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Serving the Cleaning Industry Since 1922

MM 123

7-86
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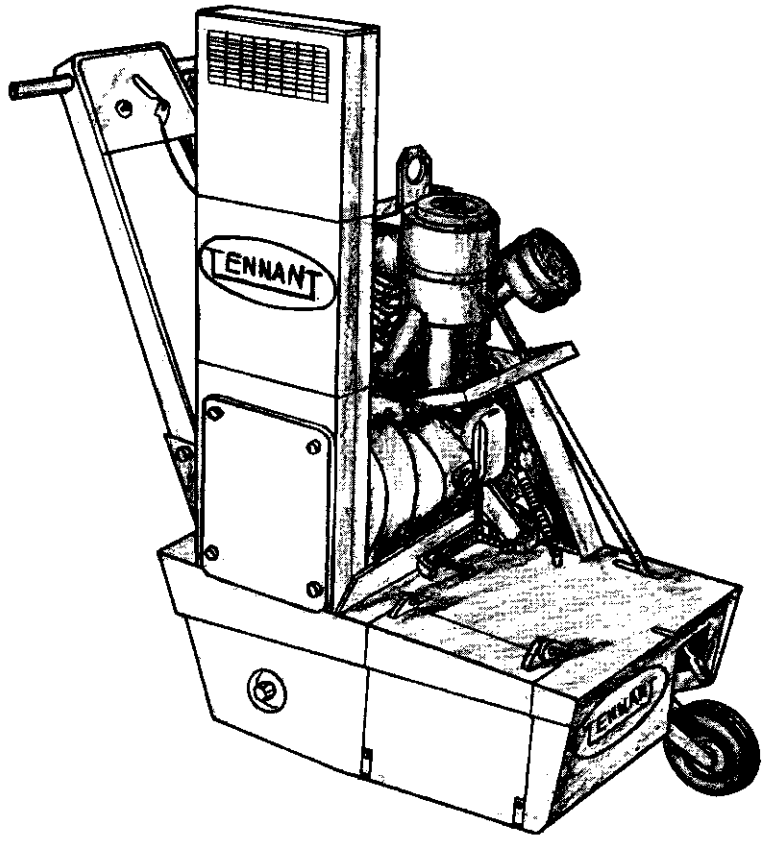
TENNANT®

RS/TLR

SCRAPING MACHINE

Operation, Maintenance, and Parts Manual

FOR MACHINES WITH SERIAL NUMBER 3342 AND ABOVE



SPECIALIZED MAINTENANCE EQUIPMENT

SWEEPERS • SCRUBBERS • SCARIFIERS • FLOOR COATINGS

Home

This manual is furnished with each new TENNANT® Model RS/TLR. It provides necessary operating and preventive maintenance instructions. Read this manual completely and understand the machine before operating or servicing it.

The instruction portion of the manual consists of the Specification, Operation, and Maintenance, and Appendix sections. The parts section consists of the Parts and Engine Parts sections.

All right side and left side references to the machine are determined by facing the direction of forward travel. All hardware considered to be of a common nature or locally available has been omitted from the parts sections. Make sure you use equivalent hardware when replacement becomes necessary.

This machine will provide excellent service. However, the best results will be obtained at minimum costs if:

- The machine is operated with reasonable care.
- The machine is maintained regularly – per the maintenance instructions provided.
- The machine is maintained with Tennant Company supplied or equivalent parts.

Parts and supplies may be ordered by phone or mail from any Tennant Company parts and service center, distributor, or from any of the Tennant Company subsidiaries. Before ordering parts or supplies, be sure to have your machine model number and serial number handy. Fill out the data block below for future reference. The telephone numbers, telex numbers, mailing addresses, and locations of those outlets are listed on the last page of the manual.

Home

MACHINE DATA

Please fill out at time of installation.

Machine Serial Number – _____

Engine Serial Number – _____

Sales Representative – _____

Date of Installation – _____

Manual Number – MM123

Published: ~~7-86~~ 9-88 12-90 reviewed with No changes

Acknowledgments: Technical information and/or illustrations supplied by Teledyne Wisconsin Motor.

1988

SAFETY PRECAUTIONS

The following symbols are used throughout this manual as indicated in their descriptions.

DANGER: To warn of immediate hazards which will result in severe personal injury or death.

WARNING: To warn of hazards or unsafe practices which could result in severe personal injury or death.

CAUTION: To warn of hazards or unsafe practices which could result in minor personal injury.

ATTENTION: To warn of unsafe practices which could result in extensive equipment damage.

NOTE: To give important information or to warn of unsafe practices which could result in equipment damage.

The following information signals potentially dangerous conditions to the operator or equipment. Read this manual carefully. Know when these conditions can exist. Then, take necessary steps to train machine operating personnel.

WARNING: Do not fill gasoline fuel tank with engine running. Do not smoke or use open flame near the fuel tank. Make sure fuel container and machine are electrically connected when refueling.

WARNING: Provide adequate ventilation system to properly expel discharged gases. Check exhaust system regularly for leaks. Ensure that exhaust manifolds are secure and not warped.

CAUTION: Avoid moving parts of the unit. Loose jackets, shirts or sleeves should not be permitted when working on machine because of the danger of becoming caught in moving parts. Make sure all nuts and bolts are secure. Keep shields and guards in position. If adjustments must be made while the unit is running, use extreme caution around hot manifolds, moving parts, v-belts, etc.

WARNING: Safety glasses or goggles must be worn by the machine operator. Dirt, dust and projectiles are generated by the machine when in operation.

WARNING: Ear protective device(s) must be worn by the machine operator. Excessive noise is generated by the machine when in operation.

CAUTION: Park the machine on a level surface. This machine is not equipped with a parking brake.

WARNING: An adequate lifting mechanism must be provided to hoist machine to a higher level. Machine may be hoisted as one unit or separated into two units if a lifting mechanism of lesser capacity is used. The lifting mechanisms must be capable of lifting the following:

To lift entire machine – 500 lb (225 kg)
To lift in two units, one at a time – 300 lb (135 kg)

WARNING: Stay clear of machine when it is being hoisted or lowered to or from a surface.

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TENNANT COMPANY WARRANTY POLICY

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SPECIFICATIONS

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MACHINE SPECIFICATIONS

POWER TYPE
Engine type – piston
Ignition – magneto-type spark
Cycle – 4
Aspiration – natural
Cylinders – 1
Bore – 3 in (76 mm)
Stroke – 3.25 in (83 mm)
Displacement – 23 cu in (377 cc)
Net power – 9.2 hp (6.8 kw) @ 3600 rpm maximum
Fuel – gasoline, unleaded, 90 octane
Cooling system – air

POWER TRAIN
Tool – belt driven

SUSPENSION SYSTEM
Front – 6 x 2.00 solid tire
Rear – 10 x 2.75 solid tire (2)

SYSTEM FLUID CAPACITIES
Engine lubricating oil – 3 pt (1.7 L)
Fuel tank – 1.3 gal (5 L)

GENERAL MACHINE DIMENSIONS – CAPACITIES
Length – 49.5 in (1255 mm)
Width – 18.75 in (475 mm)
Height – 44.75 in (1135 mm)
Scrapping path width – 10 in (255 mm)
Paint Removal path width – 6 in (150 mm)

MACHINE WEIGHTS
Net weight, engine and handle – 173 lb (78 kg)
Net weight, frame and tool – 162 lb (73 kg)
Net weight, total – 335 lb (150 kg)
GVWR – 365 lb (164 kg)

SECTION 2
OPERATION

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PREPARATION FOR OPERATION

1. Mount control handle with 0.50 in bolts provided. Position handle to desired height by selecting appropriate holes in handle mounting plates.

2. Check engine oil level. Although properly lubricated at factory, some oil loss may have occurred during shipment and must be checked before starting engine. If needed, add oil as recommended in Engine Section.

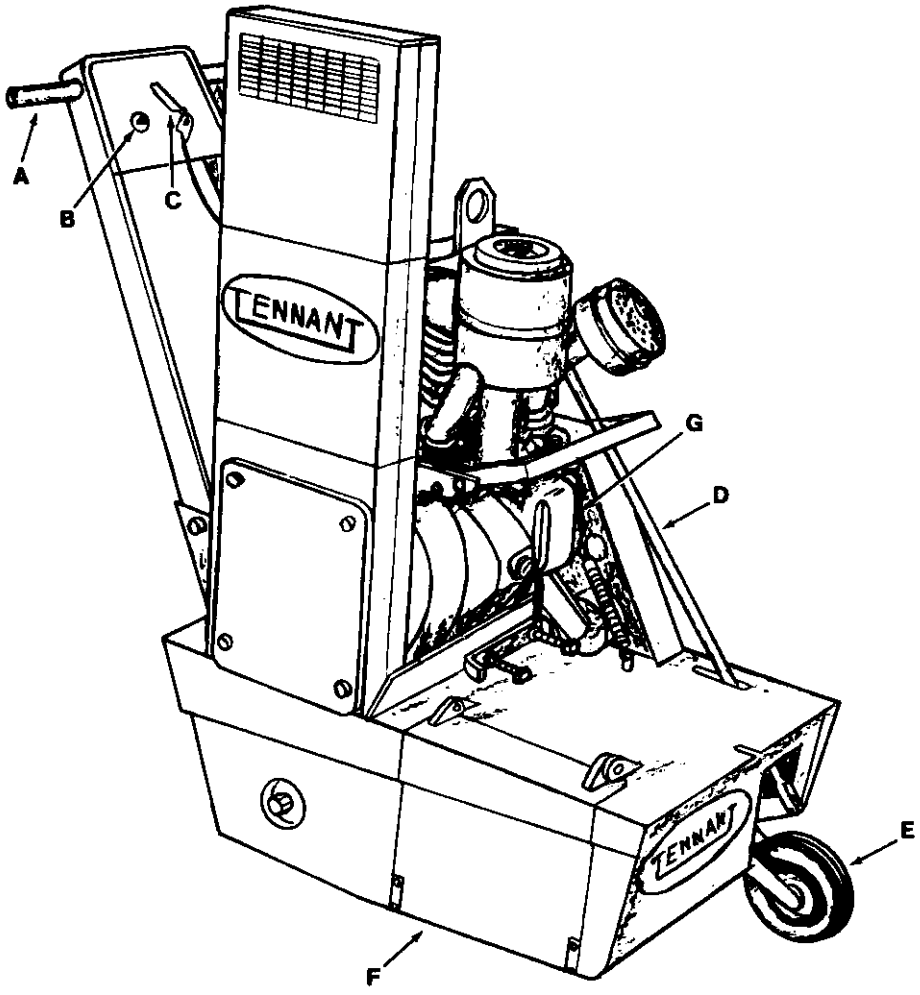
NOTE: When adding oil, be careful not to over-fill. Also, make sure filler plug is kept tight to avoid oil being forced out when engine is running.

3. Fill fuel tank with clean, fresh regular grade gasoline. Do not mix oil with gasoline.

WARNING: Never fill tank while engine is running. Always be sure the gasoline storage container and machine are electrically connected before pouring gasoline. This can easily be done by providing a flexible wire (permanently attached to the container), with a battery clip on the other end.

4. Check tightness of air cleaner mounting bolt and make sure element is in place. See instructions on side of air cleaner. Regular inspection after each eight hour shift will prevent intake of dirt, causing excessive engine wear.

5. See following pages to install the machine tool appropriate for the job.



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MACHINE COMPONENTS

A. Handle
B. On–Off Switch
C. Throttle Lever
D. Third Wheel Control Lever
E. Third Wheel
F. Tool Access Door
G. Stop Button

ON-OFF SWITCH

The on-off switch controls the machine engine. Pull the switch out into the "on" position tao start the machine. Push the switch in into the "off" position to stop the machine.

THROTTLE LEVER

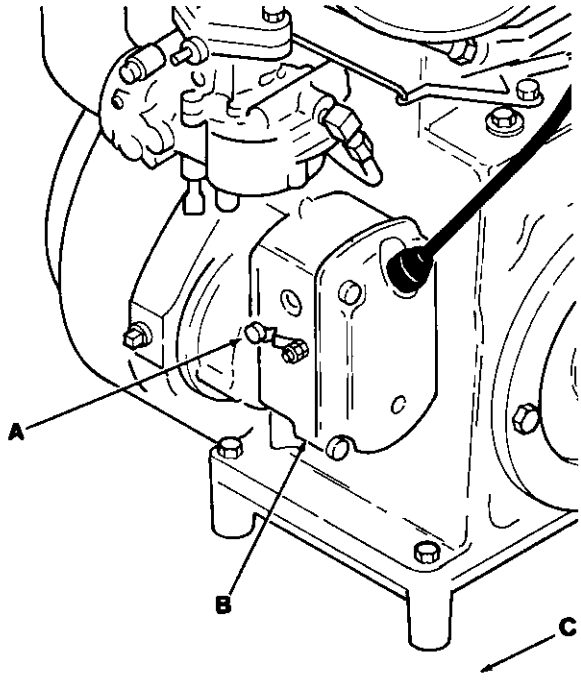
The throttle lever controls the engine speed. Pull the lever up to speed the engine. Push the lever down to slow the engine.

THIRD WHEEL CONTROL HANDLE

The third wheel control handle controls the position of the tool. Pushing the handle forward and pulling the handle up lowers the tool. Pushing the handle forward and down raises the tool off the floor. It also controls tool depth.

STOP BUTTON

The stop button is an engine mounted stop button. Hold the button down to short out the breaker points until the engine stops.



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ENGINE STOP BUTTON

A. Engine Stop Button
B. Magneto

TO START ENGINE

1. Lower the third (front) wheel so machine tool is clear of surface to be cleaned.
2. Open fuel shut-off valve under fuel tank.
3. Pull switch to "on" position.
4. Choke as needed – usually in cold weather or when first starting machine.
5. Move throttle lever half way open.
6. Start machine with recoil starter.

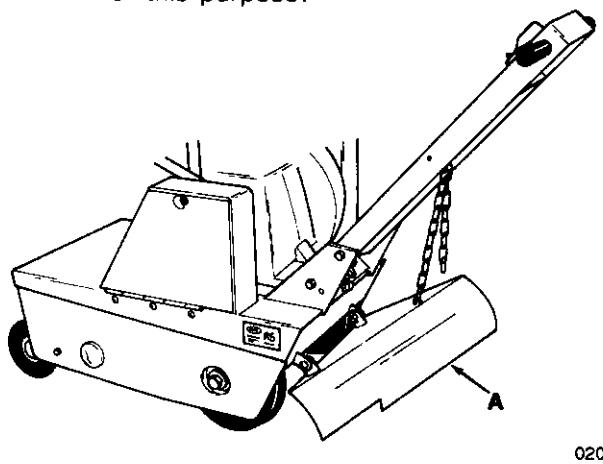
TO STOP ENGINE

1. Raise the tool off the floor with third wheel control handle.
2. Push the on–off switch into the "off" position.

TO OPERATE MACHINE FOR ROOF REMOVAL OR CUT OFF JOBS

Use the path scraper when needed for windrowing loosened gravel. The path scraped will show the operator where he has cut and will facilitate successive cuts and overlapping as required for a cleaner cutting job.

Mount the path scraper to mounting lugs on the rear of the frame. Clevis and cotter pins are provided for this purpose.



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PATH SCRAPER

A. Path Scraper

1. Be sure the right tool is being used for the job to be accomplished. See To Mount Machine Tools for Roof Removal.
2. Adjust the third (depth control) wheel to desired height. See To Adjust Depth of Cut. While this wheel has been provided primarily for gauging the depth of the cut when using the cut-off tool, it may also be advantageous when using scraping tool.
3. Operate the machine at full throttle.
4. For best results, observe the following procedure:
   a. Lay out an area of 5 to 10 squares of roof and follow a convenient pattern of cutting with the machine. Rectangular areas work best.
   b. Clean loose gravel from roof before using the machine. This will facilitate the removal of the embedded gravel remaining and result in longer cutter life.
   c. When operating the machine in extreme heat, water the roof before scraping. This will assure a less dusty operation. Also, the pitch is more easily scraped clean when cool.
   d. Operate the machine in the direction in which the felt is laid. When removing humps or ridges, it is usually best to run the machine lengthwise along the ridge.
   e. Overlap the scraping path slightly to assure full coverage.

TO MOUNT MACHINE TOOLS FOR ROOF REMOVAL

1. REVO®–Tool (for scraping gravel and pitch buildup from roofs).

   a. Stop the engine.

⚠ WARNING: Stop the engine before working on the machine to prevent serious personal injury.

   b. Open tool access door at right front of machine.

   c. Lower third wheel to allow clearance between tool and surface on which the machine is parked.

   d. Mount tool on tapered shaft. Be sure tapered shaft and tapered opening in tool are free of dirt and burrs. CLean these areas thoroughly and periodically to facilitate both mounting and removal of tools.

   e. Insert left–hand thread bolt (longer of the two bolts used on the machine) and tighten securely with wrench provided.

2. Cut–off tool (both rigid blade type and toothed round cutter type).

   a. Stop the engine.

⚠ WARNING: Stop the engine before working on the machine to prevent serious personal injury.

   b. Open tool access door at right front of machine.

   c. Lower third wheel to allow clearance between tool and surface on which the machine is parked.

   d. Mount cut–off tool on tapered shaft.

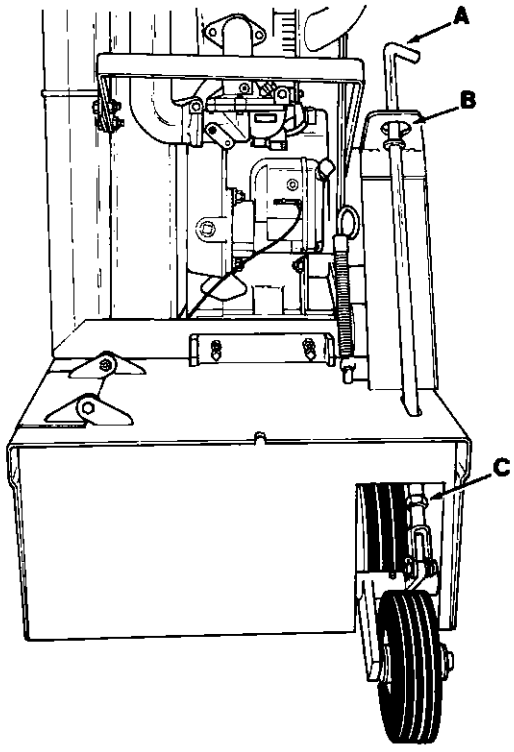
   e. Insert left–hand thread bolt, (shorter of the two bolts used on the machine) and tighten securely with wrench provided.

TO ADJUST DEPTH OF CUT

1. Stop the engine.

⚠ WARNING: Stop the engine before working on the machine to prevent serious personal injury.

2. Loosen lock nut.



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CONTROL HANDLE

A. Control Handle
B. Slotted Hole
C. Lock Nut

3. Turn control handle to change the depth of cut. (Clockwise will increase depth.)

4. Tighten lock nut.

NOTE: Push upper collar on control handle through slotted hole for transporting machine.

TO OPERATE MACHINE FOR TRAFFIC LINE REMOVAL

1. For traffic line removal, use either type 6 in (150 mm) REVO®–Tool.

   a. Full faced REVO®–Tool (no washer) – usually best suited for use on asphalt surface.

   b. Spaced REVO®–Tool (using equal amount of washer spacers with cutters) – best suited for use on concrete surface. This tool is more aggressive than the tool described under (a) above.

2. Operate the machine at the full opening of the hand throttle control. It may be good to reduce the speed with hand throttle depending upon the surface and the type of material to be removed.

3. Adjust the third (depth control) wheel by means of the control handle. Adjust the wheel when using the machine on softer surfaces to better control the cutting action of the REVO®–Tool. See To Adjust Depth of Cut.

TO MOUNT REVO®–TOOL FOR TRAFFIC LINE REMOVAL

1. Stop the engine.

WARNING: Stop the engine before working on the machine to prevent serious personal injury.

