

HYDRAULIC FAN

3. Remove eighteen cap screws, lock washers and flat washers attaching driven torus housing to crankcase front cover (oil pump housing), then pull assembly to remove.

4. Remove driven torus and hub assembly, also torus front thrust washer.

5. Remove two thrust washers used between driven and drive torus members.

6. Remove bolt and washer securing driving torus member to crankshaft.

7. Pull driving torus assembly from crankshaft. In some instances it may be necessary to remove two Allen head set screws and apply suitable puller to remove torus.

INSPECTION

1. Clean all parts in cleaning solvent to remove all traces of oil, dirt, or other accumulations. Dry parts with compressed air.

2. Inspect torus vanes for evidence of damage due to being bent or bright areas which indicate they have been in contact with other parts.

3. Inspect thrust faces of torus member hub for evidence of excessive wear.

4. Inspect inside of torus member housings for evidence of contact with torus members.

5. Inspect thrust washers for excessive wear and replace if necessary.

6. Inspect for oil seal leaks and replace seal if necessary.

7. Inspect bushing in driven torus housing and replace if necessary.

ASSEMBLY AND INSTALLATION
(TRUCK ENGINES)

The following instructions apply only to the type of fluid fan used on truck engines, and is illustrated in figure 9.

1. Install two Woodruff keys in crankshaft. Install torus driving member assembly on crankshaft.

2. Install washer and bolt at end of crankshaft, then tighten bolt to 250-300 ft.-lbs. torque.

NOTE: If end thrust of driven member, measured at time of disassembly, is not between .010" and .074" it will be necessary to install new thrust washers of the proper thickness as determined in paragraphs following. BE SURE CRANKSHAFT IS THRUST TOWARD FRONT.

3. Temporarily install torus driven member, front thrust washer, and driven torus housing.

4. Measure end thrust of driven member, using dial indicator. Select two thrust washers to obtain minimum of .015" and maximum of .082" as indicated in chart following.

Measured End Play	Washer Thicknesses Steel Bronze	Adjusted End Play
.100"-.134"	.057"-.060" & .057"-.060"	.015"-.082"
.135"-.174"	.057"-.060" & .057"-.060"	.015"-.060"
.175"-.226"	.057"-.060" & .097"-.100"	.015"-.072"
.227"-.268"	.097"-.100" & .097"-.100"	.027"-.074"

5. Remove driven torus housing, front thrust washer, and torus driven member which were temporarily installed.

6. Install two thrust washers as determined by end thrust check, using engine oil to hold washers in place during assembly. **Tangs of washers must be in drilled holes in vane retainers.**

7. Install driven torus assembly, using caution that thrust washers are properly positioned.

8. Install torus front thrust washer over torus hub.

9. Using new gasket, install torus driven housing and secure with eighteen cap screws, lock washers, and flat washers.

10. Recheck end play of driven torus member to be sure there is .015" to .082" end play.

11. Install fan hub (or pulley) using Woodruff key and nut. Tighten self-locking nut.

12. Install fan blades and secure with six cap screws and lock washers.

REMOVAL AND DISASSEMBLY
(COACH ENGINES)

The following instructions apply only to the type of fluid fan used on coach engines, and is illustrated in Figure 10. Refer to applicable Coach Maintenance Manual for additional information when equipped with air conditioning.

DISASSEMBLE DRIVEN TORUS

1. Remove cap screws and lock washers attaching fan blades to fan hub, then remove blades.

2. Remove eighteen cap screws, flat washers, and lock washers attaching driven housing to driving housing. Remove driven housing and torus assembly.

3. Remove two cap screws and washer attaching fan hub to torus hub. Pull fan hub, using suitable puller. Remove Woodruff key.

4. Press torus member assembly from bearing. Remove seal ring and carrier from torus member hub.

5. Remove oil seal assembly from torus housing. Remove snap ring from torus housing, then press bearing from housing.

HYDRAULIC FAN

DISASSEMBLE DRIVING TORUS

1. Straighten lock plate tab, then remove bolt in torus drive shaft.

2. Pull driving torus assembly from drive shaft. In some instances it may be necessary to remove two Allen head set screws and apply suitable puller to remove torus.

