

**GVB
C & E**



SERVICE INSTRUCTIONS
For
AMERICAN BOSCH
LOW REGULATION GOVERNORS
TYPES: GVB . . . C and E



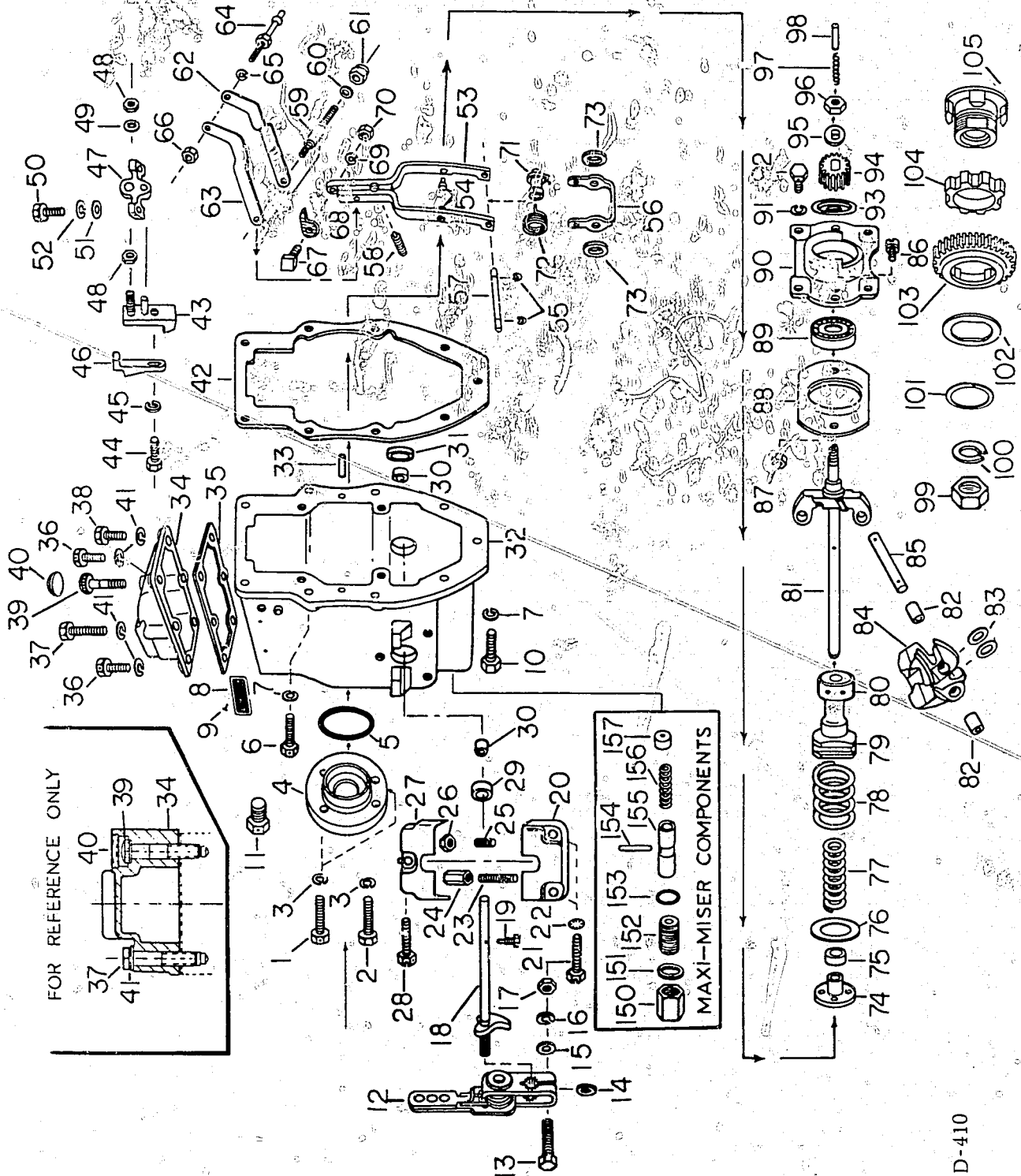


FIGURE 1

D-410

GENERAL INFORMATION

PURPOSE

The prime purpose of these governors is to serve as a means for pre-setting and maintaining within close regulation any desired engine speed within the nominal idling and nominal maximum speed range, irrespective of engine load. In addition, this governor controls the engine idling speed to prevent stalling and maximum speed to prevent racing. The GV type governor is used in Automotive, Industrial, Marine and Farm Tractor applications.

