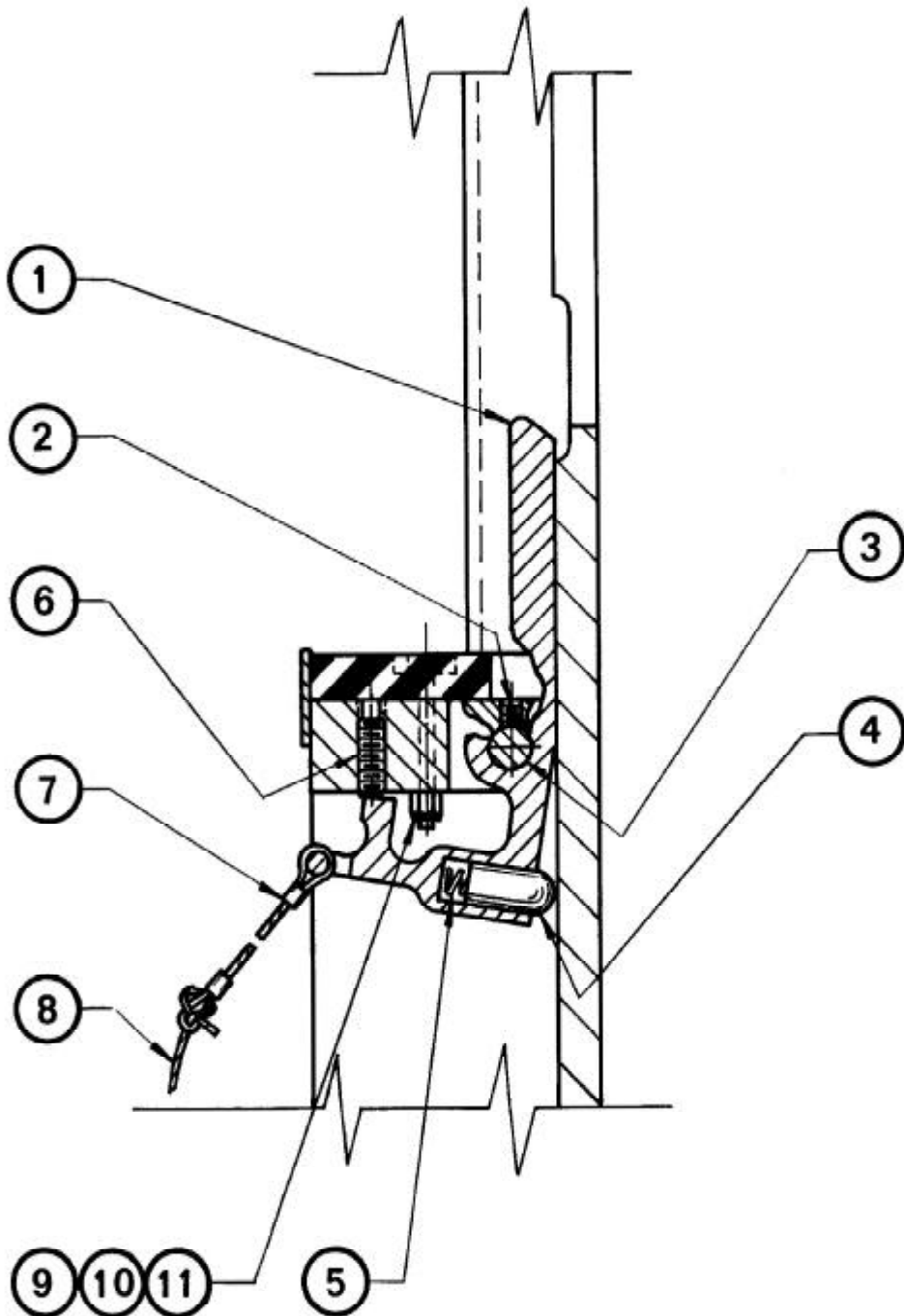
ITEM NO.	PART NO.		DESCRIPTION	QTY. REQ'D.
1	5	070 13 01	Trip Block Body	1
2	2	070 13 02	Trip Guide	2
3	1	620 05 01	Valve Cover Stud	8
4	0	900 20 23	Hex Slotted Nut 1"-8	8
5	0	904 00 03	Cotter Pin 5/32 x 2" Lg.	8
6	3	055 13 07	Lifting Hook	1
7	2	055 13 11	Pivot Pin	2
8	0	913 00 34	"O" Ring	4
9	2	055 13 12	Spring - Lifting Hook	1
10	2	055 13 10	Lifting Hook Pin	1
11	2	096 01 12	Link	1
12	2	055 13 09	Trip Lever Pin	1
13	4	055 13 08	Trip Lever	1
14	2	055 13 04	Spring Cap	1
15	0	940 00 04	Spring	1
16	2	055 13 05	Plug	1