3. Remove six stud nuts and lock washers attaching torus driving housing and bearing cage to housing.

4. Pull torus housing, and bearing cage with torus drive shaft and place on bench for further disassembly.

5. Remove two screws and lock washers attaching bearing cage to torus housing, then separate these parts.

6. Place cage and bearing assembly in arbor press, then press torus drive shaft from cage. Remove seal ring, ring carrier, and bearing cone from bearing cage.

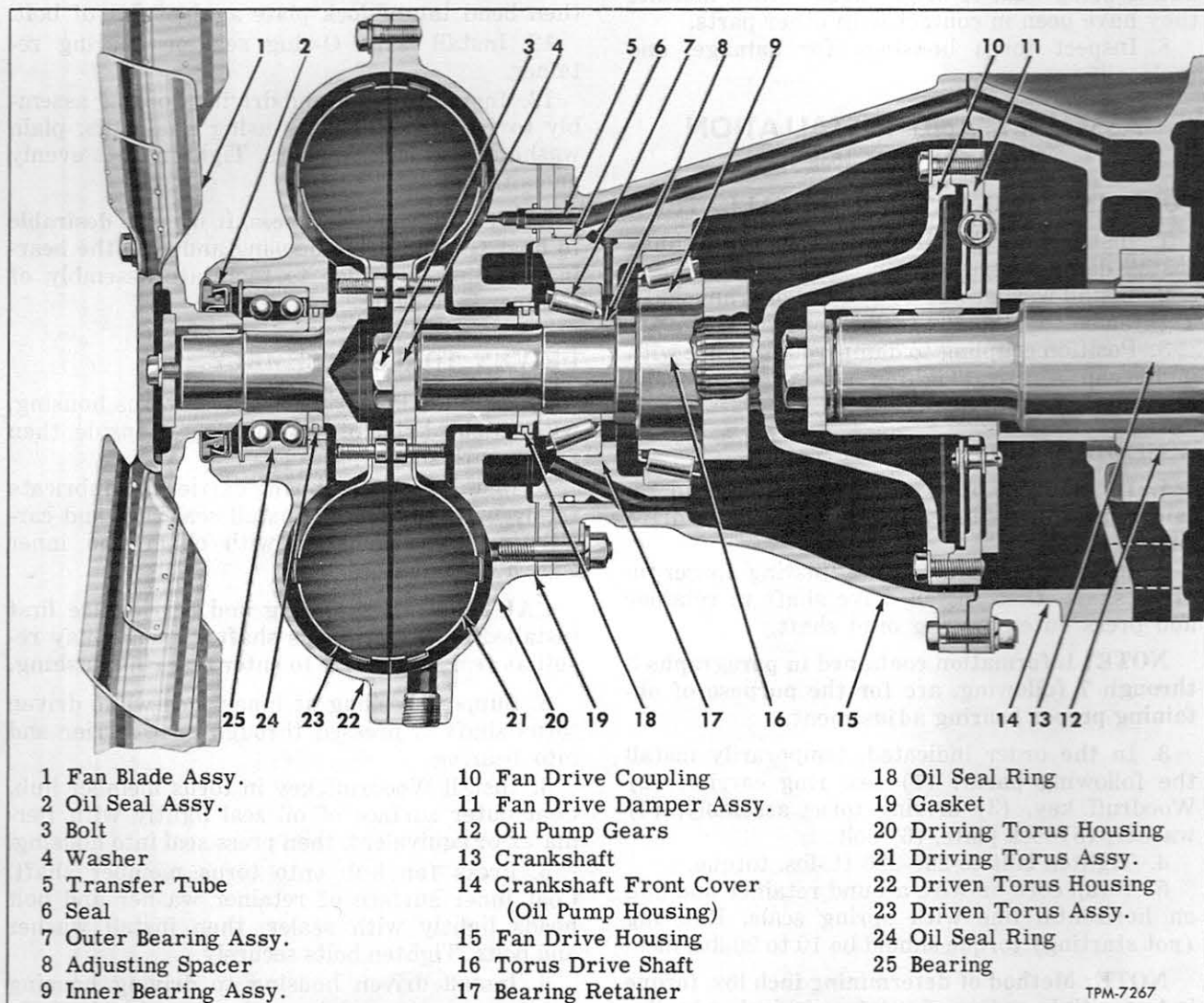
7. Remove bearing adjusting spacer from drive shaft. Tag spacer for reassembly reference.

