CONTENTS

SAFETY PRECAUTIONS

1. GENERAL

The instructions contained in this service manual are for the information and guidance of the servicemen, who are responsible for overhaul and repair of the machine.

Throughout this manual the use of the terms „left", „right", „front" and „rear" must be understood to avoid confusion when following instructions. These terms indicate the side of the vehicle when facing forward in the operator's seat.

Due to a continuous program of research and development, some procedures, specifications and parts may be altered in a constant effort to improve the machines. Some illustrations are of a general application and may not show component parts accurately in all details

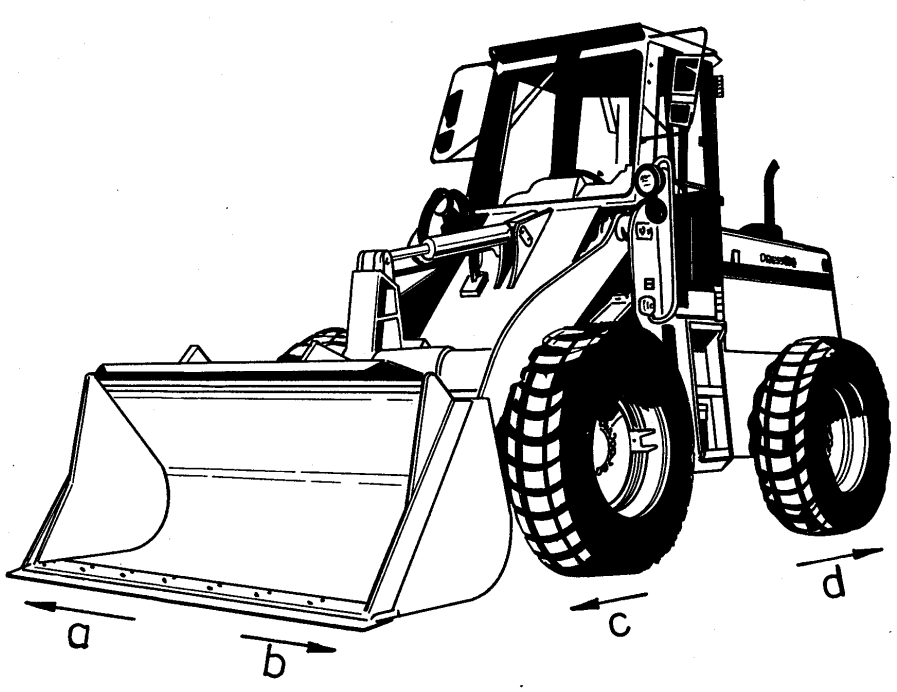


Fig. 1.1. Series G Wheel Loader (Left Front View)

a. Right Hand Side of the Machine
b. Left Hand Side of the Machine
c. Front of the Machine
d. Rear of the Machine

WORK SAFELY - FOLLOW THESE RULES

The following symbols and text in bold are used throughout this manual to call your attention to instruction concerning your personal safety.

This symbol is used throughout this manual to call your attention to warnings to instructions concerning personal safety. Carefully observe and follow these precautions. Be certain anyone operating or servicing this machine is aware of the safety rules. Failure to follow these precautions can result in serious injury or death.

DANGER! This symbol and text in bold letters is used throughout this Manual indicates an emergency, which is not avoided may result in injury or death. This sign calls your attention to a most serious danger.

DRIVE AXLE AND DIFFERENTIAL

DIFFERENTIAL

Only 520G (Fig. 7D.47)

1. Unscrew a bolt (31) and remove washer (3), O-ring (28) and yoke assy (2).
2. Remove the axle shafts (8), brake discs (17, 7D.25), brake plates (5) and brake pistons (3) with seal rings (19) as described in MASTER BRAKE in Section 4.

