EVINRUDE, GALE AND JOHNSON
12, 15, 18 AND 20 HP

EVINRUDE

Year Produced	Fastwin 15 hp	Fastwin 18 hp
1955	15014, 15015	
1956	15016, 15017, 15918, 15919	
1957		15020, 15021, 15922, 15923
1958		15024, 15025, 15926, 15927
1959		15028, 15029
1960		15032, 15033
1961		15034, 15035
1962		15036, 15037
1963		18302, 18303
1964		18402, 18403
1965		18502, 18503
1966		18602, 18603
1967		18702, 18703
1968		18802, 18803

GALE

Year Produced	12 hp	15 hp
1955	12D11	
1956	12S12-12D13-12D14	
1957	12S13-12D15-12DE16	
1958	12S15-12D17	
1959	12D18	
1960		15D10
1961		15D11-15D12
1962		15D13-15D14
1963		15D15

NOTE: Letter "E" in model number for Gale or Johnson outboard motor indicates electric starting. Letter "L" in model number indicates "Long" lower unit.

JOHNSON

Year Produced	FD 15 hp	FD 18 hp	FD 20 hp
1956	FD-10		
1957		FD-11	
1958		FD-12	
1959		FD-13	
1960		FD-14	
1961		FD-15	
1962		FD-16	
1963		FD-17M	
1964		FD-18	
1965		FD-19D	
1966			FD-20
1967			FD-21
1968			FD-22

CONDENSED SERVICE DATA

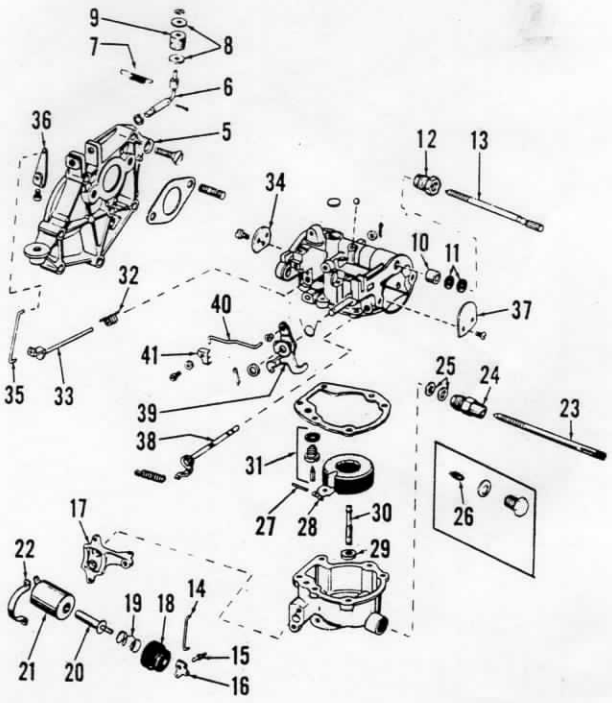
	12 hp	15 hp	18 hp	20 hp
TUNE-UP				
Hp @ rpm	12.0 @ 4000	15.0 @ 4500	18 @ 4500	20 @ 4500
Bore—Inches	2¼	2⅜	2½	2½
Stroke—Inches	2¼	2¼	2¼	2¼
Number of Cylinders	2	2	2	2
Displacement—Cu. In.	17.89	19.94	22.00	22.00
Spark Plug				
Champion	J6J	J6J	J4J	J4J
AC	M44C	M44C	M42K	M42K
Auto-Lite	A3X	A3X	A21X	A21X
Electrode Gap	0.030	0.030	0.030	0.030
Magneto				
Point Gap	0.020	0.020	0.020	0.020
Carburetor				
Make	Own	Own	Own	Own
Fuel—Oil Ratio—Before 1964	24:1	24:1	24:1	....
1964-1965 Motors	....	....	50:1	50:1
SIZES—CLEARANCES				
Piston Rings				
End Gap	0.007-0.017	0.007-0.017	0.007-0.017	0.007-0.017
Side Clearance	0.001-0.0035	0.001-0.0035	0.001-0.0035	0.001-0.0035
Piston Skirt Clearance	0.002-0.0035	0.0025-0.004	0.003-0.0045	0.003-0.0045
Crankshaft Journal Diameter				
Main Bearings	0.9995-1.000	0.9995-1.000	0.9995-1.0000	0.9995-1.0000
Crankpin	0.8730-0.8745	1.000-1.0005	1.0000-1.0005	1.0000-1.0005
Crankshaft Bearing Diametral Clearance				
Top Main Bearing	0.0025-0.0035	Roller Brng.	Roller Brng.	Roller Brng.
Center Main Bearing	0.0025-0.0035	Roller Brng.	Roller Brng.	Roller Brng.
Lower Main Bearing	0.0025-0.0035	0.0025-0.0035	Roller Brng.	Roller Brng.
Crankpin	0.0005-0.0015	Roller Brng.	Roller Brng.	Roller Brng.
Crankshaft End Play	....	....	0.007 Max.	0.007 Max.
Piston Pin Diametral Clearance In Rod	0.0003-0.001	0.0003-0.001	Roller Brng.	Roller Brng.
TIGHTENING TORQUES				
(All Values In Inch-Pounds)				
Connecting Rod	96	180-186	180-186	180-186
Crankcase Halves	120-144	120-144	120-130	120-130
Cylinder Head	96-120	96-120	96-120	96-120
Flywheel	480-540	480-560	480-540	480-540
Spark Plug	240-246	240-246	240-246	210-246

LUBRICATION

The power head is lubricated by oil mixed with the fuel. On motors before 1964, use ⅓-pint of outboard motor oil (or a good grade of SAE 30, "Type MM" motor oil) to each gallon of gasoline. On 1964 and later motors, use ⅛-pint of oil to each gallon of gasoline. Mix gasoline and oil thoroughly, using a separate container, before pouring mixture into fuel tank.

The lower unit gears and bearings are lubricated by oil contained in the gear case. Special "Outboard Marine Corporation, Type 'C' Lubricant" should be used. This lubricant is supplied in a tube and filling procedures are as follows: Remove upper and lower gearcase plugs and, with motor in upright position, fill gearcase from lower plug hole until lubricant reaches level of upper (vent) plug hole. Reinstall vent plug; then remove lubricant tube and reinstall lower plug. Tighten both plugs securely, using new gaskets if necessary, to provide an oil and water tight seal. If OMC Type C lubricant is not available, gear case may be temporarily filled with outboard motor oil through vent (upper) plug opening. If outboard oil is used, drain and refill with OMC Type C lubricant as soon as possible. Lower gear lubricant should be maintained at level of vent plug, and drained and renewed every 100 hours of operation.