The governor is a fully enclosed unit, rigidly mounted to one end of the fuel injection pump. (See Fig. 2). A large gear is mounted to one end of the camshaft which extends into the adapter plate and drives a smaller gear connected to the governor flyweight shaft.

Through this combination of gears, the flyweight is caused to travel at a higher speed than the injection pump camshaft. The centrifugal force exerted by the revolving weights causes a movement of the sleeve assembly. This movement is opposed by the compression of the governor springs. The governor is internally connected to the injection pump control rack (see Fig. 2).

A friction clutch is built into the drive gear. This clutch is designed to dampen out torsional vibrations in the pump camshaft and drive, for the protection of the governor components. The clutch also permits the drive gear to slip on its hub momentarily during sudden acceleration or deceleration of the engine thus absorbing the inertia shocks created by the rotating masses of the governor. Later type drive gear assemblies incorporate a rubber insert for dampening function (see Fig. 4).

The bumper springs where/if used are so designed that it is contacted by the yoke at high idle speeds in order to

eliminate the possibility of engine surges. It is not to be used for low idle speed adjustments.

An adjustable maximum fuel delivery stop plate is provided in the GV governors. A torque cam at the upper end of the fulcrum lever contacts the stop plate during periods when maximum fuel quantities are required by the engine. The control rack travel is therefore limited by the position of the stop plate. The stop plate can be designed to provide increased torque at declining speeds as required in certain tractor and automotive applications.

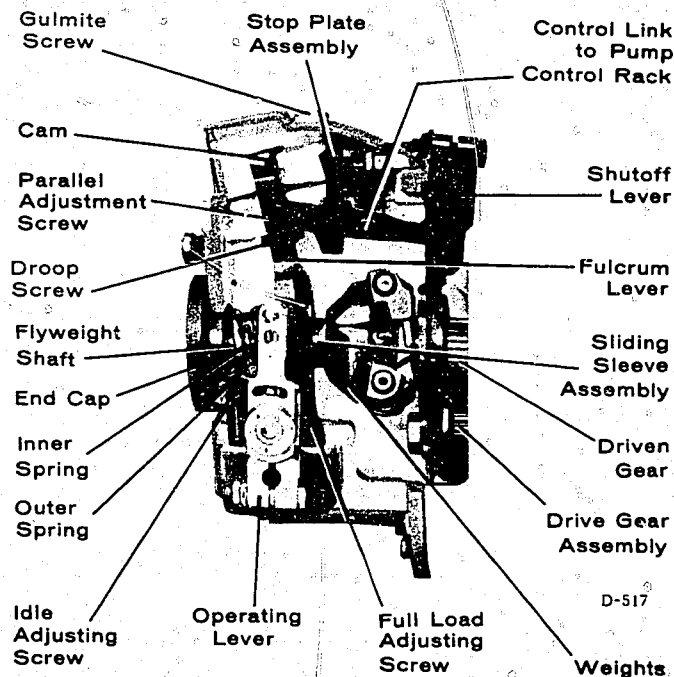


FIGURE 2

SERVICE INSTRUCTIONS

DISASSEMBLY of the GOVERNOR

All numbers refer to illustration numbers in exploded view (Fig. 1 in this manual section).

