CUSHMAN TRACKSTER SERVICE MANUAL

SAFETY SYMBOLS

THE PURPOSE OF SAFETY SYMBOLS IS TO ATTRACT YOUR ATTENTION TO POSSIBLE DANGERS. THE SYMBOLS, AND THE EXPLANATIONS WITH THEM, DESERVE YOUR CAREFUL ATTENTION AND UNDERSTANDING. SAFETY WARNINGS DO NOT BY THEMSELVES ELIMINATE ANY DANGER: THE INSTRUCTIONS OR WARNINGS THEY GIVE ARE NOT SUBSTITUTES FOR PROPER ACCIDENT PREVENTION MEASURES.

SAFETY WARNING: FAILURE TO OBEY A SAFETY WARNING MAY RESULT IN INJURY TO YOU OR TO OTHERS.

NOTE: *Advises you of information or instructions vital to the operation or maintenance of your equipment.*

Cushman Motors Division of Outboard Marine Corporation reserves the right to make design and specification changes, additions and improvements, in its products without notice and without incurring obligation to install them on products already manufactured.

SERVICE PUBLICATIONS

Additional Service Manuals, as well as illustrated Parts Books and Owner's Manuals, are available from the Trackster Service Department, OMC - Lincoln, P. O. Box 82409, Lincoln, Nebraska 68501. A minimum charge is made for these publications; prices are available on request. Always give the **VEHICLE MODEL AND SERIAL NUMBER** when requesting publications.

5C—5-83—GP

Manual No. 822360 Rev. 3

TUNE-UP PROCEDURES

Components which affect power and performance can be divided into three groups,

1. Items affecting compression.
2. Items affecting ignition.
3. Items affecting carburetion.

Any tune-up procedure should cover these groups in the order given. Correction of items affecting carburetion should not be attempted until all items affecting compression and ignition have been corrected satisfactorily. Attempts to overcome compression or ignition system deficiencies by altering carburetor settings will result in poor overall performance or increased fuel consumption. This section covers only those parts of a tune-up which involve adjustments, cleaning, and checking for performance. Trouble shooting procedures are covered in the Trouble Shooting Section. Repair and replacement of parts, as determined through trouble shooting are covered in their appropriate section.

1. Test run vehicle.
2. Check compression.
3. Remove manual starter and fan housing. If engine knocks or does not come up to speed, check for loose flywheel by rocking flywheel back and forth, and listening for knocks. Excessive wear in crankshaft journal bearings can be detected by moving flywheel back and forth. Check for end play by pushing and pulling on flywheel. End play tolerance is .011 to .026.
4. If compression and bearing condition checks are not satisfactory, engine overhaul is required.
5. Test for adequate spark at each cylinder using a spark checker. Inspect and test points, ignition coils, amplifier, timing and spark plug high tension leads. See Electrical System.
6. Check spark plugs to be sure they are the correct type. Clean spark plugs and regap, or replace as necessary.
7. Check breaker points, and clean or adjust as necessary.
8. Remove and drain fuel tank, flush, and clean thoroughly. Install tank, refill with fresh fuel mixture, and check primer operation.
9. Inspect entire fuel system for leaks, install new fuel filter and clean fuel screens in fuel tank, pump, and carburetor.
10. Check governor for proper operation and oil level.
11. Adjust carburetor.
12. Check air cleaner element.
13. Inspect starter and governor belts.
14. Tighten all external bolts, nut, and screws.
15. Check track tension. See Suspension Section.
16. Repeat test run on vehicle. Check carburetor needle adjustments.
17. After engine has run sufficiently to indicate satisfactory condition, stop and restart it several times. Operate it at high and low speeds. Check acceleration from low to high speed.

ENGINE OVERHAUL

Description

The Trackster is driven by a two-cycle, twin-opposed cylinder, air-cooled engine (Figure 8). This section gives instructions for removal and overhaul of the engine. Principles of two-cycle engine operation are discussed on Preceding Pages. Trouble shooting procedures are given in the Trouble Shooting Section.

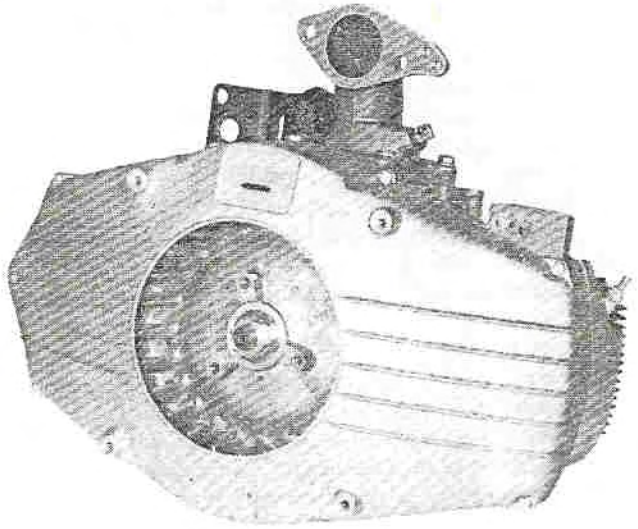


Fig. 8

ENGINE REMOVAL

Whenever engine service is needed, only the engine needs to be removed from the vehicle. If transmission service is also needed, it is recommended that the entire power unit be removed. Refer to Transmission Section for power unit removal.

To remove the engine only, proceed as follows:

1. Disconnect the battery.
2. Remove the hood, engine cover and heat exchanger cover.
3. Remove air silencer.
4. Remove air cleaner assembly.
5. Disconnect throttle spring and carburetor linkage from the governor.
6. Disconnect choke cable from carburetor.
7. Disconnect fuel lines from carburetor.
8. Remove carburetor and intake manifold extension.
9. Remove rewind starter assembly.

NOTE: *One or two washers (depending on the type of starter used) are used as spacers between the starter and fan housing on the left side. These spacers are equal in thickness to the governor bracket.*

10. Remove governor and belt.

NOTE: *Remove screw from rear fan housing and leave governor bracket connected to governor and battery cable.*

11. Remove starter ratchet and hub assembly.

12. Remove front fan housing.
13. Remove flywheel and starter belt. Remove flywheel nut using strap wrench number 112020 to hold the flywheel. Figure 9. Remove the flywheel from the crankshaft using a 3/8-18 knock-off (part no. 809315). Be sure the knock-off is screwed onto the crankshaft as far as it will go. apply light pressure to the back of the flywheel and hit the knock-off a sharp blow with a metal hammer (Figure 10).

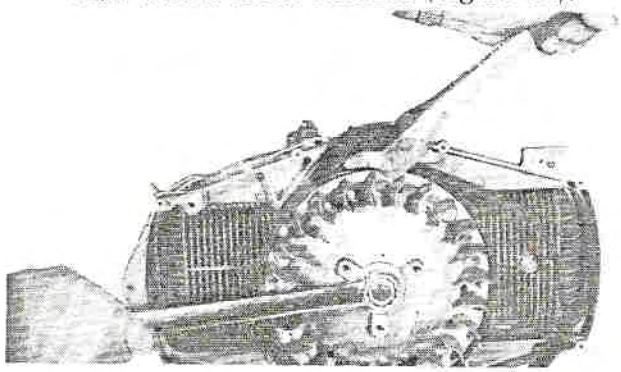


Fig. 9

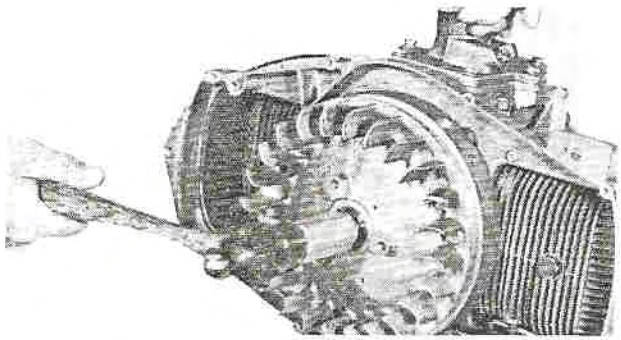


Fig. 10

14. Disconnect control rods from T-handle assembly and hydrostat control arms. Remove both control rods.
15. Remove both mufflers.
16. If Trackster is equipped with an alternator, it must be removed.
17. Remove left exhaust pipe.
18. Disconnect starter cable from starter. Feed the cable rearward through fire wall.
19. Disconnect pulse and primer line from manifold.
20. Remove starter and adjusting bracket.
21. Remove starter mounting bracket and muffler support assembly.
22. Disconnect left coil ground wire from rear fan housing.
23. Disconnect spark plug wires.
24. Disconnect black wire at junction block near amplifier and pull forward through fire wall.
25. Disconnect the drive shaft coupling from the engine side of the fan.
26. Remove four engine mounting screws.
27. Disconnect the two yellow alternator wires from the terminal board.
28. Remove the engine.

NOTE: *It will be necessary to apply some pressure near the coupling while raising the engine.*

ENGINE DISASSEMBLY

1. Remove right exhaust pipe.
2. Slide the timing advance cam off the crankshaft and remove the armature plate ass'y.
3. Remove the rear fan housing.
4. Remove the intake manifold and reed valve assembly.
5. Remove both spark plugs. Remove the cylinders from the crankcase. See Figures 11 and 12.

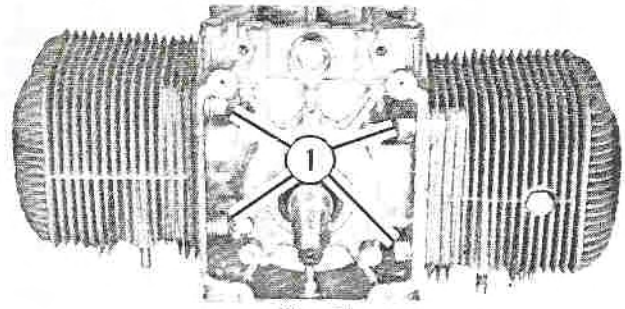


Fig. 11
1. Cylinder Stud Nuts

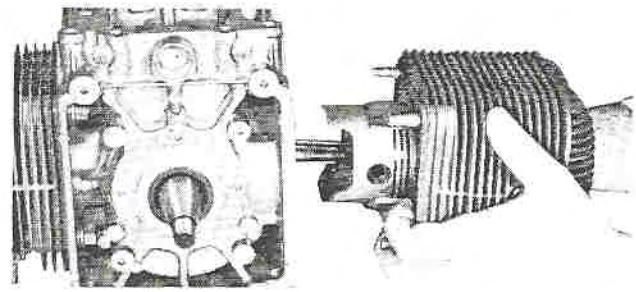


Fig. 12

6. Remove the eight screws securing the crankcase halves together and drive out the aligning pins toward the flywheel side. Tap the crankcase halves with a rawhide mallet to break the seal and separate the halves. It may be necessary to heat each crankcase half with a heat lamp to free the crankshaft bearings.

NOTE: *Pistons, connecting rods and caps are matched parts. Because of this, it is essential to maintain their original positions at reassembly. Mark each connecting rod and cap, piston, and bearing component to assure correct mating during reassembly. Also mark the cylinders "right" and "left".*

7. Remove connecting rod caps. Remove connecting rods from crankshaft.

8. Reinstall matched caps on connecting rods.
9. Remove rings from pistons.

NOTE: *DO NOT try to save the rings. Install a complete set of new rings on every overhaul.*

10. If necessary to remove connecting rods from pistons, remove wrist pin retaining rings, using a screwdriver. Press out wrist pin to free piston from connecting rod. Piston wrist pin hole, marked "Loose", should be down when pressing out wrist pin to prevent piston damage.

CLEANING AND INSPECTION

Cylinders

Remove all carbon from the exhaust ports and cylinder heads. Carefully scrape the carbon with a carbon scraper or other blunt instrument. Exhaust ports must be free of carbon to insure maximum performance.

NOTE: *Do not scratch or mar gasket surfaces.*

Check the cylinder walls for excessive wear. Measure the cylinder bore for size and straightness using an inside micrometer or a dial bore indicator. A cylinder with more than .005" out of round or taper should be replaced. Figure 13. A standard cylinder measures 2.749-2.751.

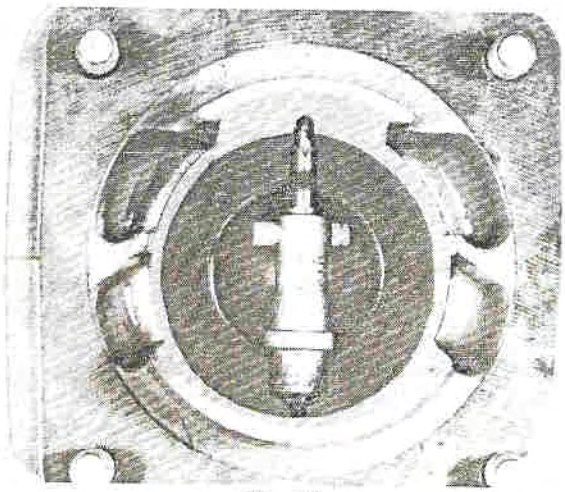


Fig. 13

Pistons

Carefully remove any carbon deposits from the piston head. Inspect the ring grooves for carbon accumulation, excessive wear and damage to the ring seats. Scrape all carbon from the ring grooves. A broken ring makes a suitable tool for this operation. Dull the leading edge slightly to prevent damage to the ring land. Figure 14.

Check the pistons for roundness, excessive taper, skirt wear and scoring. The piston skirts must be perfectly round and unscratched to prevent entry of

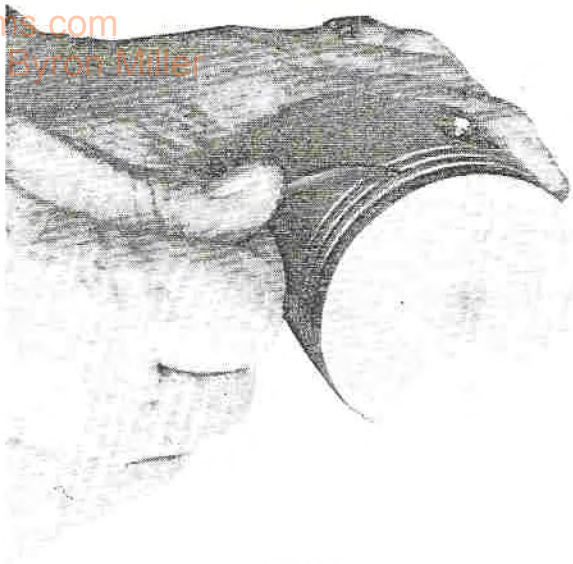


Fig. 14

exhaust gases into the crankcase chamber. A new piston will measure 2.7430" - 2.7440" at the bottom of the skirt and 2.739" - 2.740" just below the bottom ring. (Figure 15).

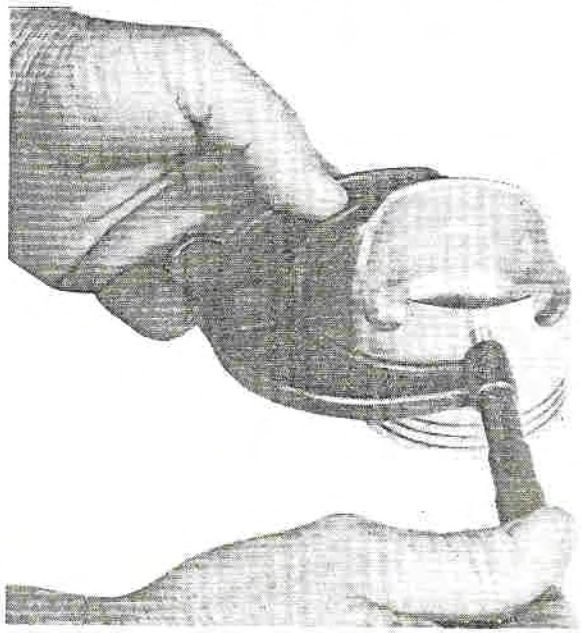


Fig. 15

Bearings

The bogie wheel support plate, Part number 821730, can be used in conjunction with a press to remove the main bearings from the crankshaft.

All areas where bearings are to be serviced must be free of oil and dirt.

NOTE: *Do not spin ball or roller bearings before they are cleaned. Dirt in the races can cause serious damage.*

Place the bearings in a wire basket and immerse in a solvent. The tank should be equipped with a

screened false bottom to prevent settlings from being stirred up into the bearings. Agitate the basket frequently until all oil, grease, and sludge have been loosened and can be flushed out. Bearings with especially heavy carbon deposits or hardened grease should be soaked in a separate container of solvent.

Use a spray gun with air filter and a cleaning solvent to flush each bearing until all dirt and residue have been removed. Turn one of the races slowly while flushing to dislodge dirt from around the balls and separators. Blow solvent out of bearings, using dry, filtered air. Be careful not to spin bearings by force of air.

Since dry bearings rust rapidly, lubricate them immediately in light, clean oil. Rotate them a few times to spread the oil film and place them in a clean, covered container for inspection.

Discard and replace any bearing that shows any of the following:

1. Rusted balls, rollers, or races.
2. Fractured ring. This may be caused by forcing a cocked bearing off a shaft or by too heavy a press fit.
3. Worn, galled, or abraded surfaces. These may be caused by too loose a fit, or a bearing locked by dirt and turning on the shaft or in the housing.
4. Badly discolored balls, rollers, or races. This is usually due to an inadequate supply of lubricant. Moderate discoloration is not a cause for discard.

Gaskets and Gasket Surfaces

Discard all gaskets and seals. Use only new gaskets and seals in reassembly.

Remove all traces of dried sealer and old gasket material, using trichlorethylene or lacquer thinner.

ASSEMBLY OF ENGINE

Refer to Parts Catalog exploded views for correct sequence of assembly. Make no forced assemblies unless press fits are called for. Make no dry assemblies. Lubricate all moving parts with a light film of oil. Be sure all parts are clean and free from dirt and grit. Perfectly good cylinder walls, pistons, and rings can be ruined in a few minutes of operation if grit remains after assembly. Work in clean surroundings and with reasonably clean hands. Coat all bearing surfaces, cylinder walls, etc., with clean oil before assembly.

NOTE: *Use new gaskets and seals throughout when reassembling the engine. Apply Perfect Seal No. 4 to both sides of crankcase gasket before assembly.*

Pistons, Wrist Pins and Connecting Rods

Each piston is marked either No. 1 or No. 2. Due to the piston design, each piston must be installed in the proper cylinder (Figure 16).

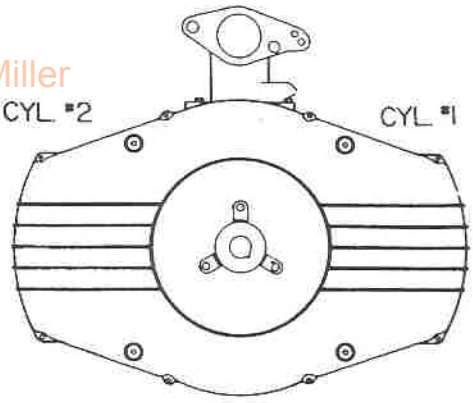
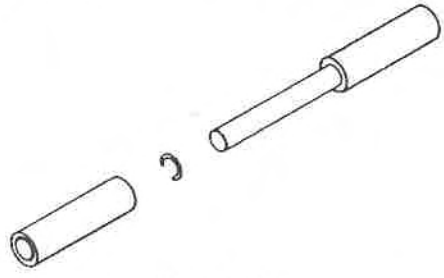


Fig. 16

1. Install wrist pin needle bearing in connecting rod.
2. Install a retaining ring in the piston pin boss opposite the boss marked "L." This can best be done with the aid of a driver and cone. (Drawing 1). Insert the retaining ring into the cone from the tapered end. Push the retaining ring partially through the cone with the driver. Place the shouldered end of the cone firmly against the piston pin boss and insert the retaining ring into place by exerting pressure on the driver.



Drawing 1

3. Lubricate wrist pin, bearing and piston pin bosses with a coating of STP or equivalent.
4. Heat the piston to 230° F. This can be done with a heat lamp directed as near as possible to the inside of the piston for approximately 15 minutes. Insert the wrist pin through the larger hole (marked "L") of the piston. Place connecting rod in position in piston and complete wrist pin installation.

NOTE: *Pistons must be installed so that the dowel pins for the rings are positioned upwards.*

5. Replace retaining rings, using Driver No. 317829 and Cone No. 317830. Make certain they seat securely in the groove provided.

NOTE: *Open end of wrist pin retainer must face the top of piston.*

6. Check piston with micrometer to determine whether the piston has been distorted during assembly. Maximum permissible distortion is .003 below wrist pin boss only.

Piston Rings

Before installing new piston rings, check the ring gap by placing the ring in its respective cylinder bore. Press the ring midway into the bore with the piston to square it up. Measure the gap with a feeler gauge. New ring gap should be .007'' - .017'' (Figure 17).

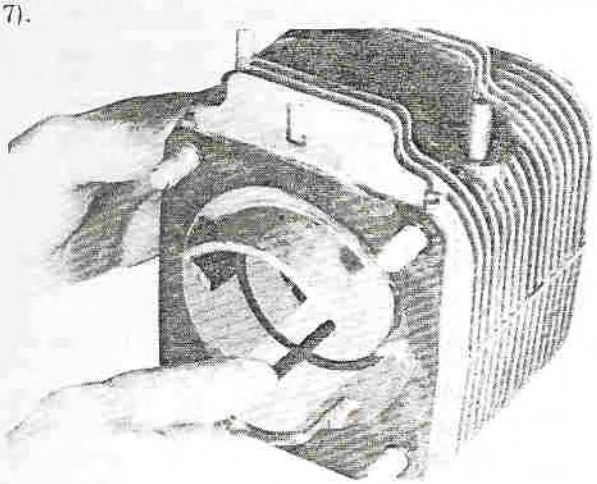


Fig. 17

Check each ring in its respective ring groove for tightness or binding by rolling the ring around the piston groove (Figure 18). Check the groove side clearance with a feeler gauge. Clearance should be .002'' - .004'' (Figure 19).

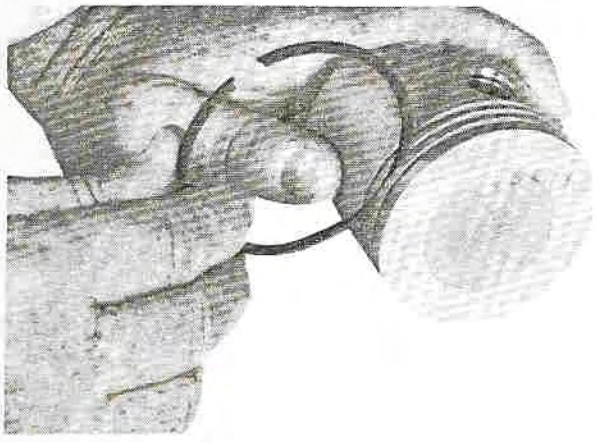


Fig. 18

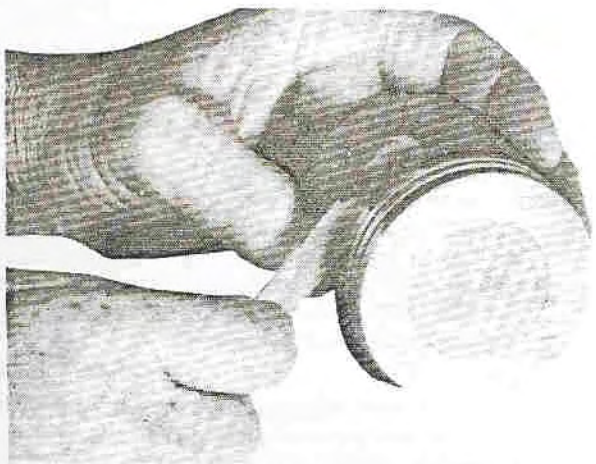


Fig. 19

Install the piston rings on each piston. Spread each ring with a ring expander just enough to slip it over the head of the piston and into place.

Be sure that piston rings are correctly positioned in piston ring grooves. Be sure the dowell pin on the piston is centered between the ring gaps (Figure 20).

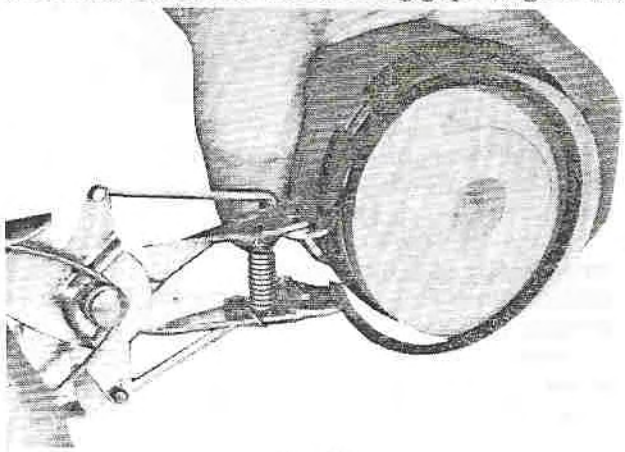


Fig. 20

Crankshaft

If the main bearings have been removed from the crankshaft, install new bearings using an arbor press. Be sure to support properly to prevent distortion.

Remove the connecting rod caps from the connecting rods. Apply a film of grease to the connecting rod bearing area. Assemble the needle bearings (16) and retainer halves, with connecting rod and connecting rod cap, to crankpin.

NOTE: *Do not pack the bearing area full of grease, apply only enough to hold the needle bearings in place during assembly. (Figure 21).*

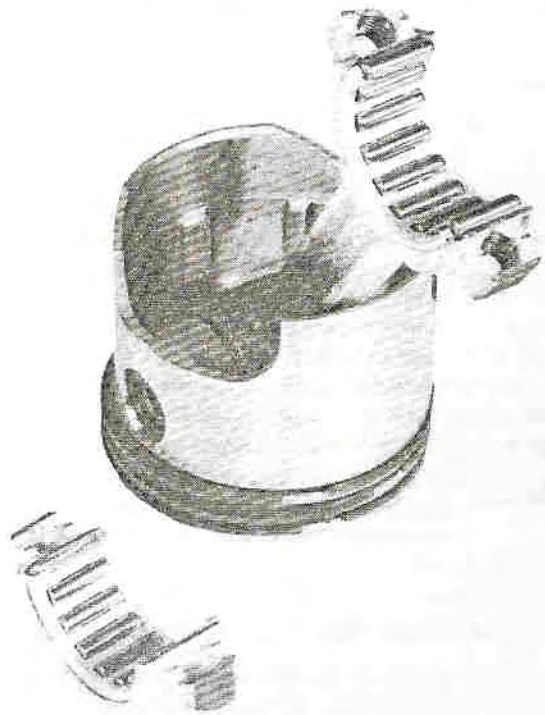


Fig. 21

Attach connecting rod to caps. Connecting rod caps are not interchangeable, nor can the caps of the same rod be turned end for end. Match marks are provided to assure correct assembly. Draw a pencil over surface edge on both sides of rod to make certain that cap and rod are correctly aligned. If misaligned, offset edge will be felt with pencil point. Tighten connecting rod cap screws together. If alignment is satisfactory, tighten connecting rod cap screws with a torque wrench to 30 ft-lbs. Check for binding. Bearings and retainers must float freely on crankpins.

Install new crankshaft seals in crankcase halves.

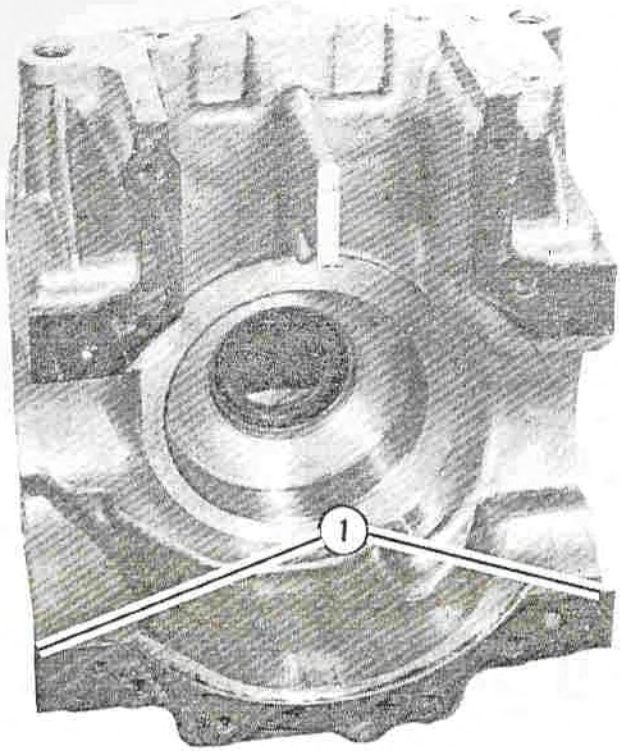


Fig. 22
1. Trim excess gasket material after crankcase halves are put together.

Coat gasket with Perfect Seal No. 4. Place the new gaskets on one crankcase half. If gasket requires trimming, be sure to use a very sharp cutting tool and trim as necessary after the crankcase halves are torqued together. Uneven edges may result in crankcase leakage. Figure 22.

It may be necessary to heat crankcase halves with a heat lamp for approximately 15 minutes. This allows easier installation of crankshaft bearings into the case.

Replace crankcase aligning pins, driving in carefully with a hammer from flywheel side. Replace all crankcase screws and tighten with a torque wrench to 16-20 ft-lbs.

NOTE: *Cylinder stud nuts (#114232) must be replaced with new nuts before re-assembly.*

NOTE: *Refer to page* 13 *for correct cylinder identification.*

Install cylinders, using new gaskets coated with Perfect Seal No. 4. Use a hinged ring compressor to install pistons in cylinders. Tighten nuts in correct sequence to 16 - 20 ft./lbs.

Install reed plate assembly being sure the air chamber is positioned as shown in Figure 23. Coat both sides of the gasket with Perfect Seal No. 4.

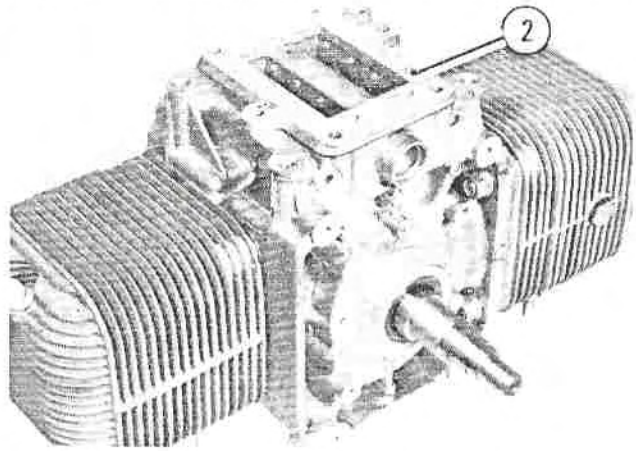


Fig. 23
2. Air Chamber

Before installing the intake manifold, check the gasket face for flatness. Under certain conditions, gasket faces may warp or spring, particularly where thin sections or flanges are employed and are subject to temperature changes. To check for flatness, lay a sheet of No. 120 emery cloth on a surface plate or piece of plate glass. Place part to be surfaced on emery cloth and move slowly back and forth several times in a figure 8 motion, exerting evenly distributed, light pressure. Lift part from surface plate to observe results. If surface is actually warped or sprung, high spots making contact with lapping surface will take on a dull polish, while low areas will retain their original state. To insure flatness over entire surface, continue surfacing until entire gasket surface has been polished to a dull luster (Figure 24). Finish surfacing with No. 180 emery cloth. Wash part in solvent to remove all grit. Install the manifold using a new gasket coated with Perfect Seal No. 4.

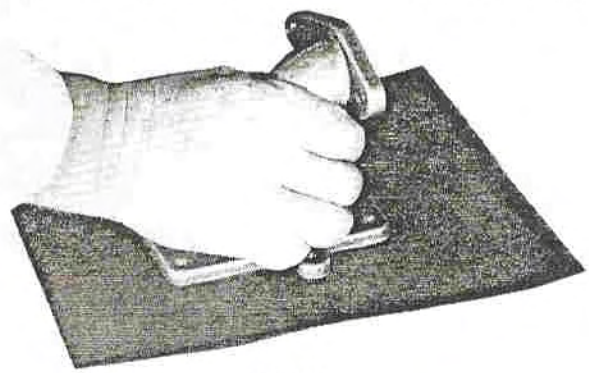


Fig. 24

Assemble left exhaust manifold to cylinder using a new gasket. Install the armature plate to the crankcase, be sure the wire clip is in position to prevent the flywheel from rubbing the wires (Figure 25).

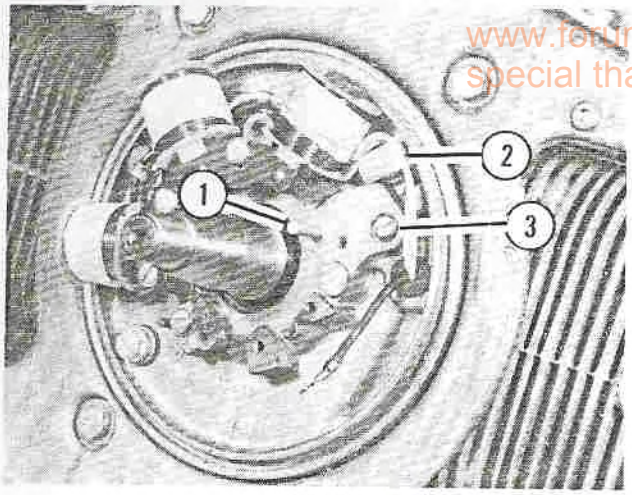


Fig. 25
1. Breaker Post 2. Wire Clip
3. Eccentric Screw

Install new breaker points:

1. Clean the breaker post thoroughly.
2. Turn the eccentric adjusting screw into the plate until it bottoms.
3. Install breaker assembly over breaker post.
4. Connect the wire lead to the breaker point screw terminal. Replace breaker retaining screw and clip.
5. Install new oiler clip and wick. Apply distributor lubricant to the oiler wick and to fiber cam follower on side toward cam rotation.
6. Install the breaker cam and key on the crankshaft, position the breaker arm on the high lobe of the cam and adjust the points to a .020-.022 gap with a feeler gauge.

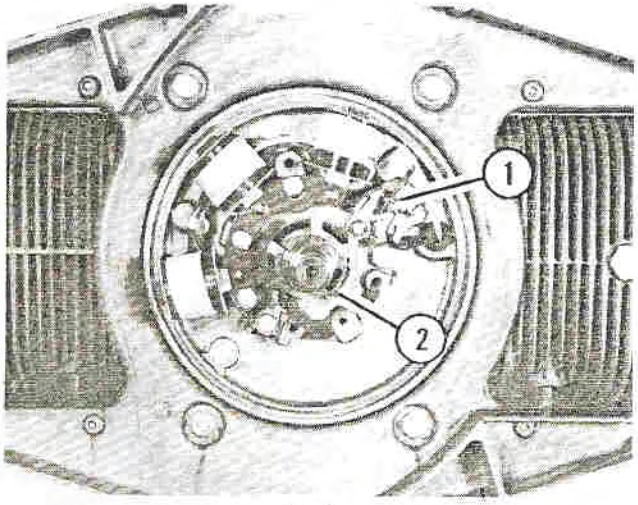


Fig. 26
1. .020"-.022" Gap 2. Breaker Cam

7. Remove the cam from the crankshaft and position it in the flywheel as shown. Edge of keyway in cam must be aligned with edge of keyway in flywheel when viewed from the outside of the flywheel. Figure 27.