Fig. OM7-1—Exploded view of typical carburetor. Late models may have fixed high speed jet (26) instead of needle (23). Electric choke (14 through 22) is optional with electric starter.



5. Intake manifold
6. Follower arm
7. Spring
8. Washers
9. Roller
10. Bushing
11. Packing
12. Gland nut
13. Idle mixture needle
14. Link
15. Stud
16. Lever
17. Bracket
18. Boot
19. Spring
20. Plunger
21. Body
22. Clamp
23. High speed mixture needle
24. Gland nut
25. Packing
26. Fixed jet
27. Float pin
28. Float
29. Washer
30. Main nozzle
31. Inlet needle and seat
32. Spring
33. Shaft
34. Throttle plate
35. Link
36. Arm
37. Choke plate
38. Choke shaft
39. Choke bellcrank
40. Choke to throttle link
41. Guide

FUEL SYSTEM

CARBURETOR. Float type carburetors are used on all models. Refer to Fig. OM7-1. Normal initial setting for both the high speed mixture adjusting needle (23) and the low speed mixture adjusting needle (13) is ¾-turn from closed position. On some models, knob or bellcrank arm must be removed from needle to make the initial adjustments. On all models, final adjustment must be made when motor is in operation, by turning knobs on control panel. Clockwise rotation of both needles leans the mixture. On motors after 1964, a fixed jet (26) may be used instead of high speed mixture needle (23).

To set the carburetor float level, remove the shroud and control panel; then unbolt and remove the carburetor. Remove the float chamber and invert the carburetor body with float attached as shown in Fig. OM7-2. The upper surface of float (lower surface when assembly is inverted) should be level and flush with gasket surface of carburetor body as shown. If it is not, carefully bend float lever; then check after assembly, to be sure float does not bind or rub. When in correct operating position and float has dropped, no more than 1½ inches clearance should exist between near edge of float and gasket surface of carburetor body. The amount of drop can be adjusted by bending the small protruding tab on float lever.

Some Johnson & Evinrude models are equipped with an electrically operated choke which employs a carburetor mounted solenoid (14 through 22—Fig. OM7-1). To adjust the electric choke, loosen band (22—Fig. OM7-3) and pull out manual choke control rod until choke is fully closed. Push solenoid through band as indicated by arrow, until plunger bottoms in housing. Tighten band, then check to see that choke operates properly.

SPEED CONTROL LINKAGE. The speed control lever rotates the magneto armature plate and the carburetor throttle valve is synchronized to open as the ignition timing is advanced. A cam attached to the bottom of the magneto armature plate moves cam follower (6, 8 & 9—Fig. OM7-1) which opens the throttle plate (34). It is very important that the ignition timing and throttle plate (valve) opening be correctly synchronized to obtain satisfactory operation.

Before adjusting the speed control linkage, make certain that roller (9—Fig. OM7-1) contacts the cam at idle speed and choke linkage is not holding throttle partially open. Check the condition of spring (7) and link (35). On 1966 and earlier motors, turn speed control grip until the one index mark (L—Fig. OM7-4) is aligned with center of cam follower (F). On 1967 models, turn the speed control grip until the cam follower roller is centered between the two index marks as shown in Fig. OM7-5. On all models, loosen the two cam attaching screws and while holding throttle closed, move cam in slotted attaching hole until all slack is removed from linkage. Tighten the attaching screws, then check to be sure that throttle valve starts to open as cam follower passes the scribe line when speed control is advanced.

On models with idle speed adjusting screw (Fig. OM7-6), idle speed should be set at approximately 550 RPM.

PRESSURIZED FUEL TANK. Most Johnson and Evinrude motors before 1960 use a pressurized fuel tank. Pressure from the power head crankcase is conducted to the fuel tank through one of the passages in the dual passage hose. As air pressure is built up in the fuel tank, fuel is forced back through the other hose passage to the car-

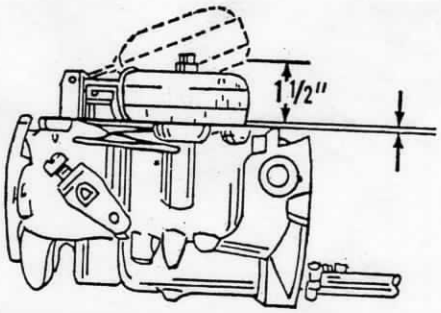


Fig. OM7-2—When carburetor body is inverted, float should be even and flush with gasket surface as shown by arrows. Maximum drop of float should not exceed 1½ inches.

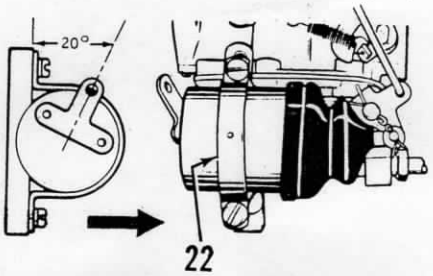


Fig. OM7-3—To adjust the choke solenoid, pull out on manual choke, loosen clamp (22) and push solenoid housing through clamp in direction of arrow until plunger bottoms.

buretor. Check valves (4—Fig. OM7-8) are provided to prevent air pressure returning to the crankcase. A hand operated, diaphragm type fuel pump is used to provide starting fuel to the carburetor. Refer to Fig. OM7-7 for an exploded view of the pressurized fuel tank.

Overhaul of the fuel system consists of renewal of the damaged or worn parts, however the following items should be checked: The tank must maintain about 2 to 5 psi of air pressure to force fuel to the carburetor. Any leak in the air hose, fuel tank (around screws), tank cap or pressure relief valve (46) will release pressure. Also, failure of the check valves (4—Fig. OM7-8) will prevent fuel reaching carburetor.

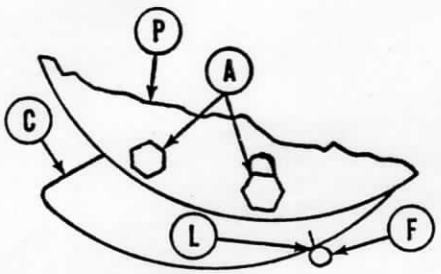


Fig. OM7-4—Schematic view of speed control mechanism. Johnson and Evinrude 1967 models have two marks as shown in Fig. OM6-5.

