



RUPPSTER SERVICE MANUAL



\$2.50

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SECTION 1
INTRODUCTION

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SECTION 1 INTRODUCTION

A. GENERAL

The *Ruppster Baja 230* inherits the best of all the fun features built into a light, compact, versatile vehicle. Low-slung, it hugs the turf like a kart, and has a tough kart-type frame under its mini-dune, Rupp-red body.

1. 230cc 2-cycle engine kicks the Baja 230 along over all kinds of terrain.
2. ABS body is light, durable and formulated to take the toughest punishment.
3. Padded polyfoam seats and pleated naugahyde upholstery iron out the bumps.
4. Rugged sports car type rack and pinion steering with automotive tie-rod ends for safe, positive control.
5. Accelerator pedal - delivers power to get you over the humps with ease.
6. Pedal-controlled rear hydraulic-disc brake - for quick, sure stops and holding.
7. Super-wide low-pressure (4 psi) Knobbies - 21 x 11 tires on 8" wheels.

VITAL STATISTICS

Transmission - driven by sealed gearbox and infinite speed ratio Rupp torque converter to handle all terrain and load requirements.

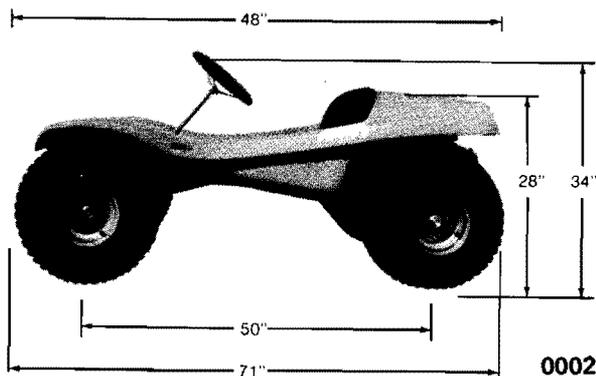
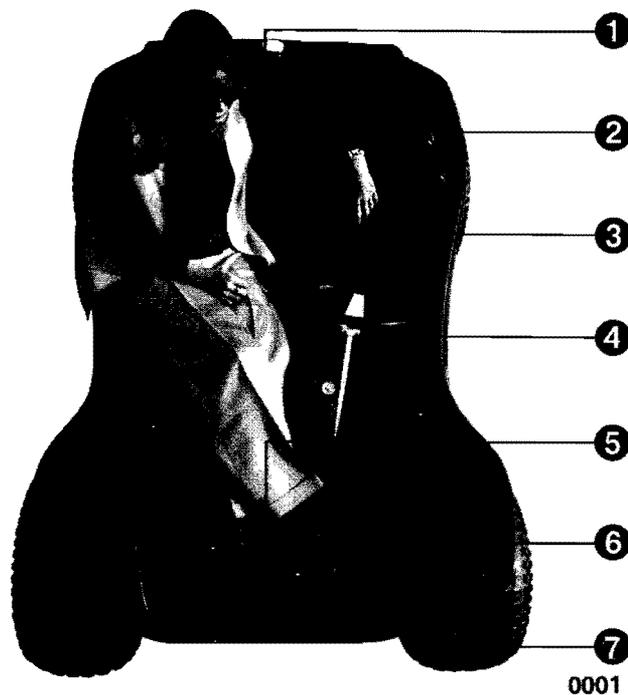


FIG. 1

Engine - 230cc, JLO 2-cycle. Offered in electric or manual starting models.

Top speed, climb - capable of 40 mph, depending on terrain. Climbs 45-degree slope.

Turning radius - 10-ft. turn radius for close cornering.

B. STARTING AND INITIAL CHECK-OUT PROCEDURE

The following procedure must be followed on initial set up of the Ruppster.

1. Install steering wheel on steering column.
2. Check "lug" nuts holding wheels to hubs.
3. Check tire pressure, and adjust to 2-1/2 lbs. per sq. in. in front, 3 lbs. per sq. in. rear. Tires are supplied with 4PSI and may be run at this setting if only hard surfaces will be run on.
4. Check carburetor throttle shutter operation as follows:
 - a) Depress throttle pedal all the way to the floor stop.
 - b) Check that the throttle shutter arm is all the way to the wide open throttle carburetor stop. If not, adjust the cable at the carburetor.
 - c) Release the throttle pedal and be sure the throttle shutter returns to the idle set stop.
5. Mix your fuel in a 20:1 ratio - i.e. 1 qt. of 2 cycle air cooled engine oil to every five gallons of gasoline. Low leaded automotive gas is highly recommended; otherwise, regular grade automotive. **Note. Be sure to mix well.**
6. Fill Ruppster gas tank.
7. Remove 2 nuts in rear wheel wells holding seat back in place.
8. Remove seat back.
9. Remove air cleaner by removing wing bolt in center of air cleaner cover.
10. Squirt small amount of gasoline in tube to carburetor throat to prime carburetor. Replace air cleaner.
11. Turn ignition key to the on position (first position in a clockwise direction).
12. Set parking brake on brake pedal.
13. Advance throttle, pull choke out and pull re-coil starter. When engine fires, push choke in slowly. Engine may run a short time and stall, due to the filling of the gasoline line and filter. Should this occur, it should only be necessary to choke and re-start.

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A. VEHICLE OPERATION

STEERING (FIG. 2, ITEM 1)

The Ruppster steering is controlled by the steering wheel. The rack and pinion steering system provides a 10-foot turning radius.

THROTTLE (Fig. 2, ITEM 2)

Engine speed is controlled by the accelerator pedal, which is on the right-hand side of the steering column. Pushing the pedal towards the front of the vehicle will engage the transmission and provide forward motion or an increase in speed. When foot pressure is released, the engine speed will decrease to the idle speed setting and the transmission will return to neutral.

BRAKE (FIG. 2, ITEM 3)

The brake pedal is located on the left-hand side of the steering column and incorporates a parking brake in the pedal linkage.

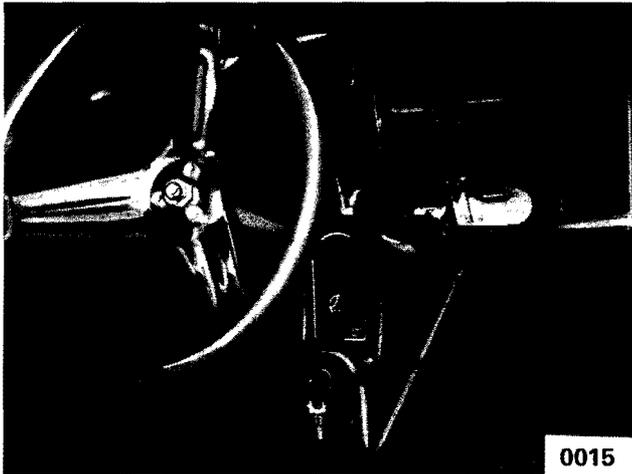


FIG. 2

STARTING

The following items should be checked prior to starting the engine, or if in regular use, once a day.

- a) Fuel tank full.
- b) Tire air pressure 2-3 psi front, 3-4 psi rear, depending on the terrain and load.
- c) Gear Box oil level. (Bottom of inspection hole).
- d) Brake adjustment and linkage.
- e) Carburetor controls (choke & throttle).

START UP (FIG. 1, ITEM 4)

1. **MANUAL START** - Set parking brake and turn ignition switch (Fig. 2, Item 4) to "on" position. At the rear of the vehicle, pull choke lever to "on" position and pull the handle on the rope rewind starter until a slight resistance is felt then pull firmly. Do not pull the starter rope to end of travel and prevent it from snapping back. It may be necessary to repeat starting action several times if the engine has not been run for some time. To avoid flooding the engine with fuel, pull twice with choke on, then return choke to off position, and repeat starting action.

2. **ELECTRIC START** - Push choke control to on position, depress throttle pedal slightly and turn ignition switch to START position. Exercise caution as too much throttle will engage clutch and put the vehicle in motion unexpectedly. Prolonged use of the choke will cause engine flooding so return choke lever to off position after engine starts or after a few turns of the starter motor.

3. **WARM UP** - Allow the engine to warm up slightly before putting the vehicle in motion. This is done while slowly returning the choke to the "off" position.

OPERATION

Once the engine is warmed up, the Ruppster is set in motion by depressing the throttle pedal. If the parking brake has been set for starting purposes, it must be released at this time. Once under way, the transmission will automatically shift for varying operating conditions and the operator needs only to operate the throttle. Releasing the throttle will put the transmission in neutral. There is very little "engine braking" so it is necessary to utilize the brake pedal for most slowing and stopping situations.

DRIVING

The Ruppster is ready for operation when delivered by your dealer but special consideration is required during initial operation. Full throttle driving should be avoided for the first five or six hours and sustained periods of full throttle should be avoided for the first 10 hours.

During this period many parts are seating themselves and may require adjustment as outlined in the maintenance section plus a general tightening of fasteners.

STOPPING

To stop the engine turn the ignition key to the off position. The parking brake should be set whenever the machine is unattended.

B. TWO CYCLE ENGINE FUNDAMENTALS

Engines used today are basically similar. All are known as "Internal Combustion" engines.

The source of power is heat formed by the burning of combustible mixture, in this case a petroleum product and air. In the reciprocating engine this burning takes place in a closed cylinder containing a piston, which is moved up and down in the cylinder by a crankshaft and connecting rod.

The internal combustion engine must perform the following cycle of events to operate.

1. **INTAKE:** Piston on the down stroke forces the fuel-air mixture from the crankcase into the combustion chamber through the transfer ports. (Fig. 3)
2. **COMPRESSION:** Piston on the up stroke compresses the fuel-air mixture in the combustion chamber, and creates a lower than atmospheric pressure in the crankcase, which draws air through the carburetor picking up fuel and entering the crankcase. (Fig. 4)
3. **POWER:** Piston at T.D.C. and ready for the down stroke. The spark plug ignites the compressed fuel-air mixture, causing an explosion, forcing the

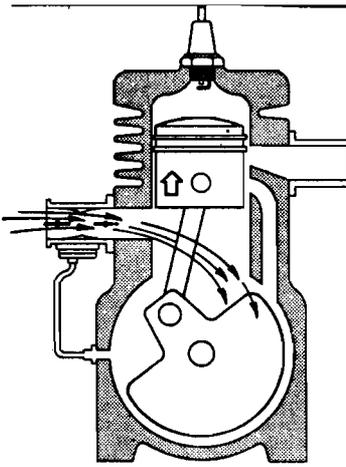


FIG. 3

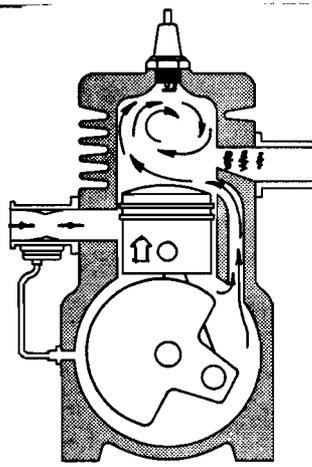


FIG. 4

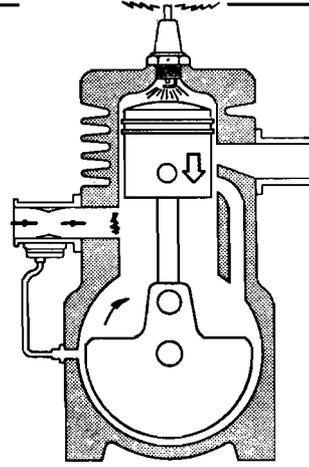


FIG. 5

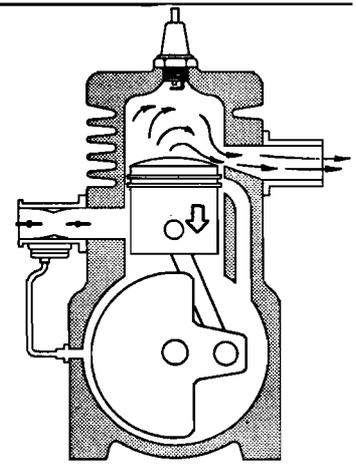


FIG. 6

piston down thus transmitting power to the crankshaft. (Fig. 5)

4. EXHAUST:

As the piston is on the down stroke, it uncovers the exhaust port in the cylinder wall allowing the exhaust gasses to be forced out of the combustion area. (Fig. 6)

In two-stroke engines, the piston is used as a sliding valve for the cylinder intake and exhaust ports. The intake and exhaust ports are both open when the piston is at the bottom of its downward stroke (bottom dead center or "B.D.C."). The exhaust port is open to atmospheric pressure; therefore, the fuel-air mixture must be elevated to a higher than atmospheric pressure in order for the mixture to enter the cylinder. As the crankshaft is turned from B.D.C. and the piston starts on its upward stroke, the intake and exhaust ports are closed and the fuel-air mixture in the cylinder is compressed. When the piston is at or near the top of its upward stroke (top dead center or "T.D.C."), a spark across the electrode gap of the spark plug ignites the fuel air mixture. As the crankshaft turns past T.D.C. and the piston starts on its downward stroke, the rapidly burning fuel-air mixture expands and forces the pistons downward. As the piston nears the bottom of its downward stroke, the cylinder exhaust port is opened and the burned gases exit the open port.

Slightly further downward travel of the piston opens the cylinder intake port and a fresh charge of fuel-air mixture is forced into the cylinder. Since the exhaust port remains open, the incoming flow of fuel air mixture helps clean (scavenge) any remaining burned gaseous products from the cylinder. As the crankshaft turns past B.D.C. and the piston starts on its upward stroke, the cylinder intake and the exhaust ports are closed and a new cycle begins.

Since the fuel-air mixture must be elevated to a higher than atmospheric pressure to enter the cylinder of a two-stroke engine, a compressor pump must be used. Coincidentally, downward movement of the piston decreases the volume of the engine crankcase. Thus, a compressor pump is made available by sealing the engine crankcase and connecting the carburetor to a port in the crankcase. When the piston moves upward, volume of the crankcase is increased which lowers pressure within the crankcase to below atmospheric. Air will then be forced through the carburetor, where fuel is mixed with the air, and on into the engine crankcase. In order for downward movement of the piston to compress the fuel-air mixture in the crankcase, a valve

must be provided to close the carburetor to crankcase port. To accomplish this, the piston is utilized as a sliding carburetor crankcase port (third port valve).

A transfer port connects the crankcase compression chamber to the cylinder intake port through which the compressed fuel-air mixture in the crankcase is transferred to the cylinder when the piston is at bottom of stroke.

Due to rapid movement of the fuel-air mixture through the crankcase, the crankcase cannot be used as a lubricating oil sump because the oil would be carried into the cylinder. Lubrication is accomplished by mixing a small amount of oil with the fuel. The engine lubricating oil is carried through the crankcase and eventually is forced into the combustion chamber where it is burned. This is why the recommended fuel-oil ratio should be strictly observed.

C. CARBURETOR FUNDAMENTALS

OPERATING PRINCIPLES

The carburetor function on a spark-ignition engine is to atomize and mix fuel in proper proportions with air flowing to the engine intake port or intake manifold. Carburetors used on engines that are to be operated at constant speeds and under even loads are of simple design since they only have to mix fuel and air in a relatively constant ratio. On engines operating at varying speeds and loads, carburetors must be more complex because different fuel-air mixtures are required to meet varying demands of the engine.

Fuel-Air Mixture Ratio Requirements

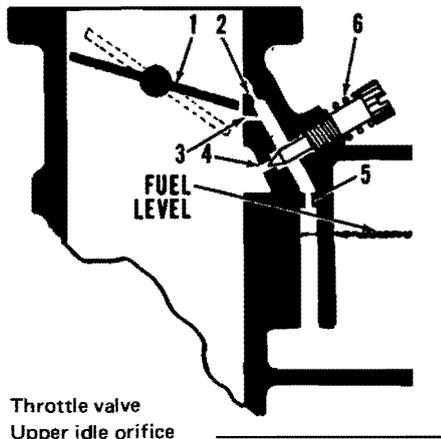
To meet the demands of an engine being operated at varying speeds and loads, the carburetor must mix fuel and air at different mixture ratios. Fuel-air mixture ratios required for different operating conditions are approximately as follows:

	<u>Fuel</u>	<u>Air</u>
Starting, cold weather	1 lb.	7 lbs.
Accelerating	1 lb. ^{>}	9 lbs.
Idling (no load)	1 lb.	11 lbs.
Part Open throttle	1 lb.	15 lbs.
Full load, open throttle	1 lb.	13 lbs.

Basic Design

Carburetor design is based on the venturi principle which simply means that gas or liquid flowing through a

D. IGNITION AND CHARGING FUNDAMENTALS



1. Throttle valve
2. Upper idle orifice
3. Lower idle orifice
4. Air metering orifice
5. Idle fuel jet
6. Idle mixture needle

FIG. 7

necked-down section (venturi) in a passage undergoes an increase in velocity (speed) and a decrease in pressure as compared to the velocity and pressure in full size sections of the passage.