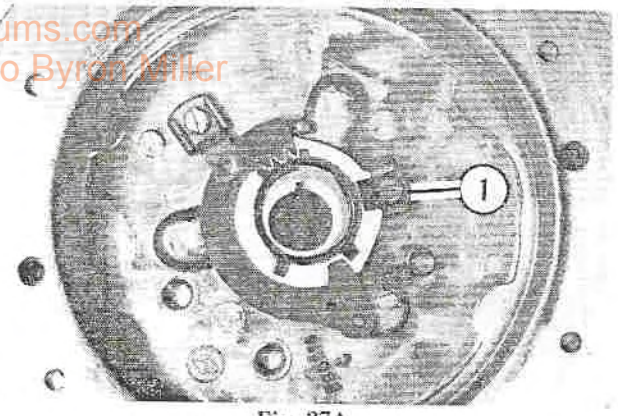


Fig. 27A
1. Cam Retainer (used on 25 H.P. engines)

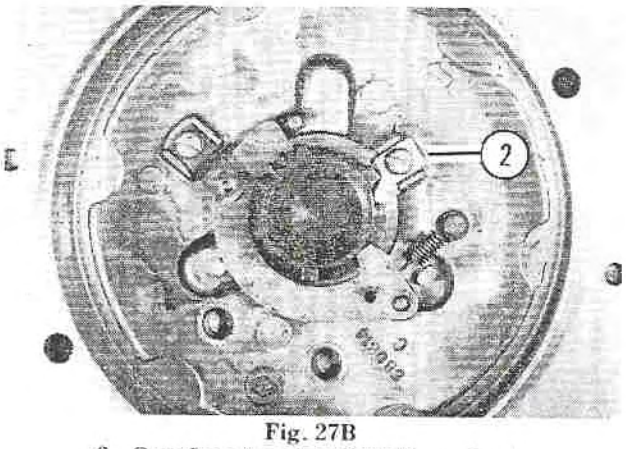


Fig. 27B
2. Cam Stop (used on 29 H.P. engines)

NOTE: *The flywheels on the 25 and 29 H.P. engines are identical, only the retainer and the stop are different.*

8. Rotate the crankshaft so the keyway is 180° opposite the breaker point pivot pin.
9. Place the Woodruff key into the crankshaft keyway. Place flywheel and cam assembly on crankshaft. BE SURE the cam has not slipped out of position. When the flywheel is properly seated, the outer edge will be approximately 1/32" above the shoulder on the crankshaft. DO NOT use force. The breaker cam can be broken by improper installation. If it is impossible to position the flywheel properly, remove it and repeat the above procedure.
10. Place the flywheel washer and nut on the crankshaft and tighten nut to 40-45 ft./lbs.

TIMING — 25 H.P. Engine

With the points adjusted .020 to .022 and the breaker cam properly installed, the ignition timing will be correct.

The previous procedure may be checked with the aid of an automotive timing light.

To check the timing, first remove the complete air cleaner assembly so that the timing slot in the upper portion of the fan housing is visible.

Connect automotive timing light to either spark plug.

With the engine operating at a fast idle speed, the yellow fin on the flywheel should be seen in the center of the timing slot when the light is focused there. The yellow fin appearing to the right of the center indicates points gapped too close, and the fin appearing to the left indicates points gapped too wide. Improperly gapped points will affect engine operation, especially at high altitudes.

TIMING — 29 H.P. Engine

With the points adjusted .020 to .022 and the breaker cam properly installed, the ignition timing will be correct.

BREAK-IN

Make certain that when an engine is returned to service following an overhaul, the owner is advised to follow break-in procedures as described. This will allow the internal moving parts to seat themselves, thus greatly prolonging engine life.

1. For the first tankful of fuel the vehicle must be operated at reduced speeds.
2. Allow engine to warm up before putting vehicle in motion. Start out slowly; avoid jack-rabbit starts. DO NOT overspeed engine.
3. Observe fuel mixing precautions and be sure correct mixture is used.

GOVERNOR

Service parts for the governor are not available. When a malfunction occurs, the complete unit must be replaced.

Lubrication

Fill the governor to the filler plug level with 10W30 engine oil (Figure 28). DO NOT OVERFILL. Use a squirt can to pump oil into the filler plug and allow all excess to run back out before inserting the plug.

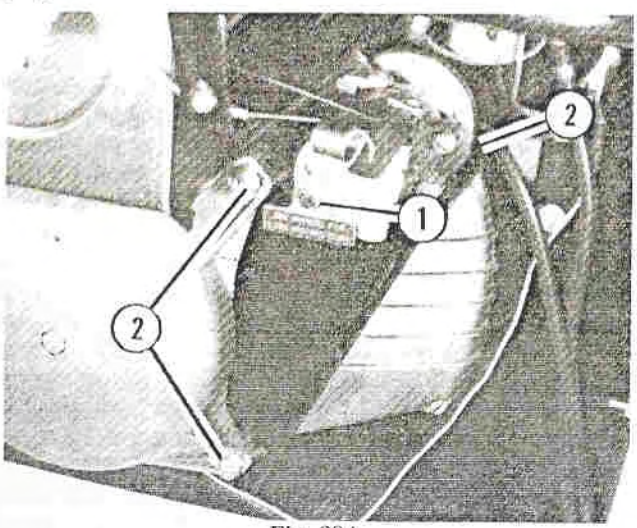


Fig. 28A
(Four-point Mounting Starter)
1. Oil Level Plug 2. Loosen Screws and Slide Bracket to Adjust Belt Tension

Belt Adjustment

Adjust the governor belt to provide ½'' deflection with slight pressure of the belt midway between the pulleys. Loosen the governor bracket mounting screws and slide the bracket to adjust the belt tension (Figure 28). A belt adjusted too loose will cause the belt to "turn over."

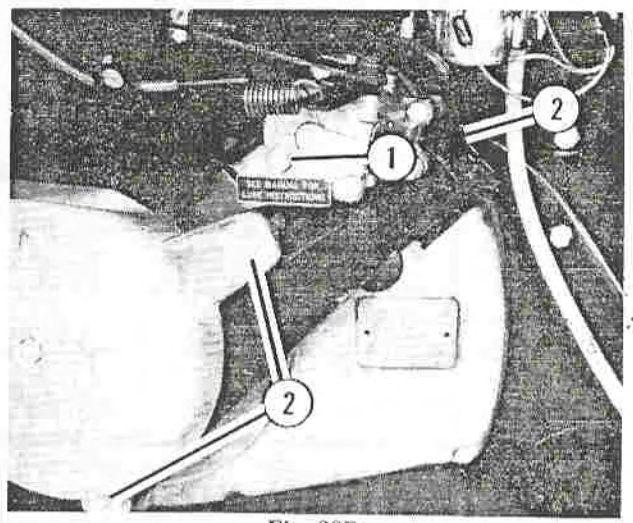


Fig. 28B
(Three-point Mounting Starter)
1. Oil Level Plug 2. Loosen Screws and Slide Bracket to Adjust Belt Tension

Governor to Carburetor Linkage Adjustment

A. Disconnect throttle cable spring from governor arm. Loosen connector screw (carburetor linkage to governor arm) and hold carburetor link and governor arm in a full forward position. Pull governor arm only, back 1/64'' and tighten connector screw. This will assure a wide-open throttle plate position upon governor demand.
After setting has been made, check governor and throttle movement for binding. Any binding between governor and carburetor will cause erratic governor action. Reconnect throttle cable spring to governor arm.

B. Five holes are provided in the governor arm. The spring will normally be connected in the center hole of the governor arm. Connecting the spring in a hole closer to the governor will increase the governor sensitivity. Connecting the spring in a hole away from the governor will decrease its sensitivity. This adjustment should be made when the engine is at operating temperature and after a careful carburetor setting has been made.

Governor Adjustment

Proper governor adjustment will provide a maximum engine r.p.m. of 5600-5900. Place the T-handle in the stop position, start the engine, advance the Engine Speed Control to maximum and check the engine r.p.m. with a tachometer.

Use a tachometer suitable for two-cycle engines. Attach one lead to the grey wire on the terminal board and the other lead to the engine ground connection.

If the engine r.p.m. is too high, loosen the throttle wire clamp on the engine speed lever and adjust the wire to decrease the tension on the governor spring (Figure 29).

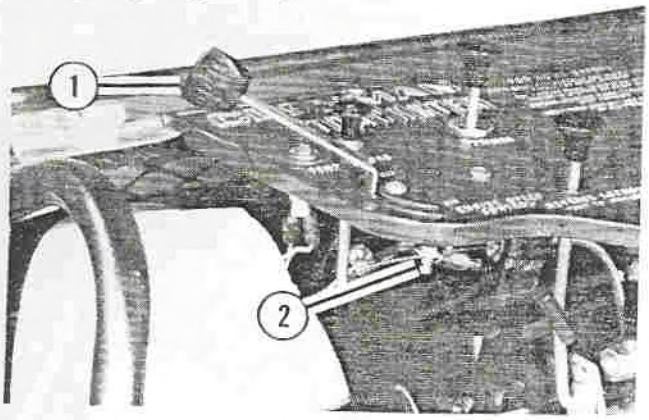


Fig. 29
1. Engine Speed Lever 2. Throttle Wire Clamp

If the engine r.p.m. is too low, adjust the wire to increase the tension on the spring. Be sure the wire housing is not obstructing the wire travel on the spring end.

When the engine will not maintain a constant r.p.m. or is "hunting" continually, the governor is adjusted too sensitive or the carburetor high speed needle is adjusted too lean. Refer to Part B of Governor Section for Carburetor Linkage Adjustment. Readjust the throttle wire and spring for top r.p.m. of 5600-5900.

A slight variation in r.p.m. or "hunting" at maximum engine speed with the T-handle in the STOP position is normal.

TROUBLE SHOOTING

ENGINE TURNS NORMALLY BUT WILL NOT START

A. Use a spark checking device to check for spark at the plug leads. Spark must jump a ½" gap while the engine is being cranked with the starting motor. If spark is normal, proceed with Check B. If spark does not occur while cranking engine, proceed with the following checks.

1. Disconnect the two black wires at the plug near the amplifier. With the ignition switch in the "on" position, observe spark at the spark plug leads while arcing the "spade" terminal of black wire to a ground.
   If a good spark occurs during this test, it is an indication of bad points or possibly a broken wire between the points and plug that has been disconnected. Replace points and/or check wire.
2. If there is no spark during test 1, check the voltage (with ignition switch on) at the purple wire on the terminal board. Battery voltage should be shown on the voltmeter.
   If battery voltage is indicated, replace amplifier or check the old amplifier as explained on Page 45.
   If the amplifier checks good, both coils and the related wiring should be checked.
   If no voltage was indicated during first part of Check 2, check out entire primary ignition circuit. Refer to wiring diagram.

B. Remove spark plugs.
   Check compression as outlined on Page 9. An engine with portions of the piston skirts broken will in some cases indicate good compression readings. Good piston skirts are essential for proper port timing. A visual inspection of the piston skirts can be made by removing the intake manifold and reed plate assembly. If compression is satisfactory on both cylinders, observe the condition of the spark plugs that were removed.

1. If the spark plugs were wet, the cylinders are getting fuel and the engine may be flooded as a result of overchoking or excessive priming. If new plugs are available, install them and proceed to start the engine with the throttle open. Do not choke or prime to start or flooding will persist. If flooding continues without choking or priming, check the needle and seat in the carburetor for dirt or worn parts.
2. If no fuel is evident on the spark plugs, fuel is not reaching the cylinders and the fuel system must be checked. Proceed as follows:
   (a) Check fuel tank for fuel. Fuel must be fresh and mixed with proper amount of oil. Insure that fuel gauge is vented.
   (b) Check choke valve for damage and proper operation.
   (c) Check carburetor and mounting screws for tightness. Check manifold for leaks.
   (d) Remove fuel supply hose at the carburetor. Fuel should discharge readily from disconnected hose as the engine is cranked with the starter. If no fuel is discharged during this test, the following test should be made in the sequence given:
   (1) Check and/or replace fuel filter.
   (2) Remove the fuel pickup assembly

from the fuel tank and inspect the following:

Check screen for obstructions (dirt, rust, etc.).

Check operation of check valve (check valve prohibits fuel in fuel lines from draining back into the tank when the engine is stopped).

Check hose for cracks.

NOTE: *The pick-up hose must lack 1/8" of contacting the threaded area for the fitting. Failure to maintain proper clearance may cause extreme flooding.*

Replace fuel pickup assembly.

(3) Check condition of hose from tank to the filter. Be sure the hose is not pinched causing a restriction. (Improper routing of the hose may cause it to be pinched between the seat cushion and the hand-hold tube.)

(4) Remove the hose leading to the fuel pump and check operation of the check valve. This valve must allow fuel to pass to the fuel pump but not back. The purpose of the check valve is to allow the primer to take fuel from the fuel tank but not from the fuel pump.

(5) Inspect all primer hoses. A broken primer hose may allow the fuel pump to pump air rather than fuel.

(6) Remove cap, screen and gasket from the fuel pump. Clean and replace parts as necessary.

(7) Check pulse line from fuel pump to intake manifold for cracks or obstructions. Repair or replace as necessary.

(8) Check fuel pump pressure as described in Fuel System Section. Replace as necessary.

(9) Repeat the first part of Check d. If fuel is now discharged at carburetor but no fuel is evident at the spark plugs after normal starting procedures have been made, replace or repair carburetor as described in Fuel System Section.

EXCESSIVE SPARK PLUG FOULING AND POOR HIGH R.P.M. PERFORMANCE

Oil saturated air cleaner element
Incorrect gas-oil ratio
Incorrect carburetor mixture adjustments (including idle mixture screw)
Improperly installed fuel return hose at tank
Choke cable improperly adjusted causing partial choking
Improper timing
Poor compression

It is characteristic of the Trackster engine to exhaust more smoke from the left tail pipe. This engine utilizes a single crankcase to charge both cylinders. Natural accumulation of heavy ends of fuel collecting in the crankcase is scavenged through the left cylinder due to crankshaft rotation.

During idle and no load conditions, combustion in both cylinders may not appear equal. Even minimal power requirements from the engine will result in equal firing of both cylinders.

The aforementioned characteristic will not affect spark plug life, unless aided by items listed under "Spark Plug Fouling".

NOTE: *Do not install hotter spark plugs in an attempt to remedy plug fouling.*

STARTER SYSTEM

Description

The electric starter system consists of the starter motor, starter solenoid and the necessary cables and wires with their connectors. The starter motor converts electrical energy from the battery into mechanical power which is transmitted to the engine through the starter belt. The starter switch controls the operation by activating the starter solenoid which makes and breaks the circuit between the battery and the starter motor.

The starter solenoid (Figure 1) closes the circuit through a movable contact disc which strikes two terminal contacts that are connected to the starter motor circuit. The solenoid winding, when energized, exerts a magnetic pull on the solenoid plunger causing it to move the contact disc against the terminal contacts.

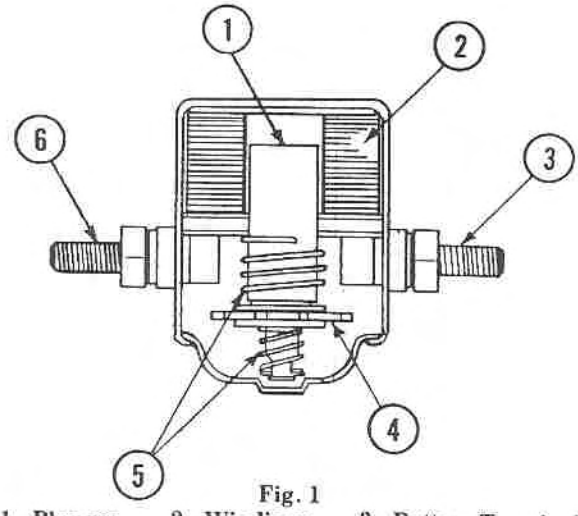


Fig. 1
1. Plunger 2. Windings 3. Battery Terminal
4. Contact Disc 5. Springs 6. Motor Terminal

SPECIFICATIONS

VEHICLE SPECIFICATIONS

ENGINE

Bore	2¾"
Stroke	2¼"
Piston Displacement	26.7 cu. in. (437 c.c.)
Horsepower	25 or 29 at 5000 RPM
Spark Plug	Champion J2J or equivalent
Spark Plug Gap	.035 to .040
Carburetor Adjustment	
High Speed	approx. 1 1/8 turn open
Low Speed	5/8 turn open
Breaker Point Gap	.020-.022
Lubrication	50:1 gasoline to oil mixture

TRANSMISSION .... Sunstrand Model 90-1025/26

CAPACITIES

Fuel Tank	10 U.S. gallons
Transmission 1974 & Earlier	7 quarts
Transmission Oil	4 Quarts of Arctic Oil (Mil. Spec. 5606, use Mobil Aero HFA or Texaco Aircraft Hydraulic Oil AA or BB) and 3 Quarts of Type "F" Automotive Transmission Fluid
1975 & Later Transmission	8 quarts (4 qts. Arctic Oil — 4 qts. Type "F")

BATTERY

Volts	12
Ampere-hour Rating	67
Ground Terminal Polarity	Negative
Terminals	Standard taper

WEIGHT - Standard Model	1040 lbs.
Marsh Model	1170 lbs.
CAPACITY	800 lbs.

GROUND PRESSURE

Dry unloaded	0.50 P.S.I.
Wet with one operator	0.63 P.S.I.
Wet with two persons and 100 lbs. equipment	0.77 P.S.I.

HEIGHT	41"
LENGTH	92"
WIDTH	62"

BOLT TORQUE SPECIFICATIONS

TRANSMISSION

Transm. on halves	18 ft-lbs
Hydrostat mounting	38 ft-lbs
Pinion gear seal retainer	18 ft-lbs
Transmission to frame	50 ft-lbs
Drive shaft hub	50 ft-lbs
Gear to axle	30 to 45 ft-lbs

ENGINE

Engine to frame	38 ft-lbs
Spark plugs	20 to 20½ ft-lbs
Flywheel	40 to 45 ft-lbs
Cylinders	16 to 20 ft-lbs
Crankcase halves	60-80 in-lbs or 5-7 ft-lbs
Connecting rods	29 to 31 ft-lbs

SUSPENSION

Bogie wheels to leaf spring	21 ft-lbs
Bogie wheels to upper rear frame	21 ft-lbs
Bogie wheels to upper rear frame tube	10 to 15 ft-lbs
Diagonal frame brace to center frame	38 ft-lbs
Leaf spring to center frame	20 ft-lbs
Rear bogie wheels to carrier	55 ft-lbs
Shear mounts	20 ft-lbs
Torsilastic springs	15 ft-lbs
Rear release arms	60 ft-lbs
Side rails to frame	30 ft-lbs

BODY

All ¼" screws through body	5 ft-lbs
Latch mounting screws, #10	20 to 30 in-lbs
Handholds to trim	20 ft-lbs
Bumper to body	8 ft-lbs

SAFETY WARNING: WHEN REPLACING ANY BOLT, SCREW, OR OTHER FASTENER, USE ONLY ORIGINAL EQUIPMENT REPLACEMENT PARTS OR PARTS OF EQUIVALENT STRENGTH AND MATERIAL.

SAFETY WARNING: WHEN RE-USING LOCKNUTS BE SURE THEY FIT TIGHTLY. LOCKNUTS REMOVED AND REPLACED MORE THAN A FEW TIMES CAN LOSE SOME OF THEIR LOCKING ABILITY. IF THERE IS ANY DOUBT AS TO THEIR CONDITION, THEY SHOULD BE REPLACED WITH NEW PARTS.

The starter motor drive pulley is disengaged when at rest and is made to engage the starter motor drive belt by the rotation of the starter motor armature. When the engine has started, the starter pinion is driven faster than the starter motor shaft and becomes disengaged.

NOTE: *Starter belt tension must be set with sufficient slack to prevent the engine from driving the starter motor.*

Maintenance

The only starter motor maintenance required is periodic cleaning of the outside of the starter motor and drive and a check of the starter belt tension. No periodic lubrication of the starter motor or solenoid is required. Starter motor need be removed for reconditioning only every 1000 hours or if the following tests indicate that the starter is not operating properly. If the starter motor does not crank the engine or if it cranks too slowly, check the battery, cables and connections. Inspect all wiring connections in the starter circuit to insure that they are clean and tight. Proceed with the following tests if additional trouble shooting is necessary.

Starter System Testing

The following tests fall into two groups, starter circuit tests and starter motor tests. Starter circuit testing is a quick means of pinpointing causes of hard starting which may result from a faulty electrical component in the starter circuit and can be performed without removing any components from the engine. Starter motor tests are used to determine starter motor condition and most can be performed without removing the starter from the engine.

NOTE: *All starter circuit testing must be done with a fully charged, 12-volt battery.*

Starter Circuit Testing

Starter Motor Amperage Draw Test

1. Ground spark plug high tension leads so that engine can be cranked without firing. Place clamp-on ammeter capable of reading at least 200 amperes against starter motor lead (Figure 2).
2. Turn ignition switch to START and observe amperage reading with engine cranking. Current should be between 75 amperes minimum and 140 amperes maximum after initial surge.

NOTE: *Do not operate starter motor for more than 30 seconds at a time without pausing to allow motor to cool for at least two minutes.*

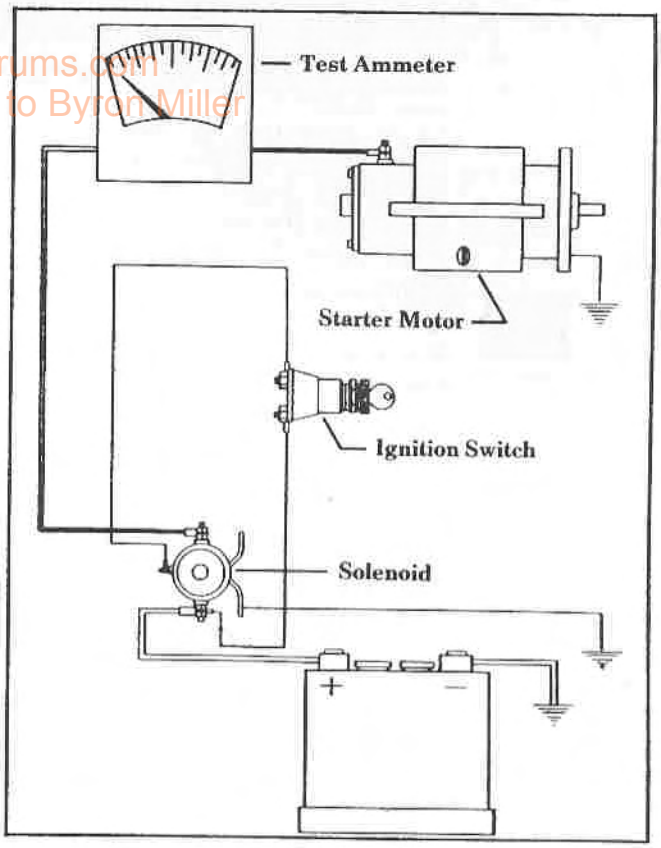


Fig. 2

Starter Motor Available Voltage Test

1. Inspect battery and cables to make sure that battery has ample capacity for cranking.

NOTE: *Engine must be at normal operating temperature when test is made.*

2. Ground spark plug high tension leads so that engine can be cranked without firing.
3. Connect a voltmeter across starter motor (Figure 3) with positive (+) lead to starter motor terminal, and negative (—) lead to ground on starter frame.
4. Turn ignition switch to START to crank engine and observe voltmeter reading as quickly as possible.

NOTE: *Avoid running starter motor continuously for more than 30 seconds during test to prevent overheating. Allow ample time between tests for starter motor temperature to normalize. Voltmeter readings will change as starter temperature increases.*

5. If starter motor turns engine at normal cranking speed with a voltage reading between 9.5 volts minimum and 10.5 volts maximum, starter motor is satisfactory. If available voltage reading at the starter motor is low, review the following chart for probable causes.

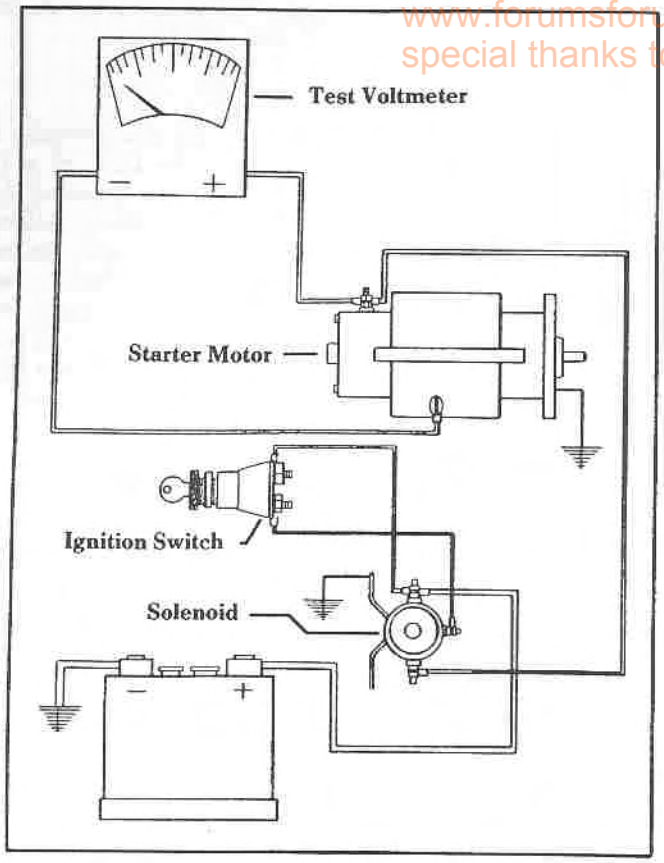


Fig. 3

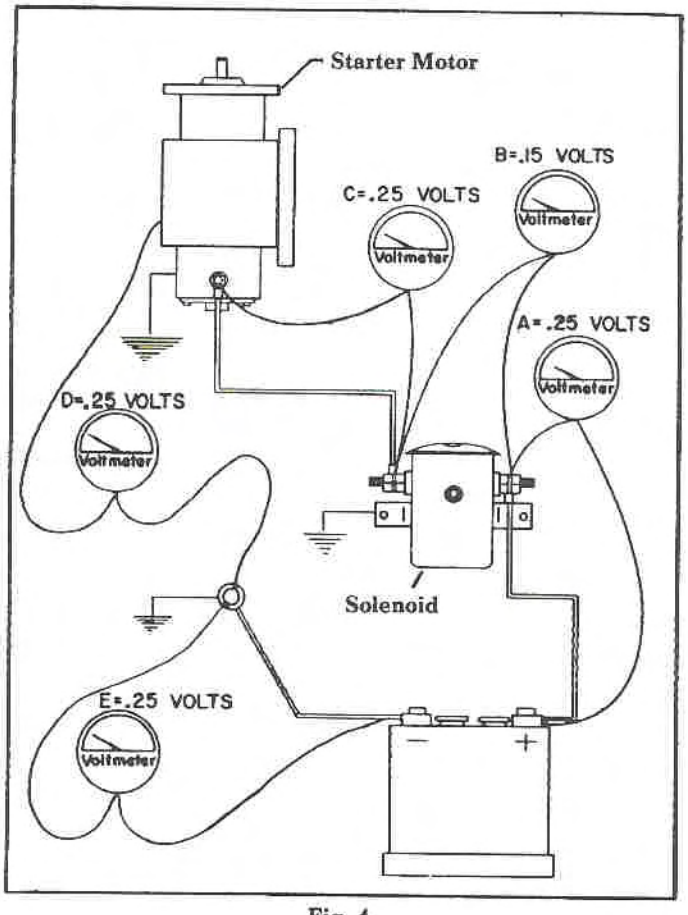


Fig. 4

Starter System Voltage Drop Test

1. By making a systematic check from the positive battery terminal through the starting circuit and back to the negative battery terminal, any component or electrical connection having excessive resistance, thus causing high voltage drop and subsequent hard starting, can be pinpointed (Figure 4).
2. Ground spark plug high tension leads so that engine can be cranked withoug firing. Connect voltmeter and turn ignition switch to START to crank engine. By placing voltmeter leads against battery, solenoid and starter motor terminals rather than against connecting cable ends, each connection can be tested for high resistance along with component.
3. Clean and retighten, or replace, any connection, cable, or component having greater than specified voltage drop.

Starter Motor Testing

The no-load test is used to determine quickly the general mechanical and electrical condition of the starter motor. The stalled torque test is used to determine whether or not the starter motor has sufficient torque to crank the engine for fast starting.

No-Load Test

1. Connect starter with an ammeter in series to a 6-volt source (Figure 5). Use a tachometer or r.p.m. indicator to indicate armature speed.
2. Ammeter should indicate 60 amperes maximum; r.p.m. indicator should indicate 4200 r.p.m. minimum. If readings are not as specified, check for binding in starter or failure of windings.

NOTE: *If starter motor turns slowly, smokes after a very few seconds of running, or gets hot instantly, stop testing. Disassemble starter and check for shorts.*

Stalled Torque Test

1. Connect a voltmeter between the starter terminal and motor frame. Using a torque wrench to stall motor armature (Figure 6), connect starter motor through on ammeter to a 12-volt battery.
2. Voltmeter reading should be approximately 10 volts during this test. Torque should be a minimum of 108 inch-pounds, or 9 foot-pounds and current should be a maximum of 405 amperes.

NOTE: *If motor smokes or gets hot instantly, stop testing, disassemble starter and check for shorts. Use only a fully charged 12-volt battery when making stalled torque test. Obtain readings as rapidly as possible to prevent starter overheating. Allow sufficient time for starter to return to room*

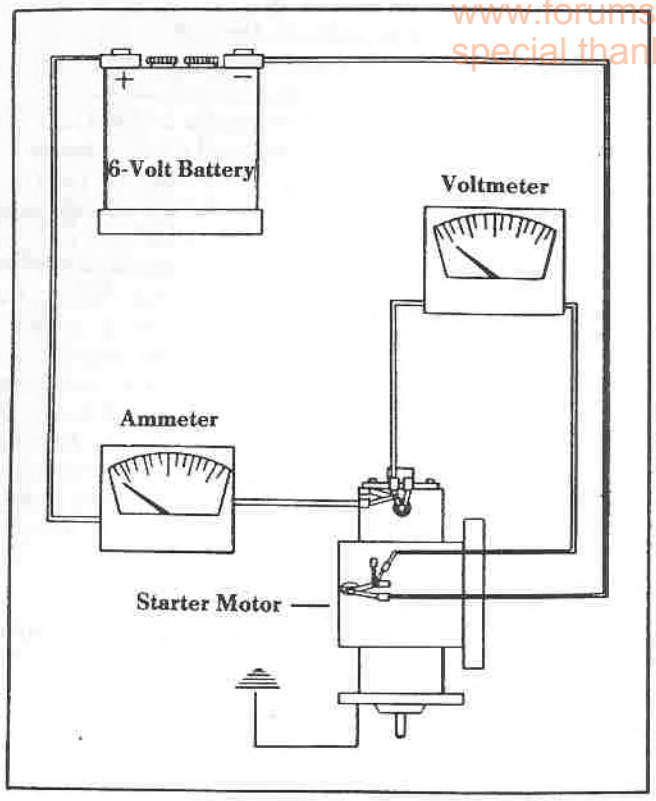


Fig. 5

temperature if it is necessary to repeat stalled torque test.

3. Check each armature coil for open circuits by rotating torque wrench handle through a 180 degree arc after initial torque reading has been noted. This must be done quickly. Torque should be uniform through this arc, although reading will decrease slightly each time brush moves from one commutator segment to another. If an appreciably wide area is found in which torque is very low, disassemble starter and check armature.

Inspection of Starter Motor

1. Check armature on a growler for shorted turns.

NOTE: *Follow operating instructions furnished with armature growler for proper test procedures. Clean between commutator segments of armature and recheck armature on growler. If shorted turns are still indicated, replace armature.*

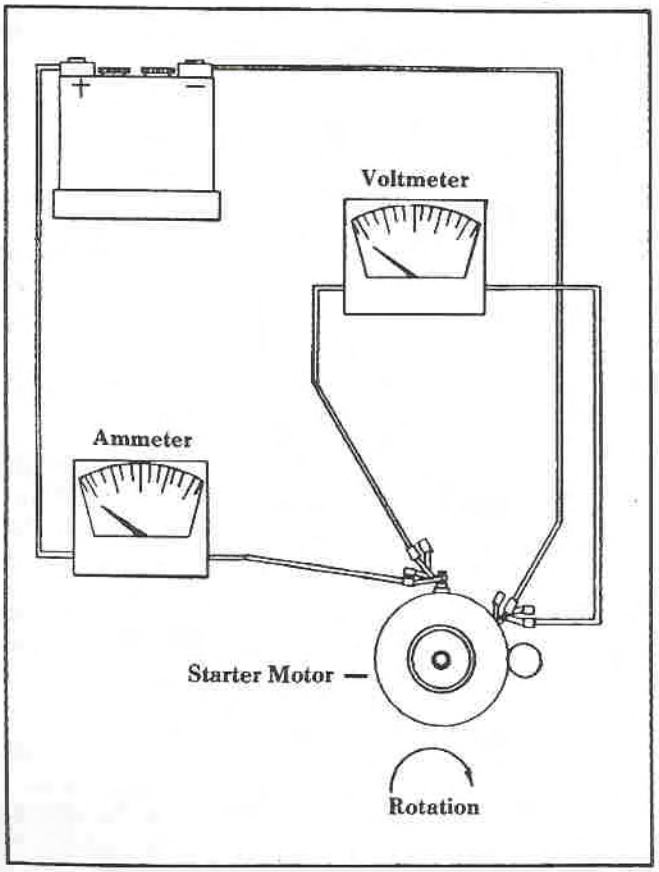


Fig. 6

2. Check armature for grounded windings. Rotate one lead of continuity tester (test light or meter) around circumference of commutator while holding other continuity meter lead on the armature core or shaft. An indication of continuity means that the armature windings are grounded and armature must be replaced.
3. Check armature for open windings by using a testmeter. Measure resistance between adjacent commutator segments using LO OHMS scale. Rotate leads around entire circumference of commutator. An open winding is indicated if any one reading is much higher (three times higher or more) than the average reading.
4. Inspect commutator segments. If they are dirty or show signs of wear, turn commutator in a lathe until surface is clean and smooth.
5. After turning commutator, undercut insulation between commutator segments to a depth of approximately 1/32''. The undercut must be flat at the bottom (triangular groove cuts are unsatisfactory) and should extend beyond the brush contact area for the full length of each insulated groove (Figure 7).
6. After commutator has been undercut, sand lightly with No. 00 sandpaper to remove burrs left during the undercutting process. After sanding, clean commutator thoroughly, removing all traces of metal chips or sanding grit, and recheck armature on growler.

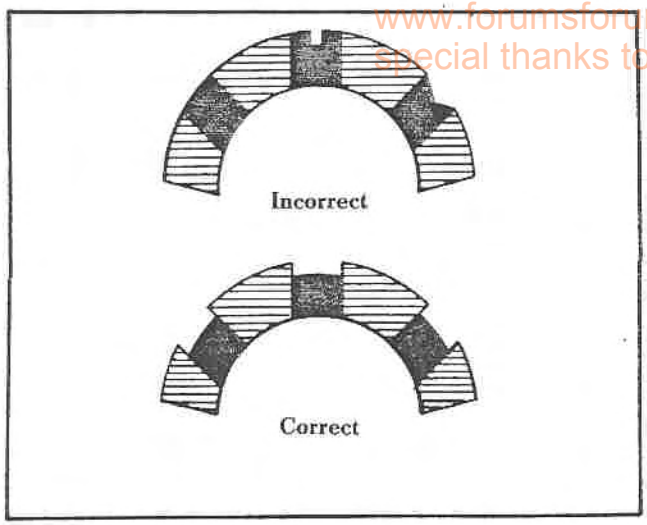


Fig. 7

7. Inspect armature insulation for indications of overheating or damaged windings. Clean off any deposits of carbon which may contribute to later failure of the windings.

NOTE: *Starter motor components should not be washed off in cleaning solvents. Most solvents will soften varnish insulation used on armature and field windings. All starter motor components can be cleaned adequately with a clean cloth or soft brush. Cleaning end heads in solvent may dissolve the oils that have impregnated into the armature shaft bearings. If these oils are removed, bearing or armature shaft wear can be expected. Cleaning of armature in solvent will leave oily residue on the commutator segments causing arcing between the commutator and brushes.*

Brushes

1. Inspect the brushes; replace if one-half worn, damaged or cracked. Replace brush springs if weak.
2. Inspect brush springs. Springs should have a pressure of 35 to 90 ounces when compressed to 9/32". Measure brush tension with scale hook under brush screw or under bend in brush spring and take reading as brush just leaves commutator. Pull-off spring scale must be directly opposite line of force exerted by brush spring.