A. Cam adjusting screws
C. Speed control cam
F. Cam follower
L. Index mark
P. Armature plate

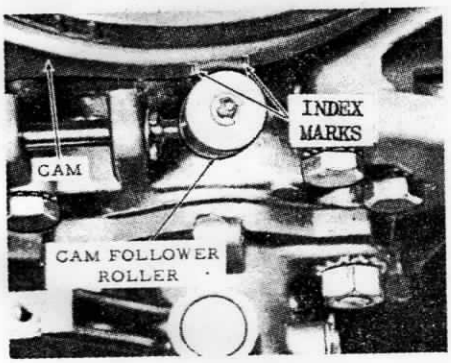


Fig. OM7-5—View of the cam follower centered between index marks on speed control cam. Cam attaching screws are on under side.

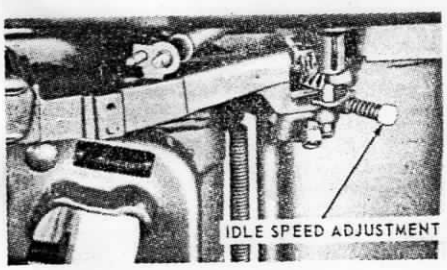


Fig. OM7-6—Some models have an idle speed adjusting screw shown. Speed at idle in forward gear should be approximately 550 RPM.

REED VALVES. The reed type inlet valve unit (1 & 2—Fig. OM7-8) attaches to reed plate (3). The reed valves sould be checked whenever the carburetor is removed for service. The reed petals should seat very lightly against reed plate throughout entire length of reed, with the least possible tension. Renew reed petals if broken, cracked, warped, rusted or bent. Do not attempt to bend or straighten reed petals. Seating surface of reed plate must be smooth and flat and reed petals must center over inlet holes in plate when assembled. The extensions on reed stop must be centered on reed petals.

FUEL PUMP. Refer to Fig. OM7-9 for motors equipped with a diaphragm type fuel pump. Pressure and vacuum pulsations in crankcase are directed through a passage to one side of pump diaphragm (11). Vacuum in the crankcase draws the diaphragm inward and fuel is drawn from the tank past the inlet check valve (5). As power head piston moves downward in cylinder pressure is induced to back side of pump diaphragm, forcing fuel out past the outlet check valve (4) as shown.

All defective or questionable parts should be renewed. Diaphragm (11) should be renewed if air leaks or cracks are found, or if its condition is in any way questionable.

On late models, fuel pump is available as an assembly only, and diaphragm and valves are not serviced.

On 1965 and later models, make certain that fuel filter parts are installed as shown in Fig. OM7-10. The small guides on cover (4) should go through screen (5), gasket (6) and enter holes in pump housing.

CRANKCASE BLEEDER VALVE. All models are equipped with a reed type bleeder valve as shown in Fig. OM7-11. The bleeder valve is designed to remove any liquid fuel or oil which might accumulate in crankcase; thus, providing smoother operation at all speeds and lessening the possibility of spark plug fouling during slow-speed operation.

There is a small passage leading from the bottom of each crankcase to the bleeder

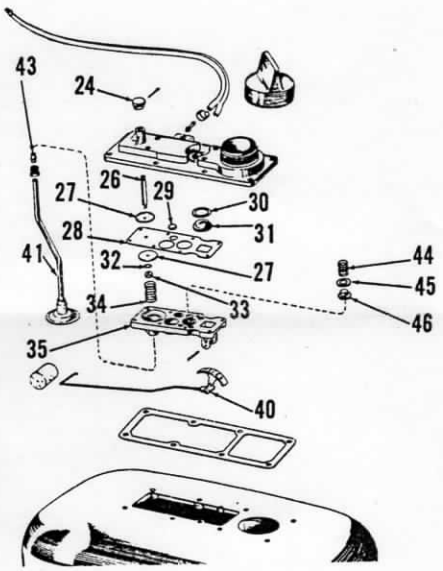


Fig. OM7-7—Exploded view of pressurized fuel tank assembly used on some models.

24. Primer button
26. Primer rod
27. Support washers
28. Pump diaphragm
29. Disc valve
30. Seal
31. Glass
32. Lockwasher
33. Nut
34. Spring
35. Lower housing
40. Fuel gage
41. Inlet tube
43. Gland
44. Spring
45. Washer
46. Relief valve

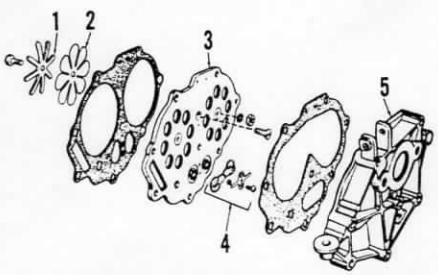


Fig. OM7-8—Exploded view of leaf (reed) valve assembly. Check valve (4) is used only on models with pressurized fuel tank Fig. OM7-7.

1. Reed stop
2. Reed petal
3. Reed plate
4. Check valve
5. Intake manifold

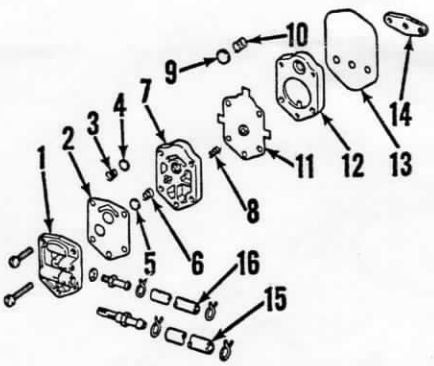


Fig. OM7-9—Exploded view of diaphragm type fuel pump used on some models.

1. Valve housing
2. Gasket
3. Spring
4. Outlet check valve
5. Inlet check valve
6. Spring
7. Inner housing
8. Spring
9. Support
10. Spring
11. Diaphragm
12. Outer housing
13. Deflector
14. Gasket
15. Inlet hose
16. Outlet hose

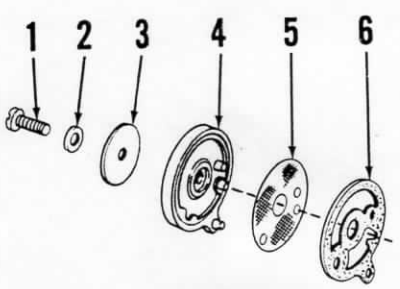


Fig. OM7-10—When installing filter on 1965 and later models, make certain that parts are installed as shown.

