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EM

MAINTENANCE INSTRUCTION

RECONDITIONING 567 SERIES DIESEL ENGINE FUEL INJECTORS

I. DESCRIPTION

The General Motors unit fuel injector, Fig. 1, has been manufactured to exacting standards of precision yet features rugged construction for a long service life. Proper engine performance depends to a great extent upon the operation of the fuel injectors and the settings and adjustments made to them. This bulletin covers reconditioning of injectors to keep their operating characteristics within designed limits. Settings and adjustments are fully covered in the Engine Maintenance Manual 252C.

The purpose of the fuel injector is to accurately meter or measure the small quantities of fuel required per cylinder and to inject it at the right time, under high pressure in an atomized condition for proper combustion. Basically an injector consists of a fuel metering pump and spray valve combined in a single unit or housing. Fig. 2 illustrates a cross-section of a unit fuel injector with principle parts named. The main working parts of the injector are: rack, gear, plunger, follower with spring, spherical valve and spring. The internal working parts are lubricated and cooled by the flow of fuel oil through the injector. External parts are lubricated by the engine lubricating oil.

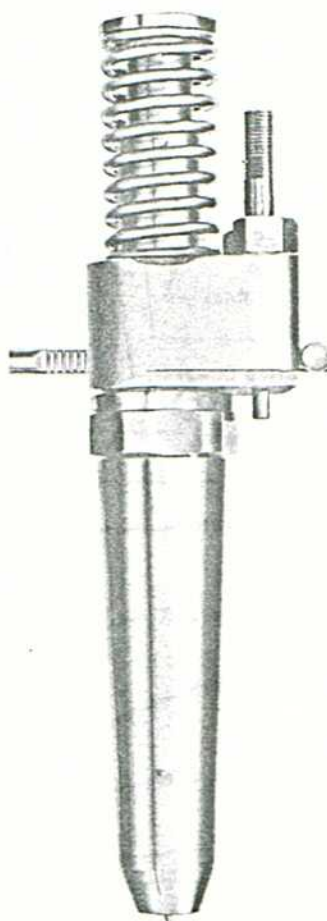


Fig. 1 - Fuel Injector
567 Series Engine

The injector is located and seated in an injector well or tapered hole in the center of the cylinder head with its spray tip protruding slightly below the bottom of the head. Dowels correctly position the injector and it is held by a hold down crab and nut.

II. OPERATION

After successive filtering, clean fuel is pumped under low pressure to the manifolds that extend the entire length on both sides of the engine. The manifolds consist of fuel supply and return pipes, both of which are connected to each injector by means of small jumper pipes. Since fuel in excess of engine requirements is being furnished, the injectors pump a measured quantity in to the cylinders with the surplus flowing out of the injector to the return pipe of the fuel manifold. This constant circulation of excess fuel serves to cool and lubricate the internal parts of the injectors.

The fuel that enters the injector passes through a fine stainless steel filter, Fig. 2, and fills the annular supply chamber around the bushing. Fuel then fills the bushing bore by entering through the two funnel shaped ports. The injector plunger then acts on the fuel providing

the timing, metering and the high pressure required for atomization and injection into the cylinder. The injector plunger is given a constant stroke, reciprocating motion by the injector rocker arm which in turn is actuated by the engine camshaft.

As the plunger starts downward, the fuel in the bushing cylinder is displaced out the ports into the supply chamber. When the bottom of the plunger covers the lower port, the fuel is forced upward through the center passage in the recess between the helices and out the upper port. As the plunger continues down the upper helix closes the upper port, then both ports are closed. Further downward movement of the plunger forces the fuel through the spherical check valve, out the six holes in the spray tip into the combustion chamber. When the lower helix uncovers the lower port, fuel injection will cease, since fuel from the bushing bore again may enter the supply chamber.

The amount of fuel injected or the effective plunger stroke and timing of fuel injection is determined by the rotative position of the plunger and the relationship between the plunger helices and bushing ports. The plunger can be rotated above its axis by its gear and rack. The gear is keyed to the plunger so as to allow plunger reciprocating action as it meshes with the rack. The rack is controlled by the engine governor acting through the injector linkage and injector control shaft, Fig. 3. In the "no fuel" position the upper port is not closed until the lower port is opened, and the fuel charge is forced back

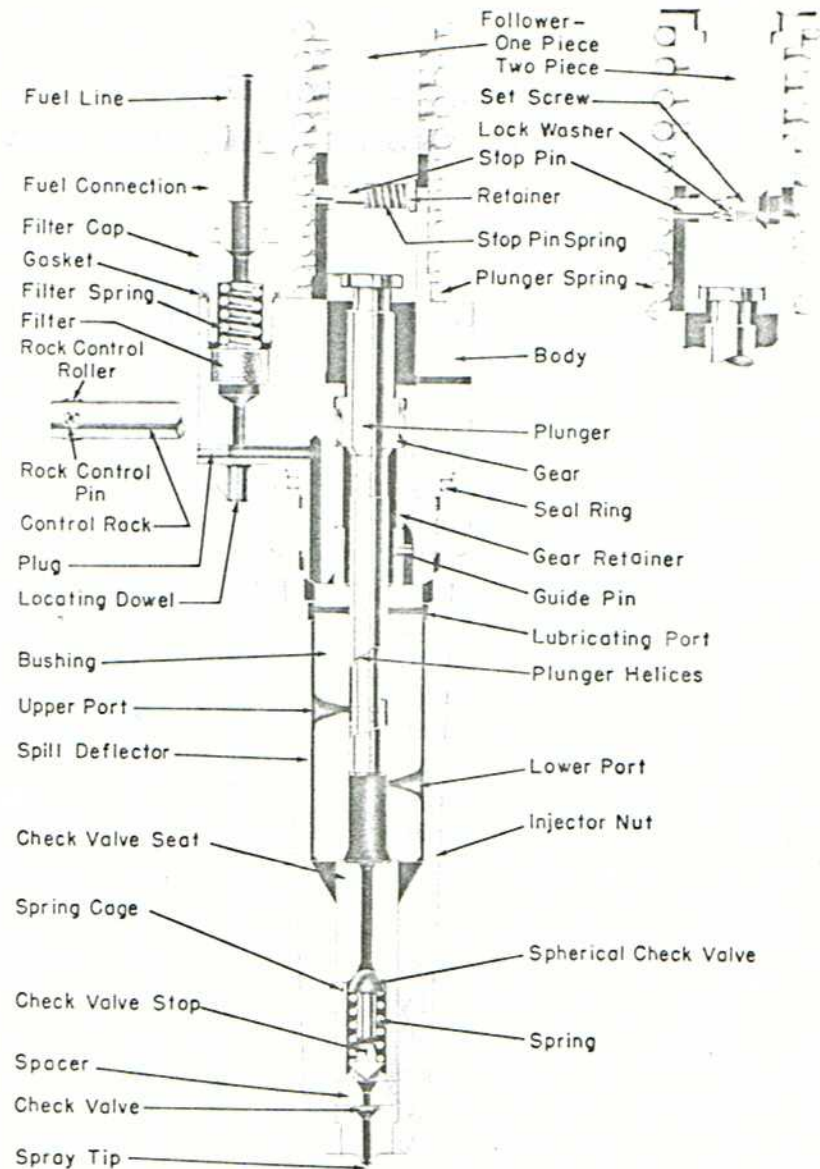


Fig. 2 - Fuel Injection Cross-Section

into the supply chamber. In the "full fuel" position the upper port is closed shortly after the lower port is closed, producing a greater effective stroke and maximum fuel injection. As the plunger is rotated toward the fuel position the helices advance the closing of the ports and beginning of fuel injection.

Check valves are used in the injector to prevent undesirable flow of fuel and gases. The spherical check valve

prevents the flow of fuel into the cylinder during the time injection is not occurring. A small flat check valve just above the spraytip prevents combustion gases from entering the injector.

III. MAINTENANCE

A. INJECTOR IDENTIFICATION

This bulletin covers reconditioning of all injectors used in Electro-Motive 567 series Diesel engines.

