TORO®

Residential and
LCE Products

21 inch Aerator
Service Manual

ABOUT THIS MANUAL

This service manual was written expressly for Toro service technicians. The Toro Company has made every effort to make the information in this manual complete and correct.

Basic shop safety knowledge and mechanical/electrical skills are assumed. The Table of Contents lists the systems and the related topics covered in this manual.

For information specific to the engines used on this unit, refer to the appropriate engine manufacturer's service and repair instructions.

The Toro 21" Aerator, model year 2012-2014, is covered in this manual. The manual may also be specified for use on later model products.

Due to the compact design, parts were removed for photographic purposes when necessary.

The hydraulic components are sophisticated pieces of machinery. Maintain strict cleanliness control during all stages of service and repair. Cover or cap all hose ends and fittings whenever they are exposed. Even a small amount of dirt or other contamination can severely damage the system.

We are hopeful that you will find this manual a valuable addition to your service shop. If you have any questions or comments regarding this manual, please contact us at the following address:

The Toro Company
Residential and Landscape Contractor Service Training Department
8111 Lyndale Avenue South
Bloomington, MN 55420

The Toro Company reserves the right to change product specifications or this manual without notice.

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General Information

This symbol means WARNING or PERSONAL SAFETY INSTRUCTION - read the instruction because if has to do with your safety. Failure to comply with the instruction may result in personal injury or even death.

This manual is intended as a service and repair manual only. The safety instructions provided herein are for troubleshooting, service, and repair of the Toro 30" Aerator. The 21" Aerator/Seeder operator's manual contains safety information and operating tips for safe operating practices. Operator's manuals are available through your Toro parts source or:

The Toro Company
Publications Department
8111 Lyndale Avenue South
Bloomington, MN 55420

Think Safety First

Avoid unexpected starting of engine...

Always turn off the engine and disconnect the spark plug wire(s) before cleaning, adjusting, or repair.

Avoid lacerations and amputations...

Stay clear of all moving parts whenever the engine is running. Treat all normally moving parts as if they were moving whenever the engine is running or has the potential to start.

Avoid burns...

Do not touch the engine, muffler, or other components which may increase in temperature during operation, while the unit is running or shortly after it has been running.

Avoid fires and explosions...

Avoid spilling fuel and never smoke while working with any type of fuel or lubricant. Wipe up any spilled fuel or oil immediately. Never remove the fuel cap or add fuel when the engine is running. Always use approved, labeled containers for storing or transporting fuel and lubricants.

Avoid asphyxiation...

Never operate an engine in a confined area without proper ventilation.

Avoid injury from batteries...

Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes, and clothing. Battery gases can explode. Keep cigarettes, sparks, and flames away from the battery.

Avoid injury due to inferior parts...

Use only original equipment parts to ensure that important safety criteria are met.

Avoid injury to bystanders...

Always clear the area of bystanders before starting or testing powered equipment.

Avoid injury due to projectiles...

Always clear the area of sticks, rocks, or any other debris that could be picked up and thrown by the powered equipment.

Avoid modifications...

Never alter or modify any part unless it is a factory approved procedure.

Avoid unsafe operation...

Always test the safety interlock system after making adjustments or repairs on the machine. Refer to the Electrical section in this manual for more information.

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Specifications 2012-13 models (Serial 312000001 & up, Serial 313000001 & up)

	21” Single Hydro Aerator
Model:	**23515 / 33515**

Engine:	**10.9 cu-in. (179cm³)**
Make	Kawasaki
Model	FJ180V
Hi-Idle	3600 RPM
Low-Idle	1250-1550 RPM
Spark Plug	BPR6ES (NKG)
Spark Plug Gap	.030"/.76mm
Oil	SAE 10W-30
Oil Capacity	0.6 Qt. (0.6 liters)
Starter	Recoil Only
Fuel Tank Volume	1.0 US gal (3.8 L)

Power System:

Transmission	Hydro-Gear T2
Hydraulic Fluid	Toro premium hydro oil or Mobil1 15w-50
Hydraulic Fluid Capacity	65.9 oz. (1950ml)
Ground Speed (fwd/rev)	4 mph/2.2 mph
Drive Tires (pneumatic)	11 x 4.00 - 4
Tire Pressure	46 psi (317 kPa)

Dimensions:

Width (in/cm)	31.0/79.0
Length Operating (in/cm)	61.0/155.0
Length Handle Stored (in/cm)	48.5/123.0
Height Operating (in/cm)	45.25/115.0
Height Handle Stored (in/cm)	32.5/82.5
Weight (lb/kg)	310.0/140.6
Max Operating Depth (in/cm)	4.0/10.2
Plugs per sq-ft. / sq-meter	4.6/49.5

SPECIFICATIONS & MAINTENANCE

Specifications 2014 models (Serial 314000001 & up)

	21” Single Hydro Aerator
Model:	**23515 / 33515**

Engine:	**10.9 cu-in. (179cm³)**
Make	Kawasaki
Model	FJ180V
Hi-Idle	3700 ± 50 RPM
Low-Idle	1250-1550 RPM
Spark Plug	BPR6ES (NKG)
Spark Plug Gap	.030"/.76mm
Oil	SAE 10W-30
Oil Capacity	0.6 Qt. (0.6 liters)
Starter	Recoil Only
Fuel Tank Volume	1.0 US gal (3.8 L)

Power System:

Transmission	Hydro-Gear T2
Hydraulic Fluid	Toro premium hydro oil or Mobil1 15w-50
Hydraulic Fluid Capacity	65.9 oz. (1950ml)
Ground Speed (fwd/rev)	4 mph/2.2 mph
Drive Tires (pneumatic)	11 x 4.00 - 4
Tire Pressure	46 psi (317 kPa)

Dimensions:

Length - handle in lowest position (in/cm)	58/147
Length - handle in middle position (in/cm)	59/150
Length - handle in highest position (in/cm)	61/155
Length Handle Stored (in/cm)	42/107
Width (in/cm)	31/79
Height - handle in lowest position (in/cm)	48/122
Height - handle in middle position (in/cm)	50/127
Height - handle in highest position (in/cm)	52/132
Height Handle Stored (in/cm)	34/86
Weight - as shipped with 2 weights (lb/kg)	380/172.4
Plugs per sq-ft. / sq-meter	4.6/49.5

Handle Adjustment (Serial 314000001 & up)

The height of the handle can be adjusted for comfortable operation. Stand behind the handle to determine the appropriate height settings.

1. To adjust the handle height, position the hardware into one of three sets of holes on each side of the mainframe (Fig. 001, Fig. 002, and Fig. 003).

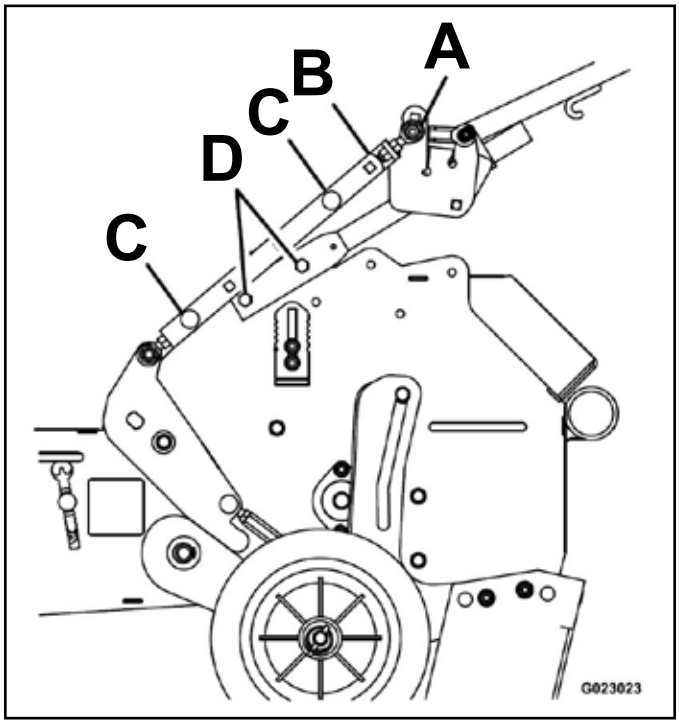

Fig. 001 fig. 7 G023023

Front handle position - lowest height

A. Trunion bracket - bottom hole
B. Lift link straps
C. Mounting bolt location
D. Handle hardware - front holes

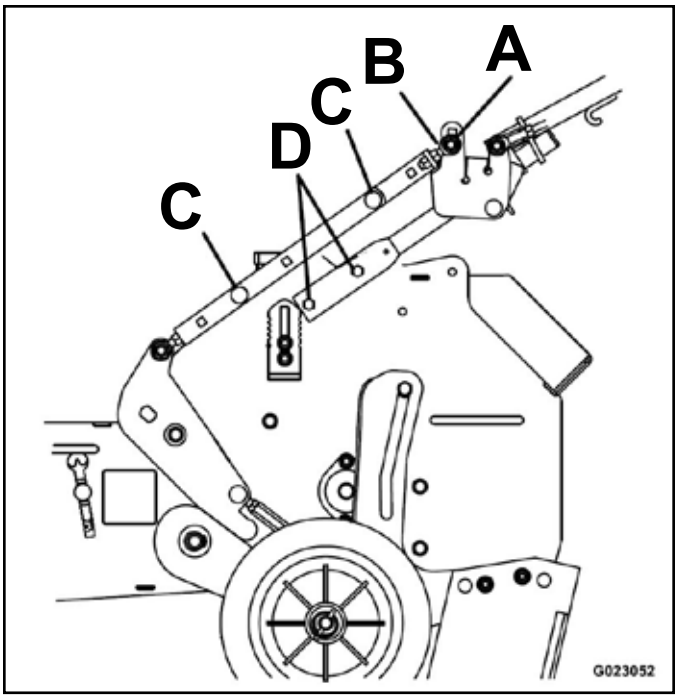

Fig. 002 fig. 8 G023052

Middle handle position

A. Trunion bracket - bottom hole
B. Lift link straps
C. Mounting bolt location
D. Handle hardware - middle holes

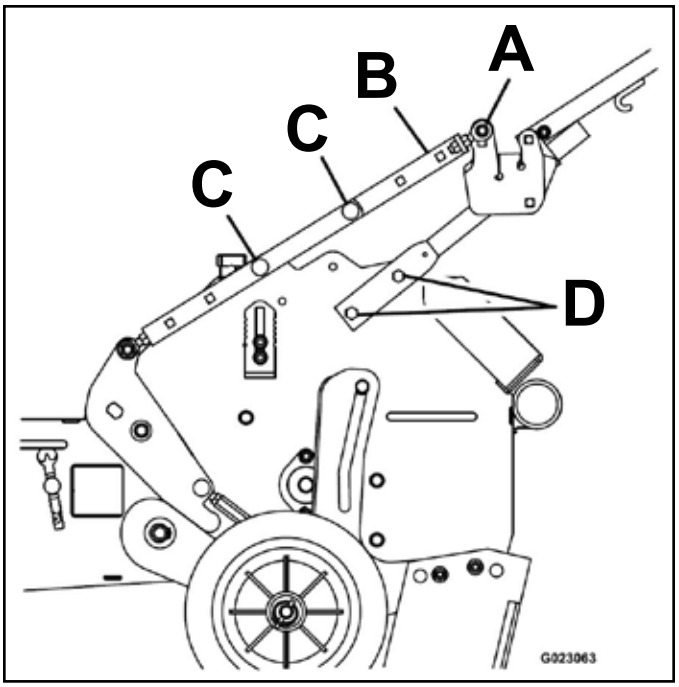

Fig. 003 fig. 9 G023063

Rear handle position - highest height

A. Trunion bracket - top hole
B. Lift link straps
C. Mounting bolt location
D. Handle hardware - rear holes

2. Secure the handle with both mounting bolts.

3. Adjust the tine-control lever.

Adjusting the Coring Depth (All Models)

A coring depth of 2-1/2” (6.35cm) is recommended, but you can change the depth as follows:

1. Stop engine, wait for all moving parts to stop.

2. Disconnect the wire from the spark plug.

3. Loosen the nuts securing the wheel stop on the right side of the machine (Fig. 004).

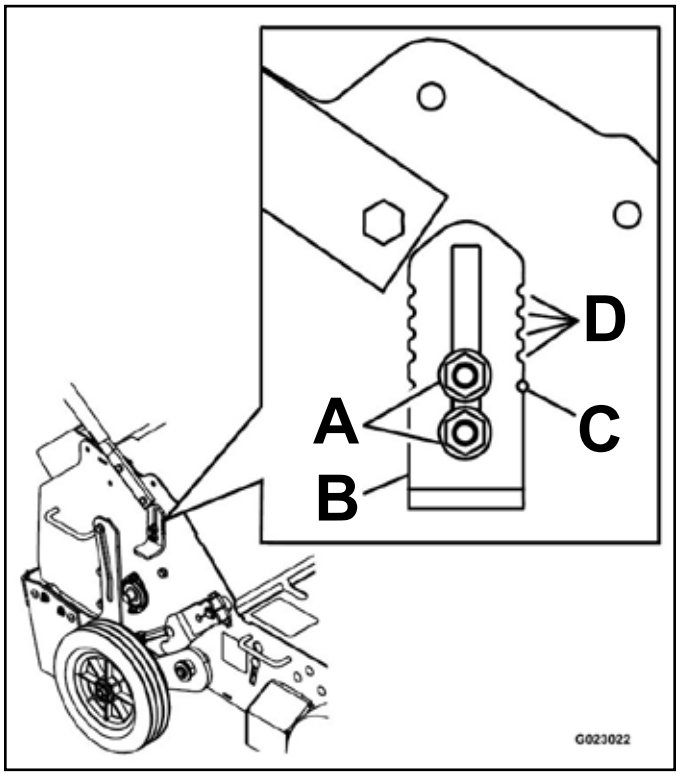

Fig. 004 fig. 17 G023022

A. Wheel stop
B. Nuts
C. Indicator hole
D. Indicator notches

4. Lower the wheel stop to reduce the depth. Raise it to increase the coring depth and as required.

Note: To ensure that the tines penetrate fully into the soil, weights can be added to the back of the machine. The machine has three weight pockets that hold the weights. When placing weight, ensure that the load is balanced; if using only one weight, place it in the center pocket and if using two, place them in the side pockets.

Note: The removable weights are heavy. Use care when lifting them. Make sure that you can hold them securely before lifting them. Use caution when positioning your hands so that you do not set them down on your hands or fingers.

5. Tighten the nuts securely to lock the wheel stop in place.

6. Repeat steps 3 through 5 for the wheel stop on the left side of the machine. Use the visual indicator notches in the wheel stop and indicator holes in the frame to set the wheel stops to the same height on each side (Fig. 004).

Adjusting the Tine Control Lever 2014 models (Serial 314000001 & up)

1. Stop engine, wait for all moving parts to stop.

2. Disconnect the wire from the spark plug.

3. Raise the tines to the transport position.

4. The wheel arm and the pivot shaft assembly should have surface-to-surface contact. If not, check the distance of the lower lift linkage and adjust if necessary (Fig. 005).

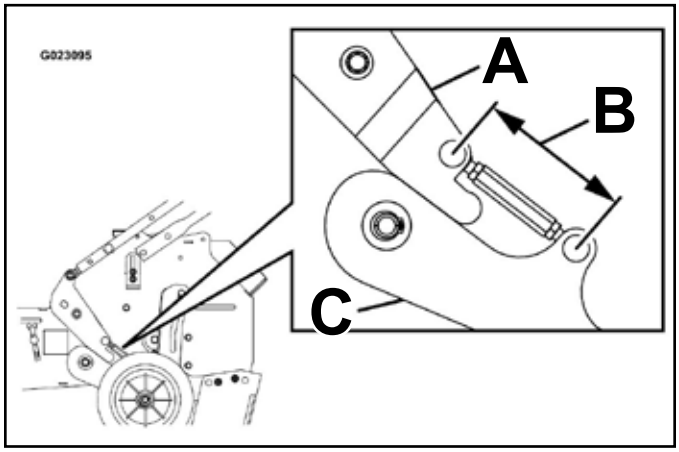

Fig. 005 fig. 18 G023095

A. Pivot shaft assembly
B. 4.8 inches (12cm)
C. Wheel arm assembly

5. The lower ball joint bolt, on the upper link rod, should be offset 1/4” (6mm) from the handle pivot bolt. If not, loosen the lock nuts on the lift link strap ball joints, adjust as necessary, and retighten locknuts (Fig. 006).

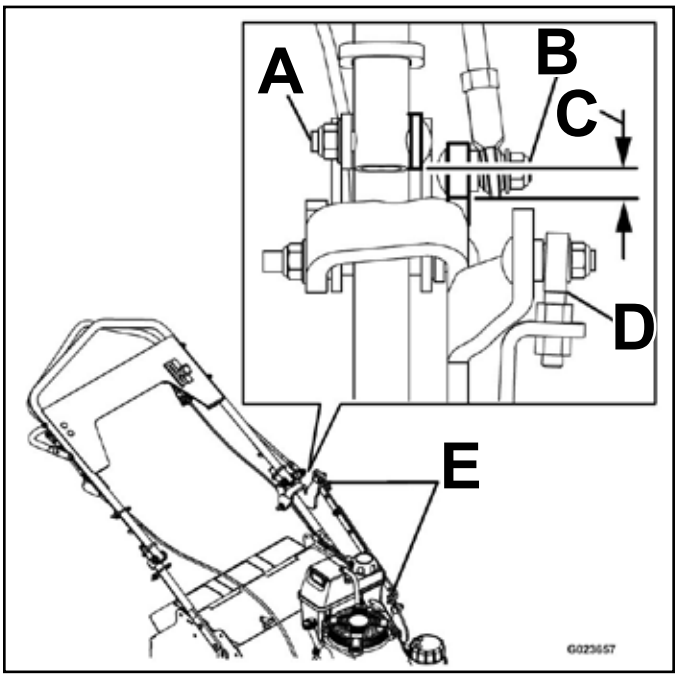

Fig. 006 fig. 19 G023657

A. Handle pivot bolt
B. Lower ball joint bolt
C. 1/4” (6mm)
D. Lift link strap ball joint
E. Adjust here

6. Slide the oval locking rings upward on the handle and fold the handle towards the engine.

7. The ball joint on the tine-control lever should contact the handle firmly (Fig. 007); if not, proceed to step 8.

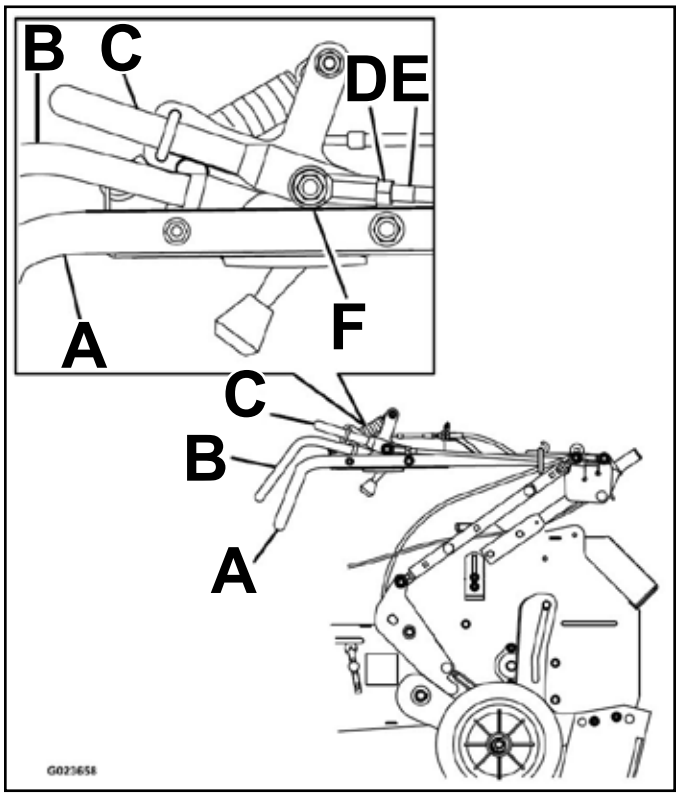

Fig. 007 fig. 20 G023658

A. Handle
B. Self-propel drive bail
C. Tine-control lever
D. Jam nut
E. Link rod
F. Ball joint contacts here

8. Loosen both jam nuts, on both ends of the link rod, next to the ball joints.

9. Turn the link rod, by hand, until the ball joint on the tine-control lever is tight against the handle.

10. Tighten both jam nuts on the link rod next to the ball joints.

Lift Drop Cable Adjustment 2012-13 models (Serial 312000001 & up, Serial 313000001 & up)

1. Adjust jam nut all the way to the end so no threads are showing. Adjust the yoke as far onto the rod as possible and re-tighten the jam against the yoke (A - Fig. 009).

2. Adjust the Cable Housing Anchor Nuts so there are an equal number of threads on each end and re-tighten (B - Fig. 010).

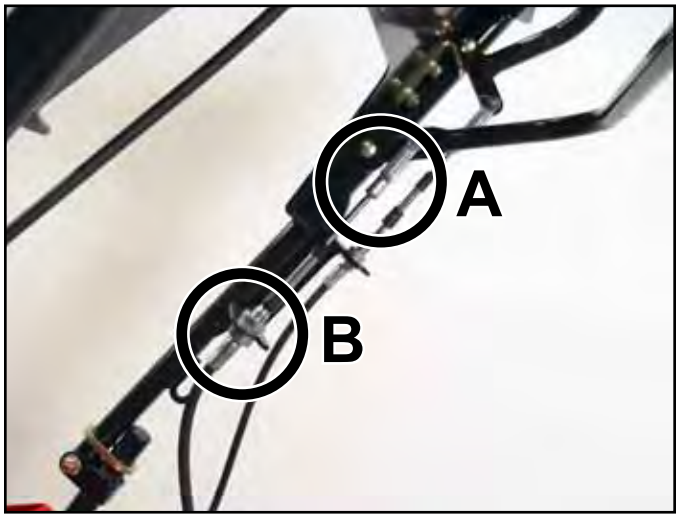

Fig. 008 DSCN-0016a

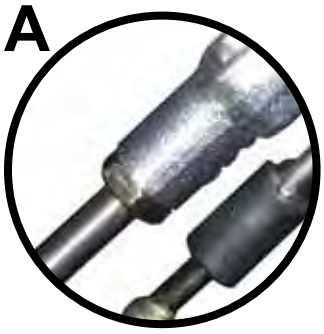

Fig. 009 011a

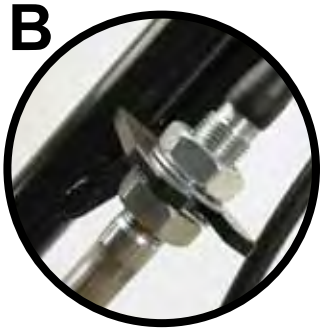

Fig. 010 DSCN-0019a

3. Adjust the lower nut all the way to the end so that one thread is showing at most. Tighten the internal nut to secure the cable to the bracket (C - Fig. 012).

4. Adjust jam nut all the way to the end so no threads are showing. Adjust the yoke as far onto the rod as possible and re-tighten the jam against the yoke (D - Fig. 013).

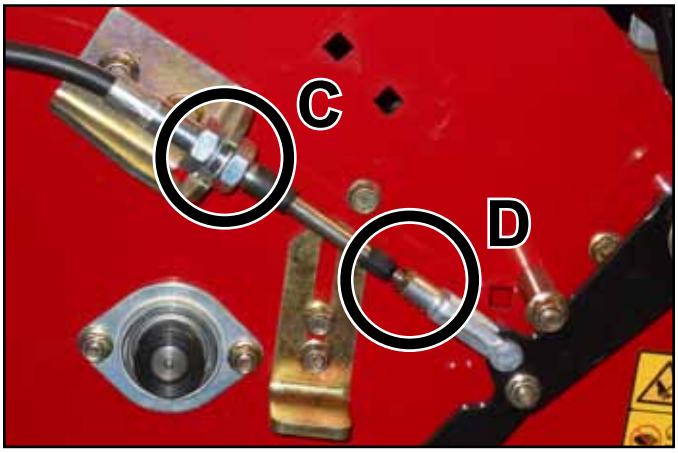

Fig. 011 DSCN-0024

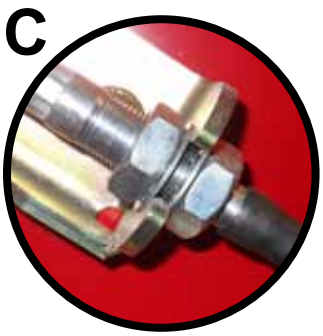

Fig. 012 DSCN-0032

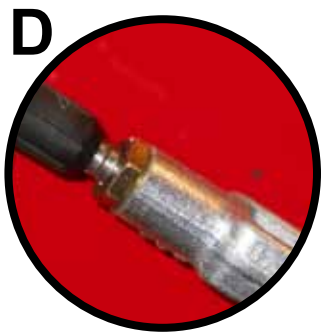

Fig. 013 DSCN-0029

SPECIFICATIONS & MAINTENANCE

Recommended Maintenance Schedule

Maintenance Service Interval	Maintenance Procedure
After the first 5 hours	• Change the engine oil.
Before each use or daily	• Check the engine oil level. • Check the condition and tension of the tine drive chains. • Check the condition of the front drive chains. • Check the condition of the drive chain sprockets. • Lubricate the tine drive chains. • Check the condition of the coring tines and replace any that are damaged or excessively worn. • Check for loose fasteners. • Clean the engine and exhaust system area. • Clean grass and debris buildup from the machine.
Every 25 hours	• Grease tine shaft bearings. • Grease tine assembly idlers. • Lubricate the front drive chains. • Clean the foam pre-cleaner (more frequently in dusty conditions). • Check the tension of the hydrostatic drive belt.
Every 50 hours	• Change the engine oil. • Check the spark arrester (if equipped). • Check for leaks in the fuel systems and/or deteriorating fuel hose. • Check the tire pressures.
Every 100 hours	• Change the oil filter. • Inspect, clean, and adjust the spark plug; replace it if necessary. • Clean the fuel filter element. • Change the hydraulic transmission fluid.
Every 200 hours	• Replace the spark plug.
Every 250 hours	• Replace the fuel filter. (More frequently in dusty conditions.)
Every 300 hours	• Replace the air cleaner elements (more frequently in dusty conditions).
Yearly or before storage	• Touch up chipped paint.

⚠ CAUTION ⚠

If you leave the spark pug wire connected, someone could accidently start the engine and seriously injure you or other bystanders.

Before performing any maintenance, park the unit on a level surface, stop the engine, and disconnect the spark plug wire. Set the wire aside so that it does not accidentally contact the spark plug.

Accessing the Tines & Tipping the Machine

The machine has a rear access panel that you can remove to access and maintain the tines (Fig. 014).

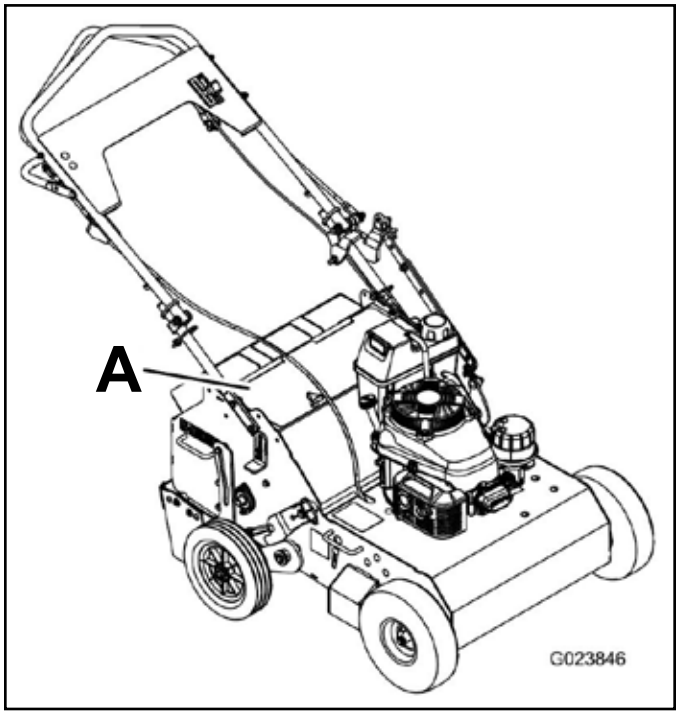

Fig. 014 fig. 21 G023846

A. Rear access panel

WARNING

If you operate the machine with the rear access panel removed some one could be severely injured by contact with the moving tines or by flying debris.

Always securely install the rear access panel before operating the machine.

If you need to work on the underside of the machine, you can tip it backward (Fig. 015). Do not tip the machine forward or you will foul the air cleaner with gasoline. Secure the machine with a jack stand before working under it.