1. Screw
2. Washer
3. Washer
4. Cover
5. Screen
6. Gasket

valve. Any condensed liquid accumulates in the bleeder pocket and passage until piston travels its downward stroke. Crankcase pressure forces the leaf valve (LV) off its seat and blows the liquid out into the exhaust passage.

Access to the bleeder valve is possible after removing carburetor and inlet manifold. Check the bleeder valve whenever improper crankcase pressure or vacuum is indicated or whenever the power head is overhauled. The leaf valve (LV) should exert a slight pressure against its seat. Seating surface of crankcase should be smooth and flat. Renew valve leaf and stop if leaf is broken, cracked, warped, rusted or bent. Bleeder passages should be blown out with compressed air whenever motor is overhauled. Clearance between ends of reed stop (RS) and leaf valve (LV) should be 0.023-0.039 inch.

IGNITION

Breaker point gap should be 0.020 and both sets of points should be synchronized so that they open exactly 180° apart. The manufacturer provides a timing fixture (OMC Part No. 376969) to be used in adjusting and synchronizing the magneto. The fixture is installed on crankshaft in place of flywheel as shown in Fig. OM7-12, and used in conjunction with a timing light or continuity meter.

To synchronize the points using the timing fixture and light, remove flywheel and install timing fixture, making sure it is properly fitted over flywheel key. Disconnect condenser and magneto coil leads from both sets of breaker points. Attach test light or meter to the opening set of breaker points and to a suitable ground. Bulb should light when points are closed, and go out when points are opened. Turn crankshaft until fixture pointer rests midway between the two embossed armature plate timing marks shown in Fig. OM7-12. Adjust the gap until points just open when timing fixture pointer is between the two marks (TM) on armature plate. Turn the crankshaft exactly ½-turn until the opposite pointer of timing fixture is aligned; then adjust the other set of points. NOTE: Timing fixture pointer legs are marked "T" and "B" to indicate upper and lower cylinders respectively.

Side of breaker point cam marked "TOP" should face up. Face of coil shoes should be flush with machined surfaces on armature plate. One of the three points is shown at (F—Fig. OM7-12). The drive key for flywheel and cam should be installed with marked end down and edge parallel with center of crankshaft.

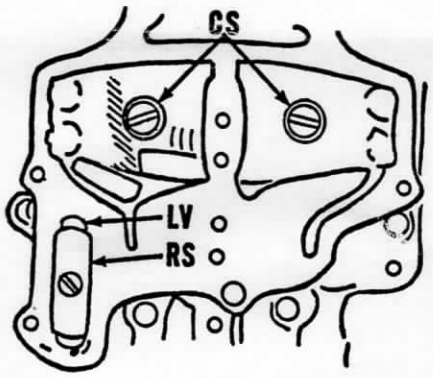


Fig. OM7-11—Crankcase with carburetor and inlet manifold removed. The reed-type crankcase bleeder valve (LV) and reed stop (RS) can be removed for service after manifold is off. To disassemble the crankcase, the two center main bearing screws (CS) in inlet ports must be removed.

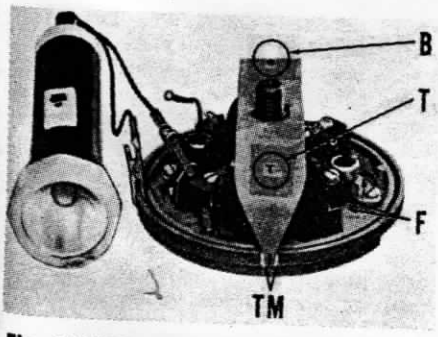


Fig. OM7-12—Timing fixture installed and aligned with armature plate timing marks (TM) for adjusting points for upper cylinder.

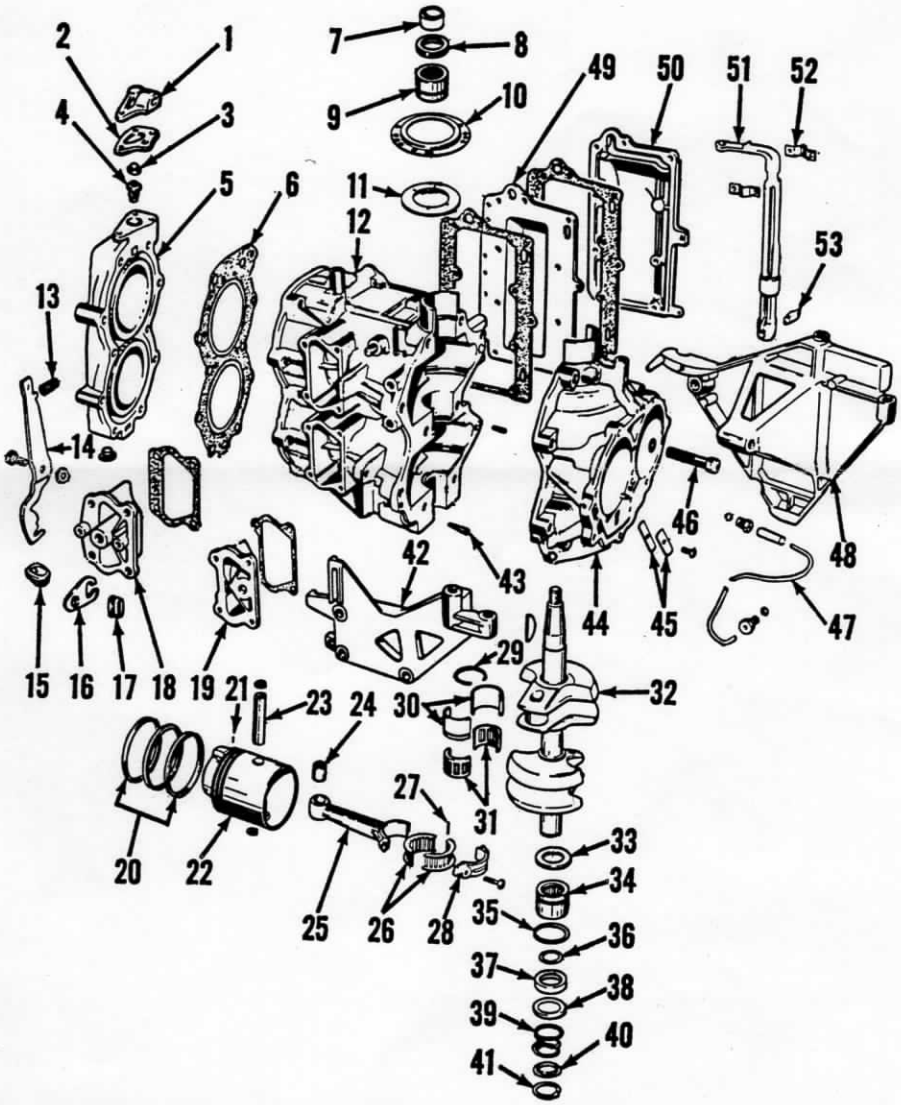


Fig. OM7-13—Late model power head. Early models are similar except thermostat is not used. Flat side of magneto armature plate retainer (11) should be toward top of motor.