A simple carburetor which relies only on the venturi principle will supply a progressively richer mixture as engine speed is increased, and will not run at all at idle speeds. The carburetor must be modified if the engine is to perform at varying speeds. The first step in modification is usually the addition of a separate fuel mixing and metering system designed to operate only at slow engine speeds. A representative idle system is shown in Fig. 7. An idle passage is drilled in the carburetor body leading from the fuel chamber to the air horn at the approximate location of the throttle valve (1). When the throttle valve is closed, the air flow is almost shut off. This reduces pressure in the inlet manifold, and therefore the density of the charge in the combustion chamber. The pressure drop at the venturi ceases to exist, and fuel cannot be drawn from the main fuel nozzle. The high manifold vacuum above the throttle valve (1-Fig. 1) draws fuel up the idle passage through idle jet (5) then through primary idle orifice (2) into the intake manifold. At the same time, air is being drawn through the secondary idle orifice (3) and air metering orifice (4) to mix with fuel in the idle passage. The sizes of the two orifices (2 and 3) and the idle jet (5) are carefully calculated and controlled. The amount of air passing through metering orifice (4) can be adjusted by the idle mixture adjusting needle (6) to obtain the desired fuel-air mixture for smooth idle.

When throttle valve (1) is opened to a fast idle position (as indicated by the broken lines) both primary and secondary idle orifices (2 and 3) are subjected to high manifold vacuum. The incoming flow of air through secondary orifice (3) is cut off, which increases the speed of fuel flow through idle jet (5). This supplies additional fuel needed to properly mix with the greater volume of air passing around the throttle butterfly valve. As the throttle valve is further opened and edge of valve moves away from the idle orifices, the idle fuel system ceases to operate and fuel mixture is again controlled by the venturi of the main fuel system.

In many applications, the main fuel system and idle system will supply the fuel requirements for all operating conditions.

MAGNETO OPERATING PRINCIPLES

In a magneto ignition system, energy contained in permanent magnets is converted to electrical energy. A brief description of operating principles is as follows:

When an electrical current passes through a conductor a magnetic field builds up around the wire.

When a magnetic field cuts across the path of a conductor an electric current is induced in the conductor.

When the conductor is straight or the magnetic field constant, nothing much happens, but if the wire (conductor is coiled, the minute current can be multiplied until its effect is significant.

The effect of the magnetic lines of force can be utilized by moving the conductor through the magnetic field, moving the field across the conductor or causing the field to collapse by interrupting the production of electrically induced magnetism.

Fig. 8 shows a typical magneto flywheel with magnets in place. North-South magnets are alternately placed around the flywheel rim. The lines of force are dispersed as they flow through the air but are concentrated in flywheel rim as they complete the field.

When the laminated magneto armature containing the coils is placed inside the flywheel, the magnetic field is concentrated in the armature as shown in Fig. 9. As the flywheel turns and the magnets change position with relation to the coil (Fig. 10), the lines of force change direction as they pass through the coil as shown, resulting in a buildup of pulsating alternating current in the ignition primary winding (Fig. 10). This electrical current generates its own magnetic field which surrounds the many fine windings of the ignition coil secondary circuit. In order to induce high-voltage secondary current which forms spark, the breaker points open, interrupting the primary current at a pre-determined time. Point opening (or timing) must occur when the engine piston is in the proper position for best performance. Point opening must also be timed to occur when alternating primary voltage is at peak or secondary voltage will be weak and spark plug may not fire. It is impossible or impractical in the average shop to measure the alternating primary current relative to flywheel position, so proper timing for peak voltage is determined by design engineers and becomes a service specification variously referred to as **Edge Gap**, **Break Away Gap** or **Pole Shoe Break**. Fig. 11 shows a typical method of measurement between leading edge of pole shoe laminations and trailing edge of magnets.

Energy is transferred from the magneto to an external secondary coil.

In electric start units, a second generating coil is added to provide electrical power to charge the battery.

ALTERNATOR

The electrical system functions to provide energy for charging a 12 volt storage battery for electric starting. An alternator coil attached to the stator plate also uses the magnetic field or permanent magnets in the flywheel. By alternate placement of north-south poles in relation to the coil, alternating current is induced in alternator coil windings. The leads from the alternator go to a rectifier to convert the alternating current to direct current for battery charging. (Fig. 12)

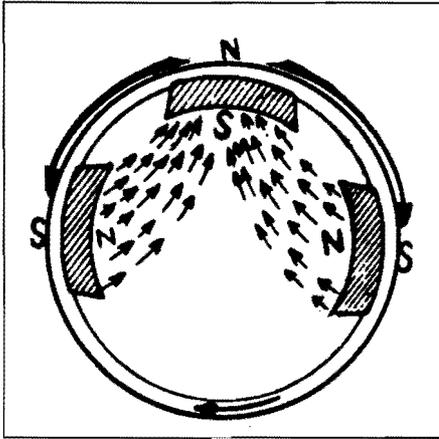


FIG. 8

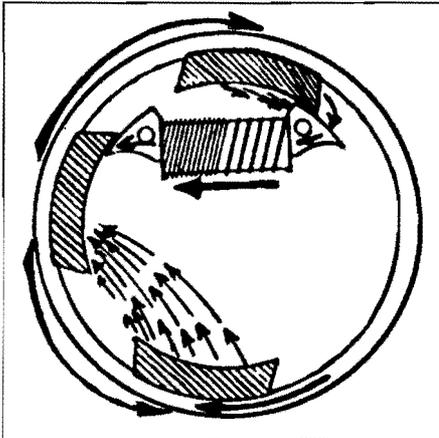


FIG. 9

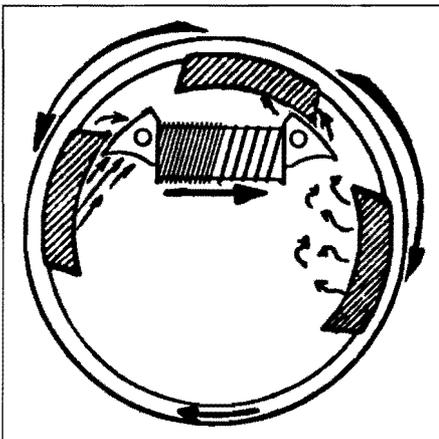


FIG. 10

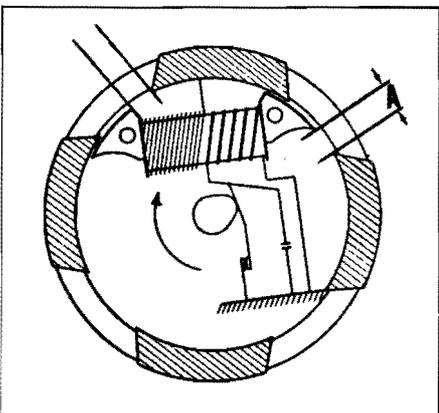


FIG. 11

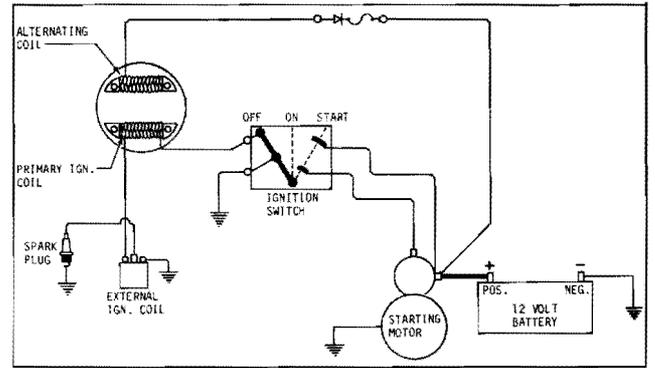
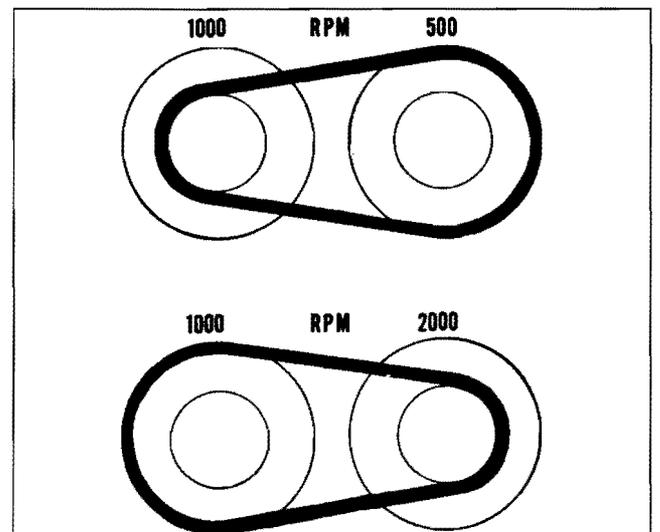


FIG. 12

E. TORQUE CONVERTER FUNDAMENTALS

The "automatic" part of the power transmission system is all taken care of by a pair of variable circumference pulleys and an incredibly strong, flexible belt that transfers power from one pulley to the other. The initial, or drive, pulley keys to the engine's crankshaft. The driven pulley is mounted on the differential pinion shaft. At low RPM the drive pulleys flanges are spread apart, consequently, if the belt is turning at all, it is turning at low speed. As engine speed increases, centrifugal force acts on weights outboard of the moveable flange forcing it closer to the fixed flange; effectively the circumference increases, increasing the speed of the belt.

The driven pulley works centrifugally too, but exactly opposite from the drive pulley. Its job is to change the direction of the power flow and transmit it to the axle-driving differential. At low speed the driven pulleys flanges are close together; consequently it rotates slowly relative to the speed of the belt. Then, as engine and belt speed increases, centrifugal force spreads the flanges of the driven pulley farther and farther apart, increasing the speed of the pulley. So: when the engine is running wide open and the Ruppster is operating at maximum speed, the drive pulley is at its largest circumference (measured, of course, where the belt operates), and the driven pulley at its smallest. It is a simple and effective system that offers an infinite number of ratios and an infinite number of variations in the torque transmitted.



Schematic view of drive unit with fixed distance shaft centers and variable effective diameter of both sheaves. With constant input speed of 1000 rpm, output shaft speed can be infinitely varied from 2:1 underdrive to 1:2 overdrive as shown. Almost any desired ratio can be obtained.

FIG. 13

SECTION 3
TROUBLE SHOOTING CHARTS

INDEX

A. VEHICLE	3-1
B. ENGINE	3-2

A. VEHICLE

<u>SYMPTOM</u>	<u>CAUSE</u>	<u>CURE</u>
INOPERATIVE BRAKES	Hydraulic Reservoir Empty Hydraulic Line Ruptured Brake Pads Worn	Refill and Bleed Brake Replace Replace
IMPROPER HANDLING	Wrong Tire Pressure Alignment Out of Adjustment Tie Rod Bent	Check Tires Alignn Front Wheels Replace
POOR PERFORMANCE	Torque Converter Belt Worn	Replace
<p>NOTE: ALL DIFFERENTIAL SERVICING OTHER THAN FLUID CHECKS SHOULD BE PERFORMED BY AN AUTHORIZED RUPP DEALER.</p>		

SECTION 3
TROUBLE SHOOTING CHARTS
B. ENGINE

ENGINE WILL NOT START		
1. No ignition spark:	Spark plug oiled up, defective or shorted Ignition cable loose or broken Contact points oiled up, corroded or filled with dirt Ignition coil faulty Condenser Faulty	Replace Repair or replace Clean or replace Replace Replace
2. Engine not getting fuel:	No fuel in tank Fuel line kinked or pinched Carburetor Jets blocked Pulse line from crankcase plugged or leaking Fuel Filter plugged	Fill tank Re-route Clean Jets Check carburetor & manifold gaskets Replace
3. Lack of compression:	Cylinder head loose Piston rings broken Piston & Cylinder excessively worn	Dealer Repair Dealer Repair Dealer Repair
ENGINE POWER DWINDLES		
1. Lack of compression:	Cylinder head loose Piston rings broken Piston & Cylinder excessively worn	Dealer Repair Dealer Repair Dealer Repair
2. Due to dirt:	Air cleaner clogged Exhaust port clogged	Clean or replace Clean
OTHER ENGINE TROUBLES		
1. Irregular running:	Ignition cable loose or damaged Contact points oiled up or clogged Over-heated engine causing fuel vapor to form in carburetor Fuel Filter Plugged Carb. Set Too Lean	Repair or replace Clean Allow engine to cool & clean engine cooling fan (behind recoil starter) Replace filter Adjust
2. Engine "four-strokes":	Choke is on Carburetor main jet adjustment too rich Air Filter Plugged	Turn choke off Turn main jet in 1/16th of a turn at a time & check by running Replace air-filter
3. Engine backfires:	Carburetor main jet adjustment too lean Spark plug bridged, dirty, or defective Engine has intake air leak	Turn main jet out until engine "Four-strokes" then turn in 1/16th of a turn Replace plug Check or replace intake gaskets
4. Overheated engine: Piston jams:	Carburetor main jet adjustment too lean Fuel Filter Plugged Fuel Line Kinked	Allow engine to cool, turn main jet out until engine "Four-strokes" then turn in 1/16th of a turn Replace filter Re-route line

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A. PERIODIC MAINTENANCE AND LUBRICATION CHARTS

<u>FREQUENCY</u>	<u>CHECK POINT</u>	<u>PROCEDURE</u>
25 HOURS	Differential Oil Level at Inspection Hole	Fill to Inspection Hole With SAE 90 Gear Oil See Sec. # 5.
25 HOURS	Front Wheel Alignment	See Section 5 - H
25 HOURS	Torque Converter Belt Wear	If Belt is Frayed or Performance is down, Change Belt
25 HOURS	Air Filter	Tap on Flat Surface Lightly to Clean - Change if Clogged Permanently
25 HOURS	Brake Fluid Level	Maintain Fluid Level to within one-half inch of cover Plate with Automotive Brake Fluid
25 HOURS	Tire Air Pressure	Maintain: Minimum 2½ lbs. Front, 3 lbs. Rear. Increase by 1 lb. for severe usage.
50 HOURS	Front Wheel Bearings	Repack with Wheel Bearing Grease
50 HOURS	Steering Box	Coat gears with Wheel Bearing Grease
50 HOURS	Torque Converter Shafts	Coat moving parts (except flange) with wheel bearing grease
AS REQUIRED	Brake and Throttle Pedals	Oil Pivot Points - SAE 30
AS REQUIRED	Front Sprindle Pivots	Oil Pivot Points - SAE 30
25 HOURS	Spark Plug	Clean, Check Gap, Adjust if necessary to .018".
25 HOURS	Engine Cooling Fan	Remove Debris and Check for unobstructed Air Flow
25 HOURS	All Fasteners	Check for tightness
50 HOURS	Carburetor	Check all Fittings for Possible Leaks. Check Throttle Control for Smooth Operation.
AS REQUIRED	Ignition Timing	Check Point Gap-.016". Check Timing-.091 - .126 BTDC. Lubricate Felt Pad.
AS REQUIRED	Exhaust System	Check for Carbon Build-up.
AS REQUIRED	Fuel Filter	Change once a year or sooner if accumulation is apparent.

B. VEHICLE GENERAL MAINTENANCE

FUEL

The high performance two-cycle air cooled engine in the Ruppster uses a 20:1 gasoline to oil fuel mixture.

Gasoline: A regular grade of a good automobile gasoline. **CAUTION: Do not use naphtha, methanol or other fuels.**

Oil: Use a known brand of SAE 40W MS grade automotive oil or a well known motor cycle or snowmobile oil. **CAUTION: Do not use two-cycle outboard motor oil.**

FUEL MIXING PROCEDURE

Thoroughly mix 1 quart of oil to five U.S. gallons of gasoline in a clean separate container (Fig. 14). Measure gasoline and oil accurately. Pour a small amount of gasoline into the container and add about the same amount of oil. Shake or stir vigorously to insure mixing completely. Add balance of oil and gasoline and mix again. **CAUTION: At temperatures below freezing more care in mixing must be taken to get a good mixture.**

After mixing the fuel pour it into the Ruppster fuel tank. Cleanliness is extremely important in mixing fuel. Even small particles of dirt can cause carburetor trouble. Always use fresh gasoline. Gum and varnish deposits found

in old gasoline may cause carburetor trouble and spark plug fouling.



FIG. 14

SECTION 4 MAINTENANCE

FUEL FILTER SERVICING

The Ruppster is supplied with an in-line fuel filter (Fig. 1). It should be changed once a year and may be replaced by removing clamps and pulling off lines. Be sure to install new filters with arrow in direction of fuel flow.



FIG. 1

AIR FILTER SERVICING

The automotive type paperpack air filter (Rupp P.N. 16813) is located behind the seat-back and can be checked or changed by removing the two hex-head nuts inside the rear wheel wells that secure the seat-back to the body and the seat and two rear body mount bolts (Fig. 2). Remove the seat-back from the Ruppster and then remove the wing nut that holds the filter cover in place (Fig. 3). If the filter seems to resist removal (Fig. 4), keep pulling from different locations on the filter, rather than pulling extremely hard in one location which could damage an otherwise serviceable filter.