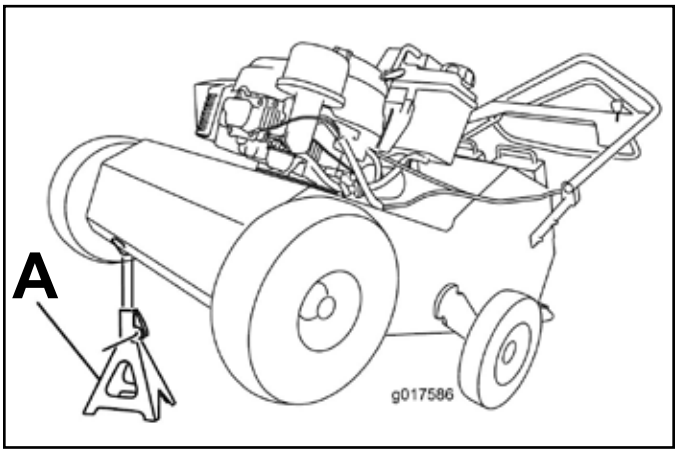

Fig. 015 fig. 22 G017586

A. Jack stand

WARNING

Mechanical or hydraulic jacks may fail to support machine and cause a serious injury.

- **Use jack stands when supporting machine.**
- **Do not use hydraulic jacks.**

Greasing the Tine Shaft Bearings

1. Raise the tines, stop the machine, stop the engine, and disconnect the spark plug wire.
2. Remove the rear access panel.
3. Lubricate fittings with NGLI grade #2 multi-purpose gun grease.

Refer to the following chart for fitting locations and lubrication schedule.

Lubrication Chart

Fitting Locations	Initial Pumps	Number of Places	Service Interval
A. Tine Shaft Bearings	1	2	25 hours
B. Tine Assembly Idlers	1-2	2	25 hours

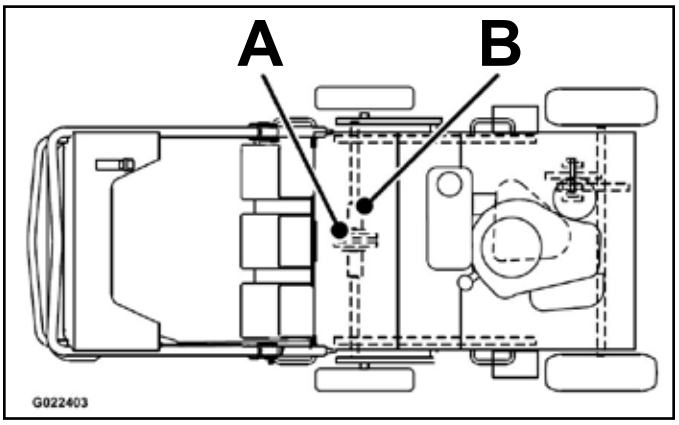

Fig. 016 fig. 23 G022403

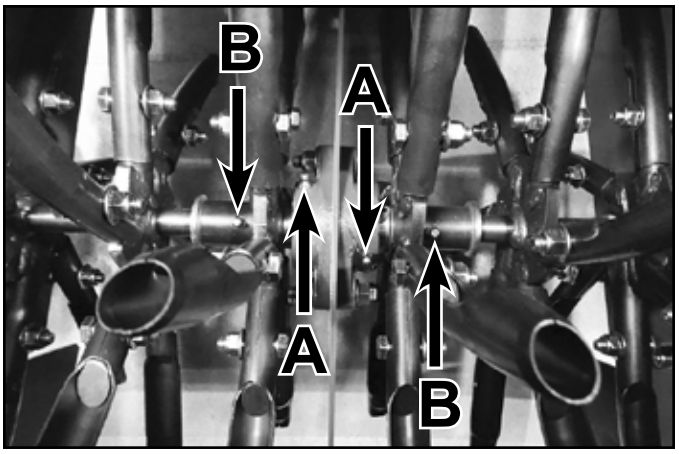

Fig. 017 tine grease fittings_a

Lubricating & Checking the Drive Chains & Sprockets

1. Raise the tines, stop the machine, stop the engine, and disconnect the spark plug wire.
2. Raise the front of the machine to gain access to the chains and block it in place.

CAUTION

If you do not securely block up the front of the machine, the machine could fall on you during service, injuring you.

Ensure that you place a jack-stand or block under the front of the machine to hold it up securely.

Important: Do not raise the rear of the machine. Raising the rear of the machine will cause the engine to flood and the air cleaner to be fouled with gasoline.

3. Rotate the front wheels and apply oil or chain lubricant onto the links of the lower spans of the front drive chains (Fig. 018).

4. Check the front drive chains (Fig. 018) for wear, damage, and proper tension. If chains pop or snap, replace the sprockets and chains.

5. Rotate tine shafts and apply oil or chain lubricant onto all the links of the lower spans of the tine drive chains (Fig. 018).

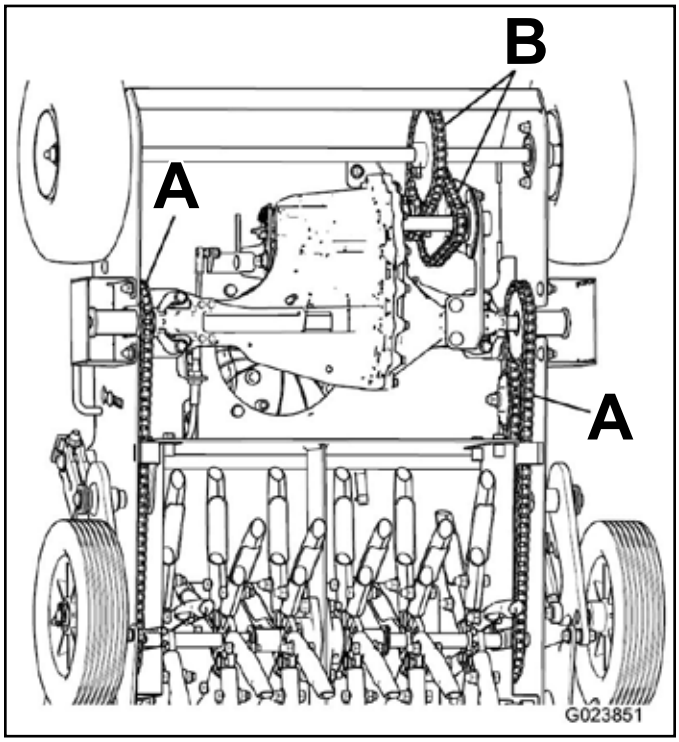

Fig. 018 fig. 23 G023851

A. Tine drive chains B. Front drive chains

6. Check the chains on both sides of the unit for wear, damage, and proper tension. The chains should be able to move up and down 1/4” (6mm) maximum.

   If chains are not tight enough or they pop or snap adjust the chain tension.

7. Inspect all chain sprockets for wear and replace them as required.

8. Wipe up any oil that spilled and lower the machine to the ground when finished.

Servicing the Air Cleaner

Important: Do not operate the engine without the air filter assembly; extreme engine damage may occur.

1. Stop the engine and wait for all moving parts to stop.

2. Disconnect the wire from the spark plug.

3. Remove the cover and clean it thoroughly (Fig. 019).

Note: Be careful to prevent dirt and debris from falling into the base.

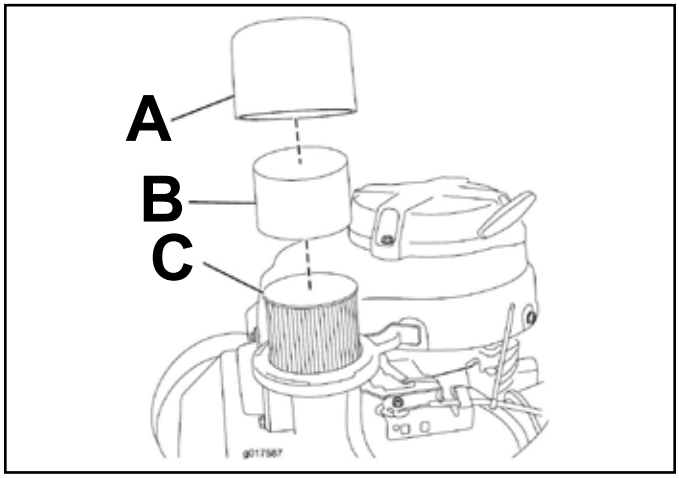

Fig. 019 fig. 24 G017587

A. Cover
B. Foam pre-cleaner
C. Paper air filter

4. Remove the foam pre-cleaner and wash it with a mild detergent and water, then blot it dry (Fig.019).

5. Remove and inspect the paper air filter (Fig. 019); discard it if it is excessively dirty.

Important: Do not try to clean a paper filter.

6. Wipe dirt from the base and the cover with a moist rag.

Note: Be careful to prevent dirt and debris from entering the air duct leading to the carburetor.

7. Install the foam pre-cleaner onto the paper air filter.

Note: Use a new paper air filter if you discarded the old one.

8. Install the air filter assembly and cover.

Changing the Engine Oil

Oil Capacity	
With oil filter	0.85 L (29 ounces)
Without oil filter	0.65 L (22 ounces)

1. Run the engine to warm the engine oil.

Note: Warm oil flows better and carries more contaminants.

WARNING

Oil may be hot after engine has been run, and contact with hot oil can cause severe personal injury.

Avoid contacting the hot engine oil when you drain it.

2. Stop the engine and wait for all moving parts to stop.
3. Disconnect the wire from the spark plug.
4. Place a drain pan on the ground to the right of the machine.
5. Remove the dipstick (Fig. 020).

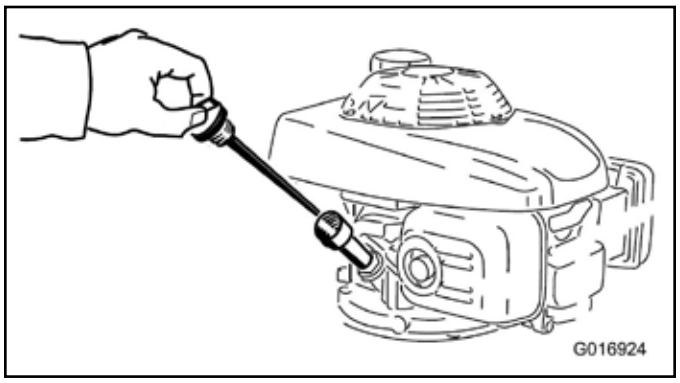

Fig. 020 fig. 25 G016924

6. Remove the drain plug (Fig. 021) and tip the machine so the oil flows to the pan.

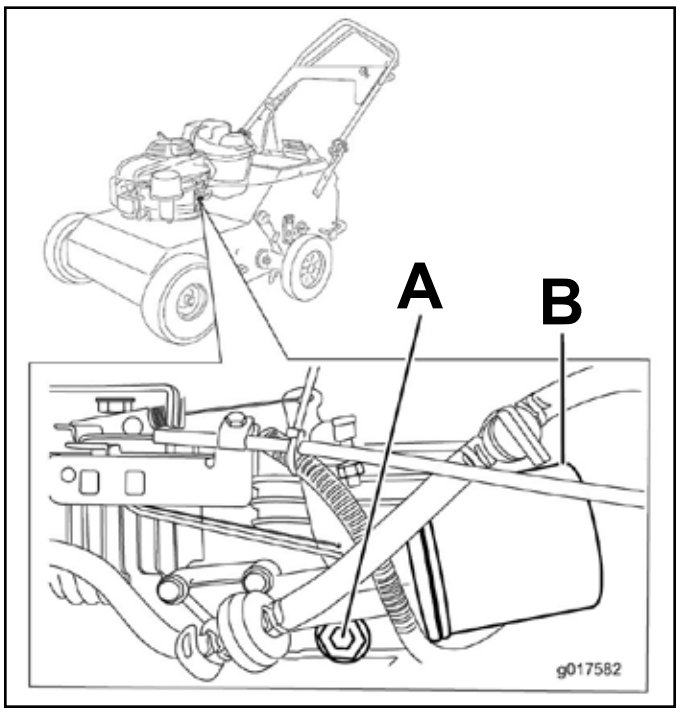

Fig. 021 fig. 26 G017582

A. Oil drain plug B. Oil filter

7. Tip the machine upright again, clean the oil from the frame with a rag and replace the drain plug.

8. **Slowly** pour oil into the oil fill tube, periodically checking the level with the dipstick, until the dipstick indicates that the engine is full. **Do not overfill.** (Max. fill: 0.55 L (20 oz), type: SAE 10-w30 detergent oil with an API service classification of SH, SJ, SL, or higher.)

Note: If you overfill the engine, pour some oil out of it.

9. Install the dipstick securely.

10. Recycle the used oil according to local codes.

Changing the Oil Filter

1. Drain the engine oil.

2. Place a rag under the oil filter (Fig. 022) to catch any oil that may leak out as you remove the filter.

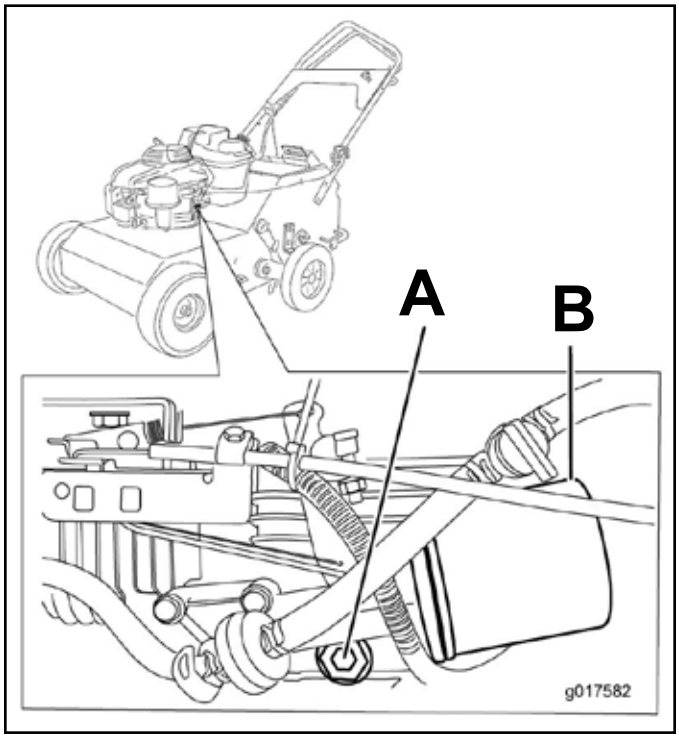

Fig. 022 fig. 26 G017582

A. Oil drain plug B. Oil filter

3. Remove the oil filter.

4. Use your finger to coat the gasket on the new filter with oil (Fig. 023).

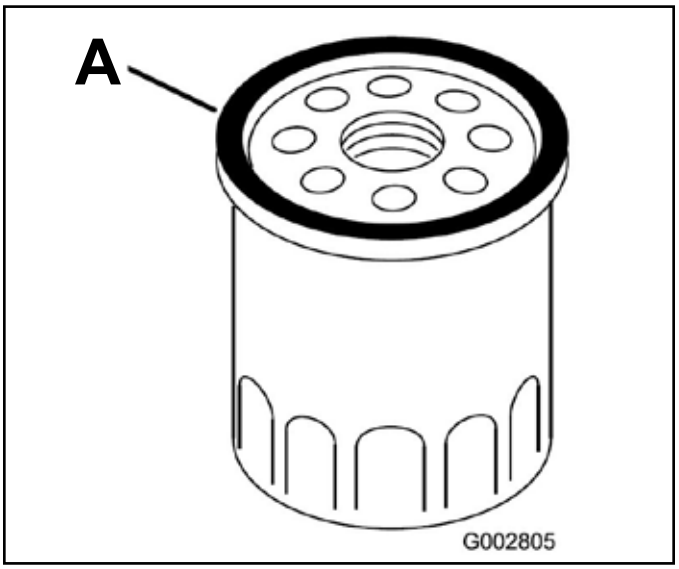

Fig. 023 fig. 27 G002805

A. Gasket

5. Install the new filter and hand tighten it 2/3 turn only.

6. Slowly pour oil into the oil fill tube, periodically checking the level with the dipstick, until the dipstick indicates that the engine is full. Do not overfill. (Max. fill: 0.55 L (20 oz), type: SAE 10-w30 detergent oil with an API service classification of SH, SJ, SL, or higher.)

Note: If you overfill the engine, pour some oil out of it.

7. Install the dipstick securely.

8. Connect the wire to the spark plug.

9. Run the engine for about 3 minutes.

10. Stop the engine, wait for all moving parts to stop, and check for oil leakage around the filter.

11. Check and add oil to compensate for the oil in the oil filter. Do not overfill.

12. Recycle the used oil filter according to local codes.

Servicing the Spark Plug

Use an **NGK BPR6ES** spark plug or equivalent.

1. Stop the engine and wait for all moving parts to stop.

2. Disconnect the wire from the spark plug.

3. Clean around the spark plug.

4. Remove the spark plug from the cylinder head.

Important: Replace a cracked, fouled, or dirty spark plug. Do not clean the electrodes because grit entering the cylinder can damage the engine.

5. Set the gap on the plug to 0.030” (0.76mm) (Fig. 024).

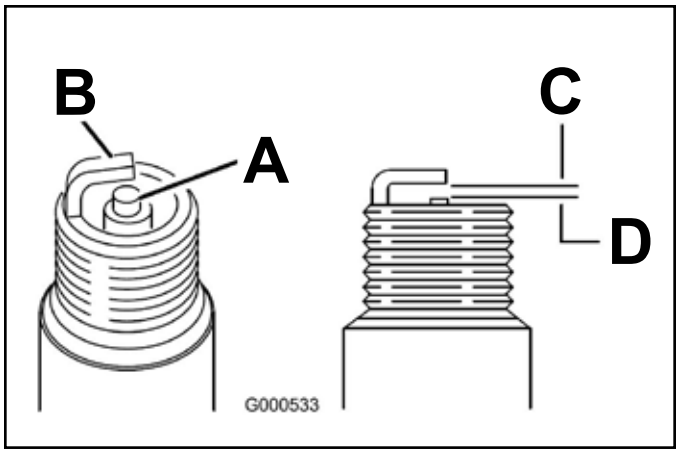

Fig. 024 fig. 28 G000533

A. Center electrode insulator
B. Side electrode
C. Air gap (not to scale)
D. 0.030” (0.76mm)

6. Carefully install the spark plug by hand (to avoid cross threading) until it is hand tight.

7. Tighten the spark plug an additional 1/2 turn if it is new; otherwise, tighten it an additional 1/8 to 1/4 turn.

Important: A loose spark plug can become very hot and can damage the engine; over-tightening a spark plug may damage the threads in the cylinder head.

8. Connect the wire to the spark plug.

Check the Spark Arrester (if equipped)

WARNING

Hot exhaust system components may ignite gasoline vapors even after the engine is stopped. Hot particles exhausted during engine operation may ignite flammable materials. Fire may result in personal injury or property damage.

DO NOT refuel or run engine unless spark arrester is installed.

1. Raise the tines, stop the machine, stop the engine, and disconnect the spark plug wire.
2. Wait for the muffler to cool.
3. If you observe any breaks in the screen or welds, replace the spark arrester.
4. If you observe plugging of the screen, remove the spark arrester, shake the loose particles out of it, and clean the screen with a wire brush (soak in solvent if necessary). Replace the spark arrester when finished.

Emptying the Fuel Tank and Cleaning the Fuel Filter

The fuel filter (screen) element is located inside the fuel tank.

1. Stop the engine and wait for it to cool down.

Note: Drain gasoline for a cold engine only.

2. Disconnect the wire from the spark plug.
3. Close the fuel valve (Fig. 025).

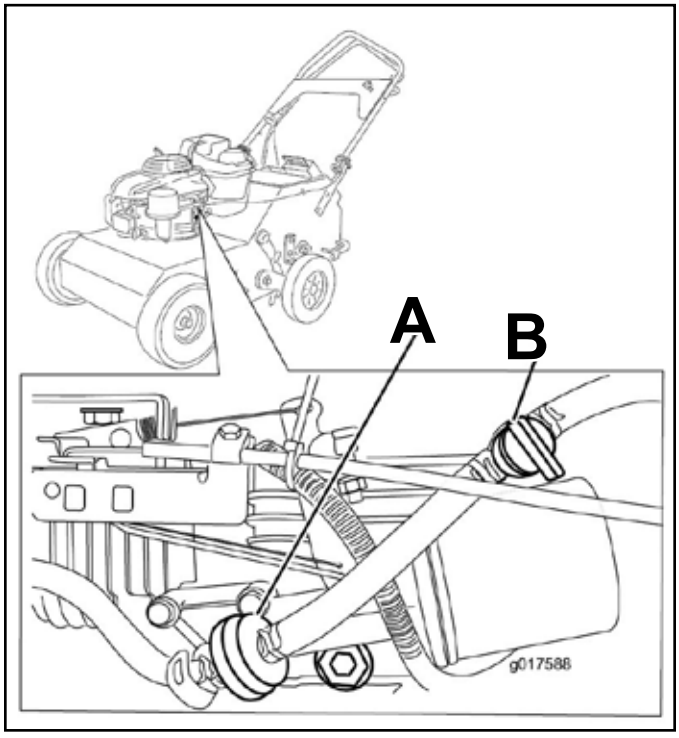

Fig. 025 fig. 29 G017588

A. Fuel filter B. Fuel valve

4. Disconnect the fuel line by loosening the tube clamp at the carburetor.

5. Open the fuel valve by turning the lever to the open position.

6. Drain the gasoline completely from the tank and fuel line into an approved fuel container.

7. Remove the fuel tank from the machine.

8. Close the fuel valve.

9. Pour a small amount of fuel in the fuel tank, move the fuel around in the tank, and pour it out into an approved fuel container.

10. Install the fuel tank and fuel line.

Replacing the Fuel Filter

1. Stop the engine and wait for it to cool down.

Important: Drain gasoline from a cold engine only.

2. Disconnect the wire from the spark plug.

3. Close the fuel valve.

4. Clamp off the fuel line on either side of the fuel filter (Fig. 026) to prevent fuel from leaking out when you remove the filter.

5. Squeeze the ends of the hose clamps together and slide them away from the filter (Fig. 026).

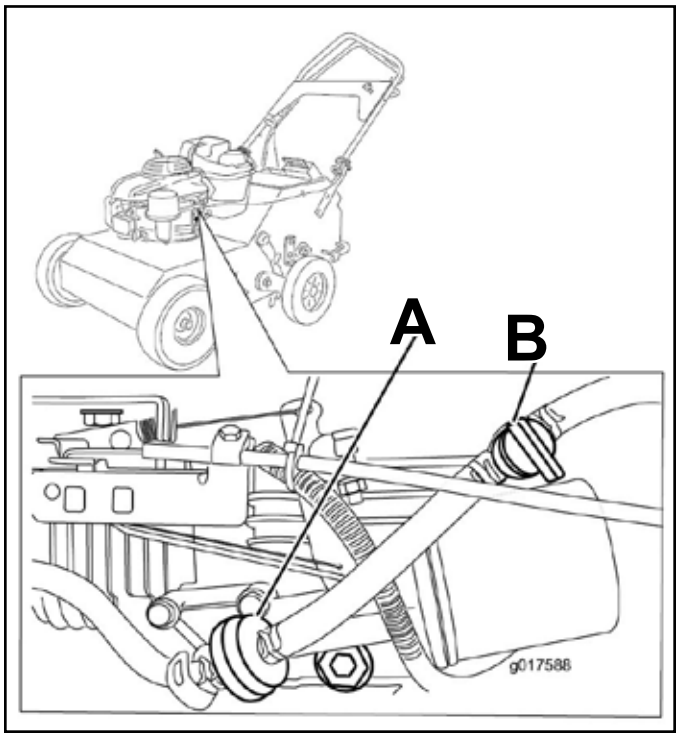

Fig. 026 fig. 29 G017588

A. Fuel filter B. Fuel valve

6. Remove the filter from the fuel lines.

7. Install a new filter and move the hose clamps close to the filter (Fig. 026).

8. Remove the clamps from the fuel lines.

9. Open the fuel shutoff valve.

Checking the Tire Pressure

Maintain the air pressure in the tires as specified. Check the tires when they are cold to get the most accurate reading (Fig. 027).

Pressure: 12-14 psi (83-97 kPa)

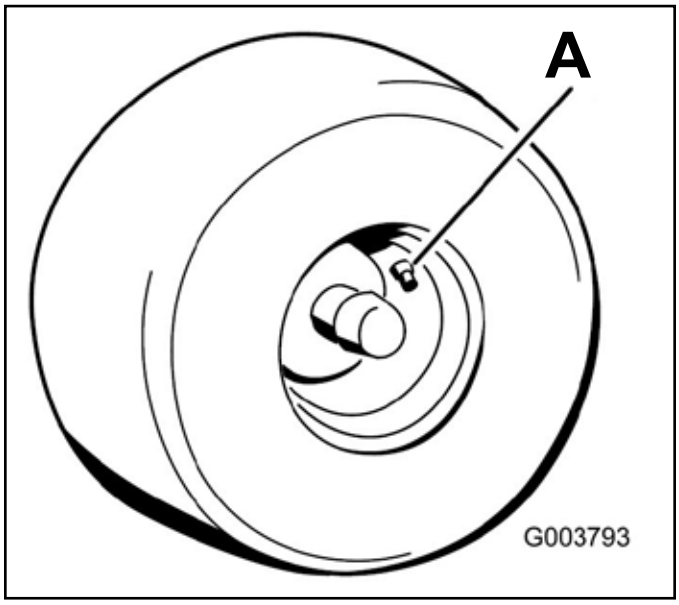

Fig. 027 fig. 30 G003793

A. Valve stem

Adjusting the Tension of Tine Drive Chains

1. Raise the tines, stop the machine, stop the engine, and disconnect the spark plug wire.

2. Raise the front of the machine to gain access to the chains and block it in place.

CAUTION

If you do not securely block up the front of the machine, the machine could fall on you during service, injuring you.

Ensure that you place a jack stand or block under the front of the machine to hold it up securely.

Important: Do not raise the rear of the machine. Raising the rear of the machine will cause the engine to flood and the air cleaner to be fouled with gasoline.

3. Pull down on each chain near the opening in the frame with 20 pounds (9kg) of force (Fig. 028). If a chain flexes more than 1/8” (3mm), tighten it as follows:

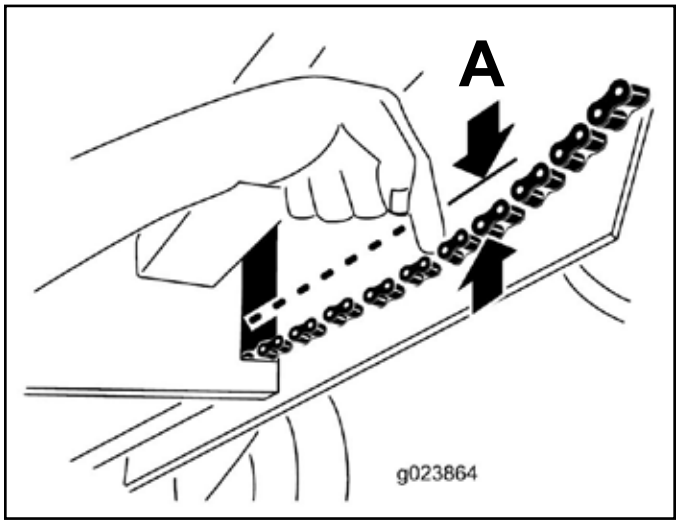

Fig. 028 fig. 31 G023864

A. Flex in the chain

A. Loosen the nut securing the idler sprocket of the chain you are tensioning (Fig. 029).

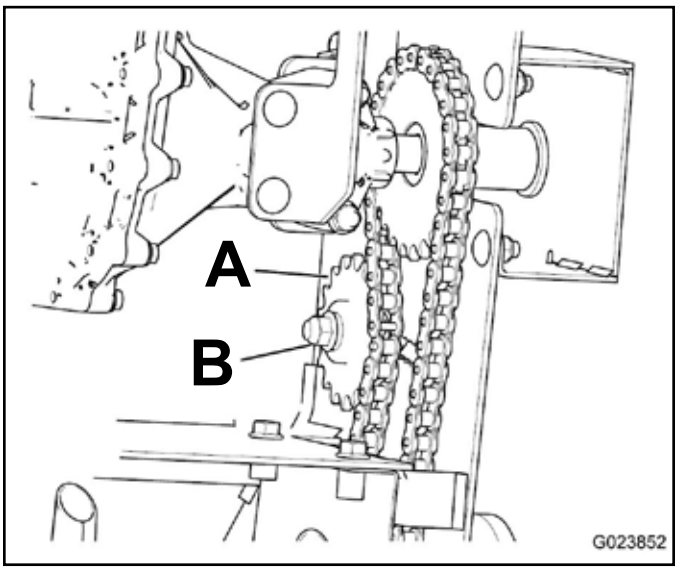

Fig. 029 fig. 32 G023852

A. Idler sprocket B. Nut

B. Pull down on the idler sprocket until the slack is taken out of the chain.

C. Tighten the idler sprocket nut and torque it to 30 ft-lbs. (40.6 Nm).

4. Repeat step 3 to test the chain tension and tighten it as needed.

5. Repeat this procedure for the other tine drive chain.

Checking the Hydrostatic Drive Belt

1. Raise the tines, stop the machine, stop the engine, and disconnect the spark plug wire.

2. Raise the front of the machine to gain access to the pump drive belt and block it in place.

CAUTION

If you do not securely block the up the front of the machine the machine could fall on you during service injuring you.