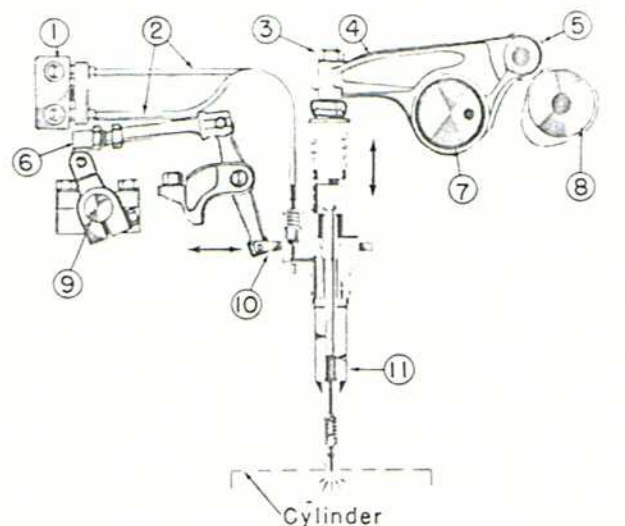
It is important to note, however, that all injectors are not identical since many design changes have occurred in recent years. Although outwardly similar in appearance, many integral working parts are not interchangeable between the various injectors that have been used. Care should thus be taken so that different injectors are not worked on at the same time since mixing of the parts may lead to difficulty in reassembly.

Differences in injector design are readily distinguished by changes in the part number stamped on the injector body. Other means of identification are also provided and may be determined by consulting the appropriate engine maintenance manual.

It is recommended that injectors of one design having the same part number be worked on as a group and all others kept separate until they in turn can be worked on together. Following this procedure will prevent possible difficulties that might occur.

B. GENERAL

When servicing the injector, clean conditions must be maintained since dust or dirt in any form is the most common cause of injector failure. When an injector is in an engine, the working parts are adequately protected against dirt, dust and other foreign material by the various filters employed. When an in-



- | | |
|----------------------------------|------------------------------|
| 1. Fuel Manifold | 6. Adjustment Link |
| 2. Fuel "Inlet" & "Outlet Lines" | 7. Rocker Arm Shaft |
| 3. Adjusting Screw | 8. Camshaft |
| 4. Rocker Arm | 9. Injector Control Shaft |
| 5. Cam Follower | 10. Injector Rack |
| | 11. Injector (Cross Section) |

Fig. 3 - Injector Operation

jector is in storage, it is also protected against harmful material by the filters that seal the body opening, which in turn are protected by shipping blocks. A different set of conditions become evident, however, when it is necessary to disassemble an injector for reconditioning. Under these conditions, great care should be exercised for proper handling of the parts and to provide the cleanest possible working facilities.

The mechanics working on the injectors must protect the parts by careful handling, as some parts are so finely finished that the slightest burr, dust or scratch can make them unfit for use. It is important also, that the hands and the apparel of the mechanic be clean.

It is advisable to provide a separate workroom for reconditioning injectors, which could also accommodate other precision repair work on other items such as governors. A drawing, File 470, showing the general arrangement and other details of such a reconditioning room, is available upon request. Facilities provided in the workroom should

include: small arbor press, bench vise (having copper jaw protectors), washing tank, work benches, compressed air supply, assorted standard tools and some special equipment and tools.

The special equipment and tools required for injector reconditioning are included in the equipment list given at the end of this instruction, as well as in the general maintenance procedure. Other more common items may be procured locally.

It is recommended that the following important factors be kept in mind while servicing injectors:

1. Maintain cleanliness.
2. Handle injector parts carefully.
3. Plunger and bushing assemblies are matched parts, if one is damaged both must be replaced. This is also true of the injector spherical valve and seat assembly.
4. Keep all parts of each disassembled injector together and separate from other injectors. (A sufficient number of small parts pans should be provided for the quantity of injectors disassembled at any one time. The pans should be made of non-rusting material.)
5. Never remove a filter unless injector is to be completely disassembled.
6. Cover filter caps with shipping blocks when the injector is assembled but not in use.

C. DISASSEMBLY

As the injector is disassembled, place the parts in the injector parts pan.

1. Clamp injector in vise #8201448, in upright position, Fig. 4, and remove the shipping block.

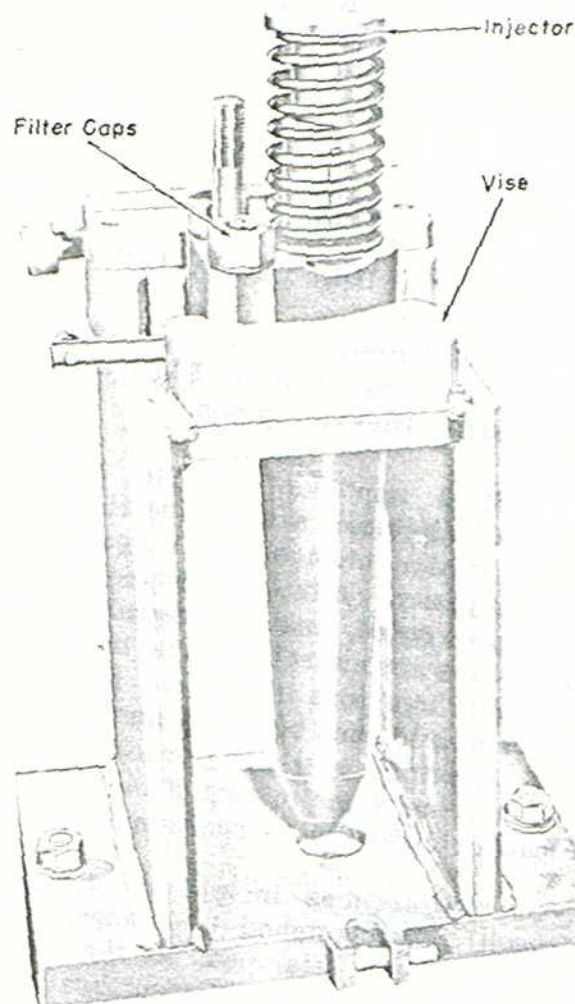


Fig. 4 - Preparation For Injector Disassembly

2. Remove the fuel filter caps using a 3/4" socket #8067714 and hinge handle #8069958. Remove gaskets, filter springs and filter elements.
3. While slightly compressing the plunger spring by pushing down on top the follower with palm of hand, insert a small rod between coils of spring and push "stop pin" in to release the follower. The spring can now be unloaded by gradually allowing the follower to move upward.

NOTE: If injectors have a two-piece follower, Fig. 2, the set screw must be backed out only four turns using Allen wrench #779431 to allow release of the stop pin.

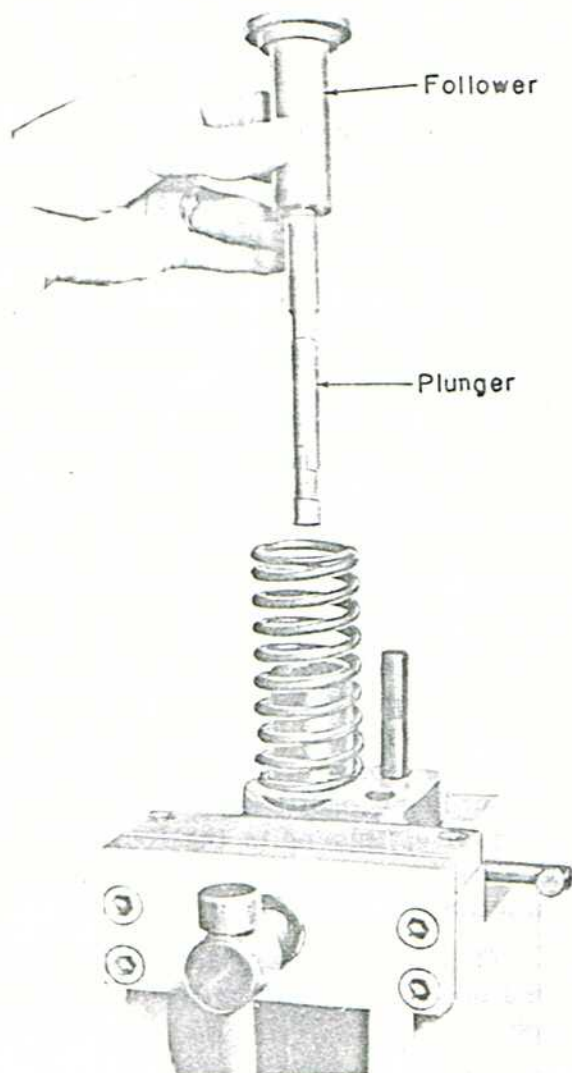


Fig. 5 - Removing Follower And Plunger

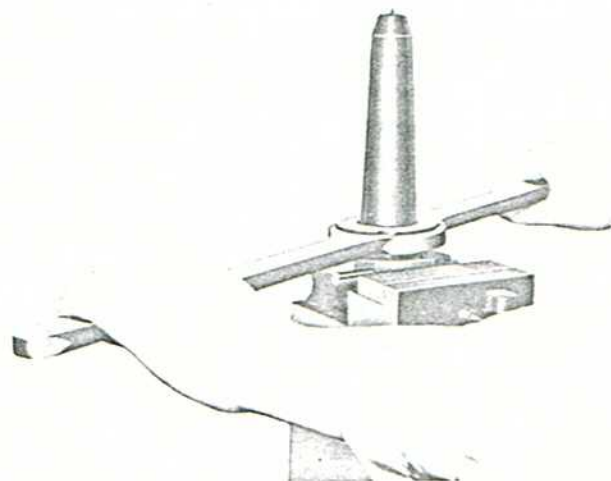


Fig. 6 - Loosening Injector Nut

4. Carefully lift the follower and plunger from the injector, Fig. 5. Disengage the plunger from the follower and remove the follower spring.
5. Invert the injector in the vise. Using wrench #8032655 loosen the injector nut, Fig. 6. Unscrew the nut by hand and lift it straight up so as not to disturb the parts underneath.
6. After the nut is removed, Fig. 7, the exposed stacked parts can be removed from atop the bushing.