X. PARTS IDENTIFICATION

P. TRIP SAFETY MECHANISM

P. DE-30B/20B, DE-50, DE-70B/50B - TRIP SAFETY MECHANISM

ITEM NO.	PART NO.	DESCRIPTION	QTY. REQ'D.
1	3 099 06 10	Trip Stop - DE-30/20B	1
		or	
1	4 051 50 01	Trip Stop - DE-50B	1
		or	
1	4 071 50 01	Trip Stop - DE-70/50B	1
2	0 943 01 15	5/8-18 x 5/8 Lg. Set Screw	1
3	2 099 02 23	Pin	1
4	1 020 13 13	Spring Cap Socket	1
5	1 020 13 15	Spring	1
6	1 099 02 98	Set Screw	1
7	1 010 17 34	Control Cable	1
8	0 938 00 11	Manila Rope, 3/8 D.	1
9	0 901 27 29	1/2-13 x 3 1/2 Lg. Hex Hd. Bolt	2
10	0 902 00 03	1/2 Std. Flat Washer	2
11	0 920 00 17	1/2-13 ESNA Hex Nut #21NE-083	2



DE-30B

TRIP SAFETY MECHANISM

FIG. 46

XI. APPENDIX

A. #0324200 - SPARE PARTS AND TOOL KIT -
FOR DE-30/20B DIESEL PILE HAMMER

The contents below have been selected to support a hammer for 12 months in normal operation.

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QTY.</u>
<u>SPARE PARTS</u>		
901 0538	Lube Pump Mounting Screw (3/Pkg.)	1 Pkg.
020 2300	Lube Pump Assembly	1
030 0300	Compression Ring	10
031 0600	Vibration Dampener	1
943 0226	Bucket Tooth Bolt	12
020 1315	Spring, Trip Mechanism (2/Pkg.)	1 Pkg.
913 0030	"0" Ring, Trip Mechanism (4/Pkg.)	1 Pkg.
020 1305	Safety Link, Trip Mechanism (6/Pkg.)	1 Pkg.
020 1200	Cushion Block	1
920 0028	Nut, Bucket Tooth Bolt	12
010 1721	Top Cylinder Gasket, Fuel Pump (2/Pkg.)	1 Pkg.
010 1722	Bottom Cylinder Gasket, Fuel Pump (2/Pkg.)	1 Pkg.
010 1723	Check Valve Tip, Fuel Pump (4/Pkg.)	1 Pkg.
010 1901	Mounting Stud, Fuel Pump (2/Pkg.)	1 Pkg.
920 0005	Nut, Fuel Pump Mounting Stud (6/Pkg.)	2 Pkg.
010 1707	Cam	1
010 1709	Wear Cap	1
010 3300	Check Valve Assembly	1
010 1728	Throttle Packing (2/Pkg.)	1 Pkg.
010 2303	Plunger (6/Pkg.)	1 Pkg.
010 3400	Teflon Tube Nut (4/Pkg.)	2 Pkg.
010 3500	Teflon Tube Ferrule (4/Pkg.)	2 Pkg.
010 3600	Teflon Tube Insert (4/Pkg.)	2 Pkg.
929 0011	Teflon Tubing, Wire Braided	25 FT.
010 1702	Standard Fuel Pump Assembly	1
010 1802	Remote Control Fuel Pump Assembly	1
010 2306	Plunger Spring (6/Pkg.)	1 Pkg.
010 2305	Check Valve Body (6/Pkg.)	1 Pkg.
010 2307	Check Valve Spring (6/Pkg.)	1 Pkg.
937 0002	Steel Ball (6/Pkg.)	1 Pkg.
913 0023	"0" Ring (4/Pkg.)	1 Pkg.
010 1732	Adapter Bolt (2/Pkg.)	1 Pkg.
010 1733	Adapter Fitting (2/Pkg.)	1 Pkg.
020 2400	Gasket, Lube Pump	1
<u>TOOLS</u>		
928 0038	1 1/2" Socket - 3/4" Drive (Snap-On #GLDH-482)	1
928 0014	Sliding Tee Handle w/3/4" Drive (Snap-On #GL-52BH)	1
928 0011	1 1/4" Box & Open End Wrench (Snap-On #GOEX-40)	1
932 0001	1" Eye Bolt	1
096 0143	Catch Lip Ring (For Removing Ram)	1
928 0013	3/4" Single End Flare Nut Wrench (Snap-On #RX-24)	1

XI. APPENDIX

B. #0514200 - SPARE PARTS & TOOL KIT -
FOR DE-50B DIESEL PILE HAMMER

The contents below have been selected to support a hammer for 12 months in normal operation.