Belt Tension

1. Correct starter motor drive belt tension is extremely important. A loose belt will cause slippage and "glazing" of the belt and a tight belt will result in a ruined starter when it is driven overspeed by the engine after starting.
2. If the starter belt "squeals" during the starter drive engagement, the belt must be tightened. To adjust, first remove the plug (Figure 8) and loosen the pivot screw. Then loosen the adjusting screw and pivot the starter up for adjustment. Retighten adjusting screw. To check the belt adjustment, run the engine at full r.p.m. If the belt rotates or creeps with the flywheel, the belt is too tight and must be loosened.

NOTE *A belt that has been allowed to operate too loose may glaze, this necessitates replacement.*

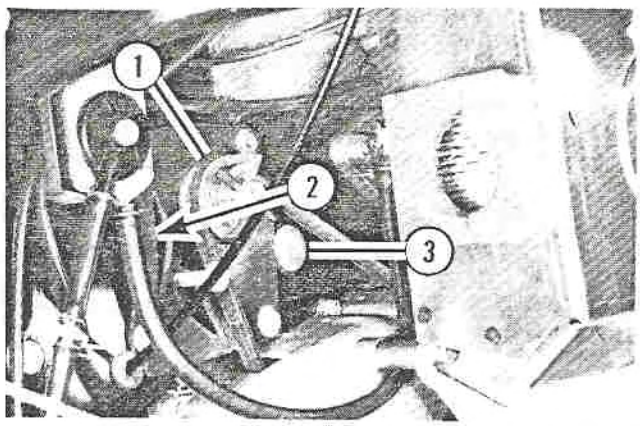


Fig. 8
1. Roll Pin Ramp 2. Adjusting Screw
3. Remove Plug to Loosen Pivot Screw

MANUAL STARTER

NOTE: *All later production vehicles have the starter handle located near the starter to facilitate use on flotation models. Manual starters may have either 3 or 4 mounting bosses, however, repair procedures remain the same.*

Description

The manual starter converts straight line motion to rotary motion necessary to crank the engine. Pawls on the starter pulley engage the flywheel ratchet when the starter rope handle is pulled. When the engine starts, centrifugal force moves the pawls outward, disengaging them from the ratchet. A recoil spring is wound as the rope is pulled and unwinds as the starter handle is returned to the starter housing.

NOTE: *Do not allow handle to snap back. Hold starter handle until cord is fully recoiled.*

Removal and Disassembly

1. Remove the screws attaching manual starter assembly to fan housing. Remove starter assembly from fan housing.

2. Pull starter rope out far enough to tie a slip knot in rope. Pry rope anchor out of starter handle (Figure 9). Remove rope from anchor and remove starter handle from starter rope.

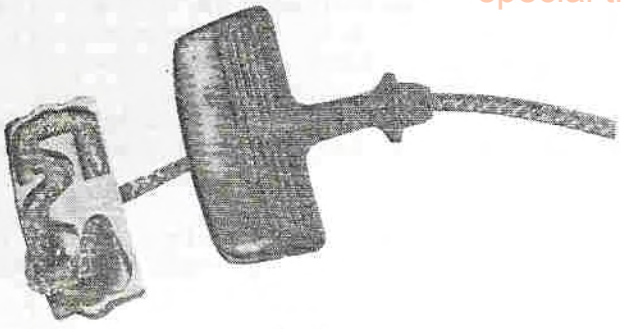


Fig. 9

3. Release knot and ease starter pulley back until starter spring is fully unwound.
4. Remove starter spindle nut and remove all components of starter pulley spindle assembly (Figure 10).

SAFETY WARNING: SAFETY GLASSES SHOULD BE WORN WHEN DISASSEMBLING AND REASSEMBLING MANUAL STARTERS.

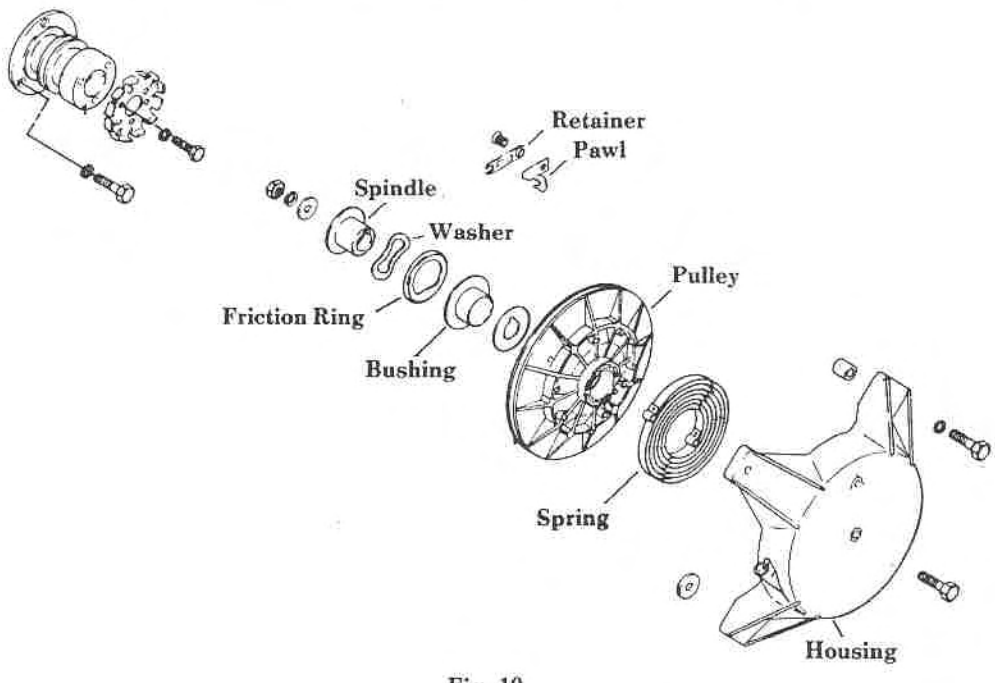


Fig. 10

5. Jar the housing, pulley side down, on bench to dislodge spring and pulley from housing.
6. Observe the rotation of the spring before removing it from the housing.

SAFETY WARNING: REMOVE THE SPRING SLOWLY BY UNWINDING ONE COIL AT A TIME FROM THE HOUSING.

Cleaning, Inspection and Repair

1. Wash metal components in solvent and blow dry with compressed air.
2. Inspect spring for broken end loops or distorted coils.
3. Remove the starter pawls and examine for wear.
4. Inspect friction ring, spring washer, spindle bushing, spindle, and retainers.
5. Inspect rope and discard if frayed. Replace with starter rope cut length of 73¼".
6. Examine pulley and housing rope eye for sharp edges and rough surfaces that might cause rope fraying. File and polish as necessary.

Reassembly

1. Place the outside spring end loop over the anchor pin in the housing.
2. Wind the spring into the housing one coil at a time.

SAFETY WARNING: BE SURE EACH LOOP IS PROPERLY IN POSITION AND HELD TO PREVENT THE SPRING FROM JUMPING OUT.

3. Wind the rope onto the pulley, place the pulley into position in the housing while guiding the pin on the pulley into the inner spring loop end.
4. Assemble the spindle, spring washer, friction ring and bushing. The flat area on the friction ring must align with the flat area on the spindle and the slots in the spindle must align with the projections on the bushing. Install this assembly through the pulley being sure

the pin in the end of the spindle enters the hole in the housing. Install the retaining screw, flat washer, lockwasher and nut. (Figure 11).

5. Turn the pulley two turns to tighten the spring before reinstalling the rope handle. Insert the rope through the housing and handle. Press the rope end into the channel in the rope anchor with the end butting firmly against the end of the channel (Figure 9).
6. Reinstall the pawls and retainers.
7. Pull on rope to make certain the pawls engage properly and release when the rope is returned.
8. Reinstall the starter on the engine.

Starter Rope Replacement

1. Pull starter handle until rope is fully unwound. Lock starter pulley in position by aligning holes in housing and pulley and inserting a nail or pin through them.
2. Pry rope anchor out of starter rope handle. Disengage rope from anchor and remove handle. Remove old rope from pulley.
3. Cut new starter rope to length of 73¾". Fuse ends of rope over open flame for about ½". Rope ends must be stiff to hold in pulley and rope anchor. Tie knot in end of rope and thread through pulley and housing.
4. Thread rope through starter handle. Thread rope through rope anchor and press rope into channel and rope anchor with end of rope butting firmly against end of channel. Press anchor into handle.
5. Remove locking pin and allow starter to rewind.

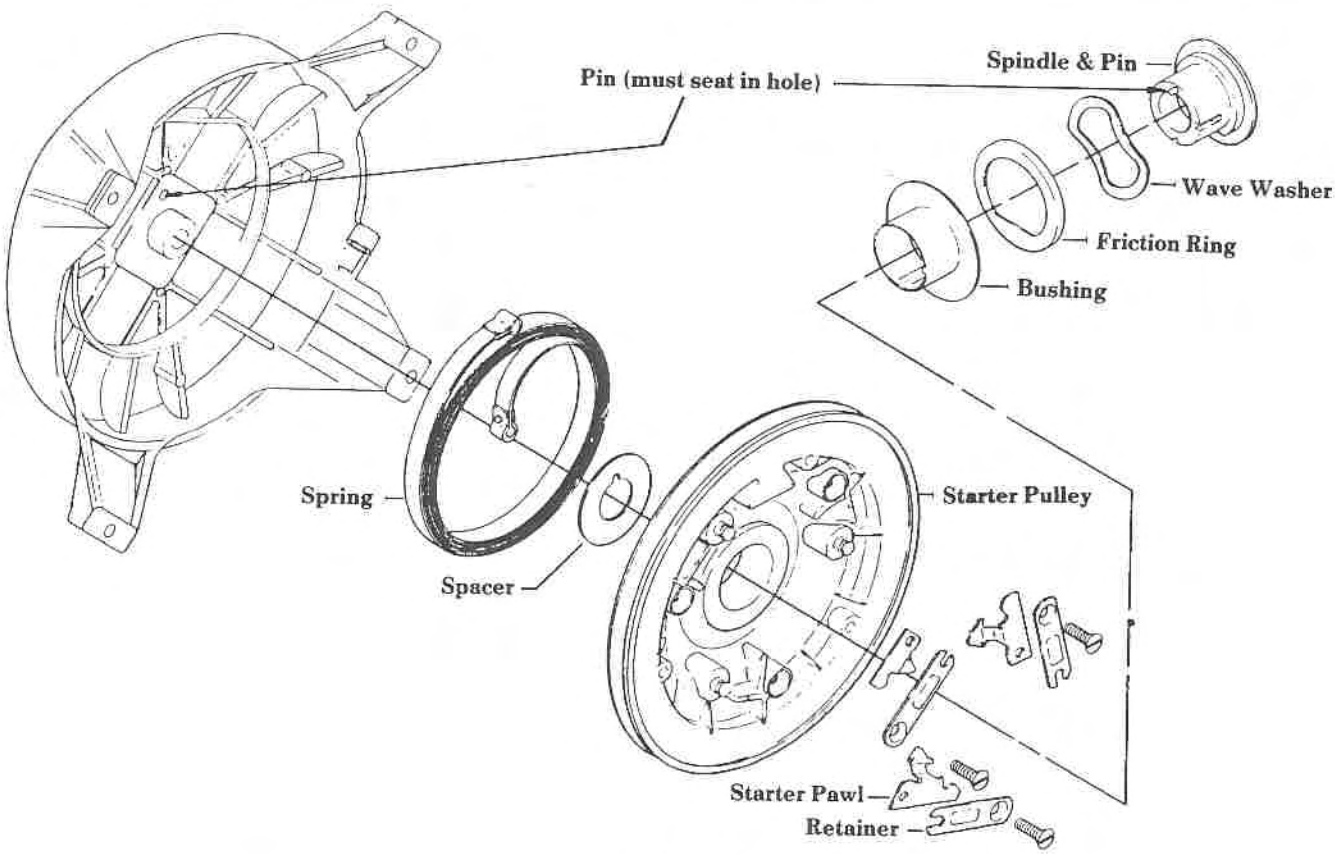


Fig. 11

TROUBLE SHOOTING THE STARTING SYSTEM

A. Engine won't crank with electric starter but can be cranked with manual starter.
   1. Starter belt too loose. Adjust as outlined under "Belt Tension."
   2. Battery discharged or faulty. Test battery as outlined on Page 48 in Electrical System Section.
      (a) If battery is discharged, check charging system as outlined on Pages 47 and 48 in Electrical System Section.
   3. Check complete starter system as outlined in this section.

B. Engine won't crank with manual starter.
   1. Remove manual starter assembly and rotate engine flywheel at least one complete revolution in the direction of normal rotation. If the engine will not rotate, it may be "locked up" and must be repaired. If engine rotates freely, repair manual starter as outlined on Pages 23 and 24 of this Section.

C. Starter drive failure.
   1. Stationary starter pulley breakage may result from the starter access boot contacting the pulley causing only partial contact of roll pin to pulley. To correct, ascertain that the boot is installed on engine side of the fire wall and that boot is not contacting the stationary pulley (Figure 12).

NOTE: *Insure only smooth portion of spiral pin contacts ramp.*

D. Internal damage to starter motor from "overspeed."
   1. "Overspeed" damage may be the result of belt tension too tight (refer to Belt Tension) or starter access boot engaging the stationary pulley. (Refer to Starter Drive Failure.)

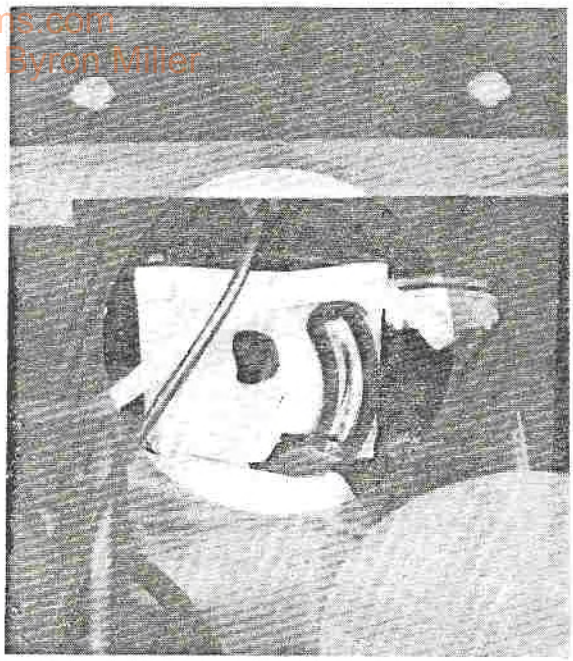


Fig. 12

TRANSMISSION SECTION

CONTENTS

Power Unit Removal

NOTE: *If service is needed on the transmission gears, the entire power unit must be removed. However, service on any other component such as the engine or drive shaft can be performed by removing only that part. On early flotation equipped models the flotation ring must be removed from the vehicle before removing the power unit. See Misc. Section.*

1. Remove rear bumper extensions on each side of the vehicle.
2. Raise the vehicle off the floor. Loosen and remove the screws securing the rear bogie wheel units and swing the wheels down to provide slack in the track (Figures 1 and 2).

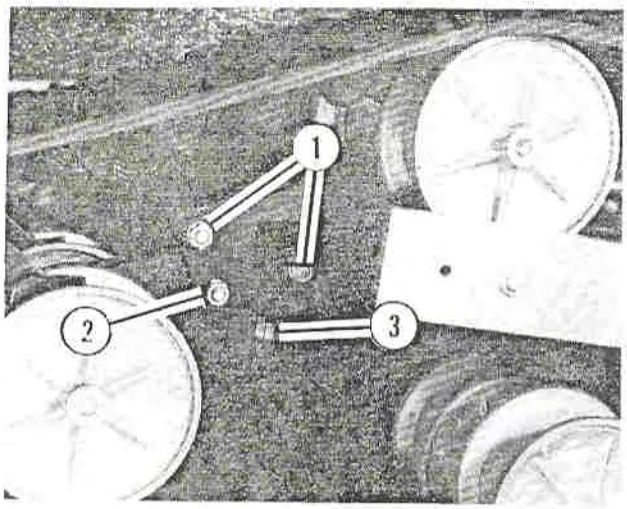


Fig. 1
1. Loosen 2. Remove
3. Track Tension Adjustment

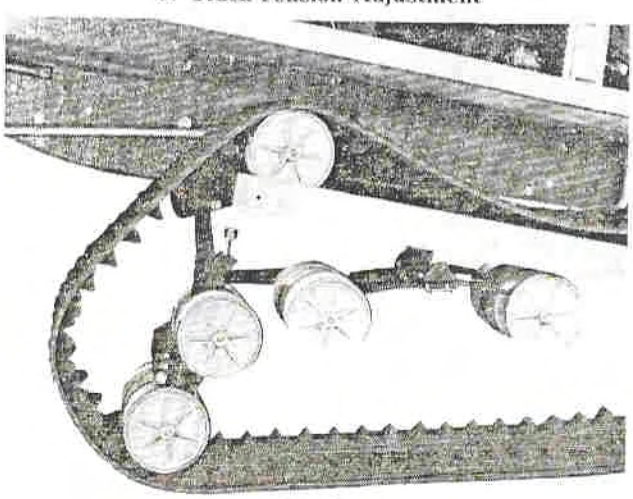


Fig. 2

Remove both tracks from the vehicle. Be sure the parking brake is released to facilitate removal of the left track. It may be necessary to loosen or remove the upper bogie wheel under the parking brake pad to facilitate removal of the left track.

3. Remove the cotter pin, castle nut and flat washer holding the drive sprocket to the axle. Use a 5/8 - 18 knock-off (Part No. 809315) to remove the sprocket. Be sure to screw the knock-off on the axle as far as it will go (Figure 3), then hit it a sharp blow with a metal hammer **while applying pressure to the back side of the sprocket.**

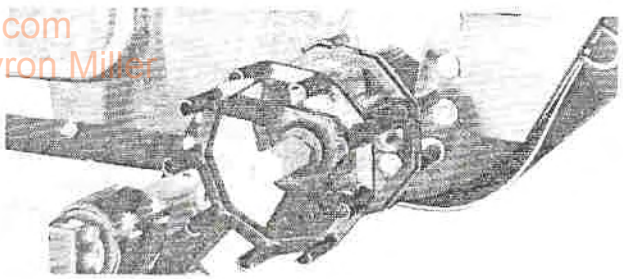


Fig. 3

4. Remove the hood and engine cover.
5. Disconnect the battery cables at the battery.
6. Disconnect the red battery cable from the solenoid. Remove the taillight wire and battery cable from the engine ground connection just below the solenoid. Disconnect the other taillight wire at the plug connector. Disconnect all wires to each headlight.
7. Disconnect the fuel lines from the fuel filter and the top of the carburetor. Insert a 5/16" bolt in the fuel line removed from the filter to prevent fuel leakage.
8. Loosen the tail pipe clamps under the body and separate the pipes. The tail pipe can be removed by removing the rear clamp and swinging the tail pipe away from the body. Loosen the lower clamps on the exhaust pipe body seal and the exhaust pipe to muffler connections. The exhaust pipe and body seal will now come out with the power unit (Figure 4).

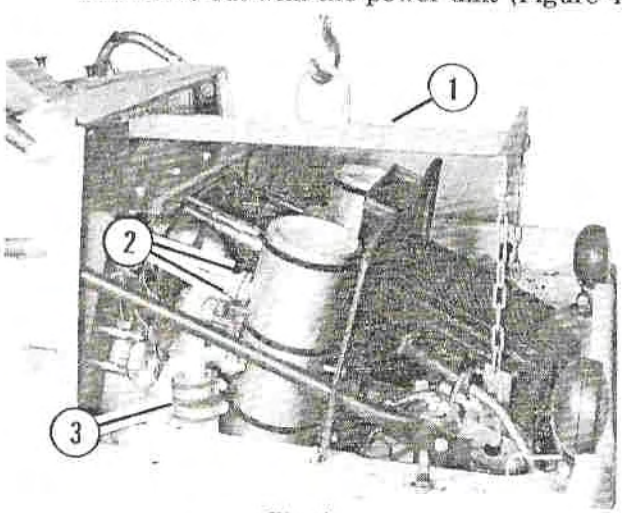


Fig. 4
1. Lift Bar 2. Loosen
3. Body Seal

9. Remove the screws securing each side of the fire wall to the body. The two screws holding the power frame to the body floor are on the front side of the fire wall inside the engine compartment.
10. Remove the three screws on each side of the divider panel securing it to the body.

ENGINE SECTION

CONTENTS

11. Remove all screws securing axle filler panels to body. Do not remove the three screws holding each filler panel to the axle housing.
12. A hydraulic or chain hoist should be used to lift the power unit from the vehicle. Attach the lift bar (Figure 4). If chains are used, hook them to the lift brackets on each hydrostatic transmission and to each handhold. Use care in positioning the chains to prevent scratching and marring the paint.
13. Lift the unit slowly while checking to be sure all wiring and hardware are removed. Push down on the front of the body to break the sealer bond around the axle filler panels. One axle must precede the other through the body openings, tip the unit slightly and guide one axle.

    Clean all old sealer from the axle filler panels and body with acetone. Before reinstalling the unit, apply a 1/8'' bead of sealant, 3M Sealant 404, Part No. 822311, or equivalent, to filler panels. Before tightening the screws, add more sealant around the body opening on the underside.

Removing Transmission From Power Unit

1. Drain all fluid from the transmission by removing the oil temperature sending unit.
2. Remove the mufflers from the engine.
3. Loosen hose clamps and slide the rubber hoses down away from the heat exchanger.
4. Remove the heat exchanger, control rods and divider panel.
5. Remove the two bolts securing the drive shaft to the transmission hub.
6. Remove the two bolts (1 each side) securing the axle tube bracket to the frame brace.
7. Remove the four axle to power frame mounting bolts.

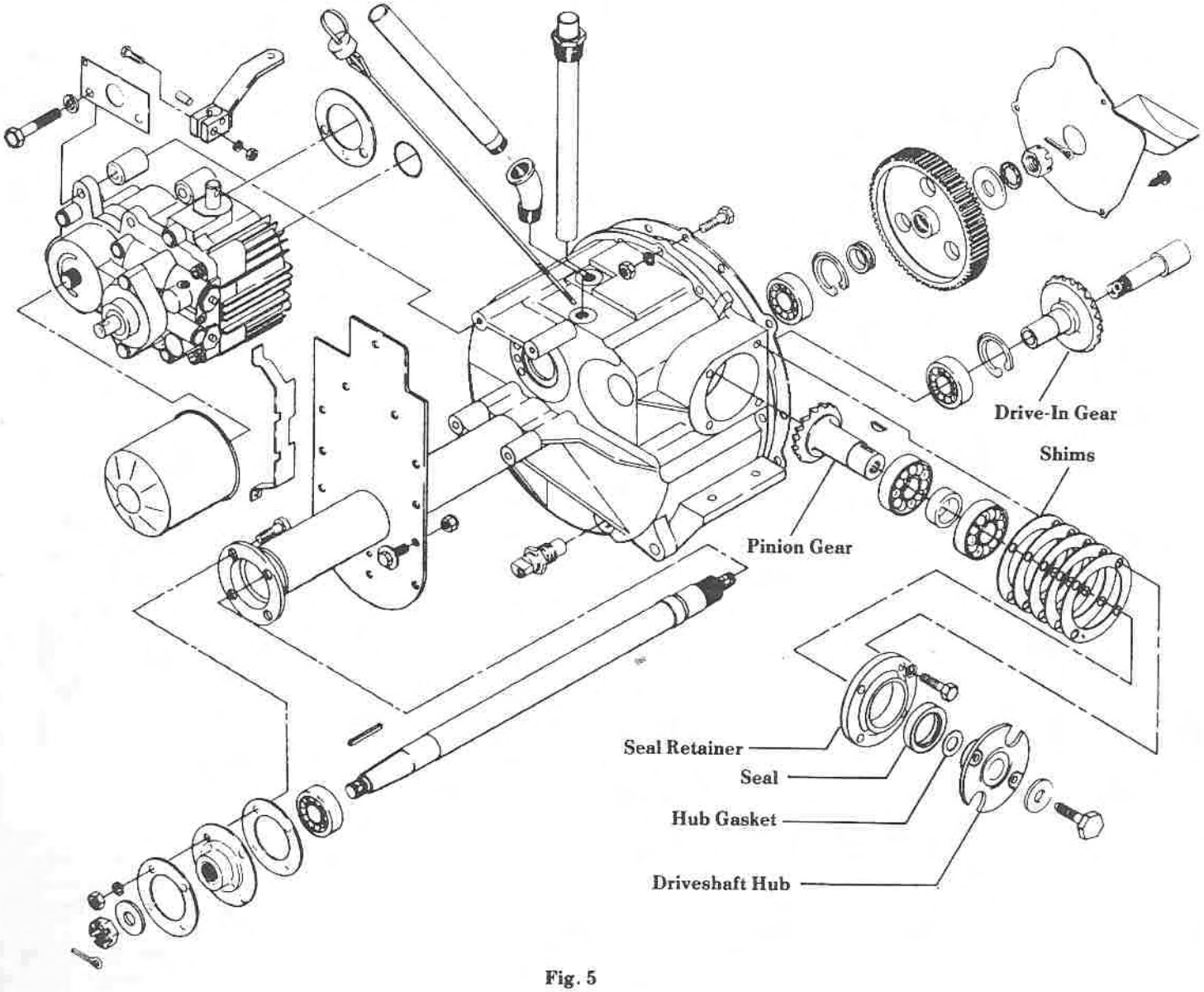


Fig. 5

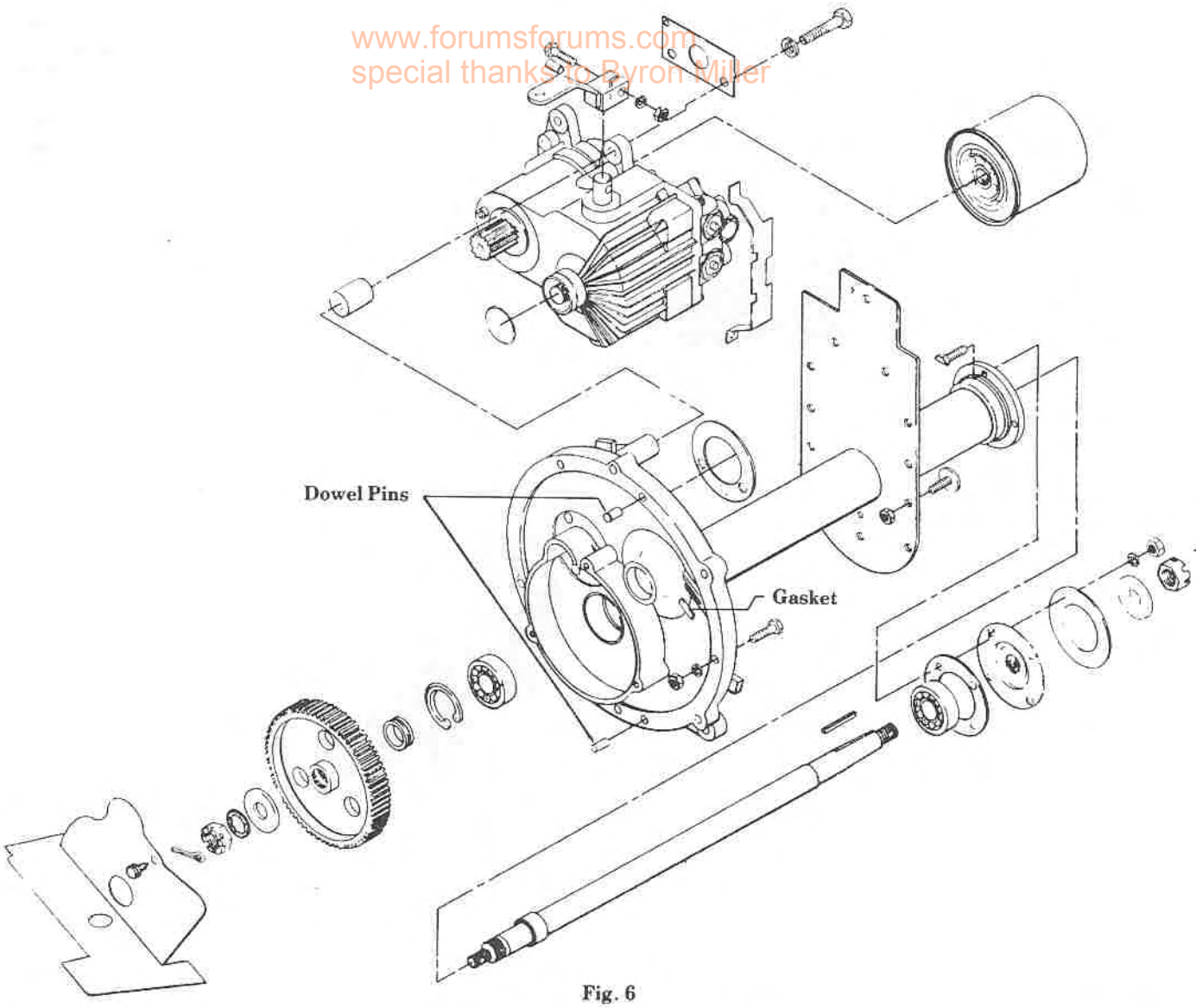


Fig. 6

Disassembly

Place the transmission upright on a bench and support the left axle in a vise or suitable fixture.

Remove the oil filters from the hydrostats using strap wrench, Part No. 112020. Each filter will still be approximately half full of fluid.

Remove each hydrostat from the transmission by removing the four bolts securing each one as shown (Figure 7). The coupling shaft may come out with the right hydrostat or can be removed as shown (Figures 8 and 9).

NOTE: *Service parts for the hydrostats are not available. Do not disassemble a hydrostat. If the unit is defective, return it to an authorized Cushman dealer for repair.*

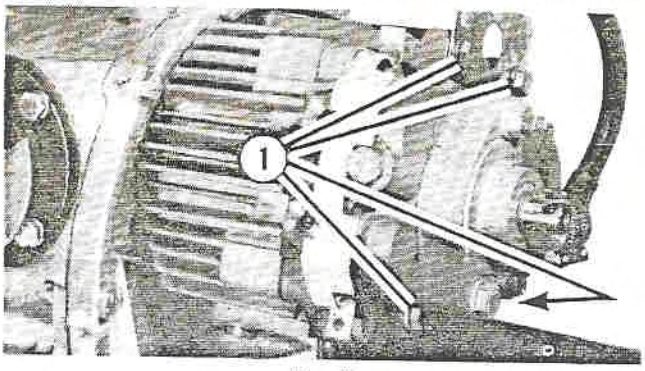


Fig. 7
1. Hydrostat Mounting Bolts

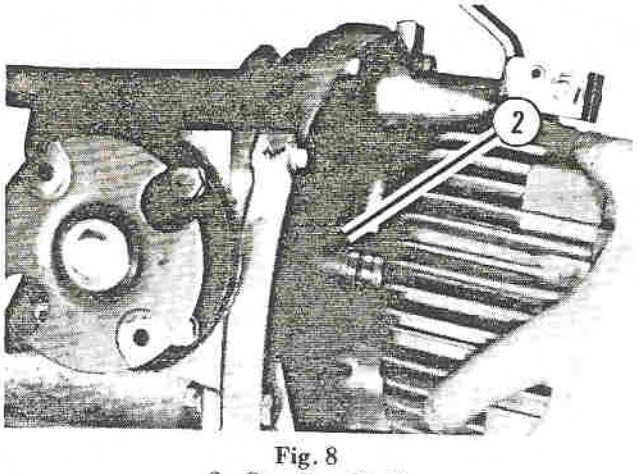


Fig. 8
2. Coupling Shaft

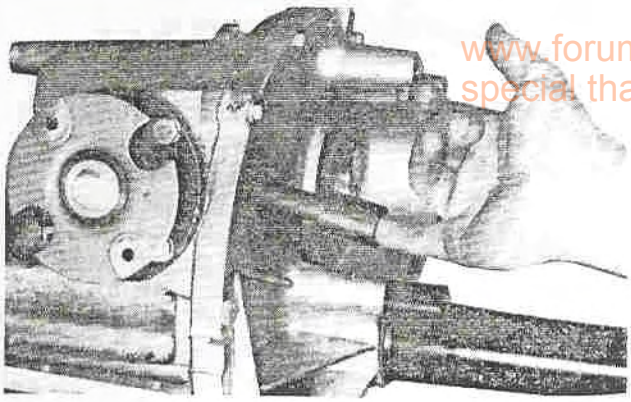


Fig. 9

Remove the control lever stop bracket from the top of the transmission and remove the oil pickup tube.

Remove all screws securing the housing halves together and separate the halves by tapping lightly with a fiber hammer.

Inspection and Repair

The left transmission housing contains the pinion gear, drive-in gear, left axle and related shims, bearings and seals (Figure 10).

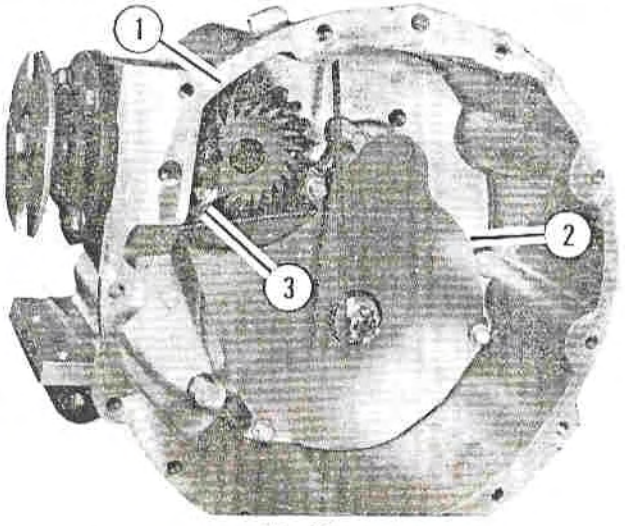


Fig. 10
1. Drive-In Gear 2. Gear Cover
3. Pinion Gear

Pinion Gear

Remove the drive shaft hub from the pinion gear —it may be necessry to use a puller. Remove the oil seal retainer and shims.

NOTE: *If the original pinion gear, drive-in gear and transmission housing are reused, the same shim stock can be cleaned with solvent and reinstalled as long as the individual shims are not damaged.*

Pull the pinion gear and bearing assembly out of the housing to the outside. Inspect the bearings and gear teeth for wear. The bearings can be pressed from the shaft for replacement.

When installing a new pinion gear, drive-in gear or transmission housing, the pinion gear seal retainer must be shimmed to provide correct gear backlash between the pinion gear and drive-in gear.

Clean all shim surfaces and smooth all nicks and mars. Push the pinion gear and bearing assembly into the housing until the pinion gear contacts the drive-in gear. Place the seal retainer in place against the bearing and measure the gap between it and the transmission housing with a thickness gauge as shown (Figure 11). ADD .008 to this measurement to obtain the total amount of shims required. EXAMPLE: The gap measurement is .015'' — .015'' + .008'' is .023''. Assemble a combination of clear shims (.005'' each) and green shims (.003'' each) to obtain .023''.

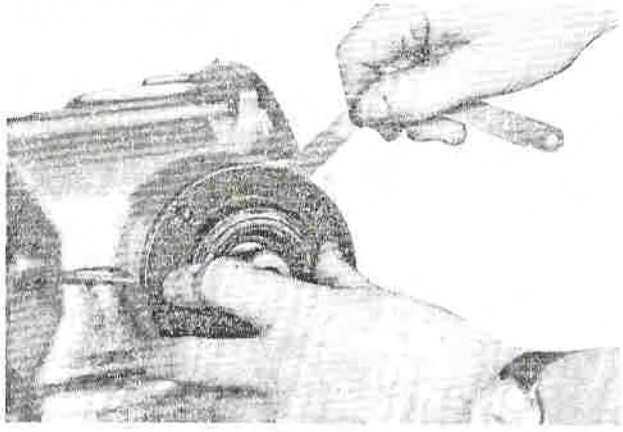


Fig. 11

Before installing the shims and seal retainer, apply sealer (K & W Copper-coat or equivalent) to both sides of the hub gasket and install over pinion gear shaft against the bearing (Figure 12).