NOTE: Occasionally the spray tip sticks in the nut and is removed with the nut. If the spray tip cannot be pressed out with the fingers, it can be removed by carefully using force. Set the nut on a

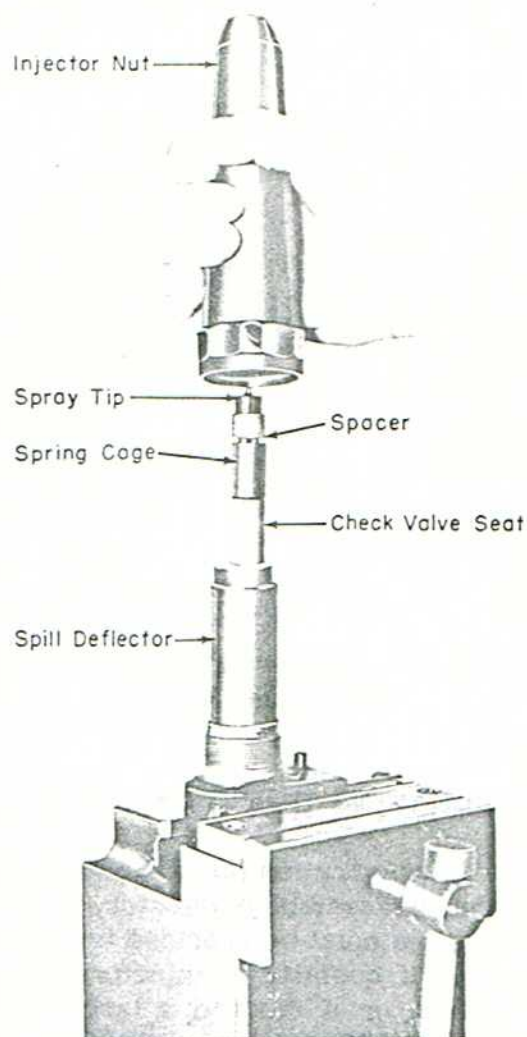


Fig. 7 - Removing Injector Nut

block of wood and using a short length of brass tubing drive the spray tip out. The inside diameter of the brass tubing must be large enough so that only the outer edge of the spray tip is contacted by the tubing.

7. Remove the spill deflector and plunger bushing by lifting them straight up. Insert the previously removed plunger into its mating bushing.
8. Remove and discard the body to nut seal ring.
9. Release the injector body from the vise and holding free hand at bottom, invert the body to remove the gear retainer and gear. After the gear is removed the injector rack can be withdrawn from the body, Fig. 8.

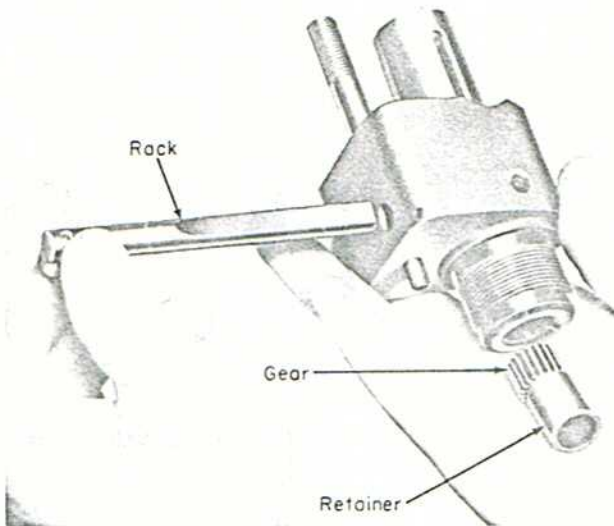


Fig. 8 - Removing Injector Rack, Gear And Retainer

D. CLEANING INJECTOR PARTS

In preparation for cleaning the parts of the disassembled injector, four separate pans must be provided for each injector. If quantity of injectors repaired warrants, or if desired, a large cleaning tank #8204639 may be provided which has four large cleaning compartments.

The cleaning tank drawing #8204639 (available upon request) shows construction of the tank assembly. Physical dimensions of the tank are about five feet long by two feet wide, with the height to accommodate the usual shop. It has provision for an air filter and exhaust fan at the top. The cleaning compartments are each twelve inches deep, the width of the tank and equally spaced along the tank length.

If cleaning tank #8204639 is used, the parts of each injector should be kept in perforated metal pans. The perforations in the pans will allow the cleaning liquid to drain when the pan is removed from the large tank compartment. If separate pans are used they may be conventional baking pans made of rust proof material of such size to accommodate all parts of one injector. Each of these pans should be provided with a removable screened frame at the bottom to hold the injector parts above material which may fall to the bottom of the pan. As the injector is reconditioned, the parts are progressively placed in the four pans or tank cleaning compartments to avoid contamination.

The four cleaning pans or compartments should contain the following solutions:

Tank #1 This tank contains the cleaning solution, Turco #3942 (8201460 55 gal. bbl.) diluted with four parts solvent, mineral spirits (8201461 - 55 gal. bbl.) or equivalent. Sufficient liquid should be added to cover all parts. Leave disassembled parts in tank #1 about fifteen minutes. All parts must thoroughly be cleaned of carbon and lacquer.

Tank #2 The second tank is filled with clean solvent such as mineral spirits. This tank is used for rinsing parts after removal from tank #1 and after secondary cleaning.

Tank #3 The third tank is used for storing the parts after they have been cleaned and inspected, until they are ready for re-assembly. Fill this tank with enough fuel oil or injector testing rust proofing oil (8203258 - 55 gal. bbl.) to completely cover all the injector parts.

Tank #4 The fourth tank is filled with the same kind of oil as used in tank #3. The fluid in this tank is not used until reassembly of the injector parts is about to begin. Just prior to assembly, the part is removed from tank #3 and blown off with filtered compressed air. Immediately after blowing off, the part is dipped into tank #4 solution and assembled in the injector without further drying. The oil that adheres to the part after dipping in tank #4 provides rust proofing and/or initial lubrication.

After the parts have soaked in tank #1 and rinsed in tank #2, they should be dried with compressed air, and cleaned further as outlined in the following procedure.

NOTE: Care must be taken while wire brushing the following parts, not to wire brush their lapped surfaces.

1. Bodies

- a. Apply abrasive disc # 8201444 (11/16" diameter - 60 grit emory disc) to seating tool #8201443. Mount the seating tool in a motor driven chuck and remove any carbon from inside diameter flat on gear side of the body.
- b. Apply abrasive disc # 8201447 (13/16" diameter - 60 grit emory disc) to seating tool #8201446 and apply seating tool in motor driven chuck. Remove any carbon from the inside diameter flat on follower side of body, Fig. 9.
- c. Using magnetized reamer #8194040, Fig. 10, clean out oil passages in the body. Pin vise #8069988 may be used to hold the reamer. There are two other passages besides the two fuel passages at the bottom of the body namely: the vent passage