2. Open tool access door at right front of machine.

3. Lower third wheel to allow clearance between tool and surface on which the machine is parked.

4. Mount the tool on the tapered shaft. Be sure tapered shaft and tapered opening in tool are free of dirt and burrs.

5. Insert left–hand thread bolt (shorter of the two bolts used on the machine) and tighten securely with wrench provided.

ROOF SCRAPING TOOLS

The cage assembly is a complete welded frame less rods, retainer bars, cutters and spacers.

TO REPLACE ROOF SCRAPING TOOLS

1. Remove retaining bars from one end only of REVO®-Tool. Slide bars out from cage frame opening. Cutters and washers will fall off.

2. Insert rod through end flange of tool frame so rod extends slightly beyond flange.

3. Slide 2 spacers on rod end extending through end flange. Then insert 1 cutter, 2 spacers, etc., progressively until complete rod has been extended through center and into other end of frame flange.

4. Insert the remaining 3 rods equally spaced around the circumference of the tool frame and replace cutters and washers on each rod in the same manner described above.

5. Replace the retaining bars and screws holding the bars in the tool.

When using the 2 in (50 mm) cutters on the REVO®-Tool, each rod should have a total of 26 cutters and 52 spacers. Therefore, the complete tool using 2 in (50 mm) cutters should be equipped with a total of 208 spacers and 104 cutters.

When using the 2.5 in (63.5 mm) cutters on the REVO®-Tool, each rod should have a total of 24 cutters and 48 spacers. Therefore, this tool should be equipped with a total of 192 spacers and 96 cutters.

NOTE: On every other rod, start with a cutter first instead of the spacer. Opposite rods will have cutters and washers identically spaced, but alternate rods will be spaced differently.

ATTENTION: Do not install the cutters and spacers too tightly between each frame section. Install only the recommended number of cutters and spacers per rod. Proper installation of cutters and spacers will assure proper tool balance and provide longer cutter life and increased scraping efficiency.

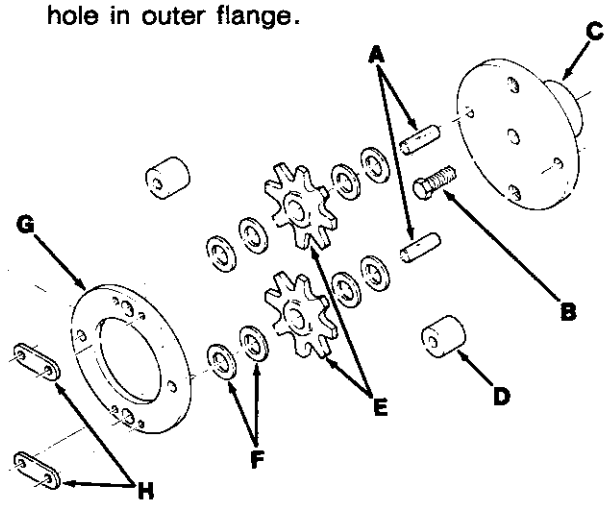
ROUND CUTTER TYPE CUT-OFF TOOL

The round cutter type cut-off tool is used for general cut-off jobs. It is recommended for rigid deck roofs where insulation is not too thick, and where cutting blade may have contact with deck. To avoid excessive cutter wear, always adjust third (depth adjustment) wheel to maximum depth of cut required.

TO REPLACE CUTTER

1. Lay tool on hub and remove two retaining plates.

2. Using punch, drive cutter pins out through hole in outer flange.



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ROUND CUTTER TYPE CUT-OFF TOOL

- **A. Cutter Pins**
- **B. Attaching Bolt**
- **C. Hub**
- **D. Sleeve**
- **E. Cutters**
- **F. Spacers**
- **G. Outer Flange**
- **H. Retaining Plates**

3. Position new cutter (with 2 spacers on each side) between flanges and align with cutter pin holes in flange.

4. Place cutter pin through outside flange and through the cutter and spacers.

5. Replace retaining plates.

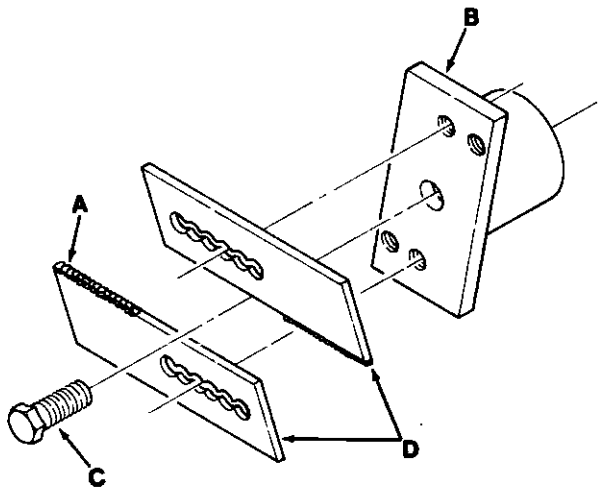
RIGID BLADE TYPE CUT-OFF TOOL

Use this type tool where extra cutting depth is required. Always adjust third (depth adjustment) wheel to maximum depth of cut required. This is necessary as a precautionary measure to avoid cutter blade wear or breakage and prevent damage to the tool.

TO INSTALL NEW CUT-OFF BLADES

1. Lay tool on hub with blades up.

2. Remove two hex screws with washers from each blade.



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RIGID BLADE TYPE CUT-OFF TOOL

A. Cutting Edge
B. Hub
C. Attaching Bolt
D. Blades

3. Place new blades in position on tool frame with cutting edges (hard surface weld) in the direction of tool travel.

4. Position blades to minimum extension notches for each blade. This setting provides the possible maximum 2 in (50 mm) cutting depth without injury to the tool compartment.

ATTENTION: Check the turning radius of the blade tips to be sure the blades clear the tool housing.

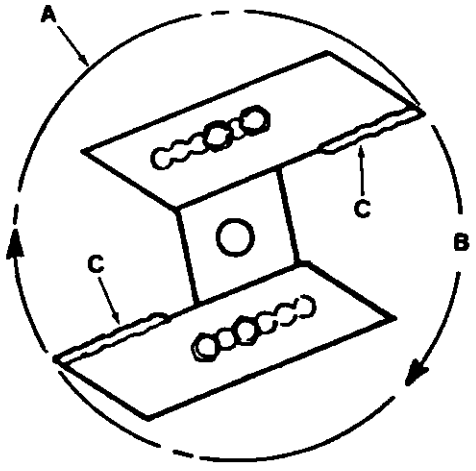
5. Insert and tighten hex screws with washers for each blade.

TO ADJUST WORN BLADES

1. Remove hex screws holding blades.

2. Slide both blades outward from tool frame. Be sure not to over-adjust and that blades are extended equally in both directions and do not strike tool compartment.

3. Replace hex screws with washers for each blade, aligning adjustment notches with tapped openings in tool frame.



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CHECKING TURNING RADIUS

A. 10 in (255 mm) Diameter
B. Tool Rotates Clockwise
C. Cutting Edge

TRAFFIC LINE REMOVAL TOOLS

There are two types of tools available for traffic line removal:

Full–faced type with 140 cutters and no spacers. This type tool is recommended for use on asphalt or other surfaces other than concrete.

Spacer–type tool with 92 cutters and 92 washer spacers. This is a more aggressive tool than the full–faced type tool. This type tool is recommended for use on concrete surfaces.

Either type tool can be changed to the other type tool simply by adding or subtracting cutters or washers. However, if changed from one type to the other, be sure that the tool is spaced properly and the correct number of cutters is added to each rod to assure proper balance to the tool.

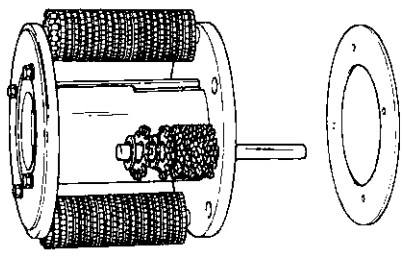
TO REPLACE TRAFFIC LINE TOOLS

1. The REVO®–Tool Cage is complete frame–– less rods, retaining rings, cutters and spacers.

2. To remove cutters, spacers and rods:

   a. Remove retaining ring from one end of REVO®–Tool.

   b. Rods will slip out of frame; cutters and washers will fall out.



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REVO®–TOOL CAGE

3. To replace cutters, spacers and rods:

   a. Insert rods through frame openings so rods extend slightly beyond inner flange. Replace a total of 42 cutters on each of 4 rods on a full–faced type REVO®–Tool. The spacer–type tool uses washer spacers between cutters. On this type tool, insert 1 spacer, then 1 cutter progressively on the first rod until the complete cutter rod has been extended into the opposite end flange of the frame. There should be a total of 21 spacers and 21 cutters per rod.

   b. Replace the cutters and spacers on each of the 3 remaining rods equally spaced around the circumference of the tool frame. However, on every other rod, start first with a cutter, then a spacer. On alternate rods, start with a spacer, then a cutter. By replacing your cutters and spacers in this manner, the opposite rods will be identically spaced. Alternate rods will have cutters in identical spots to washers on other rods.

4. After replacement of cutters and/or cutter spacers has been made, replace the retaining ring.

ATTENTION: Be sure when replacing cutters and spacers that there is an equal amount of cutters and/or cutters and spacers on every rod. Tool balance is important to the operation of the machine and tool. A tool which has been improperly spaced will have uneven weight distribution and will tend to set up a vibration. This will damage the machine or tool.

LIFTING MACHINE

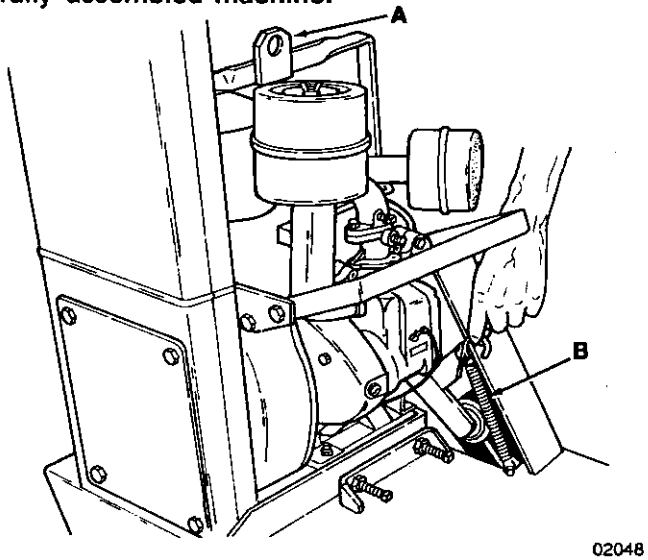
The machine may be lifted two ways. It may be lifted fully assembled or separated into the engine/handle unit and the frame unit.

⚠ WARNING: Stay clear of machine when it is being lifted or lowered to or from a surface.

LIFTING MACHINE–FULLY ASSEMBLED

Use eyelet in lifting bracket to lift fully-assembled machine. Make sure that the lifting mechanism is capable of lifting the required weight.

⚠ WARNING: Lifting mechanism must be capable of lifting 500 lb (225 kg) to lift fully-assembled machine.



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HOISTING BRACKET EYELET

A. Hoisting Bracket Eyelet
B. Idler Spring

LIFTING MACHINE–SEPARATED INTO TWO UNITS

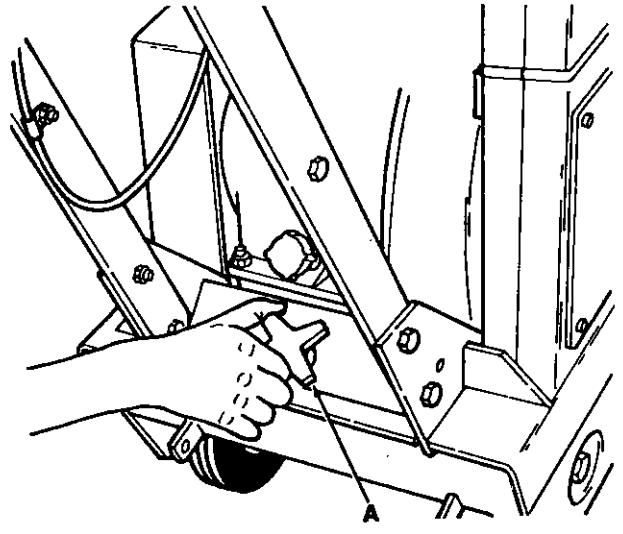
To separate the machine into two units, follow these steps:

1. Stop the engine.

⚠ WARNING: Stop the engine before working on the machine to prevent serious personal injury.

2. Detach idler spring.

3. Loosen star shaped knob or bolt for engine hold down located at the rear of engine.



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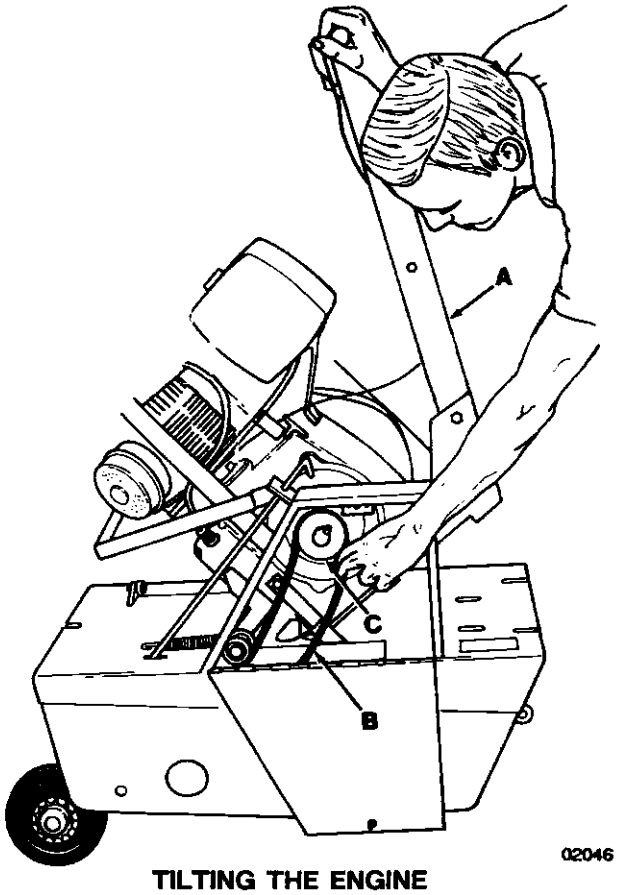
STAR SHAPED KNOB

A. Star Shaped Knob

4. Tilt the engine and handle forward, loosening belts. Remove the belts from the engine drive sheave.

5. With the engine tilted in the up position, pull handle straight back until the engine mounting plate brackets are clear of the frame openings.



TILTING THE ENGINE

A. Handle
B. Drive Belt
C. Engine Sheave

6. Use eyelet in hoisting bracket to lift engine and handle unit.

7. Strap a chain or cable to frame unit to hoist.

WARNING: Lifting mechanism must be capable of lifting 300 lb (135 kg) to lift the machine units, one at a time.

8. With both units on desired surface, remount the engine and handle unit on the frame unit. Be sure the v-belts are replaced, the idler spring connected, and the star-shaped knob is securely tightened to hold the engine and handle unit in place.

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SECTION 3
MAINTENANCE

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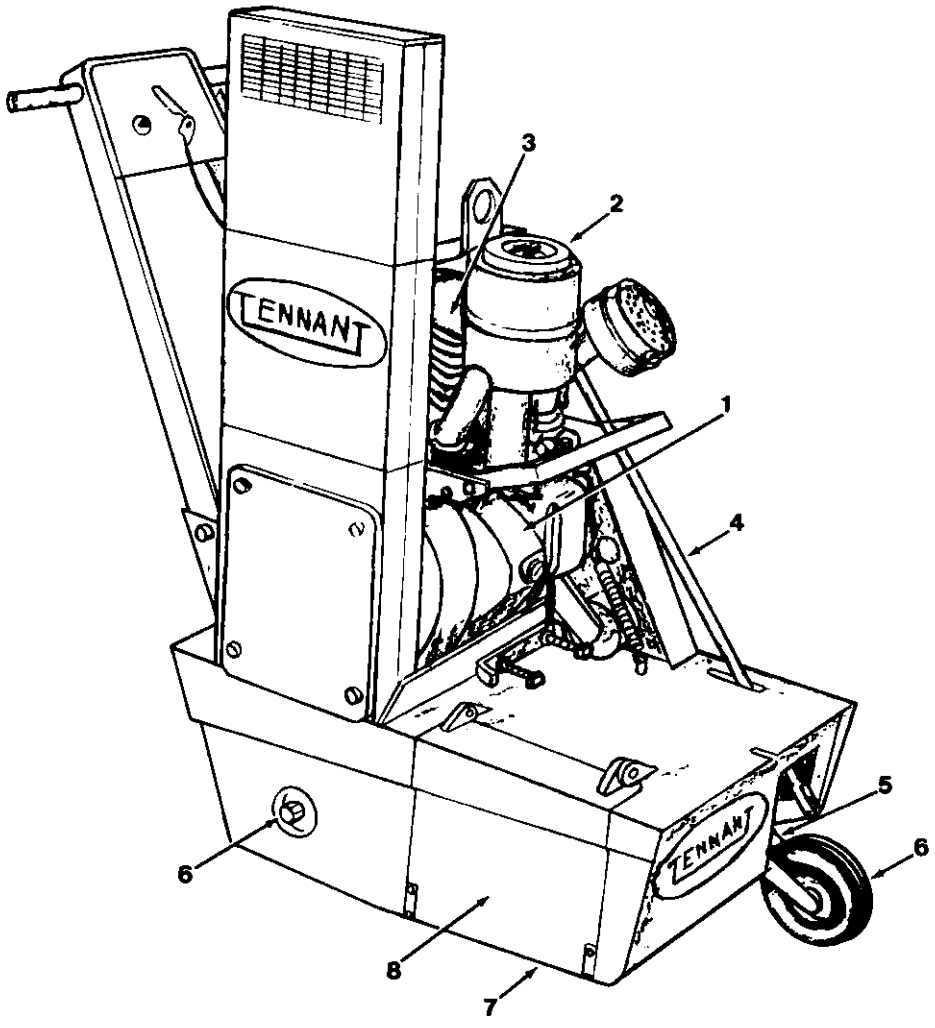
RECOMMENDED FIRST 50-HOUR MACHINE INSPECTION

After the first 50 hours of operation, the following procedures are recommended:

1. Change the engine oil.
2. Check the air cleaner element.
3. Check the hardware and tighten any loose nuts and bolts.

MAINTENANCE CHART



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MAINTENANCE LOCATIONS

MAINTENANCE CHART

Interval	Key	Description	Procedure	Lubricant	No. of Service Points
Daily	1	Engine crankcase	Change oil	EO	1
	2	Air filter	Clean when necessary	–	1
Weekly	3	Cooling fins	Clean when necessary	–	1
	4	Drive v-belt	Check tension	–	1
	5	Third wheel control arm	Lubricate	MPGM	1
	6	Wheels	Lubricate	MPGM	3
	7	Tool cage	Check for wear, check cutters	–	1
	8	REVO®-Tool	Clean compartment	–	1
	–	Hardware	Check tightness	–	Entire machine

EO – Engine oil
MPGM – Multipurpose, water resistant, lithium base, moly-disulphide EP grease

ENGINE

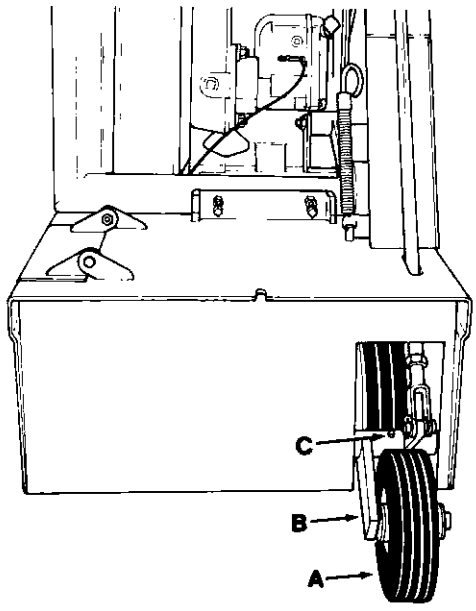
Change the engine oil daily. Use a straight SAE 30-weight, API class SF engine oil. If multiviscosity oil is used, oil consumption and combustion deposits will increase.