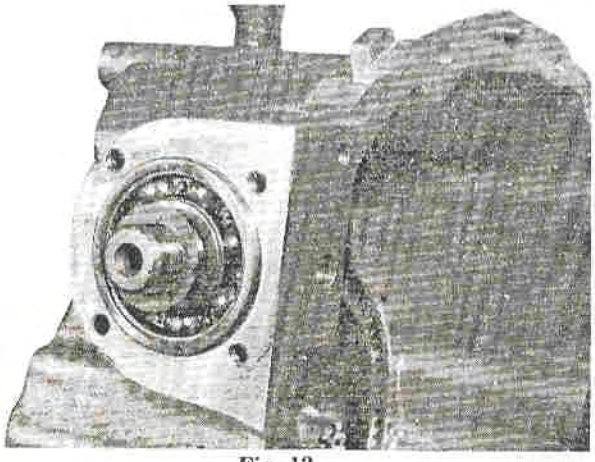


Fig. 12

Place the hub key into the slot in the shaft.

Apply an even coat of sealer to each side of each shim to be used and to the shim surfaces of the transmission housing and seal retainer.

Lubricate the lip of the seal and install seal and retainer assembly. Tighten all screws evenly to 18 ft-lbs torque with a torque wrench.

Install the drive shaft hub and torque the retaining screw to 50 ft-lbs.

Drive-in Gear

NOTE: *The pinion gear must be removed before the drive-in gear can be removed.*

Remove the drive-in gear by tapping lightly on the shaft with a fiber hammer. Remove the snap ring from the housing and remove the bearing by tapping lightly. Inspect bearing and replace if worn. Use bearing driver number 882395 to install bearing in housing. Be sure the bearing enters the housing straight to prevent peeling the aluminum, use white lead as a lubricant. Reinstall the retaining ring with the flat side against the bearing. Tap the gear into place with a fiber hammer.

Axles

Remove the four bolts on the outer end of the axle and remove the retainer ring, retainer and seal assembly, and gasket. Remove the cotter pin, nut and washers from the inner end of the axle and remove the axle gear and spacer (Figure 13).

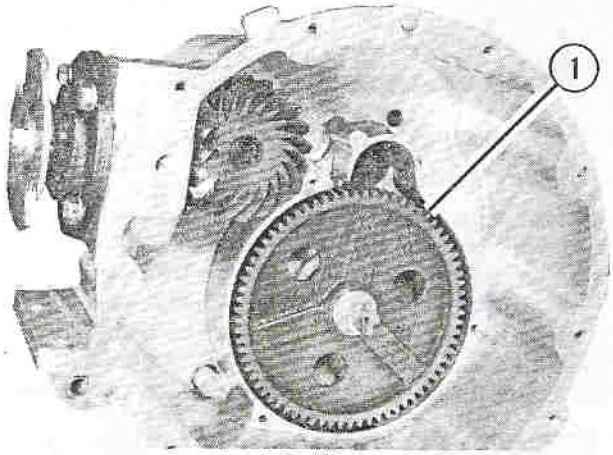


Fig. 13
1. Axle Gear

The axle must be pressed out of the housing. Install knock-off tool number 809316 on the inner end of the axle. Be sure the tool is screwed onto the axle as far as it will go to prevent damaging the threads. Support the outer end of the housing and push the axle and bearing assembly out (Figure 14). The bearing can now be pressed from the axle for replacement.

The inner bearing must be removed from the housing with a slide-hammer puller as shown in Figure 15. Be sure the retaining ring is removed first. To reinstall the bearing, use driver tool number 882395. Be sure the bearing enters the case straight to prevent peeling the aluminum and use white lead as a lubricant. Reinstall the retaining ring with the flat side against the bearing.

A new bearing should be installed as shown in Figure 16. Press the axle into the housing and inner bearing while supporting the bearing with a 6'' long piece of 1 1/16'' I.D. tubing. Place the outer bearing over the axle and press on with a 4'' long piece of 1 1/16'' I.D. tubing until it seats into the housing (Figure 17).

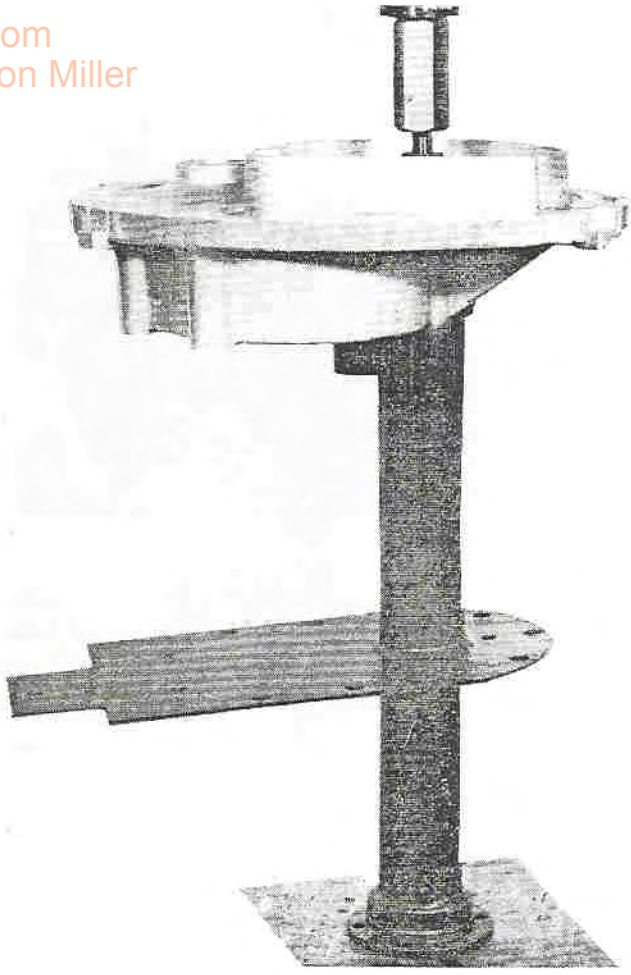


Fig. 14

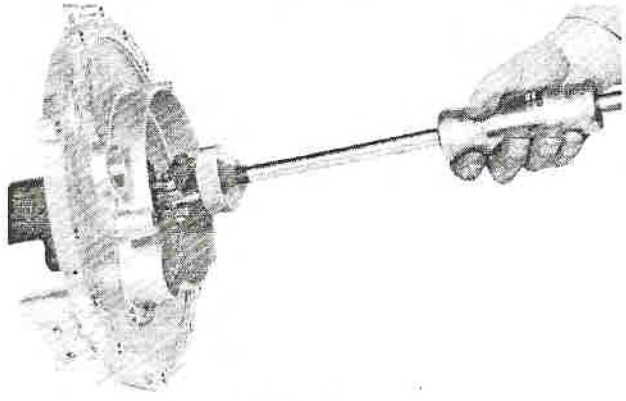


Fig. 15

Replace the spacer and axle gear on the inner end of the axle and torque the nut to 30 to 40 ft-lbs. Replace the cotter pin.

Inspect the outer seal and retainer assembly; if either part is damaged, replace the assembly. Be sure the gasket surfaces are clean, coat the lips of the seal and pack the area between the lips with grease, coat each side of the gasket with sealer (Copper-coat or equal) and assemble the gasket, seal and retainer, and retainer ring to the housing. Be sure seal is not cut by the shaft keyway during installation.

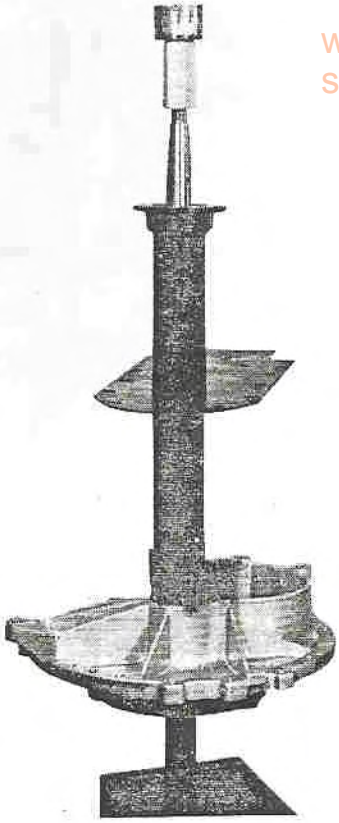


Fig. 16

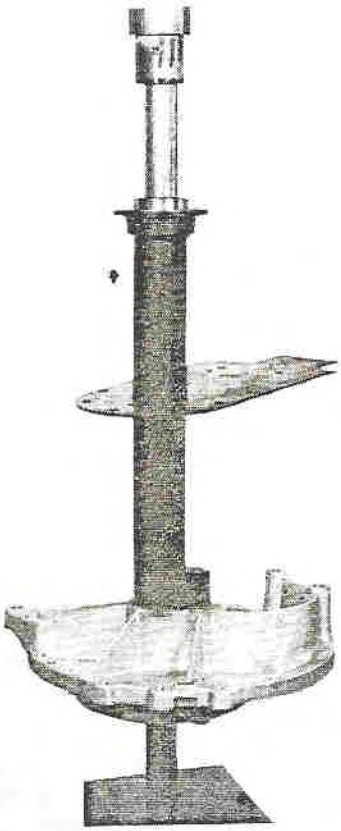


Fig. 17

Reassembly

Be sure all components are assembled into each half before joining the housings. The right housing must have two dowel pins in place and the small square gasket in the slot (Figure 18).

Be sure the gasket surface of each half is clean; apply sealer (K & W Copper-Coat or equivalent) to the left housing and both sides of the gasket. Place the gasket on the left housing, apply sealer to the right housing and join the two. Install the retaining bolts and torque to 18 ft-lbs.

Replace the control rod adjustment bracket.

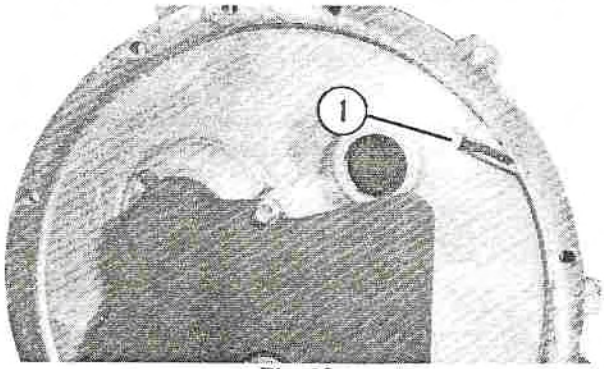


Fig. 18
1. Gasket

Installing Hydrostats

Clean all gasket surfaces on transmission housing and hydrostatic transmission—all old sealer must be removed.

Install a new "O" ring on the hydrostat shaft and coat with a light film of oil (Figure 19). Apply sealer to the gasket surfaces and the cork gasket. Be sure the coupling shaft is in place inside the transmission.

NOTE: *When installing control handles onto hydrostats, never use any impact force. Any impact puts undue pressure on the trunion shaft, and consequently, onto the washer below. This force can bend the washer, causing the seal to leak.*

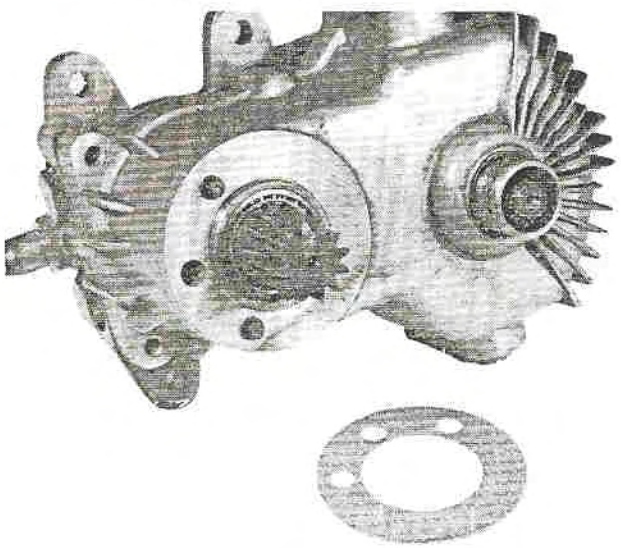


Fig. 19

Install each hydrostat onto transmission. Be sure to replace the lift tabs under the upper mounting screws. Torque screws to 38 ft-lbs.

Install a new filter on each side, coat the filter seal with oil and tighten hand tight only.

Apply sealer to the threads on the oil pickup tube and install it in the housing. Reinstall the oil temperature sending unit.

Transmission unit is now ready for installation onto power unit (Figure 20).

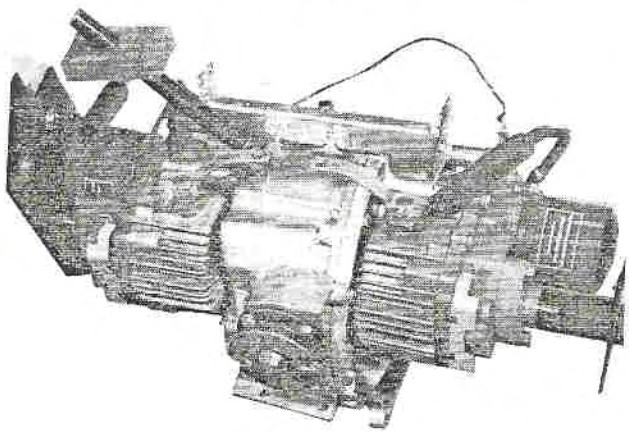


Fig. 20

Installing Transmission

Be sure the fan shroud is in position over the drive shaft, position the transmission onto the power frame, reinstall the hardware but do not tighten. Replace the drive shaft hardware.

The transmission and engine must be aligned so the drive shaft flex plates do not distort as they rotate (Figure 21).

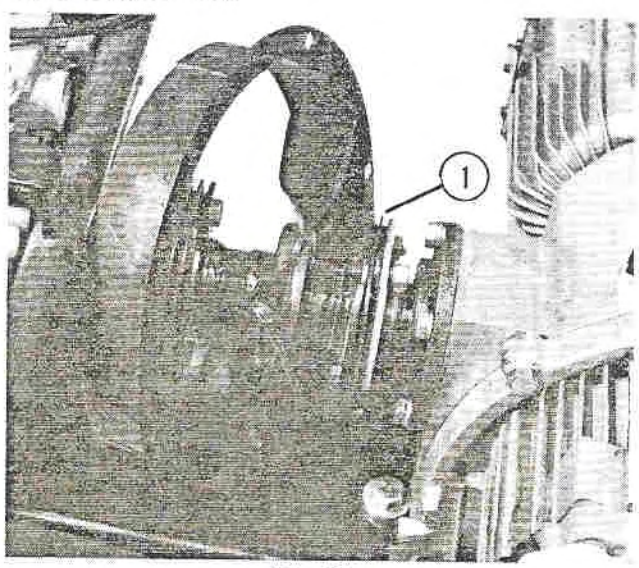


Fig. 21
1. Distorted Flex Plates Indicate Incorrect Alignment

Use tool number 821733 to align the drive shaft. Place the tool between the machined surface of the transmission housing and the raised boss on the engine crankcase (Figure 22). Shift the transmission unit as required for a snug fit of the tool and tighten

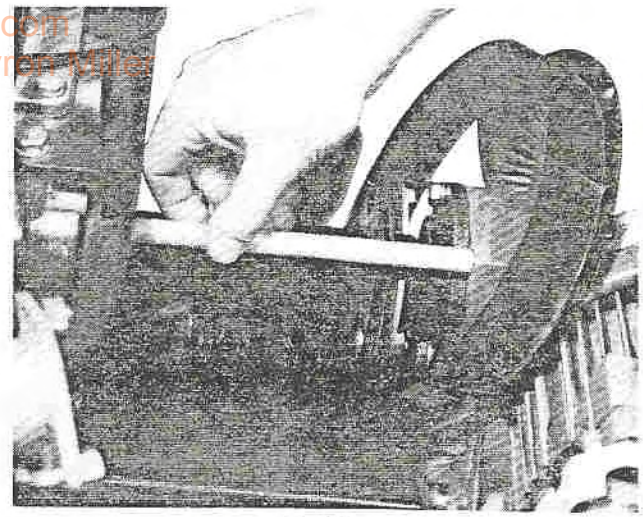


Fig. 22

mounting hardware. Rotate the drive shaft by hand and check the flex plates for distortion.

Connect the wire to the oil temperature sending unit in the lower transmission housing.

Reinstall the divider panel, control rods and heat exchanger. Check the inlet and outlets of the heat exchanger for distortion, each opening should be round to provide a tight fit for the hose. Distorted fittings can cause air leaks in the hydraulic lines which will cause erratic operation of the vehicle and damage to the transmission.

The shorter control rod should be installed on the left side. The rods can be identified as shown in Figure 23. Install the rods and check for full travel of

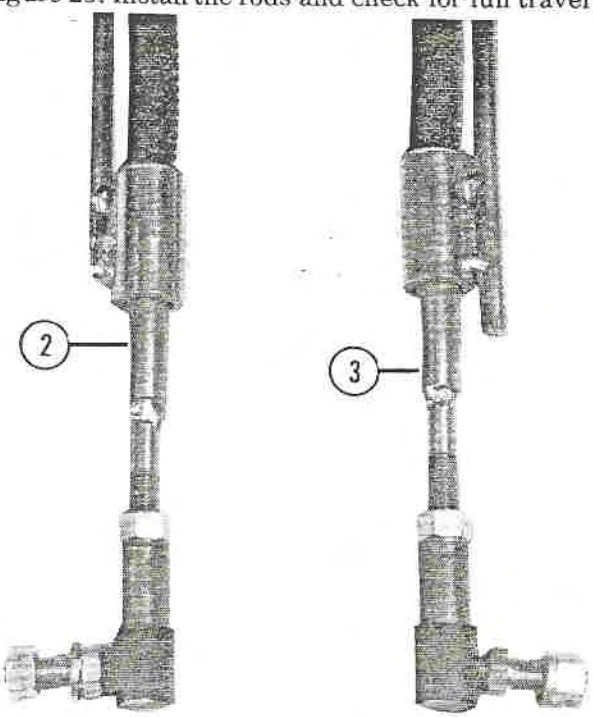


Fig. 23
2. Right 3. Left

the T-handle. Twist the rod to gain clearance between the adjusting nut and the intake manifold and tighten the ball joints (Figure 24).

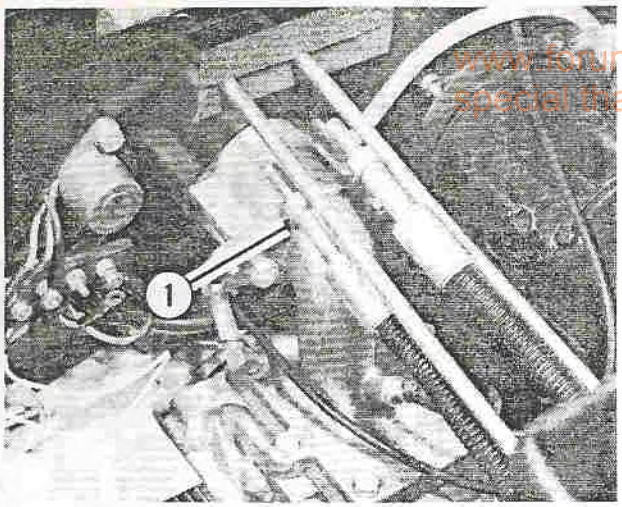


Fig. 24
1. Insufficient Clearance

Refill the transmission with the proper amount of the recommended transmission fluid. See page 12. No bleeding of the system is necessary, start the engine and run at idle speed for 2 or 3 minutes to allow full circulation of oil to all components. Test drive the vehicle to check for proper operation. Readjustment of the control rods may be necessary. Refer to page 38.

CHECKING HYDROSTAT CONDITION

One way of checking for badly worn hydrostats is to warm the hydrostatic oil by covering the heat exchanger and driving it for approximately 5 minutes. When the transmission case feels uncomfortably hot to touch, drive the Trackster against a flat wall, while the tracks are on good footing, i.e., asphalt or concrete. With the engine at ½ to ¾ throttle, the tracks should be capable of slipping (one at a time) with one person on the Trackster (9-tooth drive sprockets). The tracks should slip individually with 7-tooth drive sprockets at half throttle. Some minor revision to the above may be necessary depending on heavy accessories which may be on the vehicle (such as snow plow attachment, roll bar, cab).

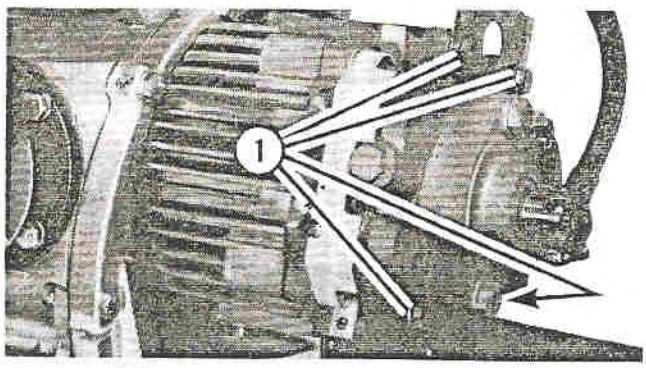


Fig. 25
1. Hydrostat Mounting Bolts

HYDROSTAT REPLACEMENT

Raise side of vehicle to be worked on 18" to keep fluid from running out after hydrostat has been removed.

Remove the control rod ball joint from the hydrostat control arm.

Remove the oil supply tube and rubber hose from the hydrostat and heat exchanger.

Remove the oil filter from the hydrostat. The filter will be approximately half full of oil.

Remove the four mounting screws as shown in Figure 25.

Work the hydrostat outward about 1" to 1¼" to free the hydrostat from the transmission and remove from the vehicle.

Replace hydrostat in reverse sequence using a new "O" ring, gasket and filter. Remove all old sealer from transmission case and hydrostat. Coat both sides of new gasket with sealer (Copper-coat or equal). Coat the "O" ring with oil and replace the hydrostat onto the transmission. Torque the mounting screws to 38 ft-lbs.

No bleeding of the system is necessary, start the engine and allow it to idle for approximately 2 or 3 minutes to allow full circulation of oil to all components. Stop the engine and check the oil level on the dipstick. Add oil to bring the level to the full mark. Be sure to use the proper type transmission fluid.

Test drive the vehicle to check for proper operation. Readjustment of the control rods may be necessary.

NOTE: *Do not open or disassemble the hydrostat. Service parts are not available. Disassembly will void any warranty that may be applicable. Return the unit to an authorized Cushman dealer for repair.*

AIR LEAKS

A vehicle which fails to move when the T-handle is advanced, pulls to the right or left when the T-handle is in a partial straightforwad position or has lack of power at either track may have an air leak in the drive system.

NOTE: *When a vehicle shows indications of an air leak, cease operation immediately. Damage to the hydrostats can result from continued operation since the system pumps air rather than oil.*

CHECKING FOR AIR LEAKS

During normal operation of the system, oil is drawn by a pump in each hydrostat from the transmission sump through the pickup tube entering the lower portion of the radiator. The oil is cooled as it passes through the radiator out each of the upper tubes into the respective hydrostats.

If no air leaks exist in the system, the oil in the radiator cannot drain back into the sump after the engine is stopped. Therefore, the oil level in the transmission, when checked with the dipstick, should show little change whether it is checked immediately after the engine is stopped or whether it is checked the following morning.

A positive method to check for leaks is to allow the Trackster to sit overnight. The following morning check and note the oil level on the dipstick. Then loosen or remove one of the hoses from the side of the radiator. This will allow the oil in the radiator to return to the transmission sump. The oil level on the dipstick should then rise approximately one and a quarter inches. If the oil level does not rise, it is known there is an air leak in the system. If the oil level rises approximately one and a quarter inches, the system is free of air leaks.

A faster method of checking for air leaks is also possible. Run the engine for a few minutes to thoroughly circulate oil through the system. Shut the engine off and check the oil level. Wait a few minutes and again check the oil level. If the oil level rises approximately one and a quarter inches, it is an indication of an air leak in the system.

Consideration must be given to the fact that some oil will drain down from the transmission walls, etc., during the aforementioned check and some rise will be normal between the two dipstick checks.

NOTE: *It should be realized that no matter how bad an air leak may be, it is unlikely that there will be any visible leakage of oil from that area. This is due to vacuum in the system during operation and also the tendency to draw in air from the leak area when the engine is stopped. This is caused by the oil returning to the sump and drawing in air as a displacement.*

LOCATING AIR LEAKS

Even though oil supplied to each hydrostat comes from a common pickup tube located near the front of the radiator, an air leak located closer to one hydrostat will affect that hydrostat operation more.

EXAMPLE: A small air leak exists in the radiator at one side. A momentary delay on that side will be experienced if the T-handle is pushed forward immediately after starting the engine. If a more severe leak exists, it may cause one hydrostat to stop functioning completely and the other to feel "spongy" at the T-handle. A large air leak may cause both hydrostats to stop functioning completely.

When it is determined that an air leak does exist, proceed to check the system in the following order:

1. Visually check the three hoses and tubes at the radiator. Tubes may have been bent from tightening hose clamps too tight. It will be necessary to remove the hoses to observe the condition of the tubes.
2. Check radiator for leaks. This may be done best by running the Trackster long enough to fill the system with oil. Then, shut off the engine and immediately listen at the radiator for air entering the system.
3. Be sure filters are tight and have not been physically damaged. If in doubt, replace filters.
4. Visually check soldered connections and fitting with ferrule, where tubes are attached to hydrostats, by removing the complete tube assembly.
5. If leaks are not located during the first four steps, remove the radiator and have it tested for leaks by a reputable radiator repair shop.

NOTE: *It is recommended that the radiator be thoroughly cleaned prior to checking as the oil film in the radiator may tend to seal small leaks.*

After an air leak has been found and repaired, start the engine to recirculate the system and again check for a rise in the oil level to be sure another leak was not missed through the original test.

No bleeding of the system is necessary. Start the engine and run at idle speed for 2 to 3 minutes to allow full circulation of the oil to all components. Test drive the vehicle to check for proper operation. Readjustments of the control rods may be necessary.

It is advisable to check the oil level before use, if the Trackster has sat for more than a few hours. A rise in oil level of approximately one and a quarter inches indicates an air leak that should be repaired immediately.

NOTE: *Continued driving with an air leak may shorten hydrostat life considerably.*

T-handle

The T-handle adjustment is obtained by changing the length of the control rods. Raise the vehicle to allow both tracks to clear the floor. Loosen the lock nuts as shown and turn the rods until both tracks are stopped when the T-handle is in the STOP position. Note: Adjustment should be made with transmission oil warm.

NOTE: *Check ball joint nut for tightness.*

SAFETY WARNING: INSPECT CONTROL ASSEMBLY AND LOCKNUTS FREQUENTLY. MISSING OR DAMAGED CONTROL ASSEMBLY PARTS COULD RESULT IN LOSS OF VEHICLE CONTROL.

The T-handle mechanism contains a means for adjusting the stiffness of handle movement. The adjusting is somewhat subjective, but an incorrect adjustment for a given vehicle operator can result in erratic vehicle response which can be hazardous in some terrain situations.

A simple test can be made by pushing the T-handle all the way forward (engine off) and hooking an ordinary "fishing" scale directly under the T-handle crossbar. Pull back smoothly (towards "stop" position), if the scale reads between 6 and 10 lbs. pull, the T-handle is within manufacturing tolerances.

NOTE: *The spring tension on each rod is preset for overload protection and must not be changed.*

Adjust by loosening the lock nut, tighten or loosen the adjusting nut as shown and retighten the lock nut. (See Figure 26)

NOTE: *Seasonal adjustments may be advantageous to the operator; i.e., more friction applied to help hold the T-handle forward when driving for prolonged periods through deep snow or less friction when extensive maneuvering is encountered.*

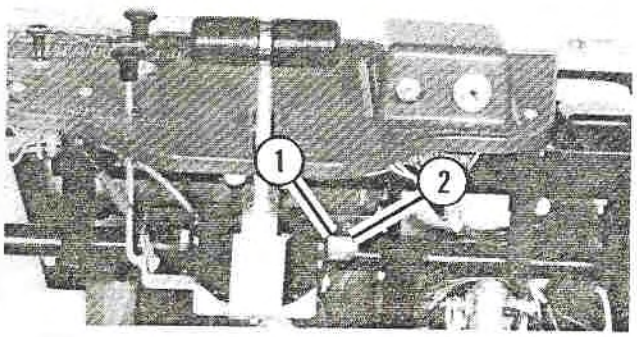


Fig. 26
1. Adjusting Nut 2. Locknut

With the engine stopped and the T-handle moved halfway forward, there must be no noticeable friction when the T-handle is rotated. To eliminate friction in T-handle pivot assembly, loosen the two screws in the pivot, and tap the lower portion down. Retighten screws.

The T-handle position is adjusted by adjusting the control rod length.

CONTROL RODS

Adjustment for Neutral

Both hydrostat transmissions should be in neutral when the T-handle is brought back firmly into the stop position and then released. If either track creeps forward or backwards, an adjustment must be made.

Three steps must be taken before the control rods are adjusted.

A. Check control lever for misuse. Repair or replace as necessary (Figures 27 & 28)

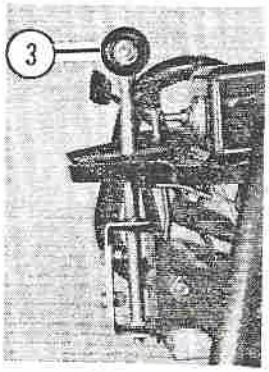


Fig. 27
3. Good

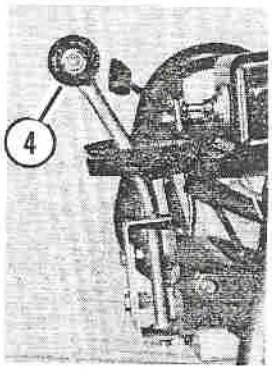


Fig. 28
4. Replace

B. Check spring tension adjustment of control rods as explained in "Replacement," Page 39, this Section. Once this adjustment is properly made, no readjustment should ever be necessary.

C. Operate the Trackster until the transmission oil is at operating temperature. Control rod adjustments will be inaccurate if they are made with the transmission fluid cold.

Loosen both lock nuts as shown in Figure 29. These are located under the heat ex-

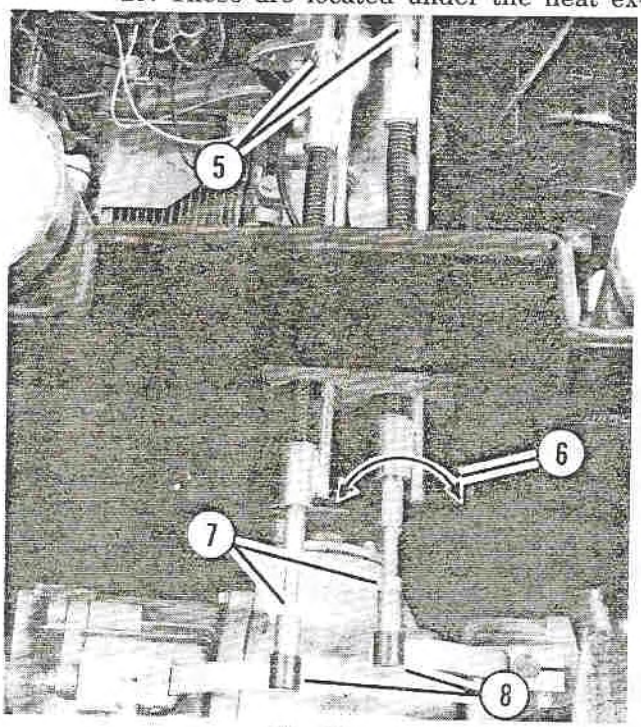


Fig. 29
5. Spring Tension Adjustment (DO NOT CHANGE)
6. Control Rod Adjustment 7. Locknut
8. Ball Joint Nut

changer.
Engage the parking brake.
Start the engine and run it at slow idle speed.
Pull the T-handle back firmly into the stop position and then release it.
With the T-handle in this position, lengthen or shorten the control rods until no action is felt in the rods. Tighten the lock nuts on both rods.
Recheck adjustment after the nuts have been tightened.

After the control rods have been properly adjusted to have neutral with the T-handle in the "stop" position, a slight reverse movement will be possible when firm reverse pressure is applied to the T-handle without depressing the reverse lock-out.

CONTROL ROD "STOP" ADJUSTMENT

A control rod adjustment bracket is located under the heat exchanger. This bracket has a long screw and a shorter screw with lock nuts for adjusting the travel on the control rods.

If the stops are ground at equal degrees within both hydrostats, both driven sprockets will turn at equal speeds with the T-handle in the full forward position.

If "pulling" to the right or left is experienced with the T-handle full forward, an adjustment will be necessary.

To check for "pulling," the Trackster should be tested on a flat level surface with both tracks adjusted equally.

When it is determined the Trackster pulls to one side, loosen the lock nut and adjust the screw to limit the travel of the control rod.

NOTE: *Limit the travel of the control rod opposite the side to which the Trackster pulls.*

At no time should both control rods contact the stops. If both rods contact both stops, top speed of the Trackster will be reduced.

Several test runs may be necessary to make the proper adjustment.

CONTROL RODS

Replacement

Remove the complete rod from the vehicle by removing the ball joint nuts on each end. Disassemble the rod by removing the spring adjusting nut.

SAFETY WARNING: PULL THE LOWER ROD OUT OF THE BUSHING AND SPRING SLOWLY WHILE HOLDING THE SPRING. THE SPRING IS COMPRESSED BETWEEN THE BUSHINGS AND WILL FLY OUT IF NOT RESTRAINED.

Reassemble the rod. Start the lower half through the bushing on the upper half far enough to place the washer and spring into position. Use clamping pliers to compress and hold the spring while placing the rod through the upper bushing (Figure 30). Be sure

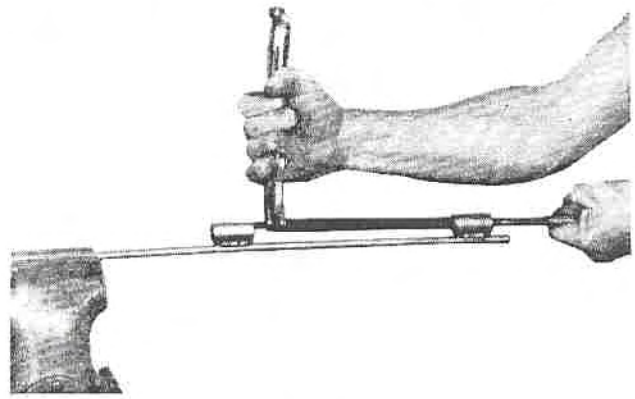


Fig. 30

to install a washer at each end of the spring. Replace the bushing and spring tension adjusting nut on the end of the rod.

Adjust the spring tension so there is no end play in the rod. Leaving the nut loose or too tight will provide end play which causes erratic vehicle operation. Tighten the nut while checking end play, stop when the rod has a solid feel (Figure 31).