1. Cap
2. Gasket
3. Seal
4. Thermostat
5. Cylinder head
6. Head gasket
7. Magneto cam
8. Upper seal
9. Upper bearing
10. Support
11. Retainer
12. Cylinder half
13. Spring
14. Shifter lock
15. Grommet
16. Anchor
17. Grommet
18. Transfer port cover
19. Transfer port cover
20. Piston rings
21. Locating pin
22. Piston
23. Piston pin
24. Needle bearing
25. Connecting rod
26. Bearing cage
27. Bearing roller
28. Bearing cap
29. Retaining ring
30. Outer race
31. Bearing assembly
32. Crankshaft
33. Thrust washer
34. Lower bearing
35. "O" ring
36. Retainer
37. Carbon seal
38. Retainer
39. Spring
40. Retainer
41. Snap ring
42. Starboard bracket
43. Taper pin
44. Crankcase half
45. Bleeder valve
46. Crankcase screw
47. Oil line
48. Port bracket
49. Exhaust cover
50. Exhaust cover
51. Speed control snaft
52. Clamp
53. Pin

COOLING SYSTEM

WATER PUMP. All models are equipped with a rubber impeller type water pump. Impeller is mounted on and driven by the drive shaft in the lower unit. Refer to Fig. OM7-18.

The main water inlet scoop is located below the exhaust outlet, above and aft of the propeller.

When cooling system problems are encountered, first check the water inlet for plugging or partial stoppage, then if not corrected, remove the lower unit as outlined in the appropriate section and check the condition of the water pump, water passages, gaskets and sealing surfaces.

THERMOSTAT. All Johnson and Evinrude motors after 1958 are equipped with a thermostat (4—Fig. OM7-13) which controls coolant temperature. Thermostat is calibrated to open when coolant temperature reaches 145°-150° F. Thermostat can be removed for inspection or renewal by first removing cover (1) and extracting the thermostat.

POWER HEAD

R&R AND DISASSEMBLE. Clamp the motor to a convenient support and remove the shroud, flywheel, magneto assembly and carburetor assembly. Unbolt power head from lower unit and lift power head off. Refer to Fig. OM7-13 for an exploded view of the power head assembly.

Unbolt and remove the cylinder head (5). Remove the upper bearing oil line (47). Drive out the two tapered aligning pins (43) and remove the armature support (10); then unbolt and remove the crankcase front half. NOTE: Two of the retaining cap screws (46) are accessible through the intake ports as shown in Fig. OM7-11. If crankcase half is stuck, tap it lightly with a soft hammer, DO NOT use a pry between the crankcase and cylinder assembly.

Pistons, rods and crankshaft are now accessible for removal and overhaul as outlined in the appropriate following paragraphs.

When reassembling, follow the procedures outlined in the following paragraph.

REASSEMBLE. When reassembling, the crankcase and intake manifold must be completely sealed against both vacuum and pressure. Exhaust manifold and cylinder head must be sealed against water leakage and pressure. Mating surfaces of water intake and exhaust areas between power head and lower unit must form a tight seal.

Whenever power head is disassembled, it is recommended that all gasket surfaces and the mating surfaces of crankcase halves be carefully checked for nicks and burrs or warped surfaces which might interfere with a tight seal. The cylinder head, head end of cylinder block, or mating surfaces of manifold and crankcase may be lapped if necessary, to provide a smooth surface. Mating surfaces of crankcase may be checked on the lapping block, and high spots or nicks removed, but surface must not be lowered. If extreme care is used, a slightly damaged crankcase can be salvaged in this manner. In case of doubt, renew the crankcase assembly.

The crankcase halves are positively located during assembly by the use of two tapered dowel pins. Check to make sure that the dowel pins are not bent, nicked or distorted, and that dowel holes are clean and true. When installing dowel pins, make sure they are fully seated, but do not use extreme force.

When reassembling crankcase on models using sealing strips, install strips in grooves of cylinder half and trim ends of strips to extend approximately $\frac{1}{16}$-inch into bearing bores.

The mating surfaces of crankcase halves must be sealed during assembly using a hardening cement such as "Sealer 1000" available from Marprox Corporation, P. O. Box 955, Sheboygan, Wisconsin. Make sure that all old cement is removed and that surfaces are flat and free from nicks and burrs. Apply cement sparingly to cylinder half only, then immediately install crankcase front half. Install the locating dowel pins, then install and tighten the crankcase screws.

All gasket surfaces must be sealed, using a non-hardening type cement such as "Perfect Seal No. 4." Tightening torques are listed in the CONDENSED SERVICE DATA table.

PISTONS, PINS, RINGS AND CYLINDERS. Before detaching connecting rods from crankshaft, make certain that rod and cap are properly marked for correct assembly to each other and in the correct cylinder.

Each aluminum piston is fitted with three rings which are interchangeable. Pistons and rings are available in standard size and oversizes of 0.020 and 0.040 for 18 and 20 horsepower models. For other engines, parts are furnished in standard sizes only.

The recommended piston ring end gap is 0.007-0.017 for all models. Ring to groove clearance is 0.001-0.0035. The recommended piston to cylinder wall clearance is 0.002-0.0035 for 12 hp models; 0.0025-0.004 for 15 hp models; and 0.003-0.0045 for 18 and 20 horsepower motors. Renew piston, rings and/or cylinder assembly if clearance is excessive.

When reassembling, piston should be installed with long, tapering side of piston head toward exhaust port side of cylinder and oil hole in side of connecting rod should be up. One piston boss is stamped "loose" on underside of piston. Thoroughly lubricate all friction surfaces during assembly.

