

AIRCRAFT CARBURETOR SERVICE MANUAL

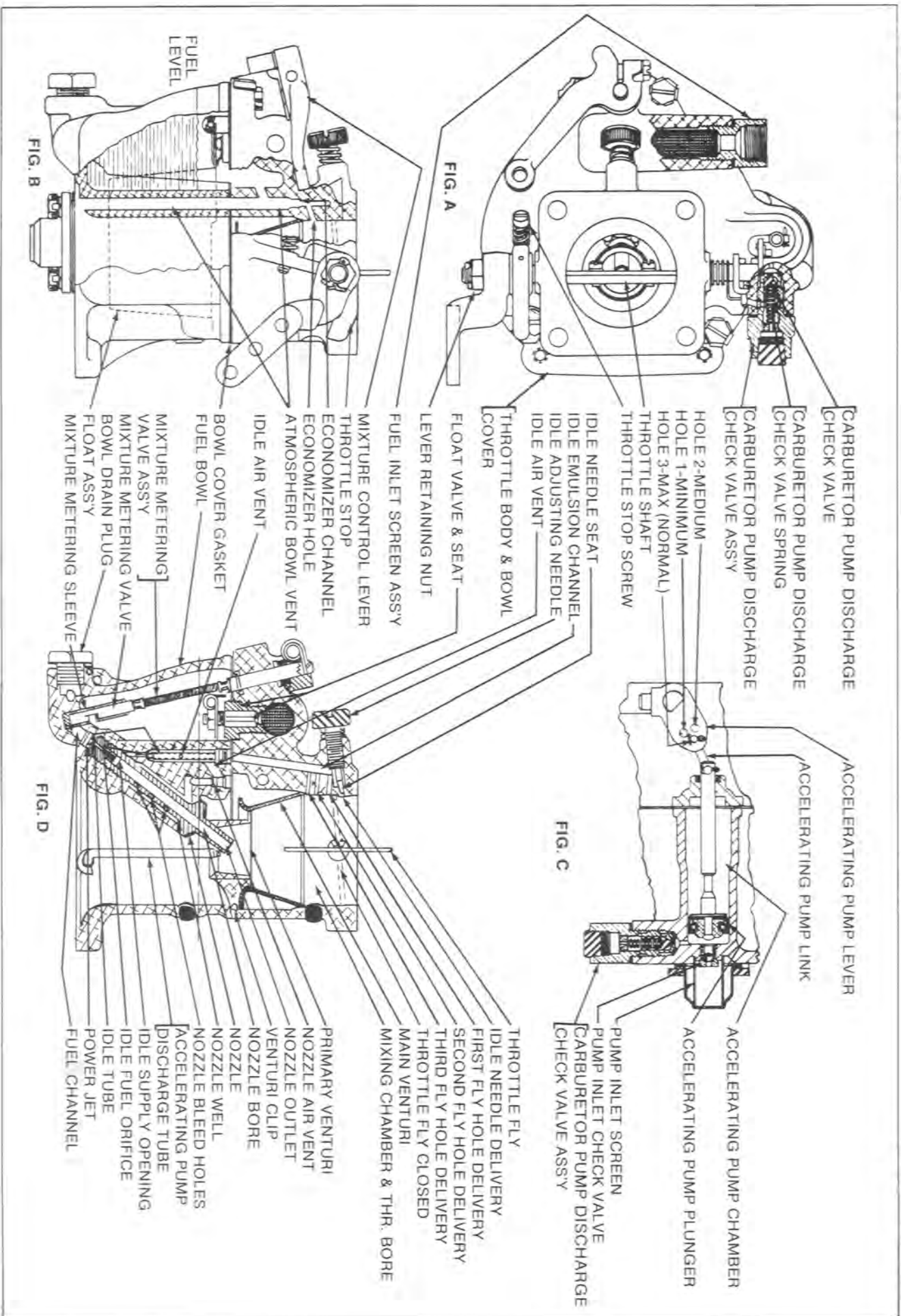
MODELS
MA3A
MA3PA
MA3SPA
MA4SPA



Facet

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MODEL MA 4SPA

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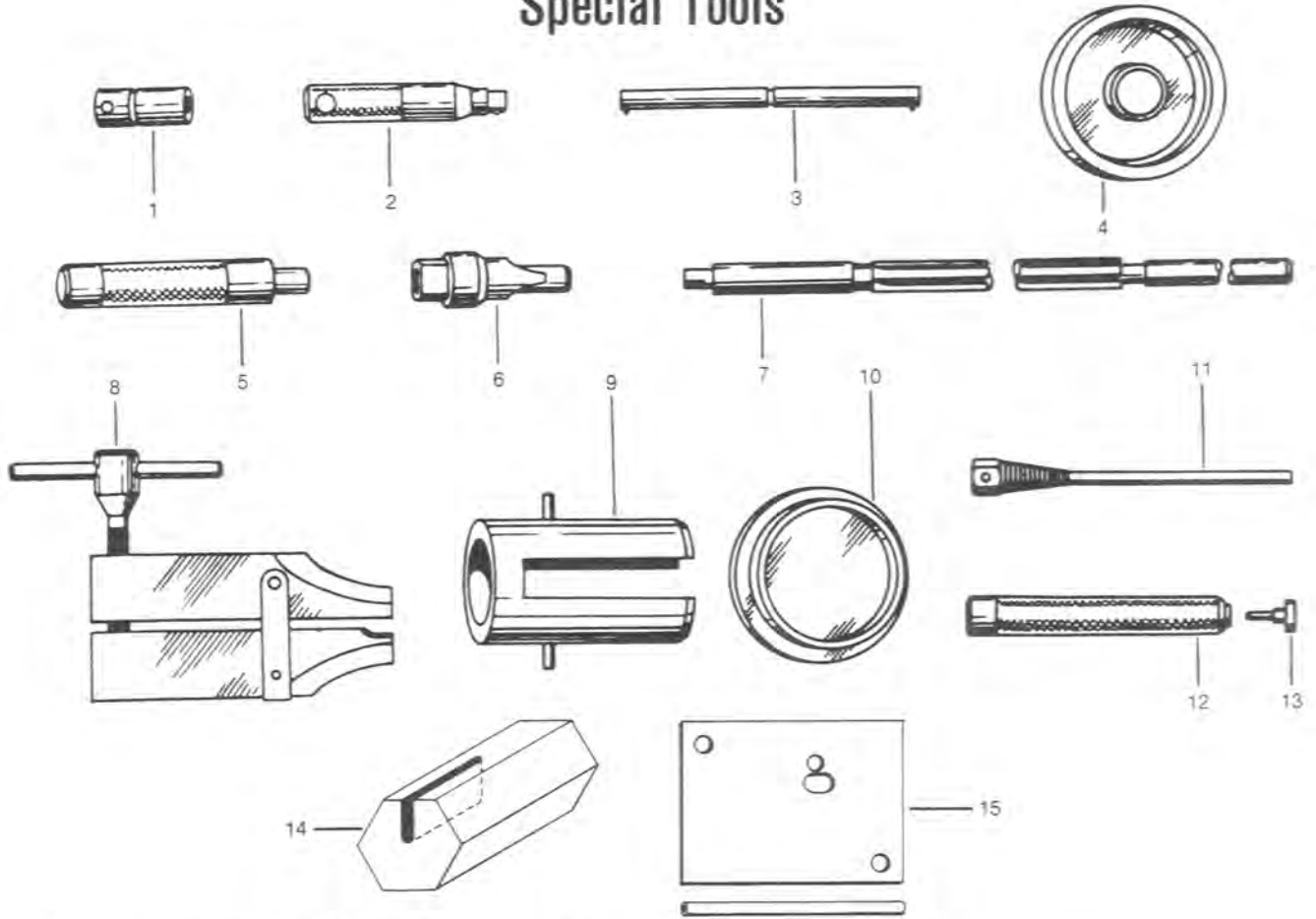
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NOTE

Models MA 3A, MA 3PA, MA 3SPA and MA 4SPA are very similar and this overhaul section will apply to all.