Using other than service class SF oil or extending oil change intervals could cause engine damage not covered by the engine warranty.

The engine oil capacity is 3 pt (1.4 L).

WHEELS

The three wheels have grease fittings located on the wheel bearings. Apply a general purpose, water resistant, lithium base, moly-disulphide EP grease to the wheel bearings weekly.



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THIRD WHEEL CONTROL ARM

A. Third Wheel
B. Control Arm
C. Grease Fitting

THIRD WHEEL CONTROL ARM

The third wheel control arm has a grease fitting located on the arm just behind the wheel. Apply a general purpose, water resistant, lithium base, moly-disulphide EP grease to the control arm weekly.

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ENGINE LUBRICATION

Change the engine oil daily. Use a straight SAE 30-weight, API class SF engine oil. If multivis-cosity oil is used, oil consumption and combustion deposits will increase.

Using other than service class SF oil or extending oil change intervals could cause engine damage not covered by the engine warranty.

The engine oil capacity is 3 pt (1.4 L).

COOLING SYSTEM

Maintaining cooling system efficiency is important. Engine temperatures must be brought up to and maintained within the satisfactory range for efficient operation. However, the engine must be kept from overheating in order to prevent damage to the valves, pistons, and bearings.

Home

Cooling is accomplished by a flow of air, circu-lated over the cylinder and head of the engine, by a combination fan-flywheel encased in a sheet metal shroud. The air is divided and directed by ducts and baffle plates to insure uniform cooling of all parts.

Never operate an engine with any part of the shrouding removed-this will retard air cooling.

Keep the cylinder and head fins free from dirt and chaff. Improper circulation of cooling air will cause engine to overheat.

Clean the engine cooling fins weekly.

⚠ CAUTION: Always wear eye protection when using air or water hoses to prevent eye injury.

AIR INTAKE SYSTEM

The importance of maintaining an air filter in proper condition cannot be overemphasized. Dirt induced through improperly installed, improperly serviced, or inadequate air filter elements wears out more engines than long hours of operation. Even a small amount of dirt will wear out a set of piston rings in just a few hours. Operating with a clogged air filter element also causes the fuel mixture to be richer, which can lead to formation of harmful sludge deposits in the engine. Always cover the air intake when the air cleaner is removed for servicing. Do not neglect servicing the air cleaner. Use only correct parts for replacement. Keep all other air intake compo-nents such as hoses, clamps, etc., secure and in good condition to prevent entrance of unfiltered air.

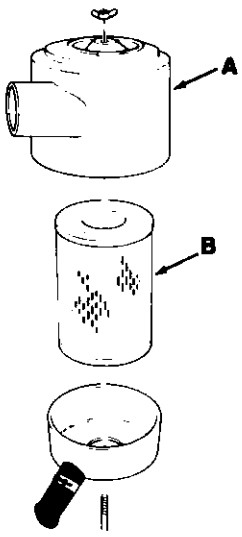
AIR CLEANER

Service daily if engine is operating in very dusty conditions. Remove the air cleaner cover and take out the element. Shake out the accumulated dirt in the element. Do not tap or strike element – it may cause damage. Wipe out dirt from inside the cover.

⚠ WARNING: Park on a level surface, stop the engine, and engage the parking brake before working on the machine to keep it from rolling.

Once each week; the filter element should be taken out and rinsed under a faucet with cold water, then washed by repeated dipping for several minutes in a solution of lukewarm water and a mild, nonsudsing detergent. Rinse in cold water from the inside out, and allow to dry overnight before installing.

After five washings or if it is damaged, replace the cartridge.



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AIR CLEANER ELEMENT

A. Air Cleaner Cover
B. Element

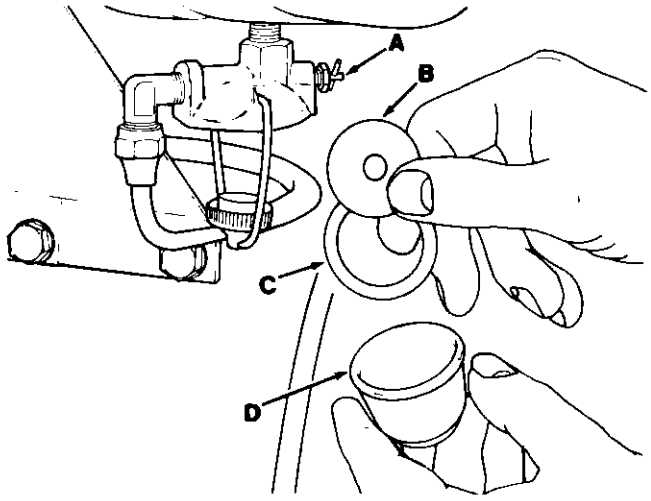
In cold weather, protect the element from freezing until dry. Excessive smoke or loss of power are good indications that the element requires cleaning.

Do not use gasoline, kerosene or solvent for cleaning – do not oil element.

FUEL SYSTEM

FUEL STRAINER
A fuel strainer is very necessary to prevent dirt from entering the carburetor and causing trouble, or even complete stoppage of the engine.

The strainer is an integral part of the shut-off valve at the bottom of the tank. Remove and clean periodically.



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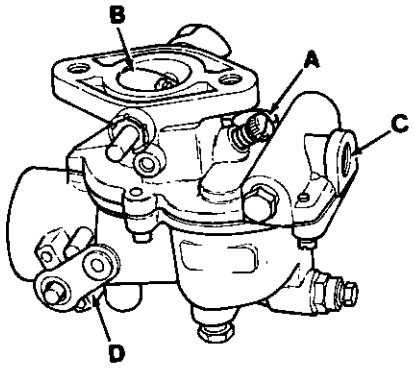
FUEL STRAINER

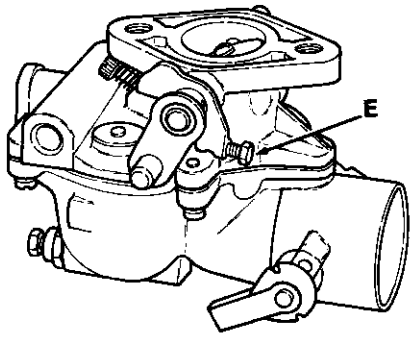
A. Shut-Off Valve
B. Screen
C. Gasket
D. Bowl

When dirt and water accumulate, the bowl and screen can be easily removed for cleaning. Twist bowl when removing to prevent damage to the gasket. Replace gasket if it has become damaged or hardened.

CARBURETOR
The main metering jet in the standard engine carburetor is of the fixed type and therefore no adjustment can be made.

To correct the amount of throttle plate opening for low idle speed is obtained by means of the throttle stop adjustment. The idle adjustment is for smooth, low speed operation and this adjustment if necessary, must be made with carburetor throttle lever closed.





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CARBURETOR ADJUSTMENTS

A. Idler Adjustment
B. Throttle Plate
C. Fuel Inlet
D. Choke Lever
E. Throttle Stop Adjustment

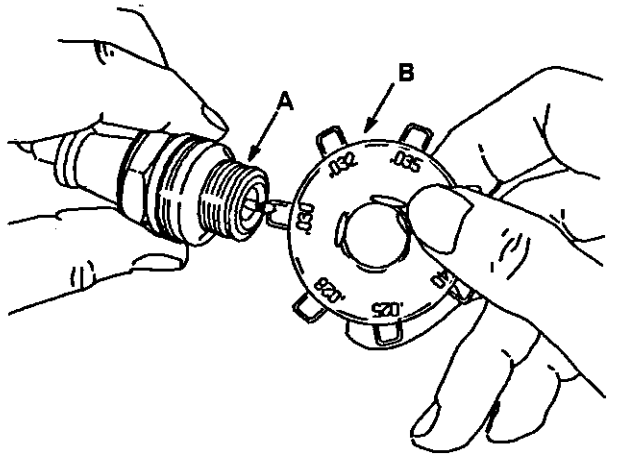
ELECTRICAL SYSTEM

SPARK PLUG

Spark plug gaps are best checked with a wire gauge unless the points are dressed to obtain a correct reading with a flat gauge. The adjustment should always be made on the side electrode and never on the center electrode, which may cause the porcelain to be broken.

The spark plug gap should be 0.030 in (0.8 mm), and plugs should be kept clean both inside and out. If the porcelain insulator is cracked, replace with a new plug of correct heat range. Use a new gasket when mounting either old or new plug and thoroughly clean threads in cylinder head before installation. Tighten spark plug 25 to 30 ft lb (35 to 40 Nm).

"Gapping" the electrode tip is more easily done with the proper tools.



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GAPPING THE SPARK PLUG

A. Spark Plug
B. Gapping Tool

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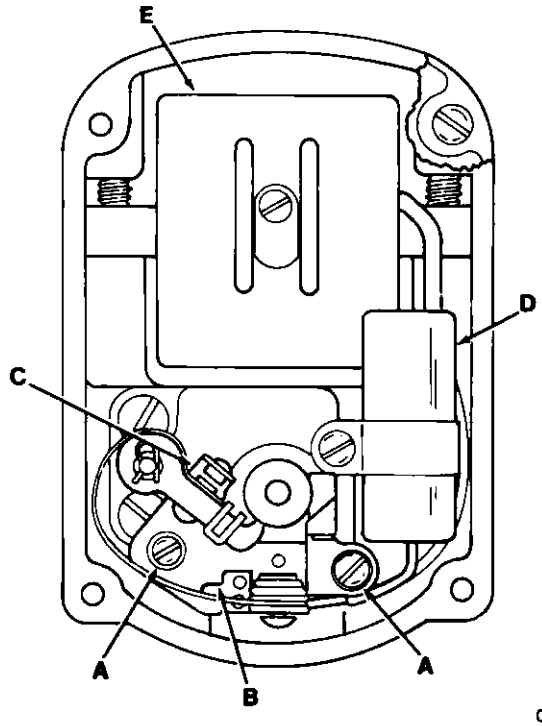
MAGNETO

Magnetos are properly adjusted and timed before leaving the factory. The breaker point gap of the Fairbanks-Morse magneto should have an opening of 0.015 in (0.38 mm) at full separation. If the spark becomes weak after continued operation, it may be necessary to readjust the breaker points. To do this first remove the end cover on the magneto. The crankshaft should be rotated (this also rotates the magneto), until the breaker points are wide open.

The opening or gap should then be measured with a feeler gauge and if necessary reset. To readjust points, first loosen the locking screws on the contact plate enough so that the plate can be moved. Insert the end of a small screw driver into the adjusting slot at the bottom of the contact plate and open or close the contacts by moving the plate until the proper opening is obtained. After tightening the locking screws, recheck the breaker point gap to make sure it has not changed. If it is found that the breaker points have become rough, they should be smoothed with a breaker point file before the above adjustments are made. Replace the magneto end cover and gasket carefully, so that it will seal properly.



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END VIEW OF MAGNETO

A. Locking Screws
B. Adjusting Slot
C. Breaker Point Gap
D. Condenser
E. Coil

If difficulty is experienced in starting the engine or if the engine misses firing, the strength of the ignition spark can be tested as follows: Remove the ignition cable from the spark plug and then wedge a piece of stiff bare wire up into the terminal boot with one end of the wire extending out. With the extended wire held about 0.12 in (3 mm) away from the cylinder head shroud stud, turn the engine over slowly. When the impulse coupling in the magneto snaps, there should be a good spark at the wire to stud gap. If there is a weak spark or no spark at all, check breaker point gap.

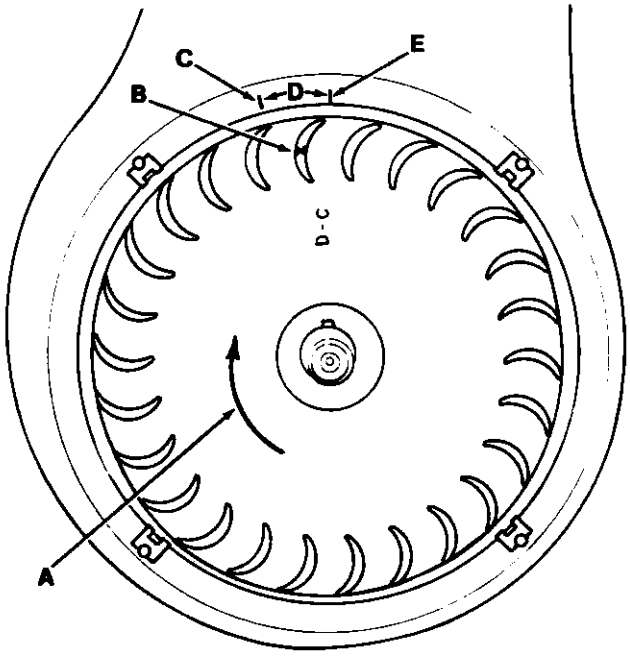
MAGNETO TIMING

If it becomes necessary to remove the magneto for cleaning or repairs, it is important that the magneto be reassembled properly so that it is timed correctly to the engine.

Removal of the recoil starter and air intake screen on the flywheel shroud, will expose the timing marks on the shroud and flywheel. It is however, possible to time the magneto to the engine without removing the flywheel screen. A 0.375 in (9.5 mm) diameter hole in line with the vertical center is located in the air intake screen. The marked air vane on the flywheel is visible through this opening.

1. Remove spark plug to make cranking easier.

2. Turn engine over with the starter sheave until the edge of the D–C and "X" marked vane on the flywheel is in line with the mark on the vertical centerline of the shroud or in the center of the timing hole.



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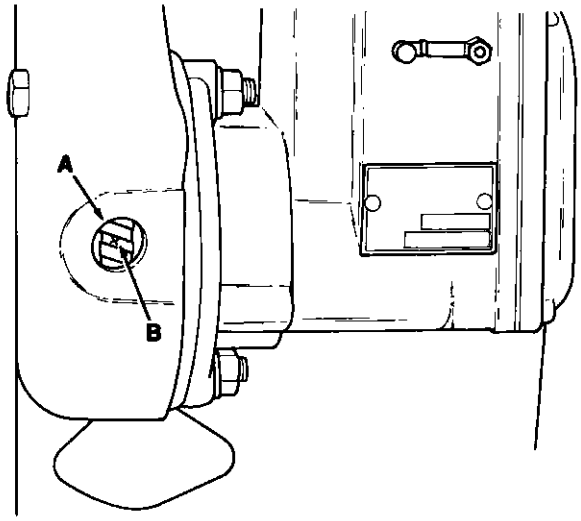
SHROUD AND FLYWHEEL TIMING MARKS

A. Engine Rotation Clockwise
B. "X" Marked Air Vane
C. Slotted Hole on Flywheel Screen
D. 20°
E. Vertical Center

3. Leave the flywheel in this position. At this point the keyway for mounting the flywheel is on the top.

4. Mount the magneto to the engine, meshing the gears so that when the magneto is in place, the "X" marked tooth on the magneto gear will be visible in the center of the inspection hole of the crankcase.



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MARKED GEAR TOOTH

A. Inspection Hole
B. Marked Gear Tooth

When the magneto is properly timed, the impulse coupling will snap when the D–C marked vane of the flywheel, lines up with the vertical centerline mark on the flywheel shroud, or with the timing hole in air intake screen, while turning the engine over slowly.

The running spark advance is 20°. For checking timing with a neon light, the running spark advance is indicated by a slotted hole on the flywheel screen rim. The center of the radii for the right hand edge of the slotted hole is 20° or 1.5 in (38 mm) before the vertical center of the cylinder.

RECOIL STARTER

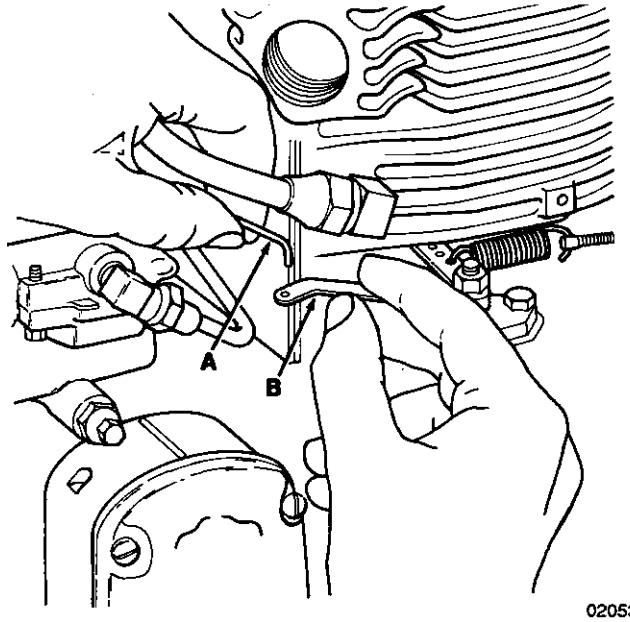
Oil and dirt, if allowed to accumulate in and around the starter, will cause wear and eventual failure of not only the starter parts, but engine parts as well.

Do not allow internal rotating screen and housing fins to become clogged with dirt. Brush clean to allow proper air flow to reach the engine. Inspect the rope for wear – replace before it breaks at a

critical time. If the engine does not turn over as the rope is pulled out, the starter dogs are not engaging with the drive hub teeth. If the rope does not rewind, rope or pulley may be binding – insufficient spring tension – spring disengaged or broken.

GOVERNOR

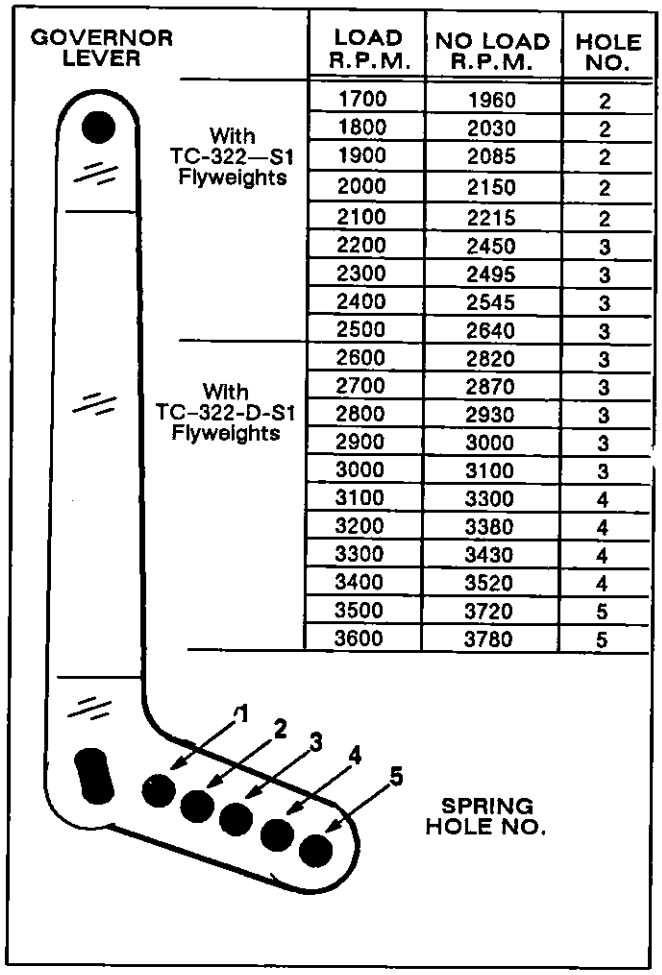
The governor rod connection to the carburetor must be very carefully adjusted for length, otherwise the governor will not function properly and may cause the engine to surge badly. The governor rod should be moved as far as possible toward the carburetor, which will open the carburetor throttle wide. The governor lever should then be moved as far as possible in the same direction, all of this being done with the rod disconnected from the lever. Holding both parts in the above position, the rod should be screwed in or out of the swivel block on the carburetor, until the bent end of the rod will exactly register with the hole in the lever. The rod should then be dropped into the lever and the cotter pin inserted to keep the rod in place.