1. Drain all lubrication oil from the governor assembly.
2. Remove the governor housing fastening, screws and lockwashers (6, 7, 10).
3. Carefully disengage the governor housing from the pump housing and disengage the governor linkage pin from the injection pump control rack.
4. Remove the governor housing gasket (42).
5. Remove the governor inspection cover (34), gasket (35), screws (36 - 40).
6. The stop plate unit assembly (43-48) is held by two screws (50), lockwashers (51-52) and can be removed from the governor housing (32).
7. Remove the operating lever covers (20 and 27).
8. Remove the set screw (19) from the operating shaft spring hub (71).
9. Withdraw the operating lever shaft (13) and remove spring hub (71).
10. Remove the end cap screws (1-2), end cap (4), rear spring seat (74), shims (75, 76) and springs (77, 78).

11. Unscrew the four fastening screws from the front bearing bridge (90) and carefully slide the governor weight shaft assembly (81-85) from the governor housing (32).
12. If necessary to remove the operating lever shaft bushing (30) and oil seal (29) use Service Tool TSE 7936.
13. Withdraw the fulcrum lever assembly (53-68) and sleeve (79) from the governor housing.

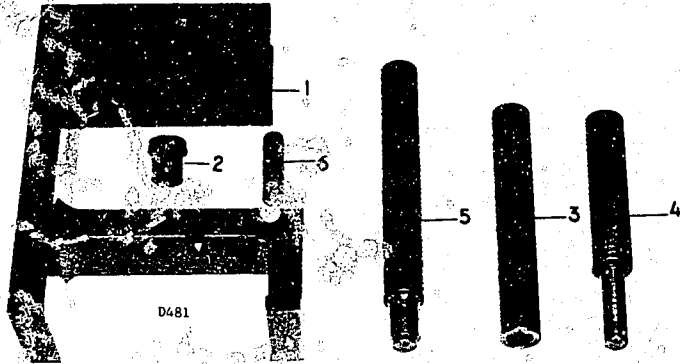


FIGURE 3

14. Remove the weight lubricating plunger (98) and spring (97). Remove the nut (96), washer (95), slinger (93) and driven gear (94).
15. Use an arbor press to remove shaft (81) from the ball bearing (89) and bridge (90).
16. Remove the ball bearing plate (88) and bearing (89) from the bridge (90).
17. Use arbor press and TSE 79104-4 to remove the weight pins (85).
18. Use a weight pin (PN 79100-1) to check inside diameter of weight bushing. If necessary to remove, use Service Tool TSE 79104-5.
19. The governor drive gear assembly (101) to (105) can be removed from the injection pump camshaft extension by removing the hex nut (99), lock washer (100). Use puller TSE 7920. The camshaft is prevented from turning by the use of the coupling wrench TSE 7913D on the drive coupling on the opposite end of the camshaft. Remove the retaining ring (101), adjusting spacer or spacers (102) and drive gear (103). The insert (104) can be removed from the hub assembly (105) as required. Do not re-use retaining ring; replace during repair. Refer to manual page D 3010/14.

EXAMINATION of PARTS

Gaskets, seals, fastening screws, nuts and washers are to be replaced if worn or damaged.

The O.D. of the oil seals (29) or oil seal and metal cap (31), used with the cut-off operating shaft (18), as well as the housing bore, must be coated with sealing compound prior to assembly. Always remove all traces of dirt or oil from the sealing surfaces. Drive and driven gear should be examined for wear or broken teeth and replaced if necessary.

Ball bearings should be examined for excessive wear or roughness. Replace if not in A-1 condition. Refer to manual page D 3010/100.

Governor springs must be free from nicks, rust spots or signs of corrosion.

Sliding sleeve assembly (79-80) must be inspected for wear in grooves. Check thrust washer face for wear and freeness. Check bushing for wear. A clearance up to 0.010" is permissible.

Flyweights (82-84) must move freely on weight pins (85), but not loosely. 0.001" - 0.004" clearance is allowable.

Fulcrum lever assembly (153-154, 157, 159-165) should be checked for wear of pivot pins, bushings, bracket, control rack linkage pin and droop screw. Smoke cam must be replaced if contact point (end) exhibits wear.