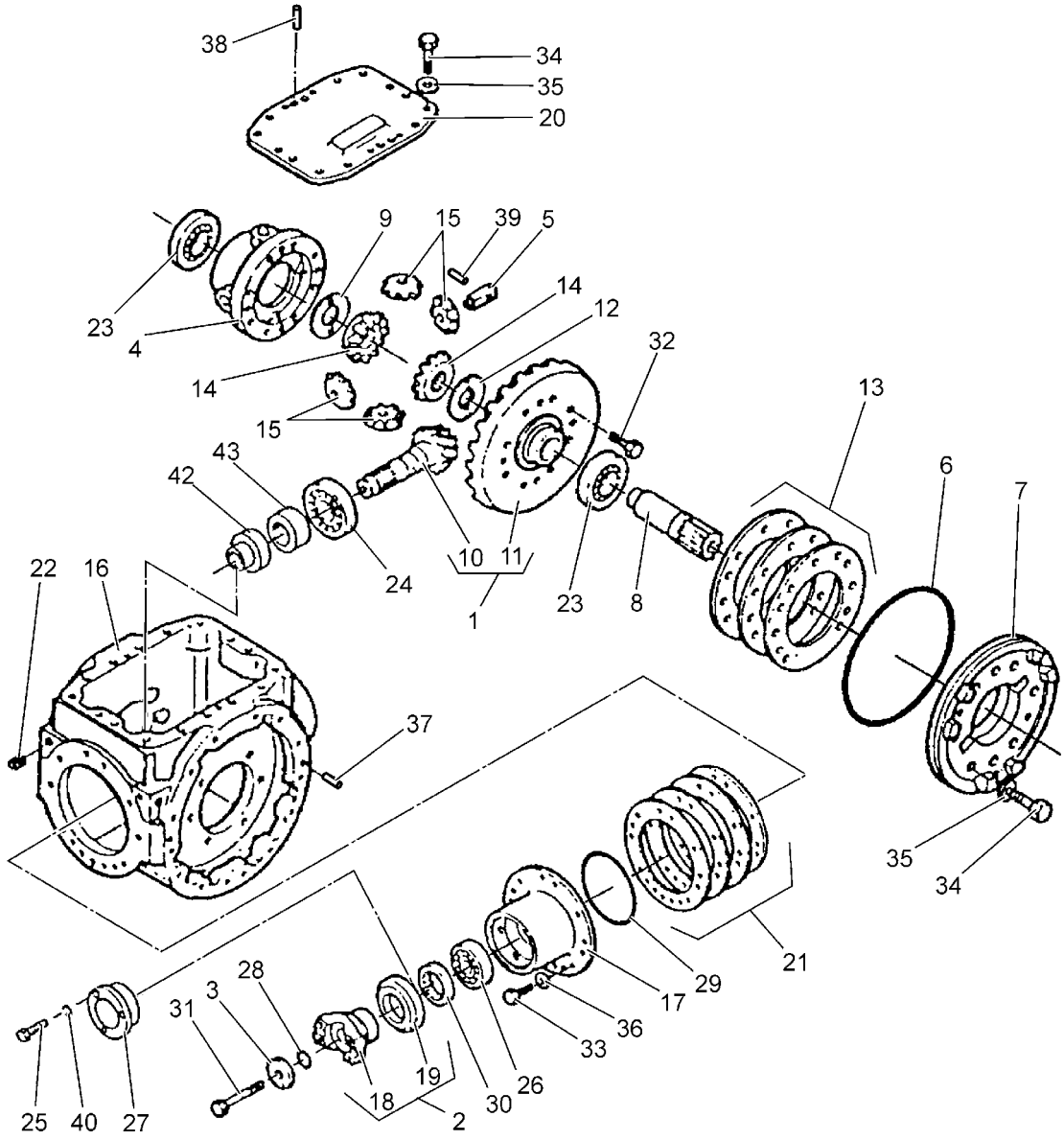


Fig. 7D.47. Rear Axle Differential Assembly Exploded View (520G)

1. Main Drive Gears Assy
2. Yoke Assy
3. Washer
4. Planetary Gear Carrier
5. Planetary Gear Shaft
6. Seal Ring
7. Bearing Retainer
8. Axle Shaft
9. Thrust Washer (K)
10. Pinion Shaft
11. Disc Gear
12. Thrust Washer (T)
13. Shim(s)
14. Crowns
15. Planetary Gears
16. Differential Assy Housing
17. Bearing Retainer
18. Yoke
19. Guard
20. Cover
21. Shim(s)
22. Plug
23. Tapered Bearing
24. Tapered Bearing
25. Bolt
26. Tapered Bearing
27. Retainer
28. O-ring
29. O-ring
30. Seal Ring
31. Bolt
32. Bolt
33. Bolt
34. Bolts
35. Washers
36. Washer
37. Pin
38. Pin
39. Pin
40. Spring Washer
42. Spacer Sleeve
43. Spacer Sleeve

DIFFERENTIAL

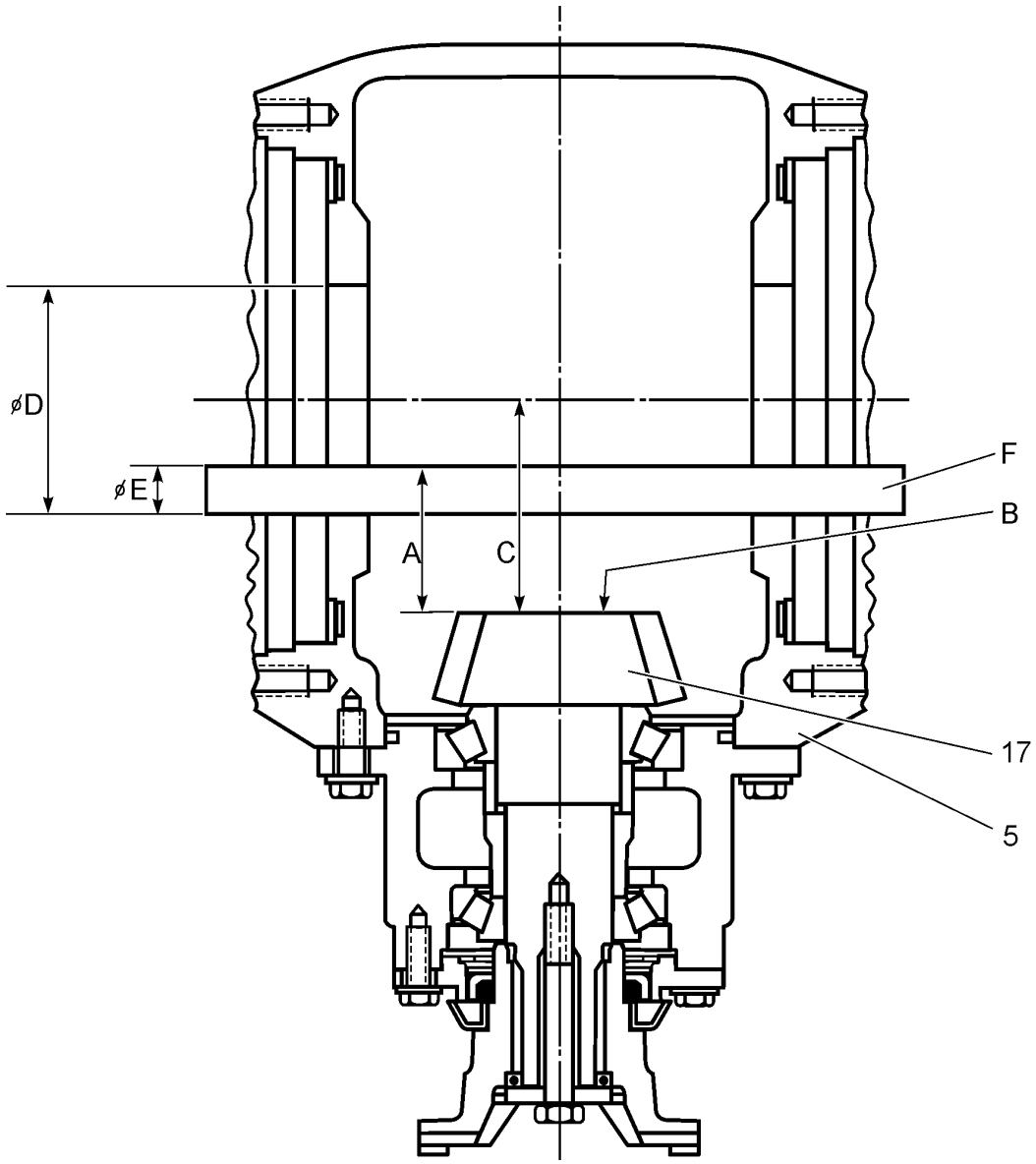


Fig. 7D.49. Dimension (C) Obtaining (Front Axle)

A. Rear Dimension
B. Location of Mounting Distance Stamped on Pinion Shaft
C. Dimension to be obtained
D. Housing Hole Diameter
E. Shaft Diameter
F. Tool Shaft
5. Differential Assy Housing
17. Pinion Shaft

38. Correct tooth contact will result as shown in Fig. 7D.53. Figures 7D.54 through 7D.57 show improper or incorrect tooth contact. To correct such conditions, readjust disc gear and pinion as described on the right side of Figures 7D.54 through 7D.57.