GOVERNOR ADJUSTMENT

A. Governor Rod
B. Governor Lever

The governor lever is furnished with five holes for attaching the governor spring. It is very important that the spring is hooked into the proper hole to suit the speed at which the engine is operated. The Governor Lever Chart shows the full load and no load speeds of the engine and the hole corresponding thereto. After the governor spring has been hooked into the proper hole, the spring tension must be applied by means of the adjusting nuts. More tension on the spring gives higher speeds and less tension, lower speeds. The fixed speed control and the variable speed control are both adjusted in the same manner.



LOAD R.P.M.	NO LOAD R.P.M.	HOLE NO.
1700	1960	2
1800	2030	2
1900	2085	2
2000	2150	2
2100	2215	2
2200	2450	3
2300	2495	3
2400	2545	3
2500	2640	3
2600	2820	3
2700	2870	3
2800	2930	3
2900	3000	3
3000	3100	3
3100	3300	4
3200	3380	4
3300	3430	4
3400	3520	4
3500	3720	5
3600	3780	5

GOVERNOR LEVER CHART

A tachometer or revolution counter should be used against the crankshaft to check speed while adjusting the governor spring tension. The engine speed without load will vary from 100 to 260 rpm higher than the speed with a load. For instance, if the engine is to operate at 3000 rpm under full load, the with no load will be 3100 rpm and this should be kept in mind when adjusting the governor.

VALVE TAPPET CLEARANCE

The intake valve clearance should be 0.008 in (0.20 mm) cold. The exhaust valve clearance should be 0.016 in (0.40 mm) cold. Grind off the end of the valve stem to obtain the proper clearance.

TUNE UP CHART

Maximum governed speed	2000 rpm
Spark plug gap	0.030 in (0.8 mm)
Valve clearances, cold	0.008 in (0.20 mm) intake 0.016 in (0.40 mm) exhaust

DRIVE BELT

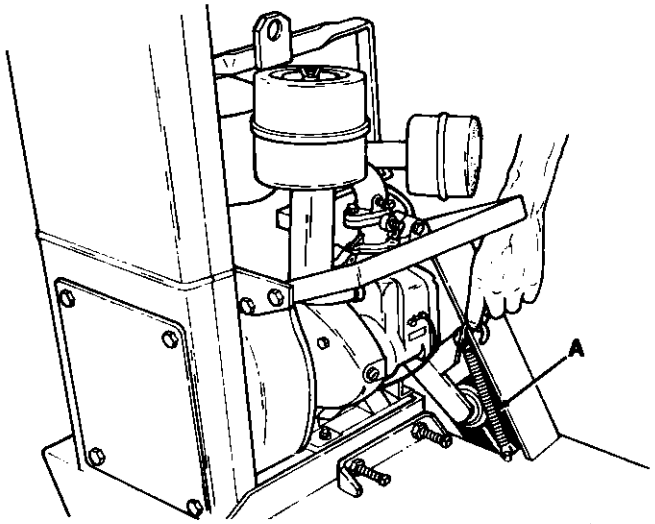
The drive belt transfers power from the engine to the tool. It is spring tensioned and does not require tension adjustment. Be sure to check the spring weekly for stretch or breakage. Replace it with a new spring if it is weak. Check the idler occasionally to see that it is turning freely.

TO REPLACE DRIVE BELT

1. Stop the engine.

⚠ WARNING: Stop the engine before working on the machine to prevent serious personal injury.

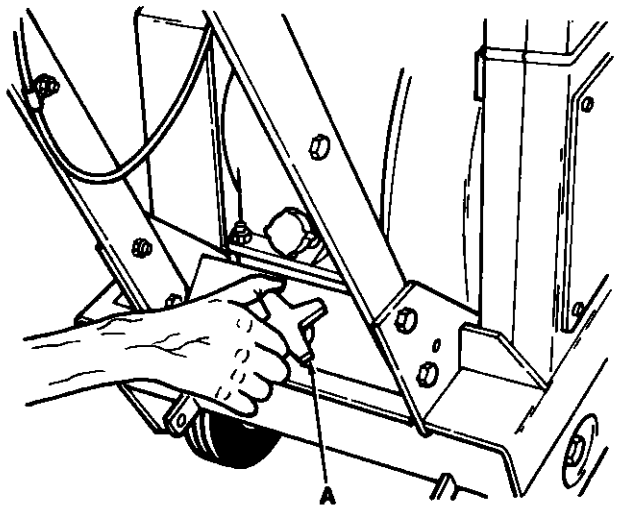
2. Detach idler spring to release idler tension from belts.



IDLER SPRING

A. Idler Spring

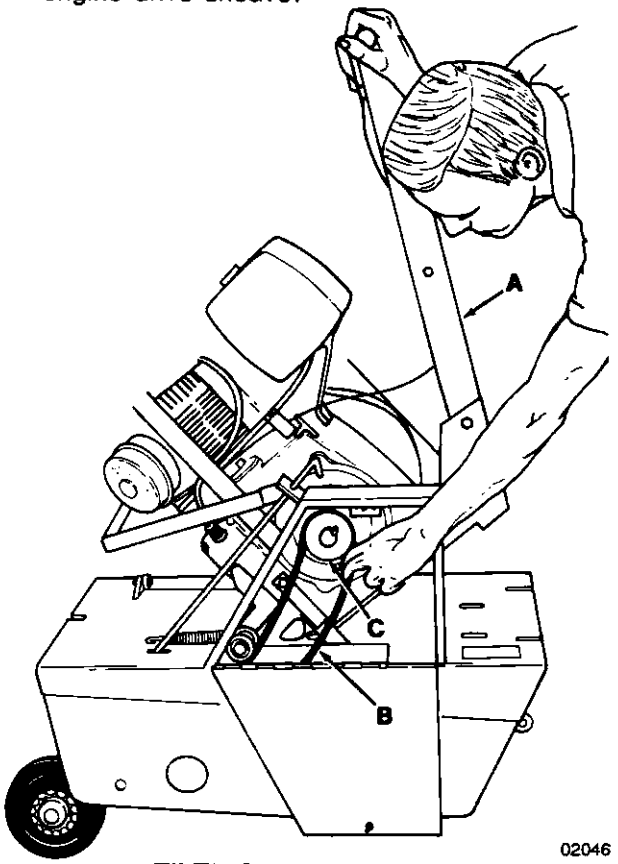
3. Loosen star shaped knob for engine hold down.



STAR SHAPED KNOB

A. Star Shaped Knob

4. Tilt engine forward removing belts from engine drive sheave.



TILTING THE ENGINE

A. Handle
B. Drive Belt
C. Engine Sheave

5. Slip belts off tool drive sheave.

6. Reverse above procedure to install new set of belts.

7. Reconnect the idler tension spring.

8. Tighten star shaped knob securely.

SECTION 4
APPENDIX

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The following charts state standard plated hardware tightening ranges for normal assembly applications. Decrease the specified torque by 20% when using a thread lubricant. Do not substitute lower grade hardware for higher grade hardware. If higher grade hardware than specified is substituted, tighten only to the specified hardware torque value to avoid damaging the threads of the part being threaded into, as when threading into speed nuts or weldments.

STANDARD BOLT TORQUE CHART

Thread Siz	SAE Grade 5 Torque ft lb (Nm)	SAE Grade 8 Torque ft lb (Nm)
0.25 in	7-10 (9-14)	10-13 (14-18)
0.31 in	15-20 (20-27)	20-26 (27-35)
0.38 in	27-35 (37-47)	36-47 (49-64)
0.44 in	43-56 (58-76)	53-76 (72-103)
0.50 in	65-85 (88-115)	89-116 (121-157)
0.62 in	130-170 (176-231)	117-265 (159-359)
0.75 in	215-280 (291-380)	313-407 (424-552)
1.00 in	500-650 (678-881)	757-984 (1026-1334)

NOTE: Decrease torque by 20% when using a thread lubricant.

METRIC BOLT TORQUE CHART

Thread Size	Class 10.9 Torque ft lb (Nm)	Class 12.9 Torque ft lb (Nm)
M4	3 (5)	4 (6)
M5	6 (9)	7 (11)
M6	10 (16)	11 (19)
M8	25 (38)	29 (45)
M10	47 (74)	58 (87)
M12	83 (128)	100 (154)
M14	133 (204)	159 (244)
M16	196 (313)	235 (375)
M20	336 (610)	440 (732)
M24	664 (1050)	794 (1270)

NOTE: Decrease torque by 20% when using a thread lubricant.

BOLT IDENTIFICATION

Identification Grade Marking	Specification and Grade
	SAE-Grade 5
	SAE-Grade 8
	ISO-Grade 8.8
	ISO-Grade 12.9

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SECTION 5
PARTS

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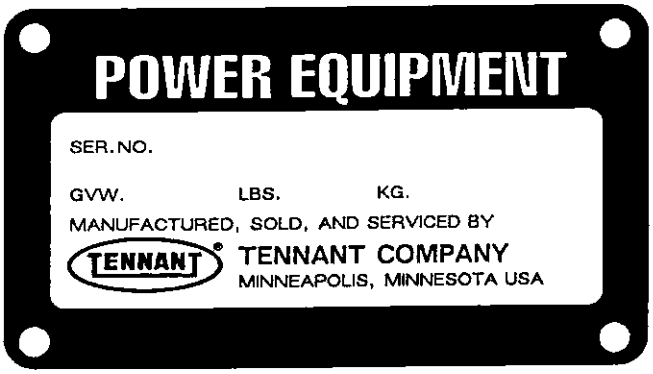
ORDERING REPAIR PARTS

To avoid errors or delays in filling parts orders, please furnish all of the following information.

1. Always specify the machine model number and the machine serial number shown on the machine data plate.



2. Give the part number, description, and the quantity needed of each item on the order. Do not order by reference number or the figure number of the illustrated parts.

3. Indented items indicate parts of assemblies. Standard hardware is furnished only when part of a purchased assembly. Please order hardware from a local hardware supplier.

4. If the old part cannot be identified, send it to us with the quantity needed specified on the order.

5. State definite shipping instructions to include the shipping address and/or the billing address if there is a difference. Any claim for loss or damage to a shipment in transit should be filed promptly against the transportation company making the delivery. Shipments will be complete unless the packing list or order acknowldgement indicate items back ordered.

If parts received are suspected to be incorrect or defective, please write, wire, or phone the Tennant Company representative from whom you ordered the part. They will give authorization for return and/or handle replacement shipments when required.

SI UNITS OF MEASURE (INTERNATIONAL SYSTEM)
Metric equivalents have been included, where applicable, throughout this parts catalog.

FASTENER STRENGTH IDENTIFICATION
Fasteners required to have high-strength qualities equivalent to SAE Grade 8 are identified throughout this catalog by the description GR 8. Unless identified by this description, all standard fasteners are SAE Grade 5.

SERIAL NUMBER INFORMATION EXPLANATION
Serial number information is listed parenthetically to show on which machines each part can be used. These listings are explained by the following examples:

(–) The part can be used on all machines.

(001234–) The part can be used on all machines beginning with the serial number listed.

(000000–001234) The part can be used on all machines up to and including serial number listed.

(001234–005678) The part can be used on all machines between and including the serial numbers listed.

Where XXXXX's are listed in place of a serial number, it indicates a serial number change was made but the exact serial number had not been established when the catalog went to press.

(Specifications and design subject to change without notice.)

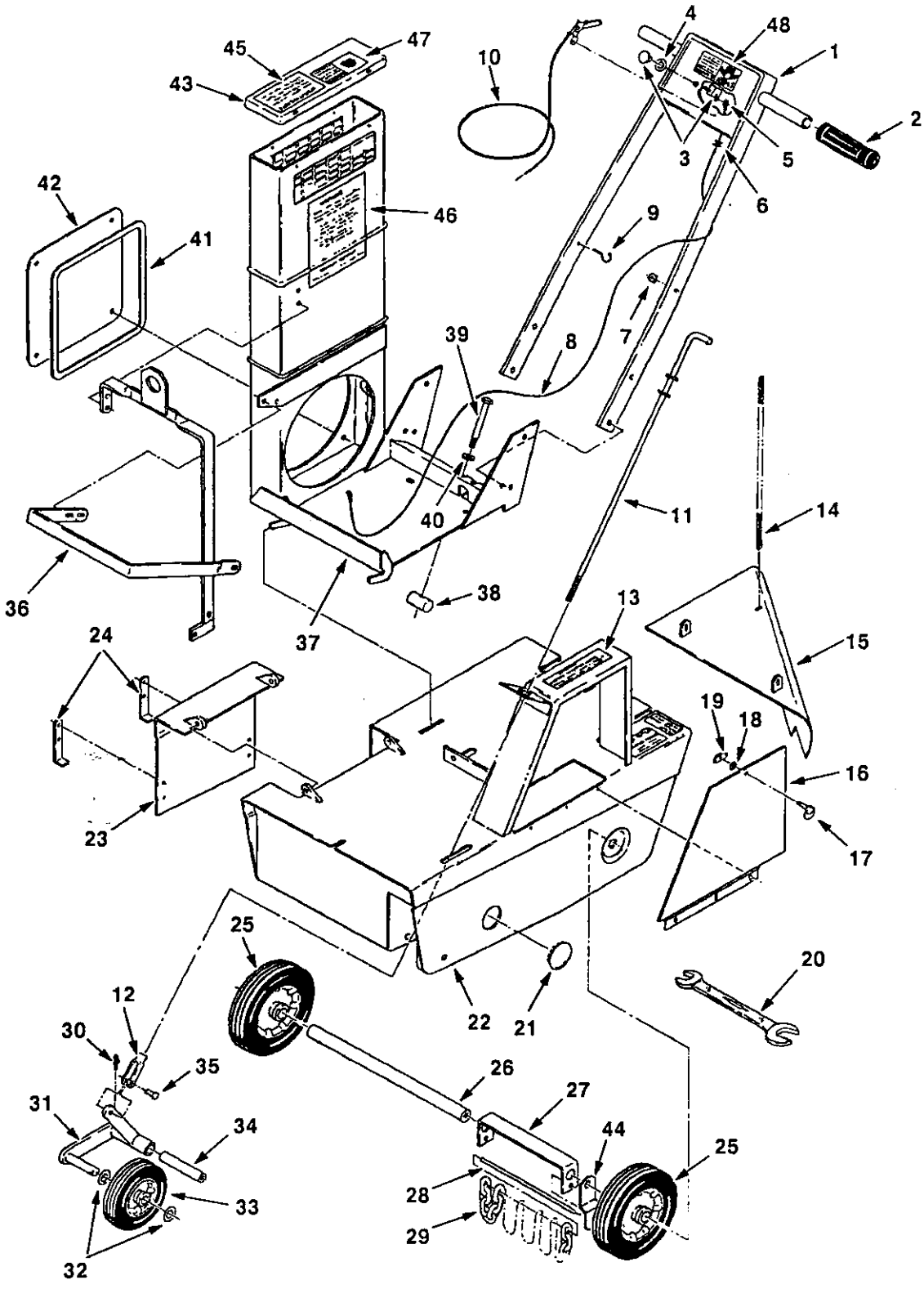


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Fig. 1 – Frame Group

Key	Tennant® Part No.	Machine Serial Number	Description	Qty.
	21178	(003342–)	Handle Assembly	1
1	21030	(003342–)	Handle, w/ Label	1
2	05186	(003342–)	Grip, Handle	2

Key	Tennant® Part No.	Machine Serial Number	Description	Qty.
3	28268	(003342-)	Switch	1
4	28288	(003342-)	Plate, Switch	1
5	55260	(003342-)	Terminal, Ring	1
6	01574	(003342-)	Grommet	1
7	09092-1	(003342-)	Clamp, Hold-Down	1
8	16945	(003342-)	Wire Assembly	1
	49266	(003342-)	Tie, Cable	2
9	21097	(003342-)	Hook, Eyebolt	1
10	21105	(003342-)	Cable, Control	1
11	02405	(003342-)	Handle, Control	1
12	14330	(003342-)	Clevis, Adjustable	1
13	17595	(003342-)	Decal, Warning, Before Starting	1
	21181	(003342-)	Chain And Scraper Assembly	1
14	21099	(003342-)	Chain	1
15	21064	(003342-)	Scraper Assembly, Path	1
16	21067	(003342-)	Plate, Belt Guard	1
17	15201	(003342-)	Fastener, Bailhead	1
18	15204	(003342-)	Fastener, Retainer	1
19	15203	(003342-)	Fastener, Retainer	1
20	21102	(003342-)	Wrench, Open-End	1
21	47178-8	(003342-)	Plugbutton	1
22	~~21002~~ 21157	(003342-)	~~Frame~~ Frame Assembly	1
23	21014	(003342-)	Door, Access	1
24	21093	(003342-)	Catch	2
25	21063	(003342-)	Wheel	2
	21509	(003342-)	Repair Kit, Wheel	1
	21180	(003342-)	Chain And Axle Assembly	1
26	21046	(003342-)	Shaft, Axle	1
27	21078	(003342-)	Support, Chain	1
28	21088	(003342-)	Rod	1
29	21079	(003342-)	Chain	1
	21179	(003342-)	Control Arm And Wheel Assembly	1
30	07259	(003342-)	Fitting, Grease	1
31	21164	(003342-)	Arm, Control	1
32	15331	(003342-)	Washer	2
33	21055	(003342-)	Wheel	1
34	21039	(003342-)	Tube	1
35	14331	(003342-)	Pin, Clevis	1
36	32040	(003342-)	Bail, Lift	1
37	32030	(003342-)	Mount, Stack And Engine	1
38	22065	(003342-)	Pin, Adjusting	1
39	48674	(003342-)	Screw, Hex	1
40	41499	(003342-)	Washer, Special	1
41	45166	(003342-)	Seal, Foam Rubber	1
42	32037	(003342-)	Cover, Rewind Access	1
43	21072	(003342-)	Cover, Air Stack	1
44	47864	(003342-)	Handle	1
45	21192	(003342-)	Label, Caution, Roof Vibration (RS only)	1
46	21515	(003342-)	Label, Warning, This Machine Is	1
47	08886	(003342-)	Label, Warning, Noise	1
48	08885	(003342-)	Label, Emission	1