Ensure that you place a jack stand or block under the front of the machine to hold it up securely.

Important: Do not raise the rear of the machine. Raising the rear of the machine will cause the engine to flood and the air cleaner to be fouled with gasoline.

3. Push on a span of the drive belt with 20 pounds (9kg) of force (Fig. 030). If the belt flexes more than 1/8” (3mm), tighten it as follows:

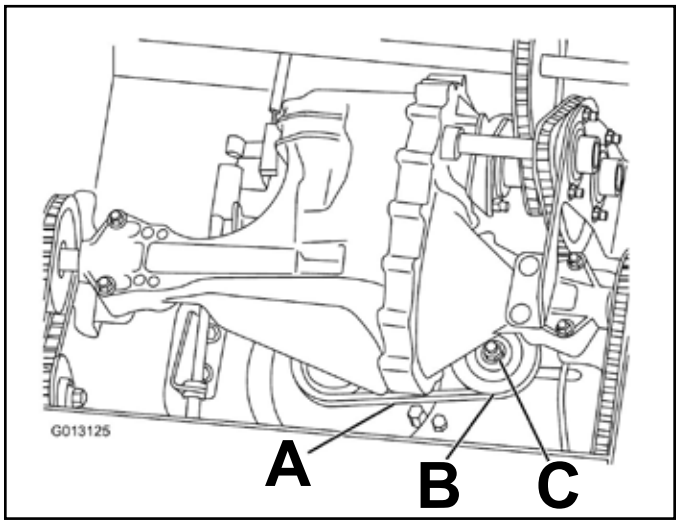

Fig. 030 fig. 33 G013125

A. Pump drive belt
B. Idler pulley
C. Idler pulley nut

A. Loosen the nut securing the idler pulley (Fig. 030).

B. Push the idler pulley to the left to tighten the belt.

C. Tighten the idler pulley nut and torque it to 30 ft-lbs. (40.6 Nm).

Adjusting the Machine Ground Speed 2012-13 models (Serial 312000001 & up, Serial 313000001 & up)

1. Loosen the 2 bolts securing the cable attachment bracket and slide it as far as possible to the left then tighten the 2 bolts (Fig. 031).

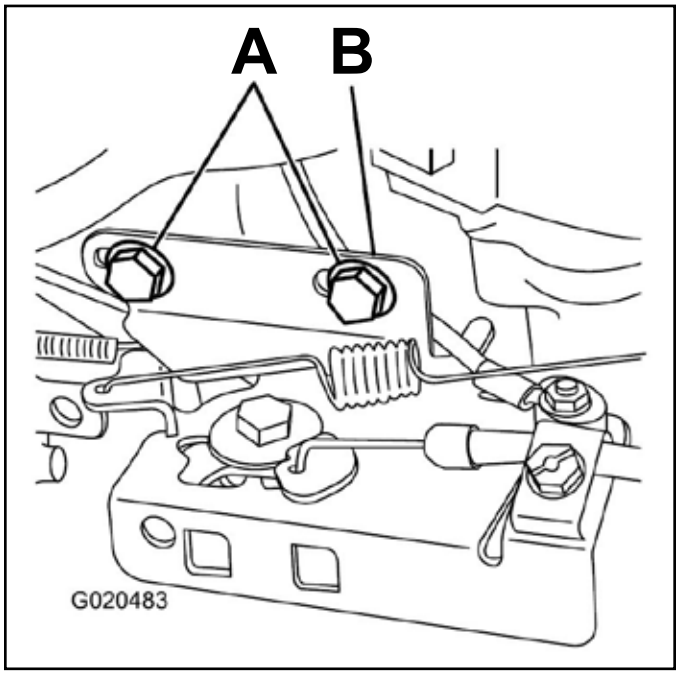

Fig. 031 fig. 29 G020483

A. Bolts
B. Cable attachment bracket

2. Adjust the traction drive cable at the lower anchor by moving the nut to the end of the thread and tightening the jam nut (Fig. 032).

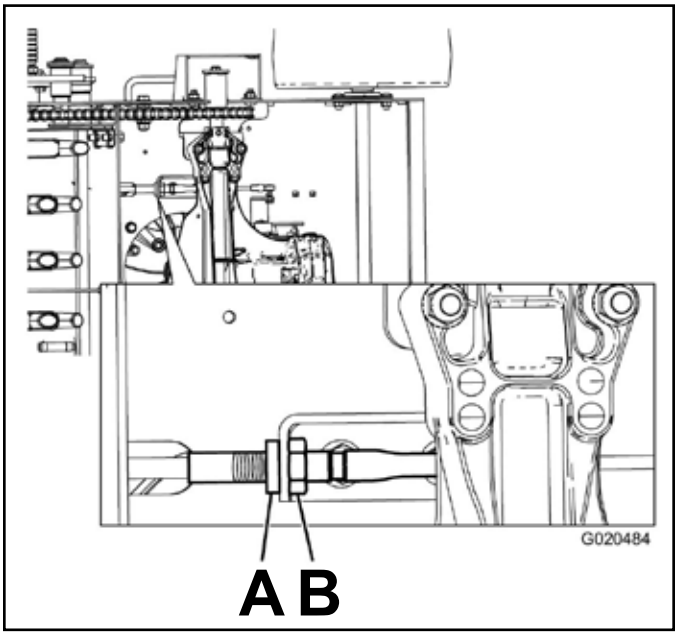

Fig. 032 fig. 30 G020484

A. Nut B. Jam nut

3. Adjust the traction drive cable at the handle as follows:

   - Loosen and remove the linkage adjustment from the bracket (Fig. 033).
   - Move the lower nut to the end of the thread (Fig. 033).

Note: Ensure that the bail will reach the handle after the transmission is engaged.

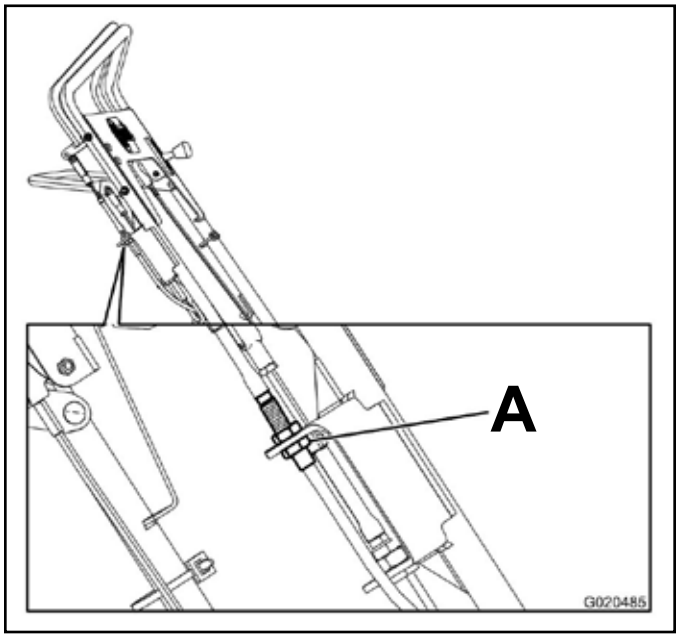

Fig. 033 fig. 31 G020485

A. Lower nut

4. Adjust the reverse speed stop as follows:

   - Loosen the 2 nuts on the reverse speed stop (Fig. 034).
   - Move the stop down to the midpoint or slightly past it and tighten the 2 nuts (Fig. 034).

Note: The reverse speed should be around 2.0 MPH (3.2km/h).

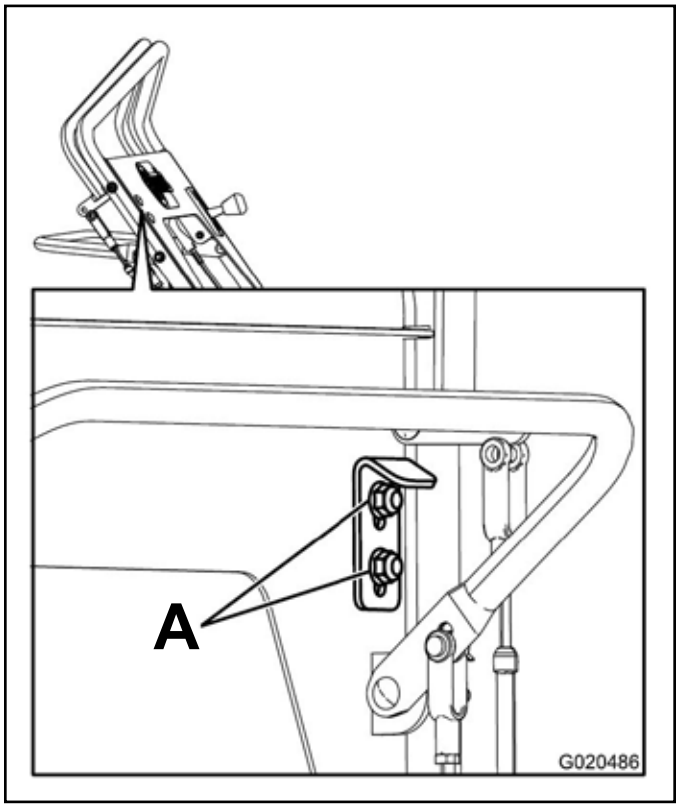

Fig. 034 fig. 32 G020486

A. Nuts

Adjusting the Self-Propel Drive 2014 models (Serial 314000001 & up)

1. Raise the tines, stop the machine, stop the engine, and disconnect the spark plug wire.

2. Squeeze the self-propel bail to the handle until the transmission is fully stroked. If the bail contacts the handle, release the bail. Loosen the top adjustment nut one turn and tighten the bottom adjustment nut. Squeeze the bail to the handle. Repeat this step until there is a gap (up to 1/8” (3mm)) between the self-propel bail and the handle (Fig. 035).

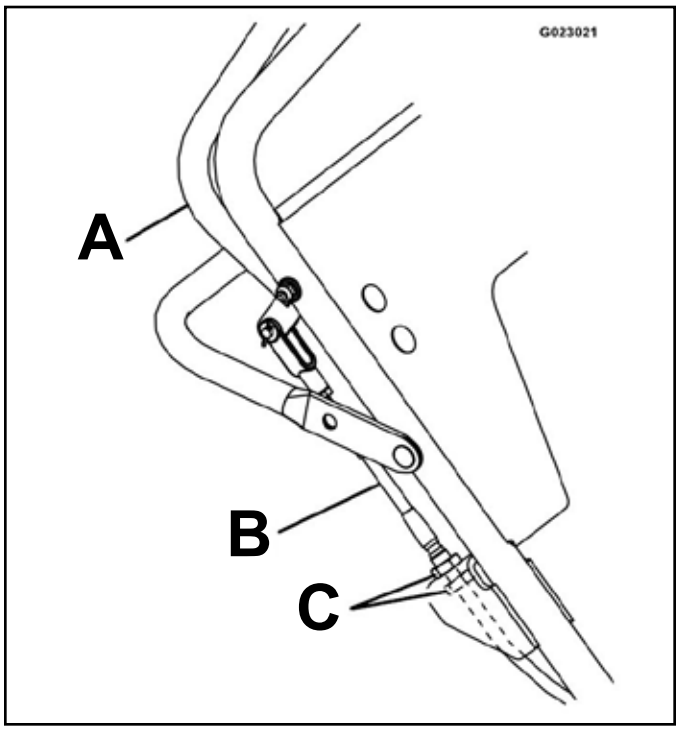

Fig. 035 fig. 34 G023021

A. Self-propel drive bail
B. Cable
C. Top/Bottom adjustment nuts

Changing the Hydraulic Transmission Fluid

See “Changing Transmission Oil” on page 4-5.

Checking/Replacing Tines

1. Raise the tines, stop the machine, stop the engine, and disconnect the spark plug wire.
2. Remove the rear access panel.
3. Manually rotate the tines on the shaft, inspecting them for wear or damage.
4. If any are damaged or broken, remove the nut and bolt securing the tine to the tine assembly (Fig. 036).

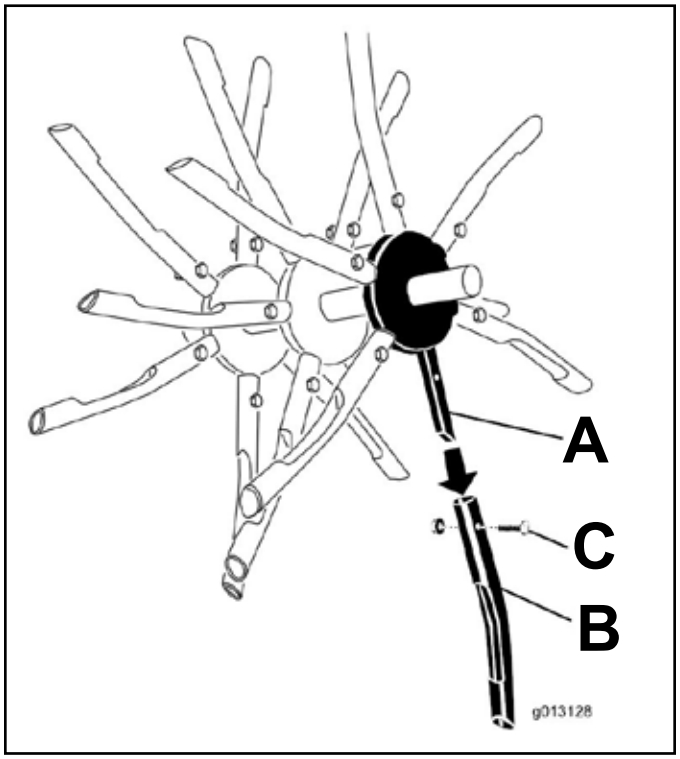

Fig. 036 fig. 36 G013128

A. Tine assembly
B. Tine
C. Bolt and nut

5. Remove the tine and replace it with a new one. Ensure that the new tine is facing the same direction as the other tines on the assembly.
6. Secure the new tine with the bolt and nut you removed previously and torque them to 30 ft-lbs. (40.6 Nm).
7. When all tines have been inspected and replaced as needed, lower the machine to the ground and engage the hydrostatic drive.

Troubleshooting

Problem	Possible Cause	Corrective Action
Engine will not start.	1. The throttle lever is in the Off position. 2. The spark plug is disconnected. 3. The fuel is turned off. 4. The traction lever is not in neutral.	1. Move the throttle lever to the Choke position. 2. Connect the spark plug. 3. Open the fuel valve. 4. Release the traction lever so it returns to neutral.
The machine vibrates abnormally.	1. Loose bolts and/or broken parts.	1. Stop the machine and engine immediately. Replace any broken or missing parts.
The machine will not pull itself up hills.	1. The drive belt to the hydrostatic pump is loose.	1. Check and tighten the pump drive belt.
The front wheels move but the tines do not.	1. A chain or drive sprocket is broken.	1. Replace the broken chain or sprocket.
The engine smokes when starting.	1. The engine was tipped forward.	1. Check the air cleaner and replace it if it is fouled. Always tip the machine back when servicing.
The engine is hard to start after transporting it.	1. The fuel valve was not closed before transport and the engine is flooded.	1. Always close the fuel valve before transporting the machine.
The ground speed is slow.	1. The drive or pump belt is worn, loose, or broken. 2. The engine idle is not set properly. 3. The chains are not properly tensioned.	1. Check and tighten the pump drive belt, or change the belt. 2. Contact an Authorized Service Dealer. 3. Adjust the tine drive chain.
The tines drop out of transport when the handle is folded over.	1. Tine-control lever is out of adjustment.	1. Adjust the tine-control lever.

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Handle Subsystem – 2012 (Serial 312000001 & up), 2013 (Serial 313000001 & up)

(Fig. 037)

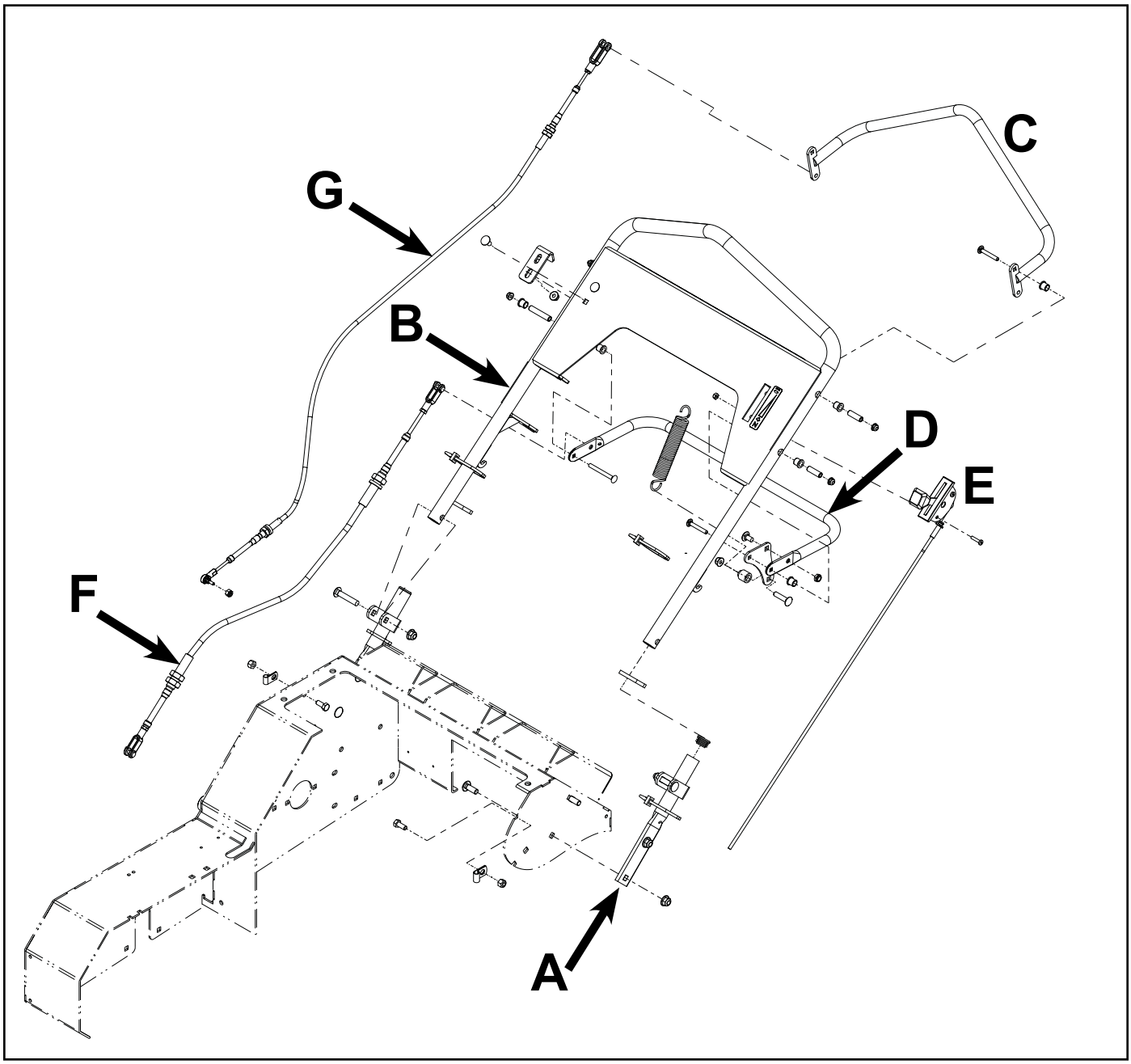

Fig. 037 subsystem handles 2012

A. Mount - Handle
B. Handle - Assembly
C. Tube - Control
D. Tube - Lift, Handle
E. Control - Throttle
F. Cable - Lift, Lower
G. Cable - Drive

Handle Subsystem – 2014 (Serial 314000001 & up)

(Fig. 038)

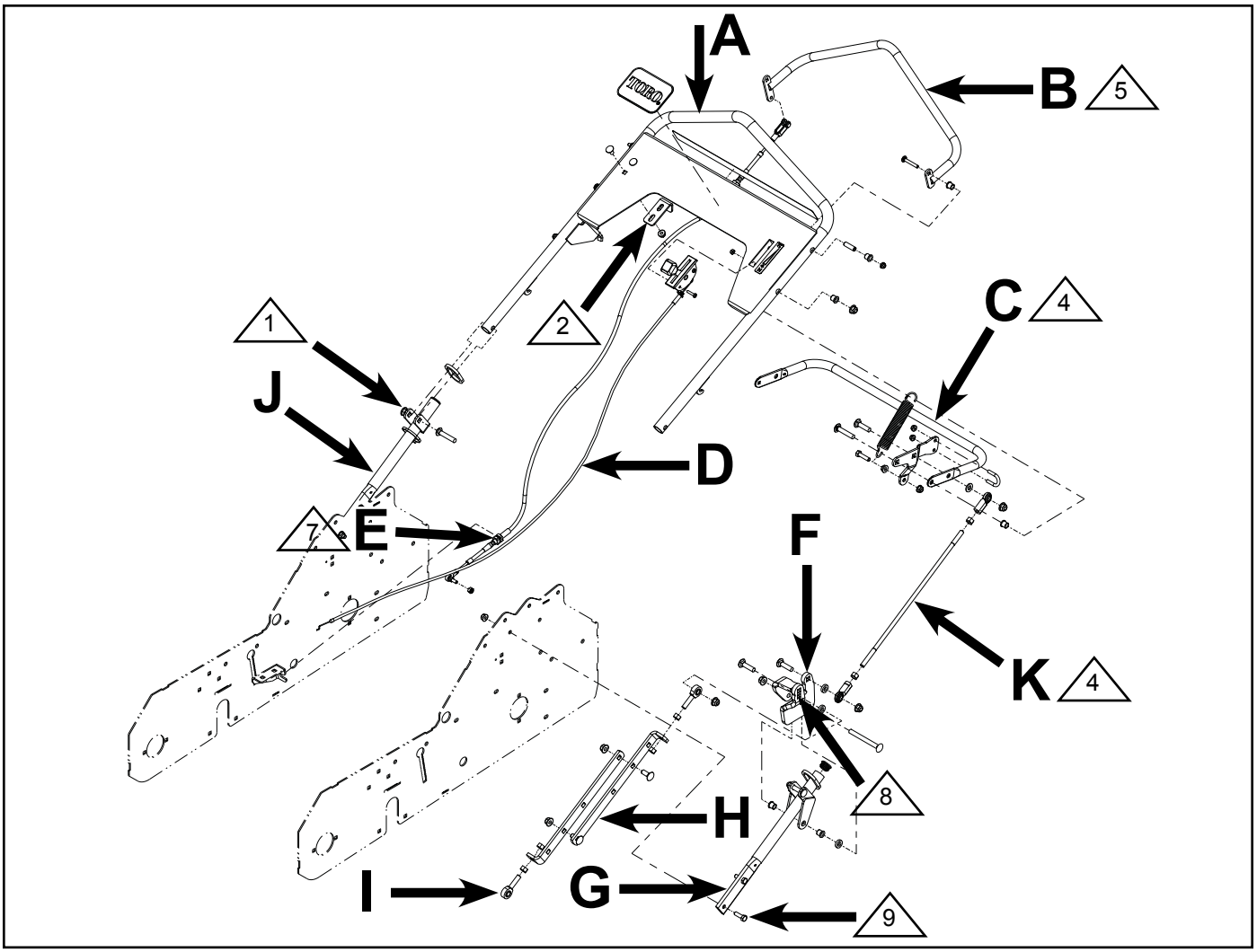

Fig. 038 subsystem handles 1

A. Handle
B. Tube - Control
C. Tube - Handle, Lift
D. Control - Throttle
E. Cable - Drive
F. Bracket - Trunion
G. Lower Handle Asm
H. Link - Lift
I. Ball Joint
J. Handle - Lower
K. Rod - Upper Link

1 Do not overtighten leave 1 or 2 threads showing. Handle must still be able to pivot.

2 Push angle stop down as far as possible.

4 With the handle folded, adjust linkage (K) by hand until the ball join on the tine ground engagement lever is tight against the handle.

5 Adjust cable so when drive handle (B) is at full speed, there is .03-.10” gap between drive handle #2 and handle #1

7 3-4 threads exposed on the front side of the front nut.