Replace torsion spring (72) during repair.

The stop plate must be tight on operating lever shaft (18). Serrations on shaft must be in good condition. Shaft must be straight.

The maximum fuel stop plate assembly (43 to 49) should be inspected for any wear by the torque cam (68).

The surface on the face of the gear (103) contacted by hub and spacers (102) (105) must be smooth. Insert (104) must be replaced if worn excessively.

REASSEMBLY of the GOVERNOR

1. After the parts have been cleaned, inspected and replaced where necessary, the governor can be reassembled. DIP all parts in clean oil to lubricate prior to installing.
2. The clearance between the drive hub (105) and the drive gear (103) must be checked. With ample clean lubricating oil between the hub and the drive gear, the latter

should move freely and easily without binding in any position. If necessary, the gear and its hub may be lapped slightly to provide a non-binding assembly. Reassemble in the positions shown in the exploded view (Fig. 4). The drive gear assembly (101 to 105) is mounted on the extending camshaft taper. No key is used. With the securing nut (99) firmly tightened, the assembly should be carefully checked.

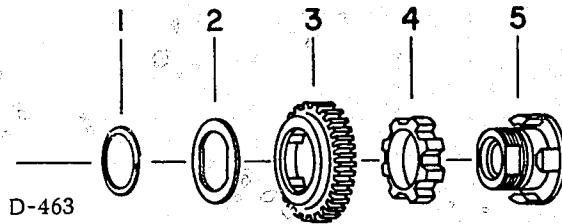


FIGURE 4

- The surfaces of the drive gear (103), spacers (102) and retaining ring (101) must be well lubricated with oil. To check the rubber insert drive gear assembly, proceed as follows:

The gear, in free position (insert removed), should obtain .001"-.006" clearance between retaining ring (101) and drive hub assembly (101-103, 105). After obtaining clearance, apply a coating of grease to insert (104) and assemble parts, under pressure, to assure proper seating of insert.

Use service tool, TSE 79105, to properly assemble new retaining ring into groove on hub assembly (105). Position ring at lowest end of taper to assist in assembly.

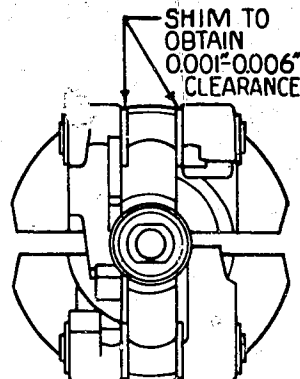
- Four types of weight assemblies are used within governor configurations. APE BB Pump-governors require 16 M/M governor sleeve travel with short finger weights WT 7958A with welded idle pin, WT 7956A and WT 7963A have no idle pin.

APE "G" Pump-governors require 18 M/M governor sleeve travel with long finger weights WT 7956A, and welded idle pin. Refer to specific governor parts list for correct type of weight. Do not intermix.

- GVB.....C-E governors utilize bushings which do not require reaming after being pressed into the weight. Correct inside diameter can be checked and obtained by pressing a 3/8" diameter ball bearing thru the bushings.

Ref: Section D 331/3006.

IMPORTANT: Before installing the weight bushings, it is recommended that they be dipped in SAE No. 30 oil.



D-506

FIGURE 5

- Position shims between shaft spider and weights to obtain 0.001" - 0.006" clearance. See Fig. 5.
- Secure the weights to the spider by pressing weight pin (85) into position.

IMPORTANT: Position the weight pin so that the center lubricating groove is directly in line with the weight shaft spider lubricating hole.

Figure 6 (D-448) illustrates weight correctly assembled.