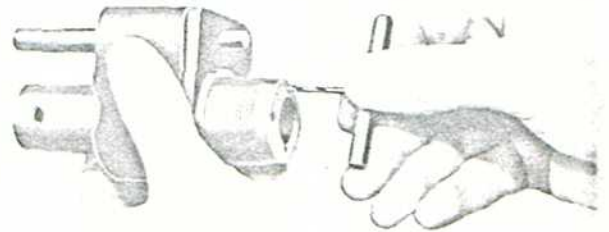


Fig. 10 - Reaming Body Fuel Passages

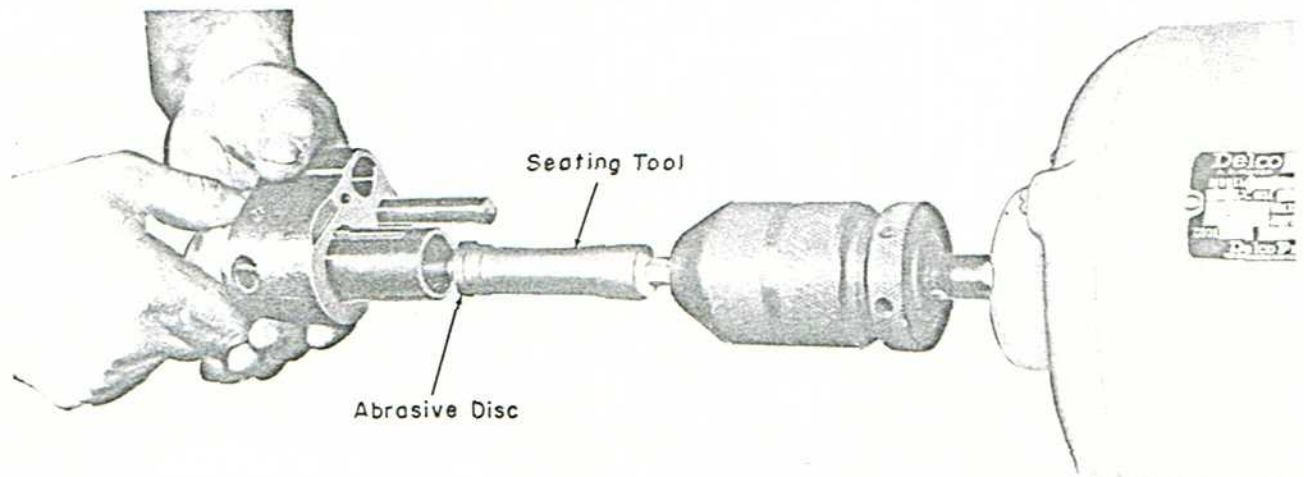


Fig. 9 - Cleaning Flat-Gear Side Of Body

at the back, and the passage of the entrance is opposite the slow timing gauge hole.

- d. Buff external surfaces (except bottom) on a soft wire buffing wheel.
- e. Wash off entire body being sure that all carbon particles are removed. Use brush #8069986 (1" diameter china bristle) to clean the body. Using compressed air, blow out fuel passages and dry the body.
- f. Place body on a clean surface or pan for inspection.

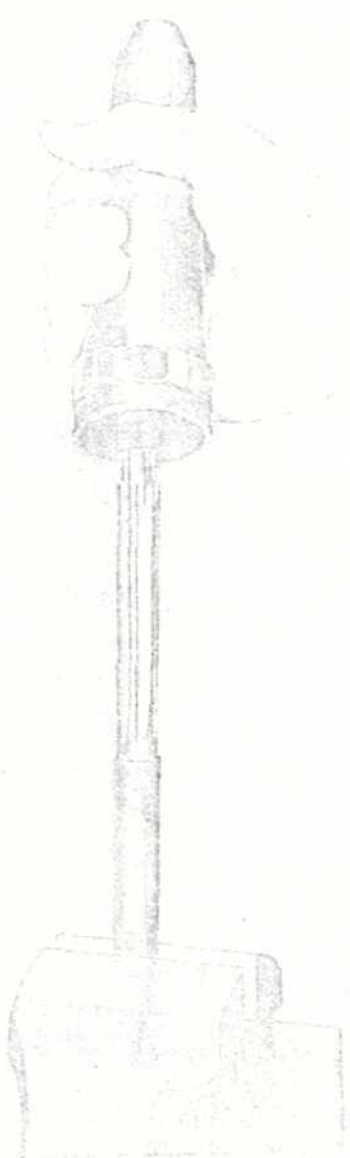


Fig. 11 - Reaming Injector Nut

2. Injector Nut

- a. Clean external surface of the nut by buffing on the soft wire buffing wheel.
- b. Using nut reamer #8070959, Fig. 11, clean carbon from inside diameter of the nut and spray tip seating surface.
- c. Wash nut, inside and out using brush #8069986 and solvent. Dry nut with compressed air and place with body for inspection.

3. Injector Rack

Buff the rack on soft wire wheel, being careful to clean thoroughly between rack teeth. Wash the rack in solvent and blow dry.

4. Injector Gear

- a. Clean gear teeth and outside surface by buffing. Clean inside using 1/2" diameter wire brush #8236901 mounted in a motor driven chuck.
- b. Wash gear in solvent, then dry and place with other items.

5. Plunger Bushing

- a. If required, lightly buff the external surface of the bushing, taking care to avoid the lapped end.
- b. Using soft bristle brush #8069987 and solvent, wash bushing bore and external surface. Dry with compressed air.

6. Plunger

- a. If required, lightly buff the plunger ends and above recess below the gear key way. Do not buff on the lapped lower area of the plunger.
- b. Wash the plunger using solvent and brush #8069986, paying careful

attention to the helical grooves. Dry with compressed air and clean tissue.

NOTE: After plunger and bushing are cleaned, insert plunger in its mating bushing.

7. Spill Deflector

Lightly buff the spill deflector to remove carbon, if required. Using brush #8069986 and solvent, wash entire part. Dry with compressed air.

8. Spherical Valve Seat

a. Lightly buff external surface of spherical valve seat, however, use care not to buff the lapped ends.

NOTE: Do not buff the mating valve. These parts, however, should be kept together.

b. Using magnetized reamer #8194041, clean out fuel passage. Reamer can be held in pin vise #8079567.

c. Wash part in solvent and blow dry using compressed air, and place with other parts to be inspected.

9. Spray Tip

a. Buff external surface of spray tip on the soft wire buffing wheel, taking care to avoid the lapped surface.

b. Using magnetized reamer #8194041, ream inside of tip as shown in Fig. 12.

c. Clean out spray holes in the tip, Fig. 13.

(1) Apply short length of .011" wire #8122519 (500 ft. roll) to pin vise #8069989. About 1/4" of wire should extend beyond vise jaws.

(2) Hone wire end to a point to remove any burrs, using abrasive stone #8070961.

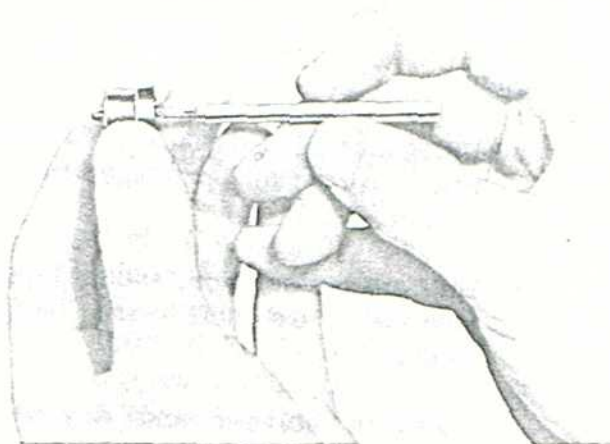


Fig. 12 - Reaming Spray Tip



Fig. 13 - Cleaning Spray Tip Orifice

(3) After cleaning holes with wire, wash spray tip in solvent and blow dry.

10. Gear Retainer

a. Buff external surface of gear retainer on soft wire buffing wheel. Remove any carbon from the inside diameter, using 1/2" diameter wire brush #8236902, mounted in motor driven chuck.

b. Using solvent, wash the retainer and blow dry using compressed air.

11. Spring Cage

a. Buff outside surface, except lapped surface, using soft wire wheel.

b. Remove any carbon from the inside diameter using 7/16" diameter wire brush #8236901, mounted in a motor driven chuck.

- c. Wash in solvent and blow dry using compressed air.

12. Spacer

- a. Using magnetized reamer #8194041, ream out fuel passage in the spacer.
- b. Buff spacer surface, except lapped surfaces, on soft wire buffing wheel.
- c. Wash in solvent and dry using compressed air.

13. Remaining Parts

- a. Clean the remaining parts given below by buffing on soft wire wheel.

Follower	Filter Caps
Follower Spring	Filter Springs
Valve Stop	Valve Spring

- b. Wash each in solvent and dry with compressed air.

14. Emergency Parts Cleaning

- a. Filters - The old filters should be discarded when reconditioning injectors. However, if it is necessary due to parts shortage to reuse old filters, they should only be cleaned by gentle sloshing in the cleaning solvent.

CAUTION: Do not use a brush or compressed air on these filters.

- b. Copper Gaskets - Copper gaskets often become hard and lose their sealing ability, so they should be discarded after use. However, in case it is necessary to reuse them, they should be cleaned and annealed.

To anneal copper gaskets, heat them to a dull cherry color (1200° F. to 1500° F.) and quench them quickly in water.

E. PARTS INSPECTION

1. Bodies

The injector bodies should be carefully inspected for any burrs, metal slivers or bad threads. The body and all drilled passages should be clean.