8 Assemble linkage into bottom hole.

9 Assemble handle into middle position on frame.

Engine Frame Subsystem – 2012 (Serial 312000001 & up), 2013 (Serial 313000001 & up)

(Fig. 039)

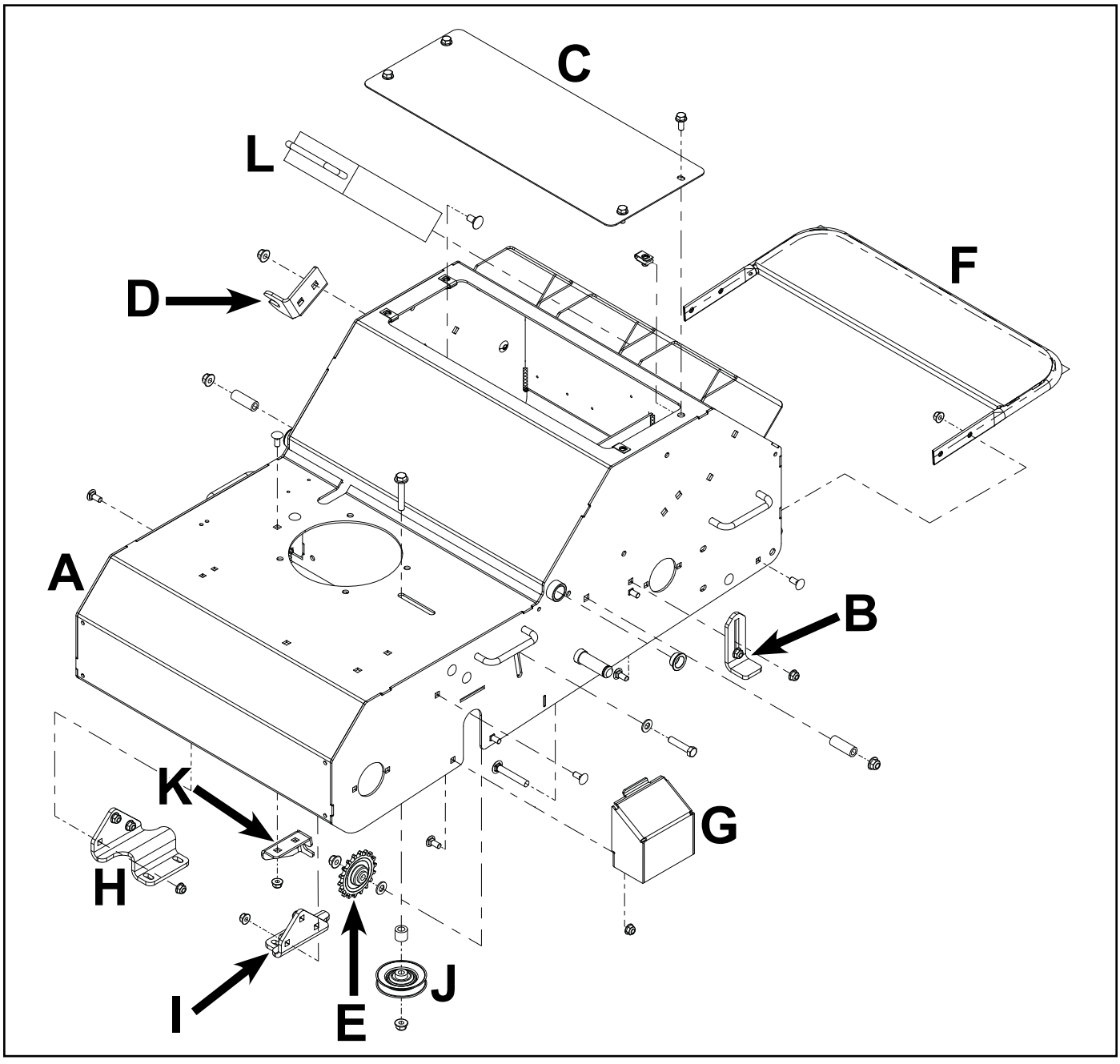

Fig. 039 subsys eng frame 2012

A. Frame - aerator 21”
B. Stop-depth
C. Cover - assembly
D. Brackt-mount, cable
E. Sprocket - idler
F. Guard
G. Cover - transaxle
H. Bracket - mount axle, RH
I. Brocket - mount axle, LH
J. Pulley
K. Bracket - mounting, cable
L. weight - aerator

Engine Frame Subsystem – 2014 (Serial 314000001 & up)

(Fig. 040)

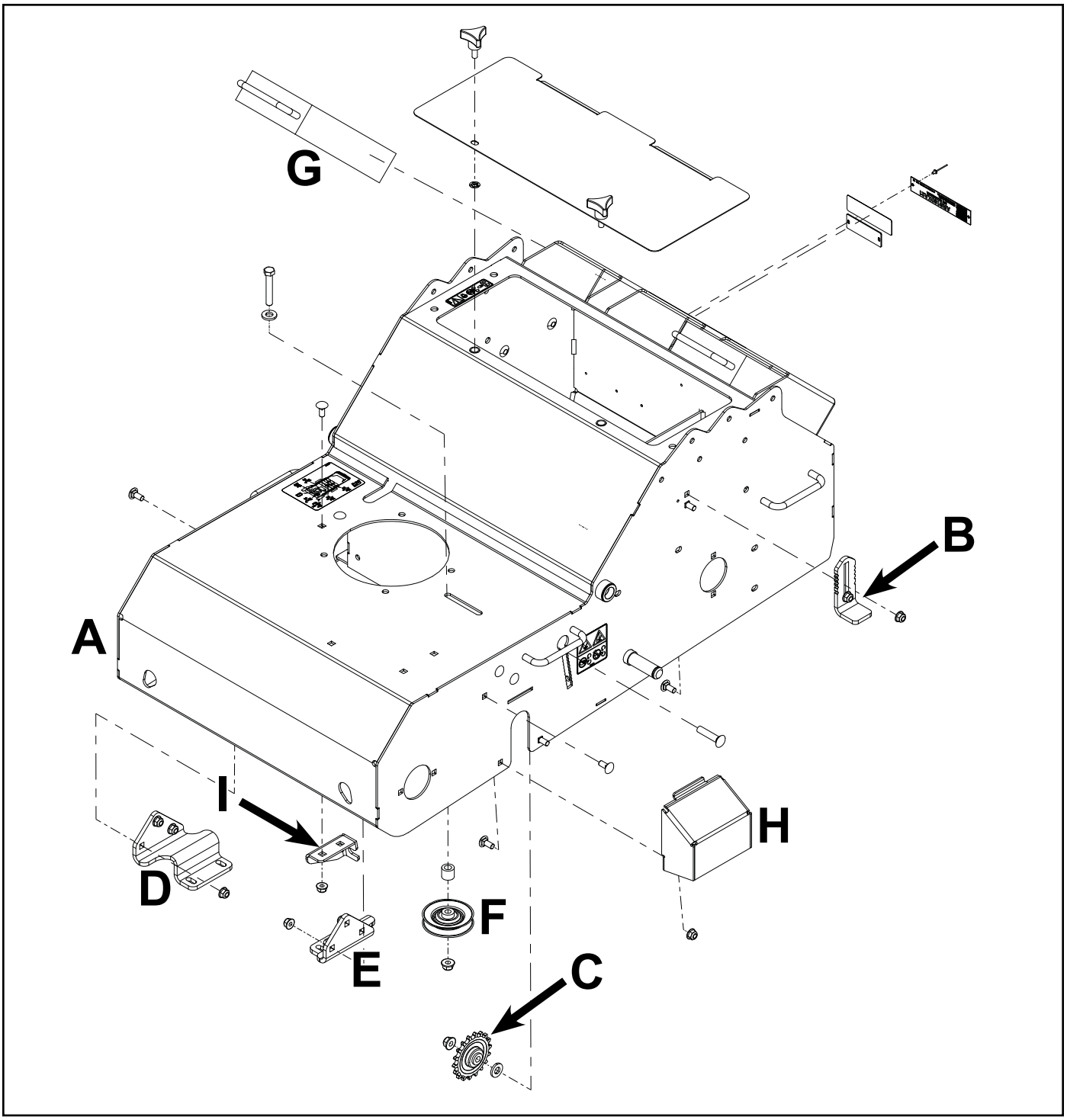

Fig. 040 subsys eng frame 2014

A. Frame - service
B. Stop - depth
C. Sprocket - idler
D. Bracket - mount axle, RH
E. Bracket - mount axle, LH
F. Pulley
G. Weight - areator
H. Cover, transaxle
I. Bracket - mounting cable

Height Linkage

Subsystem – Height Linkage - 2012 (Serial 312000001 & up), 2013 (Serial 313000001 & up)

(Fig. 041)

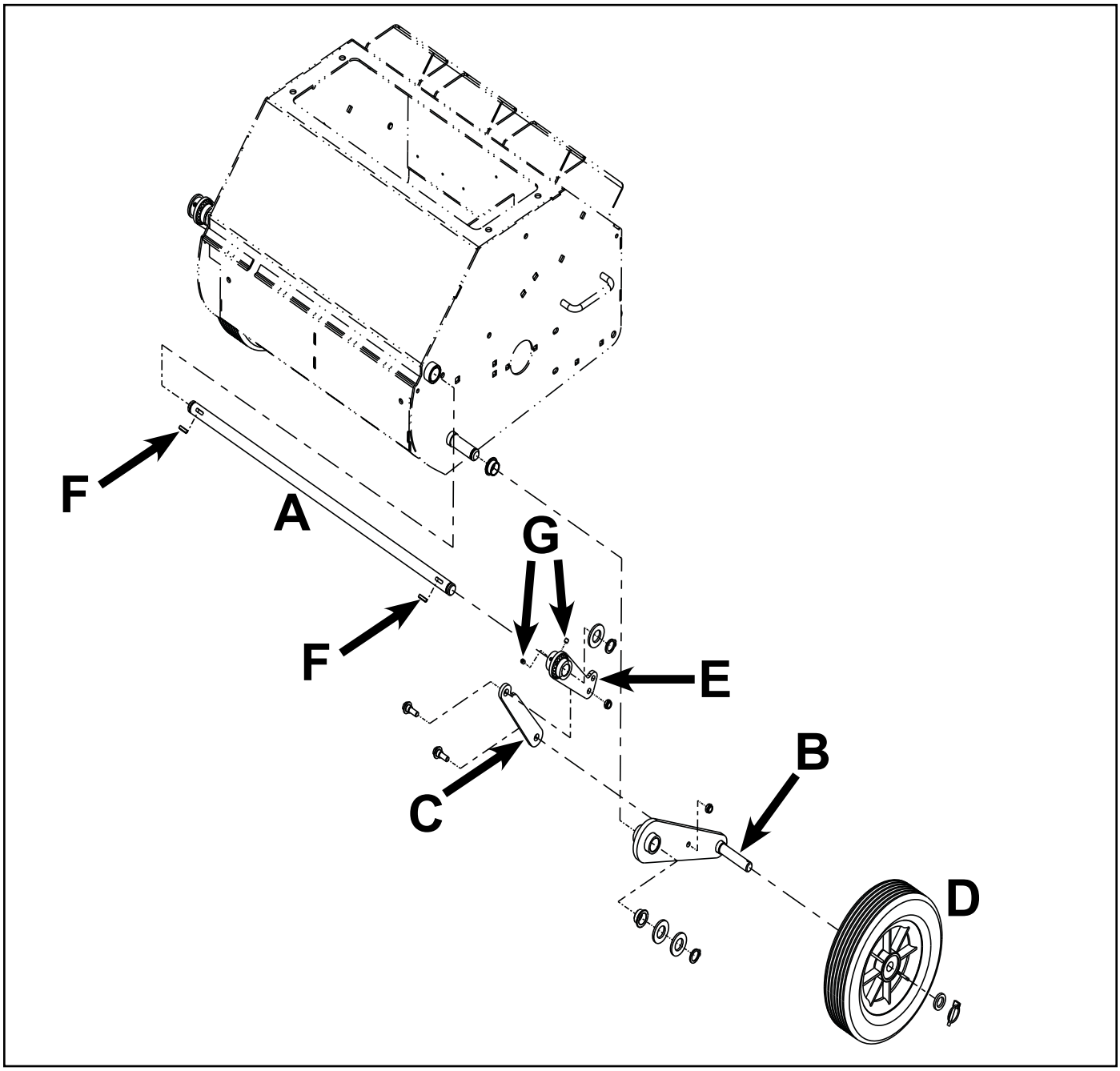

Fig. 041 subsys ht linkage 2012a

A. Shaft - pivot
B. Arm - wheel
C. Link - connecting
D. Wheel - transport
E. Arm - lift
F. Key - woodruff
G. Screw - set

Subsystem – Height Linkage - 2014 (Serial 314000001 & up)

(Fig. 042)

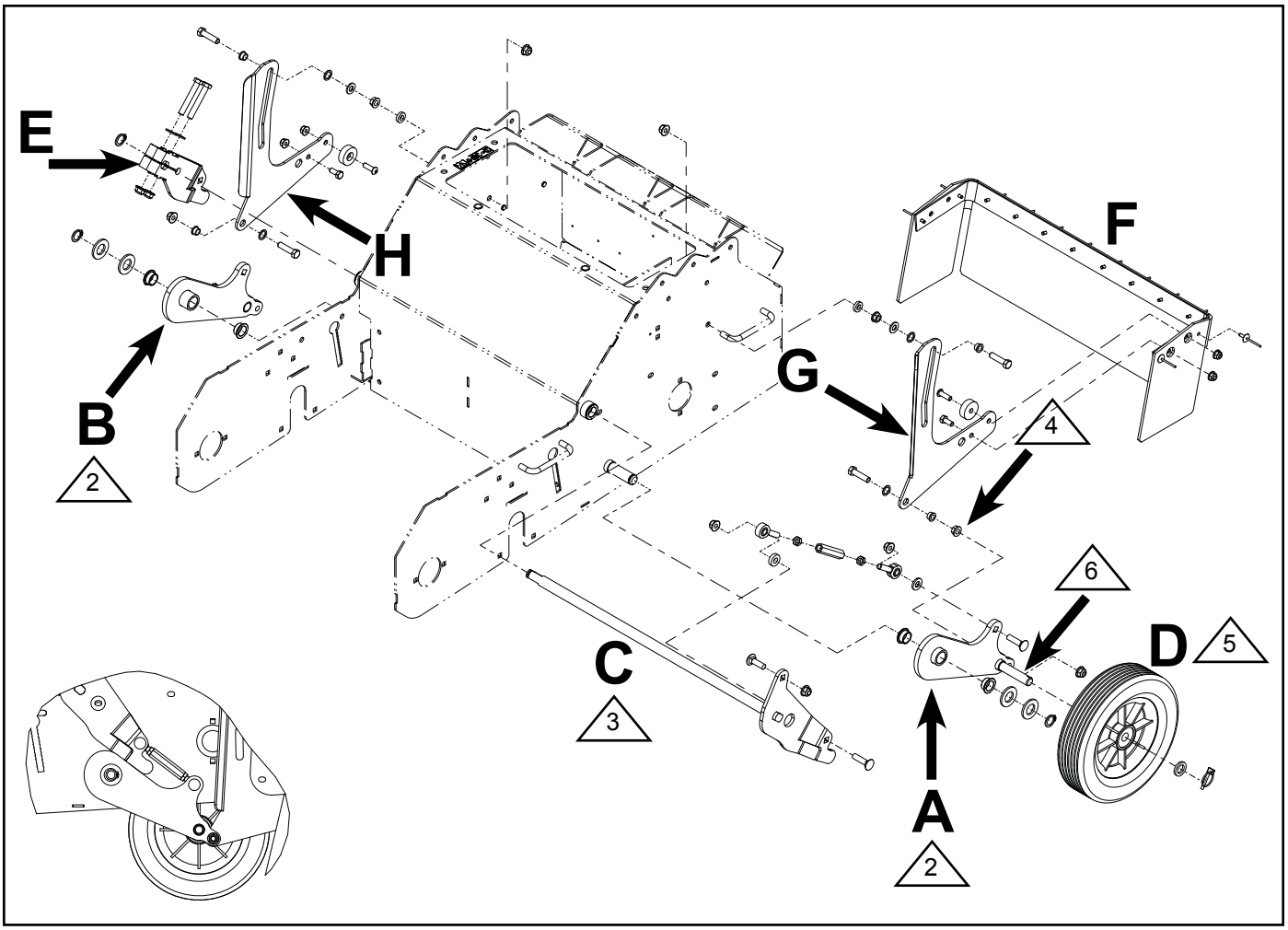

Fig. 042 subsys ht linkage_a

A. Wheel - arm asm, LH
B. Wheel - arm asm, RH
C. Shaft - pivot
D. Wheel - transport
E. Arm - lift RH
F. Foot guard
G. Arm - guard, LH
H. Arm - guard, RH

2 Wheel pivot arms must rotate freely on frame pivot pins (2x).

3 Pivot shaft assembly must rotate freely in frame bushings.

4 Tighten nut to a good finger tight snug fit against nylon bushing and washer. Assemble so flange side of nut goes away from bolt head.

5 Assembly wheel so the tire does not touch the wheel arem and turns freely (2x).

6 Apply anti-sieze to this area prior to assembly (2x).

Drive Cable Removal & Installation

1. Remove the cotter key and pin from the drive handle. Loosen the lock nuts on the handle and remove cable (Fig. 043).

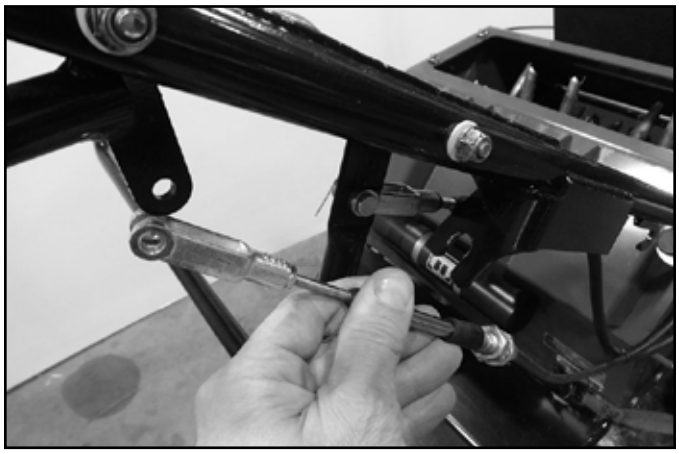

Fig. 043 drive cable 1

2. From under the machine, loosen the cable lock nuts and remove the linkage that connects the cable to the transmission. Remove the cable (Fig. 044).

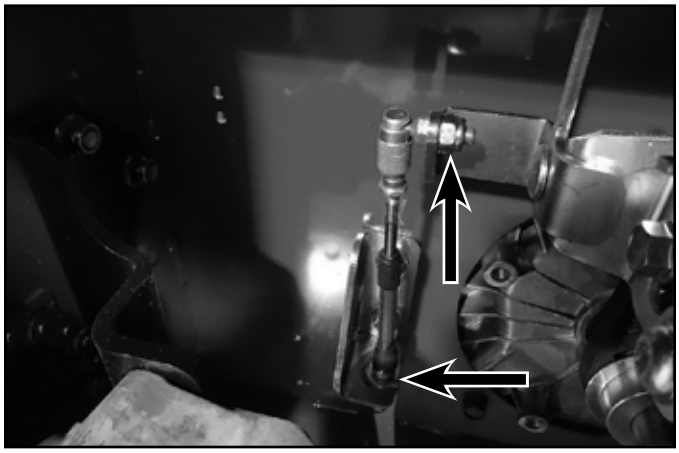

Fig. 044 drive cable 2

3. Install new cable. Install the linkage to the transmission and install all of the lock nuts and tighten. Adjust the cable as follows:

4. Adjust the traction drive cable at the lower anchor by moving the nut to the end of the thread and tightening the jam nut (Fig. 045).

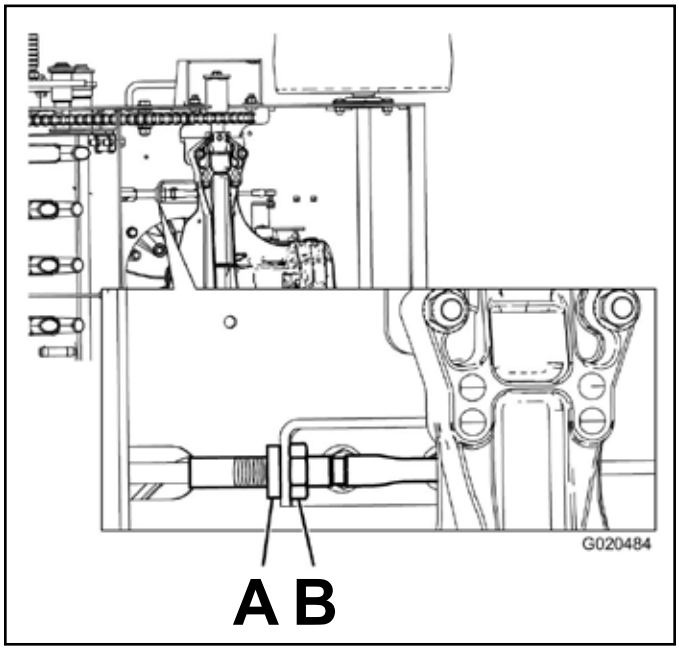

Fig. 045 fig. 30 G020484

A. Nut B. Jam nut

5. Adjust the traction drive cable at the handle as follows:
   - Loosen and remove the linkage adjustment from the bracket (Fig. 046).
   - Move the lower nut to the end of the thread (Fig. 046).

Note: Ensure that the bail will reach the handle after the transmission is engaged.

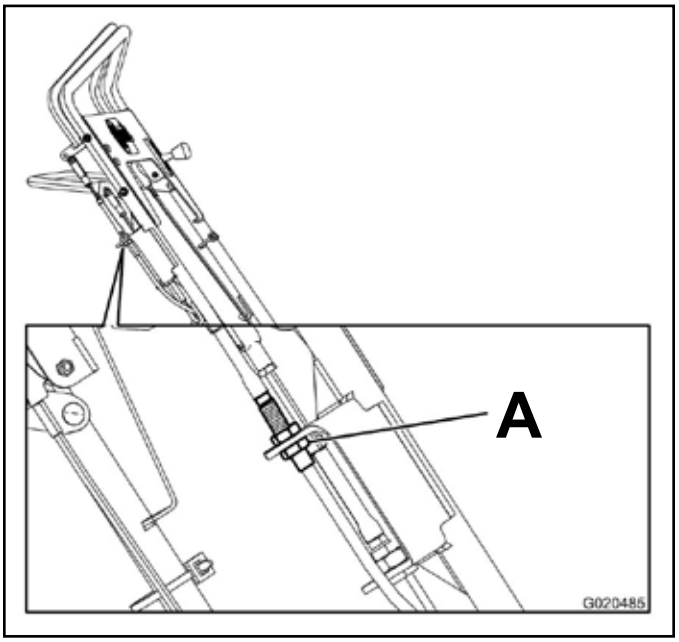

Fig. 046 fig. 31 G020485

A. Lower nut

6. Adjust the reverse speed stop as follows:
   - Loosen the 2 nuts on the reverse speed stop (Fig. 047).
   - Move the stop down to the midpoint or slightly past it and tighten the 2 nuts (Fig. 047).

Note: The reverse speed should be around 2.0 MPH (3.2km/h).

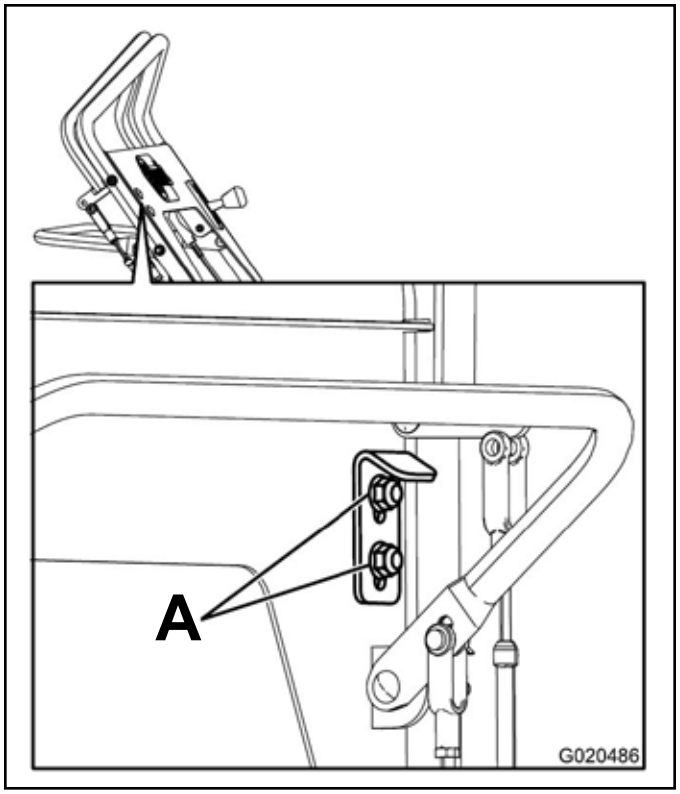

Fig. 047 fig. 32 G020486

A. Nuts

Tine Control Cable Removal & Installation - Serial 312000001 & up, Serial 313000001 & up

1. Remove the cotter key and pin from tine control handle. Loosen the lock nuts that connects the cable to the handlebar and remove cable (Fig. 048).

Fig. 048 lift lower cable 1a

2. Remove the cotter key and pin from the tine control bracket. Loosen the lock nuts that connects the cable to the stationary bracket. Remove cable (Fig. 049).

Fig. 049 lift lower cable 2

3. Install new cable. Insert all pins and cotter keys, and finger tighten lock nuts into brackets.

4. Adjust the jam nut on the tine control bracket yoke so that no threads are showing then adjust the yoke as far onto the rod as possible. Tighten the jam nut against the yoke (Fig. 050).

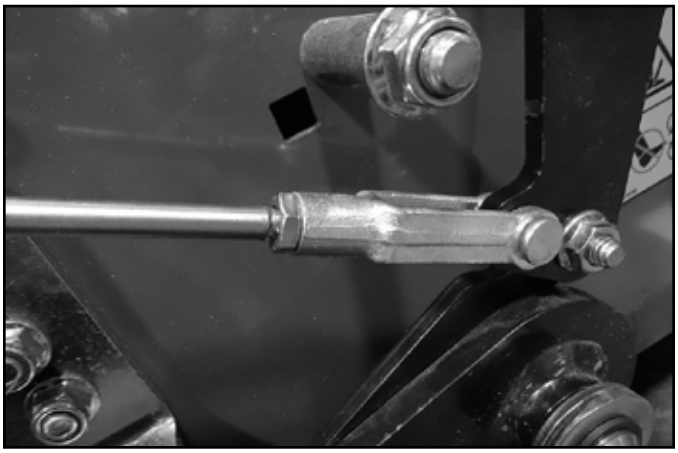

Fig. 050 jam nut 1

5. Adjust the lower nut that connects the cable to the stationary bracket all the way to the end so that one thread is showing at most. Tighten the internal nut to secure the cable to the bracket (Fig. 051).

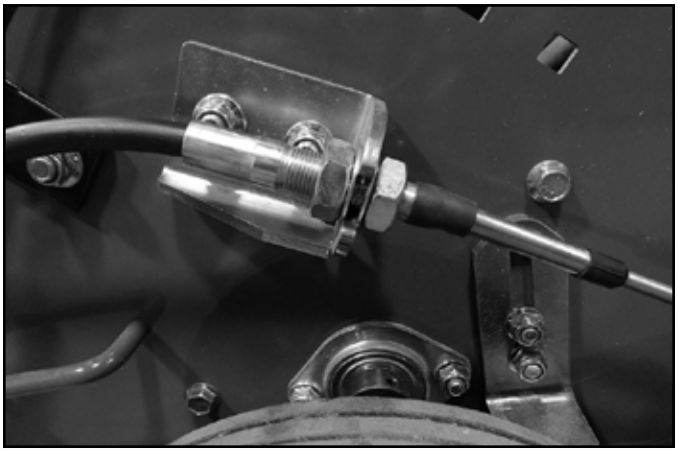

Fig. 051 jam nut 2

6. Adjust the jam nut on the handle bracket yoke so no threads are showing, then adjust the yoke as far onto the rod as possible and tighten the jam nut against the yoke (Fig. 052).

Fig. 052 upper jam nut 1a

7. Adjust the cable housing jam nuts so there are an equal number of threads on each side. Tighten the jam nuts (Fig. 053).

Fig. 053 upper jam nuts 2a

Adjusting Handle - Serial 314000001 & up

The height of the handle can be adjusted for comfortable operation. Stand behind the handle to determine the appropriate height settings.

1. To adjust the handle height, position the hardware into one of three sets of holes on each side of the mainframe as shown in Fig. 054, Fig. 055, and Fig. 056.

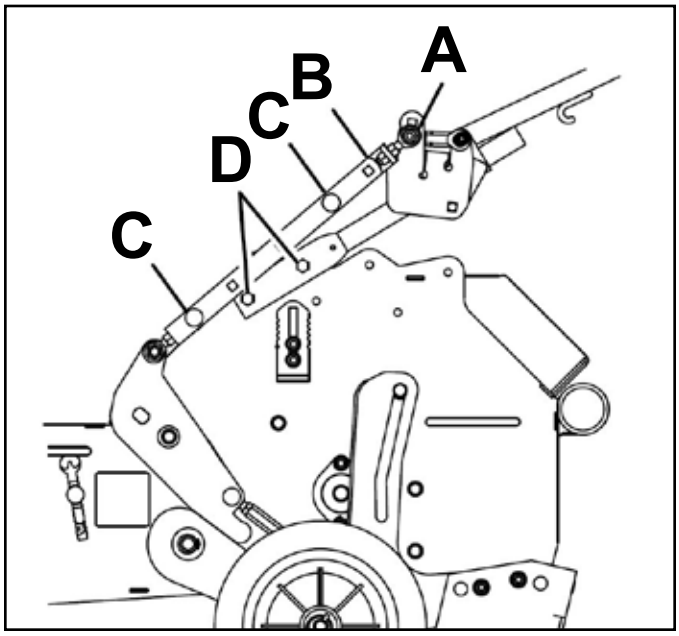

Fig. 054 fig. 7 G023023

Front handle position - Lowest height

A. Trunion bracket - bottom hole
B. Lift link straps
C. Mounting bolt location
D. Handle hardware - front holes

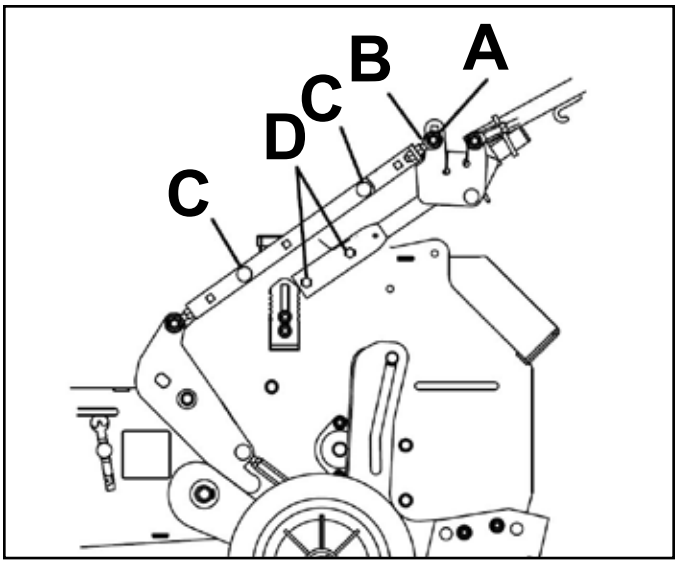

Fig. 055 fig. 8 G023052

Middle handle position

A. Trunion bracket - bottom hole
B. Lift link straps
C. Mounting bolt location
D. Handle hardware - middle holes

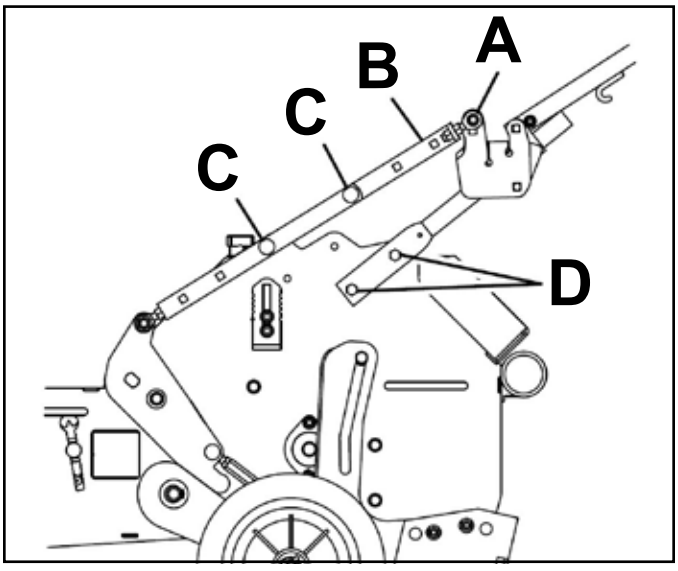

Fig. 056 fig. 9 G023063

Rear handle position - Highest height

A. Trunion bracket - top hole
B. Lift link straps
C. Mounting bolt location
D. Handle hardware - rear holes

2. Secure the handle with both mounting bolts.

3. Adjust the tine-control lever.

Adjusting the Tine Control Lever - Serial 314000001 & up

1. Stop engine, wait for all moving parts to stop.
2. Disconnect the wire from the spark plug.
3. Raise the tines to the transport position.
4. The wheel arm and the pivot shaft assembly should have surface-to-surface contact. If not, check the distance of the lower lift linkage and adjust if necessary (Fig. 057).