NOTE: *Beside obtaining the correct tooth contact for new gear set, the following disc gear and pinion adjustments can be made to bring the tooth contact back to the original wear pattern for used gear sets.*

ALTERNATOR

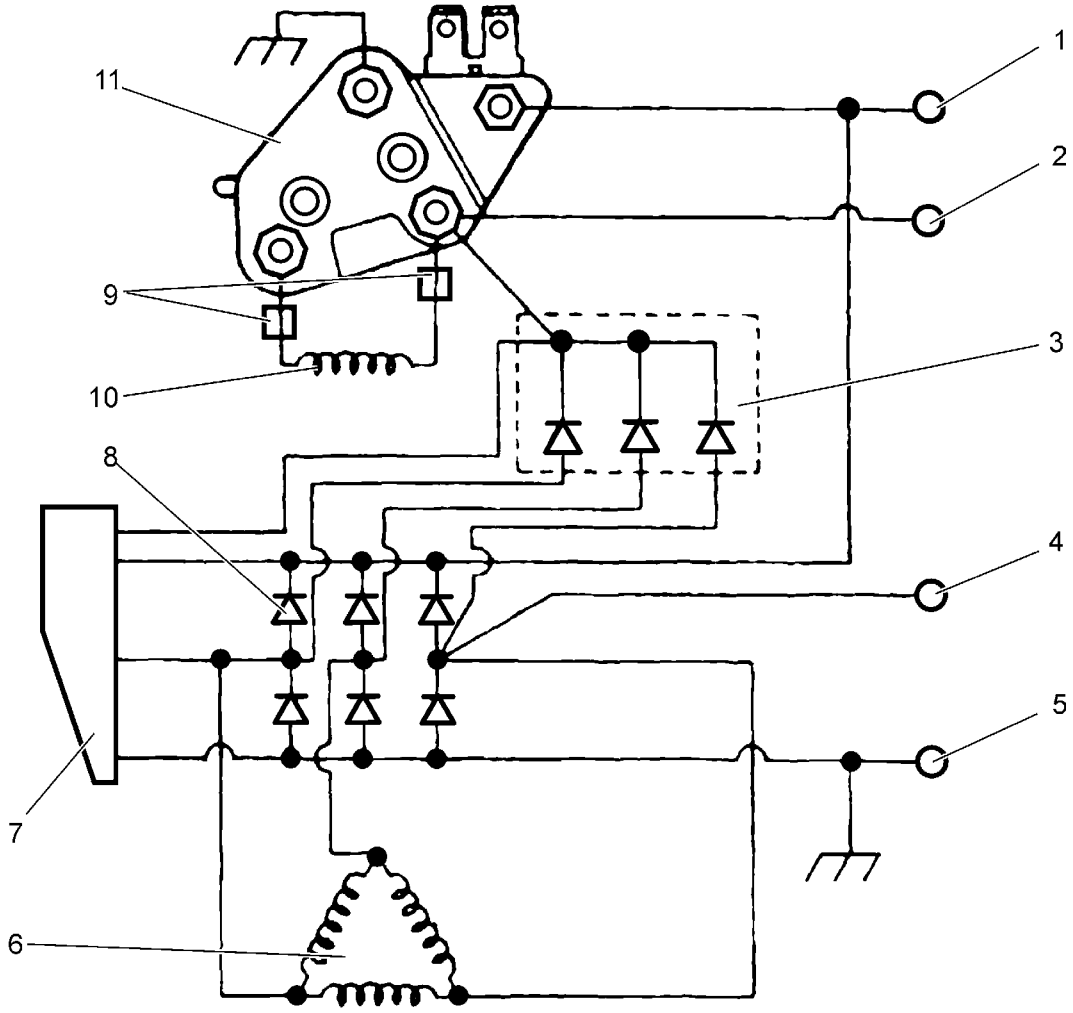


Fig. 8.5. Alternator Schematic

1. Output Terminal
2. Indicator Light Terminal
3. Diode Trio
4. Relay Terminal
5. Ground
6. Stator
7. Auto Start and Trio Assembly
8. Rectifier (bridge)
9. Brushes
10. Rotor (field)
11. Regulator

7. SPECIFICATIONS

Manufacturer type	Delco Remy 22SI 24 [V] /70 [A]
Adjusted voltage at external temp.26.7 [°C]	27.4 ± 0.4 [V]
Adjusted load parallel to the battery	2 [kW]
Permissible voltage change at 5000 [RPM] and load (5 - 95 [%]) max of current	0.5 [V]
Rotor Field Coil Specifications at 26.7 [°C]	9.3÷10.0 [Ω]
	2.4÷2.6 [A]
Cold current output at 1600 [RPM]	15 [A]
at 5000 [RPM]	70 [A]
Weight	6.3 [kg]

BATTERIES

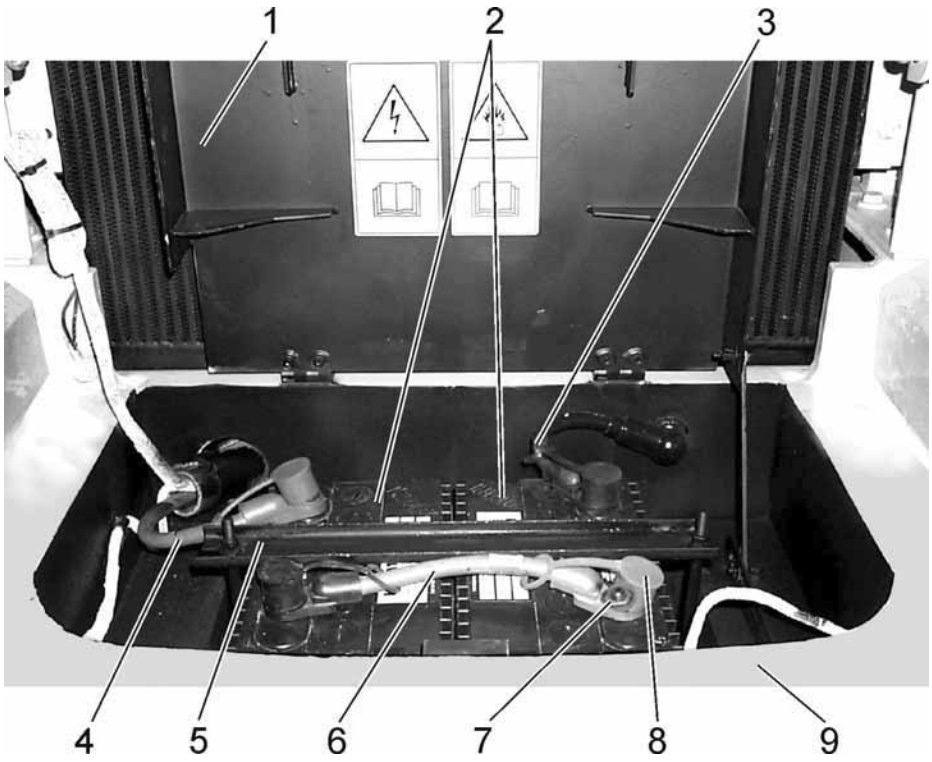


Fig. 8.35. The Batteries Mounting

1. Cover
2. Battery
3. Battery Cable (-)
4. Battery Cable (+)
5. Mounting Bar
6. Battery Cable (+ / -)
7. Nut
8. Cap
9. Counterweight