2. Plunger and Bushing

Plunger should be closely examined for scores and scratches on the lapped surface. The helices should be inspected for chipping or eroding. Scored surface on the plunger is easily seen, but the bushing requires a good light directed into the bore to see evidence of scoring. For any of these defects, reject the plunger and bushing.

It may be necessary to remove light serrations or oil stains from the plunger and bushing by polishing. Procedure for polishing these parts is given under "Lapping of Injector Parts," Section F.

In addition to being free from burrs, scratches, scores or other imperfections, the plunger and bushing must be absolutely clean. To test for cleanliness, insert the plunger in its bushing and spin the bushing. If both the plunger and bushing have been properly cleaned, the bushing will spin freely.

NOTE: The plunger and bushing must be absolutely dry while making this test. If the bushing does not spin freely, the cleaning operations should be repeated, or the parts replaced.

Plunger and bushing should always be kept together as they are manufactured and serviced only in matched sets. If these parts should become mixed, due to error in handling, lightly etched identification numbers will be found in the undercut below the head of the plunger and on the outside surface of the bushings. The

same number will be etched on each mating piece. This number will be different on each assembly and has no meaning except to identify the parts as being matched sets.

3. Nut

Inspect the outside of the nut for deep scratches or gouges on the seating surface or pits around the spray tip end. The inside spray tip seating surface must also be free of scratches or burrs and be clean. Discard nut if imperfections are present.

4. Control Rack and Gear

These parts should be free from burrs and rough spots so that the rack will move freely when the injector is assembled. Make sure that the rack is straight by checking against the straight edge #8201452. The rack must be straight so as not to bind in the injector during operation.

5. Spray Tip

The central hole in the spray tip should be clean and free from burrs at the spray tip orifices. Each orifice should be clear. To check the orifices, force some fuel into the spray tip using a pump type oil can. If the orifices are clear an equal amount of fuel will be discharged out each spray hole.

The lapped sealing surfaces should be free of oil stains and scratches. Oil stains or light scratches can be removed by lapping as outlined under Section F. Parts that are deeply scratched or worn should be discarded. However, the new part should be lapped to provide a correct finish.

6. Injector Valve Assembly and Related Parts

The spherical valve assembly together with related parts such as spacer and

spring cage include several oil tight joints that are subjected to the full injection pressure. These mating parts have contact surfaces which are lapped to a high mirror finish. They should be carefully inspected for burred edges, scratches and oil stains, also for cracks at the end faces. Since only a slight imperfection of this kind would prevent the injector from operating properly, all surfaces should be inspected with the aid of magnifying glass #8201455. Oil stains, slight burrs and light scratches on the sealing surface can be removed by lapping, as outlined under Section F following. If parts are deeply worn, scratched or in any other way damaged, they must be discarded.

7. Valve Spring

New valve springs should be used when the injectors are rebuilt. However, if due to parts shortage it is necessary to reuse springs, they should be inspected as follows:

- a. Determine if the spring has taken a set or shortened. This is done by comparing spring length with an unused spring of the same part number. If there is a noticeable difference in length, do not use the old used spring.
- b. The outside of the spring should be examined for bright marks which would indicate that the coils have rubbed hard against the wall of the spring cage. A valve spring in this condition should not be used except in extreme emergency.
- c. After all parts have been inspected, place all of them into the number 3 parts tank, except those parts which are to be given final cleaning by lapping.

F. LAPPING OF INJECTOR PARTS

As previously stated, the injector valve assemblies and their related parts

are subjected to full injector fuel pressure. Each of these parts has at least one sealing surface which mates with the sealing surface of an adjacent part. All sealing surfaces must be clean, brightly polished and absolutely flat, so that when the injector is assembled and operated, each joint will withstand full injection pressure without leaking.

The required high polish and flatness is attained by hand lapping the parts on suitable prepared "lapping blocks." This is an operation that requires some degree of skill. Since this skill can only be attained by actually lapping parts, it is recommended that some time be spent in practicing the lapping operations, using scrap parts before lapping parts intended for use in injectors.

To assure the best quality of finished lapping work requires use of correct lapping blocks and blocks that are kept in proper condition. Lapping block set #8191188 may be obtained from our Parts Department. It consists of 3 lapping blocks #8191187, 8" x 8" x 1", fitted in a wooden box with cover. The lapping surface of each plate is grooved into 1/8" squares separated by 1/64" grooves. The cover of the lapping block box should be kept closed to protect the blocks when they are not in use.

Continued use of the lapping blocks tends to cause worn or low spots to develop and sometimes the blocks become scratched. Imperfections of this kind are evident when a block is held under a strong light. When such defects are present, the lapping surfaces of the blocks must be refinished.

1. Refinishing Lapping Blocks

To refinish the lapping blocks, spread some lapping compound #8201459 (600X) or equivalent on one of the blocks. Place another block on top of this block face to face and work them together. Alternate the blocks from time to time. For example,

assuming the blocks are numbered 1, 2 and 3, work #1 and #2 together, then #1 and #3 and finally #2 and #3 together. Continue this procedure until all blocks are perfectly flat and free of imperfections. After the surfaces have been refinished, clean all compound from the blocks by rinsing in fuel oil and washing using a soft bristle brush.

It is good practice where considerable lapping work is done to devote some time each day to refinishing the blocks. This procedure assures the blocks being in first class condition at all times.

2. Lapping Procedure

Avoid unnecessary lapping of injector parts. It frequently happens that when an injector is disassembled for repairs, many of the lapped surfaces still retain their mirror finish. When parts are found to be in good condition, set them aside and lap only the parts which require cleaning or removal of mirror defects. New replacement parts also should be polished by lapping.

a. Lap following parts on the lapping blocks:

Body assembly seat	Spring cage
Plunger bushing	Injector valve
Spacer	seat ends
Flat check valve	Spray tip

- (1) Clean off lapping block using compressed air. Do not use a cloth or other material for this purpose.
- (2) Sprinkle some lapping compound #8201459 on one of the lapping blocks. (A common salt shaker is good for this purpose.)
- (3) Place the part to be lapped flat on the block, as shown in Fig. 14, moving it back and forth across the block using a

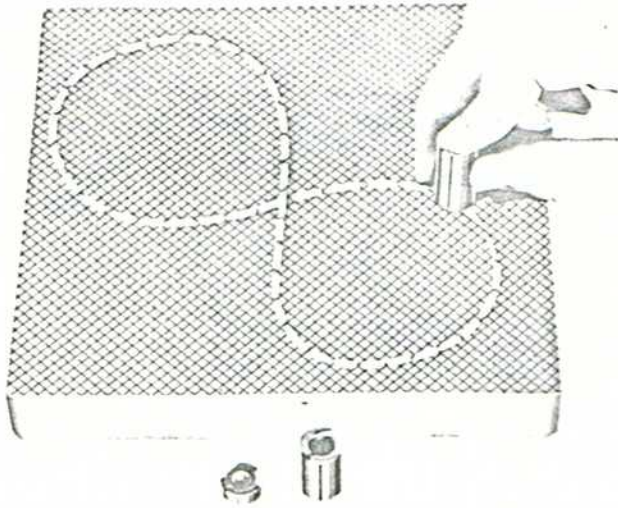


Fig. 14 - Lapping Injector Parts

figure "8" motion. Do not exert too much pressure on the part, but just sufficient to keep the part flat. Rotate the part in hand 10 to 30 degrees every few seconds to produce an even smooth surface. When the part is flat and clean, wash it in the solvent and dry with compressed air.

- (4) To provide a mirror finish on the lapped surface, lap the part on the second block dry. Do not use any compound or powder. Make several figure of "8" passes with the part.

NOTE: If the body assembly seat has a nick or low spot, buff the seat using #320 grit aluminum oxide cloth, before lapping.

b. Lapping Spherical Check Valve

Before attempting to lap the injector valve, carefully examine the valve seat. If the valve seat has a wide area close to the fuel passage, it is not practical to lap the valve assembly and it should be replaced by a new assembly. The valve seat should show a narrow seating area above the fuel passage.