- Recommended Filters:
1. FRAM CA-101 PL
 2. PUROLATOR AFP-21
 3. AC A176C

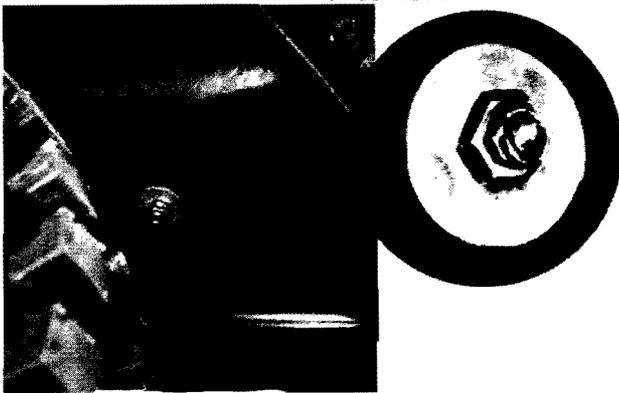


FIG. 2

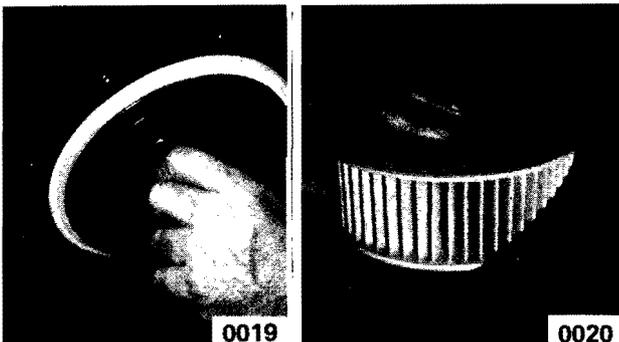


FIG. 3

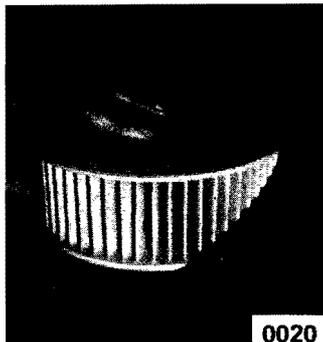


FIG. 4

To clean the filter, tap lightly on a flat, hard surface, keeping it parallel to the surface being used. If extremely dirty replace filter.

CAUTION: Do not soak in gasoline as this will break down the paper fibers and could cause deterioration of the filter which would then be drawn into the engine with the possibility of damaging results. Always replace element in the center of the cleaner so that it seals properly and tighten the wing nut.

THROTTLE ADJUSTMENT

Operate the throttle pedal to wide open position and check the carburetor for wide open throttle travel from the idle set screw to the throttle stop. If the carburetor does not go wide open:

- A) Release the foot pedal slightly and loosen carburetor lever screw (Fig. 5, Item 1).
- B) Pull the throttle cable sleeve 1/16" through the circular lever mounting hole (Fig. 5, Item 2).
- C) Retighten the lever screw and recheck for full travel.

NOTE: DO NOT ATTEMPT TO START THE MOTOR IF THE CARBURETOR THROTTLE LEVER DOES NOT RETURN TO THE IDLE SET SCREW.

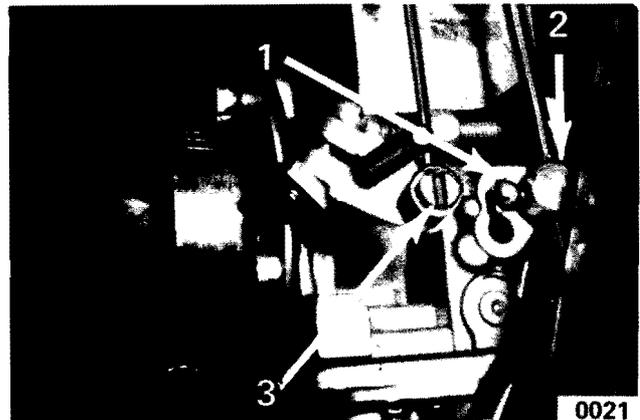


FIG. 5

CHOKE ADJUSTMENT

The choke control knob is located on the rear frame member. To close choke pull knob out. Check the choke rod on the carburetor for full travel. If choke does not close:

- A) Loosen the choke lever screw (Fig. 5, Item 3).
- B) Close choke by hand, on carburetor.
- C) Retighten choke lever screw and check for full travel.

On electric-start models, the choke control is mounted on the dashboard, right above the ignition switch. Follow the same procedure to adjust the choke.

C. ENGINE SERVICE FUNDAMENTALS

DISASSEMBLY AND ASSEMBLY

Caution must be used in repair of engines of aluminum alloy or alloy construction. Soft threads in aluminum castings are often damaged by carelessness in over-tightening fasteners or in attempting to loosen or remove seized fasteners. Recommended torque values for tightening screw fasteners should be followed closely. **NOTE:** If damaged threads are encountered, refer to "REPAIRING DAMAGED THREADS."

Heat applied to aluminum will cause it a greater expansion than steel under similar conditions. Because of different expansion characteristics, heat is usually recommended for installation of bearings, pins, etc., in aluminum castings. Sometimes, heat can be used to free parts that are seized or where an interference fit is used. Heat, therefore, becomes a service tool and application of heat a required service technique. An open flame is not usually advised because it destroys paint and other protective coatings and because a uniform and controlled temperature with open flame is difficult to obtain. Methods commonly used for heating are: 1. In oil or water, 2. With a heat oven or plate. (Fig. 6). Hot water or oil gives a fairly accurate temperature control but is somewhat limited as to size and type of part handled. Thermal crayons are available which can be used to determine the temperature of a heated part. These crayons melt when the part reaches specified temperature, and a number of crayons for different temperatures are available. Temperature indicating crayons are usually available at welding equipment supply houses.



FIG. 6

On two-cycle engines crankcase and combustion chambers must be sealed against pressure, vacuum and oil leakage. To assure a perfect seal, nicks, scratches and warp-age are to be avoided, especially where no gasket is used. Slight imperfections can be removed by using a fine-grit sandpaper. Flat surfaces can be lapped by using a surface plate or a smooth piece of plate glass, and a sheet of fine sandpaper or lapping compound. Remove only enough metal to eliminate the imperfection.

Use only the specified gaskets when re-assembling, and an approved gasket cement unless otherwise stated.

REPAIRING DAMAGED THREADS

Damaged threads in castings can be renewed by use of thread repair kits. Use of thread repair kits is not difficult, but instructions must be carefully followed. Contact your local supplier for a thread repair kit.

The simple construction of two stroke engines and benefits gained from periodic carbon removal make decarbonization a part of the recommended maintenance procedure of most two cycle experts.

Excessive carbon build-up can be harmful in two ways. First, it prevents heat from escaping normally. Second, it raises the compression ratio to create more heat. This places an additional heat load on that portion of the cylinder which is scraped clean of carbon by piston rings.

Carbon removal need is often first indicated by inability to properly adjust the carburetor. If performance is erratic and improper carburetion is indicated, but attempts to adjust carburetor fail, check first for excessive carbon

build up. No cleaning or adjustment of the carburetor can materially improve performance if exhaust passages are partially carbon blocked (Fig. 7).

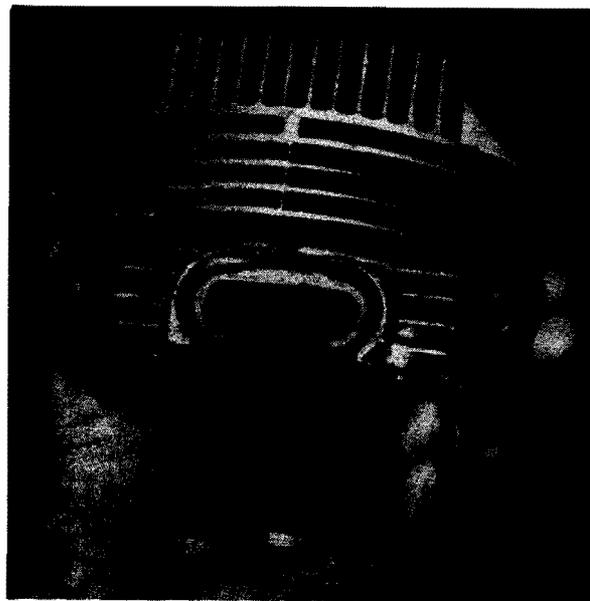


FIG. 7

No problems will be encountered in removing cylinder head and/or cylinder for carbon removal provided normal standards of care and cleanliness are observed.

Examine the parts as engine is dis-assembled for clues to engine condition, to correct possible future trouble, or identify the cause of existing trouble.

If pistons are scuffed or scored, look for metal transfer to cylinder walls. Metal transfer and score marks must be removed from cylinder walls with a hone (Fig. 8).

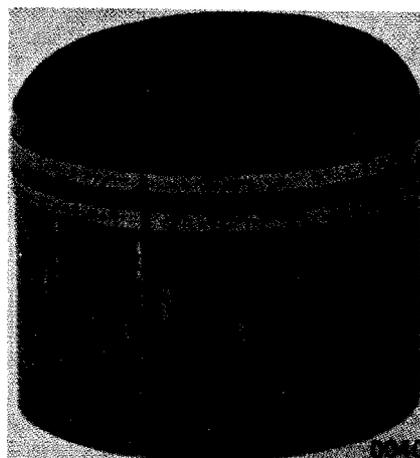


FIG. 8

Scuffing or scoring of piston above the piston pin is usually due to overheating. Damage below pin is more likely insufficient lubrication or improper fit. Overheating may be caused by a lean mixture, overloading, a damaged cooling fan or fins, air leaks in carburetor mounting gasket or manifold, blow-by (stuck or broken rings) as well as carbon build-up.

The greatest cylinder wear of a two-stroke engine generally occurs in port area of cylinder wall instead of at top of ring travel. Cast iron or aluminum bores should be measured using ring gap as an indicator or an inside micrometer.

SECTION 4 MAINTENANCE

On models with cast iron cylinder, the bore should be honed when engine is overhauled, to true the bore, remove the glaze and remove the ridge at top and bottom of ring travel area. If ridge is not removed, new unworn rings may strike the ridge and bend ring lands in piston. The finished cylinder should have a light crosshatch pattern as shown in Fig. 9. After honing, wash cylinder assembly with soap and water, then swab with new oil on a clean rag until all tendency of rag to discolor is gone. Washing in solvent will not remove the abrasive from finished cylinder walls.

When assembling piston to connecting rod, observe special precautions outlined in the individual repair sections. Check for assembly marks or other indicators on the piston and in the individual repair sections.

Lubricate piston pin bearing (or bushing), piston, rings and cylinder as engine is assembled. Run engine with slightly rich carburetor setting during break-in period and do not overload, to prevent overheating until parts wear in.

Plug fouling during this period is not uncommon and it



FIG. 9

is advisable to have spare plugs along when running in a newly overhauled engine.

CONNECTING ROD, CRANKSHAFT AND BEARINGS

Before detaching connecting rods from crankshaft, mark rods and caps for correct assembly to each other and to proper cylinder. Most damage to ball and roller bearings is evident after visual inspection and turning the assembled bearing by hand. If bearing shows evidence of overheating, renew the complete assembly. If main bearing clearances are excessive, new crankcase seals may not be able to prevent pressure from blowing fuel and oil around crankshaft. All crankcase seals should be renewed when crankshaft, connecting rods and bearings are serviced.

Crankshafts should be checked for runout when removed. Check for runout using either vee blocks or lathe centers. Should the shaft not meet specifications,

LUBRICATION

The engine is lubricated by mixing oil with the fuel. A suitable two-cycle, air cooled engine oil is recommended. Standard grade SAE 40W MS Automotive Motor Oil may be used if two-cycle oil is not available.

Mix fuel and oil thoroughly in a separate container before pouring mixture into fuel tank. For cold weather blending, pre-mix the oil with a small amount of gasoline and shake thoroughly until the mixture is liquid, then blend with remainder of fuel. Do not use kerosene or fuel oil for pre-mixing. Mix fuel/oil to a 20:1 ratio.

TORQUE SPECIFICATIONS

Recommended tightening torques are as follows:

Flywheel nut	32-36 ft.-lbs.
Standard Nuts	
6mm	80-85 in.-lbs.
8mm	16-18 ft.-lbs.
10mm	31-33 ft.-lbs.

D. ENGINE REPAIR (FIG. 10) 230 JLO

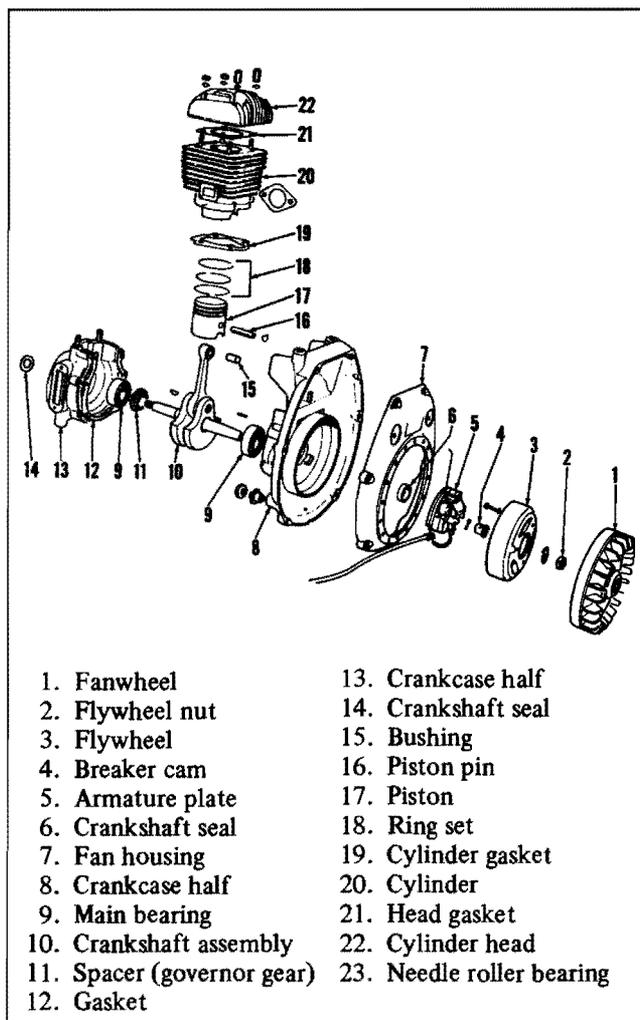


FIG. 10

CRANKCASE

DISASSEMBLY:

Remove crankcase screws. To protect radial packing rings push a protecting tube over both shaft ends. Heat both ball bearing seats to about 212°F. To avoid damaging threads, screw nuts on flush. Lift casing until lower shaft end hangs free. Knock lightly against upper shaft end with a rubber hammer until upper half of casing comes off the crankshaft. Treat lower half of casing in the same way. If necessary remove radial packing rings, drain plug and hose socket. Clean casing halves. Reuse only casings with perfect sealing surfaces.

REASSEMBLY:

Install new radial packing rings flush with casing, with sealing lip pointing towards the crank chamber. Use a shaft

which presses only on the outer diameter of the radial packing rings. Heat both halves of casing to about 212°F. Place casing half - output side - onto assembly plate and, with the aid of the slip tube, insert crankshaft equipped with ball bearings. Lightly grease sealing surface and put on casing gasket. Push slip tube over the shaft end pointing upwards and mount casing half - ignition side. Insert casing screws with spring washers and tighten lightly. Check if two halves of casing are parallel at cylinder pad, then tighten casing screws crosswise. Cut off protruding gasket. Lightly knock against the two shaft ends with a rubber hammer until crankshaft settles and turns easily. Screw in the drain plug and, if necessary, the hose socket with gasket.

CRANKSHAFT (FIG. 1)

DISASSEMBLY:

Before extracting ball bearings, screw nets flush with shaft ends. Turn setscrew in the basic part of the extractor back as far as necessary. Put an appropriate pair of half shells over ball bearing from both sides simultaneously and press collar into slot of extractor. Push retaining ring over pair of half shells. Hold extractor with a wrench and, with a second wrench, turn setscrew until ball bearing has been extracted from crankshaft.

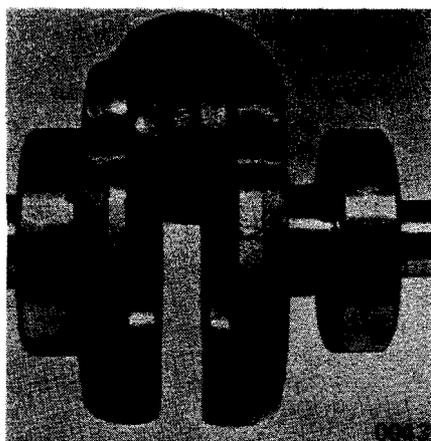


FIG. 1

REASSEMBLY:

Push crankshaft onto assembly plate so that the upper crank web is propped. Heat ball bearings in an oil bath to about 212°F and drive to stopping point with a hollow pipe, putting pressure only on the bearing inner ring.

PISTON

DISASSEMBLY:

Remove both wristpin clips with a pair of pointed pliers. Push out wristpin with pin extractor. When taking out piston watch the two check plates. Remove needle bearing from connecting rod. If piston is to be used again it must be appropriately marked, as piston and cylinder are run-in together. When taking off the piston rings spread them with both thumbs until they just slip over the piston. If necessary clean bottom of piston and piston ring slots.

REASSEMBLY:

Insert one wristpin clip into the piston with a pair of

pointed pliers. Do not compress clip any more than is absolutely necessary for the assembly. The clip must rest firmly in the slot. Push wristpin through the first opening in the piston. Put needle bearing with some grease into the connecting rod. Stick one check plate to each side and carefully slide piston over. The arrow on the piston must always point to the exhaust side. Press wristpin until it rests on the clip. Insert second clip as desired above.

CYLINDER

DISASSEMBLY:

Remove all parts from the cylinder. Unscrew cylinder base nuts. Lift off cylinder. If work is carried out on the cylinder head or the cylinder-head gasket replaced, first remove the nuts of the cylinder head and take off head with gasket.