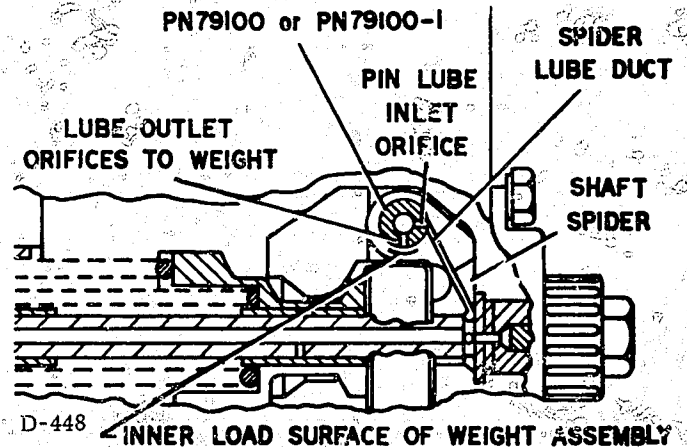
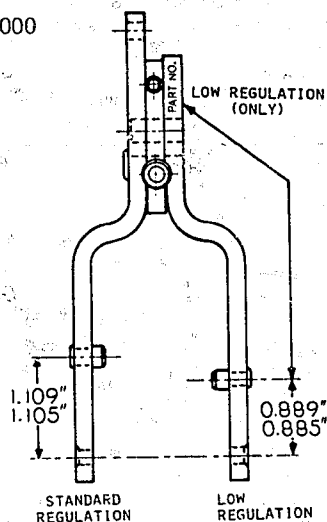


FIGURE 6

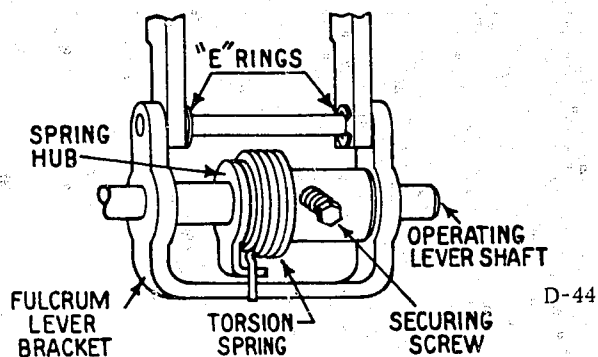
- When the bearing plate (88) is used, the ball bearing (89) is a press fit on the shaft (81) and a slip fit into the bridge (90).
- Install the weight lubricating plunger and spring (98 and 97). Assemble the driven gear (94) on the shaft (81) and secure the lock washer (95) and hex nut (96). Upset lock washer against sides of hex nut. If necessary to install new operating shaft bushings (9), press into the housing with service tool TSE 7935. Oil seals should be soaked in oil and pressed in with service tool TSE 7938.
- Position spacers (73) on inner protruding areas of operating shaft bushings (30), select spacers sufficient to obtain dimension, flush to 0.020" below end of bushing. Apply thin film of grease to spacers to assist firm positioning during assembly.
- IMPORTANT:** The fulcrum levers are classified as standard or low regulation. Low regulation levers have pivot pins in a lower position than standard (see Fig. 7, D-504). Last three digits of part number are stamped on rear side (top vertical).
- With the control rack link (62) facing the front open end of cover, assemble fulcrum lever into governor housing (32). Carefully align operating lever (18) thru housing bushing (30) and engage one side of fulcrum lever bracket (56).



D-504

FIGURE 7

13. Install the hub (71) and spring (72) to the fulcrum lever bracket (56). The spring ends must firmly straddle the lower bracket bar and the tang of the hub (71). Slide operating lever into place and secure hub and spring by inserting tapered set screw (19) with Loctite. Torque to specification.
14. Position thrust sleeve to the fulcrum lever engaging pivot pins (54) with vertical grooves in sleeve - Fig. 8 (D- 44 - new). Low regulation sleeves must be assembled with "TOP" marking upward - square corners down.