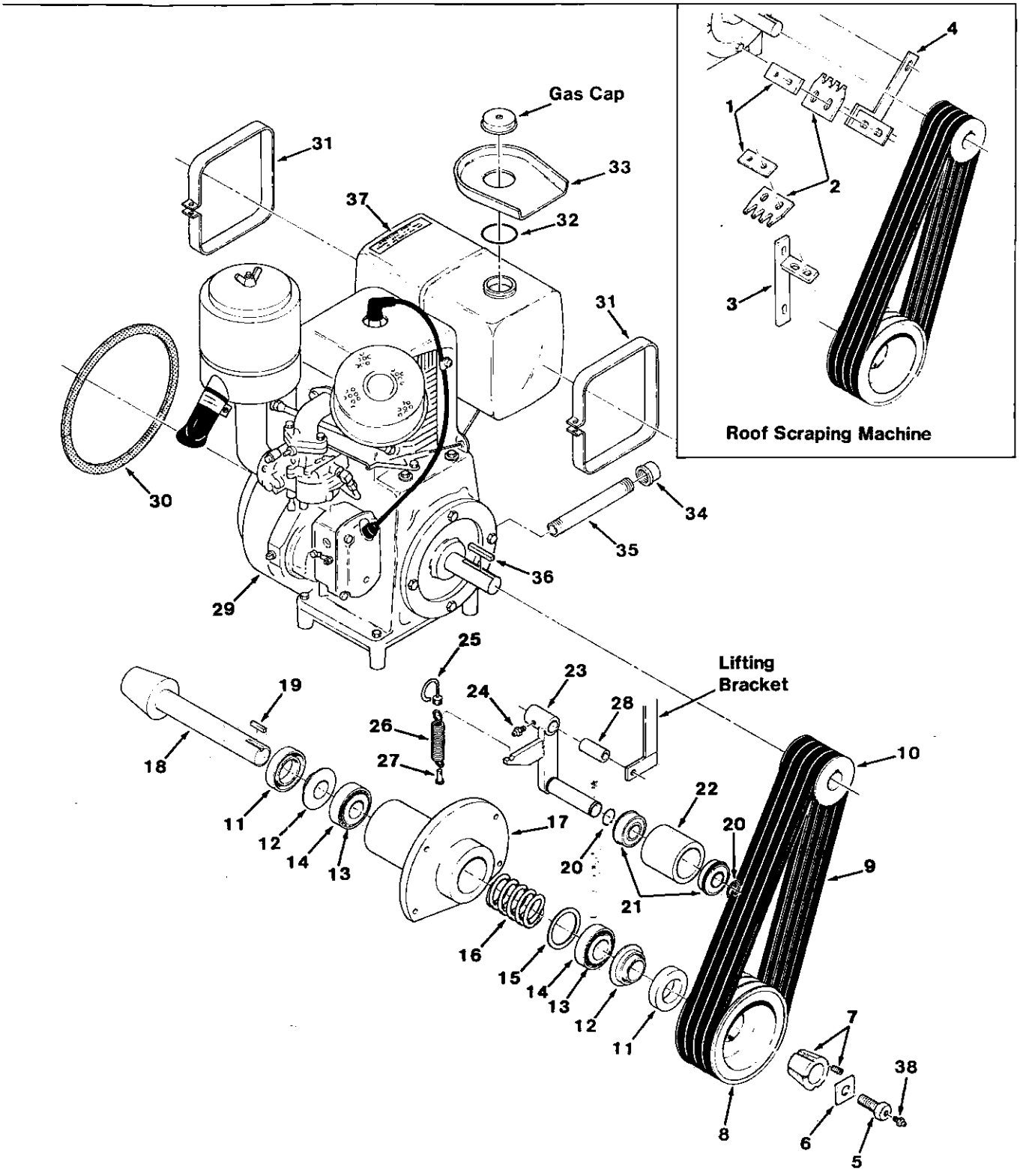


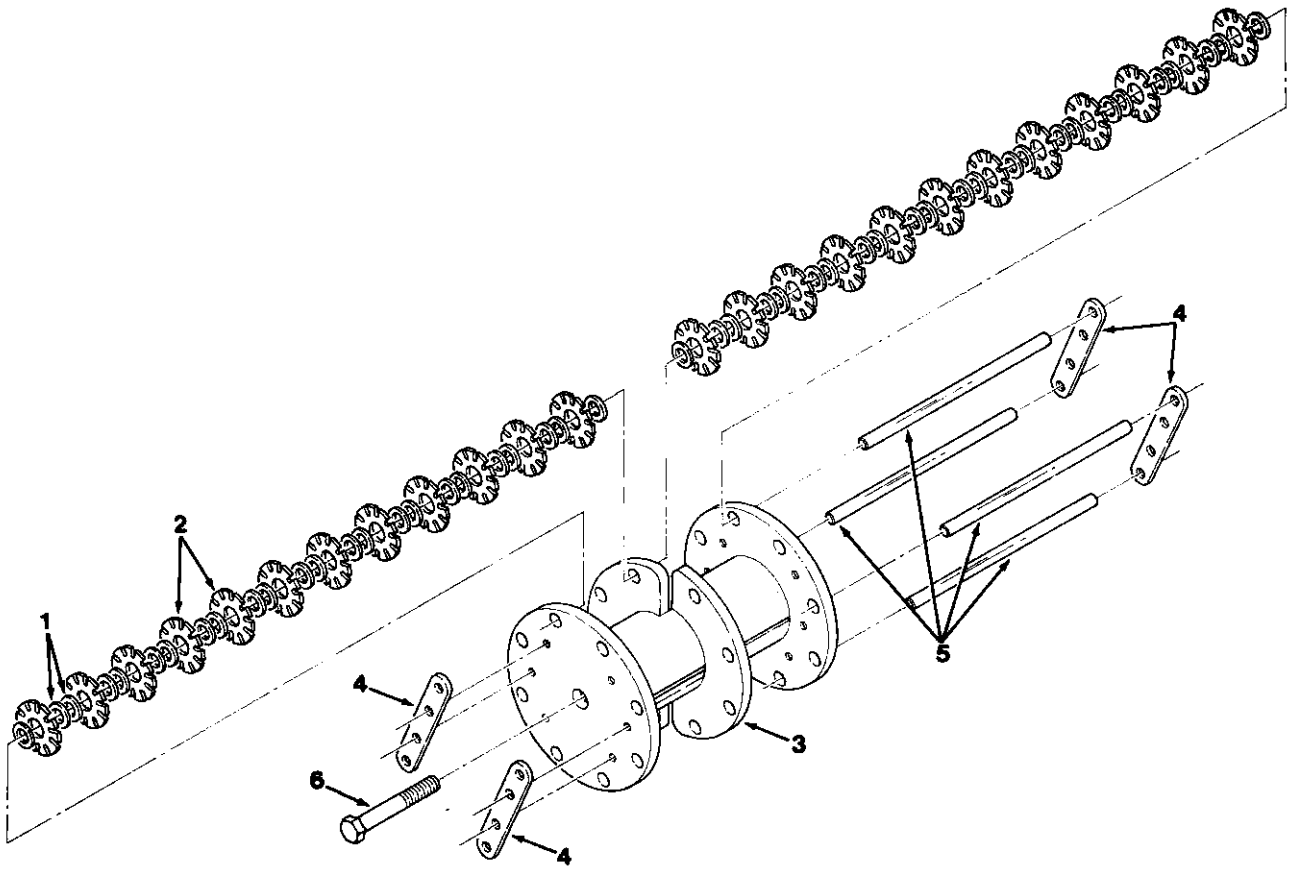
Fig. 2 – Engine And Tool Drive Group

Caution: Use care when disassembling the bearing shaft assembly. The heavy spring is under pressure. Use a press or vise when removing labyrinth and gradually release spring.

Fig. 2 – Engine And Tool Drive Group

Key	Tennant® Part No.	Machine Serial Number	Description	Qty.
1	21191	(003342–)	Bar, Fastening	2
2	21169	(003342–)	Plate, Scraper	2
3	21174	(003342–)	Mount, Sheave	1
4	50559	(003342–)	Plate, Mounting	1
5	03566	(003342–)	Screw, Hex	1
6	07690	(003342–)	Strip, Retainer	1
7	07691	(003342–)	Bushing, Taper Lock	1
8	21143B	(003342–)	Sheave, Tapered	1
9	21145-4	(003342–)	V-Belt	1
10	21144A	(003342–)	Sheave	1
	39336	(003342–)	Screw, Set	2
	39335	(003342–)	Screw, Set	1
	21054B	(003342–)	Bearing Shaft Assembly	1
	21100	(003342–)	Bearing Housing Assembly	1
11	03050-2	(003342–)	Labyrinth, Outer	2
12	03050-1	(003342–)	Labyrinth, Inner	2
13	03082-1	(003342–)	Bearing, Cone	2
14	03082-2	(003342–)	Bearing, Cup	2
15	03048	(003342–)	Washer	1
16	03052	(003342–)	Spring, Compression	1
17	21052	(003342–)	Housing, Bearing	1
	39327	(003342–)	Screw, Set	4
18	21021B	(003342–)	Shaft, Drive	1
	50011	(003342–)	Screw, Set	4
19	00934	(003342–)	Key, Square	1
	21182	(003342–)	Bracket And Idler Assembly	1
	21132A	(003342–)	Idler Assembly	1
20	09862	(003342–)	Ring, Retaining	2
21	07107	(003342–)	Bearing, Ball	2
22	21125A	(003342–)	Tube	1
23	21130A	(003342–)	Arm, Idler	1
24	07259	(003342–)	Fitting, Grease	1
25	04332	(003342–)	Lifter Assembly	1
26	03091	(003342–)	Spring, Tension	1
27	23786	(003342–)	Pin, Clevis	1
28	21126	(003342–)	Sleeve	1
29	32035	(003342–)	Engine	1
30	32036	(003342–)	Seal, Foam Rubber	1
31	21193	(003342–)	Strap, Fuel Tank	2
32	28642	(003342–)	Seal, Trough	1
33	21184	(003342–)	Trough, Spill	1
34	06431	(003342–)	Fitting, Cap	1
35	07092	(003342–)	Fitting, Nipple	1
36	00932	(003342–)	Key, Square	1
37	19048	(003342–)	Decal, Gasoline Only	1
38	06418	(003342–)	Fitting, Grease	1
	21080	(003342–)	Screw, Hex	1
	48668	(003342–)	Clamp, Wire	2

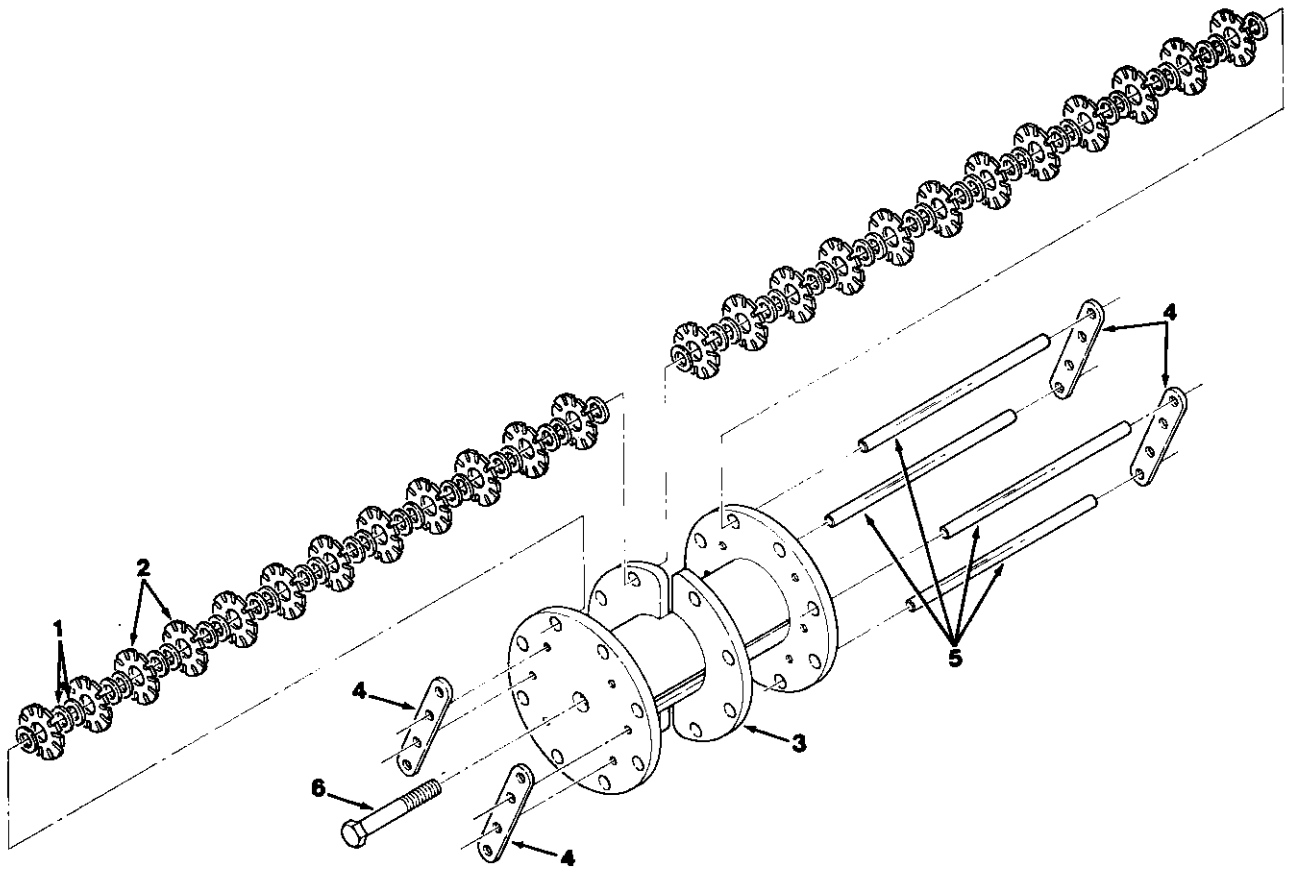
Home



02814

Fig. 3 – REVO®–Tool Assembly, RS

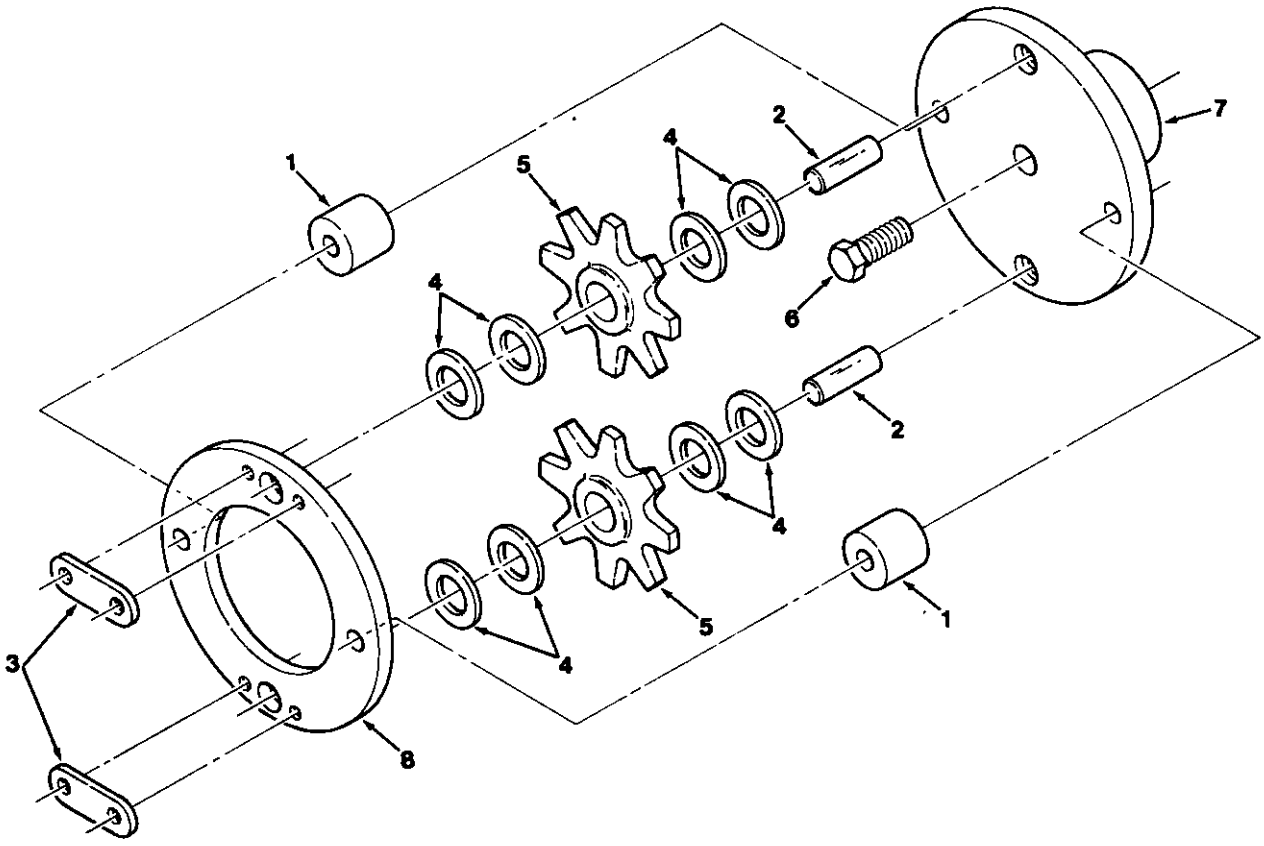
Key	Tennant® Part No.	Machine Serial Number	Description	Qty.
	21058	(003342–)	REVO®–Tool Assembly	1
1	03890	(003342–)	Washer	192
2	21012	(003342–)	Cutter, Star, 2.5" (65 mm)	96
3	21020	(003342–)	Cage	1
4	21059	(003342–)	Link	4
5	21060	(003342–)	Rod	4
6	21080	(003342–)	Screw, Hex	1



02815

Fig. 4 – REVO®–Tool Assembly, RS

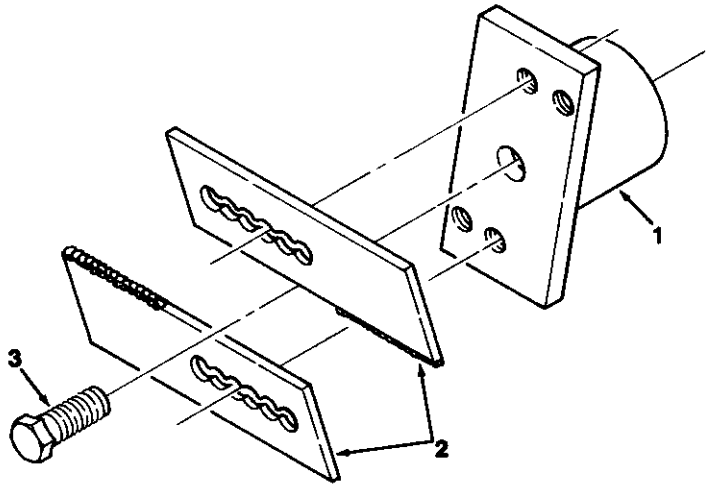
Key	Tennant® Part No.	Machine Serial Number	Description	Qty.
	21101	(003342–)	REVO®–Tool Assembly	1
1	03890	(003342–)	Washer	224
2	03895–3	(003342–)	Cutter, Star, 2" (50 mm)	112
3	21020	(003342–)	Cage	1
4	21059	(003342–)	Link	4
5	21060	(003342–)	Rod	4
6	21080	(003342–)	Screw, Hex	1



02065

Fig. 5 – Round Cut-Off Tool Kit, RS

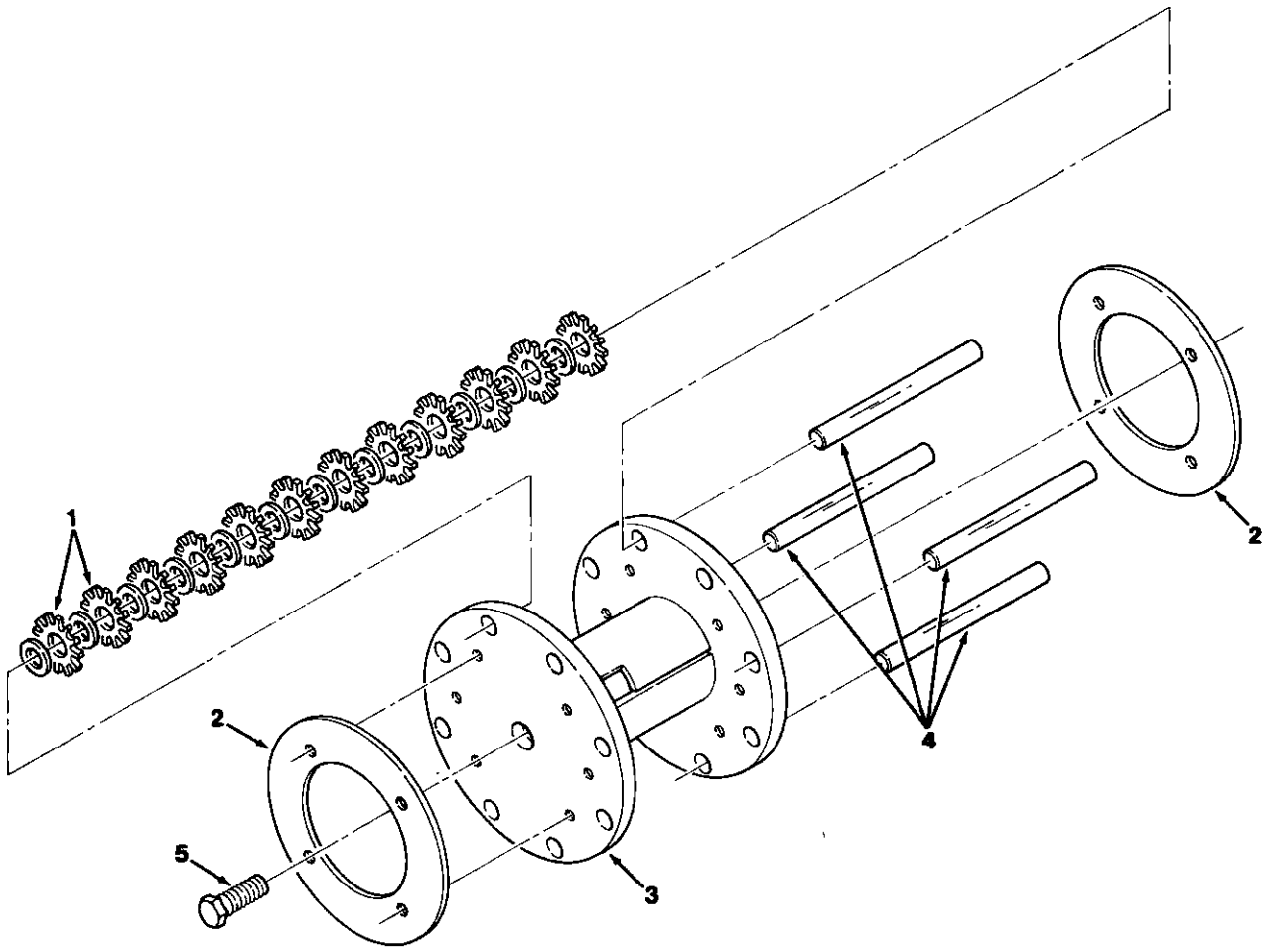
Key	Tennant® Part No.	Machine Serial Number	Description	Qty.
	21110	(003342–)	Cut-Off Tool Kit, Round	1
1	04393	(003342–)	Sleeve	2
2	04661	(003342–)	Pin, Round	2
3	04662	(003342–)	Plate, Retaining	2
4	06044	(003342–)	Sleeve	8
5	06190	(003342–)	Cutter, Star, 4.75" (120 mm)	2
6	21085	(003342–)	Screw, Hex	1
7	21107	(003342–)	Flange	1
8	21108	(003342–)	Flange, Outer	1