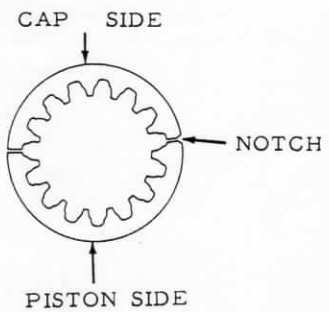


Fig. OM7-14—The connecting rod bearing cage used on most models. Retainer half containing seven rollers should be in connecting rod (toward piston). Rod cap is positioned over other side.

CONNECTING RODS, BEARINGS AND CRANKSHAFT. Before detaching connecting rods from crankshaft, make sure rod and cap are properly marked for correct assembly to each other and in the correct cylinder.

On all 12 horsepower motors (1955-1959), the connecting rod rides directly on the crankshaft crankpin. All other motors are fitted with split-cage needle bearings in rod at crankshaft end. All 18 and 20 horsepower motors use a caged needle bearing at piston end of connecting rod.

On 12 horsepower motors, the crankshaft is carried in three bronze bushings which are cast into the crankcase halves. On 15 horsepower models, the upper main bearing is a caged needle bearing, the center main bearing is a split-cage needle bearing and the lower bearing, a bronze bushing cast into the crankcase halves. On 18 and 20 horsepower motors, the upper and lower main bearings are caged needle bearings while the center crankshaft journal rides in a split-cage type needle bearing.

On all models, refer to the CONDENSED SERVICE DATA table for dimensional data and recommended tightening torques. If bearing surface of rod and cap is rough, worn, scored, or shows evidence of overheating, renew the connecting rod. Inspect crankpin and main bearing journals. If scored, out-of-round, or worn, renew the crankshaft. On later motors, crankshaft end play should be less than 0.007. If end play is excessive, renew thrust washer (33—Fig. OM7-13).

When reassembling, make certain that connecting rod caps (28) are installed on the proper rod (25). The bearing cages (26) are matched set and should not be interchanged. Notched ends (Fig. OM7-14) must be together and larger retainer half (containing seven rollers) should be positioned in connecting rod (25—Fig. OM7-13) when assembling. All bearings and friction surfaces should be lubricated during assembly. Renew crankshaft seals whenever power head is disassembled.

MANUAL STARTER

Fig. OM7-15 shows an exploded view of starter typical of those used. When installing a new starter cord or spring, invert the removed starter assembly in a vise and wind the spring by turning the starter pulley counter-clockwise until spring is completely wound. Reverse the pulley one turn and install the cord.

The starter is designed with an oval pulley (4), and a single pawl (7) which engages the flywheel at one of two points to apply additional leverage when pistons are passing over compression. The pawl (7) is extended and retracted by friction drag of spring (5) on a groove in spindle (9), whenever starter rope is pulled. Check to see that pawl does not bind, and properly

extends when starter rope is pulled and retracts when rope is released. Timing is automatic if unit is properly assembled.

To disassemble the starter, remove starter handle and allow recoil spring to completely unwind in housing. Remove pawl (7), links (6) and friction spring (5) as a unit. Remove the spindle screw and spindle (9), then carefully withdraw pulley (4) leaving recoil spring (3) in housing. When reassembling make sure recoil spring is installed as shown.

Fig. OM7-15—Exploded view of starter typical of all models. Minor differences will be noted on examination.

1. Housing
2. Rope
3. Recoil spring
4. Pulley
5. Spring
6. Link
7. Pawl
8. Retainer
9. Spindle
10. Clamp
11. Cover
12. Cover
13. Handle
14. Anchor

LOWER UNIT

PROPELLER AND DRIVE PIN. Protection for the propeller and drive unit is provided by a cushioning and slip clutch built into the propeller hub. Service consists of renewing propeller.

Propeller clutch slippage can be tested using a torque wrench and a suitable holding fixture and adapter. Slippage should occur at a torque of 60-100 Ft.-Lbs. on all models before 1965. On 1965 and later models, slippage should occur at 100-160 Ft.-Lbs. torque.

REMOVE AND REINSTALL. Most service on the lower unit can be performed by detaching the gearcase housing from driveshaft and exhaust housing. When servicing lower unit, pay particular attention to water pump and water tubes with respect to air or water leaks. Leaky connections may interfere with proper cooling of the motor. Water leaks may also permit the inside of driveshaft casing to fill with water which can eventually find its way into motor crankcase through the lower bearing, and/or into the gearcase where it washes out the lubricant. Look for water leaks if the gearcase requires an abnormal amount of lubricant. Use appropriate exploded views (Fig. OM7-16 through OM7-18) as a guide when overhauling the lower unit, together with the special precautions listed below. All gasket surfaces must be smooth, free from nicks and burrs, and assembled using a non-hardening type sealer such as Permatex No. 1 or Perfect Seal No. 4. All joints without gaskets must be smooth, free from nicks, burrs and old cement, and sealed with a hardening sealer such as "Sealer 1000," available from Marprox Corporation, P. O. Box 955, Sheboygan, Wsiconsin.

The propeller shaft (53—Fig. OM7-18) and drive gears can be removed after first draining lubricant from gear compartment, removing the pivot screw or pin (38); then unbolting and removing gearcase lower housing (21S). To remove the drive pinion, it is first necessary to remove snap ring (44S) or retaining strap on roller bearing models.

To separate gear case from the exhaust and drive shaft housing, it is necessary to remove cover (10—Fig. OM7-16 or Fig. OM7-17), then loosen the shift rod clamp screw.