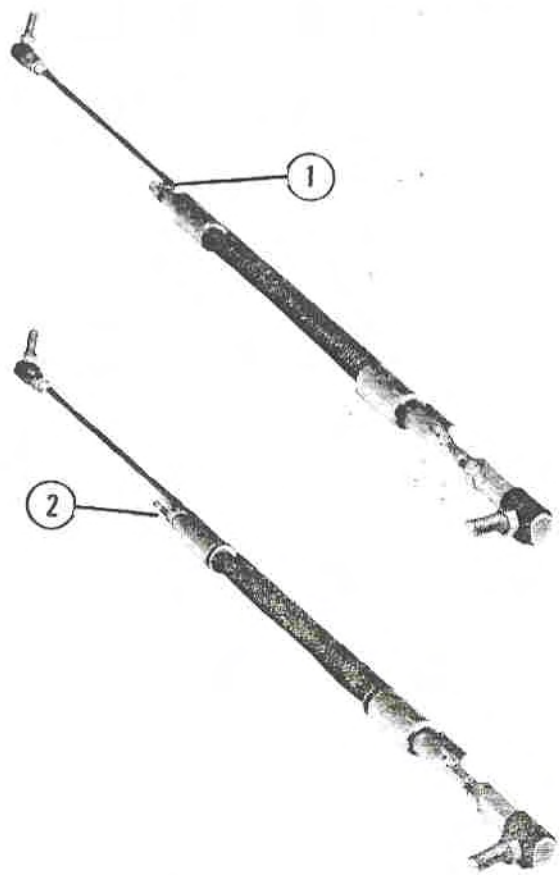


Fig. 31
1. Nut Too Loose 2. Nut Too Tight

TRANSMISSION OIL RECOMMENDATIONS

For all temperatures:

Transmission 1974 & Earlier ..... 7 quarts
Transmission Oil .... 4 Quarts of Arctic Oil (Mil. Spec. 5606, use Mobil Aero HFA or Texaco Aircraft Hydraulic Oil AA or BB) and 3 Quarts of Type "F" Automotive Transmission Fluid

1975 & Later
Transmission ..... 8 quarts
(4 qts. Arctic Oil — 4 qts. Type "F")

When adding oil, add approximately at the same ratio as above.

NOTE: *The oil types specified are the only oils approved for use in the Trackster. Do not substitute any other types.*

SAFETY WARNING: USE OF IMPROPER TYPE OF OIL, OR LOW OIL LEVEL, CAN CAUSE HYDROSTAT CAVITATION AND UNEXPECTED SPROCKET LOCK ENGAGEMENT.

OIL CHANGE PROCEDURE (When system becomes contaminated by a foreign substance such as water)

1. The transmission fluid must be at room temperature.
2. Raise and support the right side of the vehicle approximately 12" off the floor.
3. Remove the lower screw securing the left axle filler panel to the body. This will allow the fluid to drain from the body.
4. Remove both oil filters.
5. Disconnect the wire from the temperature sending unit located on the lower left side of the transmission housing.
6. Remove the oil temperature sending unit.

NOTE: *The unit can be unscrewed using a 15/16" deep socket. Use extreme care to prevent breaking the unit.*

7. Disconnect the black wire at the connector just below the amplifier. The engine can now be cranked without starting for approximately 10 seconds to allow the fluid to drain from the hydrostats.
8. Reinstall the sending unit using Copper-Coat sealer and connect the wire. Reinstall the axle filler panel screw.
9. Lower the right side of the vehicle to the floor.
10. Apply oil to each filter seal and install filters hand tight only.
11. Install 3 quarts of Arctic oil and 2 quarts of Type "F" oil through the dipstick tube.
12. Reconnect the black wire at the amplifier.
13. Start the engine and allow it to idle for approximately 3 minutes to circulate the fluid.
14. Stop the engine and check the fluid level on the dipstick. Add fluid at same ratio indicated above to bring the level to the full mark on the dipstick.
15. Test drive the vehicle and check for proper operation.

OIL CHANGE PROCEDURE (Changing from Type "F" or Arctic to "all-temperature" mixture)

Depending on the type of the existing oil in the transmission, either 3 or 4 quarts must be removed to provide the mixture. This can best be accomplished by drawing the oil out through the pickup tube in the front of the transmission with a suction gun.

1. Remove the heat exchanger mounting bolts.
2. Loosen the hose clamp securing the hose to the oil pickup tube.
3. Lift the lower end of the heat exchanger far enough to free the hose from the tube and force it slightly to one side. A short length of rubber hose or tubing attached to a suction gun can now be inserted into the pickup tube.

NOTE: *It is NOT necessary to disturb the hose connections on either side of the heat exchanger or remove the heat exchanger. Move the unit aside only far enough to provide access to the pickup tube to prevent breaking the seal on the remaining hose connections.*

4. Install the new transmission oil, reinstall hose connection and heat exchanger hardware.
5. Test drive the vehicle and check for proper operation and air leaks.

Towing Instructions

The sprocket lock cylinder must be loosened and moved away from the drive sprocket in order to tow the vehicle.

This can be done by simply removing the two bolts at the rear of the sprocket lock cylinder.

SPECIAL NOTE: IF YOUR TRACKSTER IS NOT EQUIPPED WITH A SPROCKET LOCK, ONE WILL BE INSTALLED, AT NO COST TO YOU FOR MATERIAL OR LABOR, BY ANY AUTHORIZED TRACKSTER DEALER.

SAFETY WARNING: VEHICLE MUST BE ON LEVEL GROUND OR TURNED SIDEWAYS, IF ON A SLOPE, BEFORE REMOVAL OF SPROCKET LOCK CYLINDER TO MINIMIZE POSSIBILITY OF UNIT RUNNING AWAY OUT OF CONTROL.

It is recommended that the sprocket lock cylinder be secured to the machine (wired, taped, etc.) to prevent damage or loss while towing.

NOTE: *It is not necessary to disconnect any part of the hydraulic system to remove the sprocket lock cylinder for towing.*

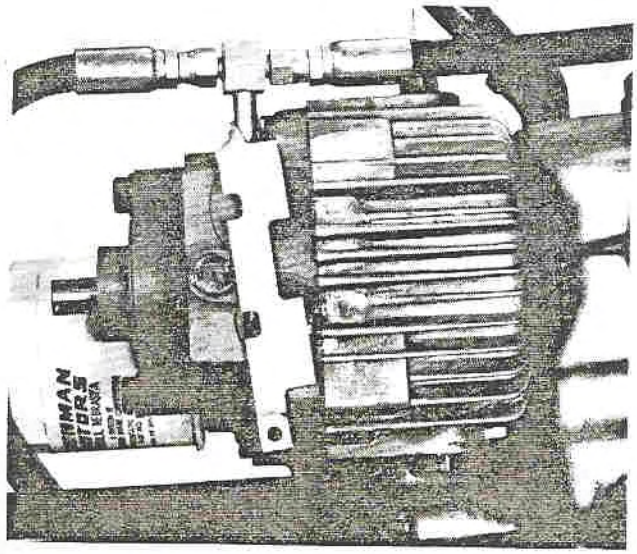


Fig. 32

Each hydrostatic transmission is equipped with two valves which release the hydraulic fluid pressure. Should the vehicle require moving, install the towing clips as shown below. With the clips in the moving position, the TRACKSTER can be moved up to 500 yards at speeds not to exceed 5 m.p.h. Never exceed these limits or hydrostats may be damaged.

Remember to return the clips to their storage position before attempting to drive the vehicle.

NOTE: *Never move vehicle when engine is not running unless clips have been installed. This includes such things as pushing the vehicle around by hand and backing the vehicle off of tilt trailers.*

SAFETY WARNING: DO NOT REMOVE CLIPS WHILE ENGINE IS RUNNING.

SAFETY WARNING: SPROCKET LOCK MUST BE RE-INSTALLED AND ADJUSTED IN ACCORDANCE WITH CUSHMAN INSTALLATION INSTRUCTION SHEET NO. 823870. A COPY OF THIS INSTRUCTION SHEET IS INCLUDED AT THE END OF THIS SECTION.

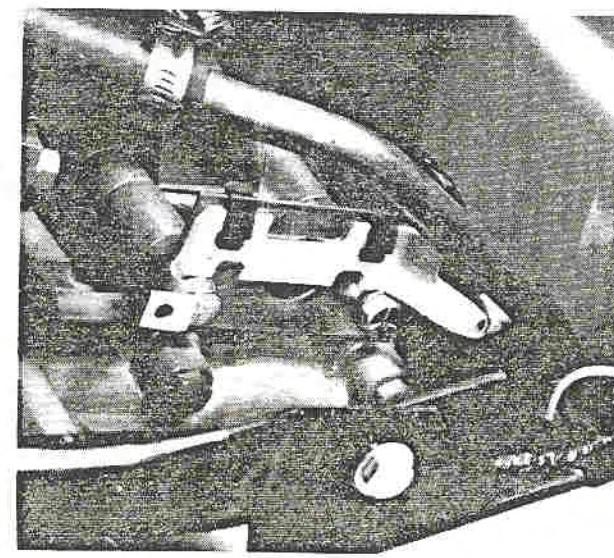


Fig. 33

CUSHMAN® installation instructions

OMC-LINCOLN a Division of Outboard Marine Corporation

IMPORTANT

READ THIS INSTRUCTION COMPLETELY BEFORE ATTEMPTING THE INSTALLATION. AFTER COMPLETING THE INSTALLATION, INSERT THIS INSTRUCTION INTO THE BAG CONTAINING THE OPERATOR'S MANUAL.

AUTOMATIC SPROCKET LOCK SET FOR TRACKSTER

PART NO. 883280

Special tools required:

Caulking gun
7/8" Hole Saw
3/16" Allen Wrench
12 Point 3/8" Socket or Box End Wrench

The automatic sprocket lock is designed to lock the right sprocket any time oil pressure is not maintained in the hydrostat charge pump system.

The set consists of a hydraulic cylinder, cylinder mount, and hoses and fittings to connect the cylinder to both hydrostats.

NOTE: PRIOR TO SPROCKET LOCK INSTALLATION, THE CONDITION OF THE HYDROSTATIC TRANSMISSION MUST BE CHECKED. A BADLY WORN HYDROSTAT(S) WILL ALLOW THE SPROCKET LOCK TO ENGAGE DURING HEAVY LOAD CONDITIONS. ONE WAY OF CHECKING FOR BADLY WORN HYDROSTATS IS TO WARM THE HYDROSTATIC OIL BY COVERING THE HEAT EXCHANGER AND DRIVING IT FOR APPROXIMATELY 5 MINUTES. WHEN THE TRANSMISSION CASE FEELS UNCOMFORTABLY HOT TO TOUCH, DRIVE THE TRACKSTER AGAINST A FLAT WALL, WHILE THE TRACKS ARE ON GOOD FOOTING, I.E., ASPHALT OR CONCRETE. WITH THE ENGINE AT ½ TO ¾ THROTTLE, THE TRACKS SHOULD BE CAPABLE OF SLIPPING (ONE AT A TIME) WITH ONE PERSON ON THE TRACKSTER (9-TOOTH DRIVE SPROCKETS). THE TRACKS SHOULD SLIP INDIVIDUALLY WITH 7-TOOTH DRIVE SPROCKETS AT HALF THROTTLE. SOME MINOR REVISION TO THE ABOVE MAY BE NECESSARY DEPENDING ON HEAVY ACCESSORIES WHICH MAY BE ON THE VEHICLE (SUCH AS SNOW PLOW ATTACHMENT, ROLL BAR, CAB).

Before starting the installation, unpack all parts and compare with the replacement parts list on last page to insure all parts are included.

Remove the hydrostat charge pressure relief springs from both hydrostats and replace with the heavier springs (Part No. 823898) supplied in the set. (See Figures 1 and 2)

Remove the 12 point cap screws from each hydrostat and replace with 824332 (black) screws supplied in set. (See Figures 1 and 2) Torque to 25 to 30 ft. lbs.

Remove the 1/8" pressure plugs from both hydrostats. Be sure to clean area around plugs. (See Figures 1 and 2)

NOTE: ALL PIPE CONNECTIONS MUST BE SEALED WITH #2 PERMATEX. USE CARE NOT TO ALLOW SEALER TO GET INTO HYDRAULIC SYSTEM.

Install 824935 tee in top of left hydrostat. (See Figure 1)

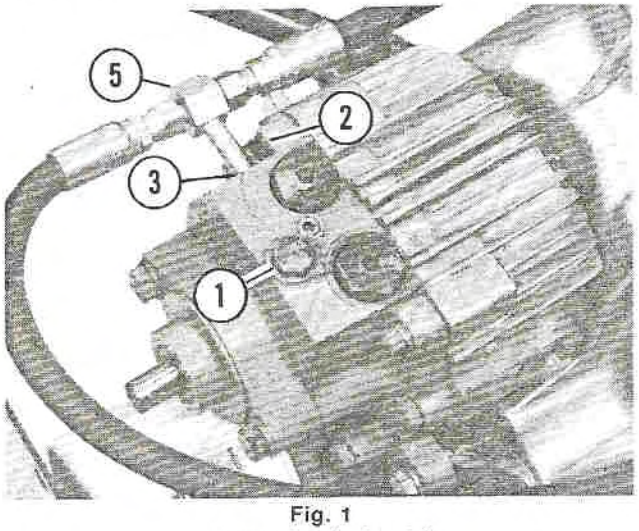


Fig. 1
Rear of left hydrostat

1. Remove plug to install spring
2. Remove 12-point cap screw
3. Remove 1/8" pressure plug
5. Tee

Install 824936 elbow in bottom side of right hydrostat. (See Figure 2) Tighten with special wrench (Part No. 824940) or small Vice-Grip.

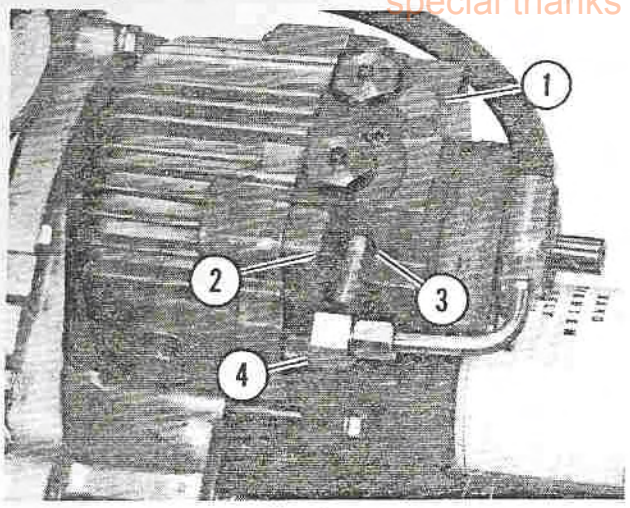


Fig. 2

Rear of right hydrostat

1. **Remove plug to install spring**
2. **Remove 12-point cap screw**
3. **Remove 1/8'' pressure plug**
4. **Elbow**

Connect hose to elbow as shown in Figure 2. Do not use sealer.

Route hose over transmission and connect to tee at left hydrostat. See Figure 1. Do not use sealer. Tighten both ends of hose.

Locate and drill a 7/8'' hole in body as shown in Figure 3.

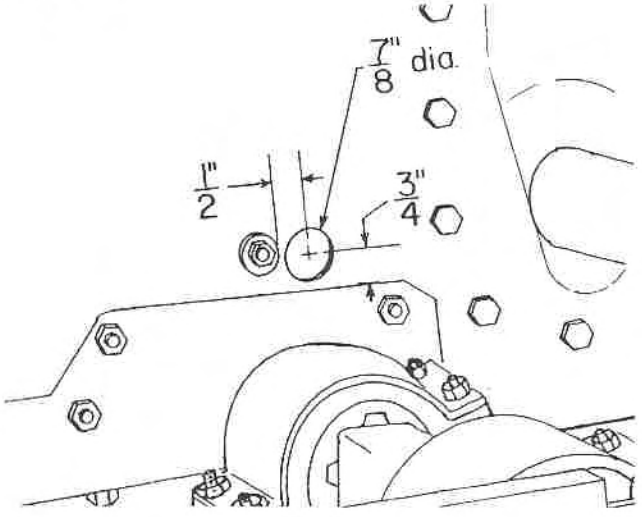


Fig. 3

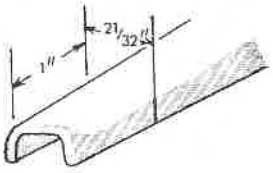
Right front of vehicle

Mount cylinder (Part No. 883279) to cylinder frame assembly (Part No. 883278) with two (2) 306834 screws and two (2) 800292 nuts.

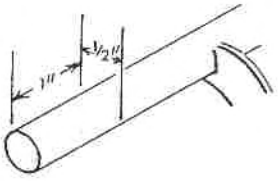
NOTE: CYLINDER MUST BE IN PROPER HOLES IN RESPECT TO SPROCKET USED. (FOR 7-TOOTH SPROCKET, USE FRONT HOLES. FOR 9-TOOTH USE REAR HOLES.) TORQUE MOUNTING SCREWS TO 25 TO 30 FT. LBS. REFER TO PARTS ILLUSTRATION.

Remove the existing aluminum spacer from front frame (between torsilastics) by inserting a screwdriver under it and prying upwards and replace with spacer (Part No. 824919) from the set. If Trackster is equipped with 7-tooth sprockets, it will be necessary to remove the scraper assembly.

Check the right sprocket for wear by measuring the width of the teeth at a point one inch from the tip. If any tooth on the sprocket is narrower at this point than the minimum widths shown in Figure 4, a new sprocket must be installed.



9-Tooth
Drive Sprocket



7-Tooth
Drive Sprocket

Fig. 4

Install boot (Part No. 811928) and spring (Part No. 824911) on cylinder end of hose. (See Figure 5.)

Install hose (Part No. 824910) through body with the end of hose having ¼'' pipe threads extending out of body.

NOTE: HOSE WILL BE ROUTED THROUGH BODY, UNDER TRANSMISSION, TO TEE AT LEFT HYDROSTAT.

NOTE: ENDS OF HOSE MUST BE PLUGGED OR TAPED TO AVOID CONTAMINATION DURING INSTALLATION.

Hose should be extended out of body at least 10 to 12 inches to allow connection to cylinder.

Locate cylinder and frame assembly to area near right sprocket and connect and tighten hose to the cylinder. Use Permatex on hose threads.

Fill cavity outside of boot with sealer. (See Figure 5) Use special sealer, Part No. 824967. Do not substitute.

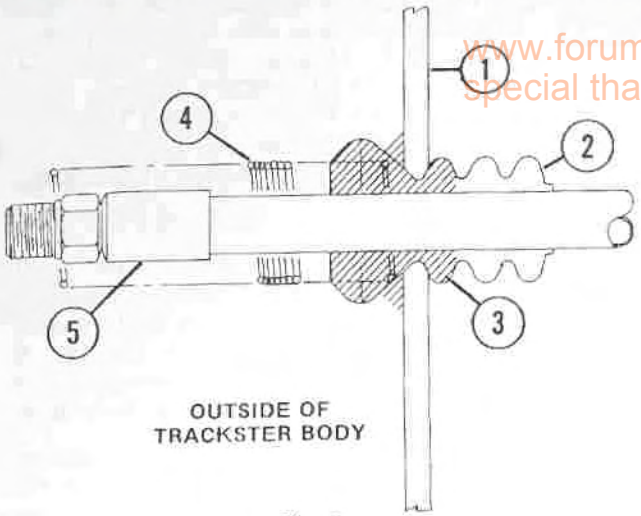


Fig. 5
1. Trackster body
2. Boot
3. Silicone sealer
4. Spring
5. Hose

Mount cylinder and cylinder frame as shown in Figures 6 or 7 and parts illustration. Attach rear of cylinder frame assembly to center frame of Trackster using an 823914 bracket, two (2) 301431 screws, and two (2) 800292 nuts. Do not tighten hardware at this time.

Instructions for Trackster with 7-Tooth Sprocket

Reinstall scraper set as shown in Figure 6. "Inner" scraper clamp brackets must hold cylinder frame inward against torsilastic. Adjust scraper to ¼" clearance. Torque hardware to 30 ft. lbs. See Figure 6. Adjust and tighten rear of cylinder frame to Trackster center frame so that cylinder ram clears sprocket web by a minimum of 1/8". Clearance can be obtained by moving rear of bracket assembly away from body of Trackster. (See Figure 6)

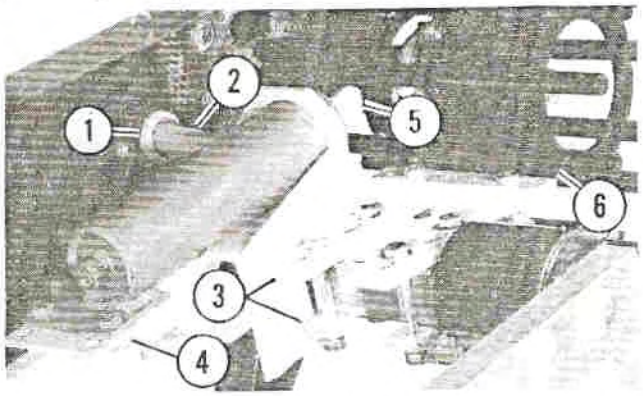


Fig. 6
1. Boot
2. Spring
3. "Inner" scraper clamp brackets
4. 7-tooth mounting holes
5. 1/8" clearance
6. 1/4" clearance

SAFETY WARNING: REMOVAL OF SCRAPER ASSEMBLY COULD RENDER SPROCKET LOCK INEFFECTIVE.

Instructions for Trackster with 9-Tooth Sprocket

Install two (2) 823914 brackets, two (2) 301431 screws and two (2) 800292 nuts to front frame as shown in Figure 7. This bracket assembly must hold the cylinder frame inward against torsilastic. Tighten all hardware to 10 ft. lbs.

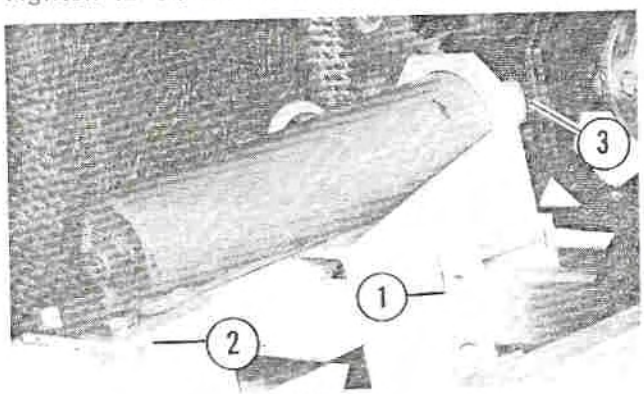


Fig. 7
1. Bracket assembly
2. 9-tooth mounting holes
3. 1/8" clearance

Adjust and tighten rear of cylinder frame assembly to the Trackster center frame so that cylinder ram clears sprocket web by a minimum of 1/8". Torque to 10 ft. lbs. (See Figure 7)

Connect and tighten hose, Part No. 824910, to tee at left hydrostat. (See Figure 1)

Check boot area for sufficient amount of sealer. It is imperative that this area be sealed sufficiently to keep water from entering the body.

Mount towing clips, one each side, as shown in Figure 8.

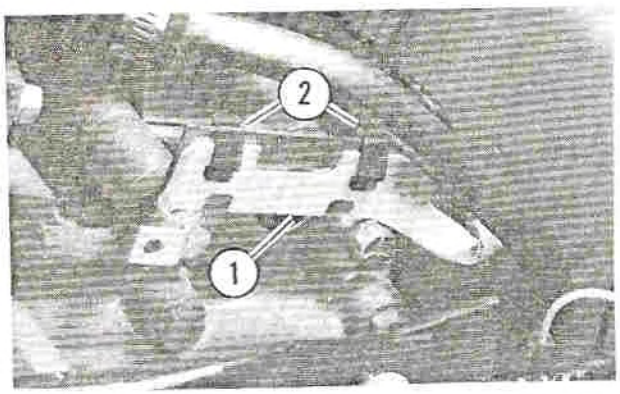


Fig. 8
Towing clips in storage position
1. Towing clip
2. Mounting clips

Wipe all hose connections off with a clean towel. Start engine and allow to run at a fast idle and check all hoses and connections for oil leaks using a clean white towel. Any connection indicating a leak must be corrected.

With engine running, brake lock plunger must disengage and clear sprocket teeth by at least 7/16" and not more than 11/16".

Check transmission oil level with engine off, add oil if necessary. Refer to owner's manual for correct type of oil.

Road test vehicle.

Instructions for Moving the Trackster with the Engine Stopped

Each hydrostatic transmission is equipped with two valves which release the hydraulic fluid pressure. Should the Trackster require moving, remove the clips from each hanger and install on each hydrostat as shown in Figure 9. The sprocket lock cylinder must be loosened and moved away from the drive sprocket in order to tow the vehicle. This can be done by simply removing the two screws at the rear of the sprocket lock cylinder. It is recommended that the sprocket lock cylinder be secured to the vehicle to prevent damage or loss while towing.

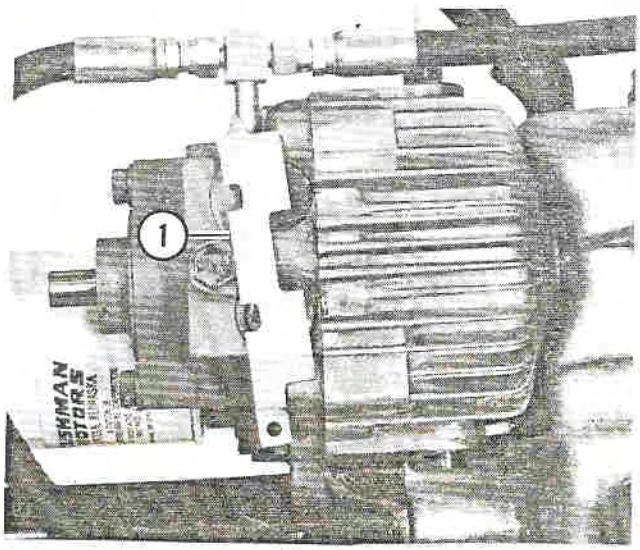


Fig. 9
Towing clips in moving position
1. Towing clip

SAFETY WARNING: VEHICLE MUST BE ON LEVEL GROUND OR TURNED SIDEWAYS IF ON A SLOPE BEFORE REMOVAL OF SPROCKET LOCK CYLINDER TO MINIMIZE POSSIBILITY OF THE VEHICLE RUNNING AWAY OUT OF CONTROL.

With the clips in the "moving" position, the Trackster can be moved up to 500 yards at speeds not to exceed 5 M.P.H. Never attempt to exceed these limits or damage may be caused to the hydrostats.

Remember to return the clips to their original storage location before attempting to drive the Trackster.

NOTE: NEVER MOVE THE TRACKSTER WHEN ENGINE IS NOT RUNNING UNLESS CLIPS HAVE BEEN INSTALLED IN THE "MOVING" POSITION. THIS INCLUDES SUCH TIMES AS PUSHING THE TRACKSTER AROUND BY HAND OR BACKING IT OFF A TRAILER.

SAFETY WARNING: DO NOT REMOVE THE CLIPS FROM THE HYDROSTATS WHILE THE ENGINE IS RUNNING.

Place sprocket lock decal on dash panel as shown in Figure 10.

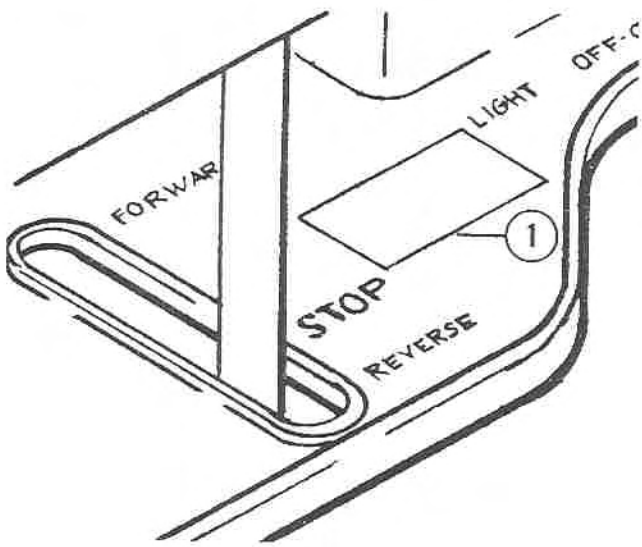
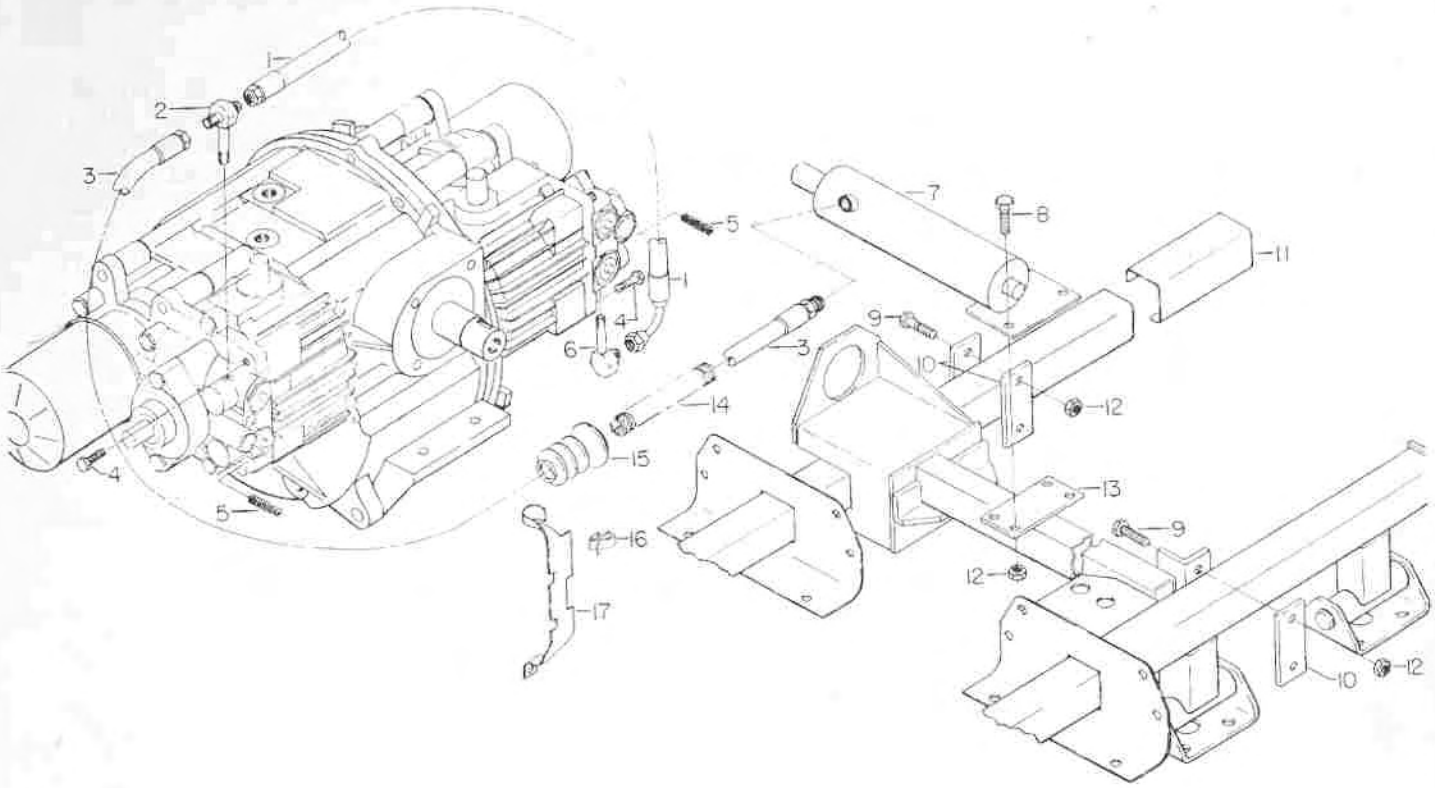


Fig. 10
1. Sprocket lock decal

Customer should retain these installation instructions for future reference.

SAFETY WARNING: WHEN REPLACING ANY BOLT, SCREW OR OTHER FASTENER, USE ONLY ORIGINAL EQUIPMENT REPLACEMENT PARTS OR PARTS OF EQUIVALENT STRENGTH AND MATERIAL.



REPLACEMENT PARTS

Ref. No.	Part No.	Description	No. Req'd	Ref. No.	Part No.	Description	No. Req'd
1	824911	Hose	1	11	824919	Spacer, torsilastic	1
2	824935	Tee	1	12	800351	Locknut, 3/8" - 16	6
3	824910	Hose	1	13	883278	Frame assy., cylinder mtg.	1
4	824332	Screw, hydrostat case (black)	2	14	824941	Protector, hose	1
5	823898	Spring, charge pump	2	15	811928	Boot	1
6	824936	Elbow	1	16	809122	Clip, towing valve clip mtg.	4
7	883279	Cylinder	1	17	823606	Clip, towing valve	2
8	306414	Screw, 3/8" - 16 x 1"	2		824940	Wrench, (not illustrated)	1
9	301431	Screw, 3/8" - 16 x 2½"	4		824961	Decal (not illustrated)	
10	823914	Bracket	3		824967	Sealer (not illustrated)	

ELECTRICAL SYSTEM

CONTENTS

DESCRIPTION OF THE C.D. IGNITION

The breaker point capacitor discharge (C.D.) ignition system consists of three major electronic components. These are the ignition coils, a set of breaker points, and an amplifier assembly. The amplifier assembly is completely sealed and is not made to be repaired.

DO NOT ATTEMPT TO OPEN THE AMPLIFIER ASSEMBLY AS THIS WILL VOID THE WARRANTY.

THEORY OF OPERATION

The transistorized converter in the amplifier changes the 12-volt battery supply to 300 volts and stores it in the energy storage capacitor.

The breaker point circuit, opened by the point cam triggers the amplifier. This discharges the 300-volt energy from the amplified storage capacitor into the coil where it is boosted to the 25,000 volts available at the spark plugs. When the storage capacitor has discharged its energy at the spark plug gap, the electronic switch opens and the converter recharges the storage capacitor.

TROUBLE SHOOTING THE C.D. IGNITION

A malfunction in the system will result in 1) engine miss, 2) engine surge, 3) engine will not run.

Precautions to be observed while trouble shooting the C.D. ignition system:

NOTE: *Do not attempt to operate the engine without a battery in the system, damage to the ignition and electrical components will result.*

SAFETY WARNING: WHENEVER THE TROUBLE SHOOTING PROCEDURE REQUIRES A CHECK FOR SPARK DISCHARGES, DO NOT HOLD THE HIGH TENSION LEAD IN YOUR HAND. THIS SYSTEM PRODUCES HIGH VOLTAGES WHICH COULD RESULT IN SEVERE ELECTRICAL SHOCK.

NOTE: *Do not attempt to remove high tension lead from coil. Coil and lead is an assembly. Lead is sealed in coil.*

Engine missing or surging may also be caused by insufficient, contaminated or excessive fuel. After determining that this condition is not caused by carburetion, proceed (in order listed) to check the ignition system.

1. Wiring — Connect a voltmeter between purple lead on terminal board and ground. With key switch in the "On" position, voltmeter should show battery voltage.
   a. If no voltage is present, check key switch and connectors, damaged terminals and connections. Check cable assembly for cuts, breaks or chafing.
2. Terminal Block — Check connections on engine against the wiring diagram to be certain all connections are electrically correct. Be sure block is not broken or contacting the panel.
3. Checking For Spark — Use a spark checking device to check for spark at the plug leads. Spark must jump a ½" gap. If spark does not occur while cranking engine, proceed with the following checks:
4. Checking Amplifier — Remove amplifier purple lead from terminal. Connect a low reading ammeter between the amplifier purple lead and the terminal. With key switch in the "On" position and the points closed, ammeter must not show a current draw of more than .2 amperes. If engine runs, current draw at 4500 rpm should be between 2.0 and 4.0 amperes. If readings are too low or too high, replace amplifier.
   DO NOT attempt to run engine with clip on connectors. The meter needle should be steady. An unsteady meter reading would indicate malfunctioning breaker points. This should be investigated before replacing the amplifier. If reading is too high or too low, replace amplifier.
5. Checking Coil — Connect a needle-type, spark-checking device to the coil high tension lead. Crank the engine electrically. Spark should jump a ½" gap. If this does not occur, the coil can be checked with a conventional ignition analyzer.
6. Breaker Points — Breaker points should be inspected at least once each season and replaced whenever necessary. Under normal running conditions, breaker point contacts will appear slightly rough and gray in color. Abnormal points will appear excessively pitted, may have considerable amount of material transferred from one contact surface to the other, and will generally be blue in color.
   Severe pitting, burning, or bluing can usually be traced to deposits of foreign material, especially grease or oil, on the contact surfaces. Foreign deposits can be attributed to careless handling of points during installation, use of excessive lubricant on the oiler wick, or a leaky front crankcase seal.
   Clean the breaker point post thoroughly before installing new breaker points to insure a clean surface for the breaker point bushing to pivot on. Turn the eccentric adjusting screw into the plate until it bottoms so that there is adequate screw engagement to hold breaker point gap of .020 for used points in good condition or .022 for new points. Set points on highest point of cam lobe.
   Breaker point spring tension is predetermined and does not require adjustment once breaker assemblies have been installed.
   Dirt, foreign particles, and oil are detrimental to contact performance. The oils and acids from a person's hand, even though clean, can

affect contact resistance. Oil deposits on the points will cause them to burn after a very short period of operation. If points need cleaning, saturate a piece of bias tape in alcohol or trichlorethylene and work it up and down between the points. Finish with a clean, dry piece of hard finish paper card stock to remove any residue which might cause point burning.