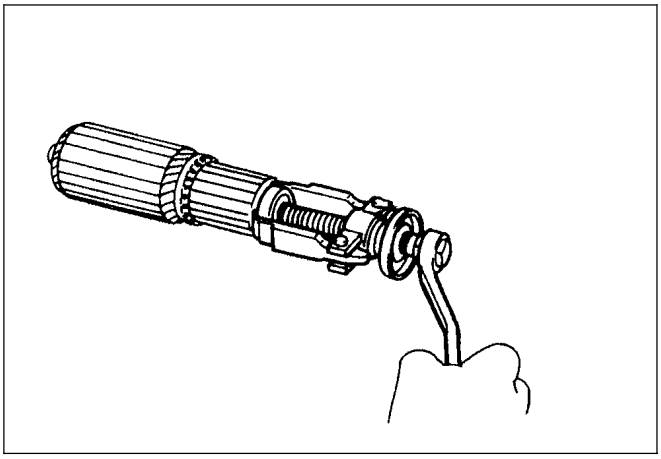
16. ELECTROLYTE STATE OF CHARGE

A battery with a fully charged specific gravity of 1.265 corrected to 26.7 [°C] contains an electrolyte with approximately 36 [%] sulfuric acid by weight or 25 [%] by volume. Pure sulfuric acid has a specific gravity of 1.835. The specific gravity can be measured directly with a hydrometer or determined by the stabilized voltage.

The state-of-charge battery shows the chart below.

Charge Level [%]	Specific Gravity	Voltage [V]
100	1.265	12.68
75	1.225	12.45
50	1.190	12.24
25	1.155	12.06
Discharged	1.120	11.89

CRANKING MOTOR

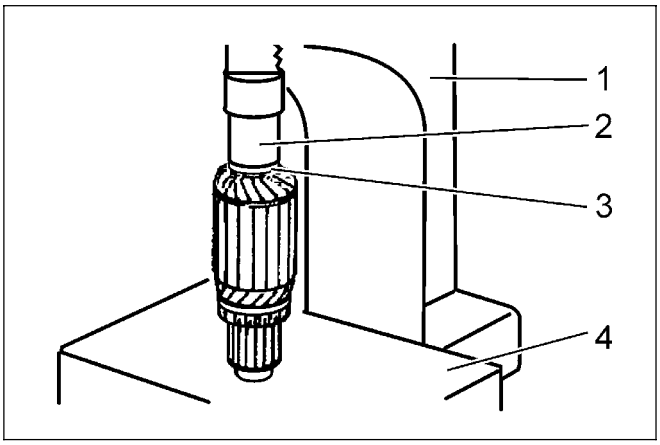


16. IF NECESSARY, REPLACE BEARINGS

a - Using a bearing puller, remove the bearing from both sides.

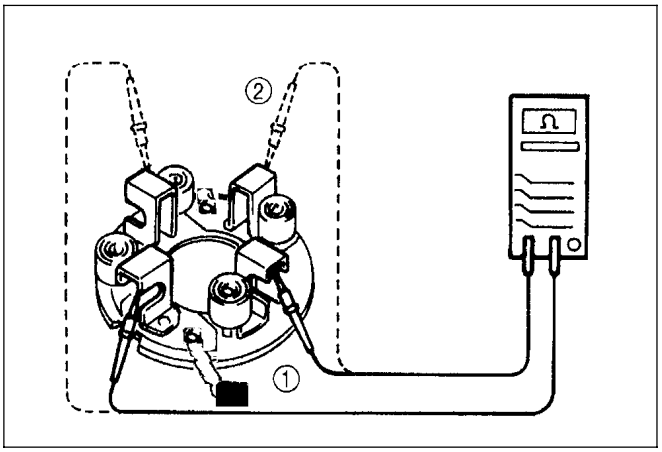
NOTE: *Make sure that the base (4) of press (1) is secure and flat. Use a spacer (2) that is similar to the size shown in Fig. 8.A. For example, a 17 mm socket is suitable. Make sure the bearing (3) is properly installed on the armature shaft.*

IMPORTANT: *Do not use a spacer (2) with an internal diameter greater than 20 [mm]. Using a spacer (2) longer than 50 [mm] may cause damage to the bearing.*



1. Press
2. Spacer
3. Bearing
4. Base

b - Using a press and spacer, press in a new bearing on both sides.



15. INSPECT BRUSH HOLDER INSULATION.

Using an ohmmeter, check for no continuity between the positive (+) and negative (-) brush holders. If there is continuity, replace the brush holder.

NOTE: *Do the inspection at locations 1 and 2 as shown above.*

GENERAL

Steering System

COMPLAINT	
PROBABLE CAUSE	**REMARKS**
Steering inoperative while roading and parking (oil pressure low)	
1. Oil level too low – equipment system inoperative too.	1. Fill hydraulic reservoir to appropriate level. Refer to the OPERATOR'S MANUAL.
2. Relief valve damaged or spoiled.	2. Repair or clean relief valve Refer to STEERING CONTROL VALVE in Section 10B
Steering inoperative or weak while parking (oil pressure low)	
1. Steering and loader equipment system pump damaged – equipment system inoperative too.	1. Repair or replace pump.
2. Steering cylinder leaking.	2. Repair or replace steering cylinder.
Steering obstructed – loader manoeuverability unaffected (oil pressure O.K.)	
1. Steering control valve components friction high.	1. Replace worn components.
2. Steering control valve bearings failed.	2. Replace bearings.
Steering wheel will not return to neutral position, tendency to "motoring"	
1. Steering control valve springs broken.	1. Replace springs.
2. Steering control valve spool and sleeve seized.	2. Clean spool and sleeve or replace with new ones.
No end stop in both directions (oil pressure low)	
1. Relief valve problem.	1. Repair or replace relief valve. Refer to STEERING CONTROL VALVE in Section 10B
2. Steering cylinder damaged.	2. Repair or replace steering cylinder. Refer to Section 10C
3. Steering control valve gerotor gears worn.	3. Replace gerotor gears set.
4. Steering control valve leaks heavy.	4. Replace steering control valve.
No end stop in one direction (oil pressure low in this direction)	
1. Shock & anti-cavitation valve failed.	1. Clean or replace valve. Refer to STEERING CONTROL VALVE in Section 10B
Steering wheel jerky	
1. See **No end stop in both directions.**	
2. Steering control valve cardan shaft and gerotor gears set installed wrongly.	2. Control valve to be installed correctly.
3. Steering control valve springs too weak or broken.	3. Replace springs.
Steering Wheel Excessive Free Movement (in neutral position)	
1. Steering control valve cardan shaft fork worn.	1. Replace shaft.
2. Steering control valve springs broken or fatigued.	2. Replace springs.
3. Steering control valve cardan shaft or sleeve splines worn.	3. Replace worn parts.