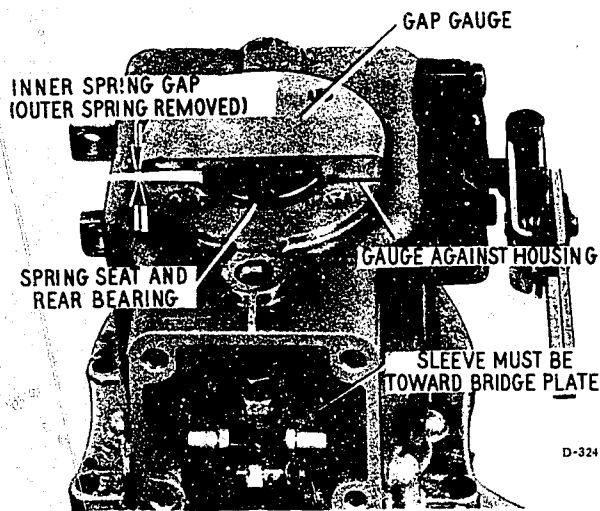


D-44

FIGURE 8

15. The internal mechanism consisting of the weight shaft assembly should be placed through the thrust sleeve. Locate the bearing bridge on the dowel pins (33) and secure.
NOTE: The cut-away portion of the bearing bridge (90) must face downward for proper clearance with drive gear.
16. Fasten the governor to the injection pump, engaging the pin (64) into the control rack of the injection pump. Check for complete engagement of pin to control rack.
17. To set the proper spring, remove the end cap (4), gasket (5) and spring seat (74) together with the outer spring (78) from the shaft. Use spring gap gauge TSE 7998. The holes in the spring seat (74) are not used when setting the inner spring gap. Refer to governor parts list for specific spring types and dimensions.
NOTE: The idle and full load adjusting screws (25) must be released when setting or checking the governor springs.

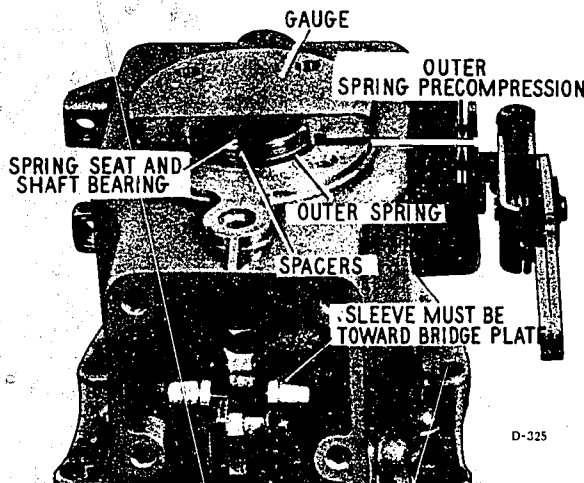
18. The inner spring (77) gap is measured with the outer spring (78) removed. Install the inner shims (75) spring seat (74) and place the gauge over the spring compartment. Add shims until gauge flange touches housing (flush).
Remove shims according to gap dimension per governor type. See Fig 9, D-324. Refer to governor spring data in parts list for the specific governor involved.



D-324

FIGURE 9

19. Remove gauge and install outer spring (78) and shims (76). Adjust outer shims to obtain precompression per parts list (see Fig. 10, D-325).



D-325

FIGURE 10

NOTE: The tolerance in setting the springs is noted in the governor parts list. If a tolerance is given such as .079" to .098", the setting must be within this range.

20. With the spring gaps properly determined, assemble and secure the end cap (4) and "O" ring gasket (3) with screws (1-2).
21. The covers (20 and 27) and inspection cover (34) with gasket (35) can be installed after the governor has been tested and adjusted.
22. For calibration data and adjustment of the governor, refer to Manual Sections D 150/100 - 100V, Pages 1-4; D 331/100V, Pages 1-3.

FOR MAXI-MISER INSTRUCTIONS, REFER TO MANUAL SECTION D 331/3005.