Model MA 3A does not have an accelerating pump circuit. (Example Part No. A10-3103-1 as used on the Lycoming O-235-C1)

Special Tools



| REFERENCE NUMBER | PART NUMBER | NOMENCLATURE |
|------------------|-------------|--|
| 1 | M-7 | Nozzle wrench ½ inch (Snapon No. SF-161) |
| 2 | M-12 | Socket extension |
| 3 | M-13 | Socket extension handle |
| 4 | M-83 | Primary venturi assembling tool |
| 5 | M-86 | Throttle shaft bushing driver |
| 6 | M-104 | Float valve seat remover |
| 7 | M-108 | Throttle Shaft bushing reamer |
| 8 | M-109 | Throttle valve bolt clincher |
| 9 | M-120 | Main venturi extractor |
| 10 | M-121 | Main venturi assembling tool |
| 11 | M-122 | Throttle shaft bushing remover |
| 12 | M-123 | Pump stem packing stake punch |
| 13 | M-123A | Pump stem packing stake pilot |
| 14 | M-133 | Torque tool for pump discharge tube |
| 15 | M-134 | Locating tool for pump discharge tube |

DISASSEMBLY PROCEDURE

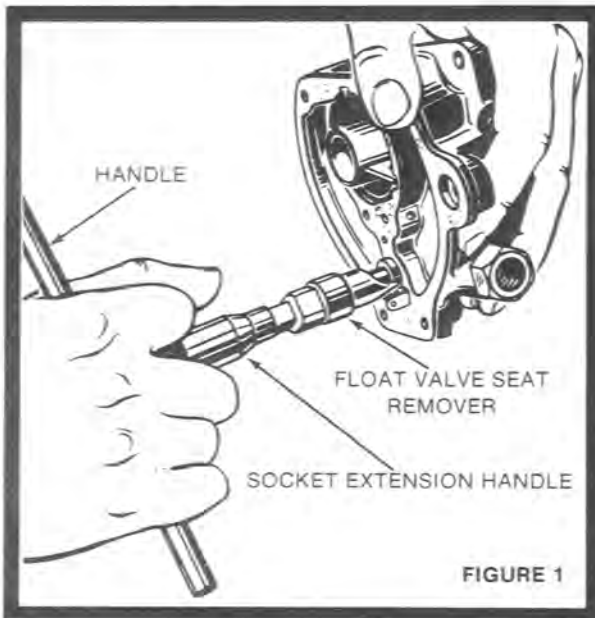
Refer to Exploded View for Reference Page 8 and 9

ITEM:

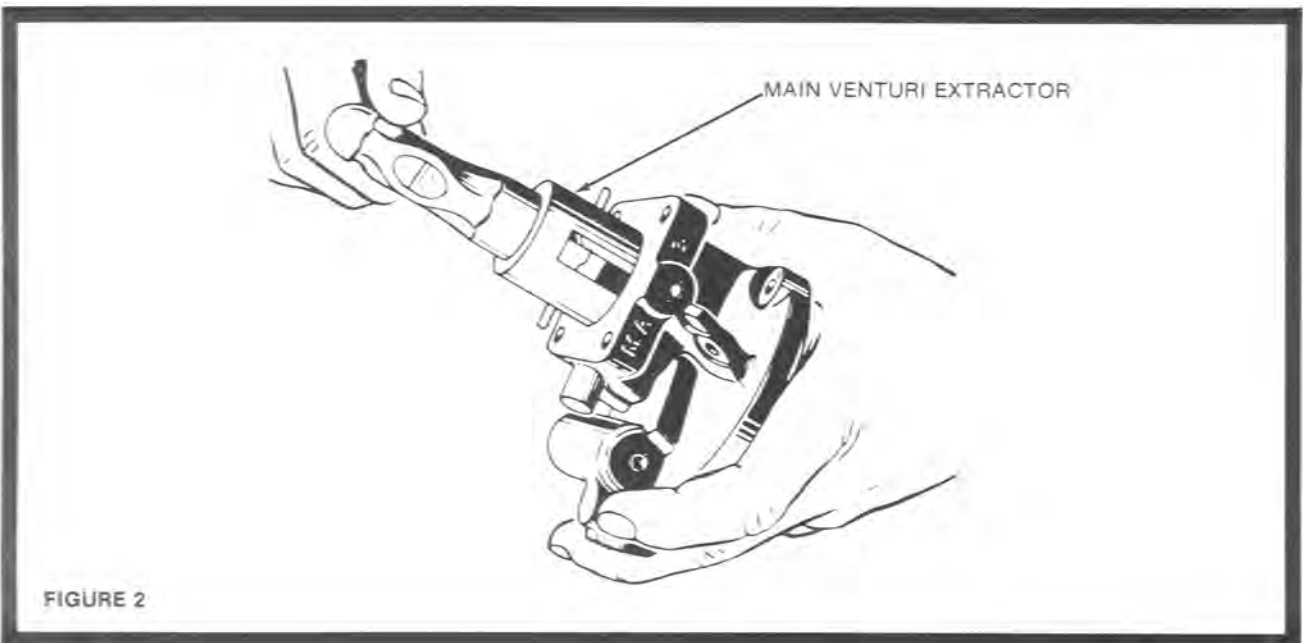
- 1) Separate the throttle body and bowl by bending tab washers (1) and removing bowl cover screws. (2)
- 2) Tap casting lightly with a soft faced hammer to loosen and pull castings apart, being careful not to damage the float.

THROTTLE BODY DISASSEMBLY

- 3) Remove float shaft cotter pin (3), shaft (4), float (5), retraction clip (6), and float valve (7).



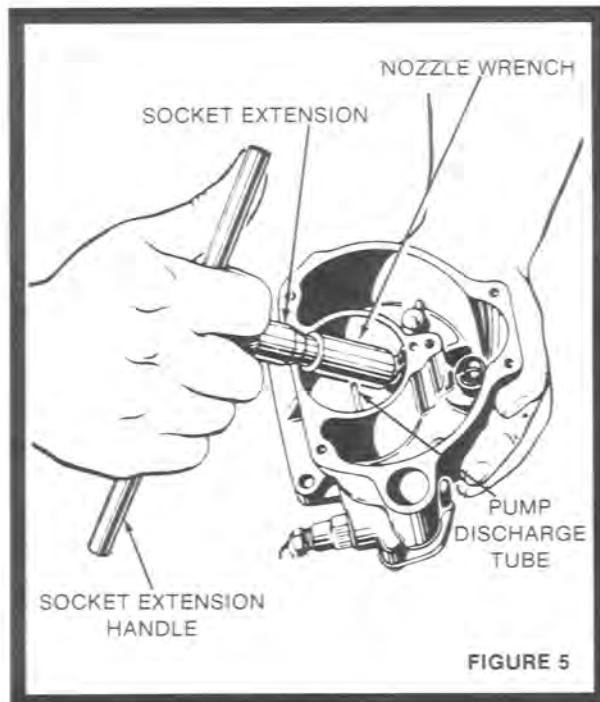
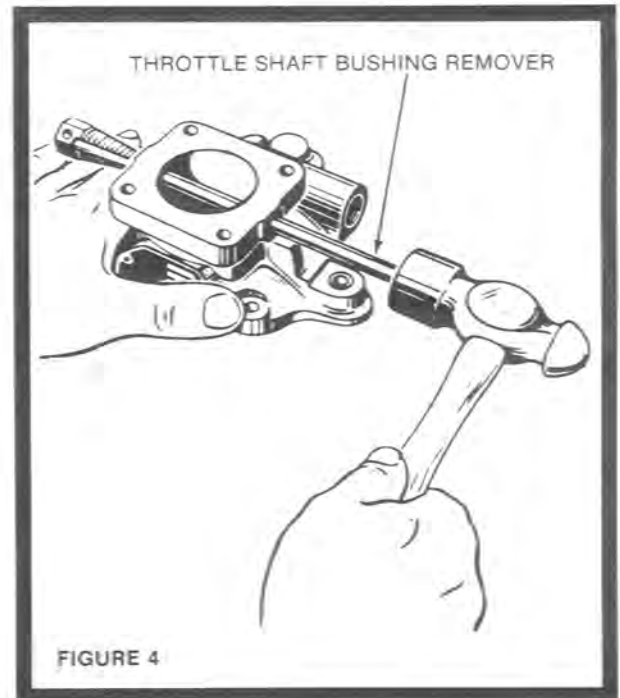
- 4) Discard bowl gasket (8).
- 5) Remove pump link cotter pins (9), pump link (10), and pump plunger assembly (11).
- 6) Remove accelerator pump lever screw (12), lever (13), and throttle opening spring (14).
- 7) Remove pump packing washer (15) and pump packing (16) with a pointed tool or small screw driver.
- 8) Remove mixture control clamp screw (17), and safety washer (18).
- 9) Remove mixture control lever (19), lock wire (20), spring (21), thrust washer (22), and "V" packing (23).
- 10) Remove mixture control valve (24), horseshoe washer (25), and gasket (26).
- 11) Remove float valve seat (27) using tool M-104 or a large screw driver; remove gasket (28). See figure 1.
- 12) Remove throttle lever cotter pin (29), nut (30), and lever (31).
- 13) Remove throttle valve screws (32), valve (33) and throttle shaft (34).
- 14) Remove throttle adjusting screw (35), and spring (36).
- 15) Remove idle adjusting needle (37), spring (38), and retainer (39).
- 16) Remove primary venturi clips (41), and primary venturi (42).
- 17) Remove main venturi (43) with extractor tool No. M-120 or a suitable wood dowel about the size of the throttle bore. Tap out lightly. See figure 2.