If the valve is to be lapped, mount the valve in a motor driven chuck, Fig. 15. Make a small quantity of paste using fine lapping compound #8201457 (800 grit fine abrasive) and mineral spirits. Place a drop of the paste on the seating surface

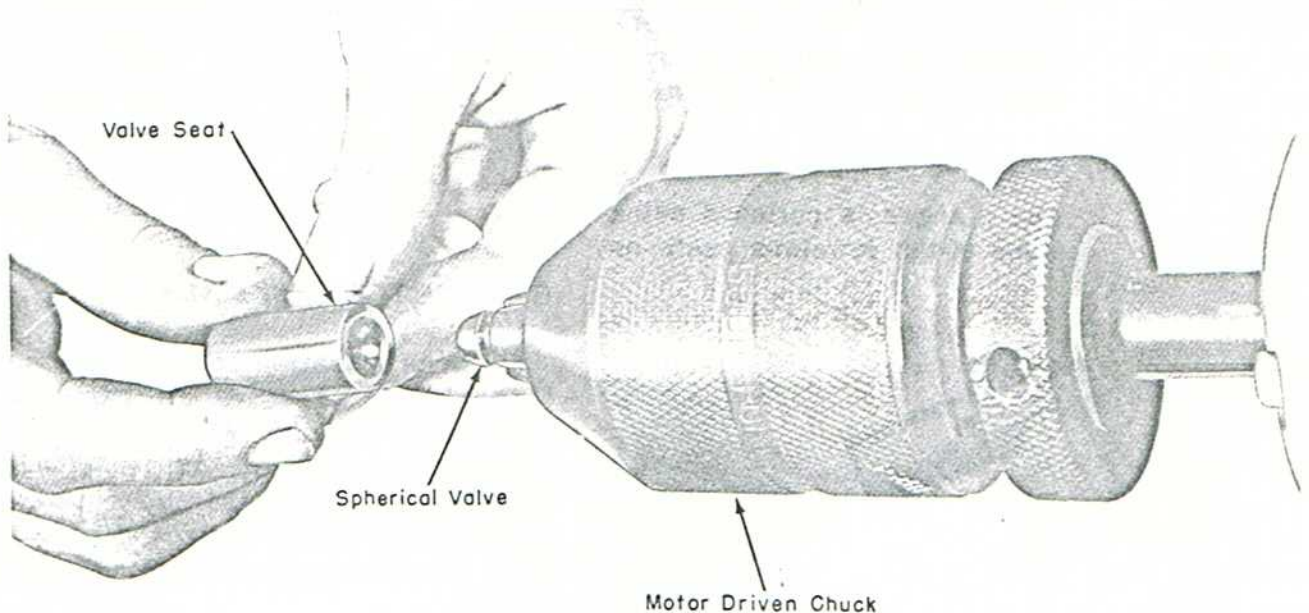


Fig. 15 - Lapping Spherical Valve To Seat

of the valve. Start the drive motor and place the valve seat against the valve using light pressure. Swing the valve seat in a small circle about the rotating valve. Limit the angle of the valve seat to the valve within a maximum angle of 15°. Turn the valve seat in the hand every few seconds and lift the seat from the valve. Do not permit the injector valve seat or valve to squeak.

c. Polishing Bushing and Plunger

The plunger and bushing are polished using jewelers rouge paste and toilet tissue. The paste is made by mixing a small amount of jewelers rouge #8201456 (1 lb. can) and mineral spirits.

(1) Polishing Bushing

To polish the injector bushing, wrap a sufficient amount of toilet tissue around a small diameter rod so that it may be inserted into the bushing bore.

Apply a small amount of the jewelers rouge paste to the toilet tissue and insert into the bushing bore, Fig. 16. Work bushing back and forth over tissue using a rotary motion.

(2) Polishing Plunger

The plunger is polished using some of the jewelers paste on

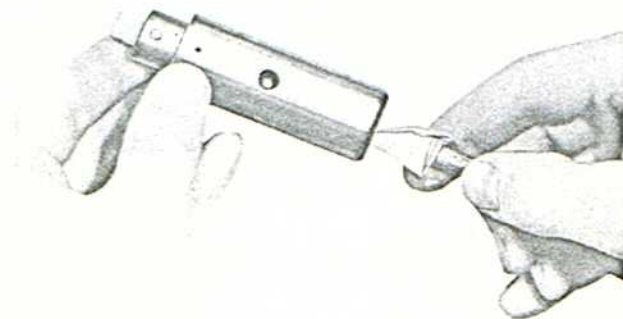


Fig. 16 - Polishing Injector Bushing Bore

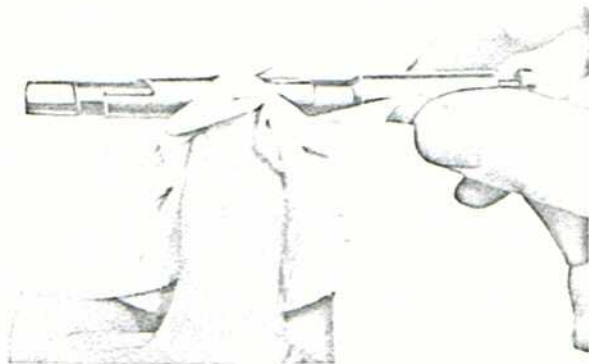


Fig. 17 - Polishing Injector Plunger

toilet tissue held in the hand, Fig. 17. The plunger is then worked back and forth using a rotary motion through the held tissue. When the plunger and mating bushing have been thoroughly cleaned and polished, the bushing should be able to be spun around the inserted plunger. It is important in making this check, that both the plunger and bushing are absolutely dry and clean. After the injector parts have been lapped and polished they should be washed in solvent to remove all compound. They then should be blown dry with clean compressed air and placed in the #3 tank or pan in preparation for assembly of the injector.

G. INJECTOR ASSEMBLY

In preparation for the assembly of the injector, remove all parts of one injector from tank #3 which have previously been cleaned, inspected and reconditioned. Blow the individual parts off using compressed air and place them in a clean dry parts pan or on clean paper.

As each injector part is selected for assembly as subsequently outlined, dip the part in tank #4, containing the

injector test and rust proofing oil #8203258 (50 gallon barrel) or fuel oil. After dipping the part in tank #4, do not blow off, but leave it wet. The liquid retained on the part will provide rust protection and/or lubrication during assembly.

The assembly sequence may be as follows:

1. Insert the injector rack into the body. Position the rack so the two marked teeth are centrally located in the body bore as viewed from the thread end (bottom) of the body.
2. Apply rack gear to mesh with the rack so timing mark on the one gear tooth is between the marked teeth of the rack. Timing markings should be facing the assembler when looking down at the parts from the thread end of the body, as shown in Fig. 18. The use of a flashlight or illuminated magnifying glass #8201455 greatly facilitates this timing of rack and gear as otherwise it is difficult to see the markings.

After gear is correctly applied to the rack, clamp the body thread end up in the injector vise #8201448.

Apply gear retainer on top of the gear.

3. Position the bushing on the body so locating pin enters the slot in the body.

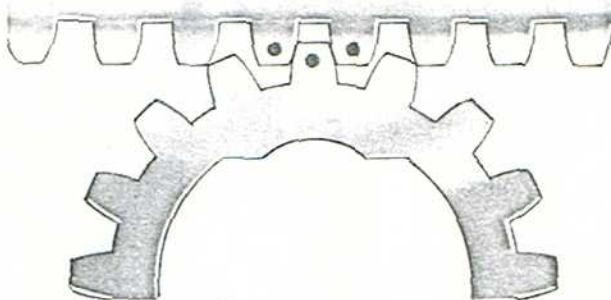


Fig. 18 - Location Of Timing Marks On Injector Rack And Gear

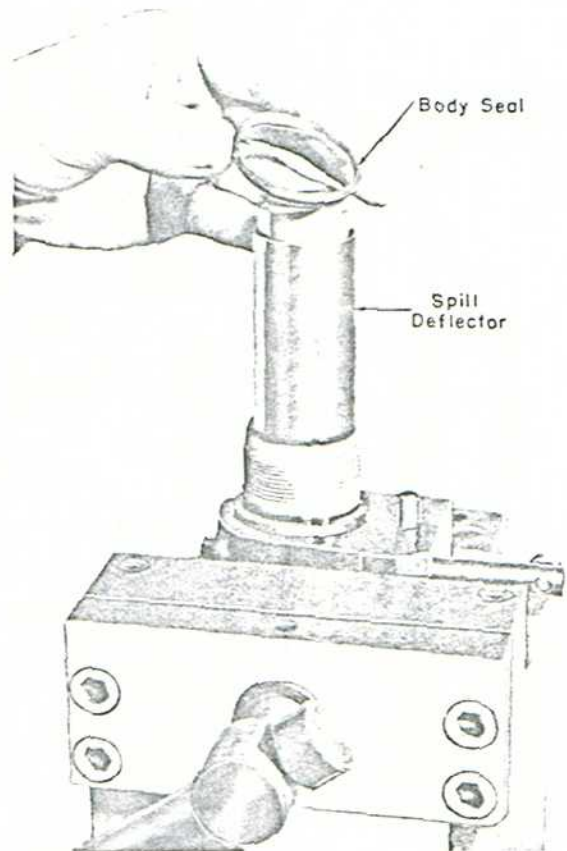


Fig. 19 - Applying New Body Seal

Place spill deflector over the bushing.