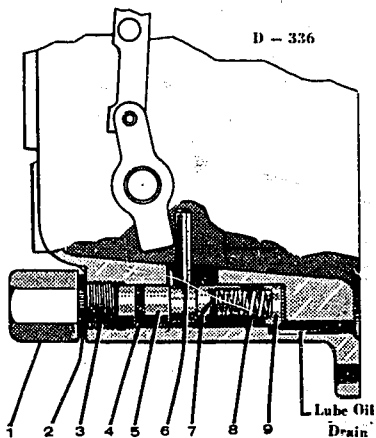
SERVICE INSTRUCTIONS
For
GVB .../... C VARIABLE SPEED GOVERNORS
(Supplement)

SUBJECT: GVB .../... C Governors With Dual Speed (Maxi Miser) Feature (Applicable to Mack Engines)

1. DESCRIPTION

- 1.1 American Bosch is supplying Mack Trucks Inc. with APE 6BB & 8V pumps equipped with GVB .../... C governors that contain a dual speed (Maxi Miser) feature.
- 1.2 This feature limits the vehicle road speed whenever the transmission is in high gear, but does not affect engine performance (speed, horsepower, torque, etc.) in any other gear range.
- 1.3 The "Maxi Miser," which is located in an exterior boss at the bottom of the governor, consists of the following:

Ill. No.	Description
1	Air Inlet Cap
2	Cap Gasket (Copper)
3	Maxi Miser Adjusting Screw
4	Piston "O" Ring Gasket
5	Air Actuated Piston
6	Fulcrum Lever Stop Pin
7	Spring Disc
8	Piston Spring
9	Spring Seat



- 1.4 When the transmission is in any gear other than high gear, air pressure provided by the vehicle's air tank through an air valve mounted on the transmission moves the piston (5) and stop pin (6) towards the pump so that the "Maxi Miser" is inoperative.
- 1.5 When the transmission is shifted into high gear, air pressure to the governor is automatically shut off and the piston spring (8) moves the piston (5) and stop pin (6) towards the rear of the governor. In this position, the stop pin restricts fulcrum lever bracket movement, thus reducing the cam departure speed which, in turn, reduces the engine's governed RPM in order to limit the vehicle's road speed.

2. SERVICE INFORMATION

- 2.1 No special tools are required to service components of the "Maxi Miser."
 - 2.2 To remove a stop pin (6), use a pair of vice grips to collapse the pin, then pull the pin from the piston. DO NOT reuse the pin.
 - 2.3 The lube oil drain hole (See Figure 1) should be blown out with pressurized air or cleaning fluid.
 - 2.4 When installing a piston (5) and stop pin (6):
 - A. Align piston stop pin hole with housing pin slot.
 - B. Support the "Maxi Miser" boss in a "V" block, to prevent distortion of the piston bore, and press the stop pin (6) into the piston (5) with an arbor press.
- NOTE:** Slot in stop pin must face open end of governor housing (towards pump).
- NOTE:** By pressing on stop pin (6), force piston (5) towards open end of governor housing to make certain that stop pin will not contact housing. If stop pin strikes housing, spring seat (9) was omitted.
- 2.5 During pump recalibration, 70 psi minimum air pressure is required at air inlet cap (1) in order to move the piston (5) towards the pump so that the stop pin (6) will not restrict fulcrum lever movement. The air inlet cap should be tightened to a torque of 150-160 lbs. in. (16.9 - 18.1 Nm).

NOTE: An air hose fitting with a .125-27 NPTF thread is required to mate with the air inlet cap.

- 2.6 Following pump recalibration:
 - A. Disconnect the air hose.
 - B. Loosen the air inlet cap.
 - C. With operating lever in full load position, insert a 1/4" Allen wrench through air inlet cap and turn adjusting screw (3) until cam leaves stop plate at 900-910 RPM. Clockwise turn of screw increases cam departure speed; counter-clockwise turn reduces departure speed.
 - D. Retighten air inlet cap to a torque of 150-160 lbs. in. (16.9 - 18.1 Nm).