PART NO.	DESCRIPTION	QTY.
020 2300	Lube Pump Assembly	1
055 0300	Compression Ring	10
055 0600	Vibration Dampener	1
943 0225	Bucket Tooth Bolt	18
920 0027	Nut, Flexloc 1 1/8-7	18
020 1315	Spring, Trip Mechanism (2/Pkg.)	1 Pkg.
913 0030	"O" Ring, Trip Mechanism (4/Pkg.)	1 Pkg.
020 1305	Safety Link, Trip Mechanism (6/Pkg.)	1 Pkg.
040 1200	Plastic Cushion Block	1
010 1721	Top Cylinder Gasket, Fuel Pump (2/Pkg.)	1 Pkg.
010 1722	Bottom Cylinder Gasket, Fuel Pump (2/Pkg.)	1 Pkg.
010 1723	Check Valve Tip, Fuel Pump (4/Pkg.)	1 Pkg.
010 1901	Mounting Stud, Fuel Pump (2/Pkg.)	1 Pkg.
920 0005	Nut, Fuel Pump Mounting Stud (6/Pkg.)	2 Pkg.
010 1707	Cam	1
010 1709	Wear Cap	1
010 3300	Check Valve Assembly	1
010 1728	Throttle Packing (2/Pkg.)	1 Pkg.
010 2303	Plunger (6/Pkg.)	1 Pkg.
010 3400	Teflon Tube Nut (4/Pkg.)	2 Pkg.
010 3500	Teflon Tube Ferrule (4/Pkg.)	2 Pkg.
010 3600	Teflon Tube Insert (4/Pkg.)	2 Pkg.
929 0011	Teflon Tubing, Wire Braided	25 FT.
010 1705	Standard Fuel Pump Assembly	1
010 1805	Remote Control Fuel Pump Assembly	1
020 2400	Gasket, Lube Pump	1
901 0538	Lubricator Pump, Mounting Screw (3/Pkg.)	1 Pkg.
010 2306	Plunger Spring (6/Pkg.)	1 Pkg.
010 2307	Check Valve Spring (6/Pkg.)	1 Pkg.
010 2305	Check Valve Body (6/Pkg.)	1 Pkg.
937 0002	Steel Ball (6/Pkg.)	1 Pkg.
913 0028	"O" Ring (4/Pkg.)	1 Pkg.
010 1732	Adapter Bolt (2/Pkg.)	1 Pkg.
010 1733	Adapter Fitting (2/Pkg.)	1 Pkg.
<u>TOOLS</u>		
928 0013	3/4" Single End Flare Nut Wrench (Snap-On #RX-24)	1
928 0014	Sliding Tee Handle w/3/4" Drive (Snap-On #GL-52BH)	1
928 0040	1 13/16" Socket, 3/4" Drive (Snap-On #GLDH-582)	1
070 4001	Extracting Tool, Thrust Bearing	2
932 0003	1 1/2" Dia. Eye Bolt (Williams #14)	1
928 0011	1 1/4" Box & Open End Wrench (Snap-On #GOEX-40)	1

XI. APPENDIX

C. #0714200 - SPARE PARTS & TOOL KIT -
FOR DE-70/50B DIESEL PILE HAMMER

The contents below have been selected to support a hammer for 12 months in normal operation.