NOTE: *If points cannot be cleaned satisfactorily by this method, replace them. DO NOT use an abrasive stone or file to remove residue across new or old breaker contacts.*

If new breaker points have high resistance across their contact surfaces making use of a continuity meter during breaker point adjustment difficult, snap the contacts open and closed manually several times.

When this procedure is followed, engine is timed correctly without further adjustment. To recheck, use an automotive timing light, either a 12-volt or 110-volt model. One of the cooling fins on the flywheel is painted yellow. With the engine operating at idle speed (1000-1100 rpm), this painted mark can be seen in center of timing slot when light is focused there. Timing slot is approximately 7/8'' long, and is located above the manual starter (at about the 12 o'clock position) in the front fan housing.

DO'S AND DON'TS FOR C.D. IGNITION SYSTEMS

DO make sure of clean, tight connections on all wiring, especially all ground connections.

DO make sure correct battery polarity is observed (negative ground) and that battery cable connections are clean and tight. (Owner should be cautioned to check this periodically as preventive maintenance.)

DO make sure connections and terminals are free of corrosion.

DO make sure all wiring is located properly so that it will not rub against any metal edges. Vibration would eventually wear a hole in the insulation and result in a service problem that might be difficult to locate.

DO make sure accurate test equipment is used when troubleshooting the system.

DO use proper tools when installing system components.

DO NOT attempt to open the amplifier as this will void any warranty.

DO NOT pull on high tension lead at the ignition coil.

DO NOT open or close any connectors while the engine is running.

DO NOT set timing to other than specifications.

DO NOT hold the spark plug wires with your hand while checking for spark discharges. A severe electrical shock will result. Use insulated pliers designed for this purpose.

DO NOT attempt any tests except those listed in the troubleshooting procedure.

DO NOT connect an electric tachometer unless it is a type which has been approved for use with this system.

DO NOT connect the system to any voltage source other than 12-volt negative ground.

DO NOT bench test this system without proper ground connections and these ground connections to be as short as possible.

SPARK PLUGS

The spark plug provides a gap inside the combustion chamber across which the high voltage from the ignition coil can be discharged. The resulting spark ignites the compressed mixture of fuel vapor and air in the cylinder.

Spark plugs are made in a number of heat ranges to satisfy a variety of operating conditions. The heat range of a spark plug refers to its ability to dissipate heat from its firing end. The heat range established for any spark plug is determined in design by the length of the path which the heat from the tip must travel to the thread and seat area where it is transferred to the cylinder. Spark plugs having a short insulator firing end transfer heat away rapidly and are used when the combustion chamber temperatures are relatively high. Spark plugs operating under these conditions must remain cool enough to avoid pre-ignition and excessive gap erosion. Those types having a long insulator firing end transfer heat slowly and are used where combustion chamber temperatures are relatively low and spark plug temperature must be sustained in order to burn off normal combustion deposits and avoid fouling. For most effective sparking through any rpm range and under all conditions or operation, the electrode and insulator tip temperature must be kept high enough to vaporize or burn off particles of fuel mixture which collect on the insulator. Low plug temperatures result in electrode fouling by an accumulation of unburned fuel particles, carbon bits, sludge, etc. Selection of the correct spark plugs for an engine depends on the type of service to which it will be subjected. A cold running engine will require a hot plug and a hot running engine, a cold plug. Spark plugs recommended for use in the TRACKSTER are the Champion J2J or equivalent. Never install hotter plugs.

The condition and appearance of spark plugs taken from an engine may be a guide to the type and source of engine trouble. Proper spark plug 'heat range and normal engine conditions will produce powdery deposits of a rust brown to grayish or tan color on the insulator firing end and a minor degree of electrode wear. Highly leaded fuels may produce white to yellowish powdery deposits on the firing end of the spark plug.

1. If the insulator tip is an exceptionally light tan or whitish color, or the center electrode burned away, the heat range may be too hot.

2. Black, sooty deposits on the entire firing end of the spark plug result from incomplete combustion due to an overly rich air-fuel mixture, incorrect choke setting, or misfiring caused by faulty ignition components.
3. A definite white coloration may indicate the presence of moisture in the combustion chamber. Similar deposits are caused by pre-ignition.
4. Oil fouling deposits or wet, sludgy deposits are a result of misfiring or of excessive oil in the fuel mixture.
5. Burned or overheated spark plugs may be identified by a white, burned, or blistered insulator nose, and badly eroded electrodes. Excessive deposits in the combustion chamber, a lean fuel mixture or improperly installed spark plugs can cause overheating.

The condition of spark plugs may provide an indication of other conditions requiring attention. Inspect each plug and gasket as it is removed. Place the spark plugs in a holder in order of removal to assist in locating trouble. Inspect each plug for worn electrodes, glazed, broken, or blistered porcelain, and replace plugs where necessary. Plugs that are severely carbon fouled, that have blistered or cracked insulator tips, or plugs that have eroded electrodes must always be replaced. Plugs that are slightly contaminated with deposits, or which have wider than recommended gap settings can be cleaned and regapped for further use. Plugs that appear slightly contaminated can be cleaned by careful scraping, using a small knife or similar instrument. After combustion deposits have been removed, bend the side electrode back slightly so that the center electrode can be filed flat.

NOTE: *DO NOT clean plugs on abrasive blasting machines. This type of cleaning tends to remove the hard, smooth finish from the insulator tip and reduces the tip's resistance to the formation of combustion deposits. Blasting also tends to pack the abrasive between the insulator top and the metal shell of the plug. If the abrasive is not removed before installing the plug, it may pass through the engine causing piston or cylinder wall scoring.*

After the plug has been cleaned, adjust the gap to .035" to .040" by bending the side electrode. Adjust only the side electrode, as attempting to bend the center electrode will crack the insulator. Use a round wire feeler gauge to measure gap adjustment **(Figure 1).**

Poor engine performance and premature spark plug failure may result from improper spark plug installation. Before installing the plug, be sure the plug seat in the cylinder head is cleaned and free from obstructions. Inspect spark plug hole threads, clean, and coat with DuPage high temperature thread compound before installing plugs. Always use new gaskets when installing spark plugs.

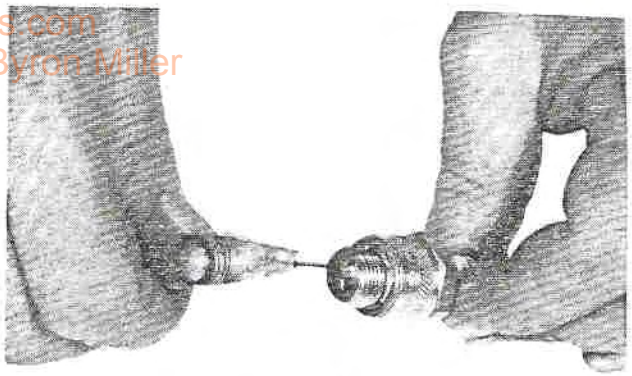


Fig. 1

Tighten spark plugs 20 to 20½ foot-pounds using a torque wrench.

Improper installation is one of the greatest single causes of unsatisfactory spark plug performance. Improper installation is the result of one or more of the following:

1. Installation of plugs with insufficient torque to correctly compress the gasket.
2. Installation of plugs using excessive torque which changes gap settings.
3. Installation of plugs on dirty gasket seal.
4. Installation of plugs in corroded spark plug hole threads.

ALTERNATOR CHARGING SYSTEM

DESCRIPTION

The charging system consists of the alternator, the rectifier assembly which changes the alternating current output of the alternator to direct current, and the battery itself.

The alternator is made up of two parts — the flywheel with cast-in magnets, and the coil and lamination assembly which is bolted to the crankcase. The flywheel rotates around this assembly, inducing alternating current in the coils.

The rectifier assembly converts the alternating current to direct current for use by the battery.

TROUBLE SHOOTING THE CHARGING SYSTEM

Failure in the charging system will usually show up when the battery becomes discharged. To determine the cause of trouble, check first the condition of the battery and electrical connections throughout the charging circuit. A visual inspection may be all that is required to locate the trouble. Check the following before proceeding with electrical testing.

CAUTION

A. Battery — Check.
B. Wiring — Check for corroded or loose connections, and check and tighten all connections. Check for worn or frayed insulation.
C. Check battery polarity. If reversed battery polarity is found, you may expect also to find a damaged rectifier.
D. Electrical load. Excessive electrical load from

too many accessories will run down the battery.

If a visual inspection of the charging system does not indicate the problem, it will be necessary to perform test of each component.

CHECKING THE ALTERNATOR

Disconnect from the terminal board the two yellow wires leading from the alternator. Connect one lead of an A.C. ammeter to one yellow wire and the other wire of the ammeter to the remaining yellow wire. At the maximum governed engine r.p.m., ammeter should indicate an output of at least 10 amperes.

If the test fails to show the coil and lamination good, replacement of the assembly must be made.

CHECKING THE RECTIFIER

Remove the rectifier from the vehicle before making the following tests.

Disconnect from the terminal board the two red wires. Connect one lead of a DC ammeter to one red wire and the other wire of the ammeter to the remaining red wire. At the maximum governed engine RPM the ammeter should indicate an out put of at least 6 amperes.

If the test fails to show the rectifier good, replace the assembly.

ALTERNATE TEST METHOD

A battery-powered continuity or test light may be used for this test, and the power of this light must not exceed 12 volts.

1. No current should flow either way between the two yellow wires.
2. Current should flow one way between yellow and red wire.
   Example:
   When one lead from the continuity tester is attached to a yellow lead, and the other lead to the red wire, the bulb should glow. If it does not, reverse the leads; then if it does not glow, the rectifier is defective. The rectifier is also defective if the current flows both ways. The current in this test should flow only one way.

NOTE: *This is only one test. Rectifier must pass all four tests before being acceptable.*

3. Current should flow one way (light very dim) between the red wire and base of rectifier.
4. Current should flow one way between yellow wires and the base.

BATTERY

Description

The battery's primary function is to provide power to operate the starting motor, ignition, lights and accessories. The storage battery is a secondary chemical generator—one that produces an electric current by chemical action after having been charged from an outside source. Each cell in the storage battery consists of a negative plate of sponge lead and a positive plate of lead peroxide immersed in a solution of water and sulphuric acid. After being charged, each cell will produce a voltage of about 2.1 volts. Six cells, connected in series, are assembled in a case to make up a 12-volt battery.

SAFETY WARNING: BATTERY ELECTROLYTE IS A CAUSTIC FLUID AND SHOULD BE HANDLED WITH CARE. IF ELECTROLYTE IS SPILLED OR SPLASHED ON ANY PART OF THE BODY, IMMEDIATELY FLUSH THE EXPOSED AREA WITH LIBERAL AMOUNTS OF WATER AND OBTAIN MEDICAL AID IMMEDIATELY.

Connect battery cables, making sure clamps are tight on battery posts to insure good contact. Apply a coat of petroleum jelly to exposed areas of the battery posts and clamp connectors to retard corrosion.

NOTE: *Correct battery polarity is extremely important. Battery must be connected with negative (—) post to ground. If positive (+) post is connected to ground, damage to the charging system will result.*

Battery Servicing

Check outside of battery for damage or signs of abuse such as broken case or broken cover. Check inside of battery by removing vent caps and inspecting for low electrolyte level. If battery shows signs of serious damage or abuse, it should be replaced. Visually inspect the battery for the following:

1. Corrosion
2. Frayed or broken cables
3. Cracked case or cell covers
4. Low or overfilled electrolyte

Battery Care

Check the following at regular intervals:

1. Clean battery top and terminals by washing with a solution of ammonia or baking soda. Keep vent plugs tight so that solution does not enter cells. After washing, flush top of battery with clean water.
2. Keep battery terminal connections tight and free from corrosion. If corroded, clean cable terminals and battery posts separately with a soda solution and a wire brush. Inspect cables for fraying or broken strands.
3. Keep electrolyte above the plates and separators at all times. Adhere to manufacturer's instructions for maintaining fluid level. Check electrolyte and add distilled water as necessary. If water is added in freezing weather, charge the battery to full charge at once.
4. Keep the battery fully charged at all times. Check the state of charge at frequent intervals by making specific gravity readings with a

battery hydrometer (Figure 2). Note that a hydrometer reading is not accurate if water has been added recently due to the fact that the water may not be mixed with the electrolyte.

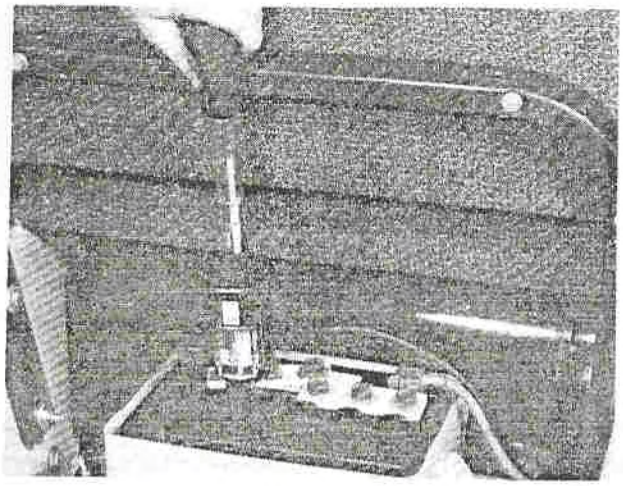


Fig. 2

Self-discharge will cause storage batteries to become discharged and sulfated if they are not properly maintained in storage. To minimize self-discharge, store the battery in as cool a place as possible so long as the electrolyte does not freeze. A battery which has been allowed to stand idle for a long period of time may be so badly damaged by sulfation that it can never be restored to a normal charge condition. A battery should be recharged every 30 days to prevent this damage. Disconnect one of the battery leads before charging battery. If storage temperature is hot, more frequent charging will be necessary. Add water if necessary before charging to bring electrolyte to proper level. Fully charged batteries have been known to withstand temperatures as low as —90° F.; a discharged battery will freeze at about 19° F., perhaps causing bursting of both the cell and battery cases.

Battery Testing

1. Make sure battery is fully charged as described under SLOW CHARGING. Hydrometer readings taken on partially charged batteries are unreliable for the following test.
2. Measure specific gravity of electrolyte in each cell and compare readings with the following: If cell readings are between 1.250 and 1.290, the battery is ready for use. Any variation in the specific gravity between cells within this range does not indicate a defective battery. Readings should be corrected to 80° F. for comparison. If the specific gravity of any cell falls outside this range (1.250 to 1.290), replace the battery.

Battery Charging

For best performance a good battery should be fully charged before being returned to service. DO NOT recharge the battery by the fast charge method. This method does not restore the full charge and also shortens the life of the battery.

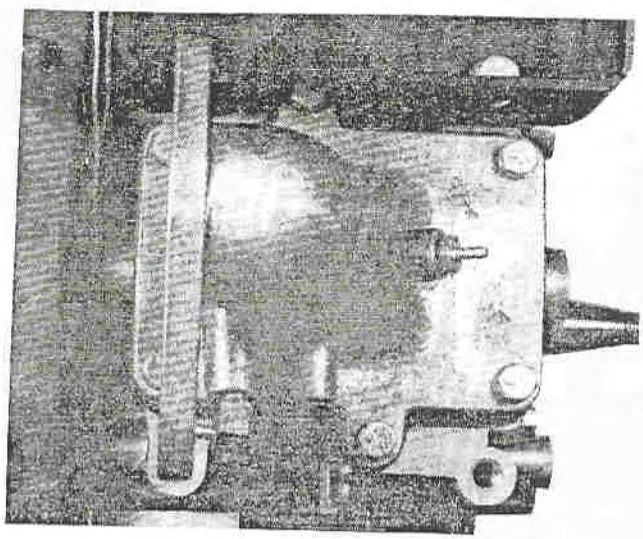
SAFETY WARNING: DISCONNECT ONE OF THE BATTERY LEADS BEFORE ATTACHING BATTERY CHARGER TO BATTERY.

Slow Charging

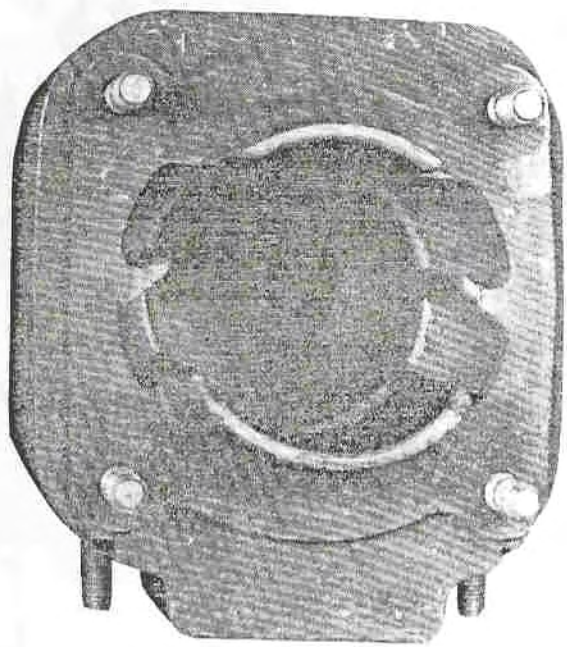
Adjust electrolyte to proper level by adding water, then charge battery at a maximum rate of 5 amperes until fully charged. Full charge of the battery is indicated when all cell gravities do not increase when checked at three intervals of one hour and all cells are gassing freely. Due to this low rate during slow charging, plenty of time must be allowed. Charge periods of 24 hours or more are often required.

ENGINE IDENTIFICATION

The Trackster is equipped with one of two engines (a 25 H.P. or a 29 H.P.). The 29 H.P. engine is also a replacement engine and may have been installed in any Trackster. Refer to the following photos for correct engine identification before ordering replacement parts.

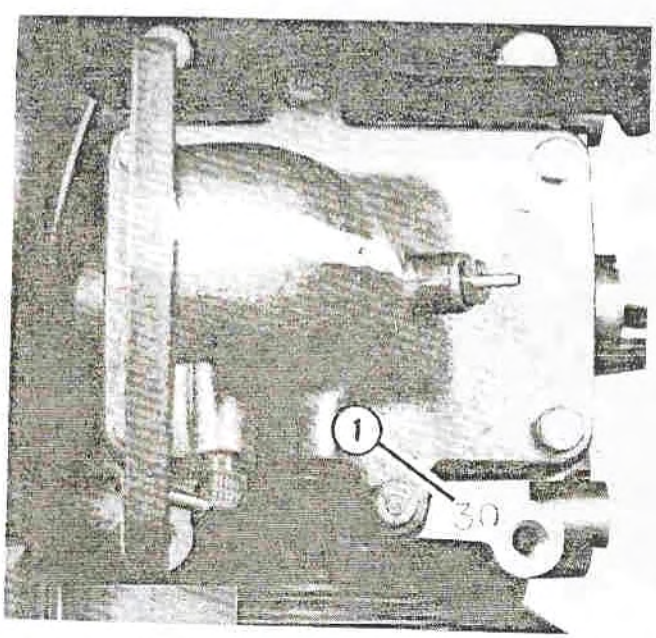


25 H.P. Engine used in Models 898000 — 7010 — 7105 — 7110 — 7210 — 7310.



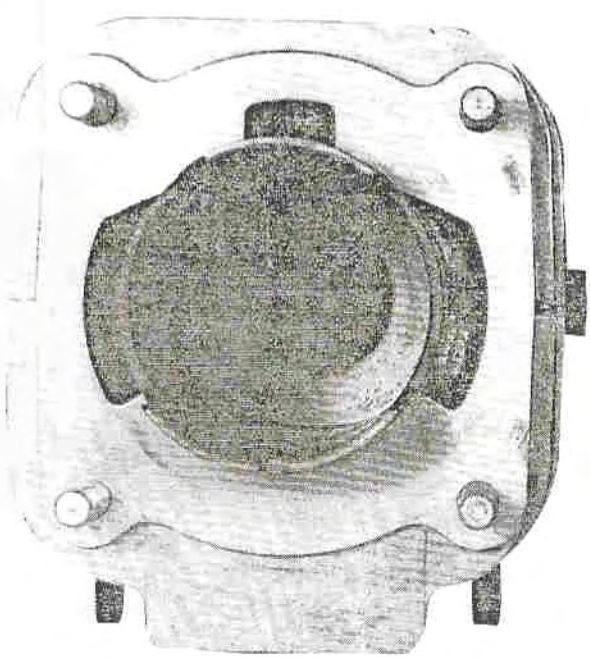
25 H.P. CYLINDER

NOTE: *Do not interchange cylinders.*

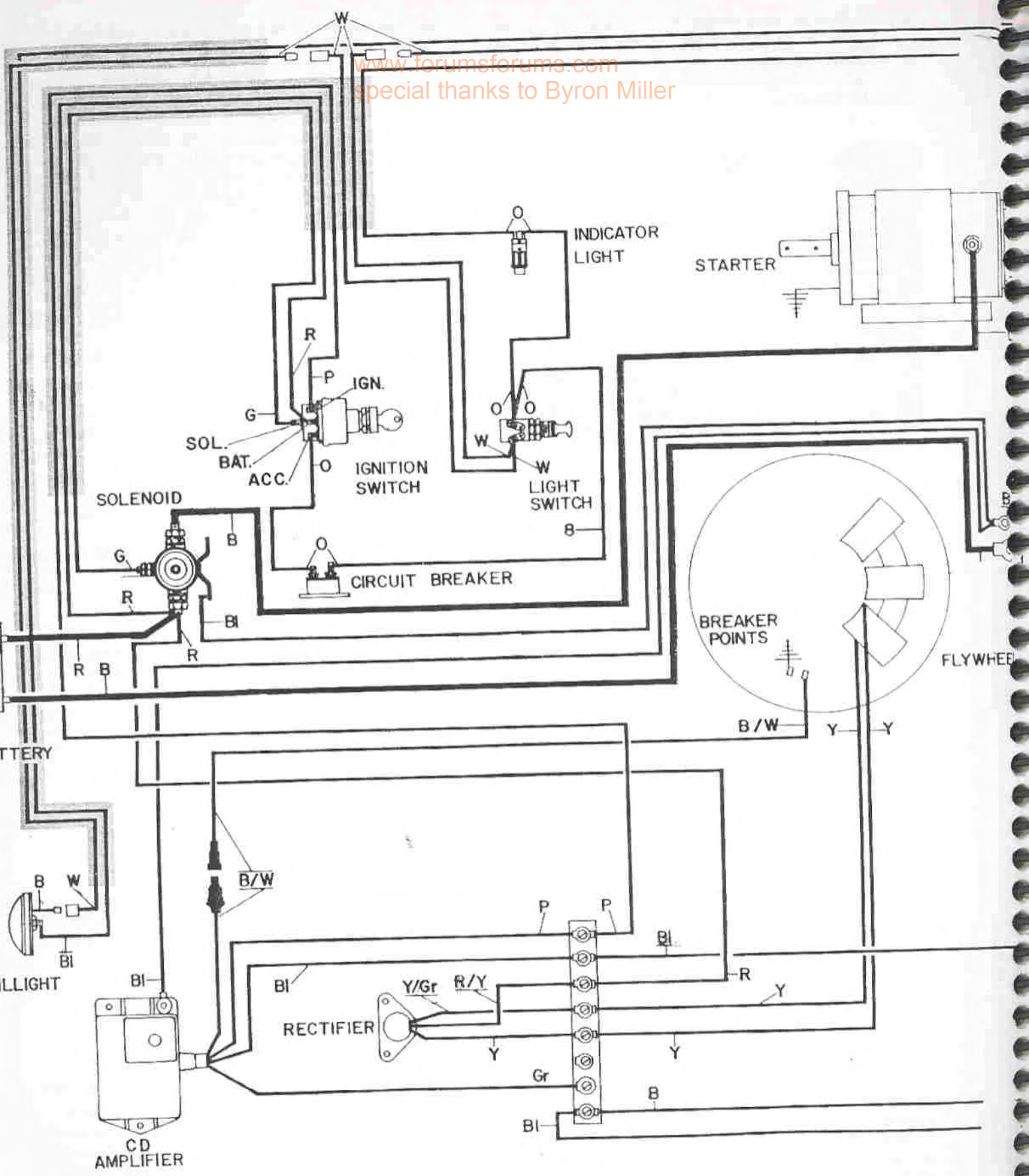


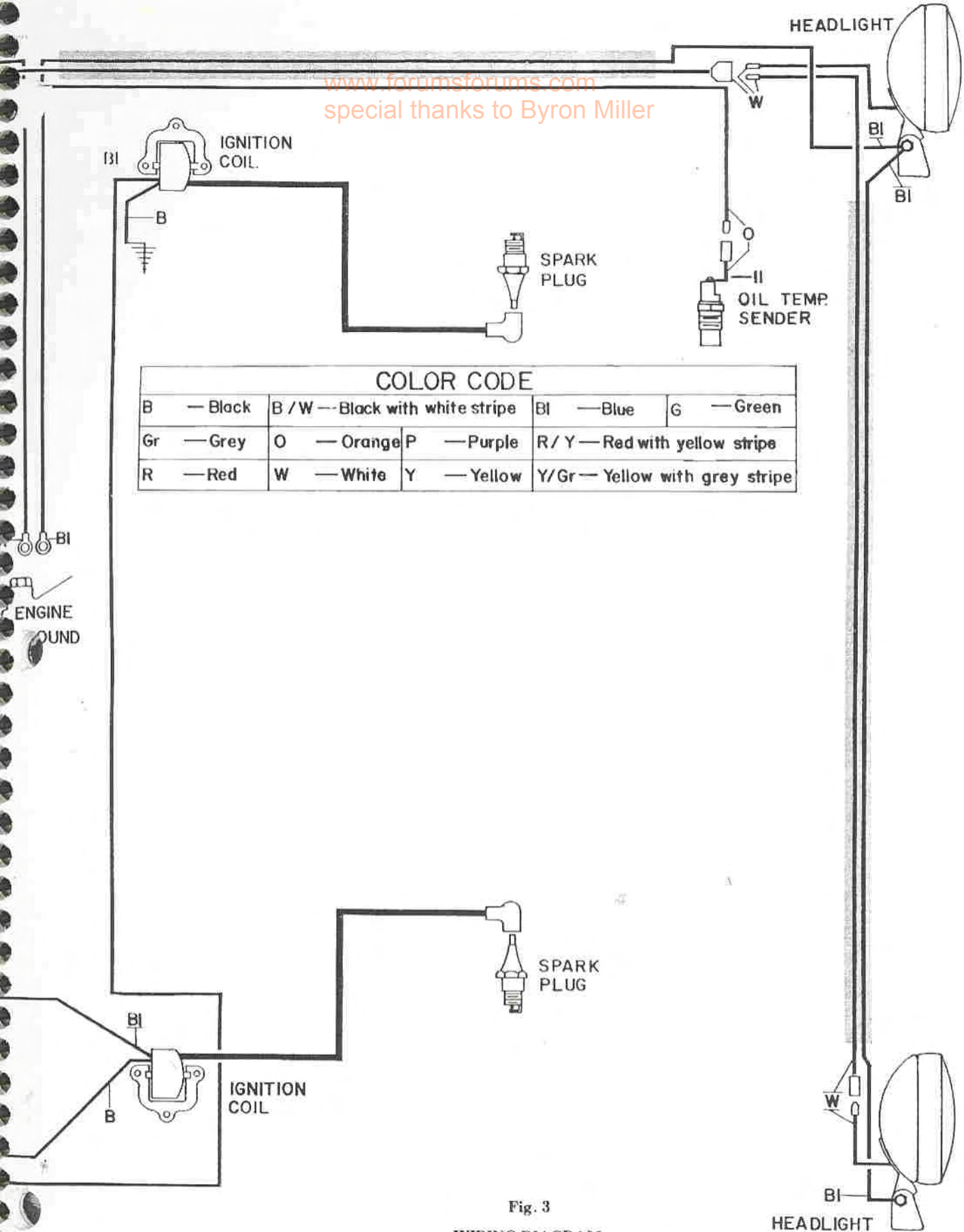
29 H.P. Engine used in 898000 — 7320 and later models, also replacement engine for all models.

1. stamped 30.



29 H.P. CYLINDER





COLOR CODE			
B — Black	B / W — Black with white stripe	Bl — Blue	G — Green
Gr — Grey	O — Orange	P — Purple	R / Y — Red with yellow stripe
R — Red	W — White	Y — Yellow	Y/Gr — Yellow with grey stripe

Fig. 3

WIRING DIAGRAM

FUEL SYSTEM

CONTENTS

FUEL RECOMMENDATIONS

The correct fuel mixture ratio is 50 parts of a good grade, regular leaded gasoline to one part Johnson 50:1, Evinrude 50:1 Lubricant, or in Canada OMC 2-cycle motor oil.

In some gasolines the amount of lead has been replaced with phosphorus. Do not use this type of gasoline, since phosphorus is detrimental when used in 2-cycle engines.

If recommended lubricant is not available, use a BIA CERTIFIED SERVICE TC-W oil mixed at 24:1 ratio. Automotive oils and 24:1 premix fuels should not be used except in emergencies when the recommended oil is not available. It should be recognized that automotive oils are formulated to fit the needs of 4-cycle automotive engines while Johnson 50:1, and Evinrude 50:1 Lubricant and OMC 2-cycle motor oils are formulated for the 2-cycle engine installed in your Trackster. DO NOT use Rotary Combustion Lubricant in any Trackster 2-cycle piston engine.

Use the following table to determine the 50:1 fuel and oil mixture for U.S. and Imperial measures:

50 TO 1 MIXTURE RATIO CHART FOR JOHNSON, EVINRUDE AND OMC 2-CYCLE MOTOR OIL			
U.S. MEASURE - 1 PINT - 16 OZ. IMPERIAL MEASURE - 1 PINT - 20 OZ.			
LUBRICANT		GASOLINE	
		U.S. MEASURE	IMP. MEASURE
½ U.S. pint	Mix with	3 U.S. gal.	2.4 Imp. gal.
½ Imp. pint	Mix with	3.7 U.S. gal.	3 Imp. gal.
1 U.S. pint	Mix with	6 U.S. gal.	4.8 Imp. gal.
1 Imp. pint	Mix with	7.5 U.S. gal.	6 Imp. gal.

Mixing Fuel

Use only a good grade of regular gasoline. Higher octane fuels may be used but generally do not offer any advantages.

SAFETY WARNING: ABSENCE OF OIL IN FUEL MIXTURE OR EXTREMELY LEAN FUEL MIXTURE WILL CAUSE ENGINE SEIZURE. THIS WILL CAUSE UNEXPECTED ENGAGEMENT OF SPROCKET LOCK.

NOTE: *Non-leaded gasoline IS NOT approved for use in the TRACKSTER.*

To prepare the Trackster fuel properly, pour into a SEPARATE clean container, half the amount of regular gasoline required and add all the required oil. Thoroughly shake this partial mixture. Next, add the balance of gasoline necessary to bring the mixture to the required ratio. Again, thoroughly shake the mixture. A clean funnel equipped with a fine screen should be used when pouring the fuel mixture into the vehicle tank.

When it is necessary to mix fuel and oil at temperatures below 32° F., the oil should be prediluted with gasoline to improve its mixability. Predilute the oil by adding one part gasoline to one part oil. When doing this, the oil temperature should be above 32° F. DO NOT use kerosene or fuel oils for prediluting oil.

Decals specifying the new mixture are available by ordering Part No. 821452.

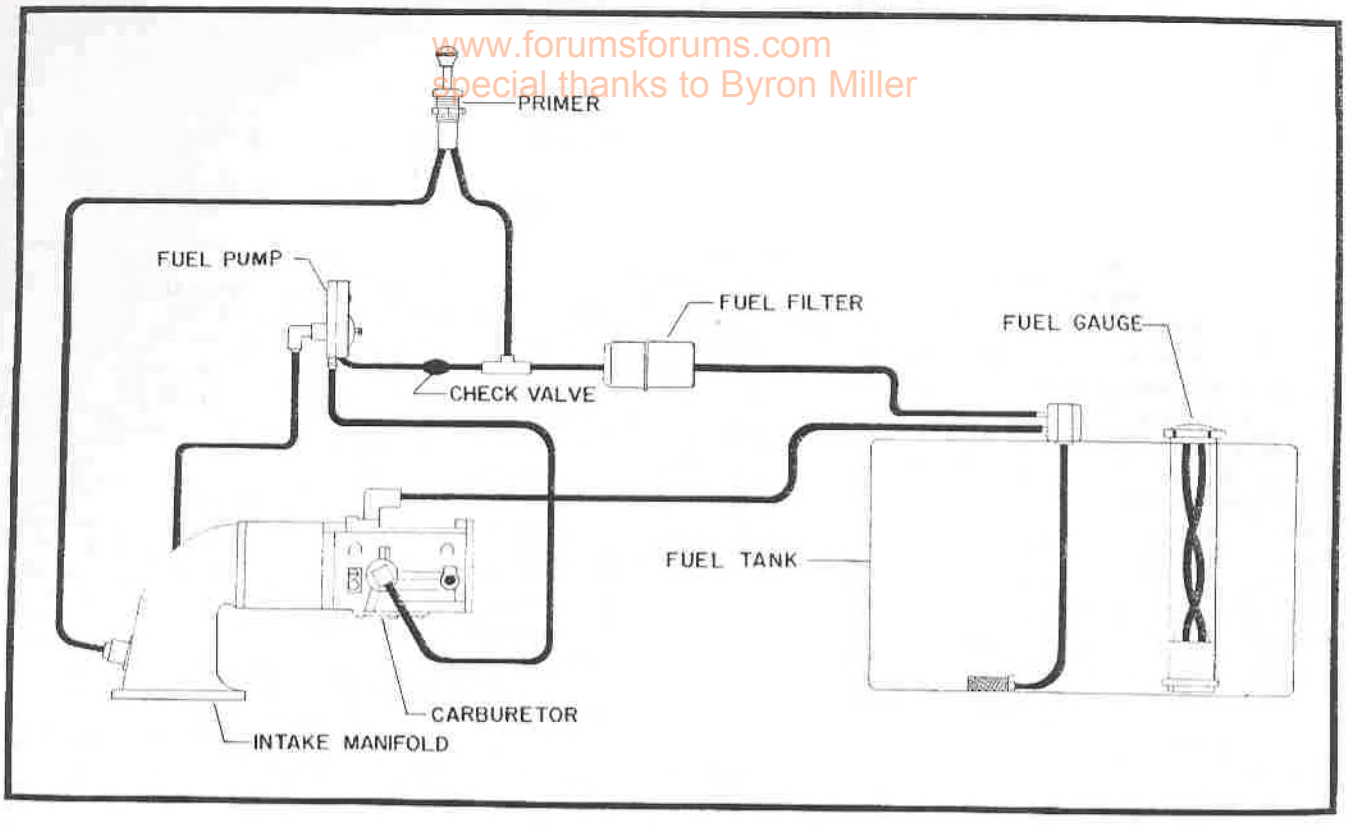


Fig. 1

FUEL SYSTEM

Description

The complete fuel system consists of the fuel tank assembly, fuel lines with various check valves and filters, fuel pump, primer assembly, carburetor, reed valve assembly, and air cleaner. This section gives complete service procedures on all components of the fuel system and carburetor adjustments.

FUEL FLOW

Fuel Tank and Connectors

Fuel is drawn from the fuel tank by the fuel pump, which is operated by changes in crankcase pressure.

Fuel is removed from the tank through a flexible hose fitted with a pickup valve consisting of a screen and check valve. The screen may need servicing periodically. The purpose of the check valve is to keep the fuel from draining back into the tank after the engine has been stopped. Failure of the check valve would cause excessive cranking to start the engine after the vehicle had set for a period of time.