REASSEMBLY:

Replace cylinder base gasket. Push wood support block on gasket. Turn crankshaft back until piston rests firmly on block. Turn piston rings until the peg (P) between the piston ring gaps is visible (Fig. 2). Oil piston and cylinder lining well. Make sure that exhaust and carburetor connections point to the correct side. By means of a piston ring clamp press piston rings into the piston slots. Carefully push the cylinder over the piston. Remove supporting wedge and clamp. Remove disc rings and slightly tighten nuts crosswise. Turn crankshaft once and leave piston on bottom dead center. Tighten nuts. (If cylinder head has been removed, the wider side of the metallic ringed gasket must face upwards towards the cylinder head. Tighten the cylinder head nuts crosswise to 16-18 ft. lbs.)

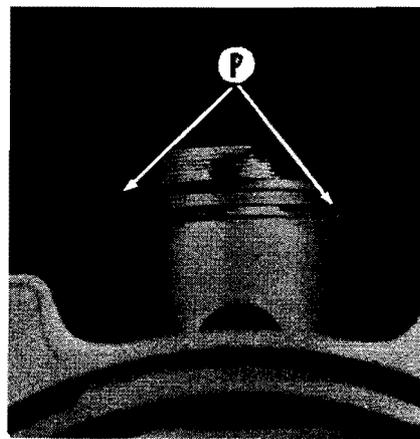


FIG. 2

FAN

DISASSEMBLY:

Unscrew recoil starter. Remove dust seal from carrier. Remove carrier and shims. Take off starter pulley. Unscrew nut on crankshaft. Attach extractor (1) to fan and remove it (Fig. 3). Remove air-path from cylinder. Remove external ignition coil and fan cover.

REASSEMBLY:

Push impeller with attached magnet wheel, and possibly starter ring gear, onto crankshaft cone which must be clean and free of grease. Make sure that adjusting ring rests properly in the slot of crankshaft and impeller. Replace spring

SECTION 4 MAINTENANCE

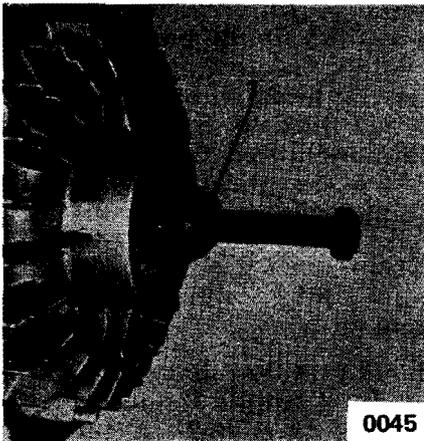


FIG. 3

washer and tighten nut to 33-36 ft. lbs. Replace fan cover and tighten on Model, tighten starter pulley. Slide dust seal over carrier and screw on recoil starter. Before the air path is mounted slide on exhaust and carburetor gaskets over the cylinder studs.

RECOIL STARTER DISASSEMBLY:

Remove starter from fan cover. Carefully remove snap ring, cover plate, spring, washers and friction shoe assembly. Remove retaining ring and retaining key of rope from handle. Pull handle from rope. Remove rope disc from starter housing. (Be careful as the recoil spring might unwind). Take starter rope from rope disc and remove recoil spring.

REASSEMBLY:

Assemble on rope drum peg, in the following order, one each: steel washer, brake washer, carrier, brake washer, steel washer, brake spring and cover plate, and lock with a snap ring. After the friction shoe assembly has been assembled, and for a) clockwise rotation of the right half of the shoe assembly, or b) counterclockwise rotation of the left half of the shoe assembly, each must move from its resting position.

TIMING PROCEDURE

1. Remove recoil starter, emergency pulley, carrier, shims and foam rubber gasket.
2. **Breaker Point Adjustment:** Insert dial indicator into the spark plug hole and then turn engine clockwise until top-dead-center has been reached. Normally, the contact breaker points are adjusted at TDC; however, since the construction of the flywheel is such that the contact breaker cannot be reached for adjustment in this position, rotate the flywheel clockwise until the points are exposed and still fully open - and can be reached through one of the flywheel slots with a feeler gauge and screwdriver.

To check the breaker point gap use only a clean, greaseless feeler gauge. The gauge gap should be between .014" and .018".

If the gap needs adjustment, loosen the lock screw of the contact breaker carrier and readjust it using a screwdriver placed in the adjusting slot between both projections. Adjust, then retighten, the lock screw. (Note: The point gap can change when tightening the lock screw, therefore, it must be rechecked after tightening). Once the specified breaker setting has been made, it may be disregarded throughout the rest of the timing procedure. (The

breaker point gap must be set before turning the stator plate). Proper contact breaker adjustment assures sufficient voltage and thus the best possible spark.

3. **Engine Timing:** Bring the piston to top-dead-center. Attach the timing light - one terminal to the black short circuit wire - the other to the ground (engine casting). Rotate the flywheel counterclockwise while observing the dial indicator. Points should make and light at .125" BTDC.

Note: The timing device must light up somewhere in between the respective engine timing points. Note, however, that some timing devices are designed to light, others to go off, when the correct ignition setting has been achieved.

4. Incorrect timing must be adjusted only by loosening the three armature plate holding screws and rotating the armature plate. Looking from the ignition side, turning the plate counterclockwise means that the timing is being advanced, while turning the plate clockwise means timing is being retarded. Slots in the armature plate permit rotating of the plate in either direction. Example: If a reading of 0.158" before TDC is observed, this means that timing is over-advanced. In order to readjust to the recommended tolerance, turn the armature plate clockwise until a reading of between 0.091" and 0.126" is observed on the dial indicator. Tighten the three lock screws, then check timing again.

IGNITION TROUBLE SHOOTING

Ignition system defects are generally due to one of two reasons 1) faulty ignition equipment or 2) incorrect installation of equipment. Cause of the defect can be rapidly detected by observing the following procedure:

1. Remove the ignition cable from the plug or the plug connector from the ignition cable. Hold the free end of the cable about .016" (4 mm.) from the engine ground and crank the engine.
 - a) If a spark jumps the gap, the defect is in the plug. Clean the spark plug, adjust plug gap to .016"/.020" (0.5 mm.), or replace plug if necessary.
 - b) If a spark does not jump the gap, or does so sporadically, defect is in the lead to the ignition switch, in the ignition cable or in the magneto itself. Check the lead to the ignition switch and the ignition cable for short circuit to ground and replace if necessary. Check contacts and clean with gasoline if necessary; check the contact gap and the breaker gap.
 - c) After defect is located and corrected, adjust ignition timing point and start engine.
2. If defect is not in ignition system, and engine still does not start, the trouble will likely be in the engine itself; i.e., in the carburetor, fuel lines, etc.

Note: Spark plug gap should be checked every 25 hours and reset, if necessary, to .016"-.020". (If spark plug gap is too wide the ignition armature will overload and may be damaged.)

JLO SPECIAL TOOLS*

Universal Assembly Device	444.31-804-10
Recoil Starter Clamping Device	444.31-863-10
Extractor	444.31-807-00
Half Shells (2)	444.31-072-00
Retaining Ring	444.31-071-00
Magneto Fly Wheel/Fan Wheel Extractor	444.31-825-00
Timing Gauge	444.31-875-00
RPM Indicator	000.15-300-10
(*JLO Part Numbers)	

E. CARBURETOR SERVICE FUNDAMENTALS

The bulk of carburetor service consists of cleaning, inspection and adjustment. After considerable use it may be necessary to overhaul the carburetor and renew worn parts to restore original operating efficiency. Although carburetor condition affects engine operating economy and power, ignition and engine compression must also be considered to determine and correct causes of poor performance.

Select a clean work area or the contamination will result in another overhaul. Clean all external surfaces and remove accumulated dirt and grease.

Be sure of solvent used in cleaning parts. Some solvents and cleaners have a damaging effect on synthetic rubber parts of the carburetor. Do not use alcohol, acetone, lacquer thinner, benzol, or any solvent with a blend of these ingredients unless the rubber parts and gaskets are removed. It is best to use petroleum products for cleaning. Gum can best be removed with alcohol or acetone solvent but care should be taken as stated.

Wash jets and passages. Do not use a drill or wire to clean. Measurement of jets to determine the extent of wear is difficult and new parts are usually installed to assure satisfactory results.

Check the fit of throttle and choke valve shafts. Excessive clearance will cause improper valve plate seating and will permit dust or grit to be drawn into the engine. Air leaks at throttle shaft bores due to wear will upset carburetor calibration and cause uneven engine operation. Inspect throttle and choke valve parts for proper installation and condition.

Power or idle adjustment needles must not be worn or grooved. Check condition of needle seal packing or "O" ring and renew packing or "O" ring if necessary.

Reinstall or renew jets, using correct size listed for specific model. Adjust power and idle settings.

It is important that the carburetor bore at the idle discharge ports and in the vicinity of the throttle valve be free of deposits. A partially restricted idle port will produce a "flat spot" between idle and mid-range rpm. The restriction makes it necessary to open the throttle wider than the designed opening to obtain proper idle speed. Opening the throttle wider than the design specified amount will uncover more of the port than was intended in the calibration of the carburetor. As a result, an insufficient amount of the port will be available as a reserve to cover the transition period (idle to the mid-range rpm) when the high speed system begins to function.

One of the common causes of carburetor malfunctioning is the formation of gum and varnish. During disassembly, should this condition be noted, all parts should be cleaned in a suitable solvent. New parts may be needed if small passages are blocked and cannot be cleaned. Fuel systems along with the carburetor should be drained when not in use to prevent a buildup of gum as a result of the gasoline decomposing.

Carburetor malfunctioning can also be caused by worn parts. Needle valve and seat should be checked and replaced as a unit. Needle valves should be checked for grooves caused by overtightening. Seats will usually be damaged if this is the case. Needle valve adjusting should be done lightly to prevent needle and seat damage.

F. WALBRO CARBURETOR (Refer to Fig. 4)

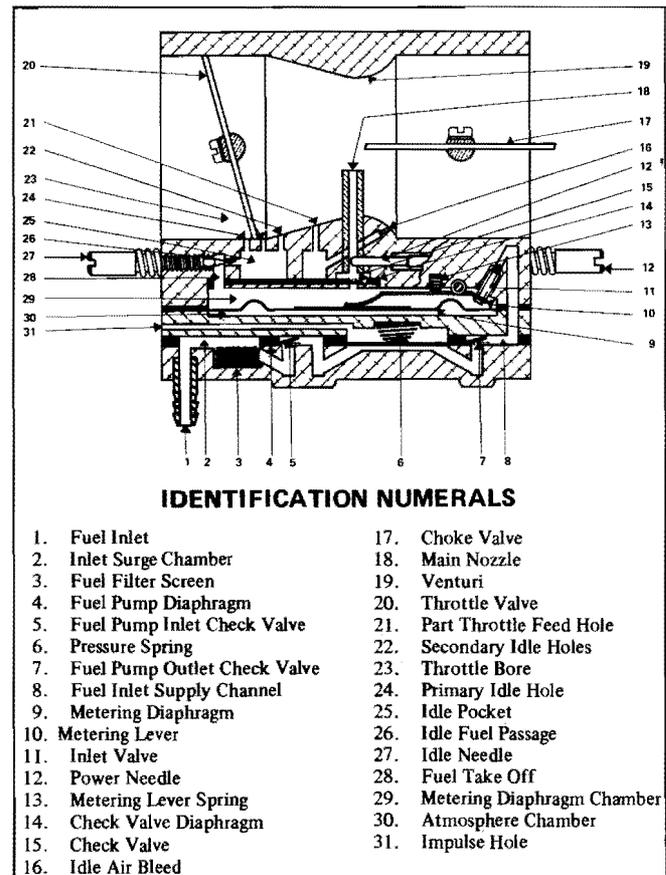


FIG. 4

THIS IS HOW IT WORKS: (Refer to Fig. 4)

Fuel from the supply tank is drawn in the Fuel Inlet (1) in the Inlet Surge Chamber (2) in the carburetor body by pulsations of the Fuel Pump Diaphragm (4). The engine crankcase pulsations transmitted through the Impulse Hole (31) actuates the Fuel Pump Diaphragm (4) which supplies the pumping action for the fuel pump. The fuel is drawn through the Fuel Filter Screen (3) from the Surge Chamber (2) into the fuel pump chamber through the Fuel Pump Inlet Check Valve (5). The fuel continues past the Fuel Pump Outlet Valve (7) through the Fuel Inlet Supply Channel (8) and to the Inlet Needle Valve (11). The Metering Lever Spring (13) transmits a force through the Metering Lever (10) and seats the Inlet Needle Valve (11) against pressure. The Metering Diaphragm (9) is pulled upward by engine action which is transmitted through the Primary Idle Hole (24) Secondary Idle Holes (22) and Third or Main Nozzle (18). The diaphragm action depresses the Metering Lever (10) and unseats the Inlet Needle Valve (11) and allows fuel to enter the Metering Diaphragm Chamber (29) and pass through the Fuel Take-off (28). At idle speed the fuel passes from Fuel Take-off (28) through the Idle Needle (27) through the Idle Fuel Orifice (26) to the Idle Pocket (25). The fuel and air continues through the Idle Pocket (25) where it is mixed with more air entering the Idle Hole (24). After mixing with air in the Primary Idle Hole (24) it flows into the Throttle Bore (23) through the Secondary Idle Holes (22). At part throttle the fuel is delivered into the Throttle Bore (23) through the Primary Idle Hole (24) and the Secondary Idle Holes (22) and the part Throttle Feed Hole (21). During idle the Main Nozzle Check Valve (15) is in the closed position, having been pulled down by suction created through the idle system.

SECTION 4 MAINTENANCE

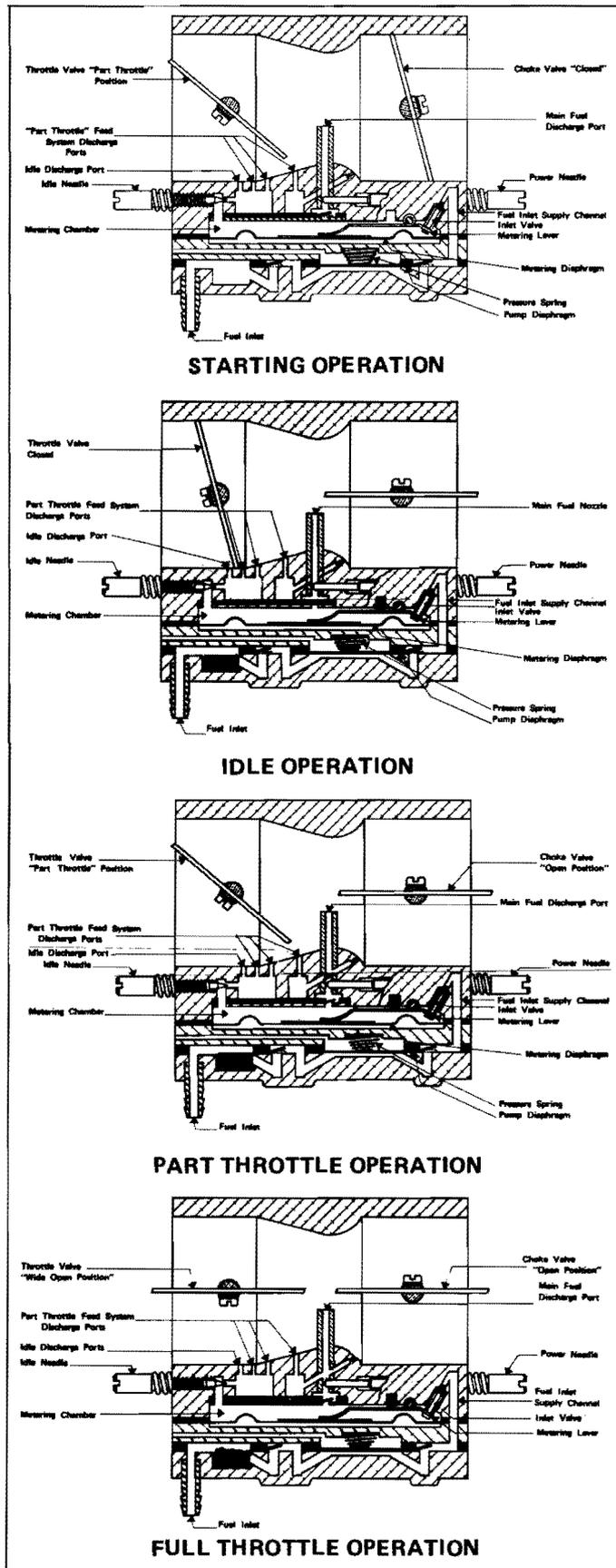


FIG. 5

back into the diaphragm chamber. At full throttle operation fuel passes through the Main Nozzle Check Valve (15) and High Speed Needle (12) and is discharged through Main Nozzle (18) into Venturi (19). During full throttle air is mixed with fuel in the Main Nozzle (18) through Nozzle Air Bleed (16).

MAINTENANCE PROCEDURE

BEFORE DISASSEMBLY

Carefully clean the outside of the carburetor of all dirt and foreign material and clear a working area for disassembly. The best cleaning material is one with a petroleum base.

DISASSEMBLE (in sequence) for cleaning and repairing the carburetor.

1. Four fuel pump cover screws
2. Fuel pump diaphragm assembly
3. Pressure spring
4. Diaphragm plate
5. Metering diaphragm
6. Metering lever pin screw
7. Metering lever pin
8. Metering lever and inlet needle valve
9. Three circuit plate screws
10. Circuit plate
11. Check valve diaphragm and gasket
12. High speed (power) needle
13. Low speed (idle) needle
14. If choke and throttle levers show signs of wear, they should be replaced, otherwise they need not be removed from casting.

Wash all components carefully with clean gasoline or a good quality carburetor cleaner. Blow out all passages and blow off components (except diaphragm) with compressed air.