02062

Fig. 6 - Blade Cut-Off Tool Kit, RS

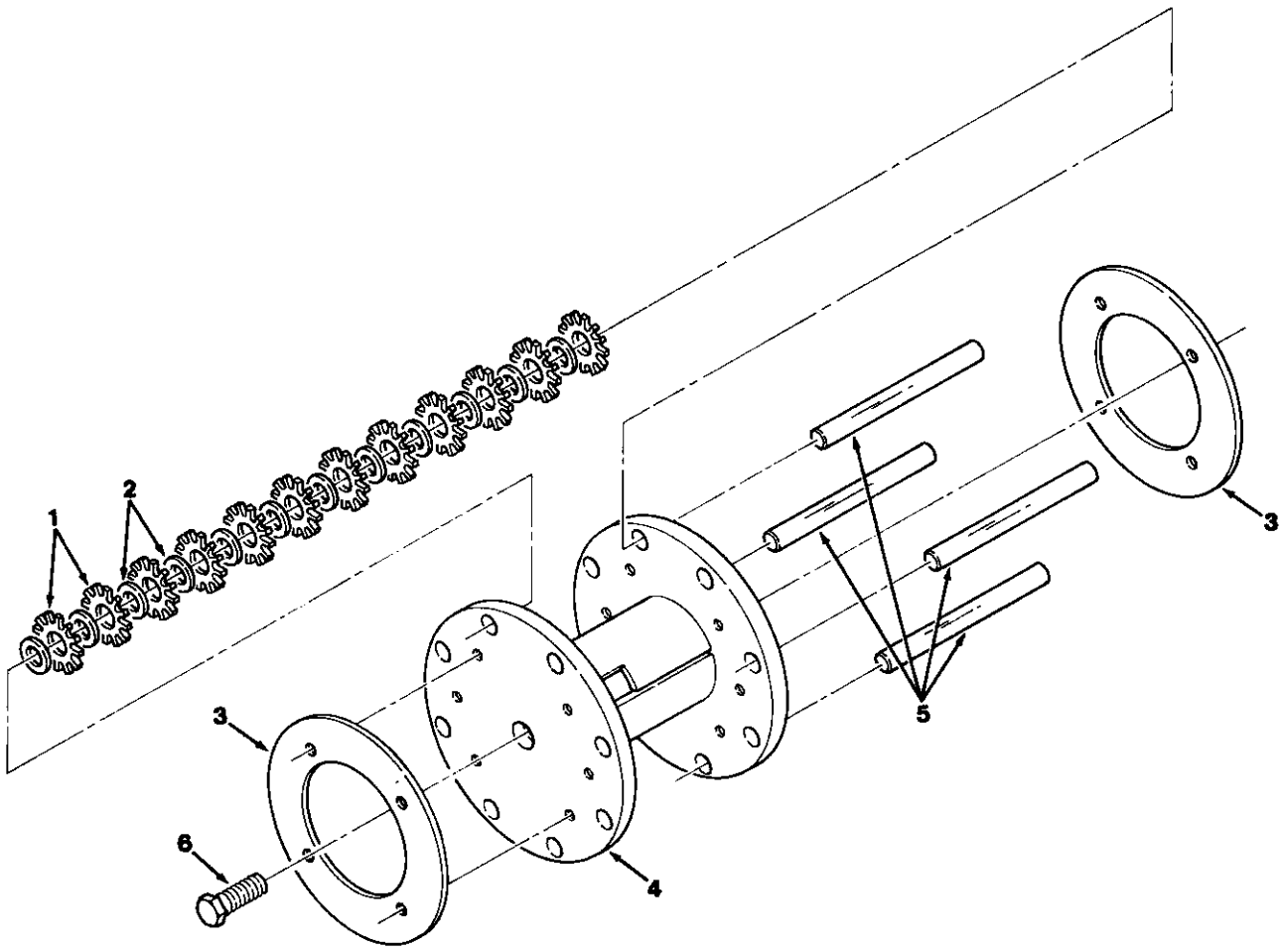
Key	Tennant® Part No.	Machine Serial Number	Description	Qty.
	21086	(003342-)	Cut-Off Tool Kit, Blade	1
1	21074	(003342-)	Plate, Cutoff	1
2	21075	(003342-)	Blade, Cutoff	2
3	21085	(003342-)	Screw, Hex	1



02816

Fig. 7 – REVO®–Tool Assembly, TLR

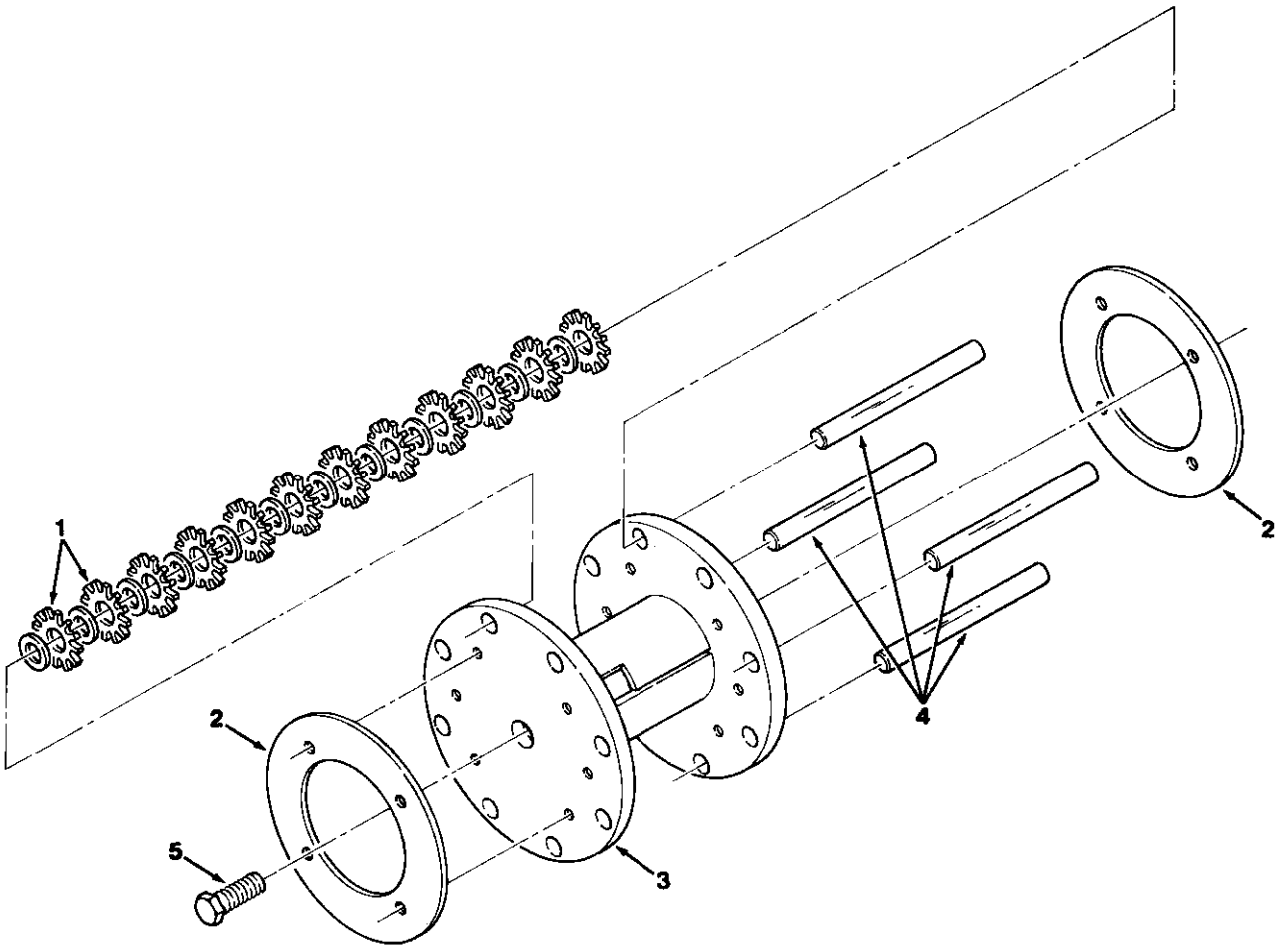
Key	Tennant® Part No.	Machine Serial Number	Description	Qty.
	21505M1A	(003342–)	REVO®–Tool Assembly	1
1	03894–1	(003342–)	Cutter, Star, 2" (50 mm)	122
	21507	(003342–)	Cage Assembly	1
2	21506	(003342–)	Ring, Retaining	2
3	21503	(003342–)	Cage	1
4	21504	(003342–)	Rod	4
5	21085	(003342–)	Screw, Hex	1



02818

Fig. 8 – REVO®-Tool Assembly, TLR

Key	Tennant® Part No.	Machine Serial Number	Description	Qty.
	21505M3B	(003342–)	REVO®-Tool Assembly	1
1	03895-3	(003342–)	Cutter, Star, 2" (50 mm)	100
2	03890	(003342–)	Washer	100
	21507	(003342–)	Cage Assembly	1
3	21506	(003342–)	Ring, Retaining	2
4	21503	(003342–)	Cage	1
5	21504	(003342–)	Rod	4
6	21085	(003342–)	Screw, Hex	1



02817

Fig. 9 – REVO®–Tool Assembly, TLR

Key	Tennant® Part No.	Machine Serial Number	Description	Qty.
	21505M3A	(003342–)	REVO®–Tool Assembly	1
1	03895–3	(003342–)	Cutter, Star, 2" (50 mm)	168
	21507	(003342–)	Cage Assembly	1
2	21506	(003342–)	Ring, Retaining	2
3	21503	(003342–)	Cage	1
4	21504	(003342–)	Rod	4
5	21085	(003342–)	Screw, Hex	1

SECTION 6
ENGINE PARTS

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ORDERING REPAIR PARTS

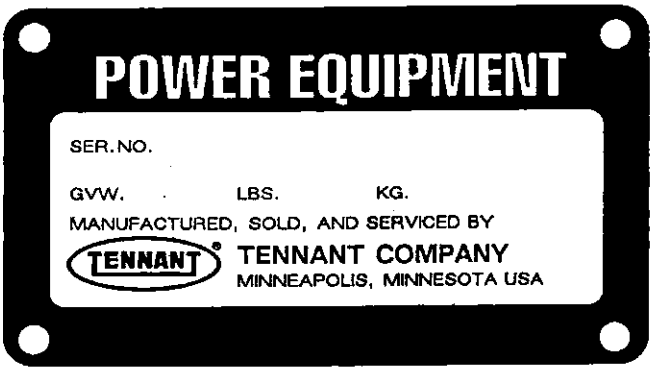
For Engine Tennant Part No. 32035

The components used in this machine have been carefully selected for performance and safety. use only Tennant Company supplied or equivalent parts.

To receive prompt service in filling your parts orders, please direct all parts orders with Tennant Company part numbers to the Tennant Company, and all parts orders with vendor part numbers to the local supplier of the respective vendor.

To avoid errors or delays in filling your parts orders, please furnish all of the following information.

1. Refer to Tennant Company data plate. Always specify the machine model number and the machine serial number shown on the machine data plate.



2. Refer to the vendor part data plate. Always specify the model number and serial number shown on the data plate.
3. Give the part number, description, and the quantity needed of each item on the order. Do not order by reference number or the figure number of the illustrated parts.
4. Indented items indicate parts of assemblies. Standard hardware is furnished only when part of a purchased assembly. Please order hardware from a local hardware supplier.
5. If the old part cannot be identified, send it to us with the quantity needed specified on the order.
6. State definite shipping instructions to include the shipping address and/or the billing address if there is a difference. Any claim for loss or damage to a shipment in transit should be filed promptly against the transportation company making the delivery. Shipments will be complete unless the packing list or order acknowledgement indicate items back ordered.

If parts received are suspected to be incorrect or defective, please write, wire, or phone the parts supplier from whom you ordered the part. They will give authorization for return and/or handle replacement shipments when required.

SI UNITS OF MEASURE (INTERNATIONAL SYSTEM)

Metric equivalents have been included, where applicable, throughout this parts catalog.

FASTENER STRENGTH IDENTIFICATION

Fasteners required to have high-strength qualities equivalent to SAE Grade 8 are identified throughout this catalog by the description GR 8. Unless identified by this description, all standard fasteners are SAE Grade 5.

SERIAL NUMBER INFORMATION EXPLANATION

Serial number information is listed parenthetically to show on which machines each part can be used. These listings are explained by the following examples:

(–) The part can be used on all machines.

(001234–) The part can be used on all machines beginning with the serial number listed.

(0000000–001234) The part can be used on all machines up to and including serial number listed.

(001234–005678) The part can be used on all machines between and including the serial numbers listed.

Where xxxxx's are listed in place of a serial number, it indicates a serial number change was made but the exact serial number had not been established when the catalog went to press.

(Specifications and design subject to change without notice.)