The connector located in the top of the tank serves both as a fuel line connector and also to return unused fuel from the carburetor.

NOTE: *The fuel pickup hose in the tank must be installed with 1/8" clearance between the hose and threads of the fitting so as not to restrict the fuel return.*

FUEL SYSTEM CLOGGING

Recent reports have indicated fuel filters and fuel pick up screens have been plugging with a jel-like substance.

We have found that the jel-like substance is caused by a bacteria growth and has its origin primarily in gasoline storage tanks. At times, this bacteria will enter the vehicle gas tank and grow in the presence of any amount of water, such as condensation forming in the tank.

To remove gel which is present in the tank, we recommend the tank be removed and washed out with hot water/steam, air-dried and rinsed with alcohol. Clean the screen in the same manner or replace with a new screen. Replace the fuel filter.

To prevent the system from plugging again, use a gasoline additive such as "Heet" at the proportion recommended by the manufacturer. Do not exceed their recommendations.

NOTE: *A restricted fuel system will cause a lean fuel condition and may result in engine damage.*

FUEL FILTER

A fuel filter is used in the fuel line and should be serviced as needed. For replacement use Part No. 821814 only.

CHECK VALVE

An in-line check valve is located in the upper hose between the fuel filter and fuel pump. Failure

of this valve would allow fuel to be taken from the fuel pump rather than the tank while operating the primer.

FUEL PUMP

Fuel pump servicing consists only of removing the cap and cleaning or replacing the screen. If the fuel pump pressure is less than 3 to 4 lbs., it must be replaced. Before replacing the pump, check the pulse line hose and connections; also make sure there is no restriction between the pulse line connector at the manifold and the crankcase. Also check all lines and connections between fuel pump and the fuel pickup in the fuel tank. It should also be noted that air leaks in the primer system may affect the capacity of the fuel pump.

Removal

1. Disconnect two hoses from fuel pump and filter assembly.
2. Remove two screws attaching pump and filter assembly to mounting plate and remove pump and filter assembly.

NOTE: *Filter assembly may be removed for cleaning and inspection without removing pump assembly by removing filter cap screw (Figure 2).*

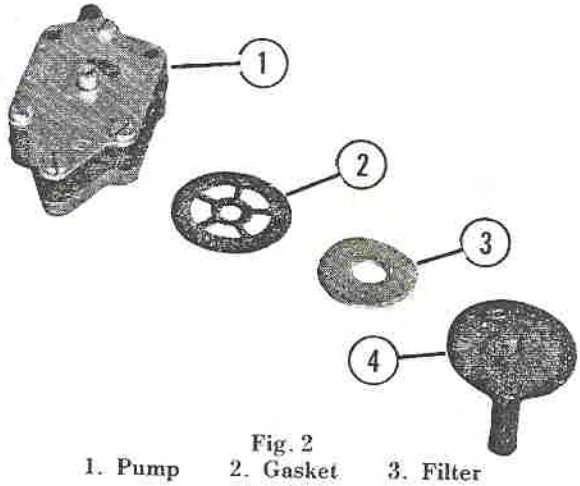


Fig. 2
1. Pump 2. Gasket 3. Filter 4. Cap

Cleaning, Inspection and Repair

1. The fuel pump components are not serviced separately. If a malfunction occurs, replace the complete pump.
2. Inspect the filter for accumulation of sediment by removing the filter cap screw and the filter cap. Clean the filter cover and fuel connectors in solvent and blow dry.
3. Check for a clogged filter element. The fuel filter element on an engine that has been in storage may be clogged without appearing to be. During storage, volatile agents as well as anti-gum and anti-varnish agents evaporate from the gasoline that remains in the fuel filter. The result is contamination of the filter element with a clean form of varnish. This varnish is not readily soluble in gasoline or cleaning solvent; therefore, the filter should be replaced at the start of each season.

NOTE: *Since the purpose of the filter is not only to trap dirt but also to prevent moisture from entering the carburetor, do not attempt to run the engine with the filter element removed. For best results, replace the fuel filter element annually.*

Reassembly

1. Reassemble the fuel pump filter.
2. Attach fuel pump and filter assembly to plate with screws. Be sure three bosses on pump align with holes in plate.
3. Reconnect fuel hoses.

Fuel Primer

1. The primer is a simple pump which pumps raw fuel from the fuel line thru check valve, directly into the intake manifold above the reed valves.
2. To check operation of the primer, disconnect hose from manifold fitting. A spurt of fuel should be evident when the plunger is depressed. If little or no fuel is discharged, check the check valve in the fuel line for leakage or sticking or a defective primer.

Fuel Tank

1. The importance of using a fresh, clean fuel mixture should not be underestimated. An aging fuel mixture precipitates petroleum gum which will clog screens, fuel passages, carburetor orifices, reed valves, etc. The tank should be removed, emptied of old fuel, installed and filled with a fresh supply at the start of each season.
2. Drain and clean the fuel tank prior to off-season storage. Disconnect the fuel line at the fuel tank and lift out tank. Remove fuel pickup line in tank for inspection.
3. Clean the tank by pouring some gasoline into the tank through a filtering funnel. Cover the fuel line opening and agitate the tank and contents. Empty the contents through the fill opening. Use additional gasoline to flush the fuel line opening. Then replace the fuel pickup line and reinstall the tank and hoses.

CARBURETION

The system which controls the intake of the fuel-air mixture in the two-cycle engine consists of a set of reed valves which serve the same purpose as the intake valves on a four-cycle engine. The reed valves are thin, flexible metal strips mounted between the carburetor intake manifold and crankcase (Figure 3).

When the piston is on the outward stroke, it creates a partial vacuum in the crankcase. Atmospheric pressure forces the reed away from the body,

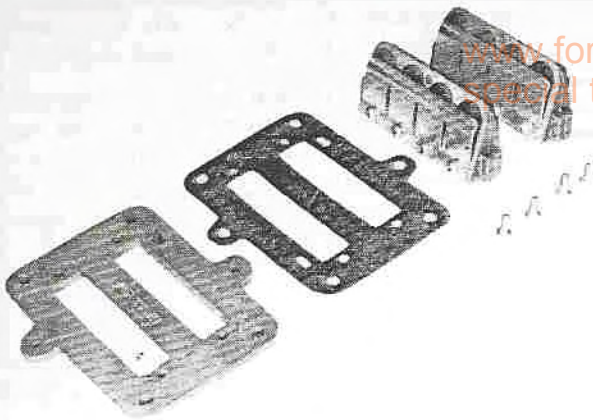


Fig. 3

opening the passage between the carburetor and crankcase. When the piston is on the inward stroke, it compresses the crankcase charge, forcing the reed against the passage opening and sealing off the crankcase from the carburetor. Since the opening and closing may occur in excess of four thousand times per minute, the reed must be thin and flexible. The reed does not have to seat exactly flush with the housing to permit normal operation.

Gasoline, in its liquid state, burns relatively slowly with an even flame. However, when gasoline is combined with air to form a vapor, the mixture becomes highly inflammable and burns with an explosive effect. To obtain best results, the fuel and air must be correctly proportioned and thoroughly mixed. It is the function of the carburetor to accomplish this.

Gasoline vapor will burn when mixed with air in a proportion from 12:1 to 18:1 by weight. Mixtures of different proportions are required for different purposes. Idling requires a relatively rich mixture; a leaner mixture is desirable for maximum economy under normal load conditions; avoid lean mixtures for high speed operation. The carburetor is designed to deliver the correct proportion of fuel and air to the engine for these various conditions.

The carburetor is essentially a simple metering device. Needle valves permit a precise amount of fuel to flow from the float chamber to the carburetor throat. The outward stroke of the piston creates a suction which draws air through the reed valves and the carburetor throat. At a particular point the throat is restricted by a venturi. The venturi has the effect of reducing air pressure in the air stream, creating a partial vacuum which draws fuel from the jet nozzles. As it is rushed along to the firing chamber, the fuel is swirled about in the air stream and vaporized.

A shutter or butterfly valve in the throat regulates the amount of air drawn through the carburetor. To vary the speed of the engine, the throttle shutter opens or closes, regulating the amount of fuel-air mixture drawn into the engine.

A richer fuel mixture is required for starting a cold engine. A second shutter, called a choke, is placed into the throat forward of the jets to restrict the flow of air. When shutter is closed, more gasoline flows into the air stream, resulting in a richer fuel mixture. When normal operating temperature is reached, the choke is opened and the standard ratio of gasoline and air is allowed to flow through the carburetor.

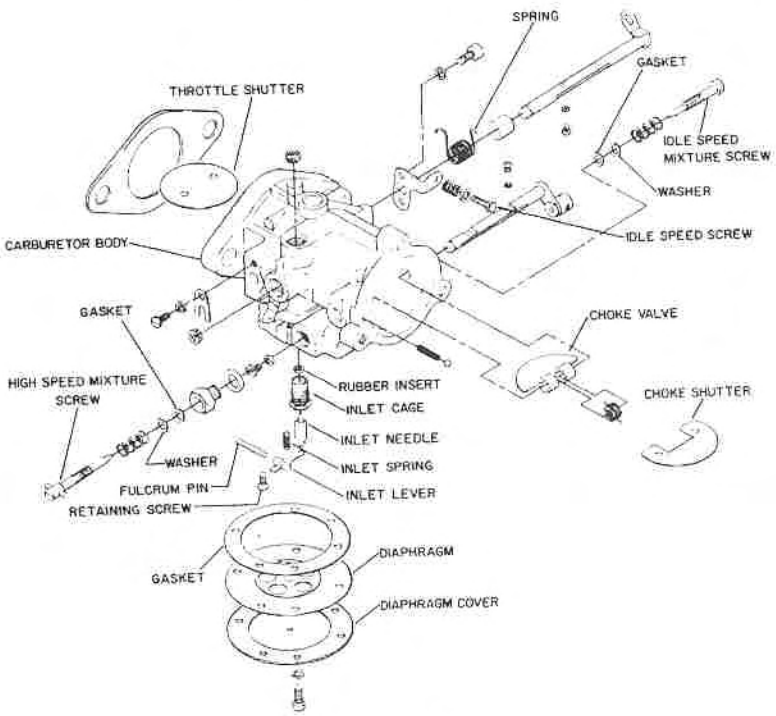


Fig. 4

CARBURETOR

Repair

The Trackster carburetor should be cleaned and inspected at regular intervals, depending on service conditions.

Select a clean work area. Dirt and carelessness are the causes of most carburetor trouble.

NOTE: *Some solvents and cleaners will damage synthetic rubber parts used in the carburetor. Use a petroleum product for cleaning. Do not use alcohol, lacquer thinner, acetone benzol or any solvent containing a blend of these agents. If you are in doubt about your solvent, test a part in it and observe the reaction.*

The entire carburetor should be cleaned and dried before disassembly. Inspect for cracks in the casting, bent or broken shafts, loose levers or swivels and stripped threads.

1. Remove the idle speed screw, washer and tension spring. Inspect for damaged threads.
2. Remove the diaphragm cover, diaphragm and gasket. Inspect the cover for nicks, dents and cracks. Check the diaphragm, the center plate must be riveted securely and the diaphragm should have no pin holes or imperfections. Replace the gasket if there are holes or creases on its sealing surfaces. When reassembling the carburetor, be sure these parts are installed in the proper sequence.
3. Remove the fulcrum pin retaining screw, fulcrum pin, inlet control lever and spring. Hold the spring while removing the pin. Inspect parts for wear or damage. The inlet lever must rotate freely on the fulcrum pin.
4. Handle the inlet spring carefully. Do not stretch or distort it. If in doubt about its condition, replace it.
5. Remove the inlet needle, seat and gasket using a 3/8" thin wall socket. The inlet seat consists of a brass cage and a rubber insert for the needle seat. If the rubber insert is removed, be sure to replace it with the flat side toward the needle. Inlet needles and seats are matched and tested for leaks at the factory, never interchange these parts. Always use a new gasket when installing the seat into the carburetor body. Torque 40 - 50 inch pounds.
6. Remove the high speed and idle speed mixture screws and inspect the points on each. Be sure to also inspect the adjustment seats in the carburetor body. If either seat is damaged, the complete carburetor must be replaced.
7. The choke and throttle shafts may be removed if there is evidence of wear. The shafts do not have to be removed to clean the carburetor body.

   Mark the choke and throttle shutters before removing them so they can be reassembled correctly. The edges are tapered for exact fit into the carburetor bore. Remove the two screws and slide the shutters out of the shaft. Remove the throttle shaft clip and pull the shaft out of the body. Examine the shaft and body bearings for wear. If the shaft shows excessive wear, replace it. If the body bearing areas are worn, replace the complete carburetor. Remove the choke shaft from the body carefully, the ball and spring will fall out of shaft hole. Inspect the shaft for wear.
8. Clean all ports before reassembling the carburetor. The metal parts can be immersed in a commercial carburetor solvent. Use compressed air to dry the carburetor. Carefully blow out each channel and orifice.
9. Assemble the carburetor. Make certain all parts are kept clean.
   a. Tighten the inlet seat to 40 - 50 inch pounds of torque.
   b. Adjust the inlet control lever so the arm that contacts the diaphragm is flush with the body (Figure 5).

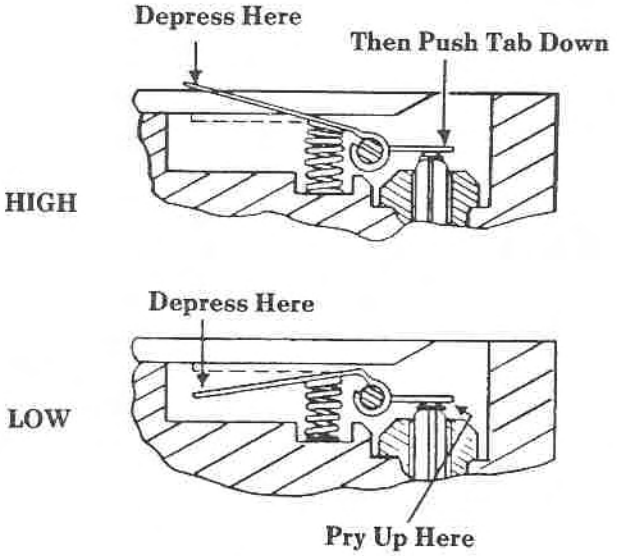
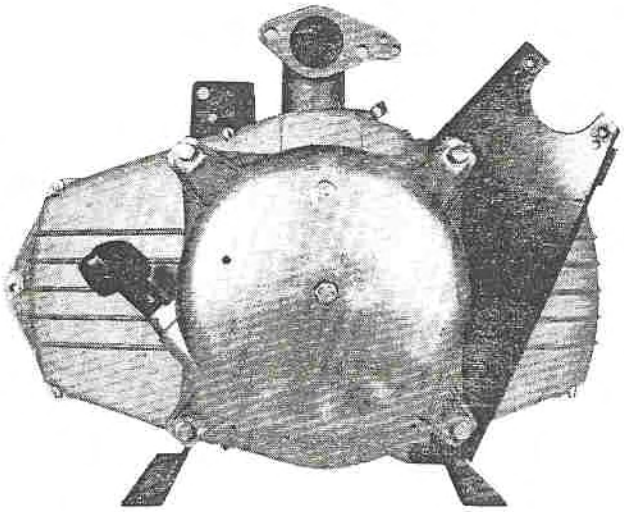


Fig. 5

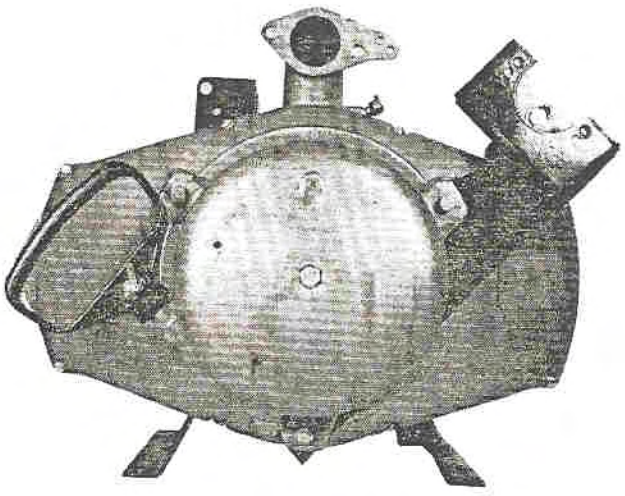
   c. Assemble the gasket diaphragm and cover in the proper sequence.
   d. Insert the throttle shaft into the carburetor body and attach the retaining clip before installing the throttle shutter. The throttle shaft spring should have one turn preload. Install the shutter and be sure it fits correctly into the throttle bore when closed.
   e. Insert the spring and ball into the choke shaft hole and install the shaft. The choke valve and spring must be installed as the shaft is inserted. Install the choke shutter over the spring and choke valve. Close the choke and be sure the shutter and valve fit tightly to the bore and that the choke valve will open and return to the closed position.

A carefully rebuilt carburetor should perform well. The most likely causes of carburetor failure are dirt and a careless repair job. A clean, carefully assembled carburetor should perform as a new unit.



4-POINT MOUNTING STARTER

Two types of recoil starter assemblies have been used. Refer to photos before ordering replacement parts.



3-POINT MOUNTING STARTER

Adjustment

Final carburetor adjustments should always be made with the engine at the normal operating temperature and the air cleaner and silencer installed. Installation of the silencer can best be accomplished with the aid of a putty knife as shown (Figure 6).

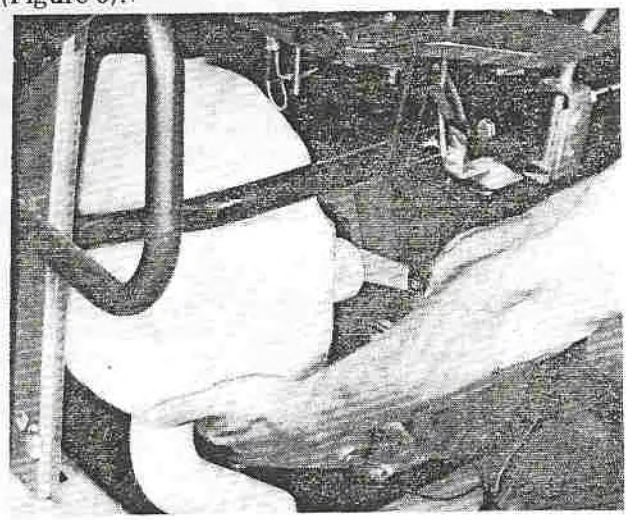


Fig. 6

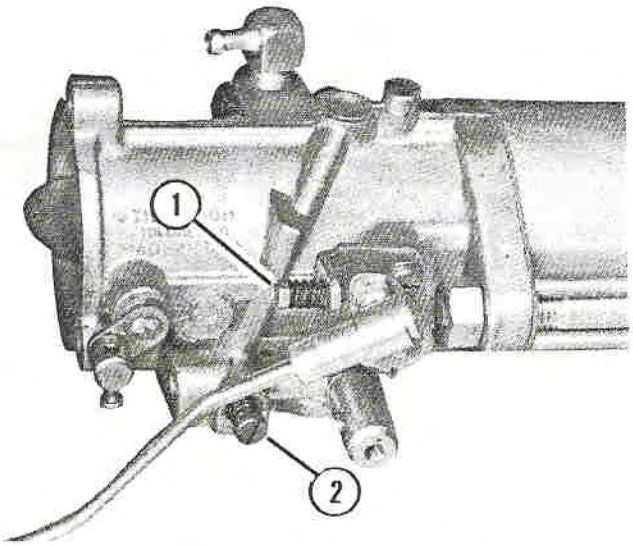


Fig. 7
1. Idle Speed 2. Low Speed Adjustment

1. Set the low speed adjusting needle at 5/8 turn open (Figure 7).
2. Set the high speed adjusting needle at 1 1/8 turn open (Figure 8).

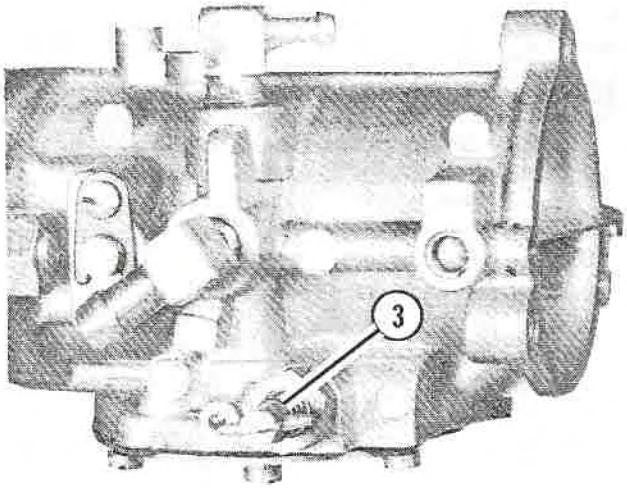


Fig. 8
3. High Speed Adjustment

3. Set the engine control on minimum and adjust the idle stop screw to maintain 1000 - 1100 engine RPM.
4. Adjust the low speed needle to provide the fastest and smoothest engine idle. Readjust idle stop screw for 1000 - 1100 RPM.
5. Move the Engine Speed Lever to maximum, turn the high speed needle counter-clockwise (out) permitting the engine to run rich to where it begins to "4-cycle" (load-up). Turn the needle back clockwise (in) gradually until the engine runs smooth. Be sure to give the engine time to respond.

NOTE: *To maintain adequate cylinder lubrication, the high speed needle valve should never be less than 7/8 turn open.*

6. Road test the vehicle.

FOR TROUBLE SHOOTING REFER TO

ENGINE SECTION

SUSPENSION

CONTENTS

FRAME

The TRACKSTER frame consists of three main cross-members which can be replaced individually. To replace a frame member, lift the vehicle off the floor, remove both tracks and side rails, and any accessories such as the skid plate which fasten to the underside of the body. Remove all bogie wheels from the frame to be replaced and remove the frame from the vehicle. When installing a new frame member, be sure to replace all sealing washers. The body must be watertight.

BOGIE WHEELS

Broken bogie wheels are generally the result of the wheel striking a solid object such as a rock while making a turn. A broken wheel should not be run any longer than necessary. Continued running may cause damage to the track.

Bogie wheels with flat areas worn on the outside diameter are the result of the bogie wheels failing to rotate. The removal of mud and snow accumulations should be made at the end of each operating period.

All of the rear bogie wheels are capped with steel. It is permissible to use this wheel throughout the entire track system if conditions warrant.

BOGIE WHEEL REMOVAL

Broken bogie wheels can be replaced without removing the track from the vehicle. Lift the side of the vehicle to be worked on off the floor and loosen the track tension.

Front

The complete front wheel and suspension arm must be removed as a unit. Remove the hardware as shown in Figure 1.

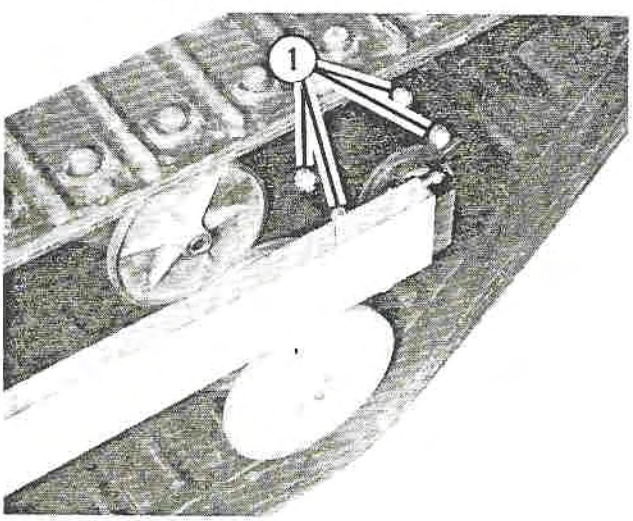


Fig. 1
1. Remove

Center

Remove the wheel and bearing assembly from the leaf spring. Proceed with replacement.

Rear

Raise the rear of the vehicle, loosen and remove

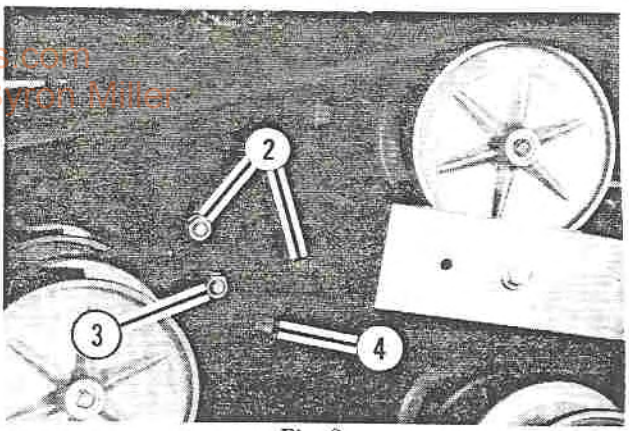


Fig. 2
2. Loosen 3. Remove
4. Track Tension Admustment

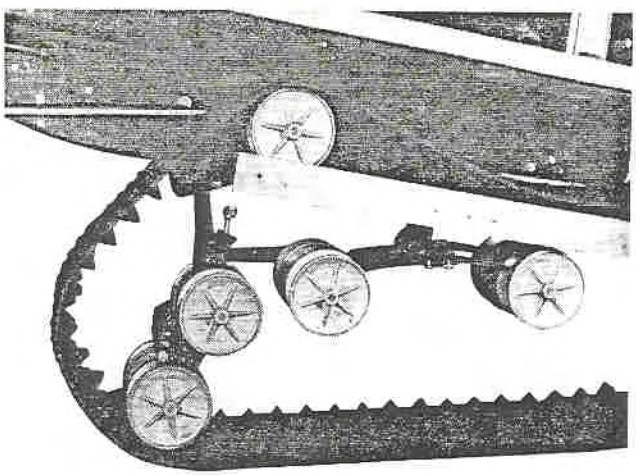


Fig. 3

the bolts securing the release arm to the rear frame, Figure 2, and swing the rear bogie wheels down (Figure 3). Remove the cotter pin in the end of the release arm and slide the pivot assembly off. Either side can now be removed from the assembly (Figure 4).

NOTE: *When reinstalling a pivot assembly to the carrier, the hardware must be tightened alternately to prevent its coming loose.*

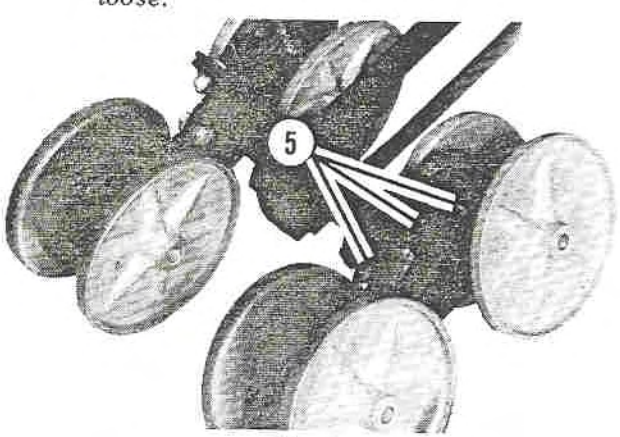


Fig. 4
5. Retaining Hardware Removed

WHEEL REPLACEMENT

Items needed for wheel replacement are: An oven capable of heating a wheel to 275° F., a hydraulic press and a set of bogie wheel tools shown in this manual.

Place the wheel, bearing and hub assembly in a press as shown (Figure 5). Use a short piece of ½" diameter steel rod to press the bearing shaft out of the wheel. Heat the new wheel to 275° F., place the wheel and bearing assembly in the press with the shaft and remaining wheel against a flat surface and press the wheel on quickly before it cools (Figure 6). Be sure the wheel is started straight to prevent peeling the aluminum from the hole.

NOTE: *A wheel should not be reinstalled. Always use a new wheel for replacement since the hole is enlarged when the wheel is removed.*

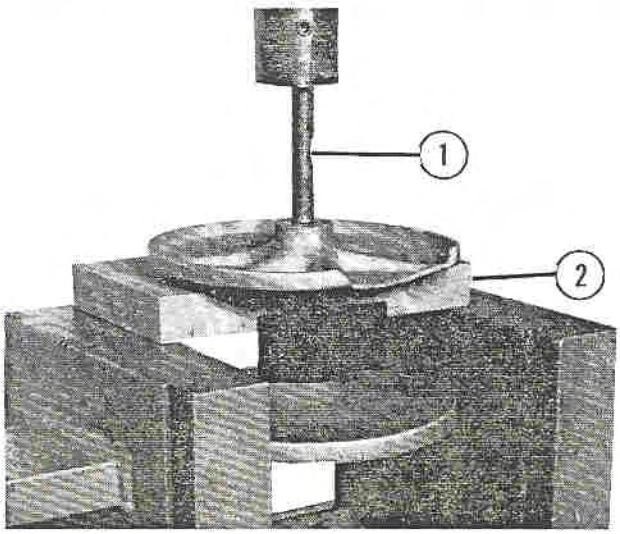


Fig. 5
1. ½" Diameter Steel Rod
2. Support Plate #821730

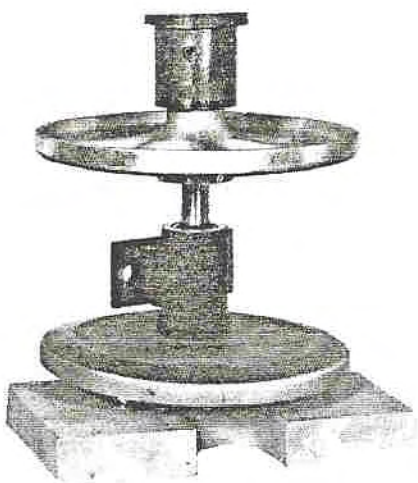


Fig. 6

BEARING AND SEAL REPLACEMENT

Remove both wheels from the bearing and hub assembly as shown in Figure 5.

Place the bearing and housing over the large hole in support plate (tool number 821731). Press the shaft and bearing far enough to free the lower seal from the housing (Figure 7). Pull the seal off the shaft, turn the assembly end for end, use tool number 821732 to press the shaft and bearing out of the housing (Figure 8).

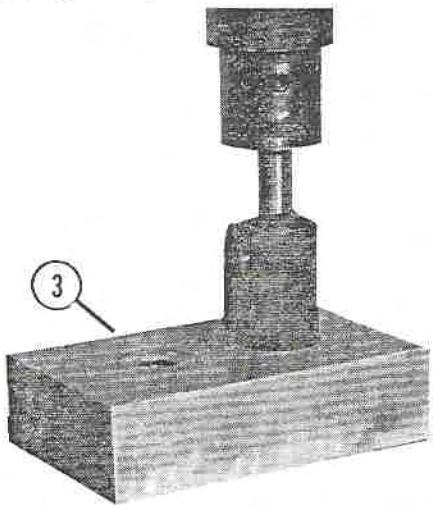


Fig. 7
3. Support Plate #821731

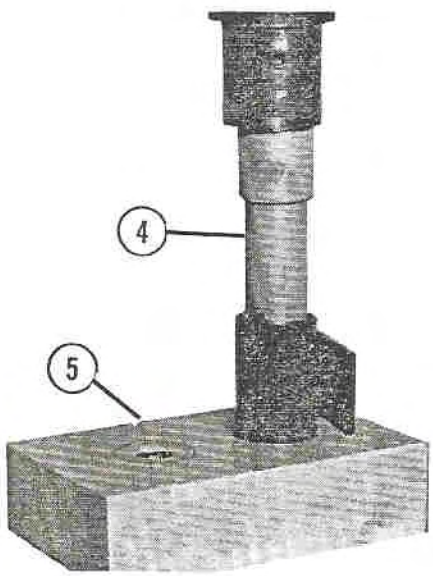


Fig. 8
4. Tool No. 821732
5. Support Plate 821731

Place the housing over the small hole in the support plate and install the new shaft and bearing. Use white lead as a lubricant and be sure the assembly is started straight. The shaft will contact the bottom of the hole when the bearing is in place. Do not apply pressure to the bearing after it is in place. The groove in tool number 821732 will be flush with the top of the bearing housing at the same time the shaft bottoms in the hole (Figure 9).

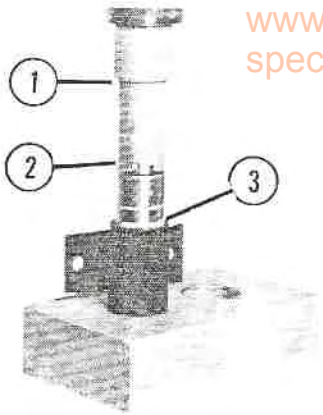


Fig. 9
1. Tool No. 821732
2. Groove 3. White Lead

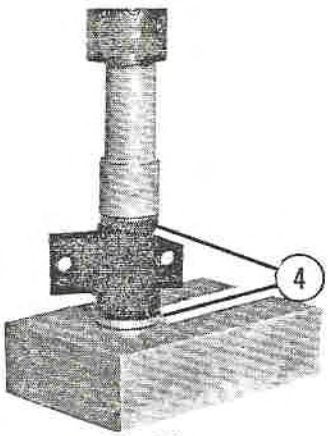


Fig. 10
4. New Seals

Coat the lip of the new seals with oil, place in position over each end of the shaft, place assembly over the small hole in the support plate and press into place using the large end of tool number 821732 (Figure 10).

Heat a new wheel to 275° F. and press quickly into place (Figure 11). Install the second wheel as described under **Wheel Replacement** (Figure 6).

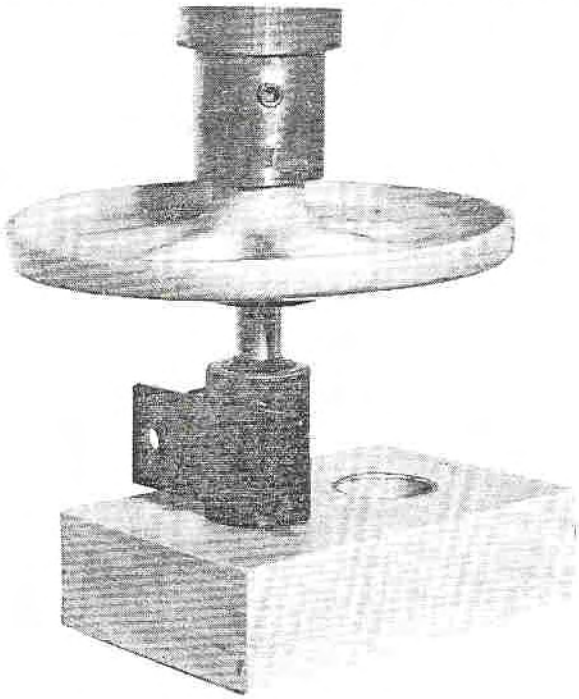


Fig. 11

TRACK TENSION ADJUSTMENT

Proper track adjustment will provide a ½'' sag between the drive sprocket and the upper bogie wheels. This distance can be measured by placing a straight edge on the top surface of the track (Figure 12). Park the vehicle on a flat, level surface before making this measurement.

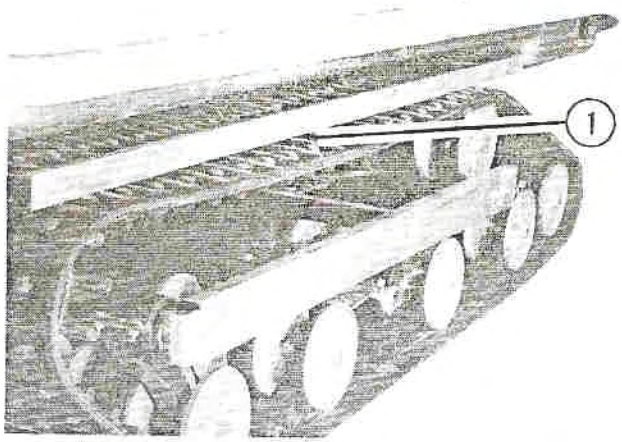


Fig. 12
1. ½'' Between Track Lug and Straight Edge

NOTE: *Never adjust tracks to less than ½'' sag. Operating the vehicle with too much tension on the tracks will cause premature wear on the bogie wheel bearings.*

Adjustment is accomplished by moving the lower rear set of bogie wheels forward or back as desired. Loosen the lock nut and turn the adjusting nut (Figure 13). Always retighten the lock nut securely.