- 18) Remove throttle shaft bushings (44) using tool No. M-122 or any standard bushing removal tool. See figures 3 and 4.
- 19) Remove economizer jet (45). Note: Some



- models do not use an economizer jet.
- 20) Remove fuel inlet fitting (46) and gasket (47). Remove float bracket screws (63), and bracket (64).



BOWL DISASSEMBLY

- 21) Remove idle tube (48) and drain plug (49).
- 22) Bend down tabs of nozzle safety washer (51). Remove nozzle (50), safety washer (51), and nozzle gasket (52). See figure 5. Note: Occasionally the nozzle gasket will stay in the casting when nozzle is removed. **Make sure it is removed.**
- 23) Remove pump discharge check valve assembly (53), safety washer (54), and gasket (55).
- 24) Remove pump inlet retainer screws (56), safety washers (57), retainer flange (58), strainer housing (59), gasket (60), screen (61), and inlet check valve assembly (62). Pump discharge tube (not shown) seldom needs service or removal. If it is damaged or loose pull it carefully out of its casting counterbore and discard.

CLEANING AND INSPECTION

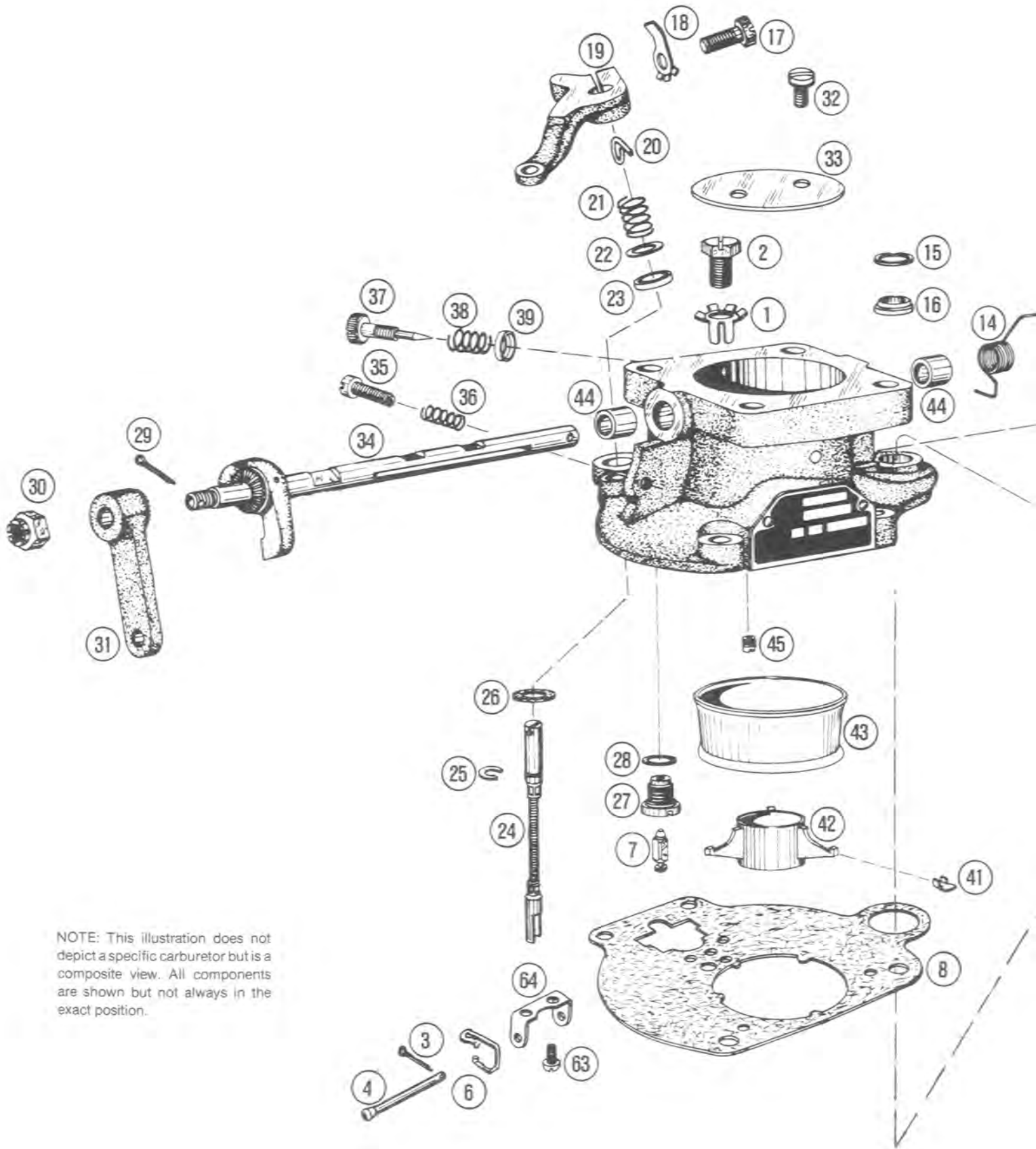
CLEANING PROCESS

- 25) Use a recommended carburetor cleaner and the cleaner manufacturer's procedure to soak, rinse, and blow out to assure complete cleaning. Only metal parts are to be placed in carburetor cleaner. Do **not** expose non metal parts to carburetor cleaner.
- 26) Always replace:*
 - All gaskets
 - Seals and packing
 - Bushings
 - Retainers
 - Float valve and seat assembly
 - Accelerator pump
 - Float shaft
- *Do not reuse any parts which in your opinion are not airworthy.
- 27) Carefully inspect the castings for cracks, warping or unusual wear or damage. Replace if not reusable.
- 28) Carburetor and carburetor parts have by design requirements very small passages, channels, and orifices. These are quite difficult to inspect. You will find invaluable the use of a medical tool. It is the Otoscope. This is the tool the doctor uses to examine your ears. We use this tool in our shop to inspect, build, and repair. They can be obtained from any medical supply house and can be used for inspecting many other aircraft parts.