VALVES

STEERING CONTROL VALVE

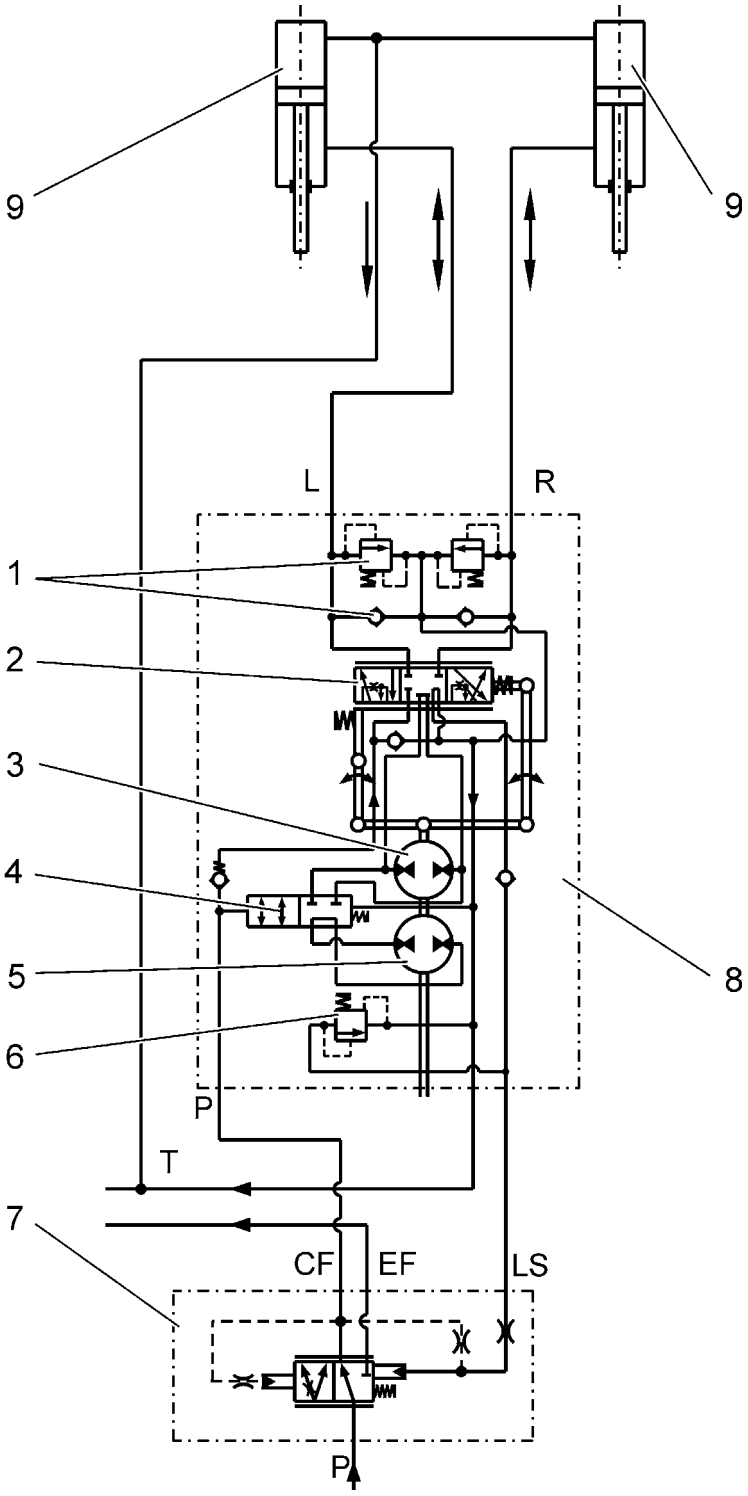


Fig. 10B.1. Steering Unit Diagram – 515G

1. Circuit Shock Valve with Anticavitation Valve 24 [MPa]
2. Steering Spool and Sleeve
3. Main Metering Pump (Gear Set)
4. Activation Spool
5. Auxiliary Metering Pump (Gear Set)
6. Relief Valve 19.5÷21.5 [MPa]
7. Priority Valve
8. Steering Control Valve
9. Steering Cylinder

NOTE: *If accelerator pedal is changed or after calibration downloaded depress pedal (key switch ON) through its complete travel 3 times. This procedure calibrates the new potentiometer with the ECM.*

After checking has been performed, machine must be checked out in actual operation for proper functioning.

NOTE: *If designated engine speeds are not achieved contact witch Authorized Cummins Service.*

5. REMOVAL

1. Position the machine in a place which makes it possible to use a lifting device for lifting of disassembled assemblies.
2. Turn the electrical master switch to the „OFF" position. Lower the bucket on the ground.

WARNING! Make sure the bucket is lowered on the ground and hand brake applied.

WARNING! Before working on the machine turn both the starting switch and electrical master switch to the "OFF" position and the take keys out to prevent accidental starting.