Replace all worn parts.

Reverse the above for reassembly.

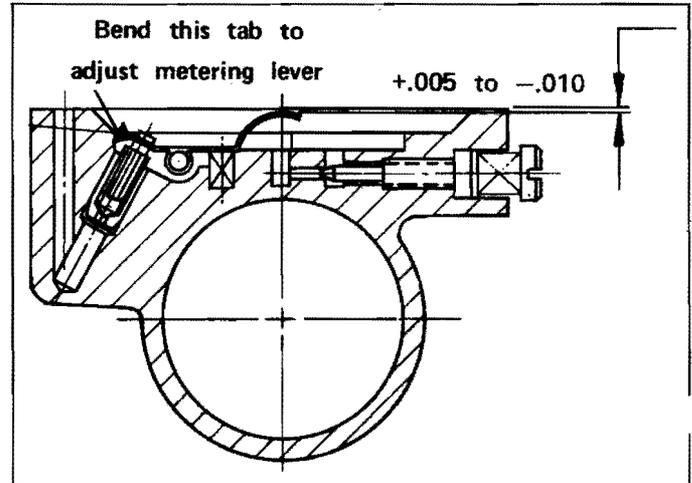


FIG. 6

SERVICE HINTS

Dirt in the carburetor, richness and leanness are the three chief causes of faulty carburetor operation. Disassembly of the carburetor for cleaning and for repair is discussed on the other side of this page.

CARBURETOR RICHNESS

Cause	Remedy
1. Diaphragm lever set too high	Set flush with main body casting (Fig. 6)
2. Dirt under inlet needle valve	Remove and clean
3. Metering lever spring not	Remove lever and install as

seated on the dimple in the metering lever.

4. Fuel pump diaphragm leaking Remove and replace with new diaphragm

CARBURETOR LEANNESS

Cause	Remedy
1. Dirt in idle fuel channels	Disassemble and clean carburetor
2. Metering lever set too low	Set flush with bases on chamber floor (Fig. 6).
3. Hole in metering diaphragm	Replace diaphragm
4. Pulse line from crankcase to carburetor plugged	Clean
5. Leaky manifold gaskets	Replace gaskets
6. Leaky diaphragm check valve	Replace diaphragm check valve assembly
7. Fuel pump diaphragm check valve worn	Replace fuel pump diaphragm
8. Dirty fuel inlet screen	Remove fuel pump cover and clean
9. Faulty fuel delivery system to carburetor	Check complete fuel delivery system from pick up in fuel tank to carburetor, fuel inlet for cracks, dirt, etc. Replace fuel line or pick up filter when necessary.

NEEDLE SETTINGS (Refer to Fig. 4)

The power and idle needles control the lubrication received by the engine. Adjustments should be done carefully. Start by turning the needle all the way in (do not force them). Set Power (high speed) needle one (1) full turn open and the Idle (low speed) needle three quarters (¾) turn open. This puts both slightly on the rich side and leaner adjustments can be made as needed. (Too lean an adjustment can cause improper lubrication).

G. DRIVE BELT AND TORQUE CONVERTER

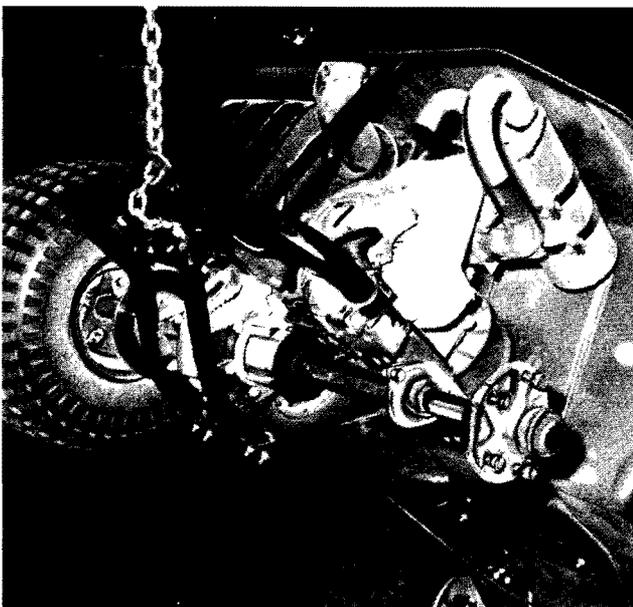


FIG. 7

TORQUE CONVERTER BELT REPLACEMENT

To facilitate belt removal and replacement it is advisable to elevate the aft end of the Ruppster by means of a chain hoist or jackstand to a level of between three or four feet (Fig. 7). Set the parking brake to prevent rotation of the rear axle. Reach in from the back, under the differential skid plate with both hands and pull the movable driven flange toward you and to the right. Once the spring is compressed, hold the flange with one hand and remove the belt from the driven torque converter assembly with the other. Once the belt is free from the driven assembly, pull it over the drive assembly and remove it from the vehicle (Fig. 8). Reverse the above procedure to install the torque converter belt.



FIG. 8

TORQUE CONVERTER OPERATION

The torque converter transmits power from the engine to the input shaft of the gearbox. The small drive portion of the Torque converter is attached to the engine and the "large" driven portion is attached to the input shaft. The two are connected by the torque converter belt.

The drive portion, held open by the drive torque converter spring, is centrifugally operated and engages when engine speed reaches approximately 2200 RPM; When the engine speed is below engaging speed the belt idles on the torque converter bushing located between the torque converter member flanges.

The driven portion is held closed by the driven torque converter spring. This positions the belt at idle, or with the engine off, toward the outside circumference of the driven flanges.

As the engine speed increases to engagement speed, centrifugal force acting on the fly weights compresses the spring and moves the moveable drive flange toward the fixed flange gripping the belt. The greater the speed the more the moveable flange movement resulting in the drive belt being forced outward to ride on a larger diameter of the drive flanges increasing the belt speed.

Since the belt length and width remains constant the driven flanges are spread apart proportionately allowing the belt to ride on a smaller diameter. This change of effective flange diameters varies the drive ratio from 3:1 to 1:1 automatically providing the most favorable ratio for the speed and load at which the machine is operating.

SECTION 4 MAINTENANCE

OPERATIONAL CHECK

The torque converter unit can be shop tested to pinpoint possible causes of trouble, but an operational test is recommended if conditions warrant. To test the torque converter unit in the shop, proceed as follows:

Remove protective shielding from torque converter unit and block up rear of vehicle.

Examine the converter unit as follows: Drive and driven sheaves should be parallel and belt grooves aligned. Friction faces should be smooth and free of oil, grease or rust. Belt should be dry and straight, and free of breaks, cracks or uneven wear; and should ride in bottom of groove in drive sheave and approximately flush with rims of driven sheave, without excessive looseness. If belt wear is uneven, check carefully for improper alignment, incorrect idle speed or malfunctioning clutch engaging mechanism. If offset between sheaves is incorrect or if sheaves are improperly matched, belt may turn over in vee. If belt turns over, check pulley centerline (Fig. 9), offset as given in vehicle section or specific overhaul section, or for improperly mated pulleys.

Start and idle the engine, converter unit should remain stopped or should be easily stopped by lightly applying brake. Stopping converter should not put an apparent load on idling engine. Slowly increase engine speed. Torque converter clutch should engage at just above idle speed and immediately disengage when throttle is released.

If clutch fails to fully disengage, slow idle speed may be too high, compression spring may be weak or broken, or moving flange may be sticking or binding.

If engagement speed is too low, compression spring may be too weak (or improperly adjusted if adjustment is provided).

If engagement speed is too high, compression spring may be too strong or improperly adjusted, or engaging mechanism may be sticking or binding.

If engagement action is erratic, engaging mechanism is probably binding.

CAUTION: DO NOT stand or allow anyone else to stand in line with drive belt when shielding is removed. Because of the high rotating speed of the units, a broken part or object dropped on the belt or sheaves can be thrown outward with damaging force!

Slowly open throttle. Belt should move smoothly outward in drive sheave and inward in driven sheave as speed

increases. Drive ratio should change smoothly as engine speed changes. Test the centrifugal action and sheave performance by varying engine speed as required to obtain full movement of sheave faces.

Check torque sensing mechanism as follows: Slowly open throttle until belt moves to outside of drive sheave, then maintain this setting by holding throttle steady. Check torque sensing mechanism by applying and releasing the brake. Drive ratio should change smoothly with varying torque load.

Vibration at higher speeds may indicate a bent shaft or imbalance of some component of the torque converter unit.

GENERAL OVERHAUL NOTES

The drive unit is threaded onto the engine crankshaft. The crankshaft and drive unit are also tapered on mating surfaces.

To remove the drive unit it is necessary to prevent the crankshaft from turning. This can be done by inserting a length of nylon tape into the combustion chamber thru the spark plug hole. Apply even tension during drive unit removal or internal component and bearing damage can occur; Do not use sharp blows to remove! Rotate drive unit counterclockwise to remove.

When installing the drive unit, make sure that fixed flanges of the two sheaves are on opposite sides as shown in Fig. 9 that mounting shafts of the two sheaves are parallel and that sheave centers are properly aligned. Check offset and belt center distance of the particular unit, if given.

When belt is removed and/or unit is disassembled, inspect all components carefully for wear or other damage. If wear is abnormal, attempt to discover the cause before completing the repairs and returning the vehicle to service. Excessive or uneven wear on sides of torque converter belt may indicate pulley misalignment, bent pulley half or improperly adjusted idle speed. Examine pulley faces for wear patterns or heat discoloration. Determine and correct the cause of trouble rather than just renew the belt. See Trouble Shooting Chart. Sheave parts should fit with a minimum of clearance without binding. Apply a light coating of oil or low temperature grease to sliding parts, but make sure that no excess lubricant will be thrown on belt or sheave faces when unit is in operation.

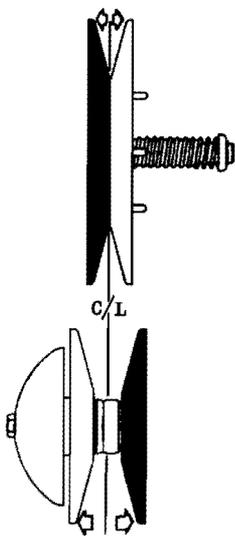


FIG. 9

TORQUE CONVERTER BELT TROUBLESHOOTING

SYMPTOMS	CAUSE	TREATMENT
1. Uneven belt wear on one side only	a. Pulley misalignment b. Loose engine mount	a. Align pulleys b. Replace or tighten engine mount
2. Belt glazed excessively or has baked appearance.	Excessive slippage caused by: a. Insufficient pressure on belt sides b. Excessive horsepower for belt and clutch c. Excessive oil on pulley surfaces	a. Check driver pulley for worn flyweights b. Consult dealer c. Clean pulley surfaces
3. Belt worn excessively in top width	a. Excessive slippage b. Rough or scratched pulley surface c. Improper belt angle	a. Check driver pulley for smooth actuation b. Replace or repair pulley c. consult application data

SYMPTOMS	CAUSE	TREATMENT
4. Belt worn narrow in one section	Excessive slippage in driver pulley caused by: a. Locked track b. Clutch not functioning properly c. Engine idle speed too high	a. Rotate track by hand until free b. Repair or replace clutch pulley(s) c. Reduce engine RPM
5. Belt too tight during engine idle	a. Idle speed too high b. Incorrect belt length c. Incorrect drive center distance	a. Reduce engine RPM b. Consult application data c. See Operator's Manual
6. Concave worn belt sides	Excessive ride-out on driver pulley	a. Repair or replace driver pulley b. Increase center distance c. See Operators Manual
7. Belt Disintegration	Excessive belt speed	Reduce engine RPM at high speed
8. Belt "Flip-Over" at high speed	a. Pulley misalignment b. Excessive belt speed c. Excessive ride-out on driver pulley	a. Align pulleys b. Reduce engine RPM c. Repair or replace driver pulley d. See Operator's Manual
9. Belt edge cord breakage	a. Pulley misalignment b. Improper belt installations	a. Align pulleys b. See Operator's Manual
10. Flex cracks between cogs	Considerable use, belt wearing out	Replace belt
11. Sheared cogs, compression section fractured or torn	a. Improper belt installation b. Belt rubbing stationary object	a. See Operator's Manual b. Check drive components

GEAR BOX SERVICING

The Ruppster gear box is a single direction (forward) locked differential that should not require any maintenance, other than lubrication, except for overhaul or repair. If internal repair is needed, the following disassembly, inspection and assembly procedure should be followed.

NOTE: Before assuming the gear box needs repair, be sure the torque converter is functioning properly, since an inoperative moveable drive flange will give the same symptoms as a gear box failure.

DISASSEMBLY

The gear box is a pinion and gear type differential driving a solid rear axle to both rear wheels. Before proceeding with the disassembly procedure, it is advisable to drain the lubrication from the gear box. To service the gear box, it is essential that the rear wheels be elevated three to four feet preferably by a chain hoist around the rear frame tube (Fig. 10).

Remove the torque converter belt (refer sec. 4G) and both rear frame tube (Fig.10) on electric start models, one of the rods will be bolted to the frame under the battery. Next remove the six bolts connecting the skid plate to the gear box. Also remove the 2 bolts connecting the gas tank to the gear box, and the three bolts attaching the motor mount to the gear box. On electric start models, it will be necessary to remove the rectifier to be able to remove the bolts holding the skid plate reinforcing rods to the gear box. At that time, the entire rear axle assembly, including the gear box, can be removed by disconnecting the flanged bearings holding the axle to the frame. Do not remove the first one without loosening the other. Loosen both to a "hand-tight" situation and then remove. Let the entire

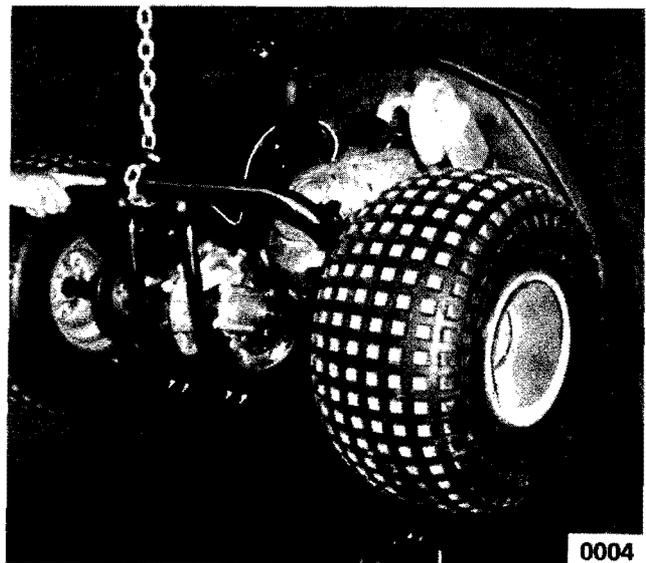


FIG. 10

assembly drop down to clear the brake disc from the caliper unit. When the brake disc is clear, pull the entire assembly out between the skid plate reinforcing rods and the rear frame tube.