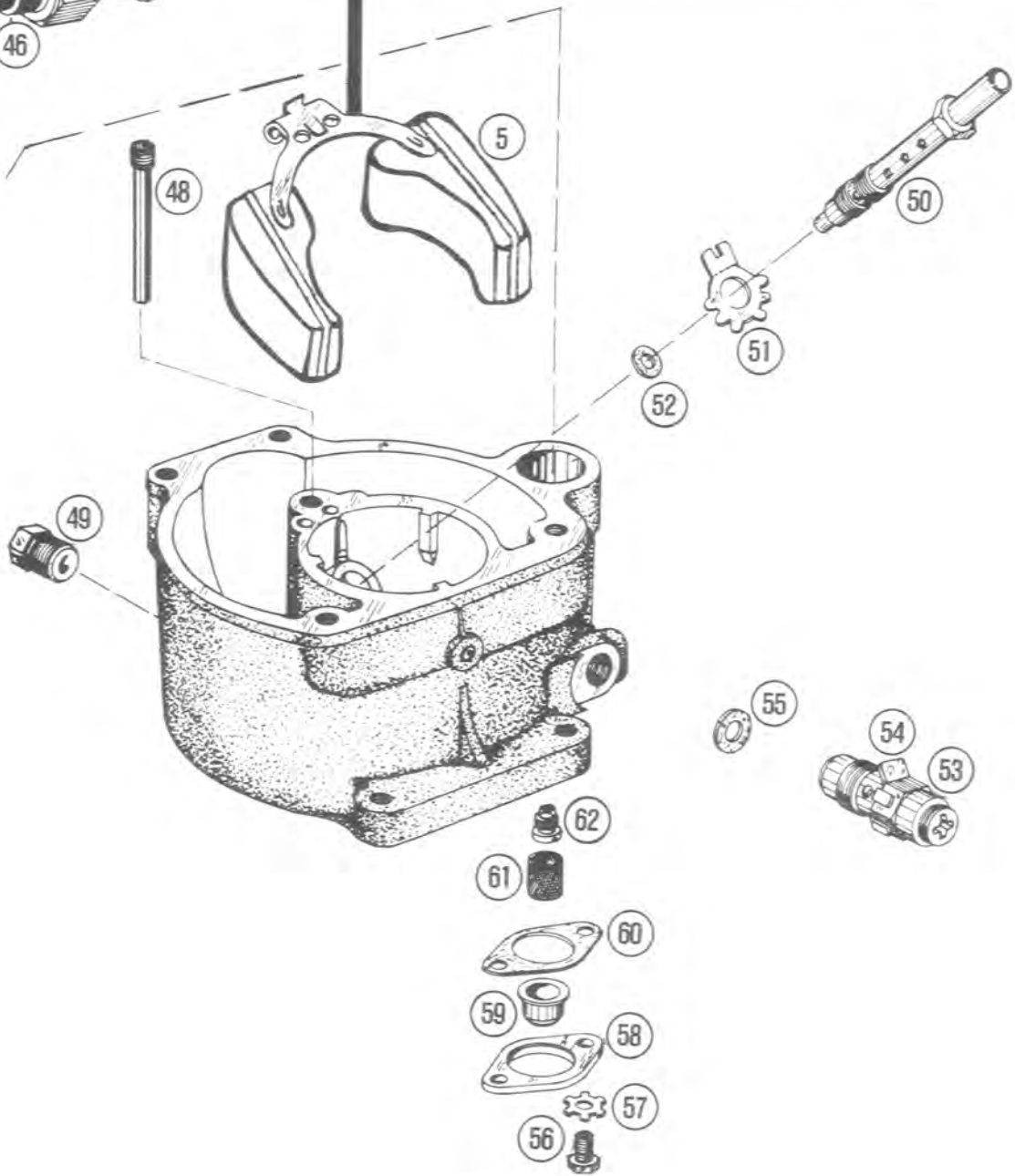
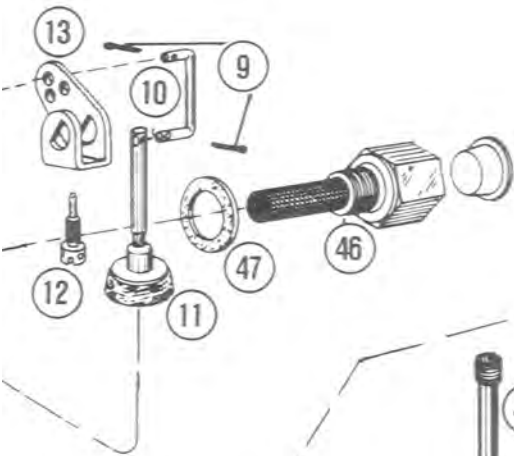
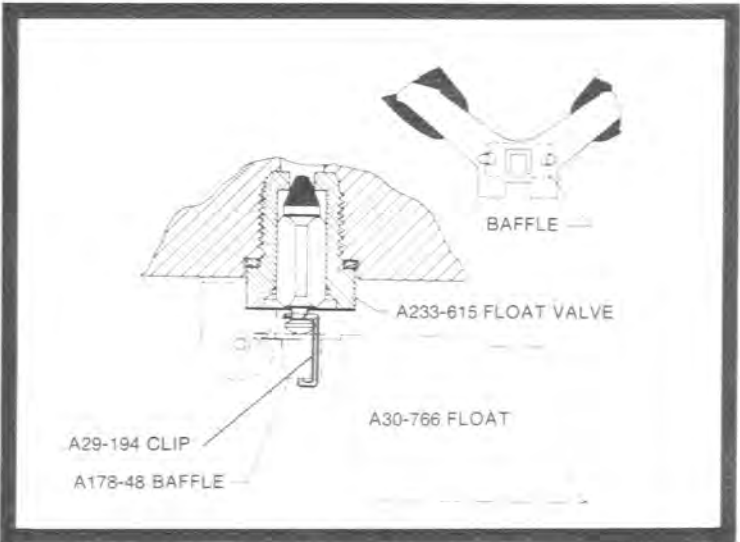
IMPORTANT: Do not clean passages in castings or calibrated parts with wire or small drills.

INSPECTION

- 29) Normal aircraft quality inspection techniques can determine reusability of carburetor components. Abnormal wear, cracks, warping damage are, of course, just cause for rejection.
- 30) Late model aircraft are all equipped with soft engine mounts. This has created a more severe vibration environment, causing different carburetor wear characteristics in different aircraft. **Careful inspection is required.**



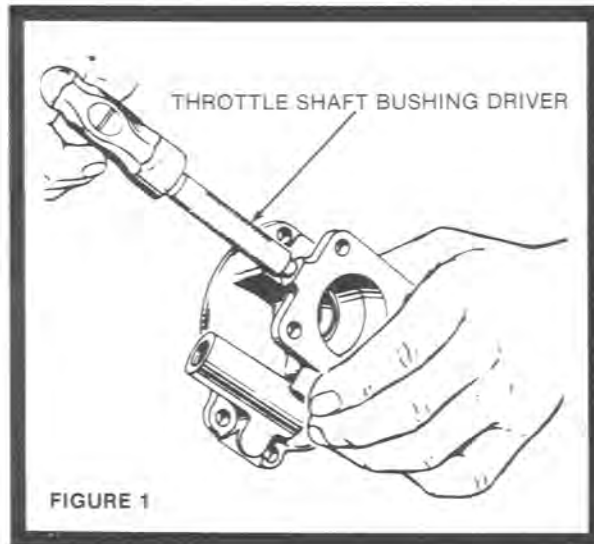
NOTE: This illustration does not depict a specific carburetor but is a composite view. All components are shown but not always in the exact position.



REASSEMBLY PROCEDURE

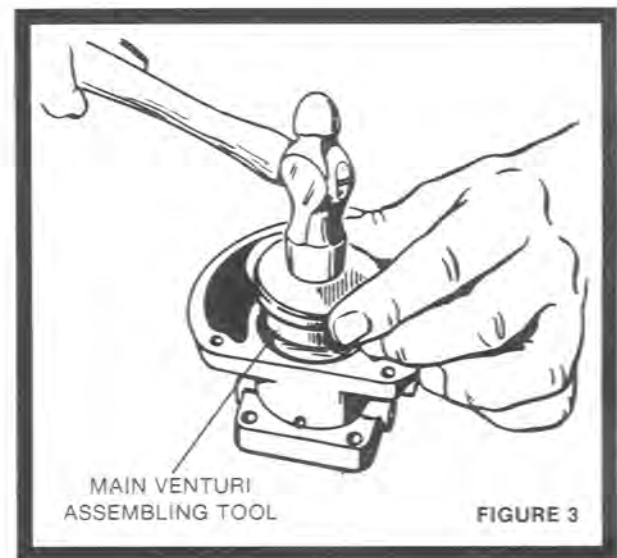
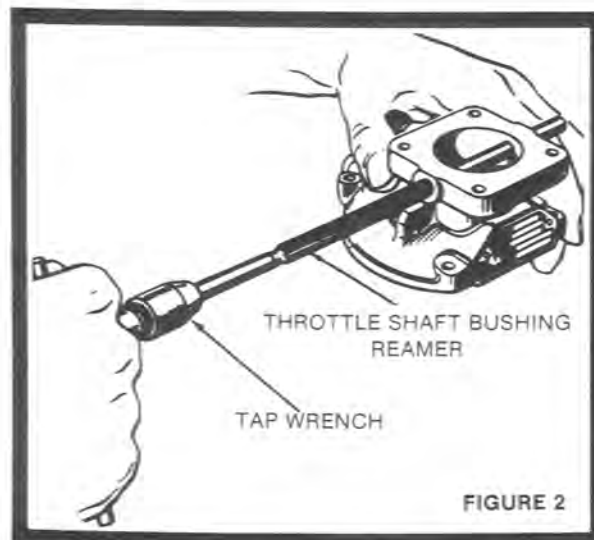
THROTTLE BODY

- 31) Lightly coat the bushing with Loctite Bushing Mount per Loctite's recommended instructions. Install throttle shaft bushings using tool M-86 bushing driver. Place bushing (44) on driver and tap into place and repeat on opposite side, as shown in figure 1. Cure in location from two to four hours. Heat not to exceed 110° F may be used to speed curing.