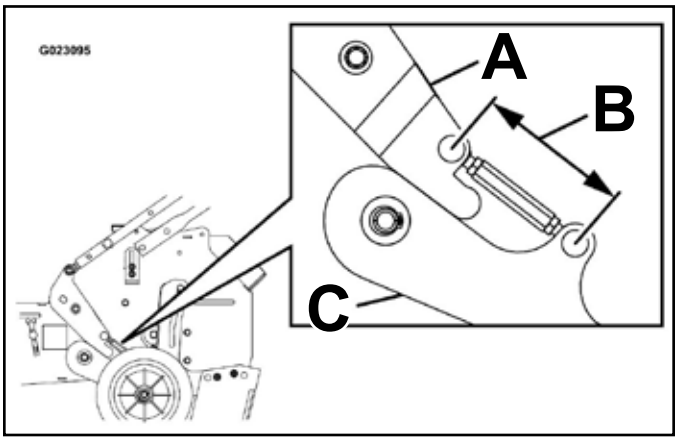

Fig. 057 fig. 18 G023095

A. Pivot shaft assembly
B. 4.8” (12cm)
C. Wheel arm assembly

5. The lower ball joint bolt, on the upper link rod, should be offset 1/4” (6mm) from the handle pivot bolt. If not, loosen the lock nuts on the lift link strap ball joints, adjust as necessary, and retighten locknuts (Fig. 058).

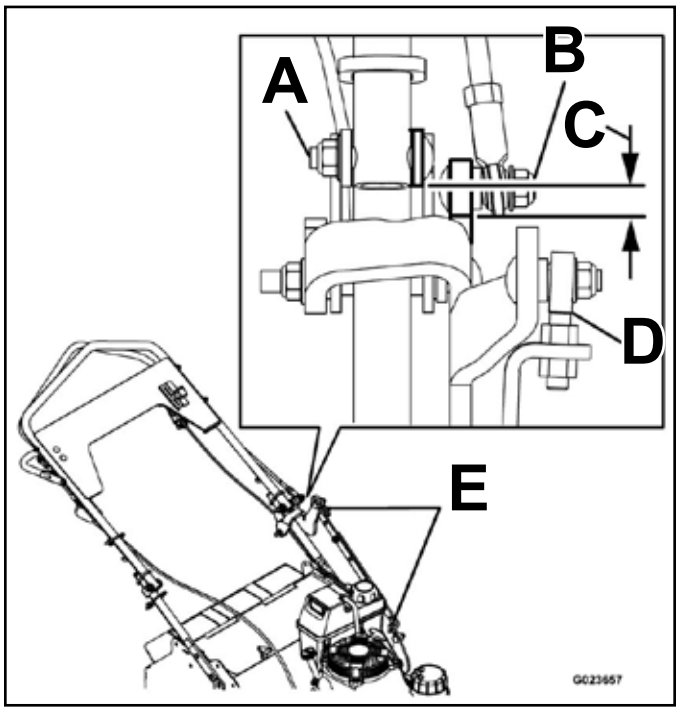

Fig. 058 fig. 19 G023657

A. Handle pivot bolt
B. Lower ball joint bolt
C. 1/4” (6mm)
D. Lift link strap ball joint
E. Adjust here

6. Slide the oval locking rings upward on the handle and fold the handle towards the engine.

7. The ball joint on the tine-control lever should contact the handle firmly (Fig. 059); if not, proceed to step 8.

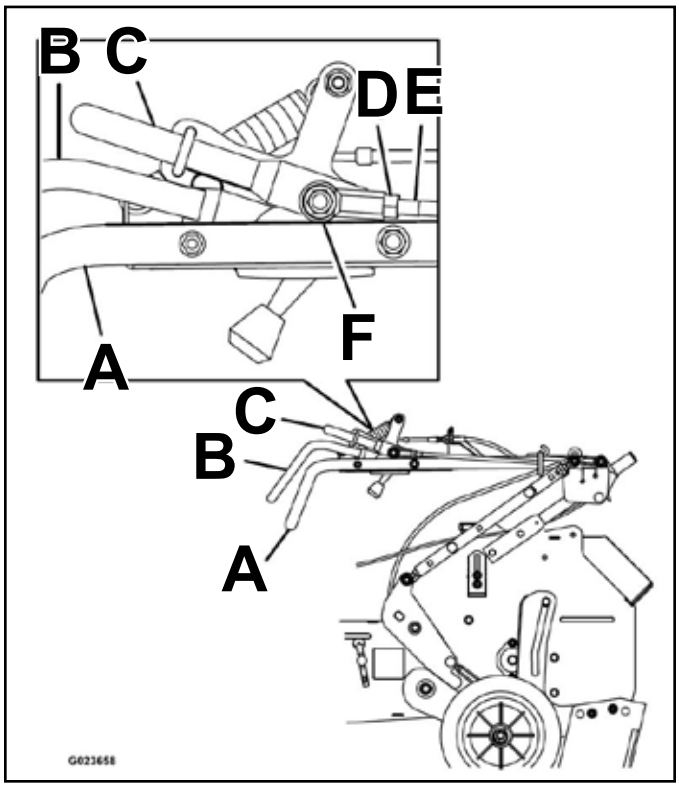

Fig. 059 fig. 20 G023658

A. Handle
B. Self-propel drive bail
C. Tine control lever
D. Jam nut
E. Link rod
F. Ball joint contacts handle

8. Loosen both jam nuts, on both ends of the link rod, next to the ball joints (Fig. 059).

9. Turn the link rod, by hand, until the ball joint on the tine-control lever is tight against the handle (Fig. 059).

10. Tighten both jam nuts on the link rod next to the ball joints.

Replacing Pivot Shaft - Serial 312000001 & up, Serial 313000001 & up

1. Lower the tines to the ground to take pressure of the lift system.

2. Remove the tine control cable from the tine control bracket (Fig. 060).

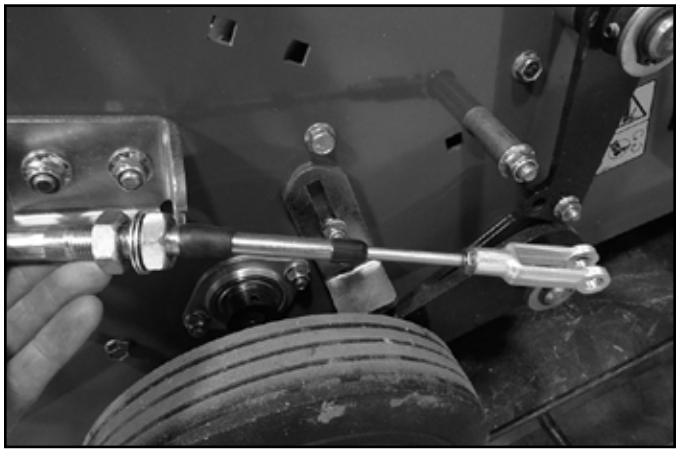

Fig. 060 lift lower cable 2

3. Remove the snap ring and washers from the wheel arm (Fig. 061).

Fig. 061 snap ring & washers_a

4. Remove the snap ring and washer from the lift arm (Fig. 062).

Fig. 062 lift arm snap ring_a

5. Loosen the set screws on the lift arm.

Note: There are two set screws (Fig. 063).

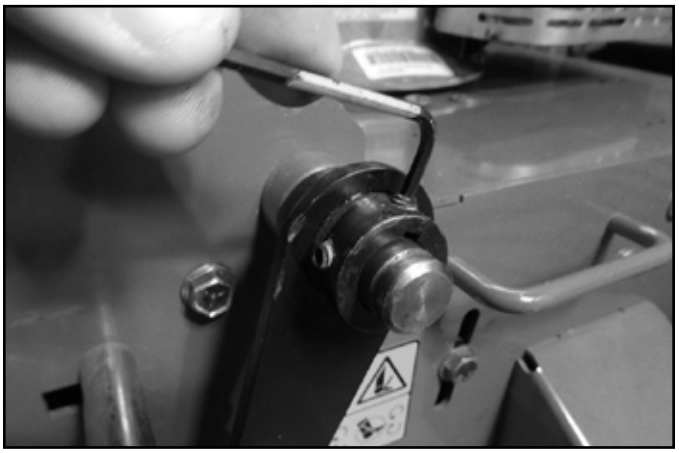

Fig. 063 set screws 1

6. Slide the wheel arm and lift arm off of the shaft (Fig. 064).

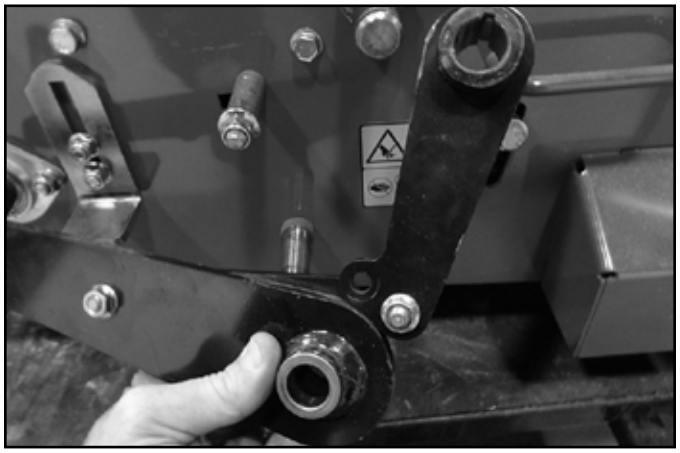

Fig. 064 arm removal

7. On the opposite side, remove the snap rings and washers from the wheel arm and lift arm (Fig. 065).

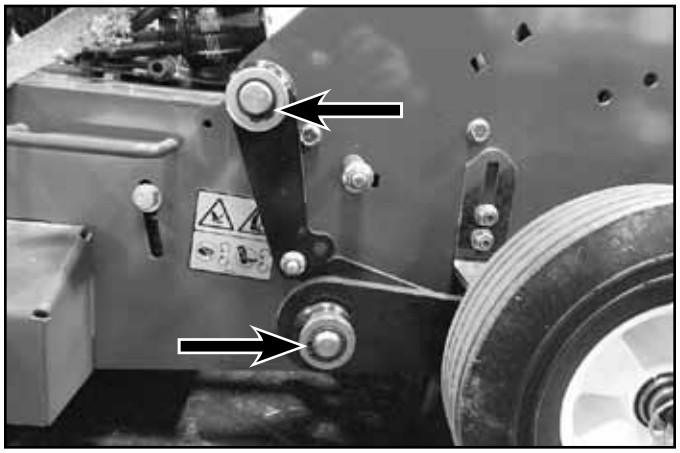

Fig. 065 wheel & lift arm_a

8. Slide the pivot shaft out of the chassis by pulling on the wheel and lift arm assembly (Fig. 066).

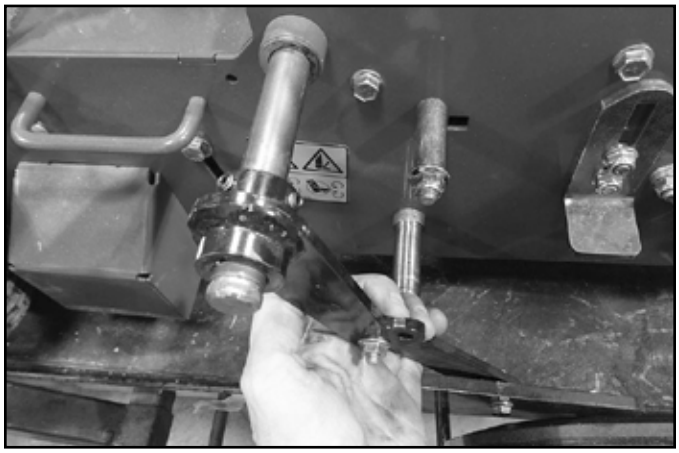

Fig. 066 remove pivot shaft_a

9. Once the pivot shaft is out, loosen the set screws on the lift arm and remove the wheel and lift arm assembly from the shaft. Replace the shaft with new, inserting it into the wheel and lift arm assembly (Fig. 067).

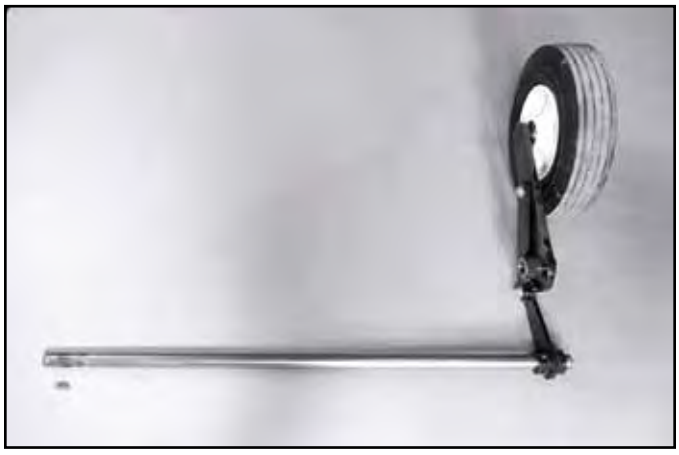

Fig. 067 new shaft_a

10. Insert the shaft and wheel and lift arm assembly into the chassis (Fig. 068).

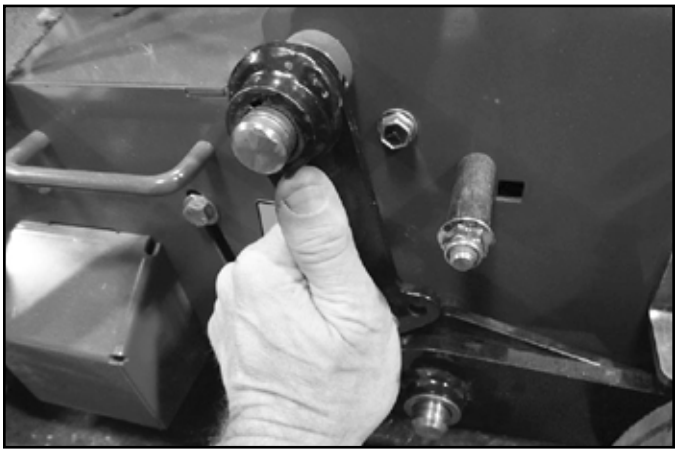

Fig. 068 insert new shaft_a

11. Guide the pivot shaft through the hole on the opposite side (Fig. 069).

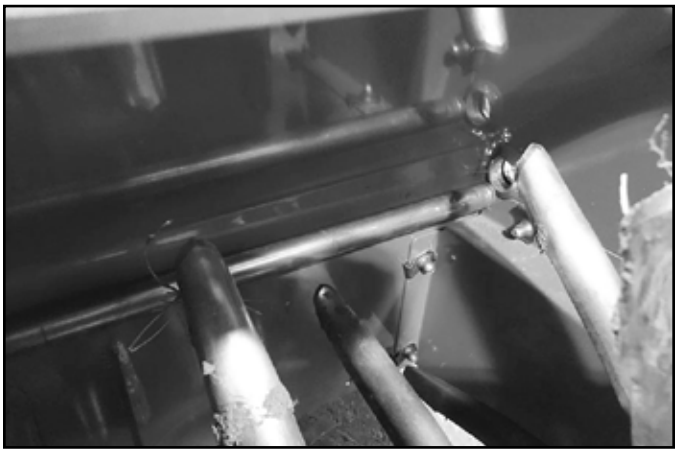

Fig. 069 pivot shaft hole_a

12. Once the shaft is through the chassis, re-install the wheel and lift arm assembly. Apply Loctite® 242 to the threads of the set screws and tighten them to 12-14 ft-lbs. (16-19 Nm).