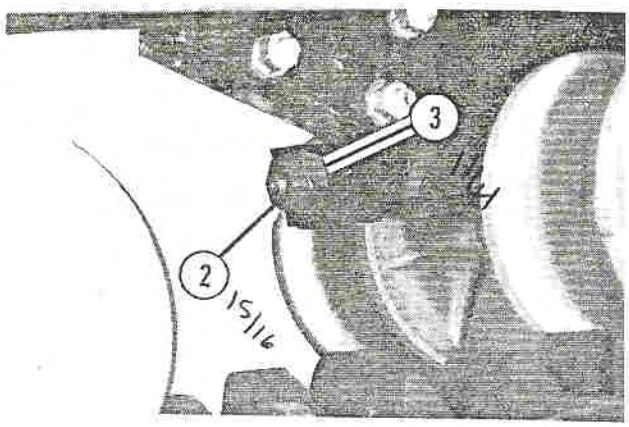


Fig. 13
2. Locknut 3. Adjusting Nut

15/16 Socket
1 1/4 End Wr.

TORSILASTIC SPRING

A quick indication of the condition of the torsilastic springs can be made by using the center line of the two screws in the side rail as a reference point (Figure 14). If the center line of the front bogie axle is more than ½" to the rear of the imaginary line, the torsilastics should be inspected for breaks and replaced as necessary.

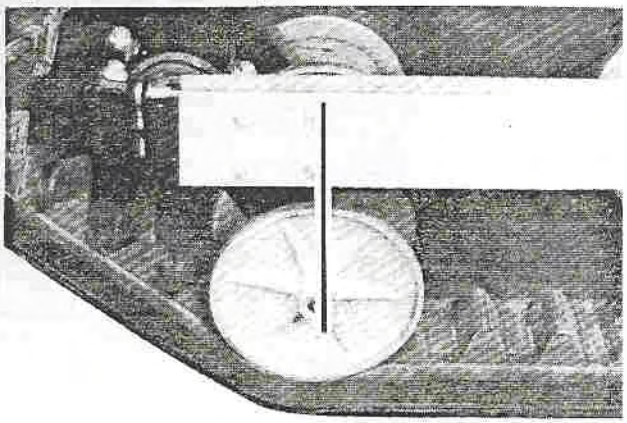


Fig. 14

REPLACEMENT

Lift the side of the vehicle to be worked on off the floor and loosen the track tension. Remove the side rail from the frame. Provide enough slack in the track so the bogie wheel is clear of the drive lugs, and slide wheel, arm and torsilastic spring assembly off of the frame.

SHEAR MOUNT

The purpose of the shear mounts located at the rear bogie pivot assembly is to keep the forward set of bogies contacting the track, yet allowing the assembly to pivot on its axis. The result of broken shear mounts usually is a complaint that the track can be run off too easily.

Replacement

Remove the rear bogie pivot assembly as outlined under "Bogie Wheel Removal — Rear". Replace the shear mount and tighten the screws alternately.

REPLACING "THROWN" TRACK

In the event that a portion of a track slips off, it will almost always occur at the rear, with the track moving toward the body.

In this instance it is usually possible to "drive" it back into place. Move the vehicle forward slowly and make a gradual turn in the direction of the slipped track. (right track off: right turn, left track off: left turn.) **DO NOT** back up as this will usually cause the front of the track to run off.

Sprocket Wear or Damage

Sprocket wear should be checked by measuring the width of the teeth at a point one inch from the tip. If any tooth on the sprocket is narrower at this point than the minimum widths shown in the illustrations, a new sprocket should be installed. If any damage to the sprocket, cylinder, or cylinder mounting frame is noted at any time (especially due to sprocket lock engagement at high speeds), all damaged parts should be replaced.

SAFETY WARNING: DAMAGE, OR EXCESSIVE WEAR CAN CAUSE TEETH TO BECOME WEAKENED, RESULTING IN BREAKING OR BENDING. THIS COULD RENDER THE SPROCKET LOCK INEFFECTIVE IF SUDDEN HYDRAULIC PRESSURE LOSS IS ENCOUNTERED.

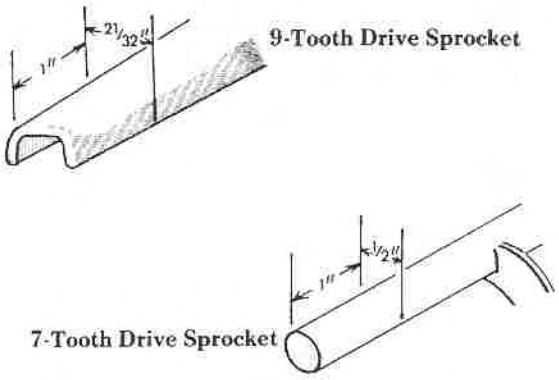


Fig. 15

DRIVE SPROCKET SCRAPER ADJUSTMENT

7-TOOTH SPROCKETS ONLY

After correctly adjusting the tracks, the sprocket scrapers should be adjusted to be ¼" from the sprockets (Figure 16). Torque all nuts to 38 ft. lbs.

NOTE: *Failure to correctly adjust the scrapers or to maintain the correct adjustment can lead to material build-up between sprocket and track. This can cause severe damage to the drive assembly.*

SAFETY WARNING: IF CHANGE IS MADE FROM NINE TOOTH TO SEVEN TOOTH DRIVE SPROCKETS, SPROCKET LOCK CYLINDER MUST BE REMOUNTED IN FORWARD MOUNTING HOLES. FAILURE TO RE-LOCATE CYLINDER WILL RESULT IN COMPLETE FAILURE OF SPROCKET LOCK.

SAFETY WARNING: REMOVAL OF SCRAPER ASSEMBLY COULD RENDER SPROCKET LOCK INEFFECTIVE.

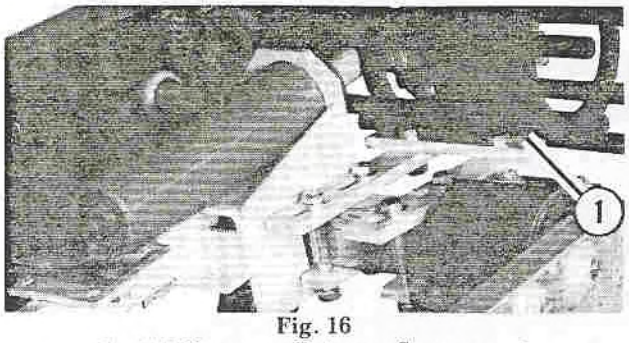


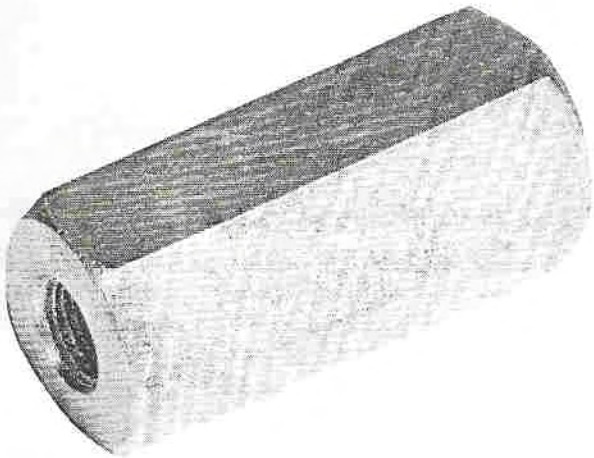
Fig. 16
1. ¼" Clearance Between Scraper and Drive Sprocket.

MISCELLANEOUS SECTION

CONTENTS

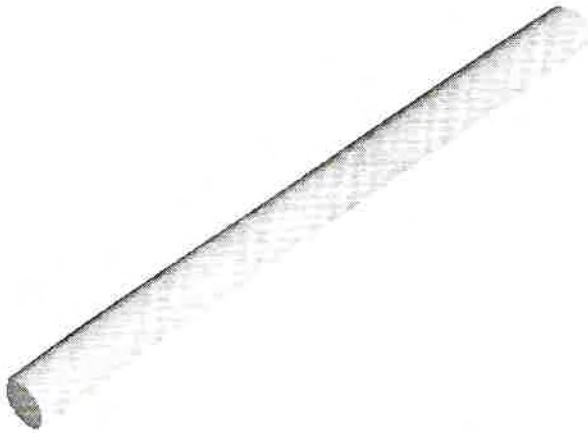
112020—WRENCH, FLYWHEEL HOLDING

Used to secure the flywheel when removing the mounting nut and lockwasher from the crankshaft, and for removing the oil filter.



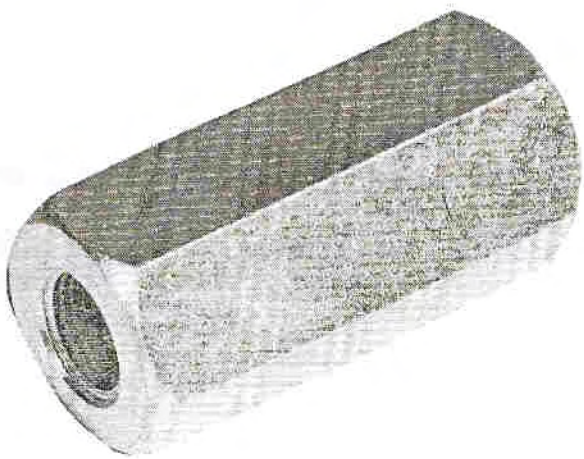
809316—KNOCK-OFF, ½—20

Used as a protector for the threads on the inner end of the axle when pressing bearings.



821733—ALIGNMENT GAUGE

Used to align driveshaft when mounting engine or transmission to power frame.



809315—KNOCK-OFF, 5/8—18

Used to remove the drive sprocket from the axle shaft and the engine flywheel from the crankshaft.

TWO-CYCLE ENGINE OPERATION

An internal combustion engine is one in which fuel is burned inside the engine: A charge of fuel is introduced into a firing chamber (cylinder) within the engine and ignited. The energy released by the expansion of the burning fuel is converted to torque by the piston, connecting rod, and crankshaft.

Internal combustion engines are classified as either four-cycle or two-cycle engines. The "four" and the "two" refers to the number of piston strokes required to complete a power cycle of intake, compression, power, and exhaust. A piston stroke is piston travel in one direction only; up is one stroke, down is another (Figure 1). In a four-cycle engine,

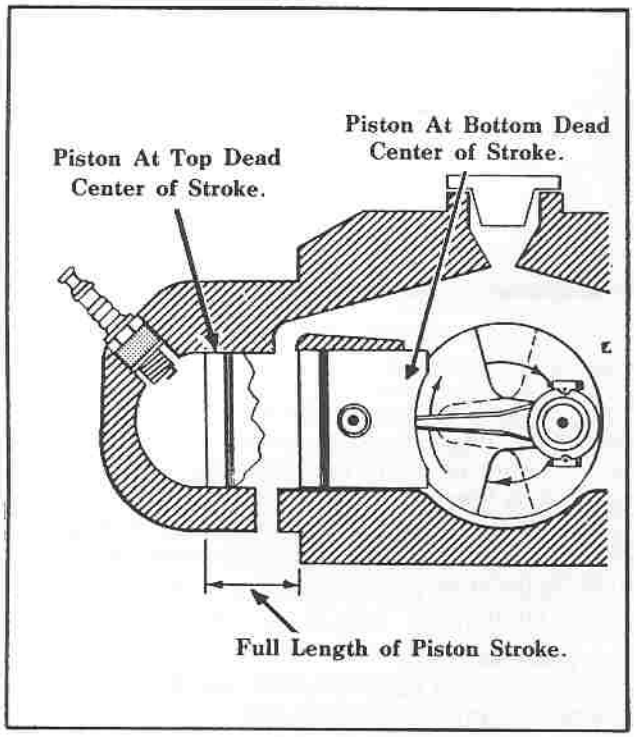


Fig. 1

two crankshaft revolutions, or four strokes, are required for each power cycle. In a two-cycle engine only one crankshaft revolution is required for each power cycle.

In a two-cycle engine, the ignition of the fuel-air mixture occurs as the piston reaches the top of each stroke. The expansion of gases drives the piston downward (Figure 2). Toward the end of the downward stroke, ports which lead from the cylinder to the exhaust system, are uncovered. The expanding exhaust gases flow into these ports, reducing pressure in the cylinder (Figure 3). Immediately after, intake ports are opened. These ports connect the cylinder with the crankcase where a mixture of fuel and air has been developed by carburetion (Figure 4). The downward motion of the piston compresses this mixture and forces it through the intake ports into the cylinder.

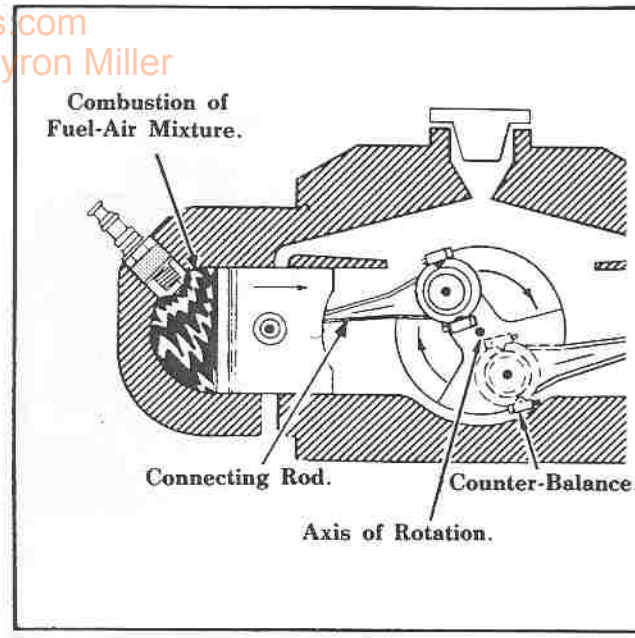


Fig. 2

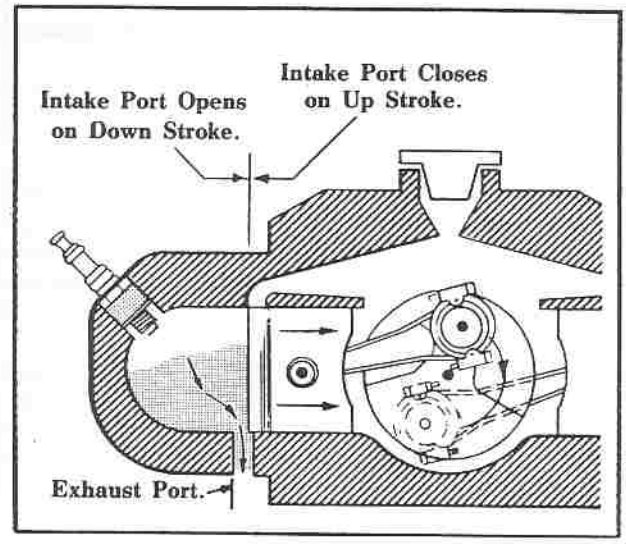
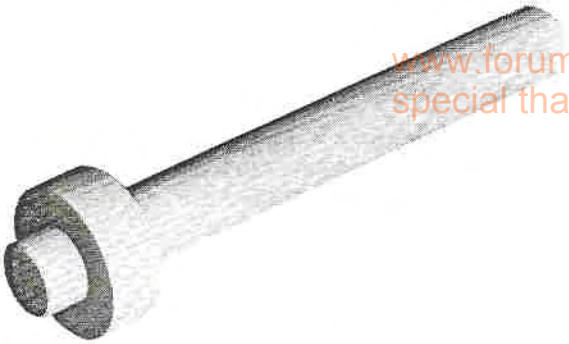


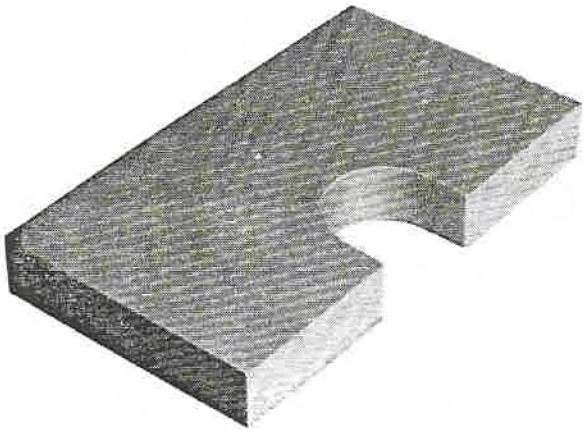
Fig. 3

The inrushing charge of the fuel-air mixture helps to eject (scavenge) the last of the exhaust gases from the cylinder. At this point, the momentum of the flywheel is required to return the piston to the top of the cylinder. As the piston begins its up-stroke, it closes the intake and exhaust ports (Figure 5), and begins to compress the fuel-air mixture trapped in the cylinder. The upward motion of the piston also reduces the pressure in the crankcase. The resulting crankcase suction opens reed valves which admit a fresh charge of air and fuel from the carburetor into the crankcase, thus preparing for the next power cycle. Near the top of the piston stroke, compressed fuel-air mixture is ignited, the piston is driven downward, and the power cycle is repeated.



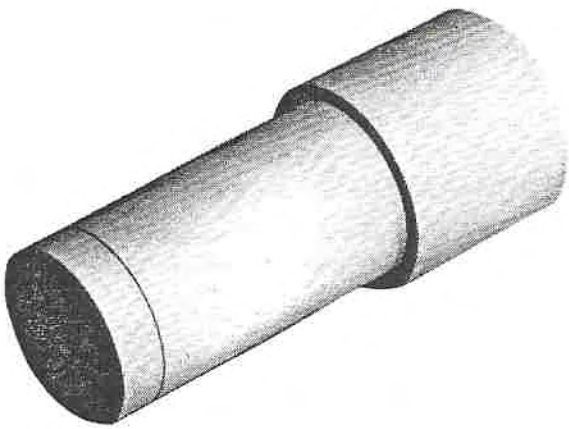
882395—BEARING DRIVER

Used to install inner axle bearings and bevel gear bearing into transmission case.



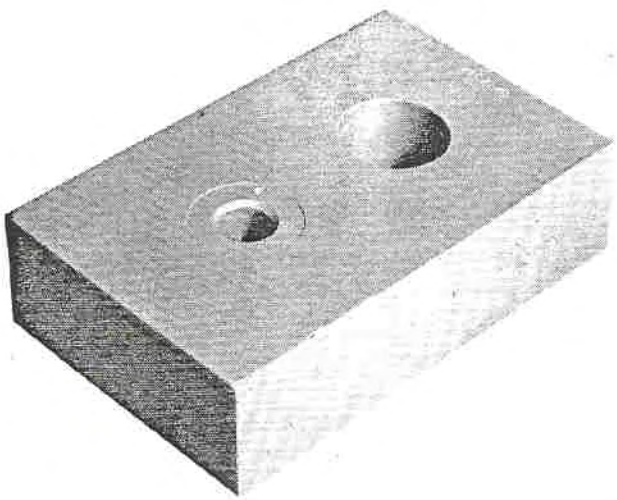
821730—BOGIE WHEEL SUPPORT PLATE

Used to remove the bogie wheel from the bearing housing and shaft after the assembly has been removed from the vehicle. Used also, for removal of the crankshaft bearings.



821732—BEARING AND SEAL TOOL

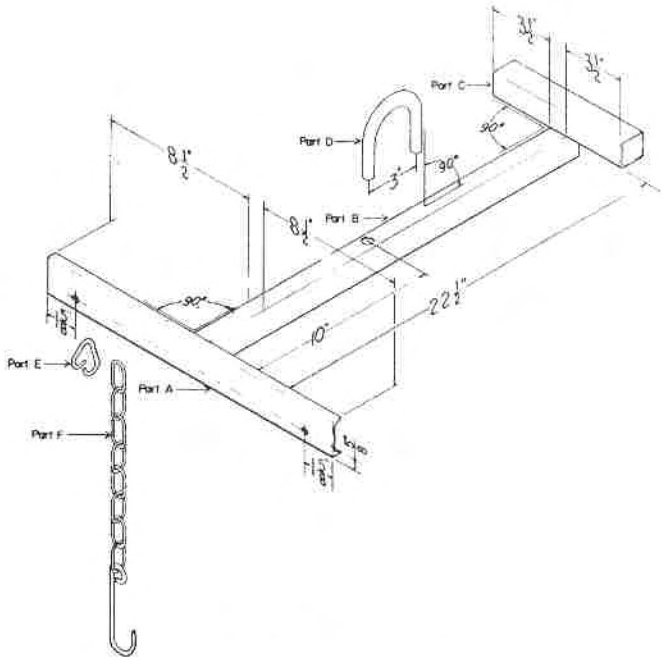
Used with 821731 to remove and install bogie wheel bearing and seal into housing.



821731—BEARING, SEAL AND WHEEL SUPPORT PLATE

Used to remove and install bearing and seal into housing and install bogie wheel on bearing and housing assembly.

817830 - CONE and 817829 DRIVER
Used together to install wrist pin retainer



POWER TRAIN LIFT BAR

MATERIALS:

PART A	2 x 9/16 x 3/16 Channel	18" Long	1 Required
PART B	1½ x 1 x 16 ga. Tube	23¾" Long	1 Required
PART C	1½ x 1½ x 12 ga. Tube	8" Long	1 Required
PART D	½" Rod	10" Long	1 Required
PART E	CUSHMAN Part 809221		2 Required
PART F	CUSHMAN Part 809222		2 Required

CONSTRUCTION:

Drill two 7 1/16" holes in Part A 1 5/8" in from both ends and 5/8" up from bottom. Weld Part A to Part B. Part B should be 8½" in from both ends of Part A and at 90° to Part A. Weld Part C to Part B 22½" back from Part A. Part B should be 3½" in from both ends of Part C and at 90° to Part C. Bend Part D in the center so the legs are approximately 2¾" apart and parallel to each other. Drill two 17/32" holes in Part B to match the legs of Part D with the front hole 10" back from Part A. Weld Part D to Part B with legs of Part D ¼" to 3/8" into Part B and Part D at 90° to Part B. Attach Parts E and F to Part A.

FLOTATION RING — REMOVAL AND REINSTALLATION

Removal

Remove the 22 retaining screws and gradually work the flotation ring up and off of the vehicle body.

Using acetone, lacquer thinner or similar solvent, remove the old sealer from the vehicle body. It is not necessary to remove the sealer from the flotation ring.

Installation

Apply a bead of sealer No. 822311 approximately 5/16'' in width along both side edges and across the rear edge of the vehicle body (Figure 1). Apply two

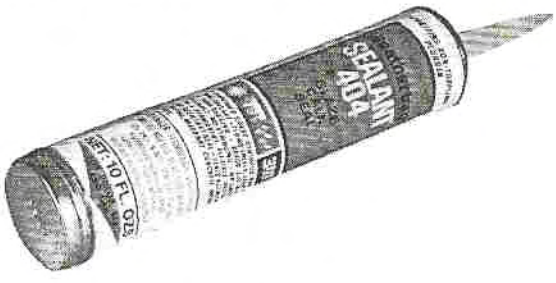


Fig. 1

beads of sealer approximately 5/16'' wide across the front of the vehicle body. Be sure each mounting hole is encircled with sealer (Figure 2).

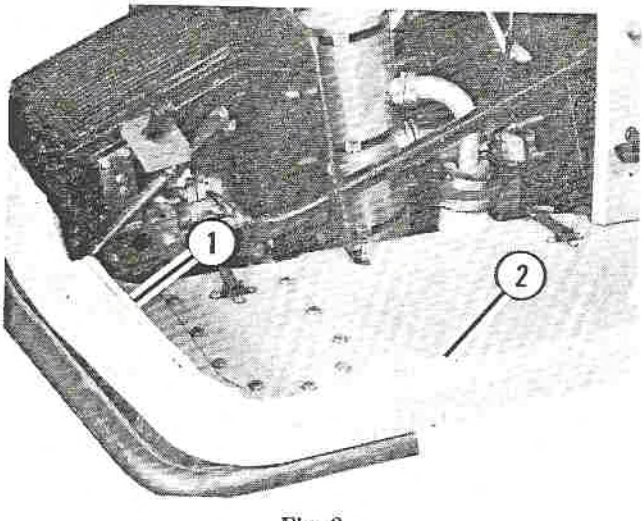


Fig. 2
1. Double Bead .2. Mounting Hole

Place the flotation ring into position on the vehicle body and apply from 160 to 200 pounds of weight at one corner. Install three side screws and three end screws alternately from side to end. Torque the screws to 5½ ft-lbs. Move the weight to the remaining corners and repeat the screw installation procedure.

Flotation must be installed water tight. Water test the vehicle to be sure there are no leaks before a long period of water navigation is attempted.

Tread Step Replacement

Thoroughly clean the body area where the tread step is to be installed with acetone. A tread step will not adhere to an uncleaned surface. Peel the backing off the new tread step being careful not to touch the adhesive back. Secure to the body by tapping the entire tread step lightly with a rubber mallet.

ADDITIONAL DRAIN PLUGS

Any number of drains may be utilized. Check desired location for obstructions underneath. Drill a 1'' hole and use plug, Part No. 821274. Figure 3 shows a drain in the driver's area.

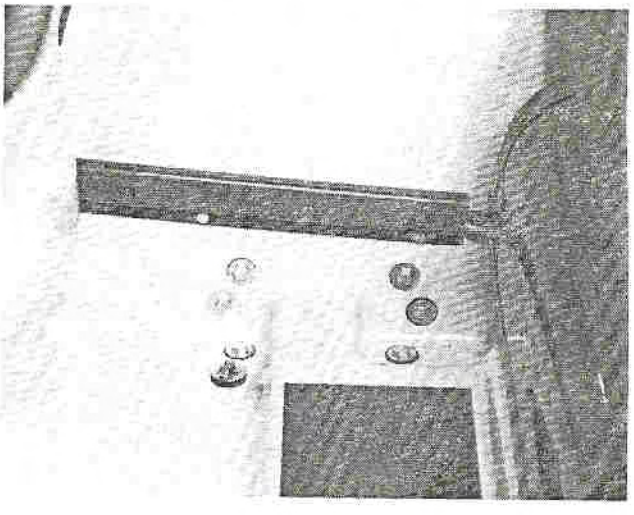


Fig. 3

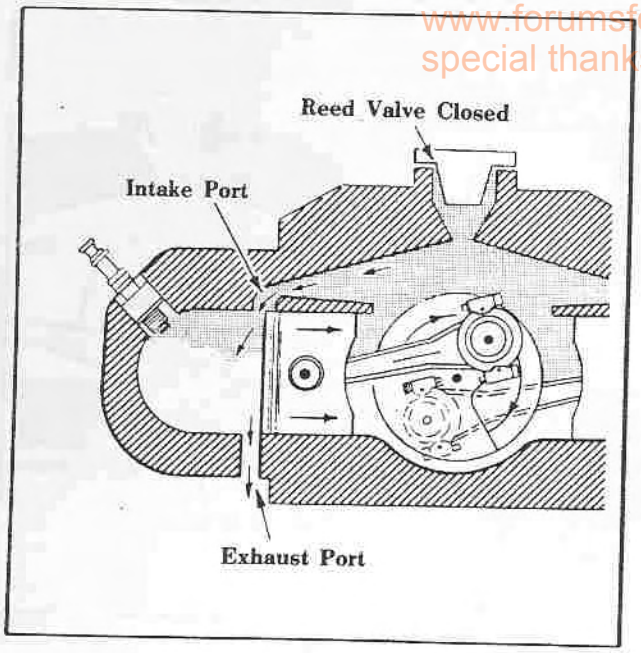


Fig 4

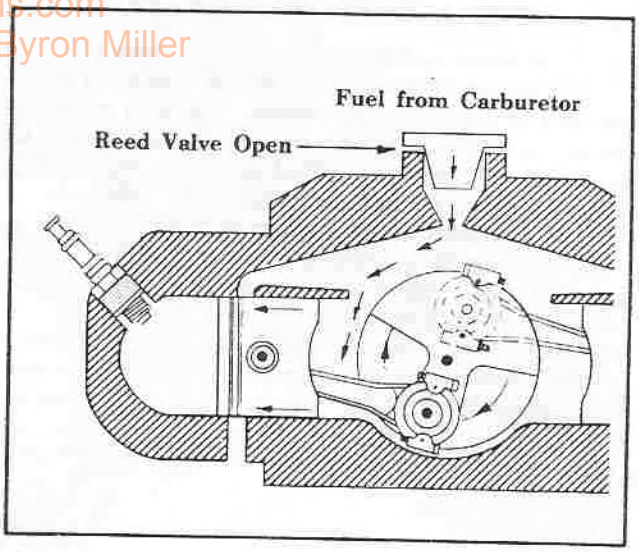


Fig. 5

FACTORS AFFECTING PERFORMANCE

In the normal operation of an engine, the operator may not be fully aware of the decrease in performance which takes place slowly over a long period of time. Economical, trouble-free operation can best be assured if a complete tune-up is performed at least once each year.

It is seldom advisable to attempt to improve performance by correcting one or two items only. Time will be saved and more lasting results obtained by following a definite and thorough procedure of analysis and by correcting all items affecting power and performance.

Fuel System

A fresh fuel mixture, with the correct ratio of oil and gasoline, is necessary for peak engine performance. The tank should be removed, emptied of old fuel, rinsed out, installed and refilled with a fresh supply at every tune-up. A stale fuel mixture may cause hard starting, stalling, and faulty operation. Inadequate fuel delivery, as the result of a faulty fuel pump or clogged filter, will affect high-speed performance. Incorrect carburetor needle adjustments may cause operating difficulties at any speed. Faulty choke operation or incorrect use of the manual choke by the operator may cause hard starting, rough running, or poor fuel economy.

Ignition System

Spark plugs having the proper heat range are very important for peak performance of the engine. See Electrical System Section for a complete description of spark plugs. A weak spark, which may be the result of faulty ignition system components, will cause hard starting, misfiring, or poor high-speed performance. The spark plugs and ignition system components are frequently checked first in a tune-up because of their importance to the operation of the engine.

Compression

Compression must be well sealed by the piston and piston rings in the cylinder to realize maximum power. A compression check is important because an engine with low or uneven compression cannot be tuned successfully to give peak performance. It is essential that compression be checked before proceeding with an engine tune-up.

An automotive-type compression gauge may be used as follows: Make certain that choke is in, throttle is wide open, and both spark plugs are removed. Turn the engine over quickly three or four times with the manual starter. Compression should be 100 pounds minimum with not more than 15 pounds difference between cylinders. An engine with portions of the piston skirts broken will, in some cases, indicate good compression readings. Good piston skirts are essential for proper port timing. A visual inspection of the piston skirts can be made by removing the intake manifold and reed plate assembly.

COMPRESSION

The piston and its rings perform two functions. They compress the mixture of fuel and air in the cylinders before ignition and receive the force of the power after ignition. For maximum compression, the cylinder must be round and the piston and piston rings correctly fitted to it. The rings must be properly seated in the ring grooves and free to expand against the walls of the cylinder. The rings will not retain the force of combustion if the pistons and cylinder walls are excessively worn, scored, or otherwise damaged, or if the rings become stuck in grooves because of carbon accumulation. Escape of compression past the piston rings is referred to as "blow-by" and is indicated by discoloration or carbon formation on the piston skirt.

Cylinder bores normally wear with operation of the engine. The degree of wear will vary with length of operation, efficiency of lubrication, and general condition of the engine. Excessive cylinder wear results in loose fitting pistons and rings causing blow-by, loss of compression, loss of power and inefficient performance.

Piston rings are formed in such a manner that when installed on the piston, they bear against the cylinder wall with a light, even pressure. Excessive ring pressure against the cylinder wall increases friction, causing high operating temperature, sluggish performance, and abnormal wear or scoring. Insufficient pressure allows blow-by, which reduces power and causes overheating and carbon formation on the piston skirt (Figure 6).

Since the ring tends to flex as it follows the cylinder contour during engine operation, clearance or gap must be provided between the ring ends to prevent butting. The ring gap also allows the ring to expand (elongate) as engine temperature rises during operation. Insufficient gap clearance will cause the ring to bend or warp as it flexes and expands; excessive gap clearance will permit loss of compression.

Compression leakage may also occur at the spark plugs. A cracked spark plug insulator will cause similar trouble. Although compression is primarily dependent on the piston, rings and cylinder, these other sources of leakage should be investigated when compression loss is noted.

Compression may also be affected by the fuel induction and exhaust systems. Since the fuel vapor is first compressed in the crankcase, leakage here will affect engine performance. Possible trouble spots include reed valve assemblies, seals between crankcase halves, and crankshaft bearing seals. Exhaust ports and pipes which have become clogged because of excessive deposits of carbon will hinder the efficient transfer of exhaust gases.

Excessive carbon buildup on piston heads or elsewhere in the cylinder walls can result in a loss of power.

Following the trouble check chart provided at the end of this section and the recommended tune-up procedures given in this section will assure that all areas affecting fuel induction, compression, and exhaust will be considered as part of every trouble shooting procedure. An engine with low or uneven compression cannot be successfully tuned for peak performance. It is essential that improper compression be corrected before proceeding with an engine tune-up.

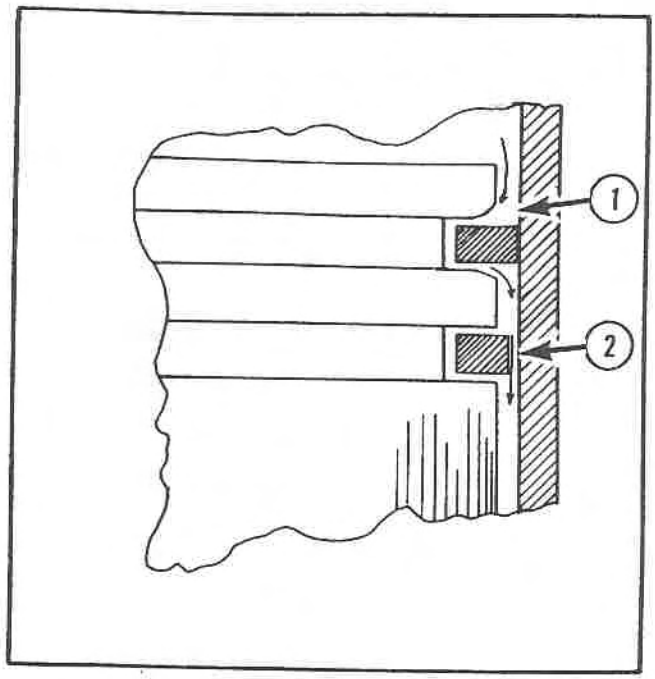


Fig. 6
1. Worn Ring Grooves
2. Worn Ring or Carboned Ring and Groove

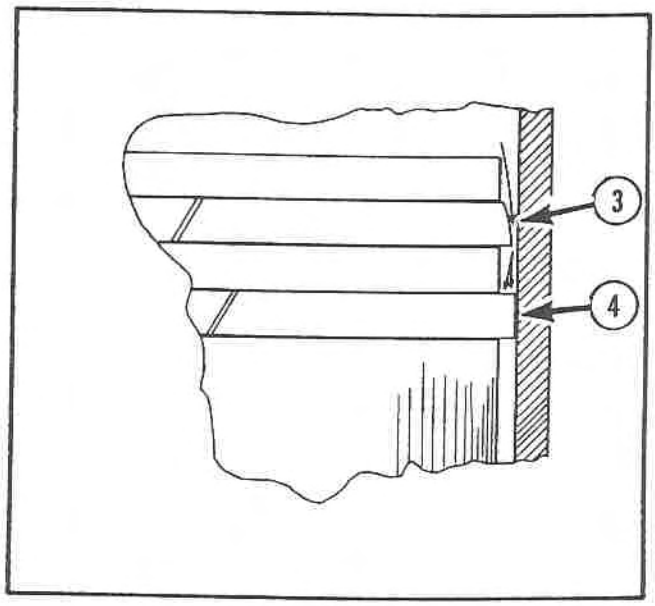


Fig. 7
3. Worn Ring (Rounded Edge)
4. Good Ring (Square Edge)