With the rear axle, gear box attached, on a bench, remove the hub cap (Fig.11) on the wheel hub next to the brake disc, straighten the bent tab on the tab lock washer (Fig. 12) and remove the axle bolt. This will allow the keyed hub to be pulled off the axle. (Fig.13). Now remove the eccentric locking collar next to the axle bearing. (Fig.14) to remove the collar, loosen the allen set screw in the collar and tap the collar against the forward motion of

**SECTION 4
MAINTENANCE**

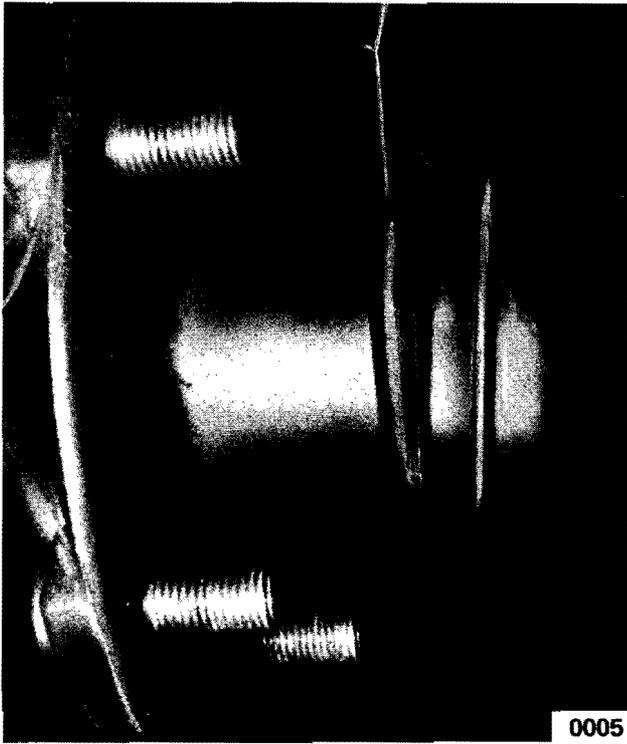


FIG. 11

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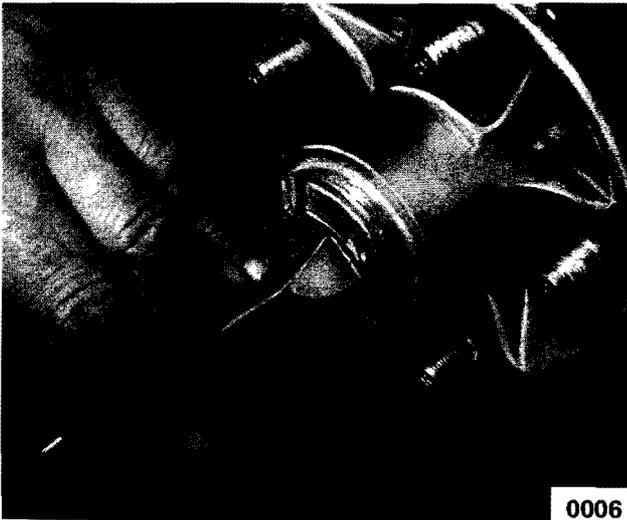


FIG. 12

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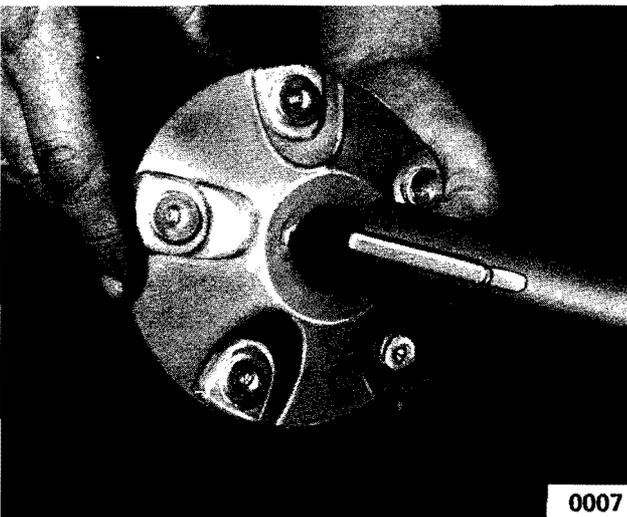


FIG. 13

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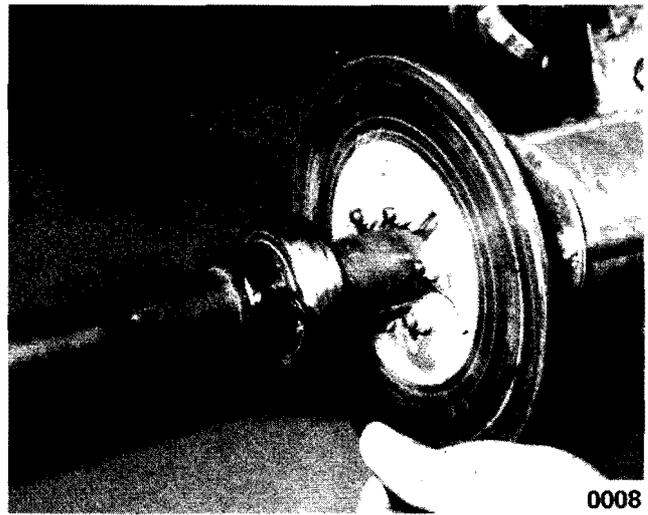


Fig. 14

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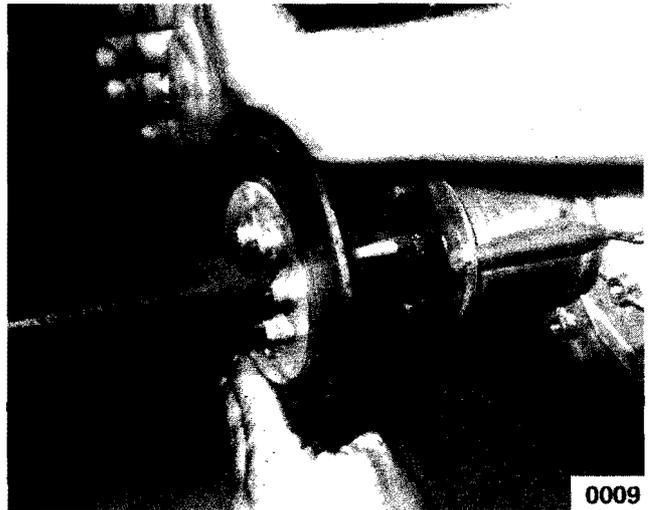


FIG. 15

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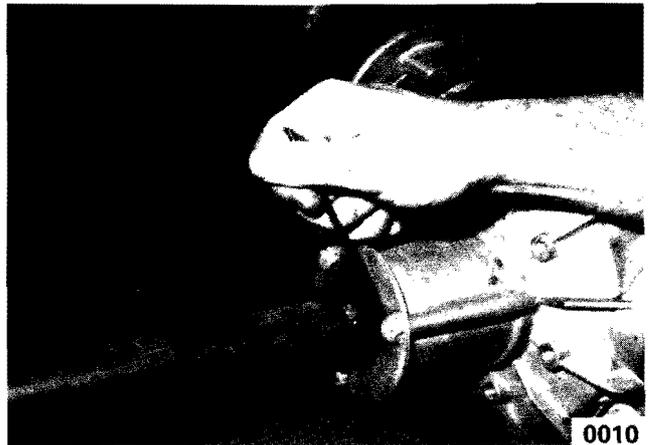


FIG. 16

0010

the vehicle. Remove the collar and the axle bearing. Slide the floating brake disc off the key it slides on (Fig.15). Remove the locking collar next to the gear box (Fig.16) by loosening the set screw and tapping in the opposite direction to forward motion. Remove the six bolts connecting the two case halves together (Fig.17) and slide the gear box, with the pinion gear off the axle. It may be necessary to assist the gear box down the axle, (Fig.18) but do not allow the case half to slide all the way down the

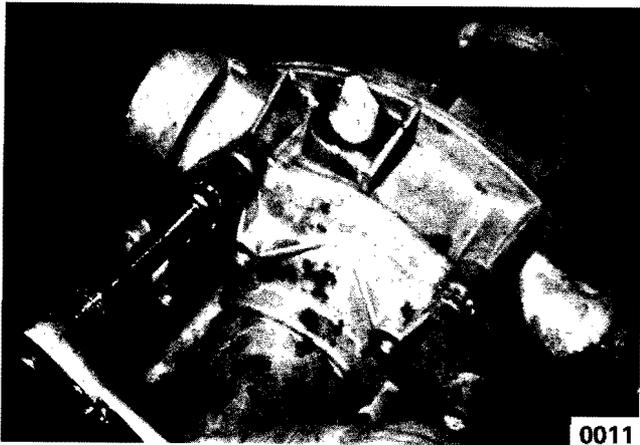


FIG. 17



FIG. 18

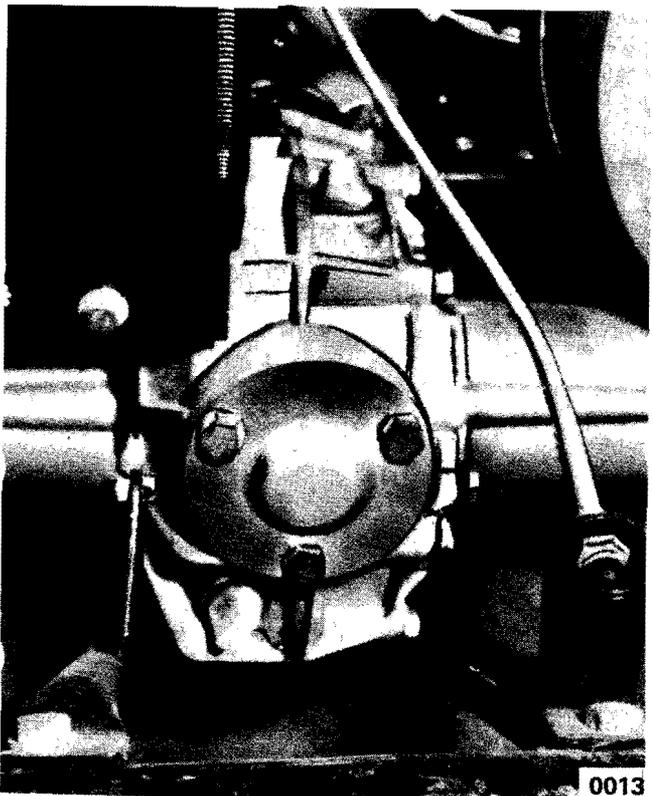


FIG. 19

axle and damage the housing. With the gear box off the axle, remove the driven torque converter assembly from the pinion shaft. First remove the retaining screw, cap and ring from the end of the shaft. Slide the fixed driven flange off the pinion shaft. Remove the retaining ring on the pinion shaft and slide the moveable driven flange with its bushing, spring and keyed ramp off the shaft. (Fig. 17).

If further disassembly is necessary, remove the cover (Fig. 19) over the pinion shaft retaining bearing. Remove the screw and washer in the shaft and the bearing spacer around the outside of the bearing. The pinion shaft can now be removed from the torque converter side of the gear case. The ring carrier must be pressed out of the gear case prior to the removal of the gear from the carrier. The primary and secondary bearings are press fit in the gear box and the carrier is a press fit in the bearings. If the bearings come out of the carrier, it is not necessary to remove them to replace the ring gear. The pinion bearing and oil slinger on the pinion shaft are also a press fit on the shaft.

INSPECTION (Fig. 18)

The primary cause of gear box failure is the teeth wear on the ring and pinion gear set. In the case of total failure, the pinion gears will usually be rounded off to the extent that there no longer exists a mesh pattern between the pinion and ring gears. The gearsets are only available with both gears and it is not recommended, at any time, to replace just one gear of the set. When replacing the gearset, it is necessary that the gear lash between the ring and pinion gears be checked and that the lash between the ring and pinion gears be within the range of .005" and .023". This check is made with the ring gear mounted on the carrier and pressed into the gear case and the pinion, with the oil slinger and bearing pressed on, seated firmly in the gearcase by pressing into the bearing that is normally under the cover plate. The gear lash is checked using a dial indicator mounted on the gear case, reading the movement on the face of the teeth on the ring gear while holding the pinion shaft in a fixed position. The measurement should be made in at least four positions on the ring gear at 90 increments. If all checks are within the tolerance range, no further checks are necessary. If the gearset does not check within the range; insure that the carrier and the pinion have been pressed all the way into their proper positions. If still out of tolerance, install another complete matched gearset. This will reveal if the first set was out of tolerance or if the problem lies in the gear case assembly.

REASSEMBLY (Fig. 19)

To reassemble the gearbox correctly it is mandatory that a press be utilized to seat the bearings in the gear case and onto the pinion shaft.

The axle bearing in the side of the gear case is pressed in first, then the secondary and primary carrier bearings are pressed in, if they have been removed from the carrier. The carrier, with the ring gear bolted on is then pressed into the bearings, or if the bearings are attached, into the case. The pinion bearing must be pressed into the case also, on the side next to the pinion gear, and then the pinion shaft, with the oil slinger and bearing pressed on, must then be pressed into the case. Insert the bearing spacer, washer and screw in the end of the pinion shaft and install

SECTION 4 MAINTENANCE

the cover with the gasket. Install the driven torque converter assembly on the outside end of the pinion, in the reverse order that it was removed in. First, the keyed ramp and the spring, then the moveable driven flange and bushing. The inside retaining ring is next with the keyed fixed driven flange outside retaining ring and the retaining cap and screw.

When installing the gearbox on the axle, it is the purpose of the fixed drive sleeve to locate the gear box on the axle. Slide the axle through the gear box until the inner teeth on the ring gear mesh with the drive sleeve completely. At that point when the axle cannot be pushed any further into the gear box because the drive sleeve is up against the carrier, the gear box is located correctly on the axle. The eccentric locking collar should now be installed over the protruding inner race of the axle bearing in the gear case. Slide the locking collar down the axle, over the bearing and twist in the direction of forward motion.

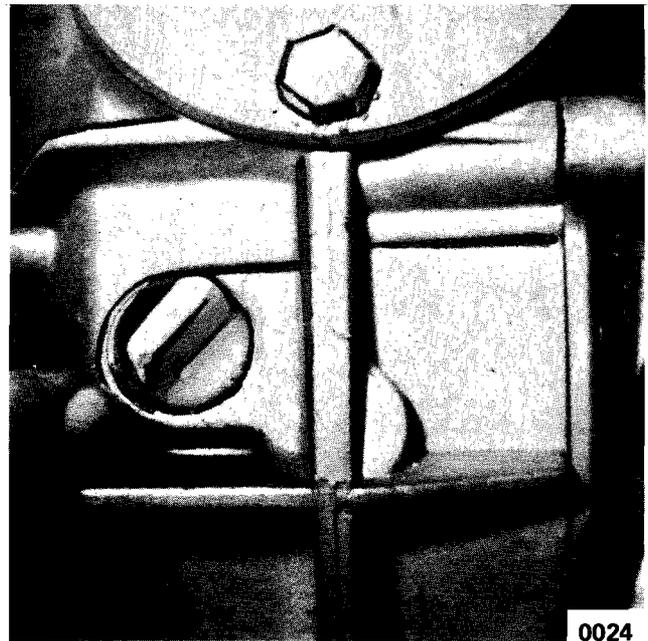
Using a center punch, tap the collar in the direction of forward motion to lock the bearing in place and tighten the set screw. Now pull up the gear case cover and after coating the O-ring seal with a light coat of oil, back the two halves together. Put the locking collar in place and tap in the direction of forward motion and lock the set screw. Install the brake disc on the proper key and locate the bearings and locking collars on the axle - loosely. After sliding the flangettes over the axle, position the axle with the gear box attached, in the vehicle. It must go in between the rear frame tube and the skid plate reinforcing rods. Assemble the flangettes around the axle bearings and hand tighten. Do not lock at this time. Now measure the length of the axle on both sides of the vehicle that protrudes past the frame. Both sides should be equal in length. When the correct length on both sides is achieved, tighten the flangettes and the eccentric locking collars outside of the bearings. This important procedure locates the rear axle in relationship to the rest of the vehicle. It is now possible to attach the motor mount, gas tank, rectifier and skid plate to the differential and bolt the skid plate reinforcing rods back to the rear frame tube.

Bolt the wheel hub back on over its key and bend down one of the tabs from the tab locking collar. Replace hub cap. Replace torque converter belt, and both rear wheels. Take the vehicle off the chain hoist or jackstand and place it level before refilling with lubricant. Remove fill plug on top and inspection plug on back and fill to inspection hole.

Reinstallation should be accomplished by reversing the disassembly procedure. The inside teeth on the ring gear must engage the drive sleeve before the two case halves will come together. Torque the bolts holding the gear case together to 50 ft. lbs. Refill the gearbox up to the inspection hole with SAE 90 anti-foaming, non-corrosive gear lube (Mobil No. 46).

LUBRICATION

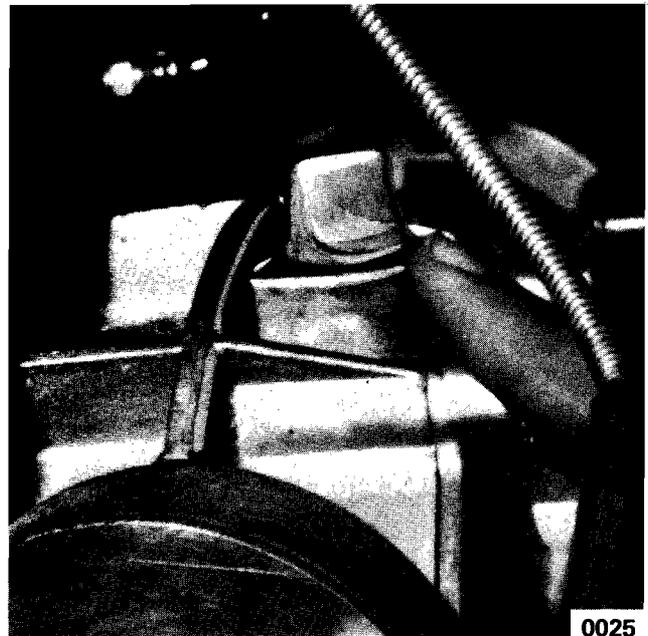
The Ruppster gear box is a gear and pinion type with special hardened gear sets. For the lubricating purposes, the gears run in SAE 90 multi-purpose anti-foaming Gear Oil (e. g. Mobilube 46). The level is checked by removing the level check plug on the rear of the differential casing (Fig. 20). If the level is lower than the check hole, remove the fill plug on the top of the casing (Fig. 21) and bring the level up to the check hole. Use only a reputable brand of SAE 90 multi-purpose anti-foaming Gear Oil. The gear box



0024

FIG. 20

lubricant level should be checked every 25 running hours or monthly, whichever is most convenient. Do not mix different oil types.



0025

FIG. 21

I. WHEELS, TIRES AND BEARINGS

WHEELS

The stamped steel five-hole wheels are designed to mount the low-pressure, tubeless, knobby-type Ruppster tires. When changing a tire, insure that the bead edge is not damaged and swab soapy water all the way around the bead edges on both sides of the wheel before installation of a new tire.

TIRES:

The tubeless Ruppster tires are designed to run between 2½ and 5 lbs./sq. in. depending on the terrain and load.

Soft conditions will generally require the lower pressure setting. In the event of puncture, normal automotive type tubeless plug should be utilized.

Flat Repair:

The special Ruppster tires are tubeless and in the event of a puncture, can be patched with a standard automotive tubeless tire repair procedure. This will consist of the preparation of the tire to receive the repair plug and the insertion and trimming of the plug (Fig.22). This can be accomplished without having to remove the tire from the rim.



FIG. 22

0026

FRONT WHEEL BEARINGS:

The front wheel bearings are heavy duty truck type roller bearings on the inside, running in wheel bearing grease. Remove cup to inspect bearings and to replenish lubricant. Excessive wheel wobble calls for replacement of the bearings which has the inner race integral with the bearing and a separate outer race that is a press fit in the hub. Both of these components, bearing and race should be changed together.