PART NO.	DESCRIPTION	QTY.
<u>SPARE PARTS</u>		
010 2303	Plunger (6/Pkg.)	1 Pkg.
020 2300	Lube Pump	1
055 0300	Compression Ring	10
055 0600	Vibration Dampener	1
943 0225	Bucket Tooth Bolt	18
920 0027	Nut, Flexloc 1 1/8-7	18
940 0004	Spring, Trip Mechanism (2/Pkg.)	1 Pkg.
913 0034	"O" Ring, Trip Mechanism (4/Pkg.)	1 Pkg.
096 0112	Safety Link, Trip Mechanism (4/Pkg.)	2 Pkg.
040 1200	Cushion Block	1
010 1721	Top Cylinder Gasket, Fuel Pump (2/Pkg.)	1 Pkg.
010 1722	Bottom Cylinder Gasket, Fuel Pump (2/Pkg.)	1 Pkg.
010 1723	Check Valve Tip, Fuel Pump (4/Pkg.)	1 Pkg.
010 1901	Mounting Stud, Fuel Pump (2/Pkg.)	1 Pkg.
920 0005	Nut, Fuel Pump Mounting Stud (6/Pkg.)	2 Pkg.
010 1707	Cam	1
010 1709	Wear Cap	1
010 3300	Check Valve Assembly	1
010 1728	Throttle Packing (2/Pkg.)	1 Pkg.
010 3400	Teflon Tube Nut (4/Pkg.)	2 Pkg.
010 3500	Teflon Tube Ferrule (4/Pkg.)	2 Pkg.
010 3600	Teflon Tube Insert (4/Pkg.)	2 Pkg.
929 0011	Teflon Tubing, Wire Braided	25 FT.
010 1704	Standard Fuel Pump Assembly	1
010 1304	Remote Control Fuel Pump Assembly	1
020 2400	Gasket, Lube Pump	1
901 0538	Lubricator Pump, Mounting Screw (3/Pkg.)	1 Pkg.
010 2306	Plunger Spring (6/Pkg.)	1 Pkg.
010 2307	Check Valve Spring (6/Pkg.)	1 Pkg.
010 2305	Check Valve Body (6/Pkg.)	1 Pkg.
937 0002	Steel Ball (6/Pkg.)	1 Pkg.
913 0028	"O" Ring (4/Pkg.)	1 Pkg.
010 1732	Adapter Bolt (2/Pkg.)	1 Pkg.
010 1733	Adapter Fitting (2/Pkg.)	1 Pkg.
<u>TOOLS</u>		
928 0014	Sliding Tee Handle w/3/4" Drive (Snap-On #GL-52BH)	1
928 0040	1 13/16" Socket, 3/4" Drive (Snap-On #GLDH-582)	1
070 4001	Extracting Tool, Thrust Bearing	2
932 0003	1 1/2" Dia. Eye Bolt (Williams #14)	1
928 0011	1 1/4" Box & Open End Wrench (Snap-On #GOEX-40)	1
928 0013	3/4" Single End Flare Nut Wrench (Snap-On #RX-24)	1

XI. APPENDIX

A. USEFUL FORM OF THE "ENGINEERING NEWS" PILE BEARING LOAD FORMULA

The "Engineering News" formula is most commonly used in the U.S.A. to convert the dynamic energy delivered by a pile hammer to the static load which will be supported by a driven pile. Even when the Engineering News formula is not specifically specified, its use can be helpful in selecting the size of hammer which will most likely be applicable to a particular pile driving job.

$$R = \frac{2E}{(S + 0.1) 2000}$$

Since "R", the load (tons) to be supported by a specified pile is usually known; and "E", the energy (ft.lb.) for the hammer which will be used, is also known; generally a pile hammer user is interested in solving the Engineering News Formula for "S", the set of the pile, or its movement per blow in inches per blow. The Engineering News Formula, as stated in the following forms can then be more useful:

$$P_1 = \frac{12,000B}{E-100B}$$

where P_1 = The observed blows of the hammer per driven foot of pile.

B = The specified load bearing of the pile in tons.

E = The energy of the hammer used in foot-pounds.*

XI. APPENDIX

D. USEFUL FORM OF THE "ENGINEERING NEWS" PILE BEARING
LOAD FORMULA - Continued

$$\text{or } P_2 = \frac{6,000B}{E-100B}$$

where P_2 = The observed blows of the hammer
per driven 6 inches of pile.

$$\text{or } P_3 = \frac{3,000B}{E-100B}$$

where P_3 = The observed blows of the hammer
per driven 3 inches of pile.

$$\text{or } P_4 = \frac{1,000B}{E-100B}$$

where P_4 = The observed blows of the hammer
per driven 1 inch of pile.

The MKT "Pile Load Bearing Data Chart" can be useful in rapidly finding the solution of the last form of the equation.

*Note: For Single-Acting diesel hammers, $E = Wh$, where
 W = weight of the Ram of the hammer in pounds
and h = the stroke of the Ram in feet. Refer to
Pages 5, 6 and 7.

XI. APPENDIX

E.