The shifting linkage must be adjusted to provide full engagement of the shifter collar with the forward and reverse gears. To make the adjustment on Gale models 12D11, 12S12, 12S13, 12S14 or 12S15, proceed as follows: With the motor not running, set the shift lever at "Neutral" and the speed control at "Slow." Rotate the propeller by hand while moving the shift lever (1—Fig. OM7-16) slowly in each direction to the point where lower unit clutch dog contacts the gear projections. Mark shift lever location on shroud at point of contact. Travel should be same distance each side of neutral position to point of contact. If it is not, loosen shaft clamping screw in shift lever (1), loosen

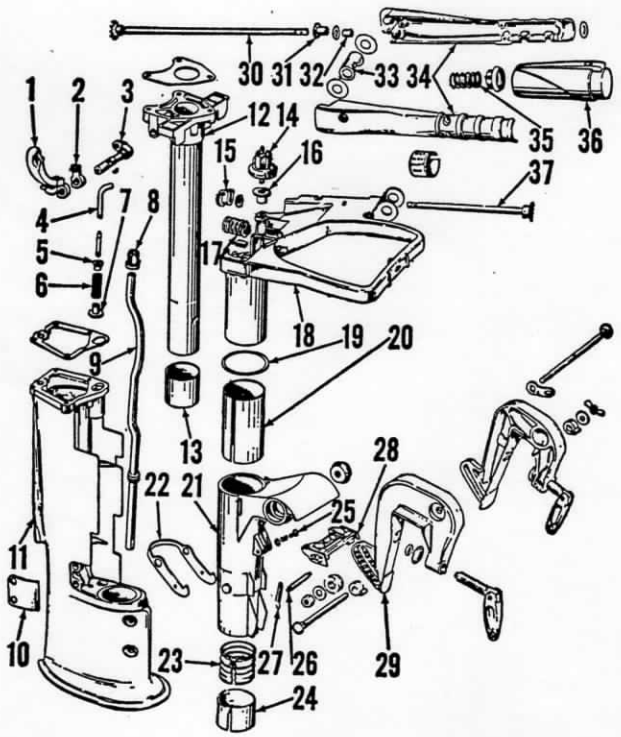


Fig. OM7-16 — Exploded view of drive shaft housing, exhaust housing and stern bracket used on models 12D11, 12S12, 12S13, 12S14 and 12S15.

1. Shift lever
3. Shifter shaft
4. Shift rod
5. Sleeve
6. Spring
7. Sleeve
8. Grommet
9. Water tube
10. Cover plate
11. Exhaust housing
13. Liner
14. Throttle gear
15. Throttle pinion
16. Bushing
17. Spring
18. Steering bracket
19. Thrust washer
20. Liner
21. Swivel bracket
22. Reverse lock
23. Rubber bushing
24. Spacer
25. Adjusting screw
26. Lock rod
27. Spring
28. Thrust socket
30. Throttle shaft
31. Bushing
32. Bushing
33. Gear cover
35. Spring
36. Throttle grip

7. Drive shaft
9. "O" ring
15. Seal
16. Plate
17. Impeller
18. Pin
19. Housing
20. Seal
21. Gear case
21S. Lower Housing
22. Bushing
23. "O" ring
26. Screen
27. Plug
28. Dowel
29. Sealing strip
32. Cover
43C. Clamp
43L. Shift rod
44. Drive pinion
44S. Snap ring
44T. Thrust washer
45. Bearing
46. Thrust washer
47. Forward gear
48. Shift yoke
49. Pin
50. Cotter pin
51. Cradle
52. Clutch dog
53. Propeller shaft
54. Reverse gear
55. Gear bushing
56. Gearcase head
58. "O" ring
58B. Seal
59. Propeller
63. Extension

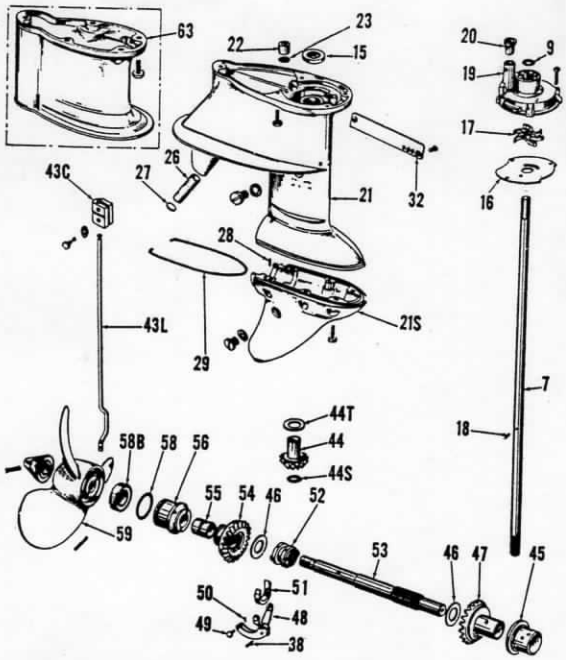


Fig. OM7-18—Exploded view of gear case assembly and water pump of the general type used.

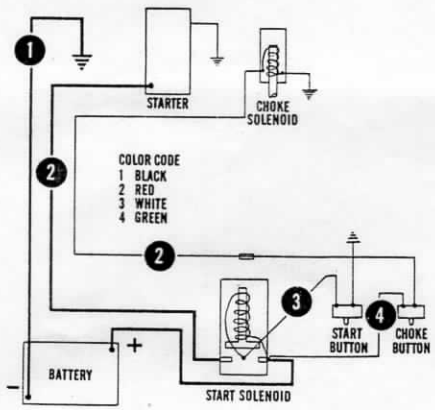


Fig. OM7-19—Wiring diagram used on some Gale models.

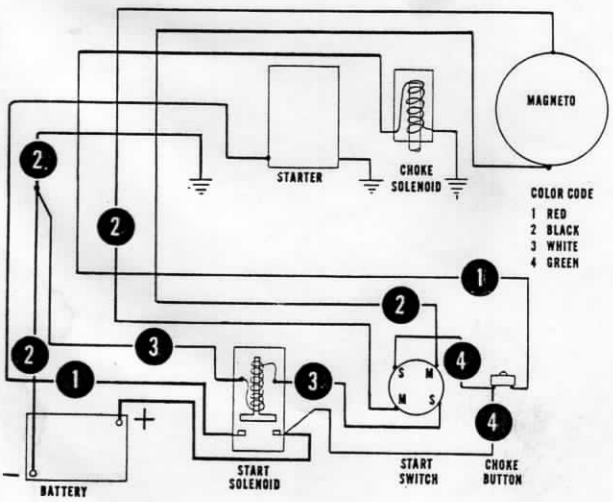


Fig. OM7-20—Wiring diagram typical of most electric starting models.

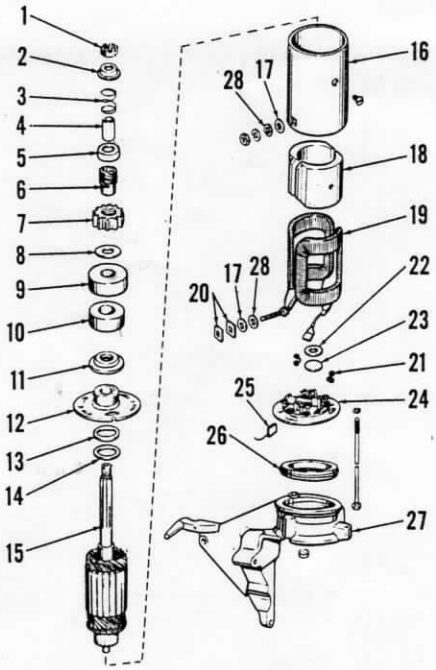


Fig. OM7-21—Exploded view of late type starter. Earlier starters are similar.