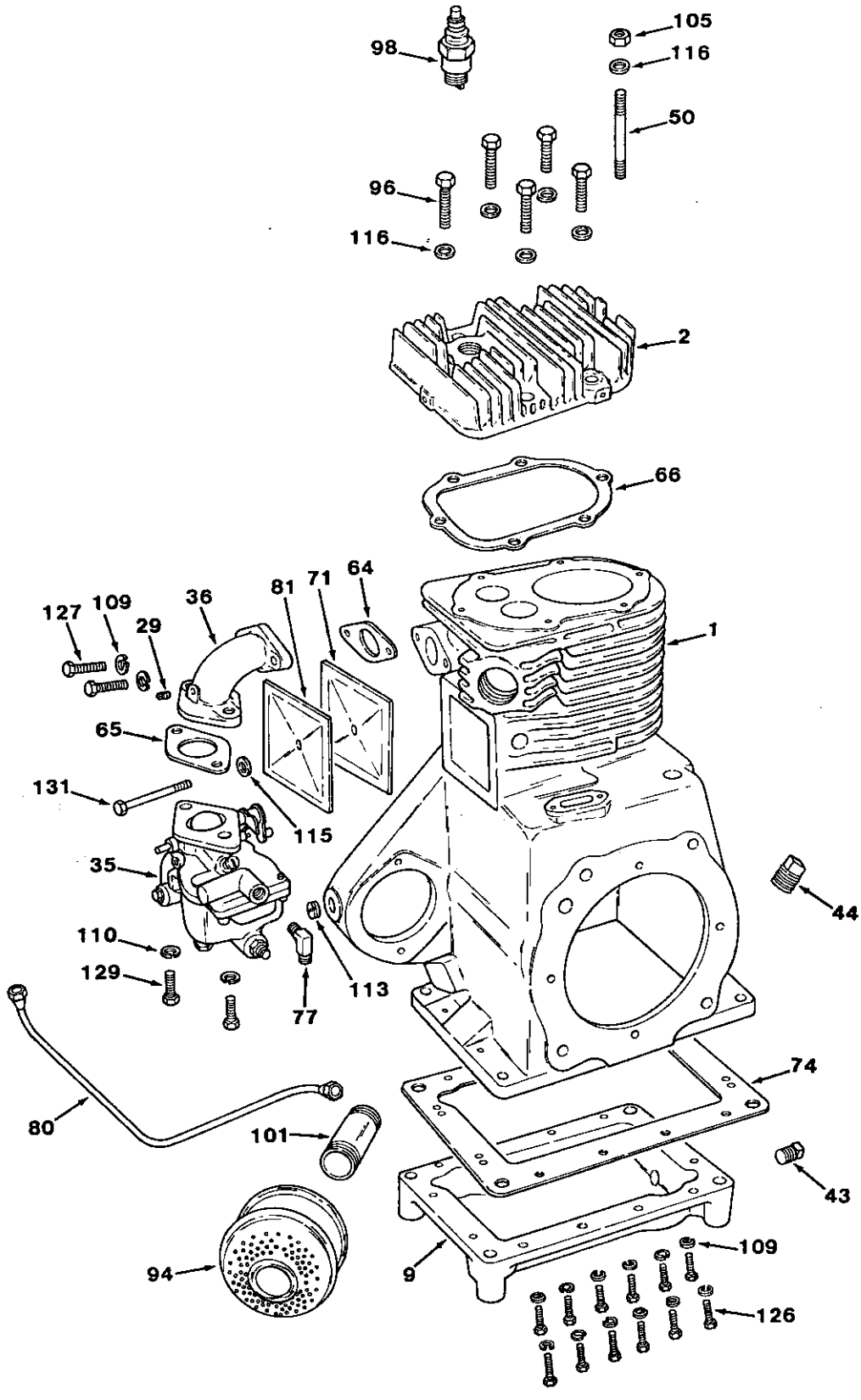


Fig. 1 – Engine Breakdown

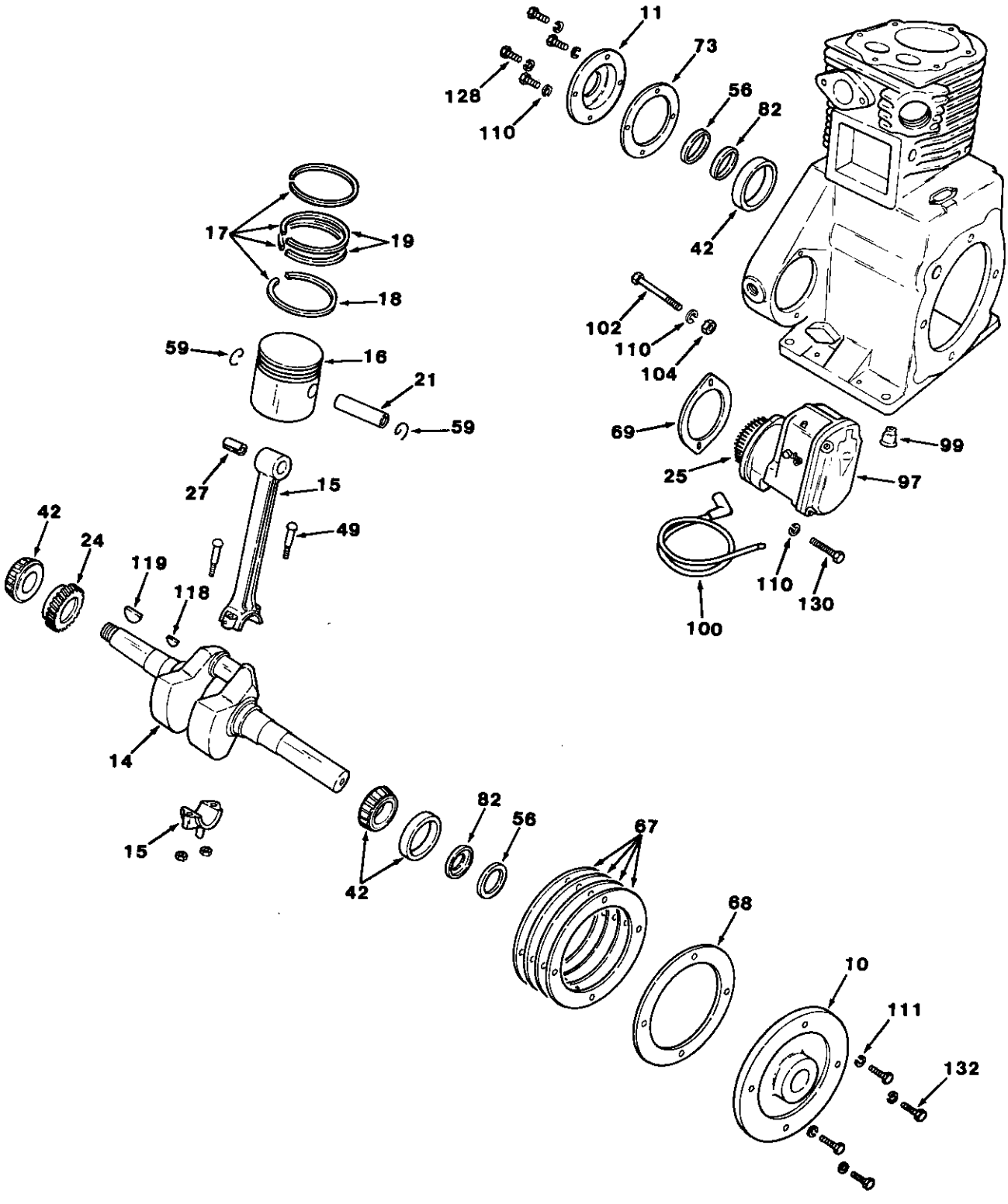


Fig. 1 – Engine Breakdown

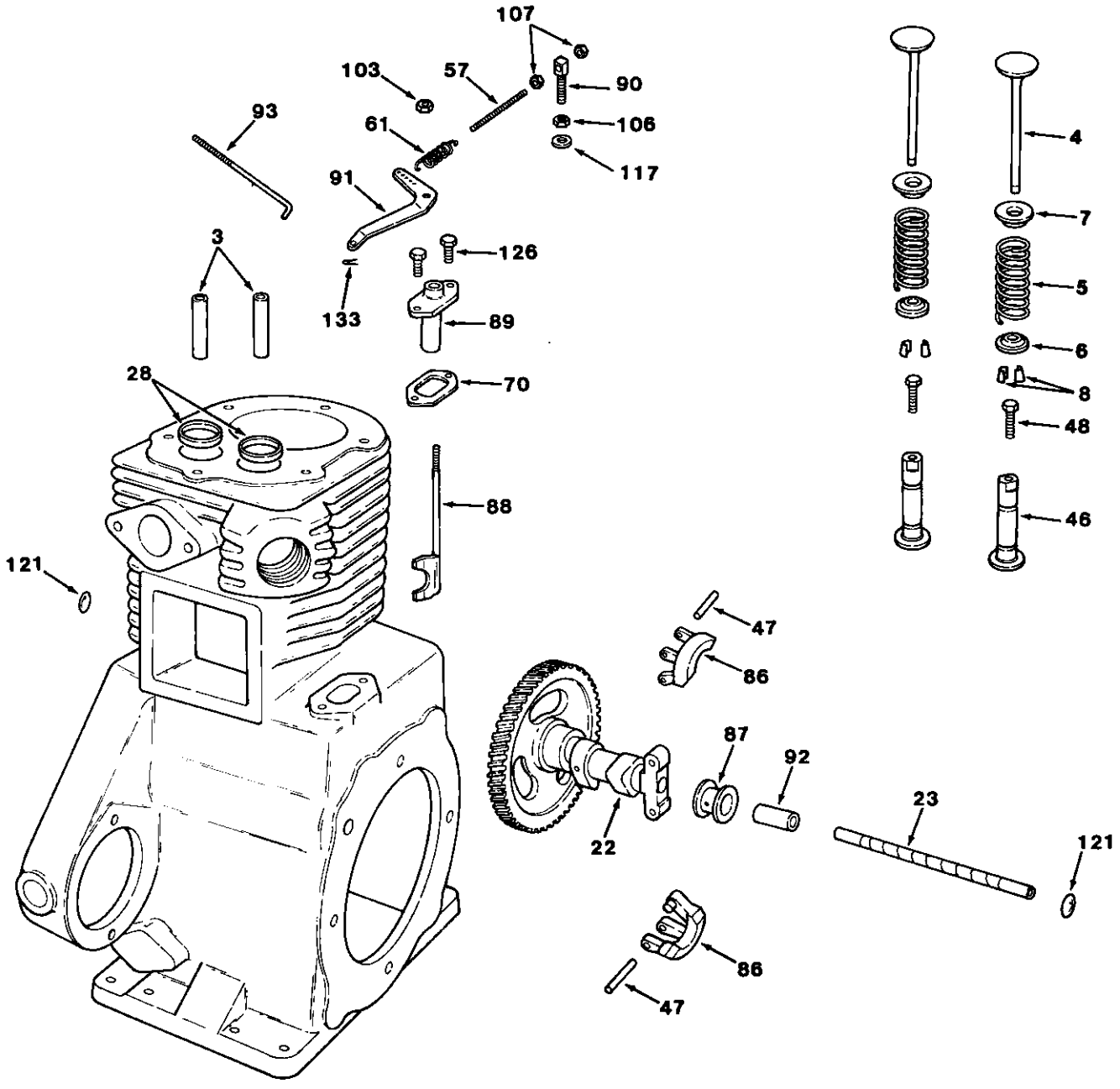


Fig. 1 – Engine Breakdown

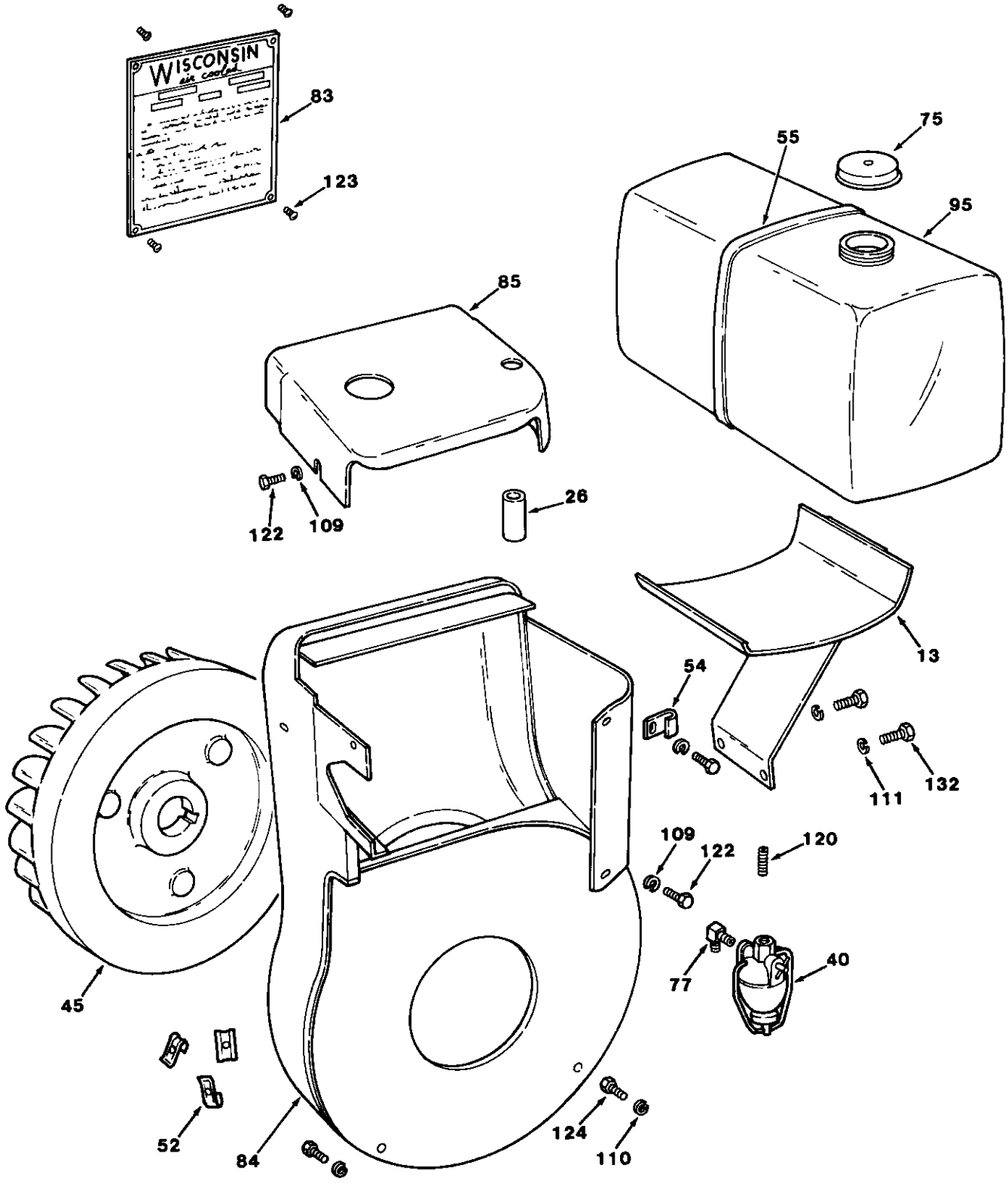


Fig. 1 – Engine Breakdown

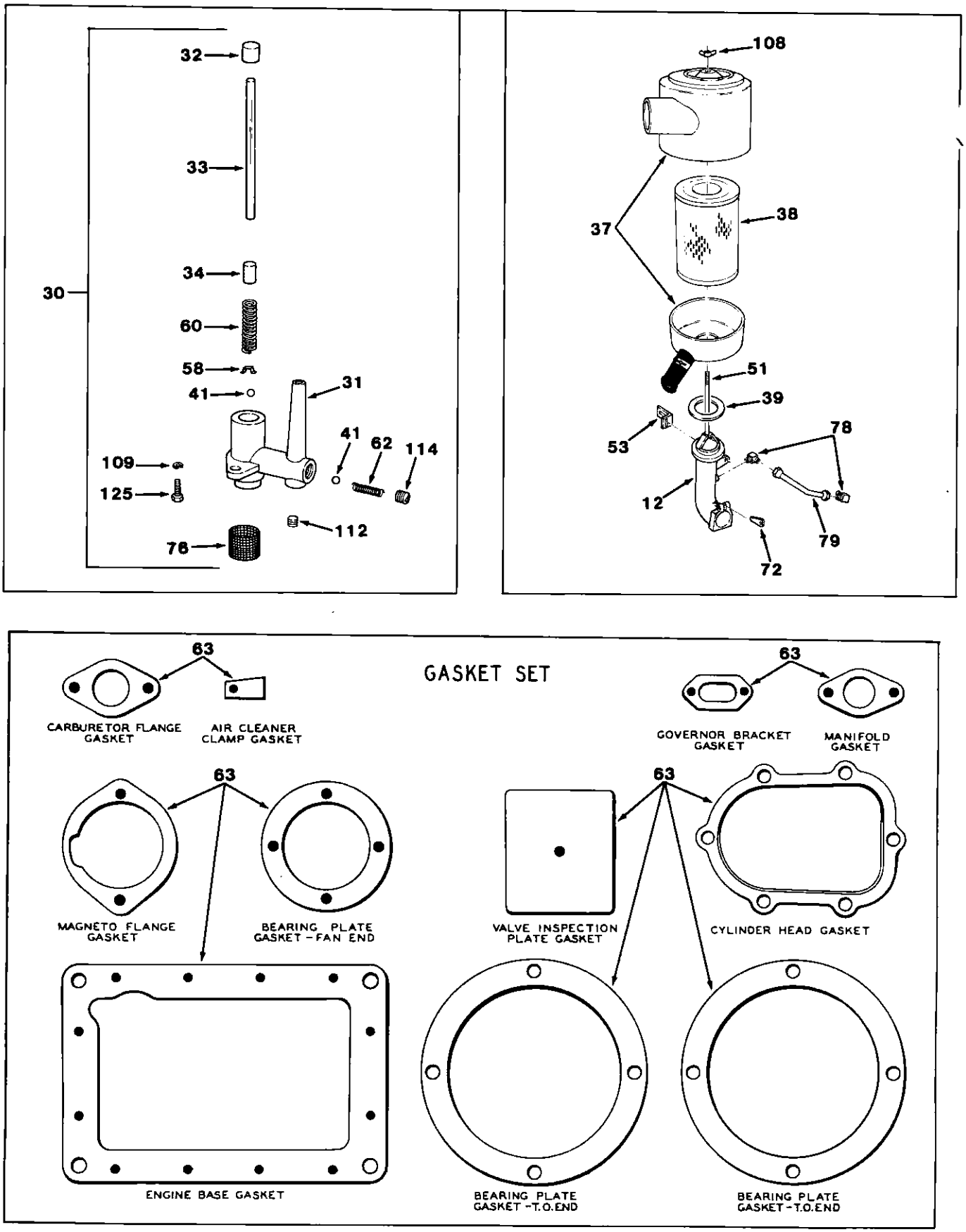


Fig. 1 – Engine Breakdown

Fig. 1 – Engine Breakdown

Key	Tennant® Part No.	Wisconsin Part Number	Engine Serial Number	Description	Qty.
1		AA-91-A-S6	(0000000-0000000)	Cylinder And Crankcase Assembly, Complete	1
2		AB-101-B	(0000000-)	Head, Cylinder	1
3		AD-43	(0000000-)	Guide, Valve Stem	2
4		AE-75-B	(0000000-)	Valve, Inlet And Exhaust	2
5		AF-49-A	(0000000-)	Spring, Valve Inlet And Exhaust, Standard	2
6		AG-26	(0000000-)	Seat, Valve Spring	2
7		AG-34-A	(0000000-)	Locator, Valve Spring	2
8		AH-9	(0000000-)	Lock, Valve Spring Seat, Pair	2
9		BB-128-A-5	(0000000-)	Base, Engine	1
10	38681	BG-241-S1	(0000000-)	Plate Assembly, Main Bearing	1
		ME-59-1	(0000000-)	Cup	1
		PH-193	(0000000-)	Seat	1
		SD-39	(0000000-)	Retainer	1
11		BG-242-S1	(0000000-)	Plate, Bearing Retainer With Oil Seal	1
12	37429	BI-291-6-S1	(0000000-)	Bracket Assembly, Air Cleaner	1
		QD-647	(0000000-)	Gasket	1
13		BK-85	(0000000-6137796)	Bracket, Fuel Tank	1
13	25973	BK-126	(6137797-)	Bracket, Fuel Tank	1
14		CA-48-D-48-S1	(0000000-)	Crankshaft Assembly	1
		GA-39	(0000000-)	Gear	1
		ME-84	(0000000-)	Bearings	2
		PL-55	(0000000-)	Key	1
15		DA-49B-S1	(0000000-)	Rod, Connecting Shell Bearing Type	1
		HG-133A	(0000000-)	Bushing	1
		PB-148	(0000000-)	Bolts	2
		PD-246	(0000000-)	Nut, Lock	2
		HA-131-S	(0000000-)	Bearing, Shell (2 Halves) Connecting Rod	1
		HA-131-S1	(0000000-)	Bearing, 0.001" Undersize	1
		HA-131-S2	(0000000-)	Bearing, 0.002" Undersize	1
		HA-131-S10	(0000000-)	Bearing, 0.010" Undersize	1
		HA-131-S20	(0000000-)	Bearing, 0.020" Undersize	1
16		DB-209-5	(0000000-)	Piston, Standard	1
16		DB-209-5-010	(0000000-)	Piston, 0.010" Oversize	1
16		DB-209-5-020	(0000000-)	Piston, 0.020" Oversize	1
16		DB-209-5-030	(0000000-)	Piston, 0.030" Oversize	1
17		DR-6-E	(0000000-)	Piston Ring Set, Standard	1
18		DC-186	(0000000-)	Oil Ring	1
19		DC-163	(0000000-)	Ring, Compression, 2nd Groove	1
		DC-163-1	(0000000-)	Ring, Scraper, 3rd Groove	1
20		DC-163-D	(0000000-)	Ring, Compression, Chrome Faced, Top Groove	1
		DR-37-010	(0000000-)	Re-Ring Set, 0.010" Oversize	1
		DR-37-020	(0000000-)	Re-Ring Set, 0.020" Oversize	1
		DR-37-030	(0000000-)	Re-Ring Set, 0.030" Oversize	1
21		DE-65	(0000000-)	Pin, Piston, Standard	1
21		DE-65-005	(0000000-)	Pin, Piston, 0.005" Oversize	1

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Key	Tennant® Part No.	Wisconsin Part Number	Engine Serial Number	Description	Qty.
21		DE-65-010	(0000000-)	Pin, Piston, 0.010" Oversize	1
22		EA-110B-S1	(0000000-)	Camshaft Assembly	1
23		PA-314-1	(0000000-)	Pin, Camshaft Support	1
24		GA-39	(0000000-)	Gear, Crankshaft	1
25		GD-145	(0000000-)	Gear, Magneto Drive	1
26		HF-432	(0000000-)	Spacer, Cylinder Head Stud	1
27		HG-133-A	(0000000-)	Bushing, Piston Pin	1
28		HG-201	(0000000-)	Insert, Valve Seat	2
29		XK-1	(0000000-)	Pipe Plug, 0.125"	1
30		K-100-G	(0000000-)	Pump Assembly, Oil	1
31		KA-64A-S1	(0000000-)	Body Assembly, Oil Pump	1
32		KF-19-A	(0000000-)	Cap, Pump Plunger Rod	1
33		KF-26	(0000000-)	Rod, Plunger Oil Pump, Standard	1
34		KF-23-1	(0000000-)	Plunger, Oil Pump	1
35		L-63-K-S1	(0000000-)	Carburetor, With Gasket	1
		LQ-39	(0000000-)	Repair Kit, Carburetor	1
36		LC-269-A	(0000000-)	Manifold, Intake	1
37		LO-187-S1	(0000000-)	Air Cleaner, Dry Element Type	1
38		LO-175-B	(0000000-)	Element	1
39		81-615A1	(0000000-)	Seal, Air Cleaner	1
40		LP-19-A	(0000000-)	Valve And Strainer, Shut-Off	1
41		ME-38-A	(0000000-)	Ball, Check, Oil Pump	2
42		ME-84	(0000000-)	Bearing Assembly, Main	2
43		XK-3	(0000000-)	Pipe Plug, 0.375"	1
44		R123-2	(0000000-)	Filler And Saber Assembly, Oil	1
45		NC-215	(0000000-)	Flywheel	1
46		F-63	(0000000-)	Tappet, Valve, With Lock Screw	2
47		PA-340	(0000000-)	Pin, Roll, Governor Flyweight	2
48		PB-169-A	(0000000-)	Screw, Adjusting, Valve Tappet	2
49		PB-148	(0000000-)	Bolt, Connecting Rod	2
50		PC-321	(0000000-)	Stud, 3" (75 mm)	1
51		PC-598	(0000000-)	Stud, Airi	1
52		PG-315	(0000000-)	Nut, Speed	4
53		PG-343-C	(0000000-)	Clip, Support	1
54		PG-430	(0000000-)	Clip, Support	1
55		PG-1196	(0000000-)	Strap, Fuel Tank	1
56		PH-193	(0000000-)	Seal, Cork Oil, Crankshaft	2
57		PI-121-A	(0000000-)	Screw, Adjusting, Governor Spring	1
58		PK-50-A	(0000000-)	Retainer, Oil Pump Check Ball	1
59		PK-52	(0000000-)	Ring, Retaining, Piston Pin	2
60		PM-58-E	(0000000-)	Spring, Oil Pump Plunger	1
61		PM-74	(0000000-)	Spring, Governor	1
62		PM-165	(0000000-)	Spring, Oil Pump Outlet	1
63		Q-22	(0000000-)	Gasket Set	1
64		QB-77	(0000000-)	Gasket, Intake Manifold	1
65		QC-71-A	(0000000-)	Gasket, Carburetor Flange	1
66		QD-484	(0000000-)	Gasket, Cylinder Head	1
67		QD-487-A	(0000000-)	Gasket, Bearing Plate, T.O. End, 0.006" (0.2 mm) Thick	6
68		QD-487-B	(0000000-)	Gasket, Bearing Plate, T.O. End, 0.003" (0.1 mm) Thick	1