13. Install all snap rings and washers (Fig. 070).

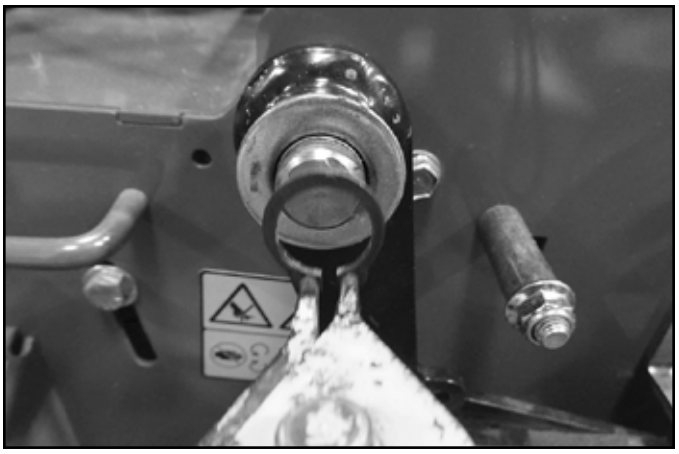

Fig. 070 install snap rings_a

Replacing Pivot Shaft - Serial 314000001 & up

1. Lower the tines to the ground to take pressure off the lift system.

2. Remove the two bolts from the right hand lift arm (Fig. 071).

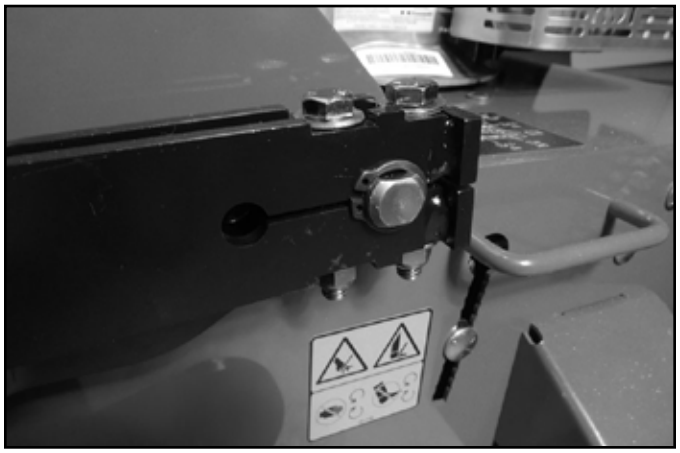

Fig. 071 RH lift arm

3. Remove the snap ring from the pivot shaft (Fig. 072).

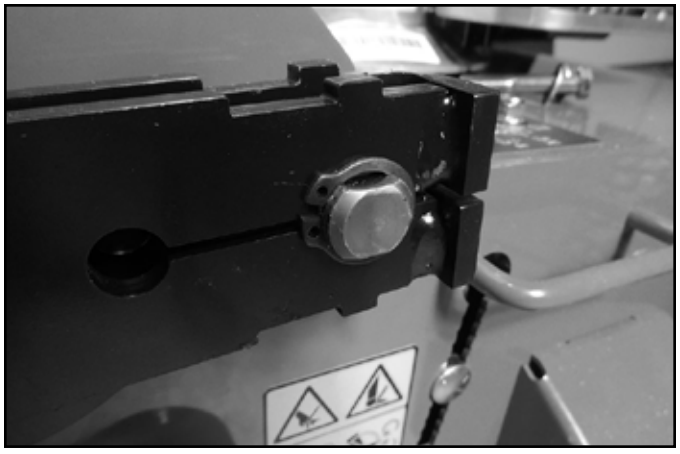

Fig. 072 PS snap ring

4. Disengage the right hand lift arm (Fig. 073).

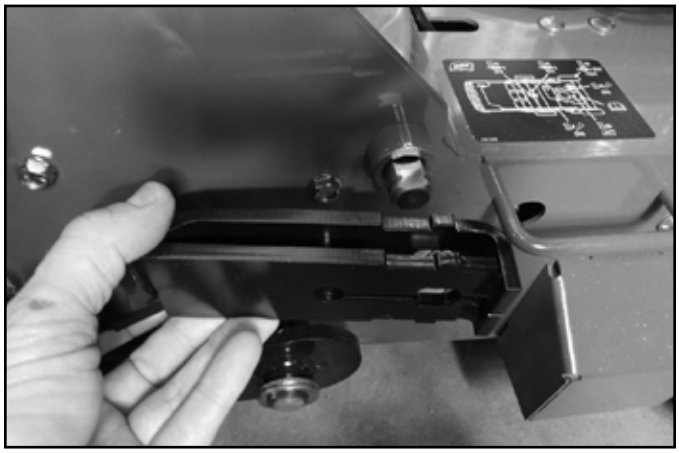

Fig. 073 RH arm remove

5. Remove the jam nut that is connected from the ball joint to the lift link (Fig. 074).

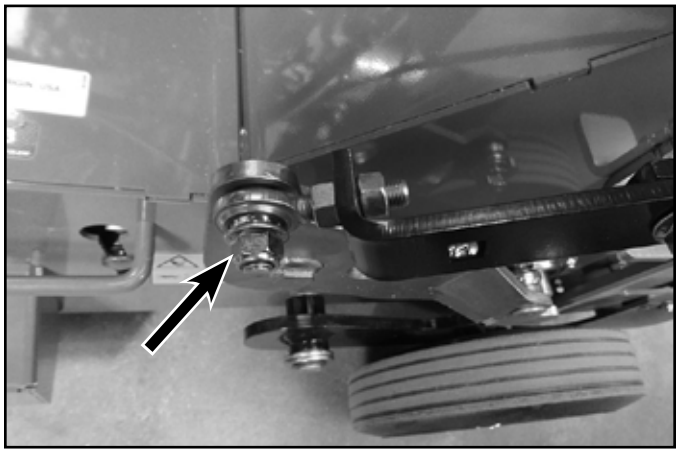

Fig. 074 ball joint nut

6. Remove the nut and bolt that connects the wheel arm assembly to the lift link (Fig. 075).

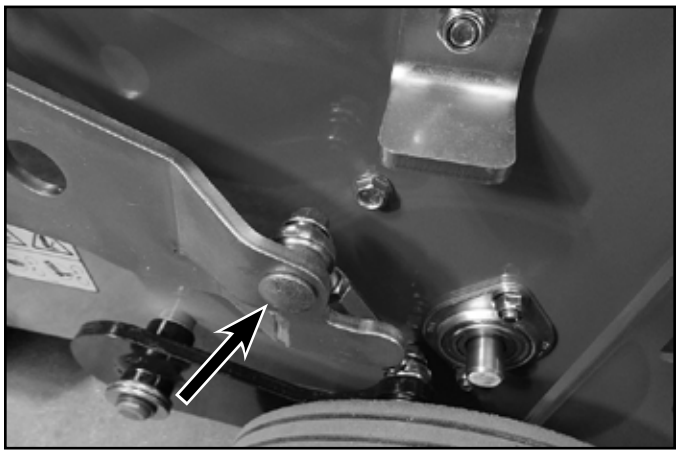

Fig. 075 wheel arm bolt

7. Remove the pivot shaft from the left side of the machine (Fig. 076).

Fig. 076 pivot shaft asm

8. The pivot shaft and lift arm are one complete unit (Fig. 077).

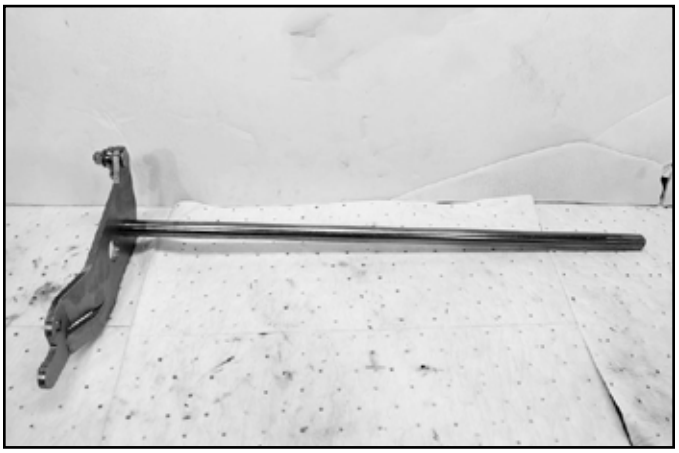

Fig. 077 pivot shaft unit_a

9. Insert new shaft through LH side of machine (Fig. 078).

Fig. 078 pivot shaft asm

10. Guide the shaft through the pivot shaft hole on the right hand side (Fig. 079).

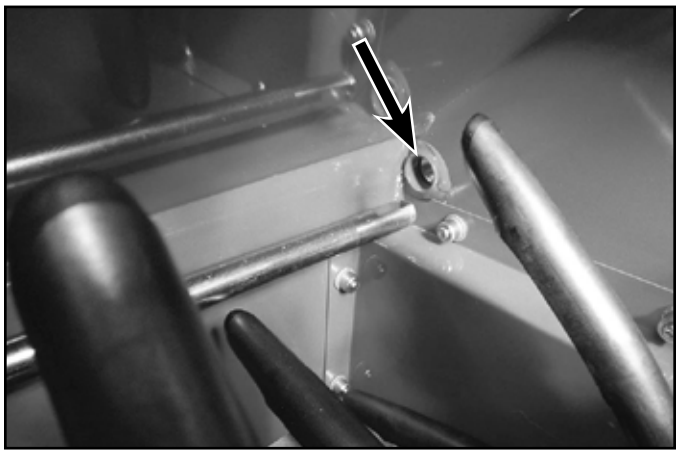

Fig. 079 RH side hole_a

11. Install the RH lift arm (Fig. 080).

Fig. 080 RH lift arm replace

12. Install the snap ring (Fig. 081).

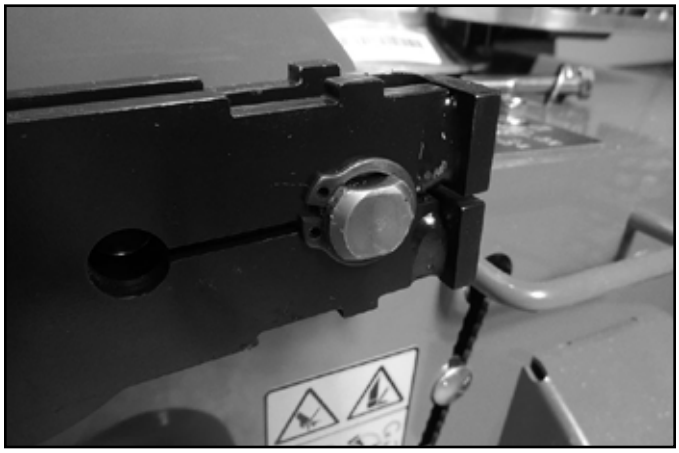

Fig. 081 PS snap ring

13. Install the two bolts on the right hand lift arm (Fig. 082).

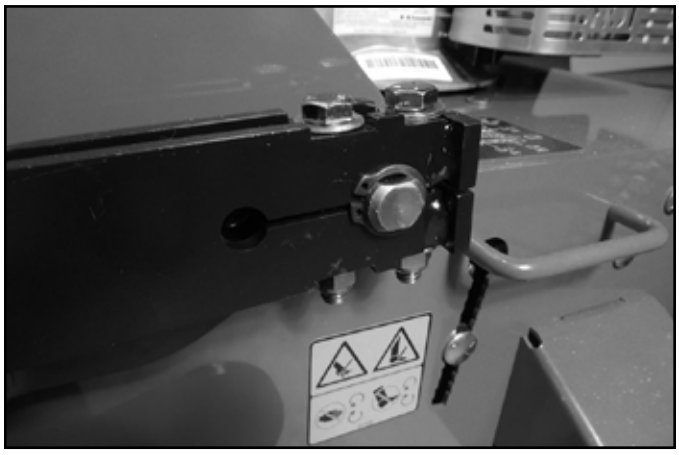

Fig. 082 RH lift arm

14. Install the nut and bolt that connects the wheel arm assembly to the lift link (Fig. 083).

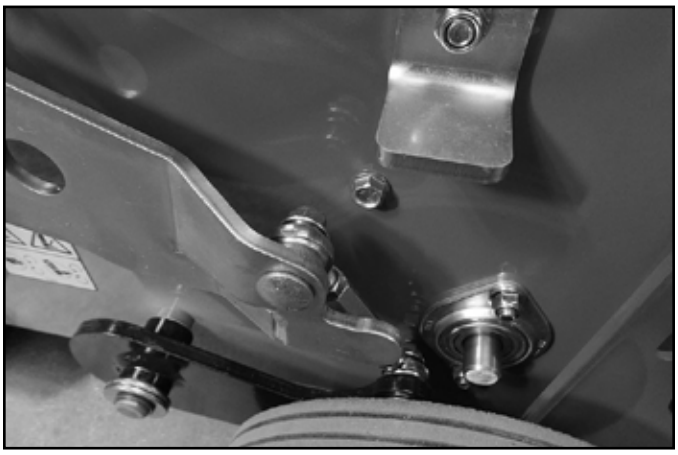

Fig. 083 wheel arm bolt

15. Install the jam nut that is connected from the ball joint to the lift link (Fig. 084).

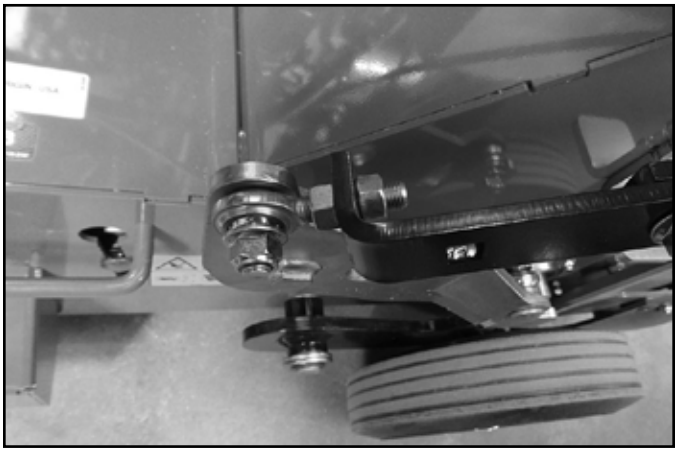

Fig. 084 ball joint nut

Replacing the Front Drive Axle - All Models

1. Jack the front of the unit up and place jack stands under the front frame.

2. Remove the snap rings and remove the front wheels (Fig. 085).

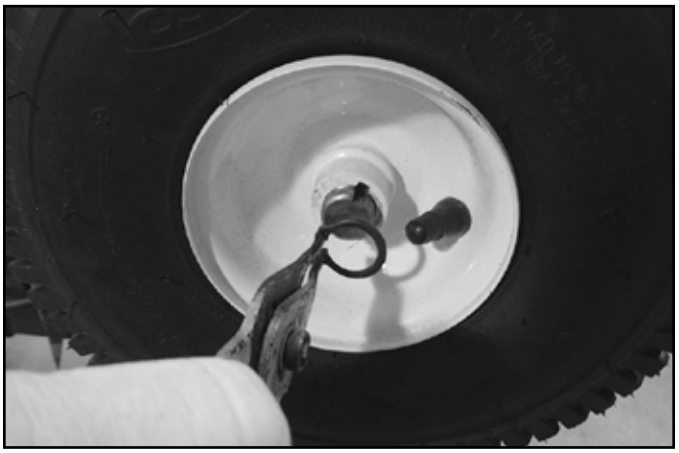

Fig. 085 wheels_a

3. Remove the keys and bushings from both sides of the axle (Fig. 086).

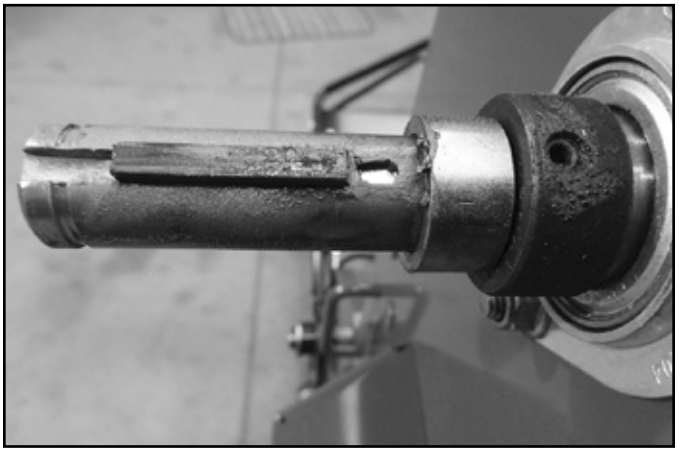

Fig. 086 key

4. With an Allen wrench, loosen the set screws on the lock collars on both sides (Fig. 087).

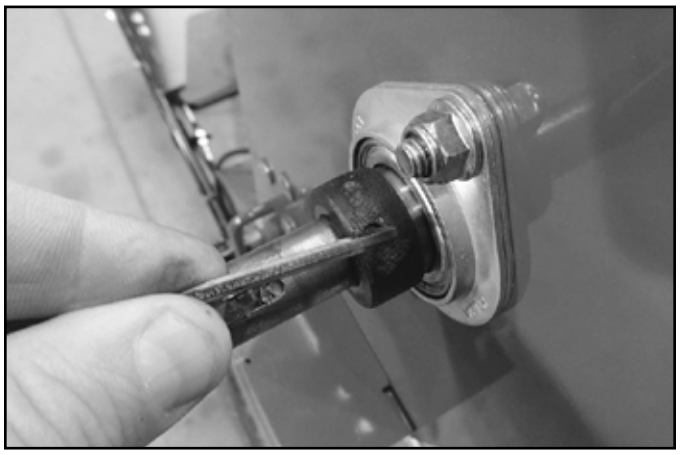

Fig. 087 lock collar 1_a

5. Insert a punch into the recess on the lock collar. Tap the punch with a hammer to loosen the lock collar. Remove lock collar (Fig. 088).

Fig. 088 lock collar 2_a

6. Remove the bolts securing the bearings and bearing flanges. Remove the bearings and flanges (Fig. 089).

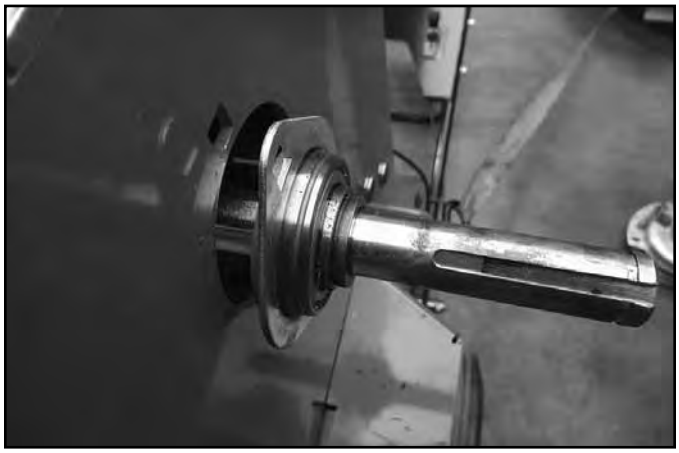

Fig. 089 bearing_a

7. Rotate the shaft until the master link is accessible on the front drive shaft chain. Remove the master link and chain (Fig. 090).

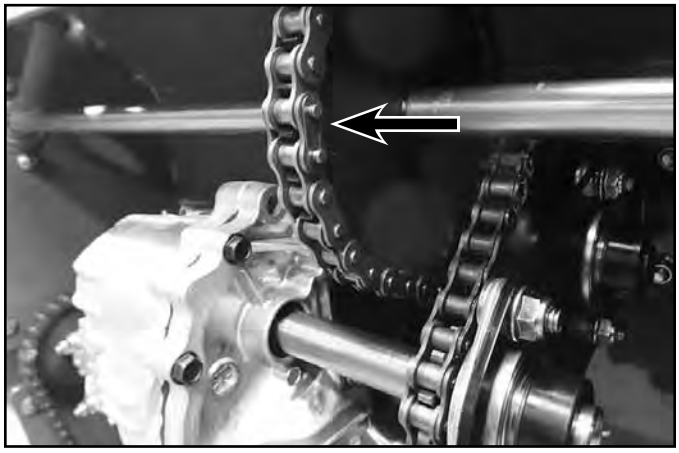

Fig. 090 master link 1_a

8. Loosen the transmission mounting bolts as outlined in the “Transmission Removal” section on page 4-2. Loosen transmission enough to gain clearance to get the sprocket past the transmission. Pull the axle out.

9. Insert new axle into the chassis.

10. Tighten the transmission mounting bolts.

11. Reinstall the chain onto the transmission sprocket and the drive shaft sprocket. Install the master link (Fig. 090).

12. Install the bearings and bearing flanges. Torque bolts to 11 ft-lbs. (15 Nm).

13. Make sure the large sprocket on the drive shaft and the small sprocket on the transmission are perfectly aligned. To align, tap the driveshaft in the necessary direction to achieve alignment (Fig. 091).

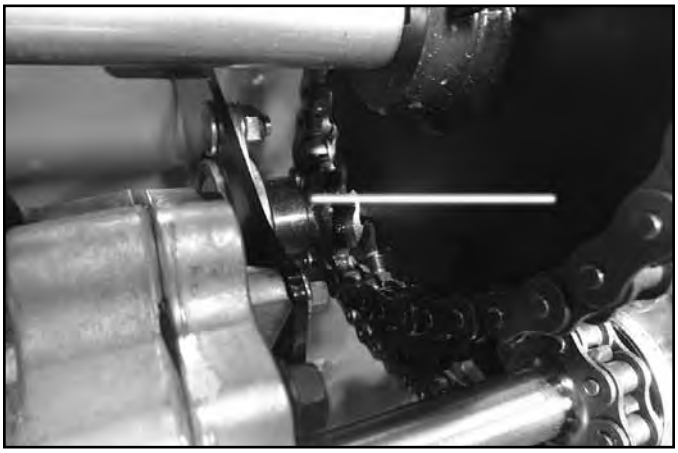

Fig. 091 alignment_a

14. Install the lock collars onto the flange bearings. With a punch, tap the recess to securely lock the collar onto the bearing. Apply Loctite® 242 to the set screws and tighten to 12-14 in-lbs. (1.4-1.6 Nm) (Fig. 092).

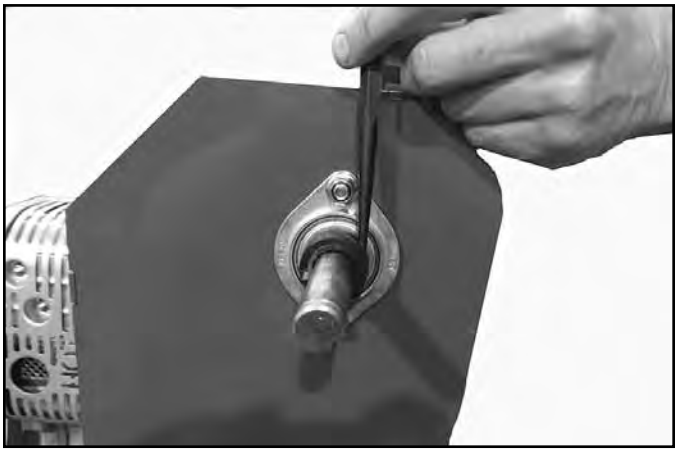

Fig. 092 lock collar 3_a

15. Install the bushings and keys.

16. Install the wheels and snap rings.

Aerator Transaxle Subsystem

(Fig. 093)

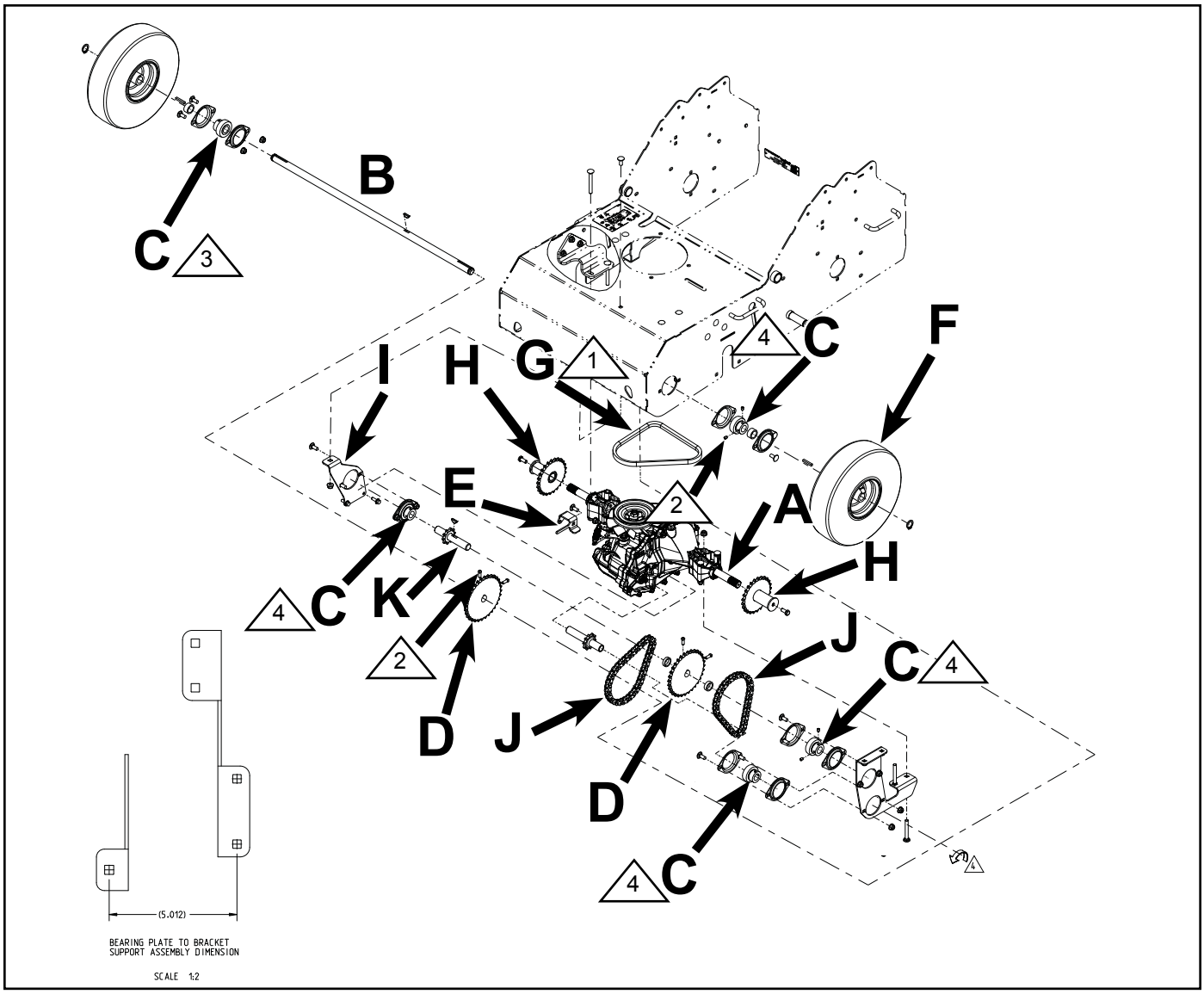

Fig. 093 subsys_aerator transaxle

A. Transaxle asm
B. Shaft - wheel
C. Bearing - lock, collar
D. Sprocket
E. Angle - control
F. Wheel asm
G. Belt drive
H. Sprocket asm
I. Bracket - support, shaft
J. Chain - drive, wheel
K. Shaft - jack

1 Ensure belt is properly tensioned with no more than 1/4” deflection witih moderate 20 - 30 lbs. pressure.

2 Apply Loctite® 242 to all bearing collar set screws and all sprocket collar set screws.

3 Set locking collar in the same direction as shaft rotation - assume forward tire rotation (clockwise on RH side).

4 Set locking collar in the same direction as shaft rotation - assume forward tire rotation (counter-clockwise 4 places).

Transmission Replacement

Transmission Removal

1. Raise the tines, stop the machine, stop the engine, and disconnect the spark plug wire.

2. Drain the fuel from the fuel tank. Dispose of fuel in an approved container.

3. Slide the oval locking rings on the handle upward, and fold the handle towards the engine.

4. Slowly lift the front of the machine until the back of the machine and weight pockets are resting on the ground. Stabilize the machine with an overhead hoist (Fig. 094).

Note: Using two people or an overhead hoist to lift the machine will make this easier.

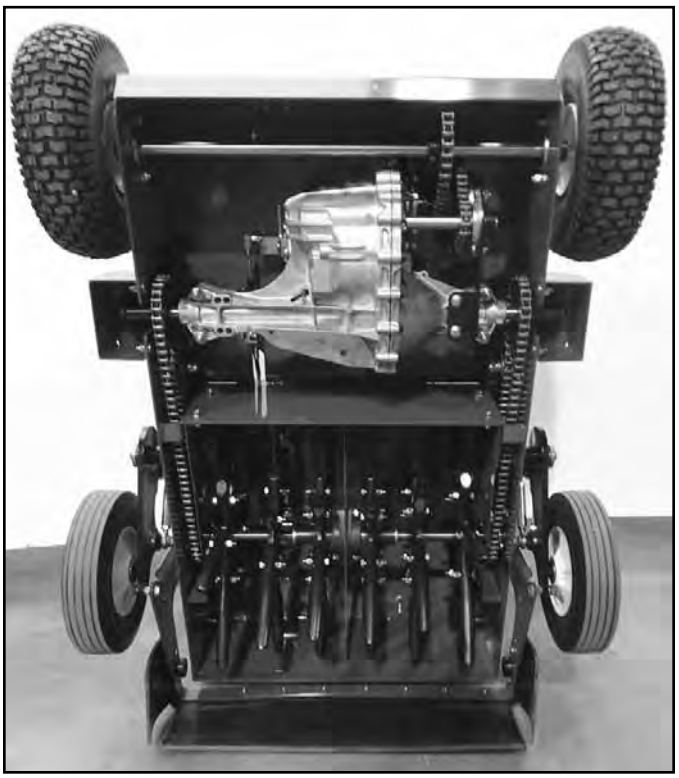

Fig. 094 1-1a

5. Disconnect the self-propel drive bail cable from the transmission (Fig. 095).

Fig. 095 1a

6. Loosen the nut on the idler pulley to make the belt go slack (Fig. 096).

Fig. 096 2a

7. Remove the belt from the pulley by working it around the pulley (Fig. 097).

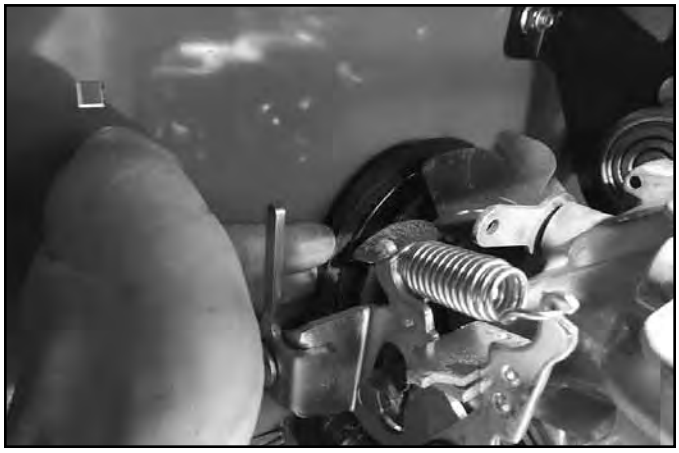

Fig. 097 3a

8. Remove and retain the connecting link from the front axle chain sprocket. Remove chain (Fig. 098).

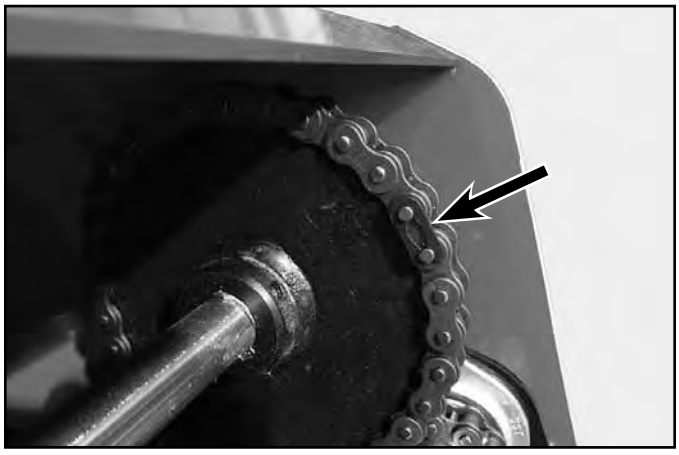

Fig. 098 4

9. Loosen the drive chain idler sprockets on each side of the unit (Fig. 099).

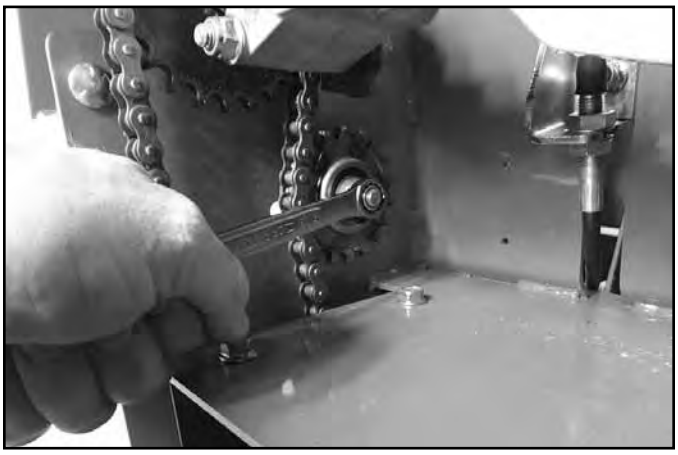

Fig. 099 5a

10. Remove and retain the connecting link from the drive chains. Remove the drive chains from the transmission sprockets (Fig. 100).

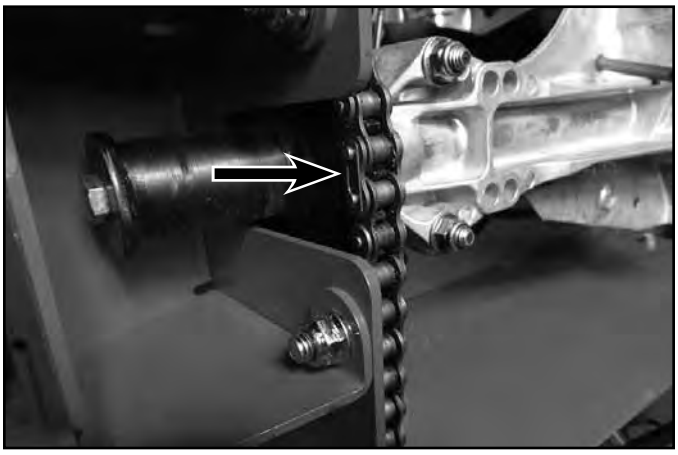

Fig. 100 6

11. Remove the bolts securing the bearing plate to the top of the deck (Fig. 101).

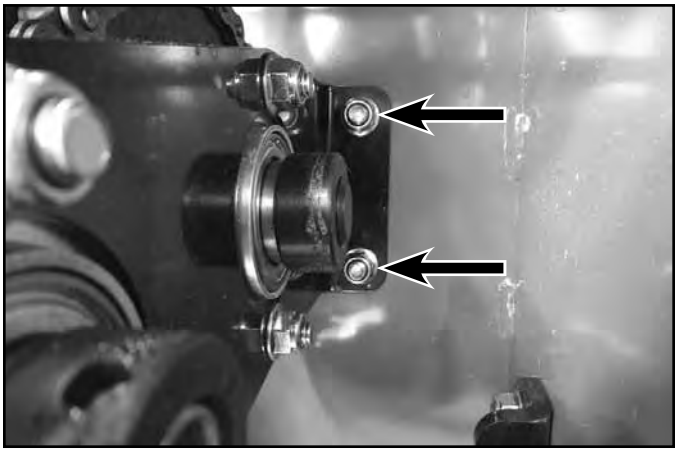

Fig. 101 7a

12. Remove the four bolts holding the transmission to the support brackets (Fig. 102).

Fig. 102 8a

13. Remove the transmission from the chassis (Fig. 103).

Fig. 103 9

Changing Transmission Oil

Service Interval: Every 100 hours

1. Carefully clean the area around the expansion tank and oil-fill port. It is important that no dirt or contamination enter the hydraulic system.

2. Remove and retain the oil-fill port fitting and position the transmission so the oil will drain completely out of the housing (Fig. 104).

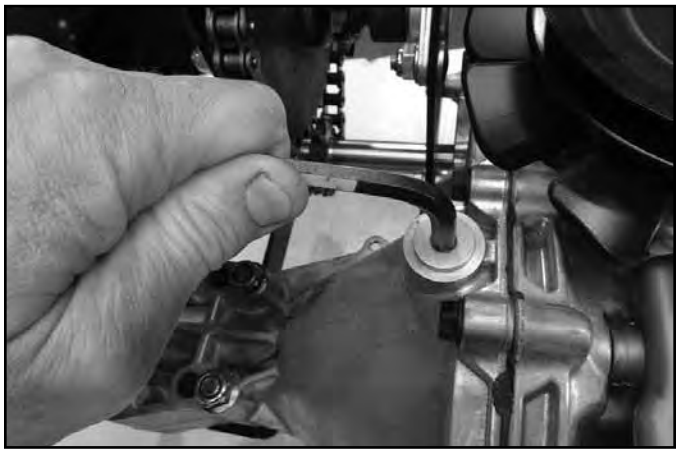

Fig. 104 10

3. When all the oil has drained from the transmission, remove and retain the #10-32 x 1/2" self-tapping screw and ratchet fastener holding the expansion tank to the housing (Fig. 105).

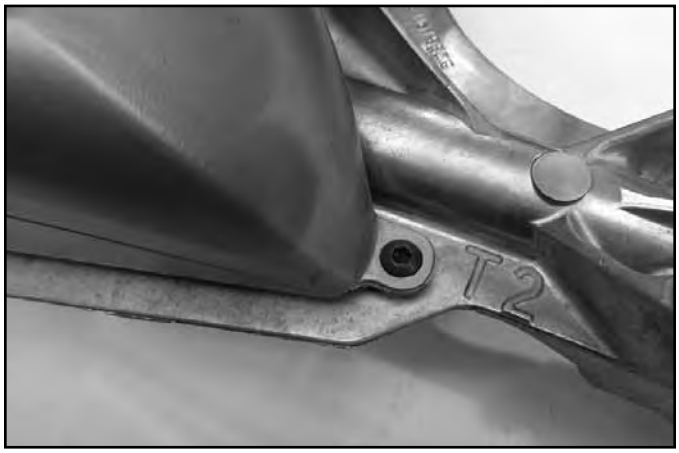

Fig. 105 11

4. Remove the expansion tank and drain the oil.

Note: Do not remove the vent cap from the tank.

Note: Do not remove the tank hose or O-ring unless a replacement is needed.

5. Inspect the belt, pulleys, sprockets, and bearings. Replace as required (Fig. 106).

Fig. 106 12a

6. Install the previously removed expansion tank by first inserting the hose into the tank (A). Place the tank opening over the O-ring and push down to ensure a proper seal (B). Install the #10-32 x 1/2" self-tapping screw and torque it to 25 in-lbs (2.8 Nm) (C) (Fig. 107).

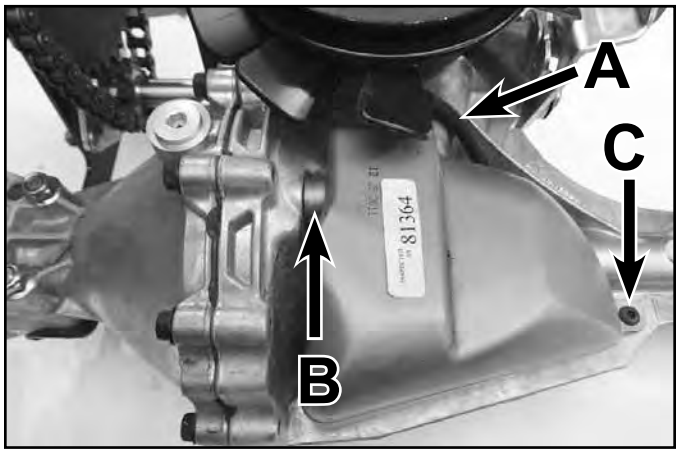

Fig. 107 13a

7. Fill the transmission at the oil-fill port until the oil level is 1/2 - 1 1/4 inches (13 - 32mm) below the top of the fill port (A) (Fig. 108).

Note: Toro Premium Hydro Oil is recommended. Mobil 1 15w-50 is an acceptable alternative.