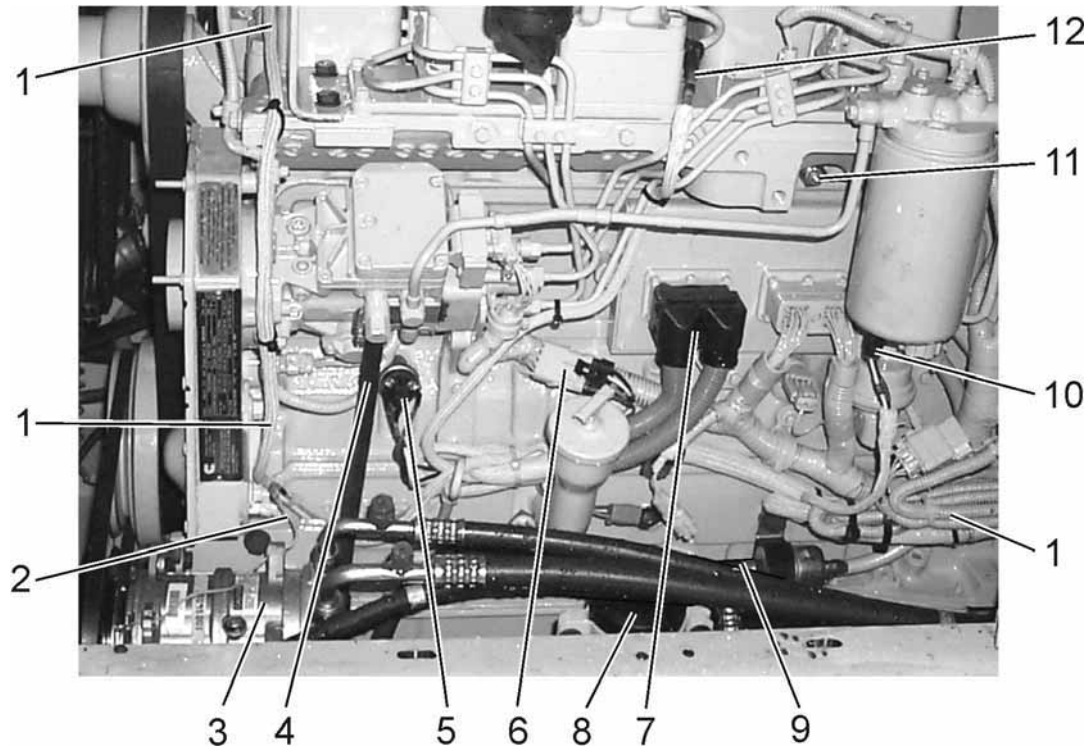


Fig. 12.4. Engine Disconnecting Points (515G RH Side)

1. Wire Harness (OEM)
2. Magnetic Clutch Wire
3. A/C System Compressor
4. Fuel Return Hose
5. Hourmeter Switch
6. Coolant Level Sensor Wire Harness Plug
7. ECM Wire Harness Plug
8. A/C System Dryer
9. Fuel Supply Hose
10. WIF Sensor
11. Coolant Temperature Sensor
12. Engine Inlet Air Heater

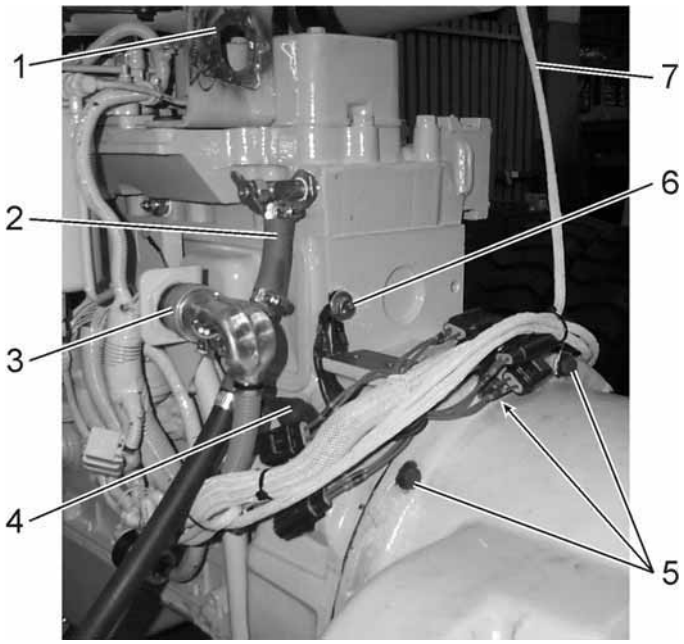


Fig. 12.6. Engine Disassembly Points (515G).

1. Rear Lifting Bracket
2. Cab Heater Supply Hose
3. OEM Wire Harness Plug
4. Tachometer Sensor
5. Bolts
6. Ground Wires (-)
7. Air Cleaner Warning Light Switch

19. Disconnect OEM wire harness plug (3, Fig. 12.6).
20. Remove wire from the engine tachometer sensor (4).
21. Remove ground wires (6) from the engine block.
22. Remove wire from the air cleaner service warning light switch (7).
23. Loose the clamp and remove cab heater supply hose (2).
24. Remove bolt (1, Fig. 12.7) and attach the oil drain hose (2) to engine with the wire.

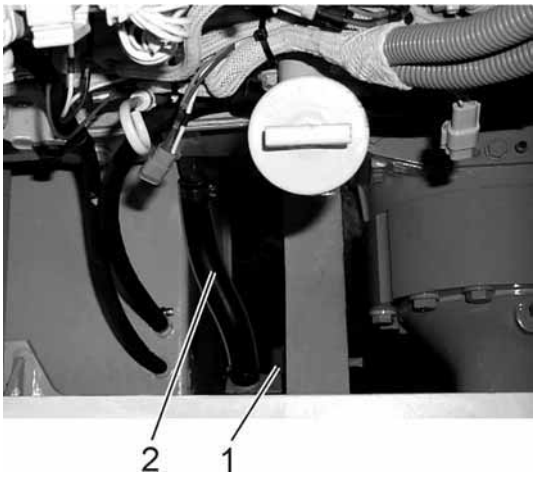


Fig. 12.7. Engine Oil Drain Hose RH Side (520G)

1. Bolt
2. Engine Oil Drain Hose

1. SPECIAL TOOLS AND INSTRUMENTS

Description **P/N of instrument/tool**

1. Tire band puller 1.559.0338
2. “KE-2” tools set for tire removal 67096-67
3. Wheel servicing tooling . . . . . SICAM - TCS 52 NW
4. Large bore adaptor for inflation 854-04-0204

2. DESCRIPTION

Depending on required equipment the machines includes tubeless tires installed on single-piece or three-piece rims. The three-piece rim has tapered bead seat ring secured against slipping out with locking ring installed in rim groove. Tire pressure through rim flange and tapered bead seat ring presses locking ring in rim’s groove to prevent uncontrolled slipping of tire. Such design enables to inflate the tire before installing the wheel to the drive axle. Wheel is mounted to drive axle with bolts. Tire thread pattern varies depending on type of ground.

Additional information on tires is included in Operator’s Manual.