Apply new nut to body seal as shown in Fig. 19.

4. After dipping each part, make a sub-assembly of the valve seat, valve spring, valve stop and valve spring cage, Fig. 20. Carefully place this assembly centrally on the bushing, with small passage end of valve seat on bushing and valve stop upward.
5. After dipping the following parts, spray tip, flat check valve and spacer, assemble them into a sub-assembly, Fig. 21.

Place the flat check valve into the counterbore recess of the spray tip. The spacer is placed with small passage end contacting the spray tip lapped surface covering the flat check valve.

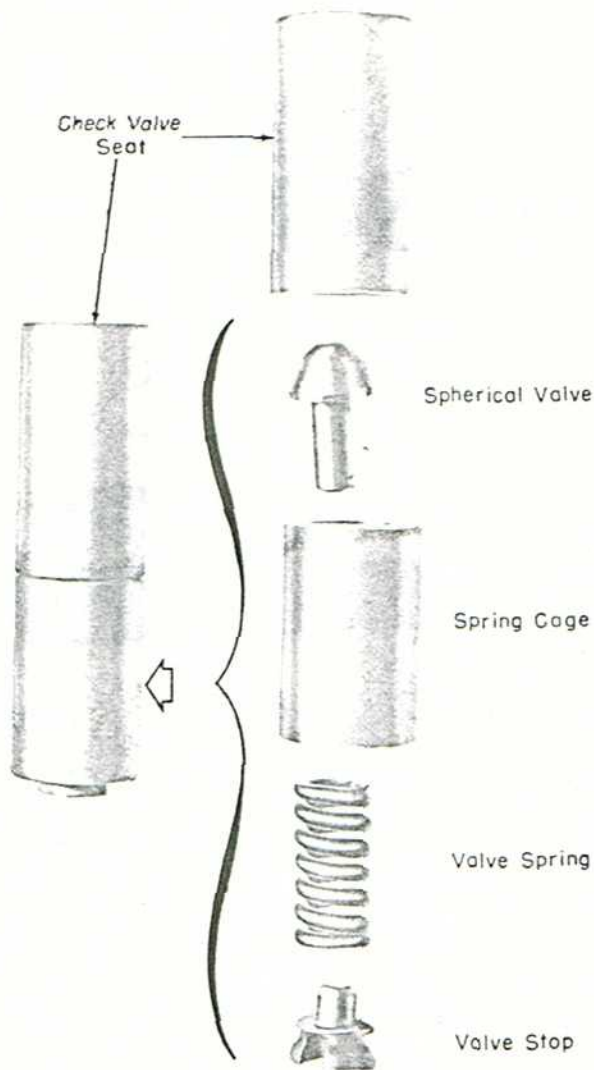


Fig. 20 - Spherical Valve Sub-Assembly

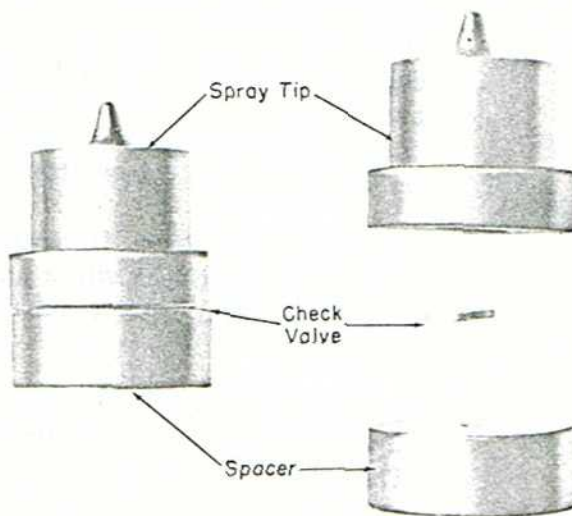


Fig. 21 - Flat Valve, Spray Tip And Spacer Sub-Assembly

Holding this assembly together, place on stacked valve parts so large opening end of spacer contacts valve stop. Make sure the flat check does not slip between the spacer and spray tip surfaces.

6. Place the injector nut carefully over the stacked parts, Fig. 22. Screw nut down by hand, then final tighten to 120 foot pounds using special injector nut socket #8201445 and torque wrench #8173332.
7. Invert the injector in the vise, nut end down and re-clamp in the vise.
8. Apply two new fuel filters in place in the body. Then apply filter springs and filter caps using new filter cap gaskets. Torque filter caps to 40 foot pounds using torque wrench #8157120.

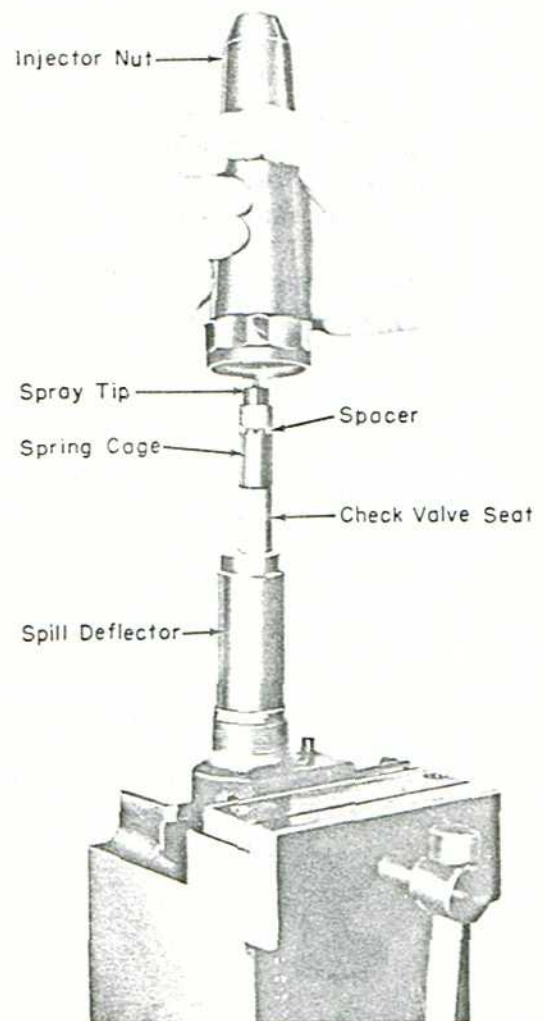


Fig. 22 - Removing Injector Nut

9. Apply follower spring in place on injector body.
10. Install stop pin, spring and their retainer in the follower. Engage the plunger with the follower.

NOTE: To assemble the two-piece follower used on earlier injectors, the plunger is inserted in the follower guide and held by the follower as shown in Fig. 2. The stop pin holes in the follower and follower guide are lined up and the stop

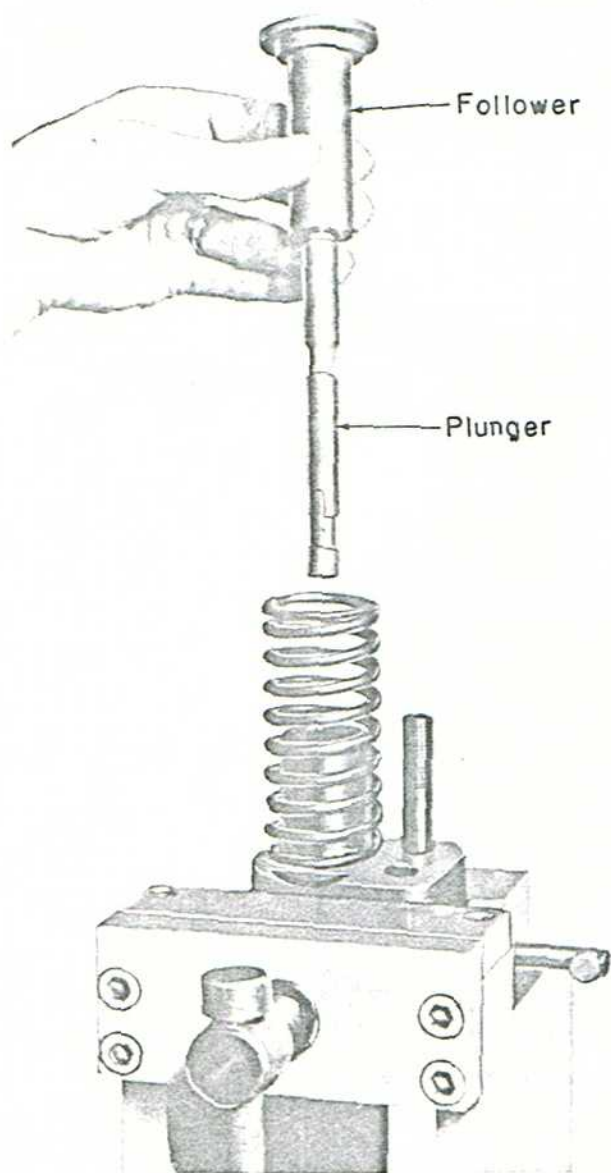


Fig. 23 - Plunger And Follower Installation

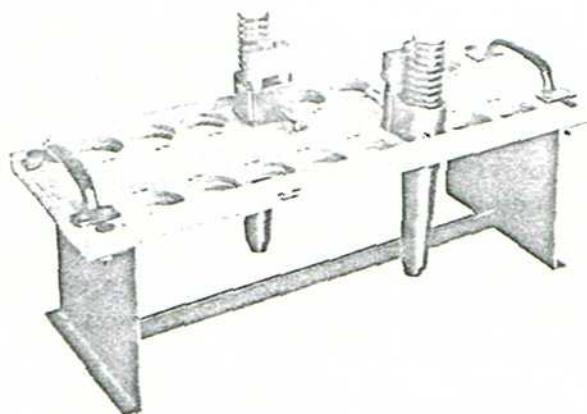


Fig. 24 - Injector Holding Rack

pin, lockwasher and set screw are applied.