1. Nut
2. Pinion stop
3. Spring
4. Spring sleeve
5. Cup
6. Screw shaft
7. Pinion
8. Thrust washer
9. Cushion cup
10. Cushion
11. Cushion retainer
12. End cover
13. Fiber washer
14. Thrust washer
15. Armature
16. Frame
17. Insulating washers
18. Pole shoes
19. Field coils
20. Bushings
21. Brush springs
22. Thrust washer
23. Felt pad
24. End cover
25. Brush (2 used)
26. Shock absorber
27. Bracket
28. Plain washers

adjusting screw securing shift lever to adjusting lever (2), and move adjusting lever (2) and shaft (3) a slight amount on shift lever (1) until travel is equalized. On these models the "Lockout" which prevents speed control grip from being advanced to "Fast" position when shift lever is in neutral can be adjusted by loosening the two shaft clamping screws and moving levers (1 & 2) in or out on shifter shaft (3). If the screw which clamps these two levers together is not loosened, shift adjustment will not be changed.

On all other models, shift lever travel is equalized in the same manner, but "Lockout" mechanism is fixed and not adjustable.

STEERING TENSION. Steering tension can be adjusted by turning adjusting screw (25—Fig. OM7-16 or 41—Fig. OM7-17) in or out until motor is easy to steer, but will maintain a set course.

ELECTRICAL UNITS

Some models use an electrical starting system. The negative battery terminal is grounded on all models. A 6 volt system was used on all models before 1957, and a 12 volt system 1957 and later. A generator is not supplied for any of the motors in this horsepower class. Refer to Fig. OM7-19 or OM7-20 for wiring diaphragm and Fig. OM7-21 for exploded view of starter.

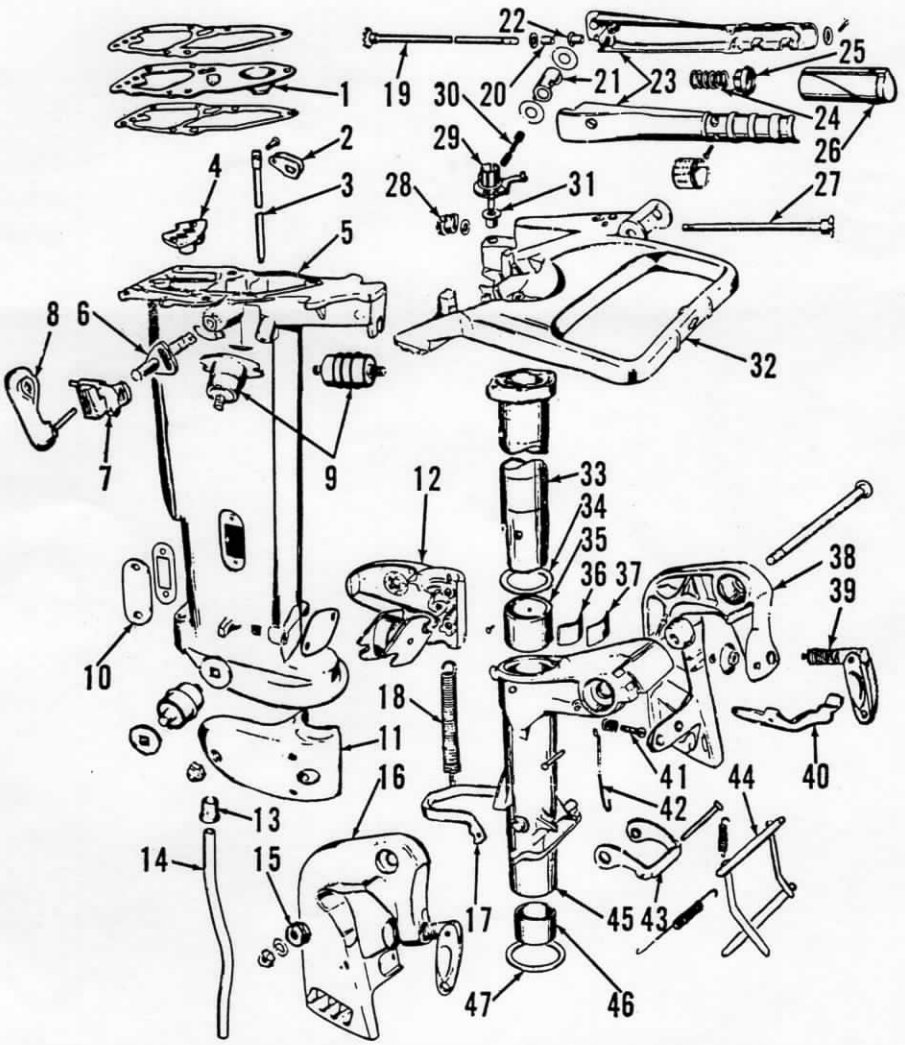


Fig. OM7-17—Exploded view of stern bracket, exhaust housing, drive shaft housing and associated parts used on 1959 production 12 horsepower models. Other models are similar.

1. Cover plate
2. Shift lever
3. Shift rod
4. Exhaust plate
5. Exhaust housing
6. Shifter shaft
7. Adjusting lever
8. Shift handle
9. Rubber mount
10. Cover plate
11. Lower mount
12. Lower mount
13. Grommet
14. Water tube
15. Spring
16. Stern bracket
17. Reverse lock
18. Spring
19. Throttle shaft
20. Bushing
21. Gear cover
22. Bushing
23. Steering handle
24. Spring
25. Friction block
26. Throttle grip
27. Throttle shaft
28. Throttle pinion
29. Throttle gear
30. Adjusting screw
31. Bushing
32. Steering bracket
33. Pilot shaft
34. Thrust washer
35. Liner
36. Spacer
37. Plate
38. Stern bracket
39. Clamp
40. Lever arm
41. Adjusting screw
42. Link
43. Link
44. Tilt lever
45. Swivel bracket
46. Shock absorber
47. Thrust washer