SERVICE INSTRUCTIONS
For
GVB . . . / . . . C VARIABLE SPEED GOVERNORS
(Supplement)

SUBJECT: GVB.../...C Governors with Parallel Fuel Adjustment Feature (Applicable to Mack Engines)

1. DESCRIPTION

- 1.1 The parallel fuel adjustment feature allows the entire fuel delivery curve to be shifted up or down without readjusting the stop plate.
- 1.2 The feature consists, primarily, of an eccentric connecting link screw and a lock nut (See Fig. 1).

NOTE: All parallel adjustment governors have 2-piece connecting links.

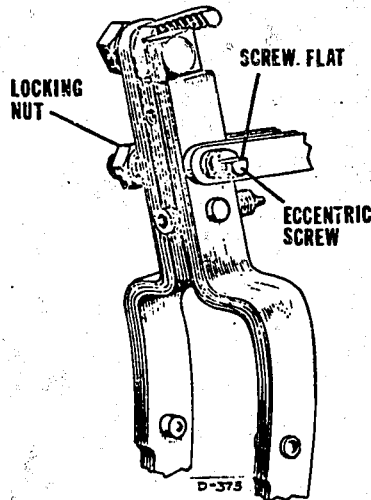


FIGURE 1

- 1.3 By adjusting the eccentric screw, the distance between the center of the control rack connecting pin and the connecting links' pivot point at the fulcrum lever is increased or decreased with a resulting change in the fuel delivery over the entire speed range.
- 1.4 The eccentric screw provides a fuel delivery adjustment of $\pm 3 - 7\%$ (depending upon pump calibration and torque curve) from the screw's neutral (set) position (See Fig. 2).
- 1.5 The parallel fuel adjustment feature was incorporated into the governors to permit a final trim of engine output during dynamometer test. However, it can also be utilized by a calibrator to make a final trim of fuel delivery.

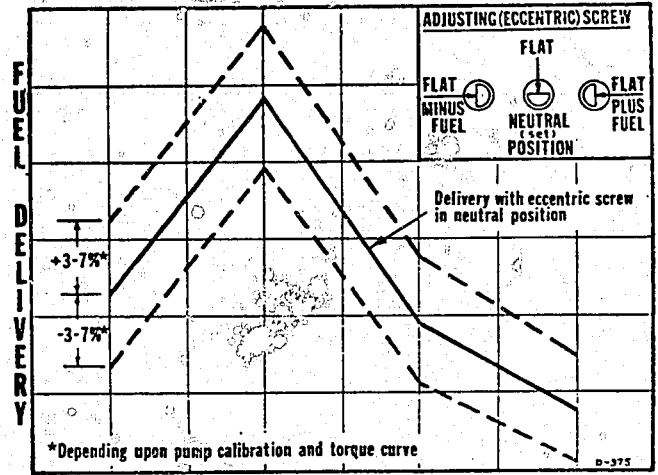


FIGURE 2

2. SERVICE INFORMATION

- 2.1 A serrated wrench, TSE 79101, (See Fig. 3), is required to hold the eccentric screw when loosening or tightening the locknut or to make screw adjustments.

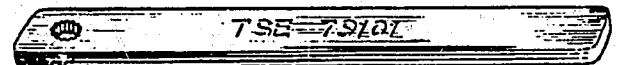


FIGURE 3

NOTE: DO NOT use pliers on the eccentric screw.

- 2.2 To remove an eccentric screw from a fulcrum lever, it is necessary to disassemble the connecting links first.
- 2.3 When assembling an adjusting screw to a fulcrum lever, the flat is to be to the right of the smoke cam as shown in Figure 1.
- 2.4 At the start of recalibration, the eccentric screw flat should be in the neutral position; that is, the flat is to be at the top and parallel to the center line of the connecting link (See Figures 1 and 2).
- 2.5 Adjusting the eccentric screw clockwise increases fuel. Adjusting the screw counterclockwise decreases fuel.

NOTE: When adjusting the eccentric Screw, the locknut must be loose.

- 2.6 Tighten locknut to a torque of 80-85 lbs. in. (9.0 - 9.5 Nm).