COUPLING AND DAMPER REMOVAL

1. Remove eight cap screws attaching fan drive housing to crankshaft front cover (oil pump housing), then remove housing.

2. Remove six cap screws and lock washers attaching coupling to damper assembly, then remove coupling.

3. Remove bolt and washer at end of crankshaft. Use suitable available puller to remove damper assembly from crankshaft.



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Figure 10—Sectional View of Hydraulic Fan—Coach

HYDRAULIC FAN

INSPECTION

1. Clean all parts in cleaning solvent to remove all accumulated oil, dirt or foreign matter. Dry parts with compressed air.

2. Inspect damper assembly for broken springs or other damage that would render damper ineffective. Replace assembly if necessary.

3. Inspect coupling for worn or twisted splines and replace if necessary.

4. Inspect bearing cones and cups for wear or other damage and replace if necessary.

5. Inspect oil seal rings and ring carriers. Replace if worn or damaged.

6. Inspect bushing in torus driven and driving housings and replace if necessary.

7. Inspect torus vanes for evidence of damage due to being bent or bright areas which indicate they have been in contact with other parts.

8. Inspect torus housings for damage, and replace if necessary.

ASSEMBLY AND INSTALLATION (COACH ENGINES)

COUPLING AND DAMPER INSTALLATION

1. Install two Woodruff keys in crankshaft. Install damper assembly on crankshaft.

2. Install washer and bolt in end of crankshaft. Tighten bolt to 180-200 ft.-lbs. torque.

3. Position coupling to damper and secure with eight cap screws. Tighten screws evenly and alternately until tight.

ASSEMBLE DRIVING TORUS

1. If removed, press new bearing cups in retainer, also press inner bearing cone onto drive shaft.

2. Install previously used adjusting spacer on drive shaft, then install drive shaft in retainer and press outer bearing onto shaft.

NOTE: Information contained in paragraphs 3 through 7 following, are for the purpose of obtaining proper bearing adjustment.

3. In the order indicated, temporarily install the following parts: (1) seal ring carrier, (2) Woodruff key, (3) driving torus assembly, (4) washer, (5) lock plate, (6) bolt.

4. Tighten bolt to 200-225 ft.-lbs. torque.

5. Wrap cord or wire around retainer and pull on horizontal line with spring scale. Rotating (not starting) torque should be 10 to 20 lbs. inch.

NOTE: Method of determining inch lbs. torque is to multiply radius of retainer in inches by lbs. pull required to rotate retainer.

6. Whenever rotating torque is not within specified limits, it will be necessary to increase or decrease the thickness of adjusting spacer at outer bearing cone. Refer to SPECIFICATIONS section for available spacer thicknesses.

7. Remove bolt, lock plate, washer, driving torus assembly, and Woodruff key.

8. Install seal ring in carrier and lubricate thoroughly. Install new gasket to bearing retainer. Install O-ring seal in counterbore of torus drive housing.

9. Attach torus drive housing to bearing retainer, using two screws and lock washers.

10. Install Woodruff key in drive shaft, then install driving torus assembly to drive shaft. Install washer, lock plate, and bolt in drive shaft.

11. Tighten bolt to 200-225 lbs. ft. torque, then bend tab of lock plate against flat of bolt.

12. Install large O-ring seal on bearing retainer.

13. Install retainer and driving housing assembly to fan drive housing using stud nuts, plain washers, and lock washers. Tighten nuts evenly and alternately.

NOTE: In some instances, it may be desirable to heat the fan drive housing and chill the bearing retainer in order to facilitate assembly of retainer in housing.

DRIVEN TORUS ASSEMBLY

1. Install ball bearing in driven torus housing, with shielded side of bearing toward inside, then secure with snap ring.

2. Install seal ring in ring carrier and lubricate freely with engine oil. Install seal ring and carrier in driven housing, with chamfered inner edge away from bearing.

CAUTION: If seal ring and carrier are first installed on driven torus shaft, damage may result as seal ring starts to enter seal ring bushing.