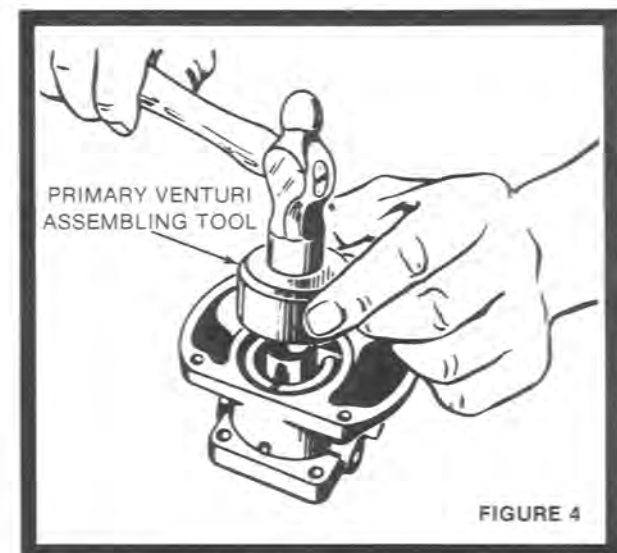


NOTE: Repeated rebushing of older models with the old style steel bushings may have enlarged the bore with resultant loss of press fit. Make sure in this case that the loose bushings are in location.

- 32) Line ream the bushings with tool No. M-108. See figure 2.

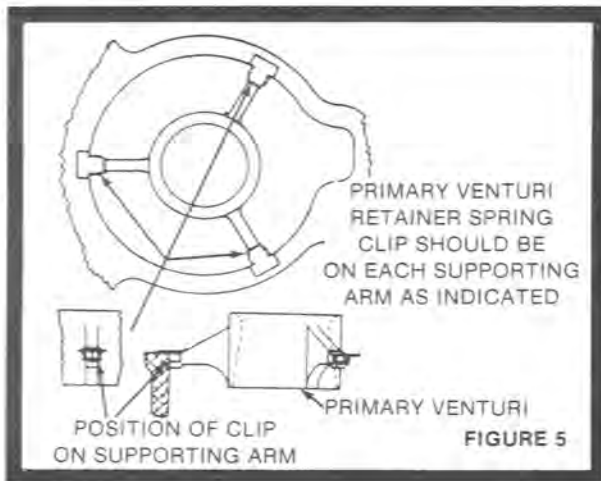


- 33) Install pump stem packing (16) and retainer (15) using tools No. M-123 and M-123A. Place tool M-123A (Packing pilot) in place on the bottom side of throttle body; slip packing (16) in the cavity on top side. Place retainer (15) over packing and stake in place with tool M-123. Remove pilot.
- 34) Install main venturi (43) using tool M-121 or a suitable wooden dowel. Use caution, this venturi rests very lightly in its location. See figure 3.



- 35) Install primary venturi (42) using tool No. M-83. Place the primary venturi in position so that the notch in the side of the venturi will be in alignment with the nozzle and the legs engaged in the grooves in the throttle bore. See figure 4.

- 36) Install and locate the primary venturi clips (41) as shown in figure 5.
- 37) Install the economizer jet (45) if used.
- 38) Exercise caution, as this is a brass jet, so as not to damage or burr since this can cause a change in flow.
- 39) Install throttle shaft (34), throttle valve (33), and throttle valve screws (32). Run screws lightly into place, rotate the shaft to the closed

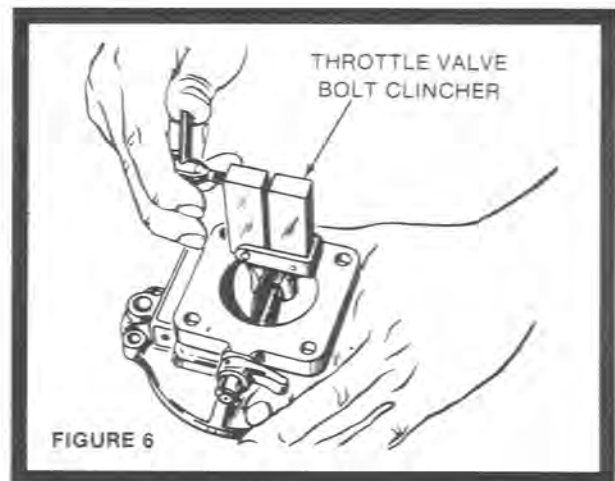


position and tap the valve lightly with the screw driver blade to seat the valve in throttle bore. Hold the throttle valve closed and tighten the screws.

- 40) Safety the throttle valve screws in place with clinching tool M-109. See figure 6. Carefully installed, the shaft will rotate freely from fully closed to wide open. Note: Certain carburetors do not use a wide open valve and you may notice that the valve is limited up to 10° from the fully open position. This is normal and an important part of the full throttle requirements. DO NOT CHANGE.
- 41) Install throttle adjusting screw (35), and spring (36).
- 42) Install retainer (39), spring (38), and idle needle (37). Approximate setting 1-1/2 to 2 turns from seat.
- 43) Place horseshoe washer (25) in its groove on mixture control valve (24). Place gasket over valve head and insert into casting from the bottom.
- 44) Slide "V" packing ("V" up) (23), washer (22), and spring (21) over valve head. Place tip of the altitude lock wire (20) into its cavity in valve head and push lever (19) down to compress spring (21). Assure that the loop of the lock wire is toward the valve.
- 45) Install clamp screw through lever and lock wire

and clamp securely, bending safety tab washer to secure.

- 46) Install float bracket (64) with screws (63). These are long loc self safetying screws requiring no additional safety features.
- 47) Slide throttle opening spring (14) (if used) over the end of shaft (34) and insert the end through the hole in casting web. Install accelerating pump lever (13) and secure in place with its



screw (12). Insert the throttle opening spring end through the cross hole drilled screw (12) to safety and bend the end of the spring over to secure. Place throttle lever (31) at proper angle location on throttle shaft and secure with retaining nut (30) torqued to 20-60 inch pounds. Install cotter pin and bend. NOTE: Carburetor without the throttle lever locknut retaining feature on the end of the throttle shaft must have the throttle lever safety wired as shown in figure 18.

- 48) Insert the pump (11) carefully through the packing and install pump link (10) and cotter pins (9).
- 49) Note: The accelerating pump lever has three holes into which the upper end of the pump connecting rod can be installed.
- 50) The outer hole, known as the No. 3 hole, is approximately midway in height between the upper and lower holes. The No. 3 hole provides the longest stroke for delivery of maximum amount of accelerating fuel. The lower hole is known as the No. 1 hole and produces the shortest stroke. The middle hole, or No. 2 hole, produces a medium supply of accelerating fuel. Refer to FIG C Page 2.
- 51) Note: Some models have a pump plunger assembly which incorporates a collapsing feature to prolong the pump stroke.