3. SPECIFICATIONS

Wheel and Rims

Type of Tires	**515G**	**515GH**	**520G**
Standard-tubeless	18.4x24 10 PR (G15)	17.5x25 12 PR (L3)	17.5x25 12 PR (L3)
Optional-tubeless (for sandy soil)	17.5x25 12 PR (L2)	17.5x25 12 PR (L2)	17.5x25 12 PR (L2)
Optional-tubeless (for sandy soil)	15.5x25 12 PR (L2)	17.5x25 16 PR (L3)	20.5x25 12 PR (L2)
Optional-tubeless (for rocky ground)	17.5x25 12 PR (L3)		20.5x25 12 PR (L3)
Optional-tubeless (for rocky ground)	15.5x25 12 PR (L3)		17.5x25 16 PR (L3)
Optional-tubeless (for rocky ground)	15.5x25 16 PR (L3)		17.5x25 20 PR (L3)

Inflation Pressure (standard and optional tires)

18.4x24 10 PR – 0.220 [MPa]	20.5x25 12 PR – 0.250 [MPa]	17.5x25 16 PR – 0.375 [MPa]
17.5x25 12 PR – 0.350 [MPa]	15.5x25 12 PR – 0.375 [MPa]	Radial tires – 0.350 [MPa]

Type of Rims

Size of Rims	**515G**	**515GH**	**520G**
Standard	W1GLx24	14 x 25	14x25
Optional	12x25		14.5x25
Optional	14x25		17x25

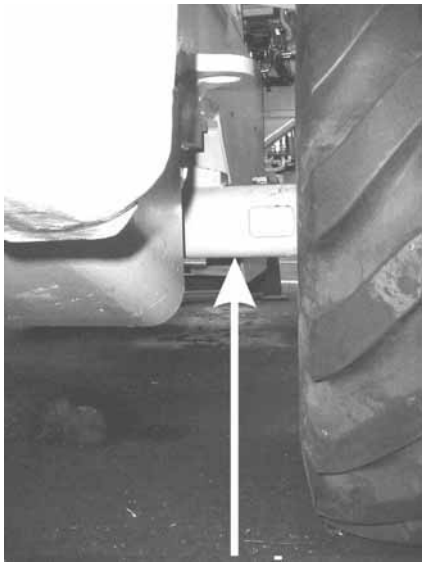


Fig. 15.3. Rear Axle Machine Support Point

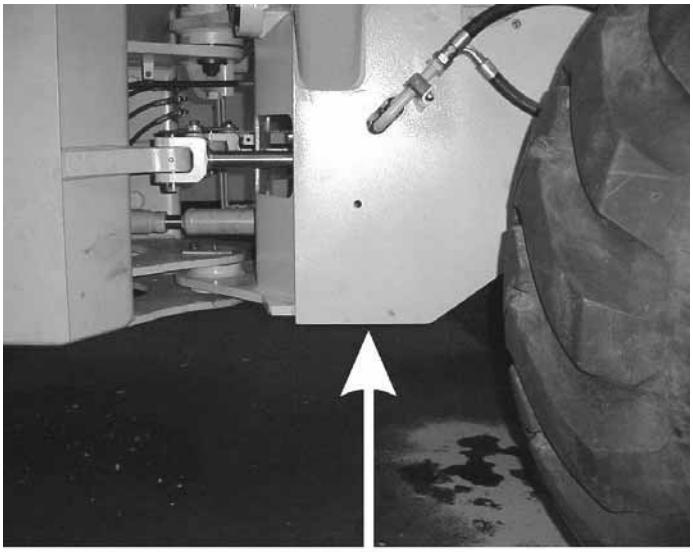


Fig. 15.3A. Front Frame Machine Support Point

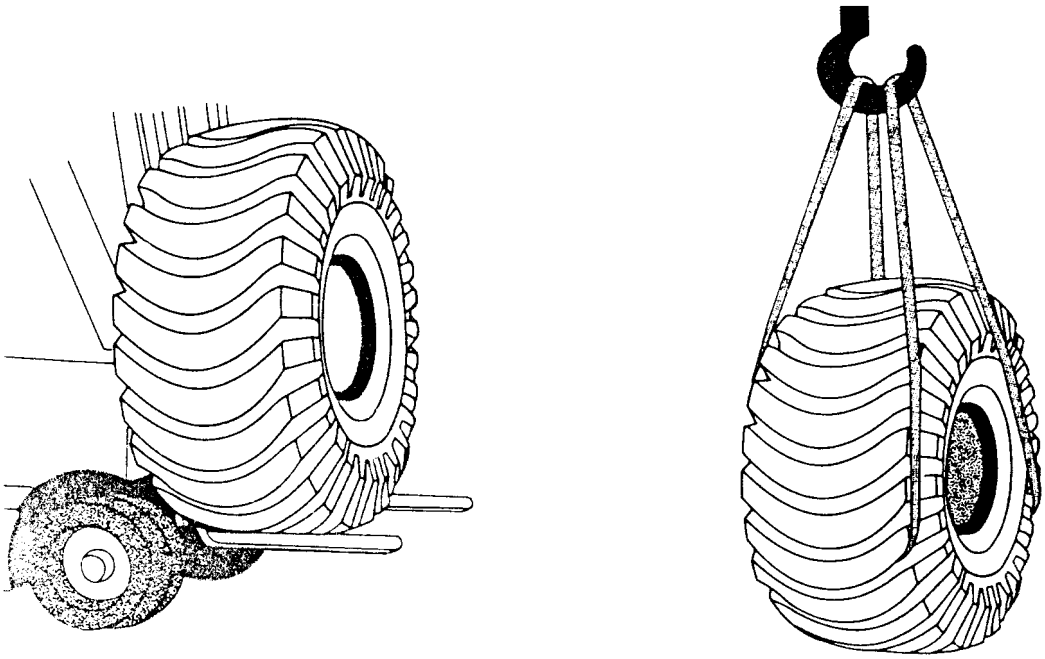
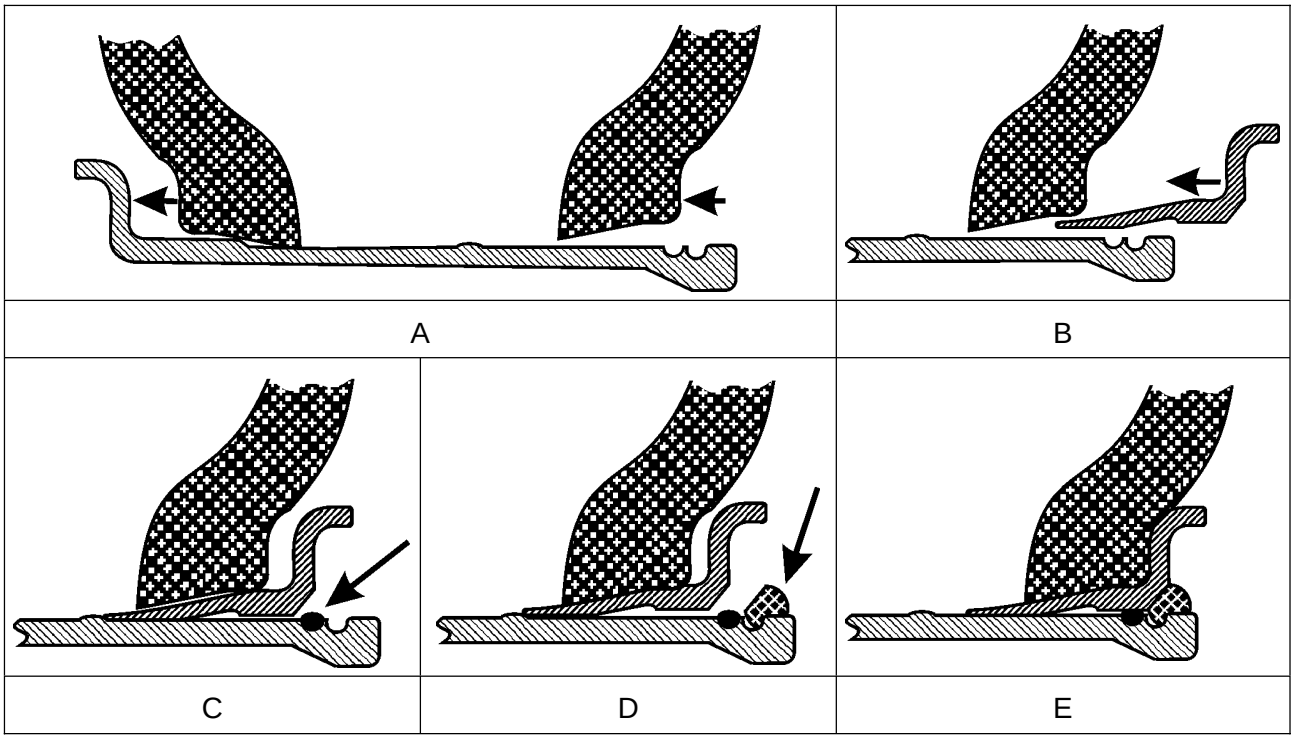