3. Support bearing at inner race while driven torus shaft is pressed through seal carrier and into bearing.

4. Install Woodruff key in torus member hub. Coat outer surface of oil seal lightly with Permatex or equivalent, then press seal into housing.

5. Press fan hub onto torus member shaft. Coat inner surface of retainer washer and bolt heads lightly with sealer, then install washer and bolts. Tighten bolts securely.

6. Install driven housing to driving housing using cap screws, plain washers, and lock washers. Tighten evenly and alternately until tight.

FLUID CONTROL VALVE

FLUID CONTROL VALVE

A fluid control valve (Fig. 11) is mounted in water return between radiator and engine water pump. Purpose of valve is to control flow of oil from torus housing. When temperature of water is such that cooling is required, the valve starts to close, thus flow of oil from torus is restricted. Speed of fan is variable depending upon the amount of oil being retained in torus.

MAINTENANCE

Ordinarily valve requires only a minimum amount of maintenance.

1. After prolonged use, wear within element may occur, resulting in the valve closing at a slightly higher temperature. Should this occur it may be advisable to readjust as directed under "Adjusting Valve."

2. Whenever it is believed that valve is not seating, due to dirt or other foreign matter, the inlet and outlet lines can be disconnected and valve flushed with fuel oil and blown out with compressed air.

ADJUSTING VALVE

Suitable test equipment must be available, which provides water under pressure, also a means of immersing element in water heated to at least 175°F.

1. Connect valve inlet to water source which will provide 30 psi pressure.

2. Immerse power element in water heated to 172°F.-174°F.

3. Maximum leakage past valve should be 1 pint per minute with element heated to 172°F.-174°F., and with 30 psi pressure at inlet.

4. Should adjustment be necessary, loosen element lock nut (2) and turn element (1) in to decrease or out to increase closing temperature.

CAUTION: Use wrench on flats of element stem. Do not grasp element with pliers. Each full turn of element changes the operating temperature about 5°F.

REPLACE ELEMENT

1. Loosen lock nut (2), then thread element out of body plug (5), and remove O-ring (3) also lock nut (2) from element.

2. Apply thin coating of thread compound on element threads, then thread nut and O-ring onto element.

3. Thread element into body plug. When element projects 1-1/16" above plug it is in its

approximately correct location. Adjust as previously instructed under "Adjusting Valve."

DISASSEMBLY

1. Loosen lock nut (2), then thread element (1) out of body plug (5).

2. Temporarily place assembly in vise while body plug (5) is loosened.

3. Remove body plug (5) from body, then lift valve, stem, and springs from body.

4. Remove three retaining rings which will permit removal of springs, valve, seal, and valve retainer from stem.

ASSEMBLY

1. Install retaining ring (6) in center groove of stem, then install small spring (8) with small end of spring against ring.

2. Install seal retainer (9) over stem with flat side down, then install seal (12), and valve (10). Compress spring and secure these parts to stem using retaining ring (6) in stem lower groove.

3. Position large spring (7) over small spring and valve and secure with retaining ring (6) in stem upper groove.

4. Place body in vise, then position stem and spring assembly in body. Apply thin coating of

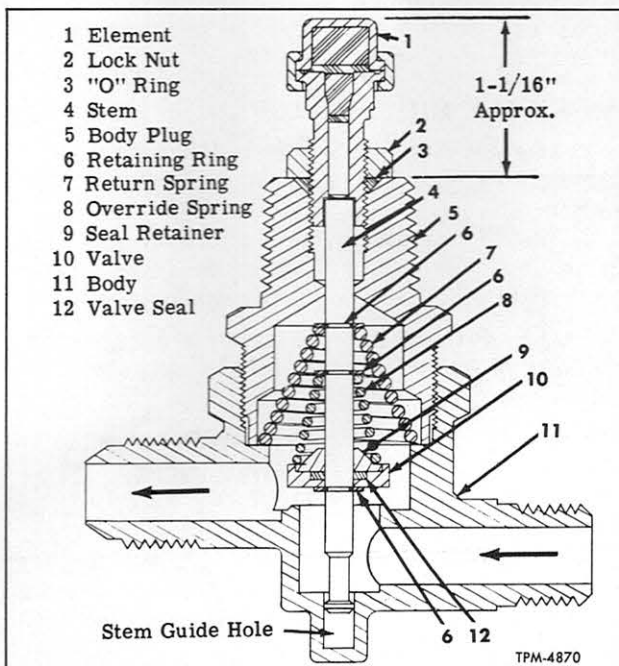


Figure 11—Sectional View of Hydraulic Fan Control Valve

FLUID CONTROL VALVE

thread compound, then thread body plug into body until it can be felt that lower end of stem is bottoming in body, then back off plug slightly.