NOISE TEST FOR MKT PILE HAMMER MODEL DE-30B

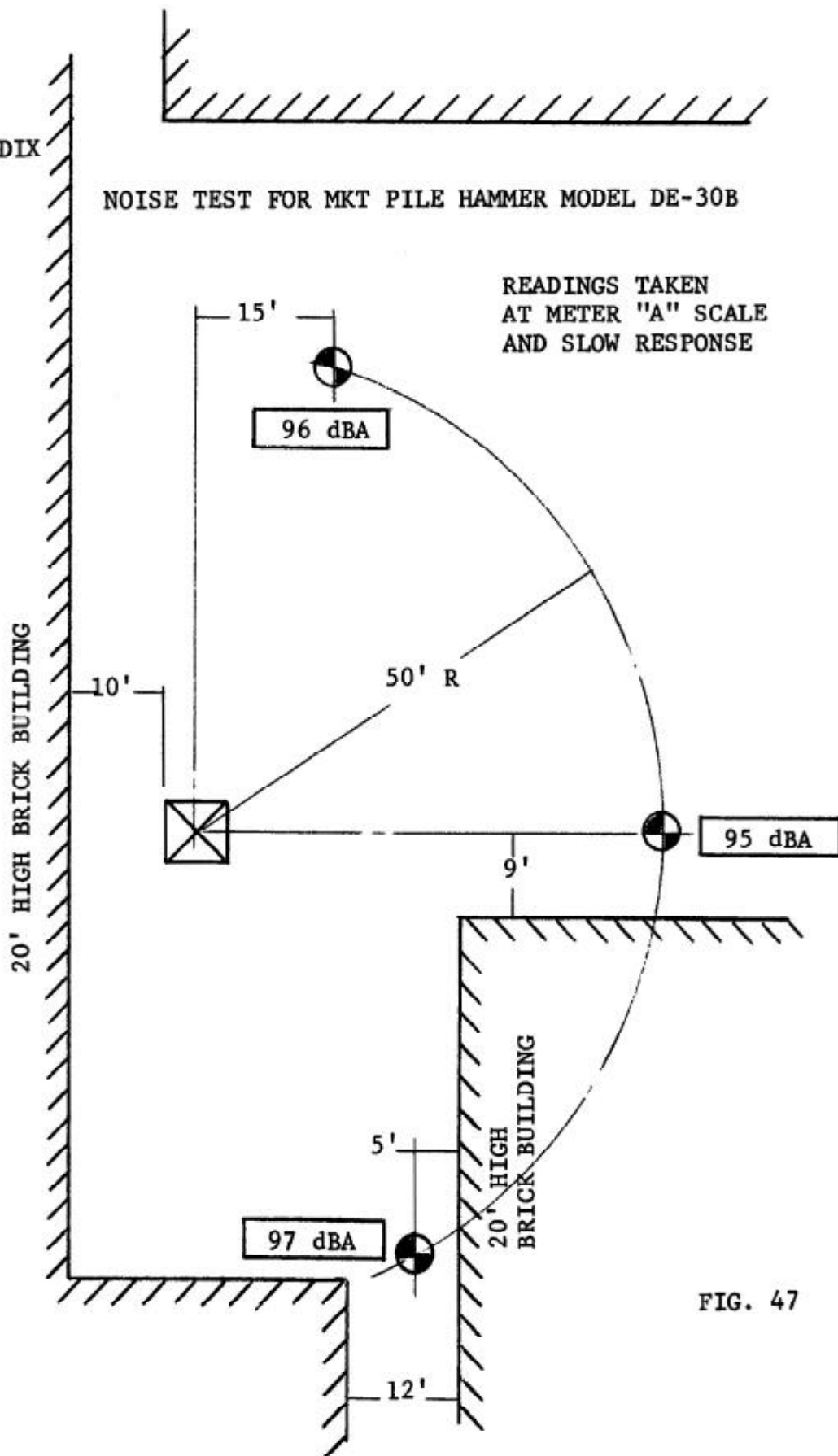


FIG. 47

NOTE:

CONDITIONS OF OUR TEST AREA ARE OF A RESTRICTED NATURE AS SHOWN. READINGS AT THE SAME RADIUS IN AN OPEN AREA WILL BE APPRECIABLY LOWER.

XI. APPENDIX

F.