Key	Tennant® Part No.	Wisconsin Part Number	Engine Serial Number	Description	Qty.
69		QD-570-A	(0000000-)	Gasket, Magneto Flange	1
70		QD-571	(0000000-)	Gasket, Governor Yoke Shaft Bracket	1
71		QD-612-A	(0000000-)	Gasket, Valve Tappet Inspection Plate	1
72		QD-647	(0000000-)	Gasket, Slot In Air Cleaner Bracket	1
73		QD-674	(0000000-)	Gasket, Bearing Plate, Flywheel End	1
74		QD-675	(0000000-)	Gasket, Engine Base	1
75	37825	RC-122	(0000000-)	Cap, Fuel Tank, Screw Type	1
76		RD-137-C	(0000000-)	Strainer, Oil Pump	1
77	06507	RF-1225	(0000000-)	Elbow	3
78		RF-296	(0000000-)	Elbow, Breather Line	2
79		RM-494	(0000000-)	Line, Breather	1
80		RM-980	(0000000-)	Fuel Line	1
81		SA-68	(0000000-)	Cover, Valve Tappet Inspection	1
82		SD-39	(0000000-)	Retainer, Crankshaft Oil Seal	2
83		SD-312	(0000000-)	Name Plate	1
84		SE-339	(0000000-)	Shroud, Air	1
85		SE-155	(0000000-)	Cover, Air Shroud	1
86		TC-322D-S1	(0000000-)	Flyweight Assembly	1
87		TC-323-A	(0000000-)	Sleeve, Governor Thrust	1
88		TC-324-D	(0000000-)	Yoke, Governor	1
89		TC-325	(0000000-)	Bracket, Governor Shaft Support	1
		TT-74-E-1	(0000000-)	Governor Control Assembly	1
		VC-25-2	(0000000-)	Bracket, Control Wire	1
		VE-428-1	(0000000-)	Connector, Control Wire	1
90		TC-330	(0000000-)	Pin, Governor Adjusting Screw	1
91		TC-432	(0000000-)	Lever, Governor	1
92		TC-433	(0000000-)	Spacer, Governor	1
93		VE-304	(0000000-)	Rod, Governor Control	1
94		WD-66-A-S2	(0000000-)	Muffler	1
95	38502	WE-306-A	(0000000-6137796)	Tank, Fuel, round with Cap	1
95	25959	WE-415-S1	(6137797-)	Tank, Fuel, rectangular with Cap	1
	37825	RC-122	(0000000-)	Cap, Filler	1
96		XD-30	(0000000-)	Screw, Special Hardness	5
97		Y-117-S1	(0000000-)	Magneto, With Gear	1
		YQ-8	(0000000-)	Points And Condensor Kit	1
	38292	YQ-9	(0000000-)	Overhaul Kit	1
98		YD-6-S1	(0000000-)	Spark Plug	1
99		YD-20	(0000000-)	Nipple, Rubber Magneto Tower	1
100	37713	YL-339-22	(0000000-)	Cable Assembly, Ignition	1
101		LJ-315	(0000000-)	Pipe Nipple, 1" x 2.5"	1
102		PB-164	(0000000-)	Screw, 0.313" - 24 x 2.5"	1
		PB-184	(0000000-)	Screw, 0.25" - 28 x 0.625"	1
		XA-123	(0000000-)	Screw, 0.25" - 20 x 0.75"	1
103		PD-9	(0000000-)	Nut, 0.25" - 28	1
		PD-77	(0000000-)	Nut, 0.25" - 20	1
104		PD-10	(0000000-)	Nut, 0.313" - 24	1
	38476	PD-246	(0000000-)	Locknut, 0.313" - 24, Special	2
105		PD-11	(0000000-)	Nut, 0.375" - 24	1
106		PD-77	(0000000-)	Nut, 0.25" - 20	1
		PD-239	(0000000-)	Nut, 0.25" - 20, Square	2
107		PD-115	(0000000-)	Nut, No. 10-32	2

Key	Tennant® Part No.	Wisconsin Part Number	Engine Serial Number	Description	Qty.
108		PD-147	(0000000-)	Nut, 0.25" - 20, Wing	1
109		PE-3	(0000000-)	Lockwasher, 0.25" Spring	22
110		PE-4	(0000000-)	Lockwasher, 0.313" Spring	10
111		PE-5	(0000000-)	Lockwasher, 0.375" Spring	6
		PE-74	(0000000-)	Lockwasher, 0.25"	1
112		PF-18-A	(0000000-)	Pipe Plug, 0.125" Slotted	1
113		XK-3	(0000000-)	Pipe Plug, 0.375" Square Head	1
114		PF-165	(0000000-)	Pipe Plug, Special	1
115		PH-14	(0000000-)	Washer, 0.313" I.D. x 0.594" O.D. x 0.063" Copper	1
116		PH-22	(0000000-)	Washer, 0.375" I.D. x 0.688" O.D. x 0.063"	6
117		PH-30-A	(0000000-)	Washer, 0.25" I.D. x 0.438" O.D. x 0.063"	1
118		PL-55	(0000000-)	Key, Woodruff No. 6	1
119		PL-87	(0000000-)	Key, Woodruff No. 22	1
120		RF-794	(0000000-)	Nipple, 0.125" x 0.75"	1
121		SA-26	(0000000-)	Plug, Expansion 0.625"	2
122		XA-33	(0000000-)	Screw, 0.25" - 20 x 0.375"	4
123		XA-67	(0000000-)	Screw, Parker No. 4, Type "a" 0.25" Long	4
		XA-61	(0000000-)	Screw, 0.25" - 20 x 1.75"	2
124		XA-113	(0000000-)	Screw, 0.313" - 18 x 0.50"	2
125		XD-5	(0000000-)	Screw, 0.25" - 20 x 0.625"	2
126		XD-6	(0000000-)	Screw, 0.25" - 20 x 0.75"	16
127		XD-7	(0000000-)	Screw, 0.25" - 20 x 1"	2
		XD-8	(0000000-)	Screw, 0.25" - 20 x 1.25"	1
128		XD-15	(0000000-)	Screw, 0.313" - 18 x 0.75"	4
129		XD-16	(0000000-)	Screw, 0.313 - 18 x 0.875"	2
130		XD-17	(0000000-)	Screw, 0.313" - 18 x 1"	1
131		XD-23	(0000000-)	Screw, 0.313" - 18 x 2"	1
132		XD-27	(0000000-)	Screw, 0.375" - 16 x 1"	6
133		XI-32	(0000000-)	Pin, Cotter, 0.047" Dia. x 0.375"	1

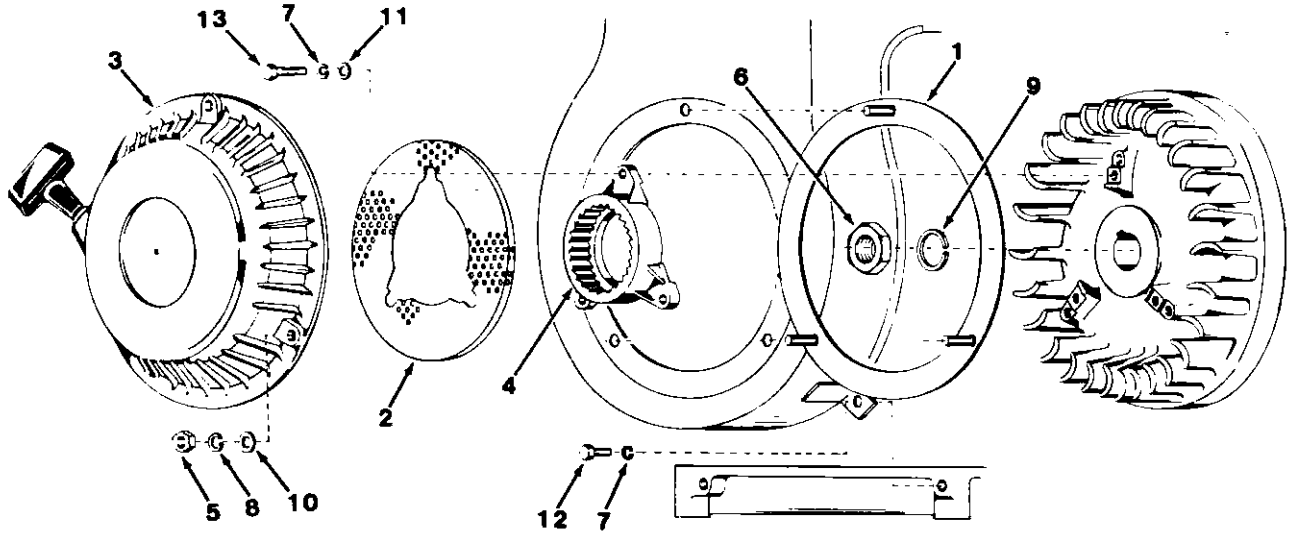

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Fig. 2 – Rewind Starter Assembly

Key	Tennant® Part No.	Wisconsin Part Number	Engine Serial Number	Description	Qty.
		RWS109	(000000–)	Starter Assembly, Rewind	1
1		PG-1300	(000000–)	Ring, Support	1
2		SE-334	(000000–)	Screen, Rotating	1
3	38023	U-283	(000000–)	Starter, Rewind	1
4		UC-204	(000000–)	Hub Drive	1
5		PD-78	(000000–)	Nut, 0.313" – 18	3
6		PD-142	(000000–)	Nut, 0.875" – 14	1
7		PE-3	(000000–)	Lockwasher, 0.25"	5
8		PE-4	(000000–)	Lockwasher, 0.313"	3
9		PE-38	(000000–)	Lockwasher, 0.875"	1
10		PH412	(000000–)	Washer, 0.313"	3
11		PH-196	(000000–)	Washer, 0.25"	3
12		XD-5	(000000–)	Screw, 0.25" – 20 x 0.50"	2
13		XD-7	(000000–)	Screw, 0.25" – 20 x 1"	3

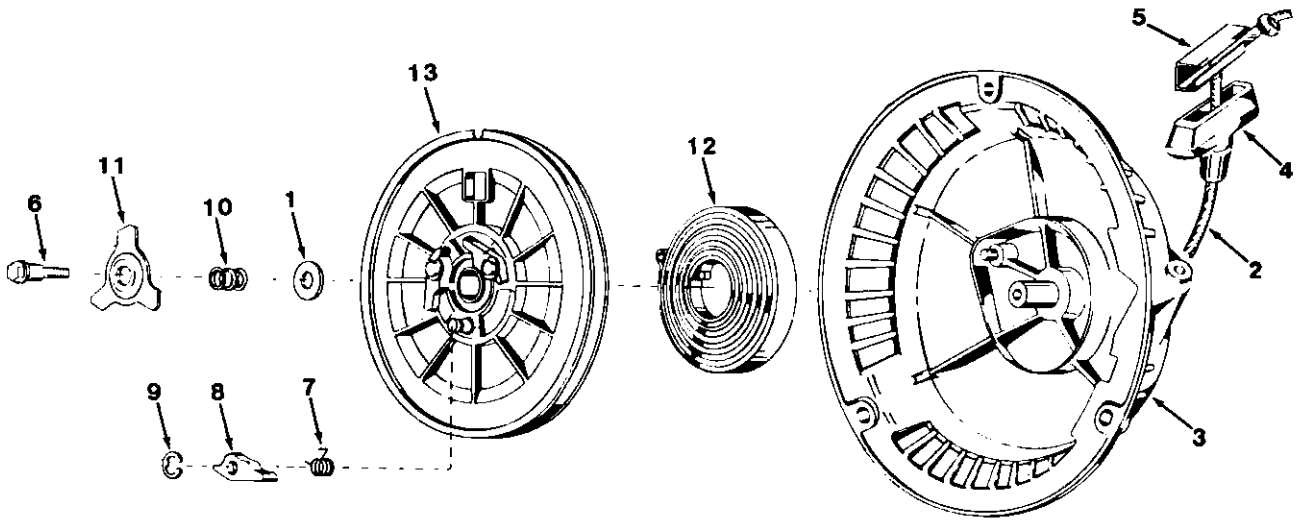

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Fig. 3 – Rewind Starter Breakdown

Key	Tennant® Part No.	Wisconsin Part Number	Engine Serial Number	Description	Qty.
	38023	U-283	(000000-)	Rewind Starter	1
1		27-504-015-0	(000000-)	Washer, Brake Spring	1
2		27-504-022-0	(000000-)	Rope	1
3		27-504-116-0	(000000-)	Housing Assembly	1
4		27-508-008-0	(000000-)	Handle, T	1
5		27-508-009-0	(000000-)	Reinforcement, T Handle	1
6		27-525-003-0	(000000-)	Screw, Cam Center	1
7		27-525-007-0	(000000-)	Spring, Dog	3
8		27-525-008-0	(000000-)	Dog	3
9		27-525-012-0	(000000-)	Clip, Retainer	3
10		27-525-013-0	(000000-)	Spring, Brake	1
11		27-526-001-0	(000000-)	Cam, Dog	1
12		27-526-003-0	(000000-)	Spring, Recoil	1
13		27-526-504-0	(000000-)	Pulley And Bearing Assembly	1

TENNANT COMPANY, TENNANT COMPANY SUBSIDIARIES, AND MAJOR PARTS AND SERVICE LOCATIONS DIRECTORY

LOCATION	PHONE	TELEX
NORTH AMERICA		
U.S.A.		
CALIFORNIA Los Angeles Parts and Service Center 1080 N. Kraemer Place P. O. Box 66066 Anaheim, CA 92806	(714) 630-0800	183-014
GEORGIA Atlanta Parts and Service Center 5805 Peachtree Corners E. Rd. Norcross, GA 30092 Toll free in - FL, MS, AL, TN, KY, NC, SC	(404) 447-1500 (800) 241-8964	70-7415
ILLINOIS Chicago Parts and Service Center 2670 United Lane P. O. Box 725 Elk Grove Village, IL 60007	(312) 595-1770	726-368
MICHIGAN Detroit Parts and Service Center 5601 Enterprise Dr. P. O. Box 927 Warren, MI 48090	(313) 573-6600	23-5627
MINNESOTA Tennant Company, World Headquarters Minneapolis Factory Customer Services 701 N. Lilac Dr. Minneapolis, MN 55422 Mailing Address: P. O. Box 1452 Minneapolis, MN 55440	(612) 540-1315	29-0451
PENNSYLVANIA Philadelphia Parts and Service Center 855 Bethel Avenue P. O. Box G Pennsauken, NJ 08110	(609) 665-2231	834-430
TEXAS Dallas/Ft. Worth Parts and Service Center 1025 Santerre Drive Grand Prairie, TX 75050 Mailing Address: P. O. Box 5584 Arlington, TX 76011	(214) 647-0801	—
CANADA		
ONTARIO Toronto Parts and Service Center 7575 Kimbel St., Unit 1, Mississauga Ontario, Canada L5S 1C8	(416) 677-8070	06-983504
SOUTH AMERICA		
BRAZIL Equipamentos Tennant Limitada Av. Dona Ruyce Ferraz Alvim, 2056 Caixa Postal 226 Diadema - SP - Brazil CEP 09900	456-2655	Cable TENBRACO

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Home

TENNANT COMPANY, TENNANT COMPANY SUBSIDIARIES, AND MAJOR PARTS AND SERVICE LOCATIONS DIRECTORY (CONTINUED)

LOCATION	PHONE	TELEX
ASIA		
JAPAN Fuji-Tennant, Ltd. Shinjuku Building 8-1, Nishi-Shinjuku, 1-chome Shinjuku-ku, Tokyo, Japan	342-8681	781-232-2268 RCA ATTN: Fuji-Tennant
AUSTRALIA		
AUSTRALIA Tennant Australia 55 Salisbury Road Hornsby, New South Wales 2077 Australia	476-5893	AA27393
EUROPE		
NETHERLANDS Tennant N.V. Industrielaan 6 5400 AA Uden, N.B., Netherlands	(4132) 63955	844 50079
UNITED KINGDOM Tennant Maintenance Systems, Ltd. Pool Road East Molesey Surrey KT 8 ONH United Kingdom	941-5585	8953787
WEST GERMANY Tennant N.V. Zweigniederlassung Remscheid Walter Freitagstr. 39 5630 Remscheid 12 West Germany	02191-53087	08 513 478 TENV D.

This is a listing of *major* Tennant Company parts and service centers. Parts and service are also available at many other Tennant Company centers or distributors located around the world. To determine your nearest Tennant Company representative, phone or write the Tennant Company World Headquarters.

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TENNANT COMPANY WARRANTY POLICY

Tennant Company warrants to the original purchaser, for the period of one (1) year from the date of delivery, that goods manufactured by it will be free from defects of workmanship and material, provided such goods are installed, operated, and maintained in accordance with Tennant Company written manuals or other instructions.

Tennant Company's sole obligation, and Purchaser's sole remedy under this warranty for all claims arising out of the purchase and use of the goods, shall be limited to the repair or replacement, at Tennant Company's option, of parts that do not conform to this Warranty.

For thirty (30) days from date of installation, Tennant Company will, at its option, provide labor for repair, pay for outside repair service, or pay the customer straight time in accordance with Tennant Company's flat rate schedule for particular warranty repairs. Thereafter, Tennant Company's sole obligation shall be limited to the repair or replacement, at Tennant Company's option, of parts that do not conform to this Warranty.

Repair parts supplied by Tennant Company are warranted for the period of thirty (30) days following installation. Tennant Company's obligation is limited to the replacement of the warranted part, and Tennant Company shall not be obligated to provide labor in installing such part.

Battery and tires will be replaced if failure occurs due to defective material or workmanship within 90 days from date of purchase. Thereafter, a pro rata adjustment from date of purchase to 12 months will be made. The pro rata adjustment price of the new battery and/or the new tire will be the Tennant Company current price as of the adjustment request less 1/12th of that price for each month remaining in the 12-month period. All warranty applies only to batteries and tires purchased from Tennant Company and installed in vehicles used in normal service.

Brushes that fail due to defective material or workmanship will be replaced on a pro rata basis within the first 12 months of purchase. The replacement price will be calculated by multiplying the current Tennant Company price by the percentage of usable bristle remaining at the time of adjustment.

No Warranty is made with respect to items made by others when such items are warranted by their respective makers or when they are supplied by Tennant Company on special order.

This Warranty shall not cover:

A. Floor materials or application, and models 140 and 140E.

B. Maintenance items, adjustments, or installation of machines.

C. Repairs required as a result of failure due to normal wear, accidents, misuse, abuse, negligence, or improperly installed repair parts.

D. Products altered or modified in a manner not authorized by Tennant Company in writing.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER EXPRESSED OR IMPLIED WARRANTIES INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS AND OF ALL OTHER OBLIGATIONS AND LIABILITIES ON THE PART OF TENNANT COMPANY, INCLUDING LIABILITIES FOR DIRECT, IMMEDIATE, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE FAILURE OF ANY MACHINE OR PART OF IT TO OPERATE PROPERLY, INCLUDING THE COST OR EXPENSE OF PROVIDING SUBSTITUTE EQUIPMENT OR SERVICE DURING PERIODS OF MALFUNCTION OR NON-USE.

This Warranty cannot be extended, changed, or modified by any representative of Tennant Company.

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