Repacking front wheel bearings is the same as standard automotive procedures. (Fig.23)

Remove cotter key from castle retaining nut and remove nut. Slide hub assembly off spindle and catch outer roller bearing (Fig. 24) Drive inner bearing out of hub with

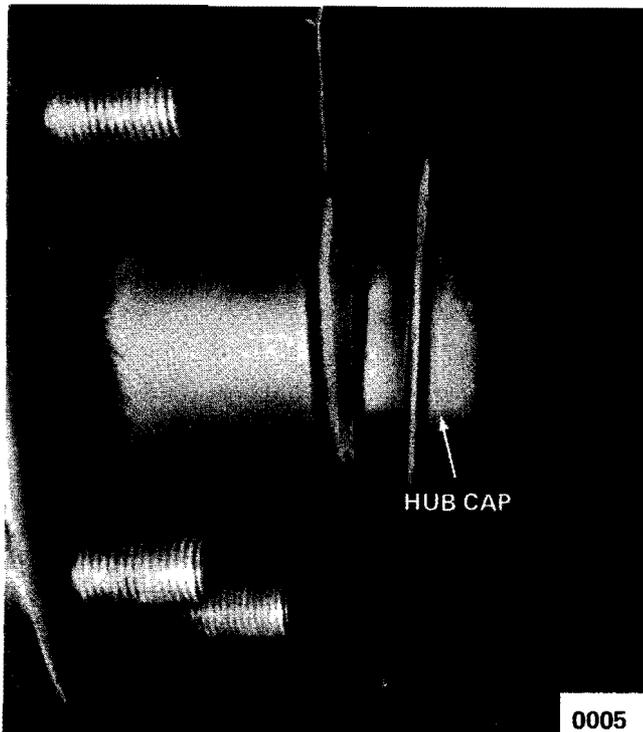


FIG. 23

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a drift thru hub center. Inspect bearings and races for defects and repack using a good grade wheel bearing grease.

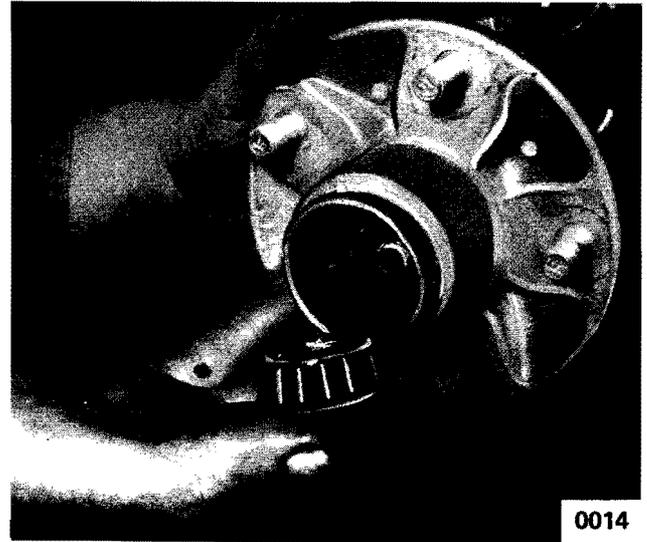


FIG. 24

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REAR AXLE BEARINGS

The Ruppster rear axle uses self-aligning, sealed ball bearings as shown in Figs. 25 and 26. These bearings are an easy slip fit on the shaft. The locking collar and inner bearing race have an eccentric flange as shown. If properly installed, the bearing will not loosen on shaft but can easily



- 1. Shaft
- 2. Flange
- 3. Bearing
- 4. Collar
- 5. Set screw

FIG. 25

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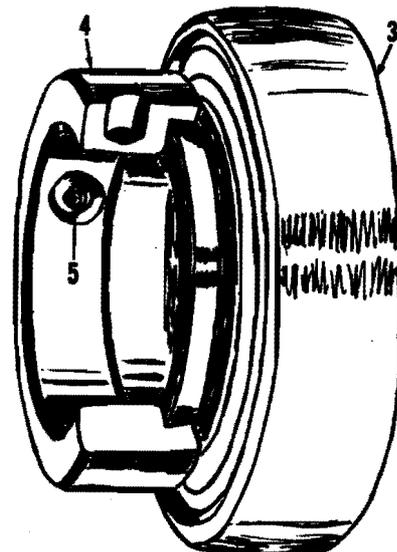


FIG. 26

SECTION 4 MAINTENANCE

be removed if disassembly is needed. To lock the bearing, be sure eccentric flange is fully engaged as shown in Fig. 26, turn flange in direction of normal shaft rotation as shown in Fig. 25. Lock by tightening the set screw securely.

When disassembling the bearing, loosen the locking set screw and tap the collar opposite normal shaft rotation to loosen the eccentric flange, then slip bearing and collar from the shaft.

Never immerse a sealed bearing in solvent or cleaning fluid. Outside may be cleaned with a brush and fluid. Replace the bearing if its condition is questionable.

J. STEERING AND ALIGNMENT

STEERING ADJUSTMENTS

The Ruppster rack and pinion steering system is factory set and requires no further adjustment.

Front wheel alignment must be maintained at the proper setting zero to 1/2" toe-in. Alignment can be checked by running a straight edge along the insides of the front wheels from the front of the wheel to the back of the wheel and measuring the distance between both wheels at similar points. If the distance between the wheels is unequal at the front and back of the wheels, loosen the lock nut on the tie rod and turn the tie rod until the distance between the wheels, at the front and the back of the wheels, is equal (Fig. 27). Tighten the lock nut on the tie rod and check the distance with the nut tightened to prevent the possibility of an improper setting.

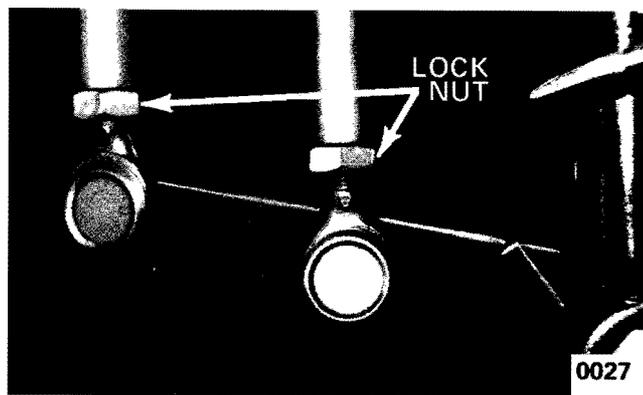


FIG. 27

K. BRAKE

BRAKE ADJUSTMENTS

The hydraulic disc brake is actuated by the brake rod running to the lever arm from the foot operated brake pedal. The parking brake is set by swinging the small metal

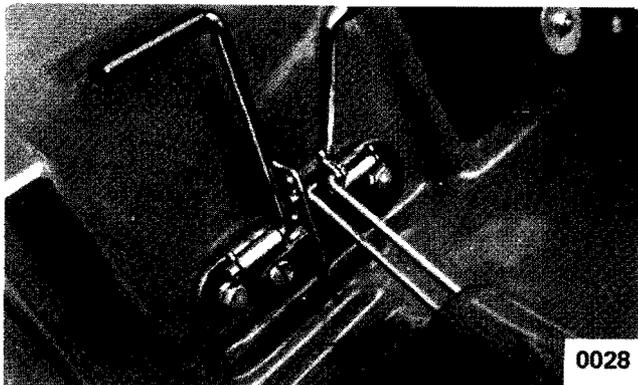


FIG. 28

tab up under the brake pedal after the brake has been actuated (Fig. 28). Adjustment of the brake is accomplished by turning the collar nut on the rear of the long brake rod. Adjust the brake rod so that the parking brake will not allow the rear wheels to turn and when released there is no drag on the brake disc. For reasons of safety, never allow the pedal play to exceed the distance between the normal pedal position and the floorboard. This condition would not allow for emergency braking to take place, if needed.

Maintain the hydraulic fluid level in the reservoir to within one-half inch from the top of the reservoir. This is checked by removing the two screws in the top cover plate, and lifting of the cover plate and rubber gasket (Fig. 29). Use only automotive disc brake fluid. SAE J1703.

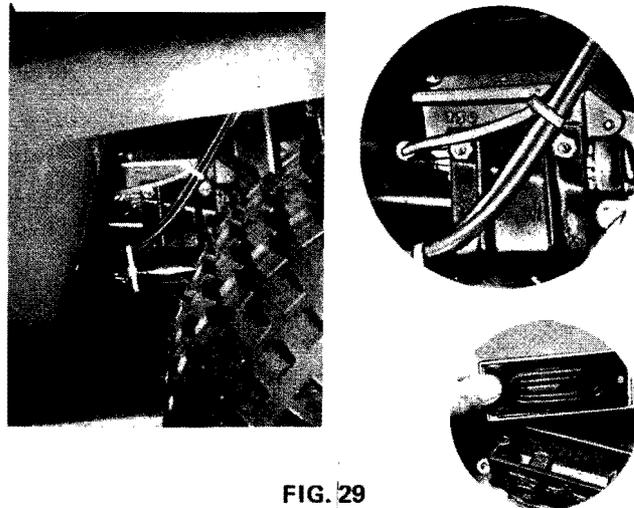


FIG. 29

MASTER CYLINDER

The master cylinder unit is not designed to be disassembled or overhauled. In the event of a failure of the master cylinder, replacement of the entire unit will be necessary.

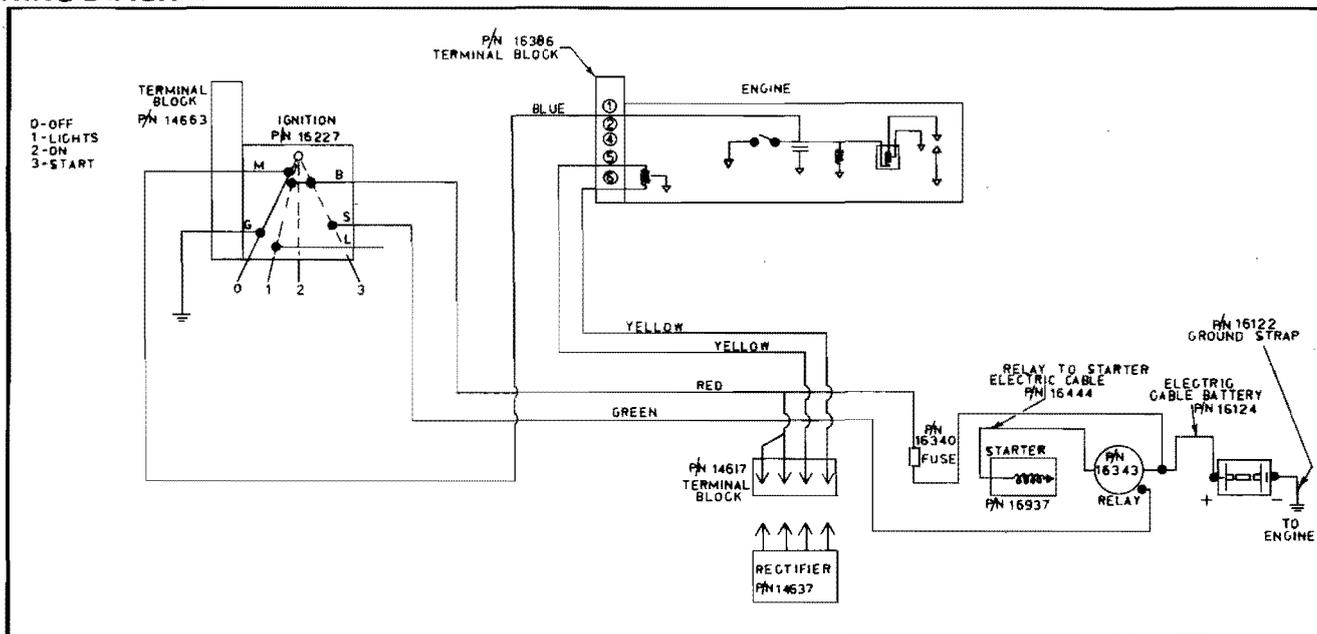
The caliper unit will have to be bled whenever the fluid line from the master cylinder to the caliper is opened or when new brake pads are installed. This is accomplished by opening the upper bleed fitting on the caliper unit and allowing the brake fluid to flow through the entire unit until there are no indications of air in the line (fluid spurting from bleed fittings).

L. MAGNETO IGNITION, STARTER AND SPARK PLUG

The electrical system of the Ruppster consists of:

1. The magneto system for engine Ignition
2. The alternator winding incorporated in the magneto which provides electricity for battery charging current.
3. The Ignition switch

WIRING DIAGRAM



MAGNETO

The magneto used is the flywheel type and is combined with an AC generator.

When the points break and the spark occurs at the plug:

- (1) Piston must be in correct firing position.
- (2) Magnets must be in proper position relative to ignition coil pole shoe.

If the screws retaining the armature plate to the crankcase are loosened and the plate repositioned, both the pole shoe and breaker point rub block will be moved an equal amount. Edge gap will remain the same when the spark occurs, but timing will be advanced or retarded depending on which way armature plate is moved. If the breaker point gap is changed and armature plate not moved, the crankshaft will be in a different position when points open and both the timing and edge gap will be affected.

Breaker Points

Breaker points can be inspected and adjusted through a flywheel window as shown in Fig. 30 but, although an inspection window is present, accurate adjustment is not always possible. Flywheel must usually be removed for renewal of parts.

Condenser

A defective condenser can cause point failure or complete failure of engine to start and run. Condenser is pressed into armature plate and leads are soldered. Use an iron and a minimum amount of heat when making the connections. Condenser should not be removed unless renewal is indicated. If condenser is to be renewed, armature plate must be removed and condenser pressed out from bottom. Condenser is swaged or staked in place (Fig. 31) when installed. If burrs remain from previous staking, remove with a scraper or file. Press in new condenser working from top (flywheel) side of plate. If condenser is not tight after installation, stake in three or four places. Use care not to crush the case when condenser is installed.

Ignition Coil

On single cylinder units the ignition coil (5-Fig. 31) is mounted on the armature plate. If testing equipment is not available, out-put can be checked by holding spark plug

wire about 1/4-inch away from block while turning engine with a starter. If no spark occurs or if spark is weak or yellow, renewal of ignition coil may be indicated.

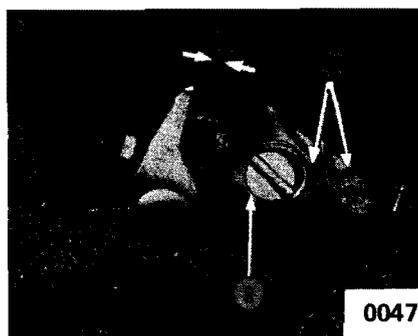


FIG. 30

The breaker points plate on the JLO L230 engine is not completely sealed from dust accumulation when the vehicle is operated in extremely dusty conditions. When all components appear to be functioning properly yet not

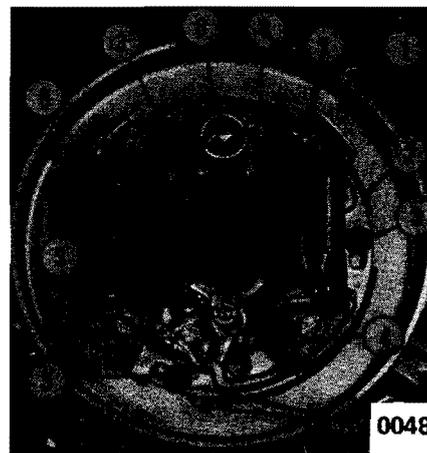


FIG. 31

SECTION 4 MAINTENANCE

enough spark is being generated to cause ignition, it is advisable to remove the manual starter and clean the points with a small point file through the access holes in the fly-wheel. Minimal blowing out the enclosed breaker plate area with compressed air will remove the majority of foreign material in this area and prevent dirt condition from recurring as rapidly as it might were it not cleaned out.

ALTERNATOR

When the unit is used to charge the battery alternating current must be converted to direct current and a dual, half-wave rectifier is used as shown in Figs. 32 and 33. Current and voltage are not regulated. Unlike a DC generator, the unit is not damaged if output circuit is open. Alternator output is two phase AC, with two identical (yellow) wires running from the generating coil. On models without battery, one of the lead wires is insulated and taped to the remaining wires.

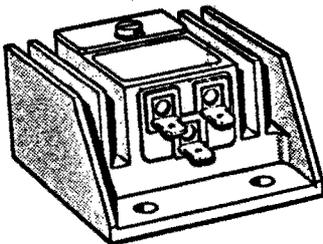


FIG. 32

Rectifiers are equipped with two fuses which can be inspected or replaced after removing the rectifier cover (Fig. 32). Rectifier diodes can be checked using an ohmmeter or continuity light, measuring from each (51) terminal on rectifier to fuse clip. Test should show continuity in one direction but not with leads reversed. If either diode is defective, rectifier must be replaced.

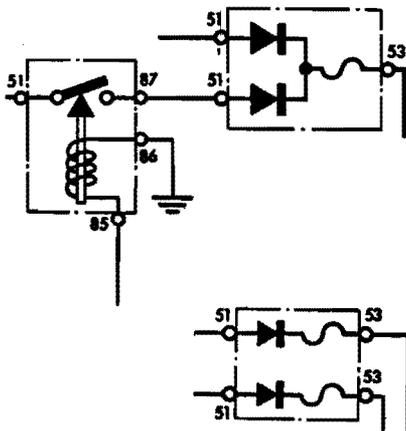


FIG. 33

STARTING MOTOR

Bosch Inertia Drive Starter

To disassemble the brush end, first remove end cap (1) and refer to Fig. 34. Remove C-Washer (3) and thrust washers (4), then remove the two through-bolts (16).