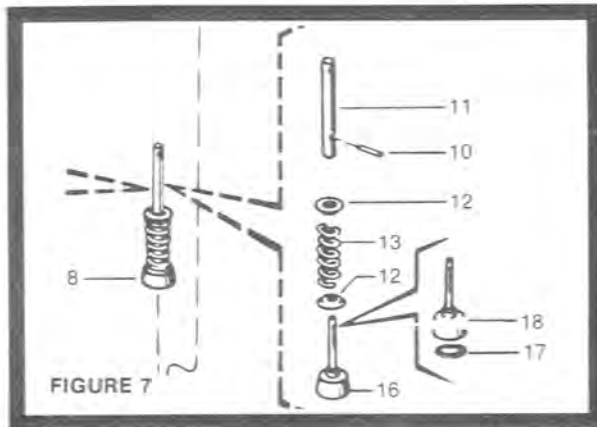


FIGURE 7

- 52) Assemble this type in accordance with this special section and figure 7.
- Hold a spring seat (12) against each end of the spring (13) and slide the pump plunger and stem assembly (16) through the spring.
 - Slide the pump plunger rod assembly (11) over the end of the pump plunger rod (11) so that the hole at the lower end will be in alignment with the slot in the stem. Apply finger pressure against the top spring seat (12) to compress the spring (13) far enough to permit insertion of the spring seat locating pin (10). After the pin (10) is in place, release pressure on the spring (13) to hold the pin securely in position. Press down against the top of the pump plunger rod assembly (11) to make certain that the stem on the pump plunger and stem assembly (16) will slide freely in the end of the stem.
- 53) If the pump leather expanding spring (17) was removed, install it carefully under the pump leather.
- 54) Install fuel inlet fitting - strainer assembly (46), and gasket (47).
- 55) Install float valve seat (27), and gasket (28) using tool No. M-104. See figure 8.

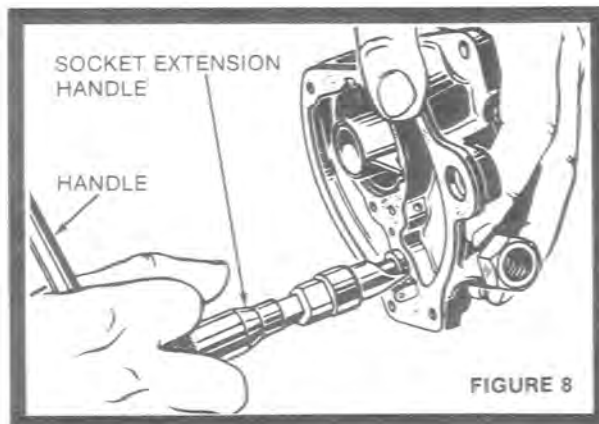


FIGURE 8

- 56) **CAUTION:** Exercise care during the following operations to prevent damage to the float.
- 57) To install the float, place the throttle body with the mounting flange down and install the proper throttle body to bowl gasket (8). If your carburetor requires the 95-57 vent screen, make certain that it is installed into the gasket so that it protrudes into the hole in the throttle body.
- 58) Place the float valve retractor clip 29-194 (6) on the float valve (7) as illustrated in Figure 9. Place the float valve and retractor clip on the 30-766 float (5) as illustrated in Figure 10.

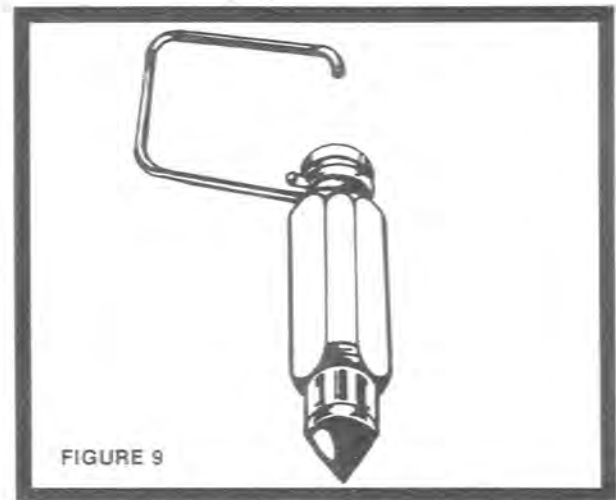


FIGURE 9

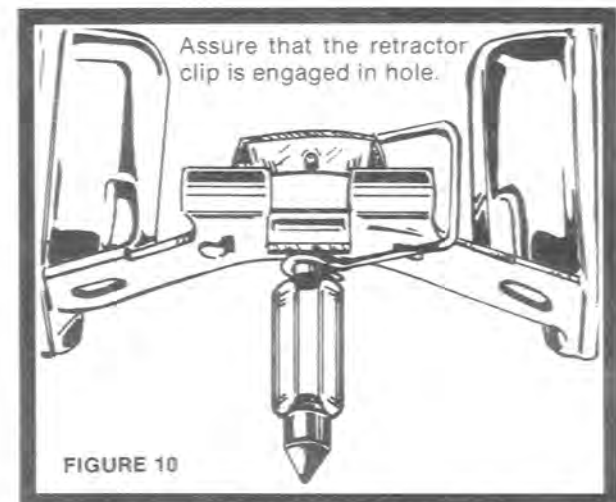
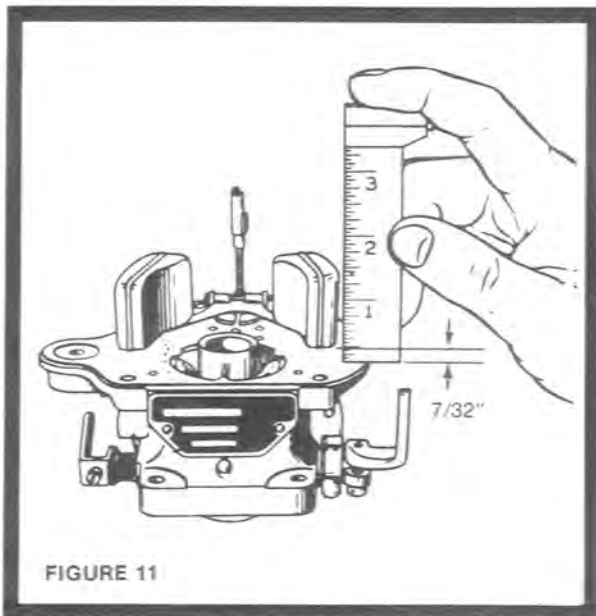


FIGURE 10

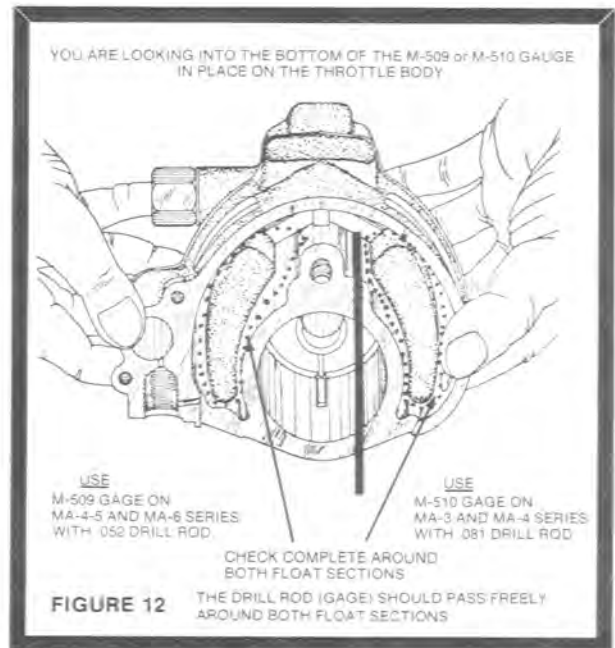
- 59) Place the float, valve and clip assembly into the float bracket (64) with the valve (7) in the float valve seat (27).
- 60) Insert the float lever shaft (4) through the float bracket and float lever hinge and safety in place with cotter pin (3). Bend the ends of the pin all the way back.

- 61) **CAUTION:** Insure that the float shaft is free to rotate and that the float and valve movement is not restricted between the fully open and fully closed position of the float valve. This is approximately 1/2-inch of float travel measured at outer end of float. The float setting is established as shown in Figure 11 with 7/32 clearance between the float and gasket measured near the outer end of each float.