5. Using a small ($1/4$ ") rod press down on upper end of stem until it can be felt that lower end of stem is entering guide hole in bottom of body. While holding stem down, tighten body plug.

6. Again press down on upper end of stem to be sure it is free to move up and down.

7. With lock nut (2), and O-ring (3) in place on element stem, thread element into body plug. When element projects $1-1/16$ " above plug it is in approximately the correct location.

8. Adjust as previously instructed under "Adjusting Valve" in this section.

ASSEMBLY

1. Install retaining ring (8) in center groove of cover, then install small spring (9) with stem of spring against retaining ring (8).

2. Install seal retainer (9) over stem with the stem of retainer against seal (10) in valve body.

3. Install seal (10) in stem lower groove.

4. Install spring (7) over stem plug.

5. Install stem (6) with retaining ring (8) in stem lower groove.

6. Install body (1) and then install nut (2) and lock washer (3). Apply thin coating of

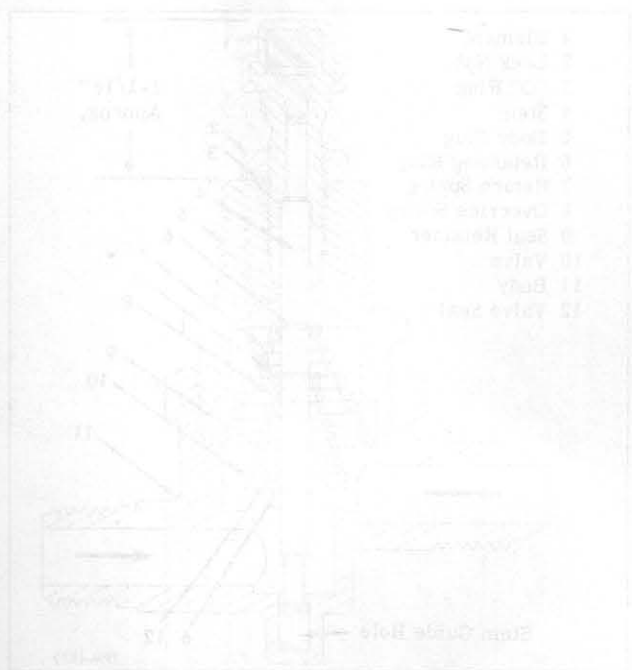


Figure 11-Sectional View of Hydraulic Control Valve

MAINTENANCE

Normally, valve requires only a minimum amount of maintenance.

1. After prolonged use, stem may become slightly higher temperature. Should be checked it may be advisable to recheck it for proper "Adjusting Valve".

2. Whenever it is believed that water is leaking into fuel or other foreign matter into inlet and outlet lines can be checked by valve flushed with fuel oil and blow out with compressed air.

ADJUSTING VALVE

Suitable test equipment must be available which provides water under pressure, also means of measuring element in water heated to at least 175°F .

1. Connect valve inlet to water source which will provide 30 psi pressure.

2. Immerse power element in water heated to 175°F to 177°F .

3. Maximum leakage past valve should be 1 pint per minute with element heated to 175°F to 177°F and with 30 psi pressure at inlet.

4. Should adjustment be necessary, loosen element lock nut (2) and turn element (1) in or out to increase closing temperature.

5. Use wrench on flats of element stem to turn element with plug. Each full turn of stem changes the operating temperature about 2°F .

REPLACE ELEMENT

1. Loosen lock nut (2), then thread element out of body plug (3) and remove O-ring (3).

2. Insert new element in body plug and tighten O-ring (3) and lock nut (2).

3. The element in body plug (3) must be in the correct position as shown in Figure 11.