NOISE TEST FOR MKT PILE HAMMER MODEL DE-50B

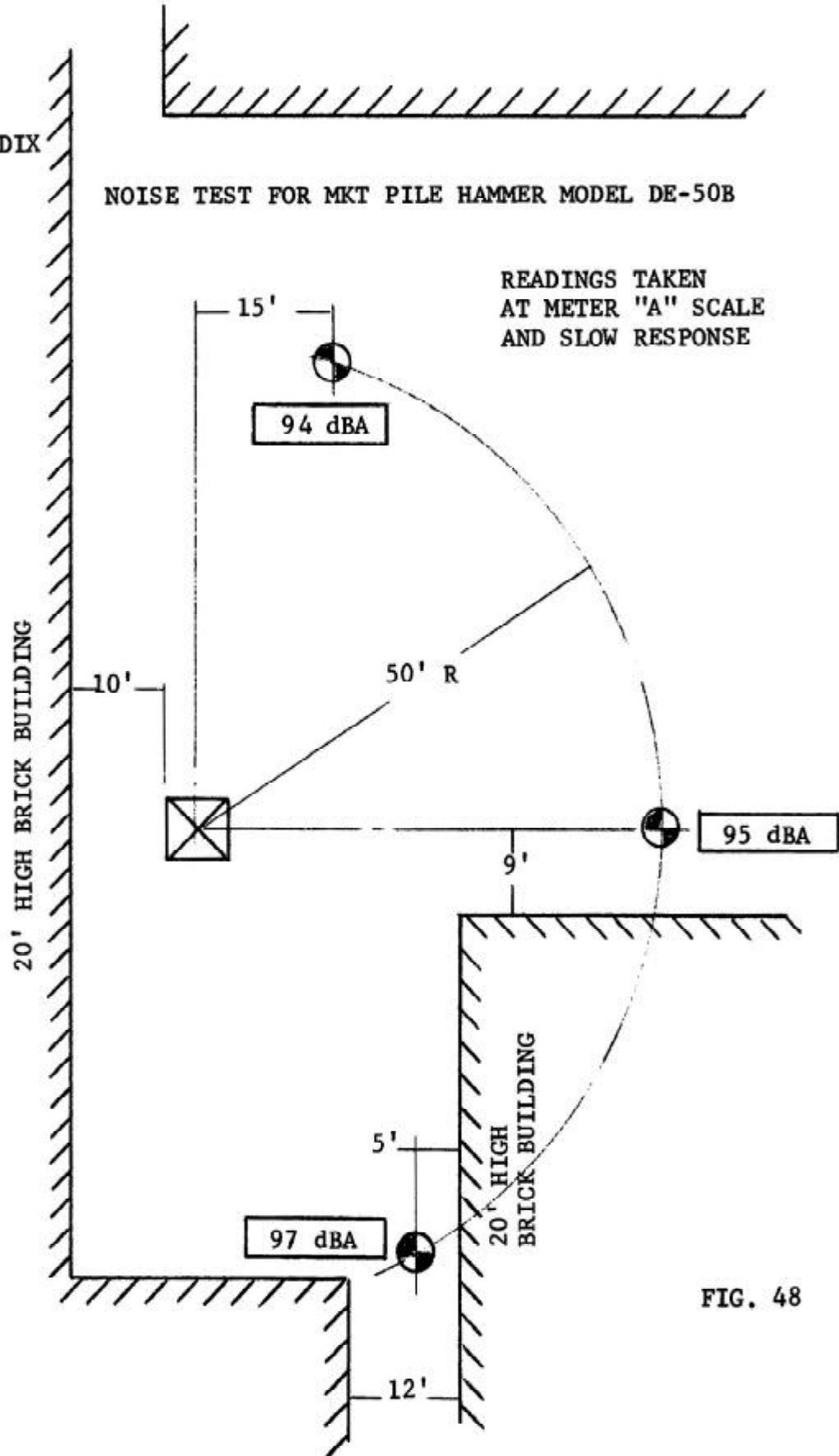


FIG. 48

NOTE:

CONDITIONS OF OUR TEST AREA ARE OF A RESTRICTED NATURE AS SHOWN. READINGS AT THE SAME RADIUS IN AN OPEN AREA WILL BE APPRECIABLY LOWER.

XI. APPENDIX

G.