Insert a thin-blade screwdriver in between brush-end cover and starter frame and carefully pry off the cover, making sure terminal post (T-Fig. 35) remains with starter frame. Pull back free end of springs (S) and lift the brushes

(B), allowing free end of spring to rest against side of brush. With all springs lifted from commutator, armature and drive assembly can be withdrawn.

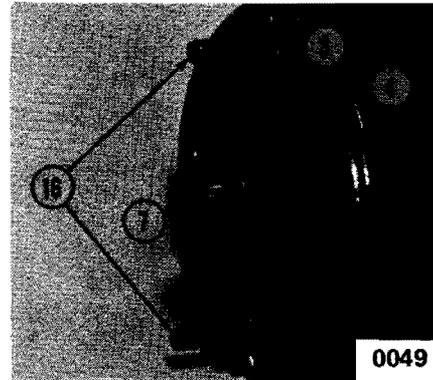


FIG. 34

Assemble by reversing the disassembly procedure. The floating brush-end frame is prevented from turning by the locating notches (N-Fig. 36) and starter through-bolts must pass through these notches when unit is assembled.

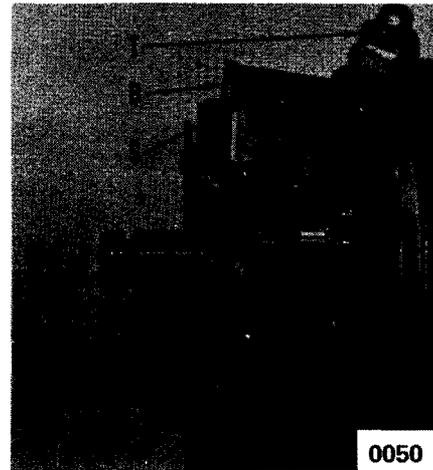


FIG. 35

To disassemble the drive end, use a suitable press and mandrel, and push down on locking collar (11-Fig. 37) until snap ring (12) is exposed. Spread and remove snap ring and remove drive components. Drive (8) contains an over-running clutch and is renewable only as an assembly. When assembling drive end, suitable support the gear and pry locking collar (1) back over ring (2) until it snaps in place. Snap ring fits in groove (A) in shaft and shallow groove in locking collar as shown in cross sectional view (Fig. 38)

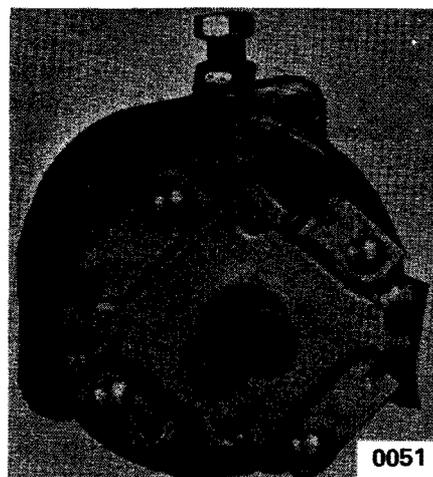


FIG. 36

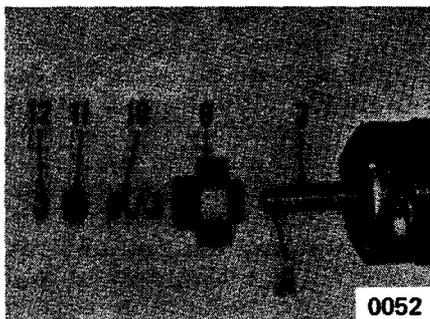


FIG. 37

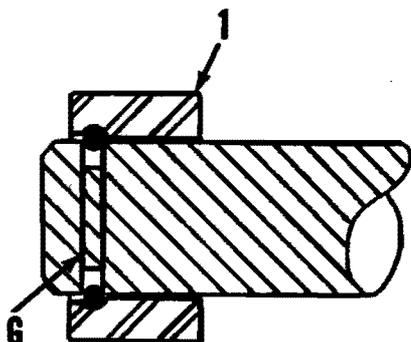


FIG. 38

SPARK 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. These deposits will not interfere with normal spark plug performance if plugs are cleaned at regular service intervals.



FIG. 39

- a. 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, ignition timing overadvanced, or piston rings stuck. (Fig. 39).

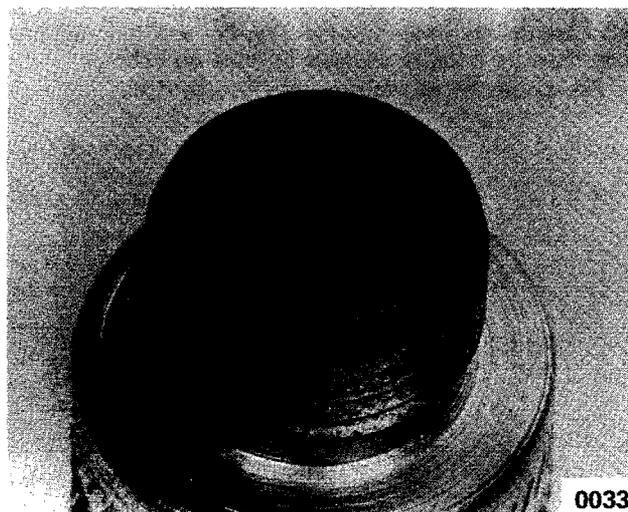


FIG. 40

- b. A dark, block or sootish coloration, or wet appearance, ordinarily indicates the heat range as being too cold. 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. (Fig. 40).
- c. A definite white coloration may indicate the presence of moisture in the combustion chamber. Similar deposits are caused by pre-ignition.

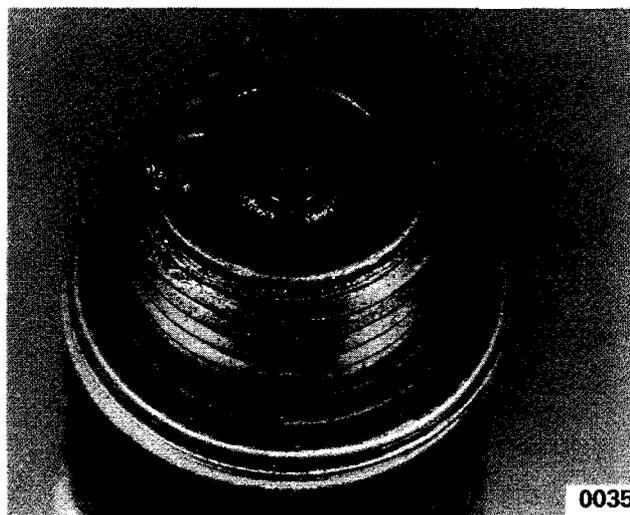


FIG. 41

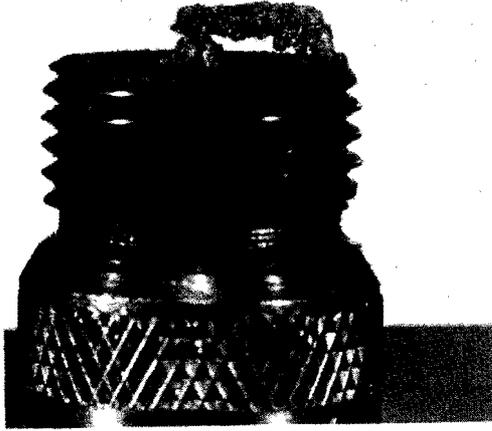
- d. Oil fouling deposits wet, sludgy deposits and is a result of misfiring or of excessive oil in the fuel mixture (Fig. 41).
- e. Burned or overheated spark plugs may be identified by a white, burned, or blistered insulator nose, and badly eroded electrodes. Excessive deposits in the combustion chamber, a lean fuel mixture or improperly installed spark plugs can cause overheating.

SECTION 4 MAINTENANCE

Core Bridging

Electrodes not badly burned. Bottom side electrode usually coated with ash-like deposits. Insulator nose "Peppered" with tiny beads or small chunks fused to firing end. Sometimes have the appearance of glass-like bubbles.

For cause of core bridging, see "Gap Bridging".



0034

FIG. 42

Gap Bridging

Spark gap shorted out by combustion particles, wedged or fused between electrodes (Fig. 42).

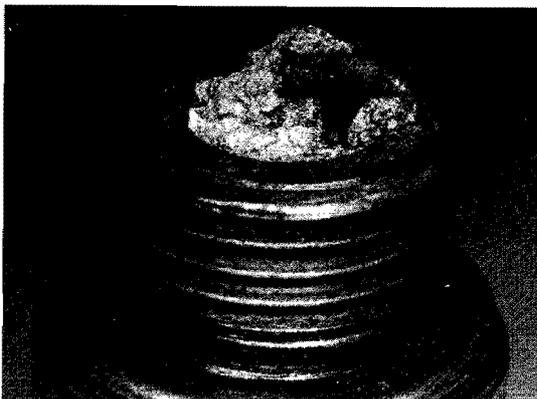
Both core bridging and gap bridging are caused by excessive combustion chamber deposits striking and adhering to the spark plug's firing end. They originate from the piston and cylinder head surfaces. These deposits are formed by one or a combination of the following:

Excessive carbon in cylinder

Use of non-recommended oils

Immediate high-speed operation after prolonged and excessive idling.

Improper ratio of fuel mix



0036

FIG. 43

Aluminum Throw-Off

Metallic "gob" of gray pot metal adhering to electrodes and plug core. Rare. (Fig. 43)

Caused by pre-ignition source within cylinder melting aluminum alloy off piston. Do not install new plugs until source of pre-ignition is determined and piston examined.

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.

DO NOT clean plugs on abrasive blasting machines. This type 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 .028 to .030 inch 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 gage to measure gap adjustment

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. Tighten spark plugs 180 in. lbs., 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.

HEAT RANGE (Fig. 44)

Heat range is especially important to an engine, because of the great differences in how an engine is used. Racing at high speed requires a much different type of plug in terms of heat range than does prolonged slow speed. Then, too, there is that middle path calling for plugs that lie somewhere in between these two extremes.

Heat range refers to a plug's ability to transfer heat from the firing tip of the insulator to the cooling system of an engine. This rate of heat transfer is controlled by the distance the heat must travel to reach the cooling medium. A "cold" plug has a shorter insulator nose and gets the heat quickly to the engine's cooling system, and is recommended for continuous high speed operation to avoid overheating. A "hot" plug has a longer insulator nose and gets heat away more slowly from the firing end. It runs "hotter" to burn off combustion deposits that tend to foul the plug during prolonged idle or low-speed operation. Always follow the engine manufacturers recommendation for

proper spark plug heat range. Failure to do so may result in damage to the engine.

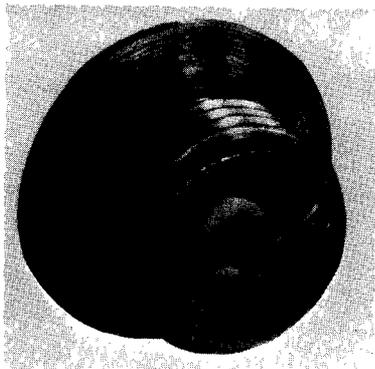


FIG. 44

M. FRAME AND AXLE REPAIR

The front axle of the Ruppster is made of high strength alloy tubing. Although this axle will not deform under hard normal use, occasional circumstances may result in a bent axle.

To effect a satisfactory repair of a bent front axle some cautions should be observed in handling the high alloy tubing. In all of the cases we have observed the axle was bent outboard of the point where it attaches to the frame rail, the area of bend is also usually identified by local buckling of the tube.

First of all, the smallest area possible should be exposed to heat, and the lowest possible heat necessary should be used. The axle should be heated to no more than a dull red color before straightening. After pulling the axle back into shape it should be allowed to air cool back to normal temperature in still air; i.e. no artificial cooling should be used such as water, oil, or moving air. This is necessary to insure minimum loss of strength and minimize chances of "hard spots" which could lead to fatigue failures.

Any application of heat in this manner will inherently reduce the strength of the high alloy tube. The repair operation, should therefore, include gusseting the axle tube to the frame with a section of tubing, angle or plate.

After repair operations are completed the toe-in of the front wheels should be set at least by "eye ball".

Any repair operations on the rest of the frame, which is constructed of low alloy steel tubing, can be made by virtually any means.

N. ENGINE REPLACEMENT

To remove the engine from the vehicle for service the following steps should be performed as follows:

1. Remove right rear tire (next to engine.)
2. Remove torque converter belt
3. Remove choke and throttle linkage.
4. Disconnect electrical plug at engine.
5. Remove gas line from carburetor.
6. Remove air intake hose.
7. Remove recoil starter pulley from rear frame member.

NOTE: On electric start models, remove battery, starter solenoid and wire running from solenoid to starter, before step # 8.

8. Remove four bolts from bottom of engine and remove.

REVERSE THE REMOVAL STEPS TO REINSTALL THE ENGINE.

O. BODY REPLACEMENT

When removing the Ruppster from storage or when an overall check of the running gear is in order, it may be more feasible to remove the body to make these checks.

TO REMOVE THE BODY:

1. Remove upholstery.
2. Remove steering wheel.
3. Disconnect air intake hose.
4. Disconnect gas tank filler hose.
5. Disconnect Brake and throttle linkage on top at the pedals also underneath at the linkage connections.
6. Remove the bolts connecting the frame uprights at the back of the body.
7. Disconnect electrical connector under ignition switch.
8. Remove the 7 body hold down bolts and lift off body.

REVERSE THE STEPS TO REINSTALL THE BODY

CAUTION: Do not operate the Ruppster under any conditions with the gas tank filler hose disconnected. After reinstallation of the body, this step should be checked to insure safe and proper connection.

SECTION 5
SPECIFICATIONS

SECTION 5 ENGINE REPLACEMENT

A. VEHICLE

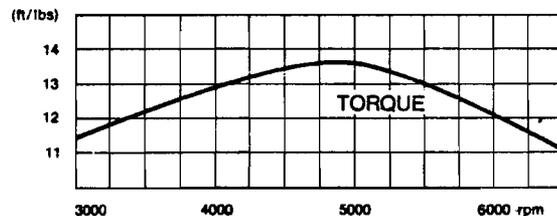
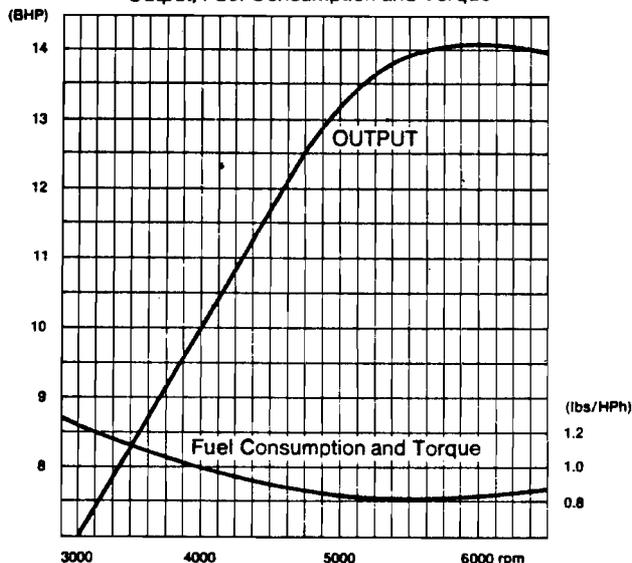
SPECIFICATIONS

Engine	230cc, 2-cycle
Starter	Recoil (Electric Start Optional)
Body	Rupp Red ABS
Power Train	Rupp Torque Converter to Forward Speed Gear Box
Wheels	8 inches
Tires	21" x 11" x 8", Exclusive Rupp Knobbies
Brakes	Rear, Hydraulic Disc
Wheelbase	50 inches
Length	71 inches
Width	49 inches
Height	Rear Deck 28"; Steering Wheel 34"
Turning Radius	10 ft.
Maximum Climb	45°
Speed	40+ mph

B. ENGINE

Model	L-230
Cycle	Two-stroke
Cylinders	One
Cooling	Air (fan)
Displacement	223 cc. (13.6 cu. in.)
Stroke	2.283"
Bore	2.756"
Compression ratio	11 to 1
Fuel consumption under full load82 lbs./Hph at 5500 Rpm.
Ignition make and type	Bosch RCP 1 with 12V/40W lighting coil
External ignition coil	Bosch type PA
Pole shoe break471" to .708"
Contact breaker gap014" to .018"
Ignition setting before T.D.C.091" to .126"
Spark plug	Champion K 57 R or Bosch M 240 T 1
Spark plug gap0157" to .0197"
Starter	Rewind with emergency starting pulley
Carburetor	BDC (Walbro)
Engine lubrication	Mixture of good gasoline and special two-stroke engine oil
Mixture ratio	20 to 1 (at normal operating conditions)
Direction of rotation (viewed from P.T.O. end)	Counterclockwise
Weight (w/rewind starter, std. configuration)	29.1 lbs.

Output, Fuel Consumption and Torque



Note: These are continuous ratings and are based on a barometric reading of 760 Torr and a suction-air temperature of 68°F. To obtain ratings to a barometric reading of 736 Torr, suction-air temperature of 68°F, air humidity of 60%, multiply the above indicated figure by 0.97.

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