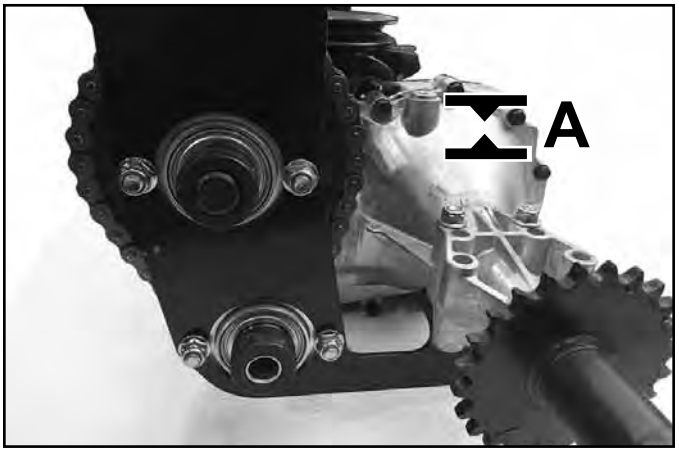

Fig. 108 13 (2)a

8. Install the oil-fill port fitting.

Servicing the Jack Shaft & Output Shaft

Jack Shaft & Output Shaft Removal

1. Remove the transmission as outlined in “Transmission Removal” in this chapter.

2. Remove the bolts that secure the bearings to the bearing plate. Remove the bolts that secure the bearing plate to the transmission (Fig. 109).

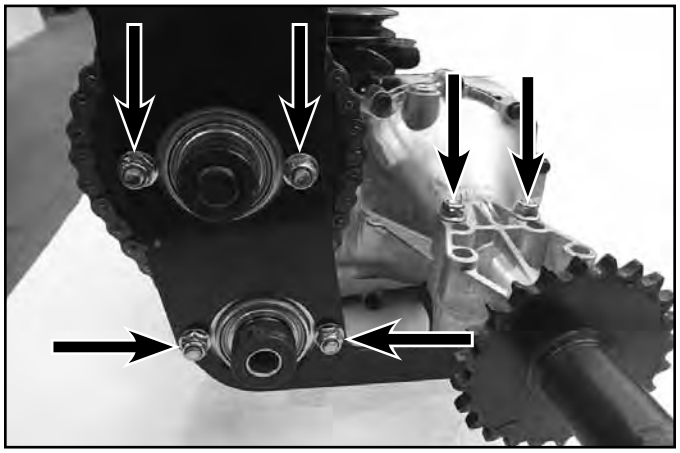

Fig. 109 14a

3. The jack shaft will be loose, allowing the removal of the chain (Fig. 110).

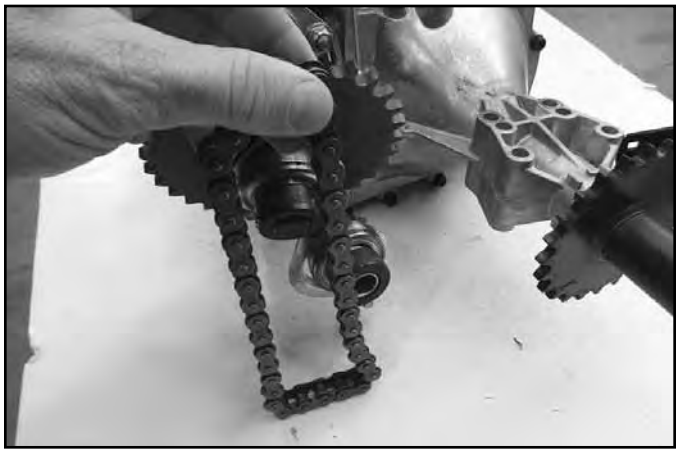

Fig. 110 15a

4. Loosen the set screws on the lock collar of the output shaft (Fig. 111).

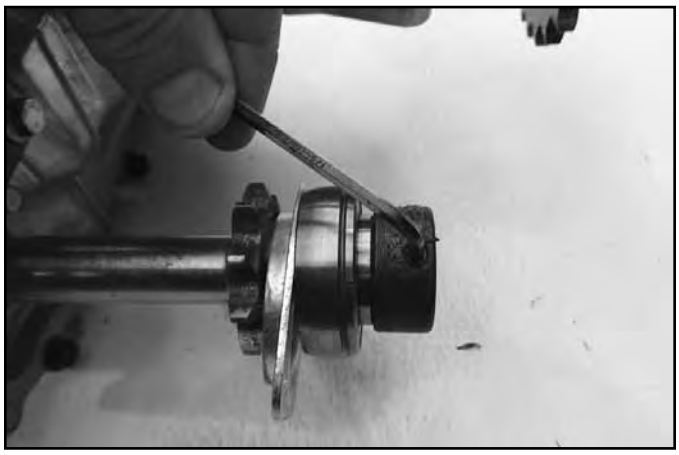

Fig. 111 16a

5. Insert a pin punch into the recessed hole in the lock collar. Tap the punch to turn the collar to loosen the collar (Fig. 112).

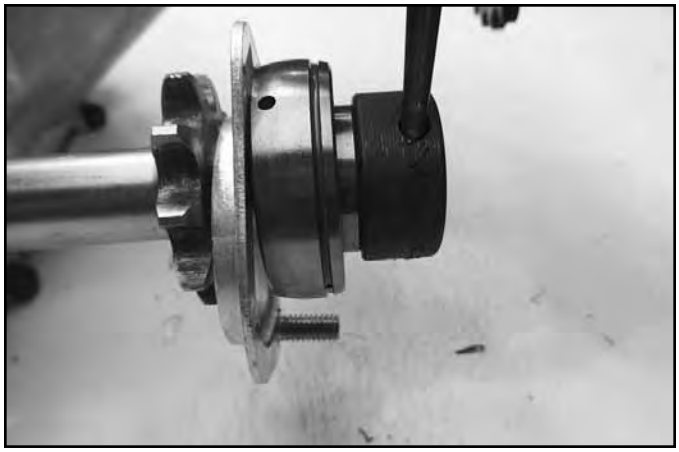

Fig. 112 17a

6. Remove the lock collar (Fig. 113).

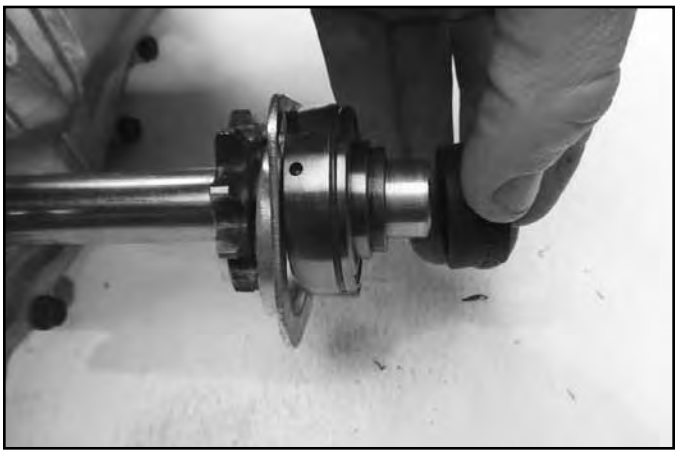

Fig. 113 18a

7. Remove the bearing from the shaft and the output shaft from the transmission (Fig. 114).

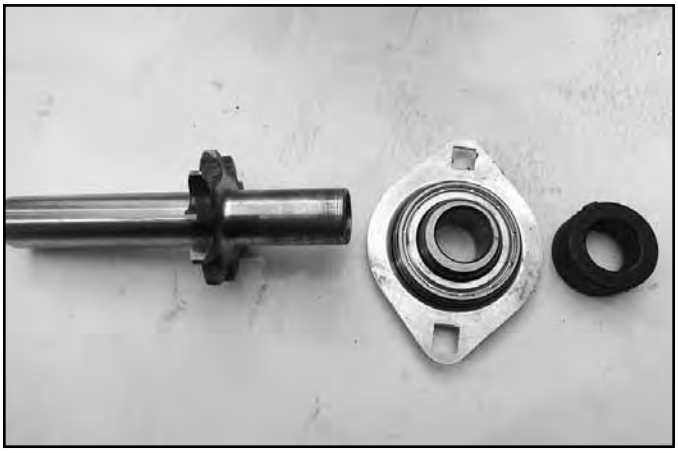

Fig. 114 19a

8. Remove the lock collar and bearing from the jack shaft the same way as the output shaft (Fig. 115).

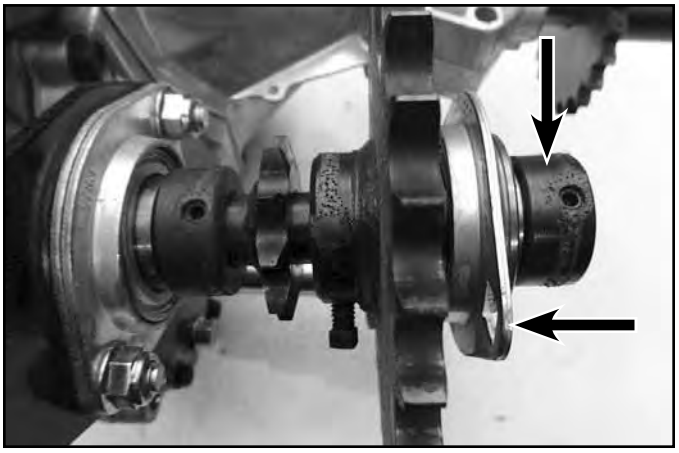

Fig. 115 20a

9. Loosen the inner lock collar set screw. Insert a pin punch into the recessed hole of the lock collar and tap the collar to loosen it from the bearing (Fig. 116).

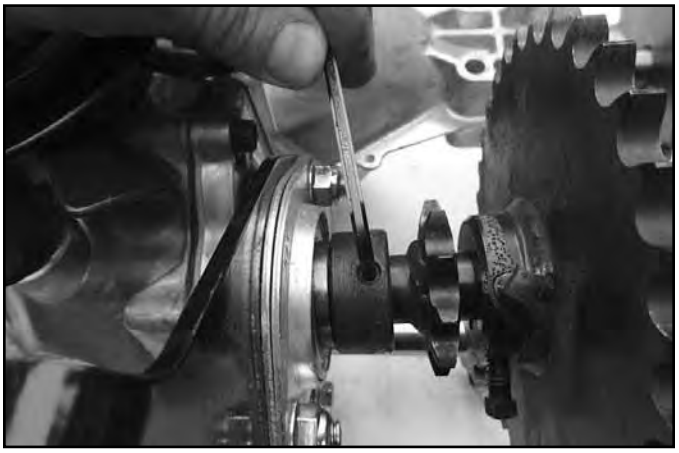

Fig. 116 21a

10. Loosen the set screws on the large sprocket (Fig. 117).

Fig. 117 22a

11. Remove the jack shaft from the transmission. The sprocket is keyed. To remove sprocket from shaft, insert the assembly into a press and press the sprocket off (Fig. 118).

Fig. 118 23a

Jack Shaft & Output Shaft Installation

1. Replace the needed parts. Re-install the output shaft and the jack shaft and install the chain. Leave the lock collars loose (Fig. 119).

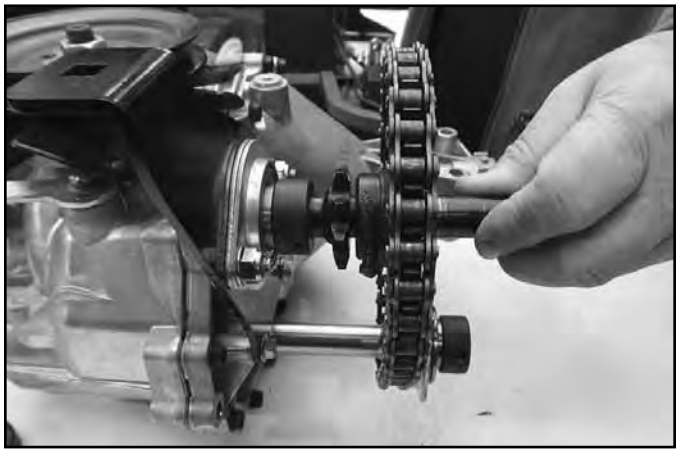

Fig. 119 24a

2. Install the bearing plate, bearings, and bearing retainers (Fig. 120).

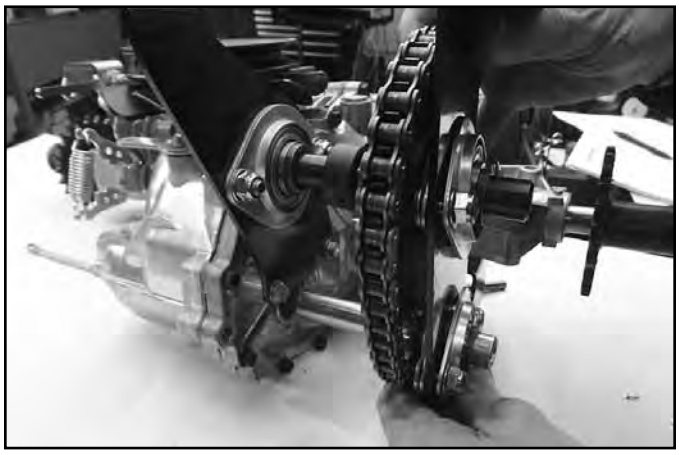

Fig. 120 25a

3. The bearing plate to bracket support assembly dimension should be 5 inches from center-to-center on the mounting holes (Fig. 121).

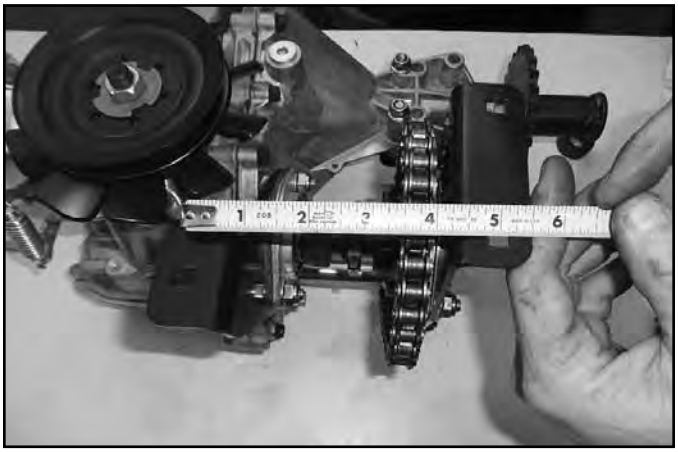

Fig. 121 26a

4. The sprockets should be exactly aligned with one another (Fig. 122).

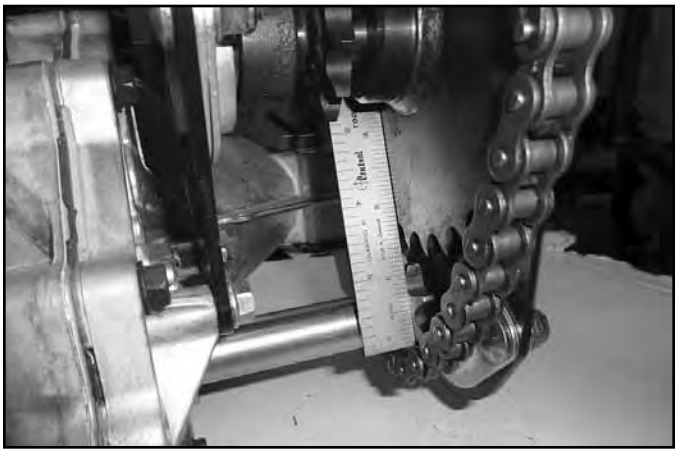

Fig. 122 27a

5. Once the sprockets are aligned, apply Loctite® 242 to the set screws on the large sprocket. Tighten the set screws on the large sprocket to 100 in-lbs (11.5 Nm) (Fig. 123).

Fig. 123 28a

6. Insert a pin punch into the recessed hole in the inner jack shaft lock collar. Tap the punch to turn the collar to tighten. Apply Loctite 242 to the set screw and torque to 12-14 ft-lbs. (16-19 Nm) (Fig. 124).

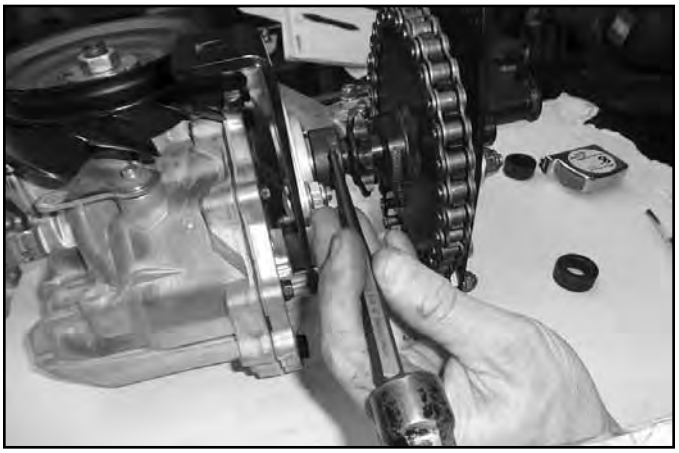

Fig. 124 29a

7. Insert a pin punch into the recessed hole in the outer jack shaft lock collar and the output shaft collar. Tap the punch to turn the collar to tighten. Apply Loctite 242 to the set screw and torque to 12-14 ft-lbs. (16-19 Nm).

Transmission Installation

1. With the transmission belt on the engine pulley and the idler pulley, loosely install the transmission using the previously removed mounting hardware (Fig. 125).

Fig. 125 30a

2. Install the transmission belt on the transmission pulley (Fig. 126).

Fig. 126 3a

3. Install the drive chains onto the idler and transmission sprockets. Insert the master link so that the spring clip is toward the outside of the machine and the opening is to the back of forward rotation. Do not tighten the chains at this time (Fig. 127).

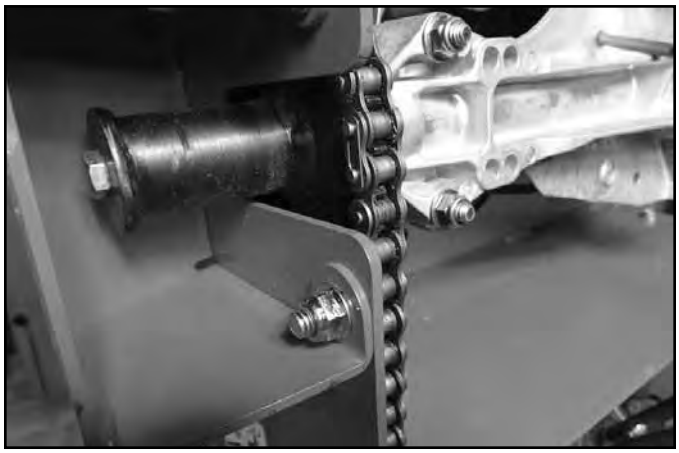

Fig. 127 6a

4. Install the chain on the front axle sprocket. Ensure that the front axle sprocket is aligned with the sprocket on the transmission. Install the master link so that the spring clip is toward the inside of the machine and the opening is to the back of forward rotation (Fig. 128).

Fig. 128 31a

5. Tighten the seven transmission mounting bolts. Torque to 17 ft-lbs. (23 Nm) (Fig. 129).

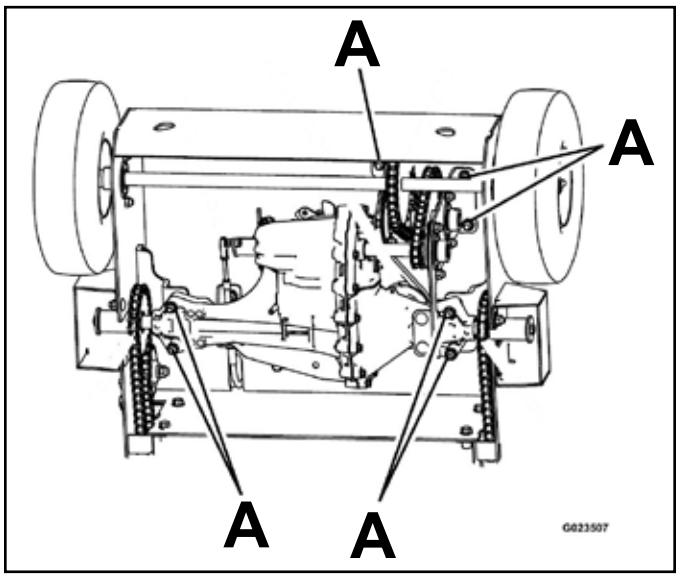

Fig. 129 fig. 35 G023507

A. Mounting hardware (7 locations)

6. Tension the transmission belt. Push the idler pulley to the left. Tighten the idler pulley to 30 ft-lbs (20.6 Nm). Push on a span of the drive belt with 20 lbs (9 kg) of force. The belt should flex no more than 1/8 inch (3mm). If it flexes more than that, re-tension the belt (Fig. 130).

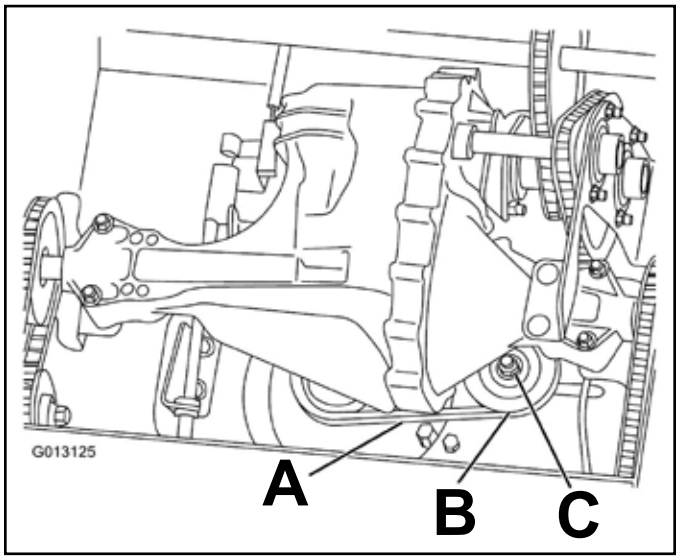

Fig. 130 fig. 33 G013125

A. Pump drive belt
B. Idler pulley
C. Idler pulley nut

7. Tension the drive chains. Pull down on the idler sprocket until the slack is taken out of the chain. Tighten the idler sprocket nut and torque it to 30 ft-lbs. (40.6 Nm) (Fig. 131).

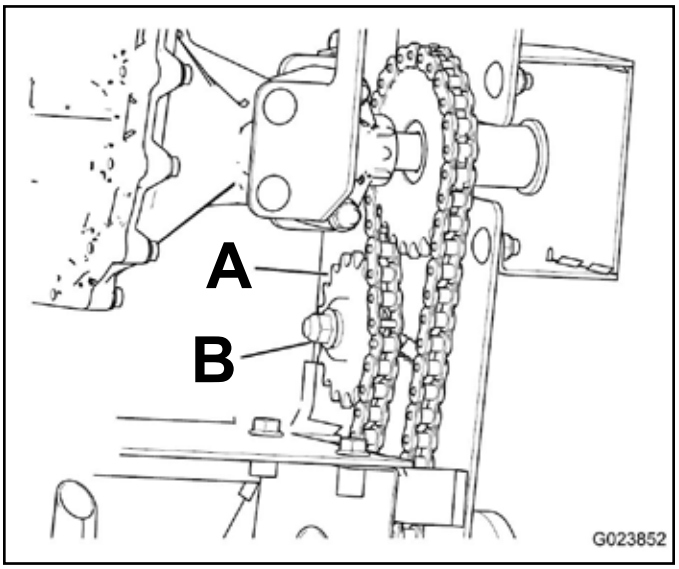

Fig. 131 fig. 32 G023852

A. Idler sprocket B. Nut

8. Inspect the flex in the chain. If the chain flexes more than 1/8 inch (3mm) with 20 lbs. (9 kg) of force applied, loosen the sprocket nut and re-tighten the chain (Fig. 132).

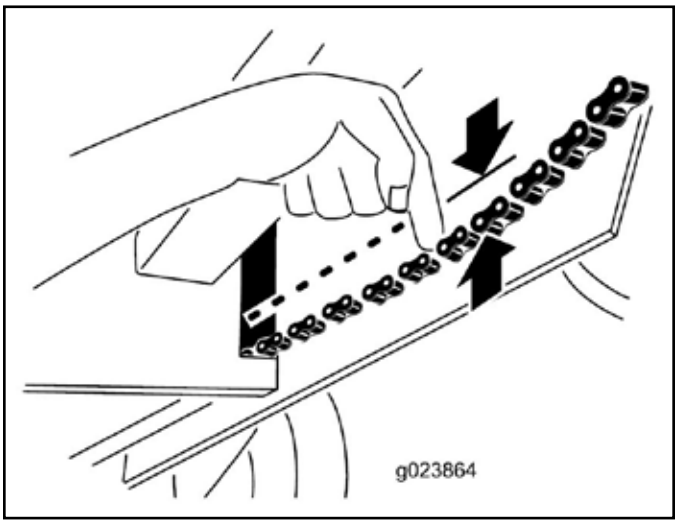

Fig. 132 fig. 31 G023864

A. Flex in the chain

9. Connect the self-propel drive bail cable (Fig. 133).

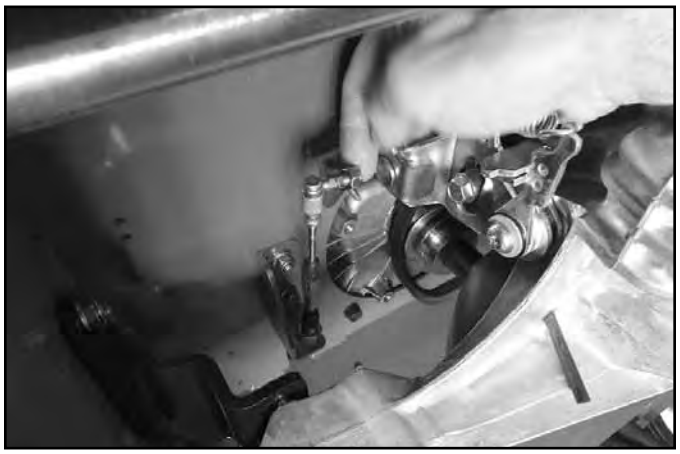

Fig. 133 32a

10. Carefully remove the hoist hooks and lower the machine to the ground. Raise and lock the handle into the operating position.

11. Check the gap between the handle and the bail. If the handle contacts the bail or if there is more than a 1/8 inch (3mm) gap, loosen the top adjustment nut one turn and tighten the bottom adjustment nut. Squeeze the bail to the handle. Repeat this step until there is a gap of up to 1/8 inch (3mm) between the self-propel bail and the handle (Fig. 134).