NOISE TEST FOR MKT PILE HAMMER MODEL DE-70B

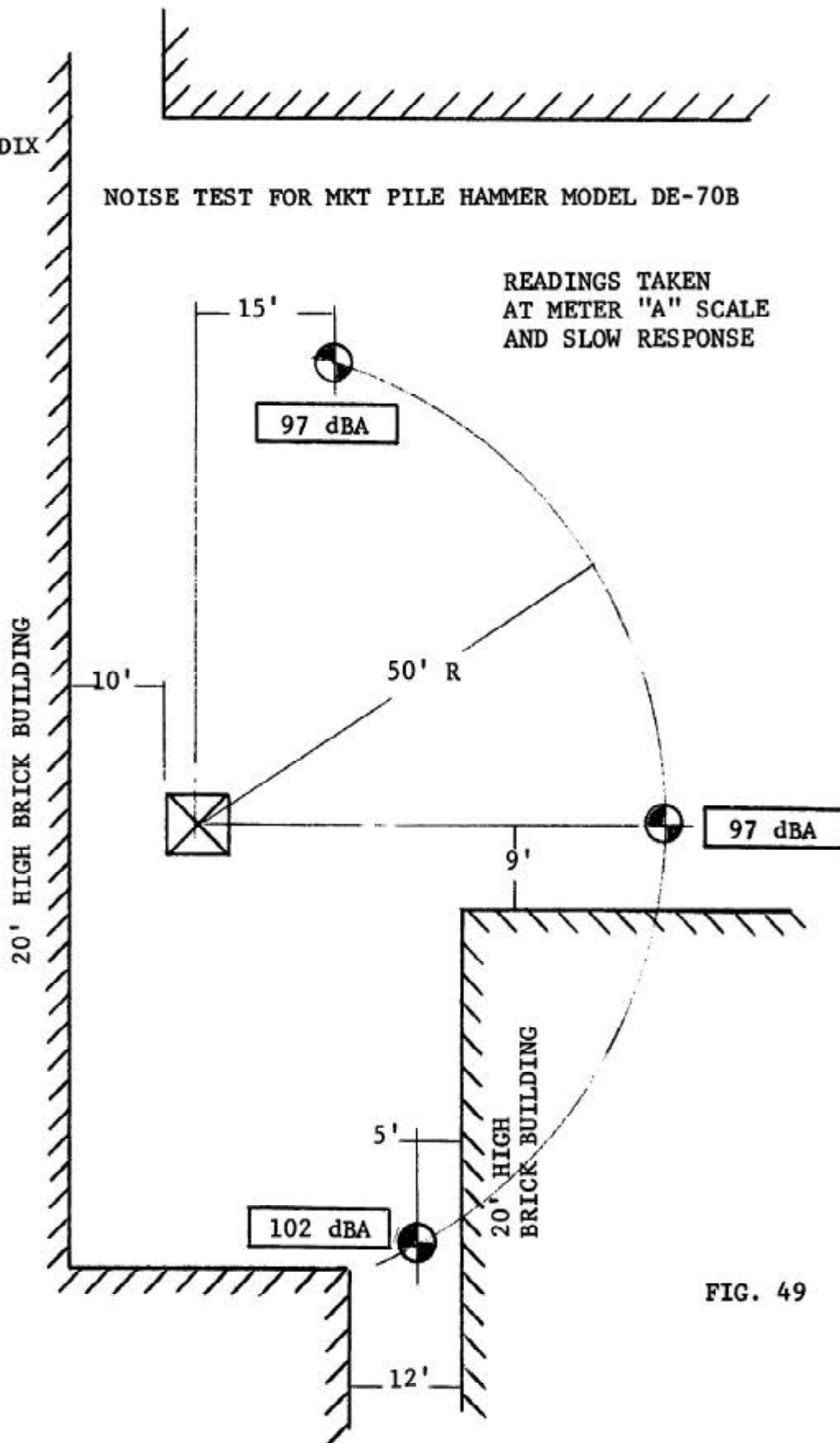


FIG. 49

NOTE:

CONDITIONS OF OUR TEST AREA ARE OF A RESTRICTED NATURE AS SHOWN. READINGS AT THE SAME RADIUS IN AN OPEN AREA WILL BE APPRECIABLY LOWER.

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TECHNICAL BULLETIN

ATTENTION: SALES-PARTS-SERVICE

IMPORTANT ADDITIONS TO
DE-30B/20B, DE-50B & DE-70B/50B
MKT DIESEL PILE HAMMERS
OPERATING/MAINTENANCE/PARTS MANUAL
NO. 01808

When changing ram sizes in a convertible hammer standing in the vertical position (V. Operation and Handling, L. Changing Ram Sizes in Convertible DE-30B/20B and DE-70B/50B Hammers, Page 23, Manual #01808):

Step 3 should be:

Assure that the lifting hook of the trip mechanism, Part #6, (See X. Parts Identification, O. Trip Mechanism Assembly for DE-70B/50B, Fig. 45, Page 69, Manual #01808) is in the down, disengaged position, by pressing down the back of trip lever and pulling up on the trip cable at the same time, and

Step 4 should be:

FOR SAFETY OF WORKERS AT THE TOP OF THE HAMMER, turn off the fuel pump throttle, Part #20, (See: X. Parts Identification, J. Fuel Pump Assembly, Figure 41, Page 64) to prevent the fuel pump from being able to inject fuel into the combustion chamber. Keep the fuel pump throttle turned off until the replacement ram is fully installed. Taking this safety step will assure that if either ram is dropped in the cylinder during its removal or installation, it will not charge the hammer with fuel and put the hammer in unexpected operation!

Steps 3, 4 and 5 should be steps 5, 6 and 7.

Step 8 should be:

The replacement ram must be fitted with compression rings properly gapped for the cylinder in which it is to be installed (See IX. Service Instructions, C. Replacement of Compression Rings, 3. Installation of New Compression Rings, Page 48).