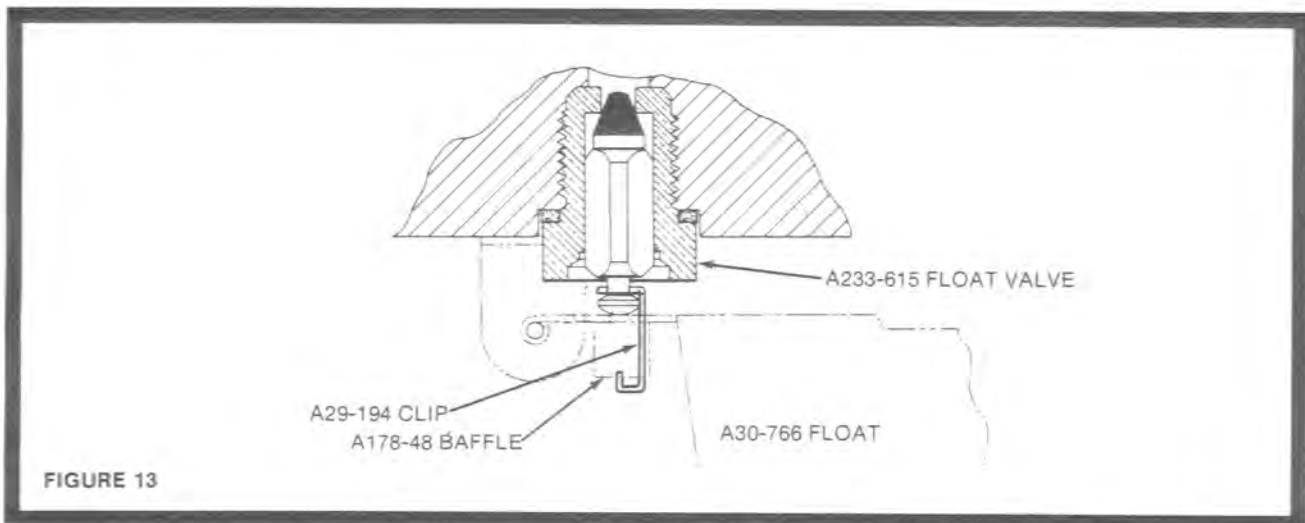


- 62) If adjustment is required, bend the float lever adjustment tab, located over the float valve, to achieve the 7/32 setting. A small screwdriver bent 30 degrees approximately 1/4-inch from its tip is a useful tool for setting the float.
- 63) **CAUTION:** Both float pontoons must be at the same height above the gasket.

- 64) **CAUTION:** DO NOT APPLY PRESSURE TO THE VALVE AND SEAT DURING ADJUSTMENT BENDING.
- 65) Use tool No. M-510 as a clearance guage to check float before assembly in accordance with figure 12. The float may be repositioned laterally by loosening the float bracket screws (63), moving the bracket slightly, and re-tightening screws. Set throttle body aside in a clean area while completing bowl assembly.



- 66) **CAUTION:** To prevent possible damage to the float do not blow on or into the carburetor assembly with compressed air. Failure to follow these instructions may result in adverse carburetor performance and engine operation.



BOWL ASSEMBLY PROCEDURE

- 67) Install idle tube (48) in casting exercising care not to damage the tube. Torque in firmly.
- 68) Install pump discharge check valve assembly (53), gasket (55), and safety washer (54). Bend tabs to safety valve in location.
- 69) NOTE: Do not disassemble the pump discharge valve (53). It is factory preset. If it has been disassembled, it must be replaced.
- 70) Install pump inlet check valve assembly (62), inlet screen (61), gasket (60), housing (59), and flange (58), and secure with screws (56) and safety washers (57). Bend tabs to secure.
- 71) Install drain plug (49) with a small amount of thread lube. (CAUTION — Make sure no thread lube can be put in ahead of the plug).
- 72) Place power jet gasket (52) on shoulder of power jet in the base of nozzle and insert nozzle through gasket safety washer (51), and install nozzle firmly into the bowl casting. See figure 14.
- 73) Bend tabs in washer to secure.
- 74) The pump discharge tube seldom needs service. However, if it needs to be replaced, it is installed with Loctite mounting compound and cured in place, in accordance with these instructions:

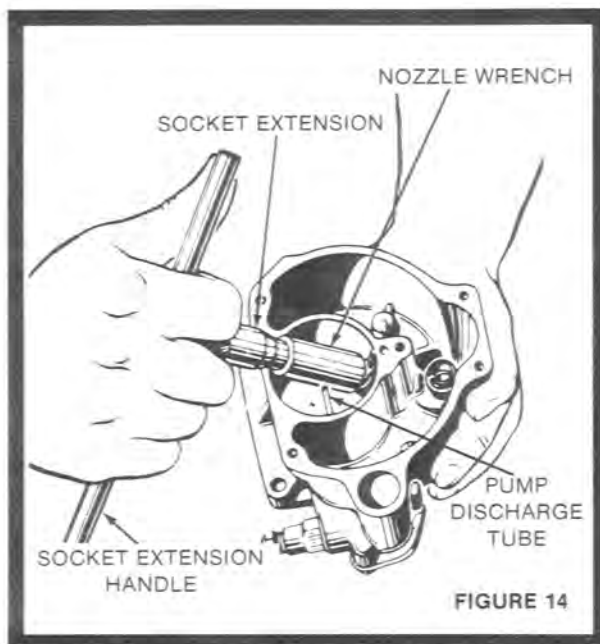


FIGURE 14

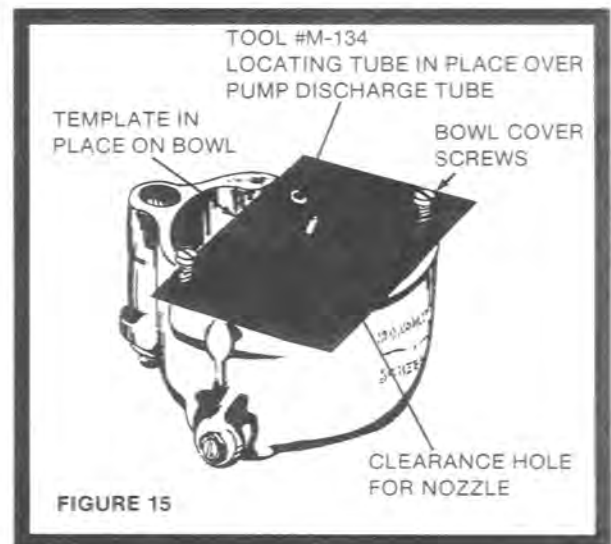


FIGURE 15

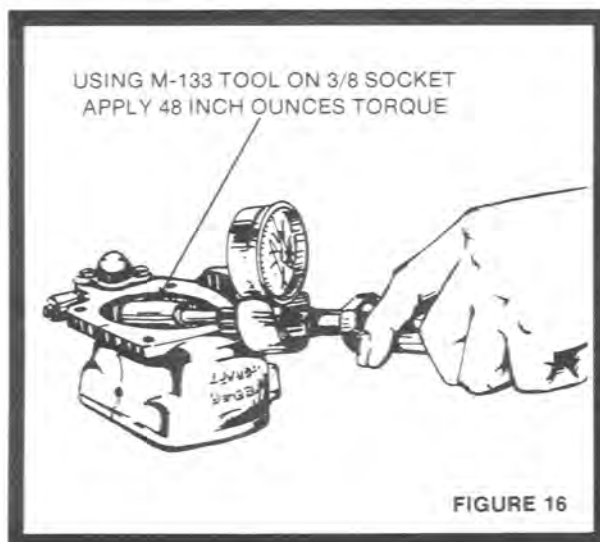


FIGURE 16

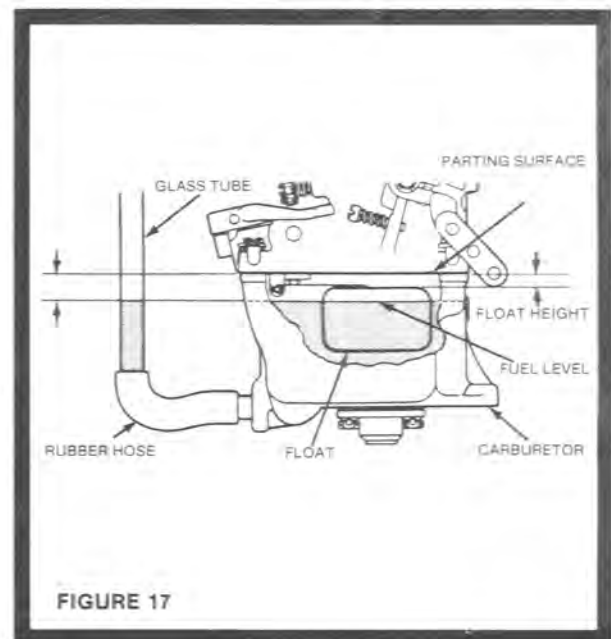


FIGURE 17

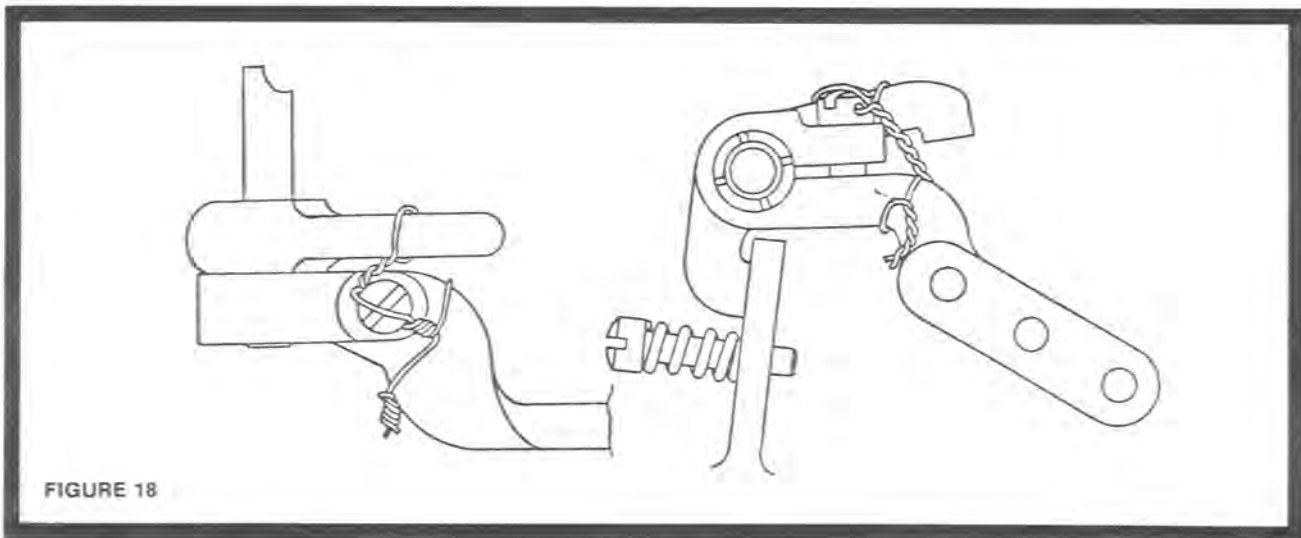


FIGURE 18

PROCEDURE TO ASSEMBLE ACCELERATOR DISCHARGE TUBE IN MA3 AND MA4 BOWLS

- 75) 1. Clean and roughen longitudinally (not radially) with #320 emery cloth approximately 1/2 inch length of the end of the accelerator discharge tube which is inserted into the bowl discharge port.

Thoroughly clean both surfaces with Loctite safety solvent. Clean surfaces insure consistent bonding results.

After applying safety solvent to accelerator discharge port in casting, swab with CLEAN pipe cleaner to remove residual contamination. After applying safety solvent to accelerator discharge tube, wipe with a CLEAN tissue to remove residual contamination.

DO NOT BLOW WITH COMPRESSED AIR AFTER APPLYING SAFETY SOLVENT — moisture and oil in the air may recontaminate the surfaces.

- 76) 2. Apply Locquic Primer T or Primer N to both surfaces. Allow primer to visibly dry (2-5 minutes) before applying retaining compound. Apply primer to accelerator discharge port in casting with a pipe cleaner wetted (not saturated) with primer. Apply primer to discharge tube by wiping.
- 77) 3. Apply Loctite Retaining Compound RC/680 to the accelerator pump discharge tube by brushing or wiping on approximately one-half inch length of the tube end which is inserted into the accelerator discharge port approximately 1/16 inch from the end of tube. DO NOT ALLOW RC/680 TO ENTER TUBE.
- 78) 4. With template #M-134 in place, assemble discharge tube into discharge port with a

rotating motion to spread retaining compound. Parts may be repositioned up to one minute after assembly.

After inserting pump discharge tube in place, place locating tube part of tool, M-134 thru the hole as indicated and down over the pump discharge tube and allow to cure in place. See Illustration #15.

If Primer T is used parts must be joined within four (4) minutes after RC/680 is applied. If Primer N is used, parts must be joined within ten (10) minutes after RC/680 is applied.

- 79) 5. Allow to cure at room temperature. With Primer T fixturing occurs within five (5) minutes with full cure in six (6) hours. With Primer N fixturing occurs in 15-30 minutes and full cure in 12 hours.
- 80) 6. After full cure — The Loctite Joint must be able to withstand 48 inch ounces of torque applied at the rotational axis of the discharge tube entering the discharge port without movement of the discharge tube. See illustration #16.

THROTTLE BODY AND BOWL ASSEMBLY

- 81) Carefully assemble the castings together by inserting the pump plunger into its cavity in the bowl (extreme care should be exercised to keep from damaging the pump leather), carefully guide the mixture metering valve (24) into its seat in bowl and the two assemblies will guide into place. Assure that the accelerator pump discharge tube is located inside the primary venturi. Install bowl cover screws (2) and safety washers (1) and torque in place 35-45 inch pounds. Bend up a minimum of two tabs of all safety washers.

TEST PROCEDURE

GENERAL

- 82) After the carburetors have been overhauled and the checks performed as specified throughout the overhaul procedures, the carburetors should be equal to new units. Final adjustments should be made at the time the carburetor is installed on the engine.

FLOAT VALVE AND SEAT TEST (See Figure 17)

- 83) **A.** Connect the inlet fitting of the carburetor to a fuel pressure supply of 0.4 psi.
- B.** Remove the bowl drain plug and connect a glass tube to the carburetor drain connection with a piece of rubber hose. The glass tubing should be positioned vertically beside the carburetor.
- C.** Allow the fuel pressure at 0.4 psi to remain for a period of at least 15 minutes and then raise the fuel pressure to 6.0 psi. (There will be a slight rise in fuel level as the pressure is increased.) Allow the 6.0 psi pressure to remain for at least five minutes after the fuel level has stabilized.
- D.** If the fuel rises to the level of the parting surface of the castings or runs out of the nozzle, the bowl and throttle body must be separated and the float valve and seat cleaned or replaced.
- CAUTION:** Under no circumstances change the float level from the established setting to correct flooding or to change fuel level.
- E.** With fuel supplied to the carburetor as shown in Figure 17, operate the throttle lever for several strokes to fill the accelerating pump and passages. Then close the throttle, open it

fully again, and hold it for a few seconds. If the accelerating pump is operating correctly, a solid stream of fuel will be discharged from the accelerating pump discharge tube or jet and will gradually die away after the spring on the pump plunger reaches its limit.

WARNING: DO NOT STAND DIRECTLY OVER THE CARBURETOR FLANGE AS FUEL WILL BE DIRECTED INTO THE FACE OF THE OPERATOR.

F. If the fuel discharge from the discharge tube or jet is weak, or if air is dispelled, it is an indication that the pump plunger or pump discharge or inlet check valve are not functioning properly. Disassemble the carburetor and make necessary repairs.

G. Remove the bowl drain plug to allow the fuel to drain out. Operate the pump to clear the fuel out of the pump cylinder and passages.

PRESERVATIVE TREATMENT

- 84) If the carburetor is to be placed in storage after overhaul, the bowl drain plug should be removed and the carburetor flushed internally with soluble corrosion preventive oil, Military Specification MIL-C-4339. After draining the surplus oil from the carburetor, enough will cling to the parts to provide internal protection during storage. Replace the bowl drain plug.

SPECIAL SCREW TORQUE SPECIFICATIONS

- | | |
|-----------------------------------|-------------------|
| 85) Float bracket Screws (63) | 8-11 inch pounds |
| Throttle lever clamp screw | 20-28 inch pounds |
| Bowl to Body screw (2) | 35-45 inch pounds |
| Throttle lever retaining nut (30) | 20-60 inch pounds |



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