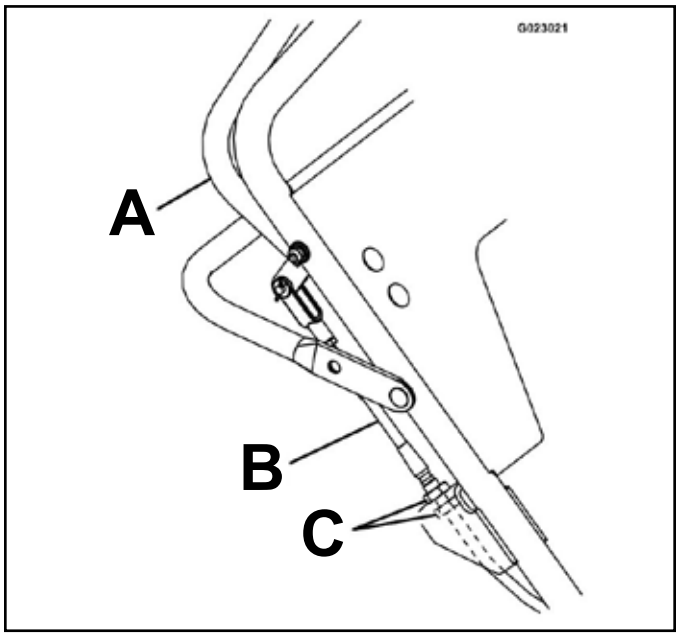

Fig. 134 fig. 34 G023021

A. Self-propel drive bail
B. Cable
C. Top/bottom adjustment nuts

Engine Subsystem
(Fig. 135)

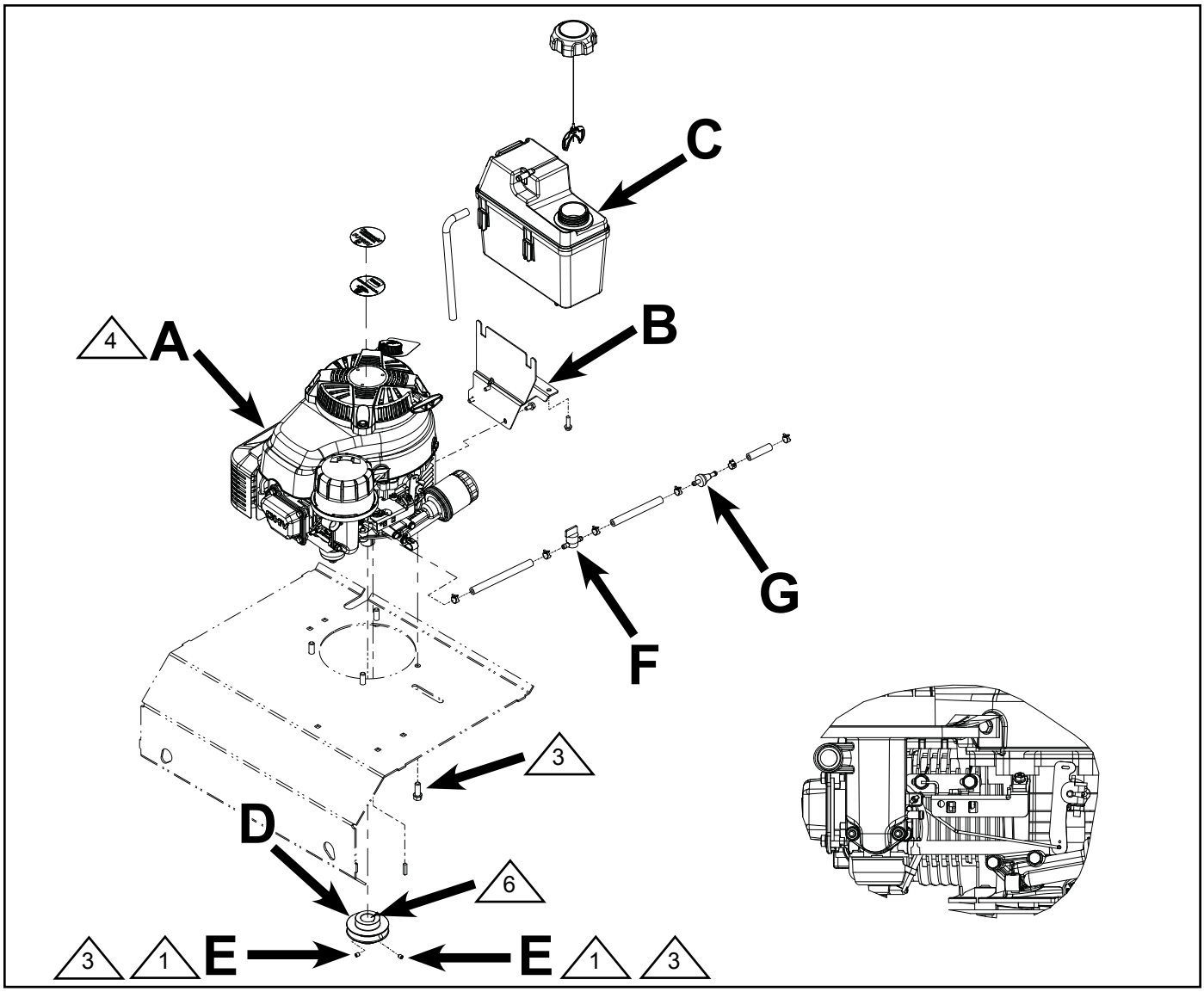

Fig. 135 subsystem_engine

A. Engine
B. Tank mount assembly
C. Tank assembly
D. Pulley - driver
E. Screw - set
F. Valve - fuel
G. Filter - fuel

1 Torque to 114 ± 12 in-lbs. (13 Nm)

3 Apply Loctite® 242 prior to tightening. Torque to 30 ft-lbs. (40 Nm).

4 Throttle adjustment: after connecting throttle/choke cable to engine, push throttle lever to detent, then tighten clamp screw making sure choke lever is not activated. Loosen throttle bracket assembly mounting bolts, adjust bracket forward/aft to achieve desired full throttle position. Retighten bolts.

6 Apply anti-seize to engine crankshaft and engine pulley prior to assembly. Pulley must be assembled tight to step on crankshaft.

Engine Replacement

Engine Removal

1. Drain the fuel from the fuel tank. Make sure fuel is disposed of in an approved container.

2. Disconnect the throttle cable from the engine (Fig. 136).

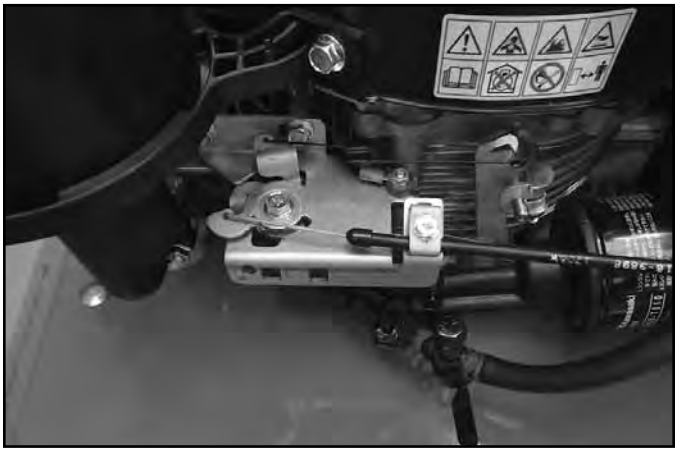

Fig. 136 33a

3. Remove the transmission as outlined in “Transmission Removal” in this chapter.

4. Remove the four engine mounting bolts (Fig. 137).

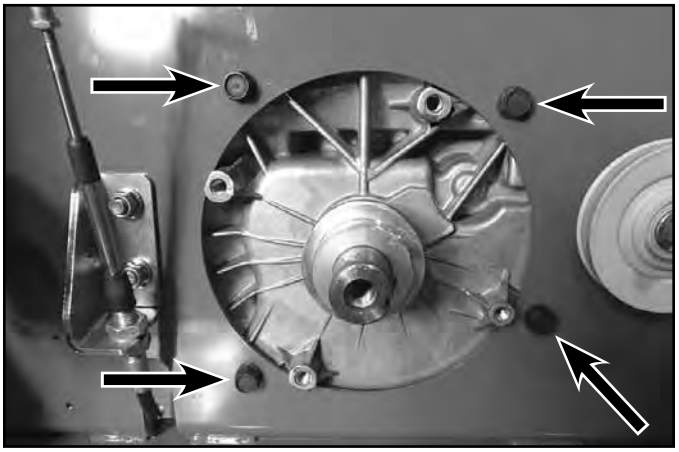

Fig. 137 34a

5. Remove engine.

Engine Installation

1. Mount engine to chassis. Apply Loctite® 242 to engine mount bolts and insert bolts. Torque bolts to 30 ft-lbs. (40 Nm).

2. Re-install transmission as outlined in “Transmission Installation” in this chapter.

3. Connect the throttle cable to the engine.

   a. **Throttle adjustment:** After connecting throttle/choke cable to engine, push throttle lever to detent, then tighten clamp screw making sure choke lever is not activated. Loosen the throttle bracket assembly mounting bolts, adjust bracket forward/aft to achieve desired full-throttle position. Re-tighten bolts (Fig. 138).

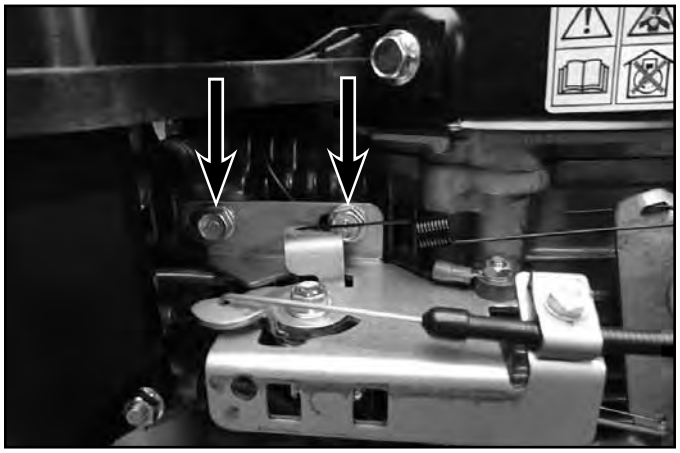

Fig. 138 35a

4. Add fuel and oil to engine and test run.

   a. Set engine RPM to 3700 ± 50 RPM.

Tines Subsystem
(Fig. 139)

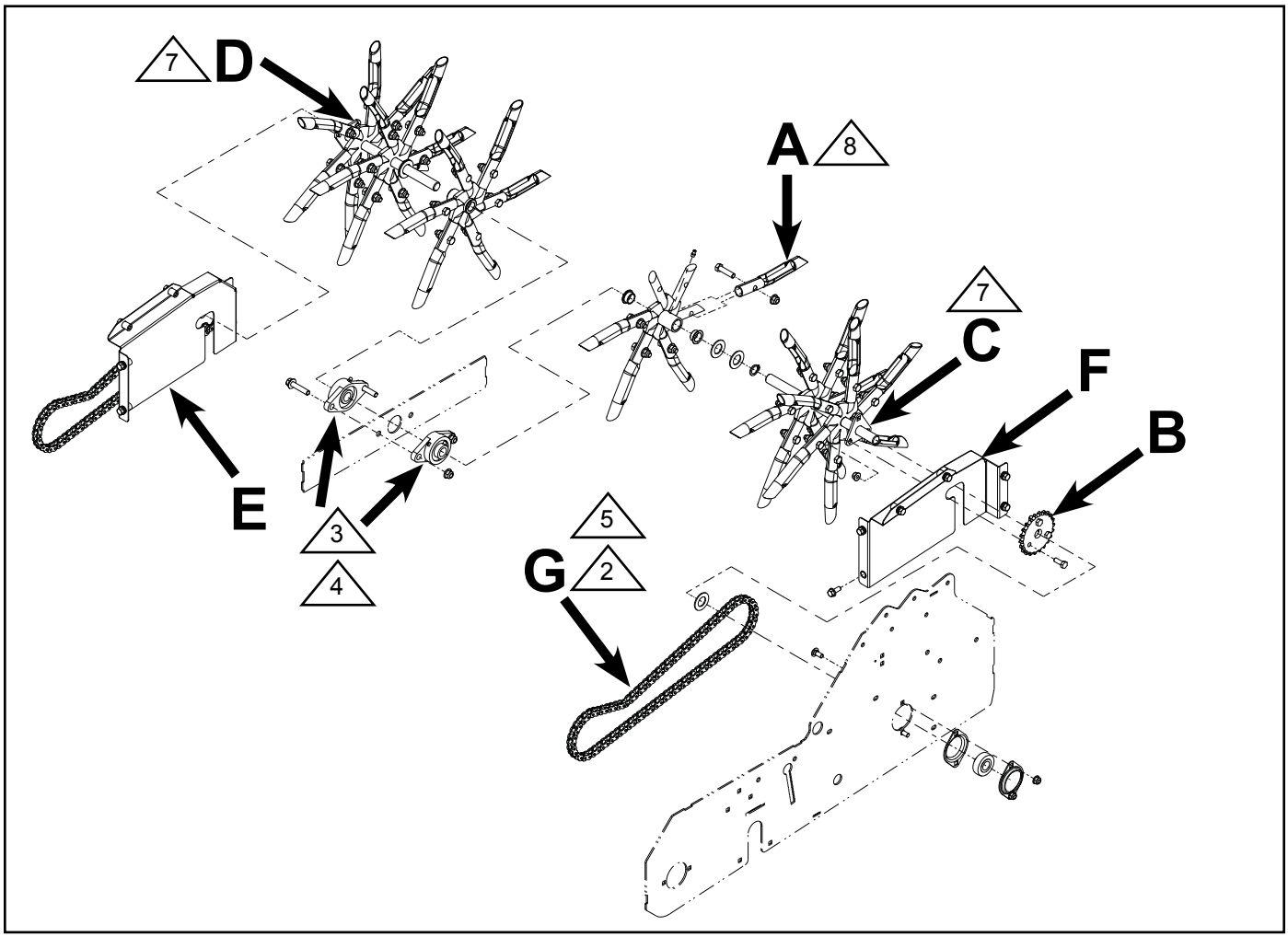

Fig. 139 subsystem_tines

A. Tine - coring
B. Sprocket - #40
C. Tine - wheel, LH
D. Tine - wheel, RH
E. Asm - chain guard, RH
F. Asm - chain guard, LH
G. Chain - drive

2 Adjust idler position so chain is tight with 1/8” max deflection with 20 lbs. of force.

3 Zerk on tine shaft bearings must face top of unit.

4 Grease location.

5 Install the connecting links so the cover plate and spring clip are to the outside of the machine. Install spring clip so opening is away from forward direction of rotation.

7 After confirming that snap rings are seated into grooves completely, adjust the shafts inward until the idler spyder weldments contact the flange bearings. Tighten set screws in bearings, torque to 12-14 ft-lbs. Tine idler must turn freely.

8 Orient the tines so that the leading edge of tine is towards the front of the machine.

TINE SYSTEM

Checking/Replacing Tines

1. Raise the tines, stop the machine, stop the engine and disconnect the spark plug wire.

2. Remove the rear access panel (Fig. 140).

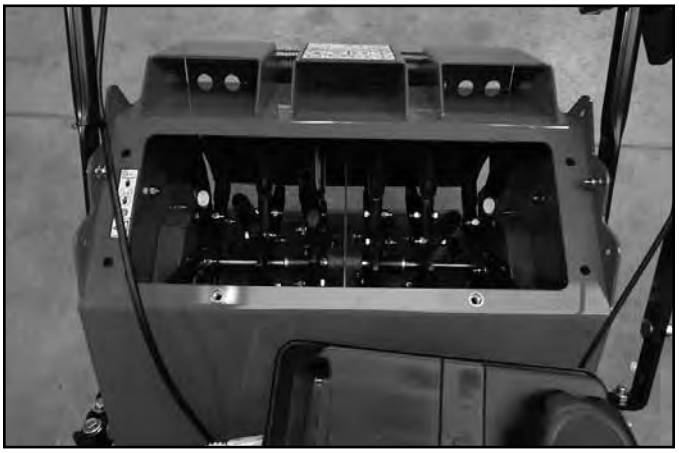

Fig. 140 36

3. Manually rotate the tines on the shaft, inspecting them for wear or damage.

4. If any are damaged or broken, remove the nut and bolt securing the tine to the tine assembly.

5. Remove the tine and replace it with a new one. Ensure that the new tine is facing the same direction as the other tines on the assembly (Fig. 141).

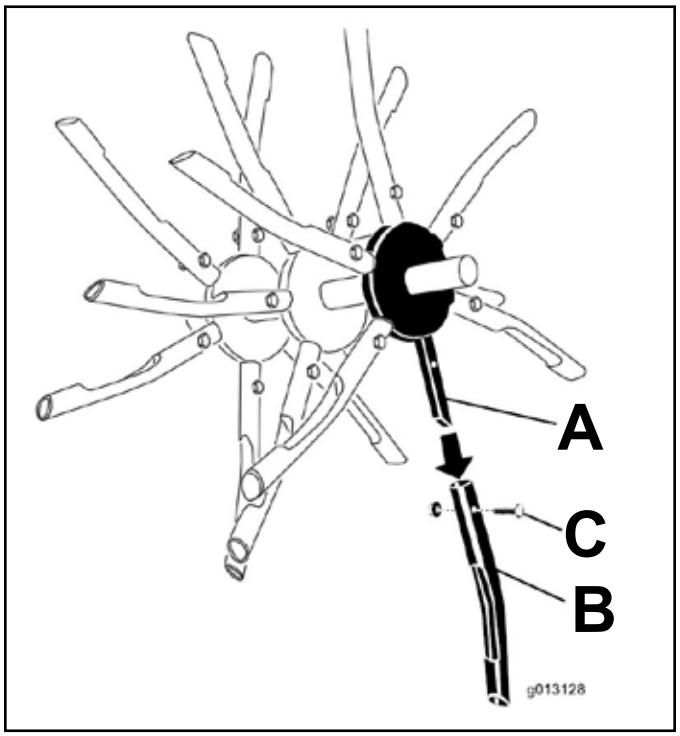

Fig. 141 fig. 36 G013128

A. Tine assembly
B. Tine
C. Bolt and nut

6. Secure the new tine with the bolt and nut and torque to 30 ft-lbs. (40.6 Nm).

7. Replace the access cover and reconnect the spark plug wire.

Tine Assembly Replacement

Tine Assembly Removal

1. Raise the tines, stop the machine, stop the engine, and disconnect the spark plug wire.

2. Drain the fuel from the fuel tank. Dispose of fuel in an approved container.

3. Slide the oval locking rings on the handle upward, and fold the handle towards the engine.

4. Slowly lift the front of the machine until the back of the machine and weight pockets are resting on the ground. Stabilize the machine with an overhead hoist (Fig. 142).

Note: Using two people or an overhead hoist to lift the machine will make this easier.

Fig. 142 37

5. Loosen the drive chain idler sprockets on each side of the unit (Fig. 143).

Fig. 143 5

6. Remove and retain the connecting link from the drive chains. Remove the drive chains from the transmission and tine sprockets (Fig. 144).

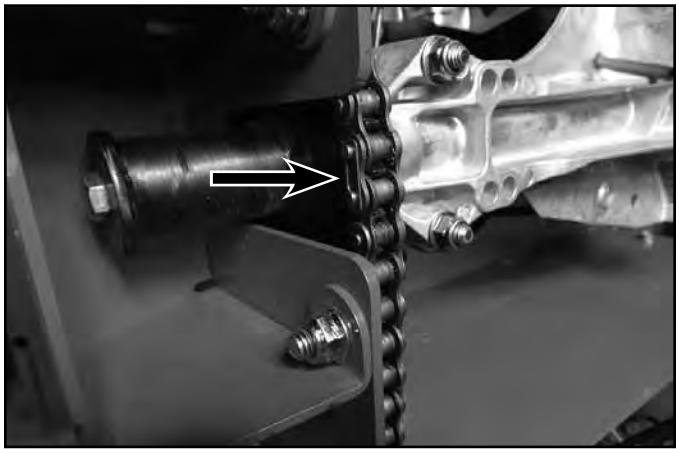

Fig. 144 6

7. Loosen the set screws on the lock collars (if applicable) on both sides of the machine. Insert a pin punch into the recess in the lock collars and tap until lock collars come loose (Fig. 145).

Fig. 145 38

8. Loosen and remove the two nuts and bolts, then remove the lock collar bearings from both sides of the unit (Fig. 146).

Fig. 146 39a

9. Remove all of the chain guard bolts (Fig. 147).

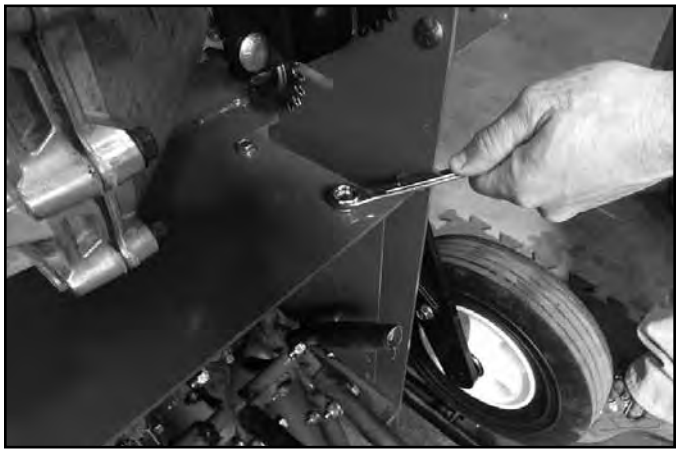

Fig. 147 40

10. Slide the snap rings on the tine shaft all the way to the outer stationary spyder (Fig. 148).

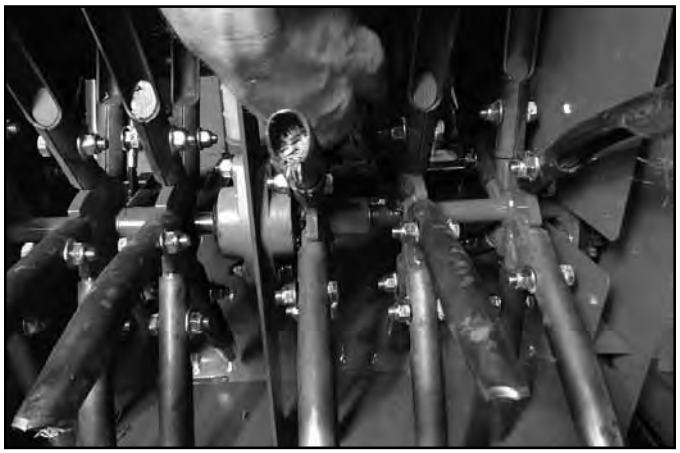

Fig. 148 41

11. Loosen the flange bearing bolts and remove the nuts (Fig. 149).

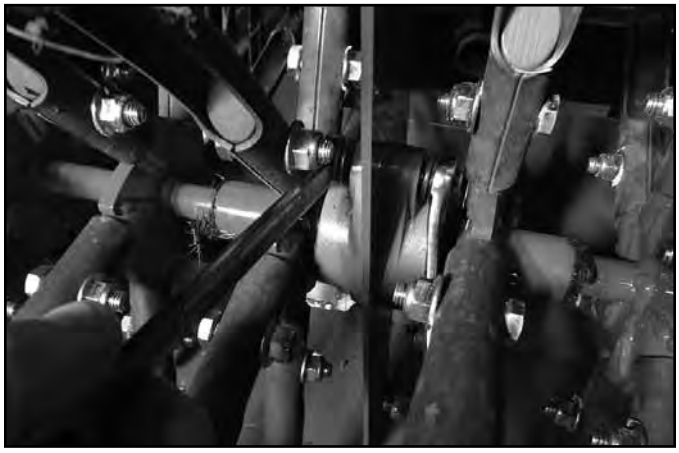

Fig. 149 42

12. Slide the inner spyder toward the outer stationary spyder (Fig. 150).

Fig. 150 43

13. Remove the tine assembly and chain guard (Fig. 151).

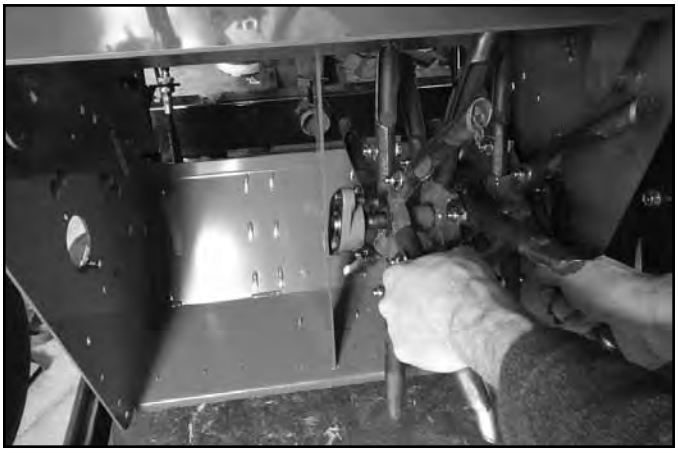

Fig. 151 44a

Tine Assembly Installation

1. Place the chain guard on the tine assembly and install into the chassis (Fig. 152).

Fig. 152 45

2. Place the chain guard on the opposite side tine assembly and install into chassis. Install all the flange bearing bolts and nuts and hand tighten the nuts (Fig. 153).

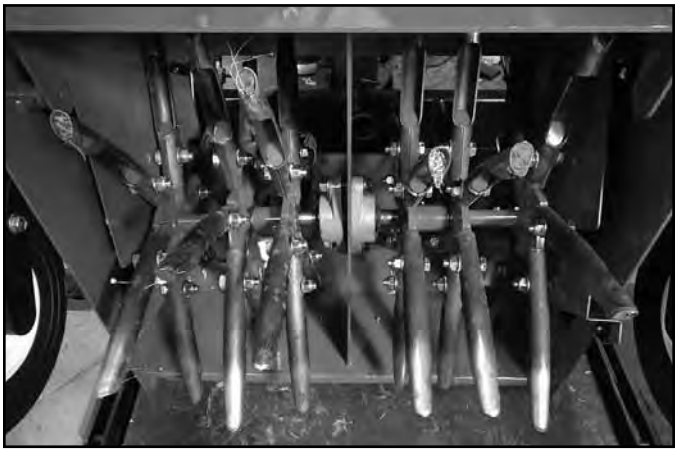

Fig. 153 46

3. Install the bearings and bearing flanges onto both tines using bolts and nuts. Torque bolts to 17 ft-lbs. (23 Nm) (Fig. 154).

Fig. 154 47a

4. Position the chain guards and install all the bolts. Torque to 17 ft-lbs. (23 Nm) (Fig. 155).

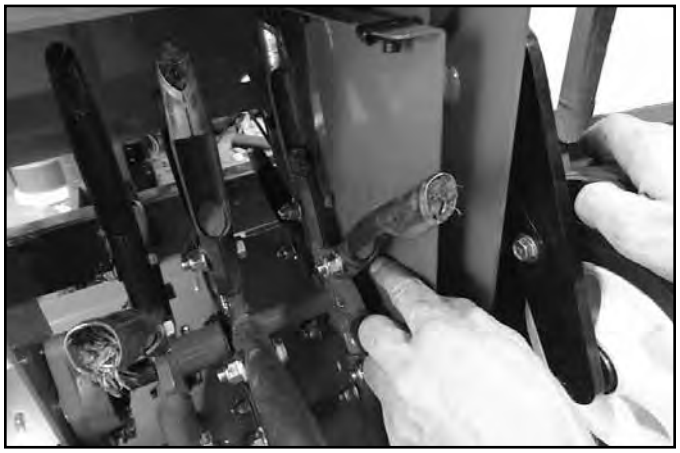

Fig. 155 48a

5. Tighten the flange bearing bolts. Torque to 30 ft-lbs. (40 Nm) (Fig. 156).

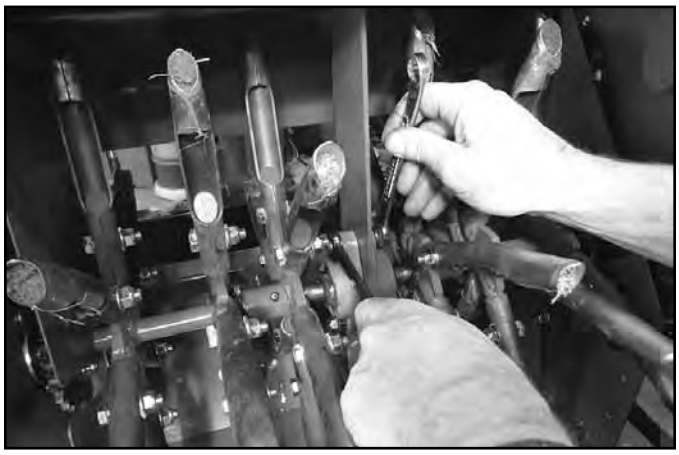

Fig. 156 49a

6. Move the inner spiders all the way toward the flange bearings. Move the snap ring back into position on the shafts (Fig. 157).

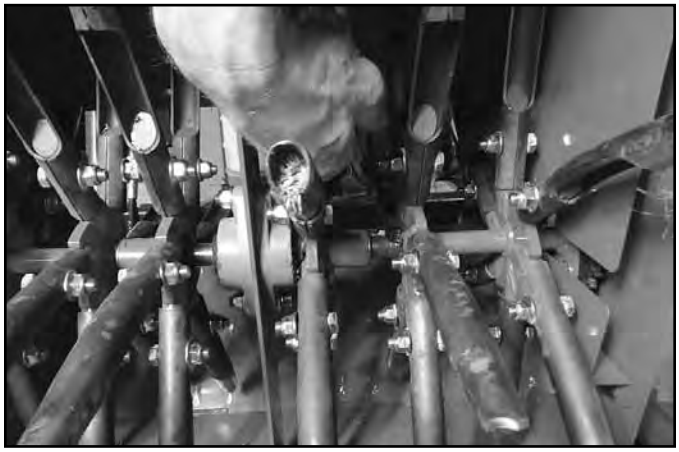

Fig. 157 41a

7. If the unit has bearing lock collars, install the collar onto the bearing. Insert a pin punch into the recessed hole in the lock collar and tap it with a hammer in the forward motion of direction until snug. Apply Loctite® 242 to the set screw and tighten to 12-14 ft-lbs (16-19 Nm) (Fig. 158).

Fig. 158 50a

8. Install and tighten the drive chains as outlined in “Transmission Installation” on page 4-10.

9. Carefully remove the hoist hooks and lower the machine to the ground. Raise and lock the handle into the operating position.

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21 inch Aerator
Service Manual

Form Number 492-9335