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ATTENTION: SALES-PARTS-SERVICE

ADDITIONS TO MANUAL NO. 01808

Step 6 should be step 9 and read:

Transfer the eye bolt to the replacement ram. Assure that the replacement ram is meticulously clean. Grit, dirt or other foreign matter carried into the hammer on the replacement ram will cause faulty hammer operation and possibly permanently damage the ram, cylinder walls or both. Raise the ram and slowly lower it into the cylinder while coating it with Texaco Aircraft Grease #4865 for its entire length as its initial lubrication. The compression rings must be carefully worked into the cylinder bore.

Steps 7 and 8 should be steps 10 and 11.

Step 12 should be:

For a smaller ram, set the fuel pump throttle at about 4/5ths of the setting for the larger ram, before starting the hammer.

Step 13 should be:

When installing a new, replacement ram for the first time, the ram and compression rings will have to be broken in.

Set the hammer on heavy dunnage, such as timber blocks and lift and drop the ram. If the hammer does not start, repeat lifting and dropping the ram to fire the hammer. Initially, a new ram will short stroke--and may even stop and have to be restarted.

As soon as the hammer is running, squirt the lube oil being used (See V. Operation & Handling, B. Fueling and Oiling Instructions, 2., Page 15) on the sides of the rising ram and into the top of the cylinder bore. Repeat lubricating from time to time while running the hammer for a minimum of thirty (30) minutes.

The stroke of the new ram will normally increase and become more consistent. It may be necessary to cut back the fuel pump throttle to limit the stroke to about 7 ft.



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NO. T2-099-001

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ATTENTION: SALES-PARTS-SERVICE

ADDITIONS TO MANUAL NO. 01808

Upon obtaining about 7-ft. ram stroke, stop the hammer. Restart the hammer and note obtaining the same stroke. Run the hammer for about ten minutes, noting that the rising ram shows wet with lubricant and is turning slightly each stroke.

A new ram and compression rings are, thus, "broken in".

TECHNICAL BULLETIN

ATTENTION: SALES-PARTS-SERVICE

DIESEL HAMMERS WITH UNPLATED CYLINDERS

As you know, MKT is now supplying diesel pile hammers in some models with cylinder bores which have not been chrome plated. These hammers which do not have chrome plated bores were originally shipped from the factory with ductile iron rams.

With the advent of the DE-30/20B and DE-70/50B Hammers with the interchangeable ram feature, there has been an increase of changing rams from hammer to hammer. When doing this, a Distributor should proceed with caution. Steel rams should not be used in hammers with unplated cylinders!

To identify whether a ram is steel or ductile iron, consult the chart below:

<u>RAM</u>	<u>LENGTH</u>
DE-20B (Ductile) - - - - -	77.25"
DE-30B (Ductile) - - - - -	102. "
DE-30B (Steel) - - - - -	94.25"
DA-35B (Steel) - - - - -	94.25"
DA-35C (Ductile) - - - - -	102. "
DE-50B (Steel) - - - - -	95. "
DE-50B (Ductile) - - - - -	102.5 "
DE-70B (Ductile) - - - - -	141.25"
DE-70B (Steel) - - - - -	130.75"

As you can see, quick identification can be made by measuring the ram.

Likewise, to identify a cylinder which is not chrome plated, consult the chart below:

DE-30/20B without chrome plating:
 S/N 760601 S/N 770901
 S/N 770708 S/N 771104 to present

DA-35C without chrome plating:
 S/N 790609 to present



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NO. T2-099-002

TECHNICAL BULLETIN

ATTENTION: SALES-PARTS-SERVICE

DE-50B w/o Chrome Plating w/Ductile Rams

S/N 780701

S/N 790409

S/N 800503

Balance of 1980 shipments w/chrome plating
and steel ram

DE-70B/50B w/o chrome plating w/ductile ram

S/N 780805 S/N 800709

S/N 790701 S/N 800911

S/N 800304

October unit will have chrome plating

TECHNICAL BULLETIN

ATTENTION: SALES-PARTS-SERVICE

LUBRICATION OF DIESEL PILE HAMMERS

Field reports indicate all too frequently both distributors and contractors are using the incorrect oil viscosity to lubricate MKT Diesel Pile Hammers--especially when operating in high ambient temperature conditions. This can lead to faulty operation of the hammer and poor driving performance.

We cannot stress too strongly the importance of using the correct oil in accordance with the operating conditions. On all MKT Diesel Hammers, the following should be followed:

<u>TEMPERATURE</u>	<u>LUBE OIL</u>
Less than 32° F. (0°C.)	Texaco Aircraft Engine Oil Premium AD-65 or equivalent
33° - 75° F. (1°-24°C.)	Texaco Aircraft Engine Oil Premium Ad-80 or equivalent
Over 75° F. (24°C.)	Texaco Aircraft Engine Oil Premium AD-120 or equivalent