The set screw is run into the follower so as to allow the pin and screw to permit installation. After the assembly is installed in the injector, with the stop pin in the body slot, the screw is tightened using 1/8" Allen wrench #779431.

11. Turn the flat side of the plunger (or gear key way) to be at same side as the stop pin in the follower. Insert the assembly in the injector, Fig. 23. Release the stop pin when it contacts the body guide and by slightly moving the rack allow the plunger key way to enter the gear so the plunger will go down and the stop pin enter its slot.
12. Apply the shipping block over the body stud to protect the open filter caps and place the completed injector in the injector storage rack #8159288, Fig. 24 in preparation for injector testing.

H. INJECTOR TESTING AND STORAGE

After each injector has been reconditioned as outlined in the preceding instructions, it must be tested before it is used in an engine. Testing will indicate whether the reconditioning is complete and if the injector is satisfactory

for use in an engine. If the injector does not test satisfactorily, it must be disassembled, the defective part again reconditioned or replaced by a new part and the injector retested. In addition, in order to assure proper engine performance, it is recommended that injectors be tested whenever they are removed from an engine, regardless of the reason for removal.

The 567 series engine fuel injector must be tested using either #8202944 test stand, Fig. 25, (or modified test stand #8171779 which corresponds to #8202944 stand) since leak off rates vary greatly with test stand assembly volume. Testing of the injector consists of determining the freeness of the rack under different load positions, checking for binding plunger, valve opening pressure, tight

assembly, condition of spray tip orifices and lapped surfaces of some parts. An explanation of each test and correct test instructions are given in Section 10 of the latest edition of the 252C Engine Maintenance Manual.

Upon completion of testing the injectors, they should be properly stored until withdrawn for assembly in an engine. The injectors may be stored in large covered compartments using holding racks #8159228, Fig. 24, which accommodate 16 injectors. The racks may also be placed in individual storage boxes. Details of construction of these storage boxes are given in file print #207, which is available upon request. The injector holding racks are recommended since they hold the injectors in an upright position.

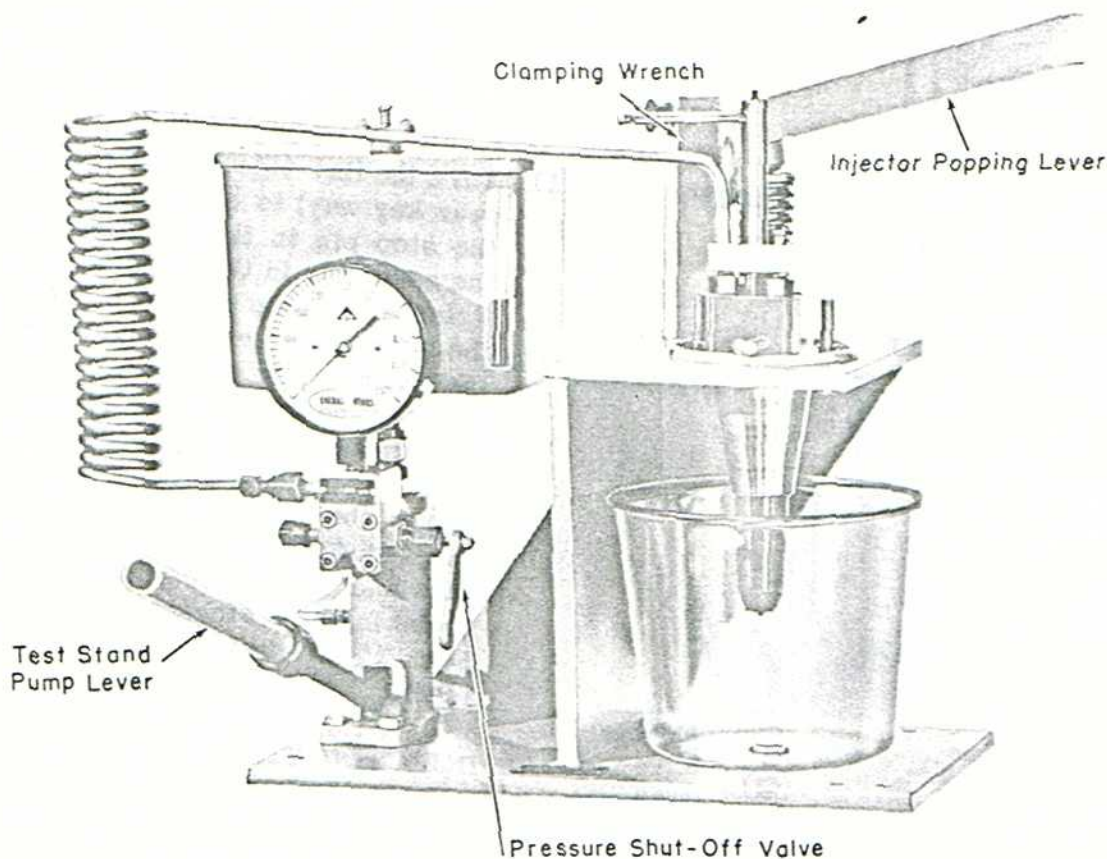


Fig. 25 - Injector Test Stand

IV. EQUIPMENT LIST

<u>Description</u>	<u>Quantity Recommended</u>	<u>Part Number</u>
Injector Test Stand	1	8202944
Wrench - Injector Body	1	8032655
Socket - 5/8" - 1/2" Drive	2	8043733
Ratchet - 1/2" Drive	1	8043741
Socket - 3/4" - 1/2" Drive	2	8067714
Brush - Injector Nut	12	8069986
Brush - Injector Bushing	12	8069987
Reamer - Injector Nut Cleaning	2	8070959
Stone - Abrasive	1	8070961
Lapping Plate Set	1	8191188
Reamer - Magnetized (Body)	1	8194040
Reamer - Magnetized (Spray Tip)	1	8194041
Seating Tool (for 8201444)	1	8201443
Disc - Abrasive	24	8201444
Seating Tool (for 8201447)	1	8201446
Disc - Abrasive	24	8201447
Socket - Special Body Nut	1	8201445
Vise - Injector	1	8201448
Stud Driver - Housing	1	8201449
Collet - 7/16"-20 (stud driver)	2	8201450
Tap - 7/16"-20	2	8201451
Straight Edge	1	8201452
Vise - Bench	1	8201453
Caps (for 8201453 vise)	2	8201454
Magnifying Glass	1	8201455
Pin Vise Set	1	8079577
Wire (.011" - 500 feet)	1	8122519
Brush - Wire (flat - 7/16" x 1/2")	24	8236901
Brush - Wire (flat - 1/2" x 1/2")	24	8236902
Rouge (Jewelers - 1 lb. can)	1	8201456
Compound - Lapping - Fine 1/2 lb. jar	2	8201457
Compound - Lapping - Medium 1/2 lb. jar	1	8201458
Compound - Lapping - Coarse 1lb. can	1	8201459
Cleaner - Liquid 55 gal. bbl.	1	8201460
Solvent - Liquid 55 gal. bbl.	1	8201461
Oil - Injector Test and Storage	1	8203258
Rack - Injector Storage (for 16 injectors)	As Req'd	8159228
Wrench - Torque (200 ft. lbs.)	1	8173332
Wrench - Torque (100 ft. lbs.)	1	8157120
Cleaning Tank and Hood	Blueprint available on request	8204639
Blueprint showing details of injector reconditioning room		File #470
Blueprint showing construction details of injector storage box		File #207