Fig. 15.4. Wheel Lifting Methods



Tire Installing Sequence

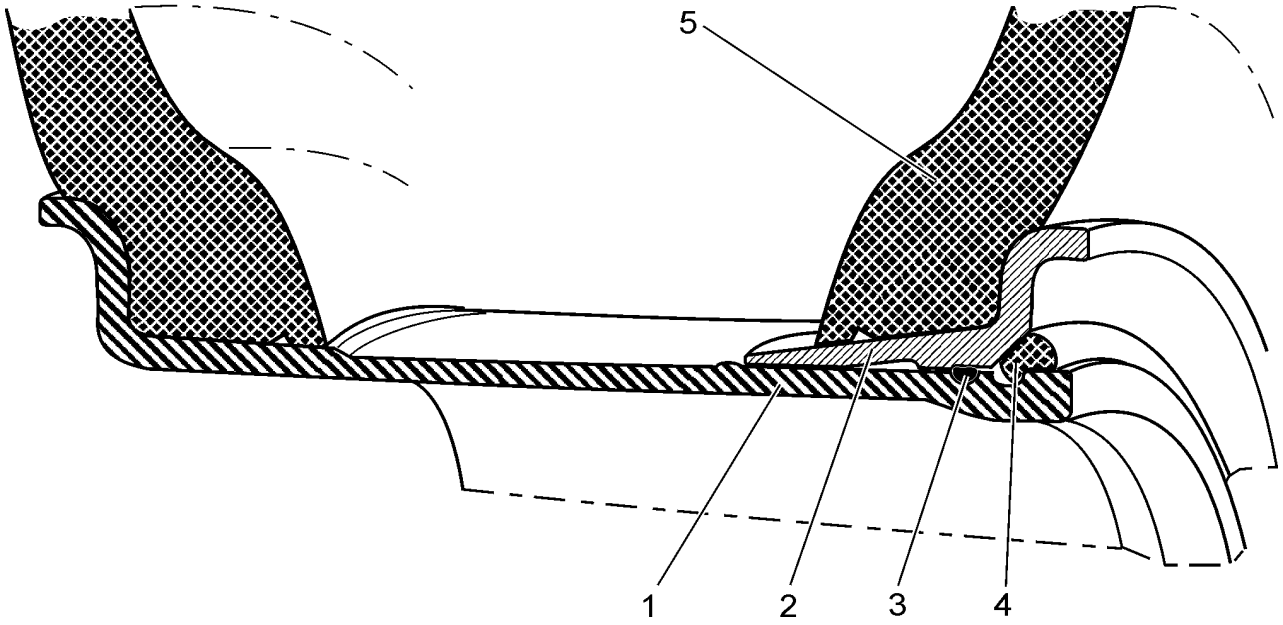


Fig. 15.11. Three-Piece Rim (cross-section)

1. Rim
2. Tapered Bead Seat Ring
3. O - Ring
4. Locking Ring
5. Tire

BOOM AND BUCKET LINKAGE

7. Block under the bucket link (10), unscrew the bolt with washer (6) securing pin (7) to the lever (2) and remove pin (7) using copper hammer 1.519.0142.
8. Unscrew the bolt with washer (6) securing the pin (4) to the lever (2) and remove the pin (4) with shims (11, Fig. 17.2) using copper hammer 1.519.0142. Lift the lever out of the machine.
9. Remove seal rings (13), if required replacement, remove the bushings (2, Fig. 17.4) with spacer sleeve (3) using portable hydraulic ram together with set of discs N°1.547.0396 and driver (see SPECIAL TOOLS).

Bucket Link:

1. Lower the bucket (9, Fig. 17.6) to the ground level and attach a hoist to the bucket link (10).
2. Unscrew the bolt with washer (6) securing the pins (8) to the bucket (9).
3. Remove pin (8) from the bucket eye with shims (12, Fig. 17.2) using copper hammer 1.519.0142.
4. Unscrew the bolt with washer (6, Fig. 17.6) securing the pins (7) to the lever (2) and remove pin (7) with shims (12, Fig. 17.2) using copper hammer 1.519.0142.
5. Lift the bucket link out of the machine and remove the seal rings (6) from their grooves in the bucket link eyes.
6. If bushings (3, Fig. 17.5) required replacement, remove the bushings, using driver 1.519.0658 N°1 and portable hydraulic ram 100 [T] together with set of discs N°1.547.0396. If required, remove two lubrication fittings (2) from the link (1).

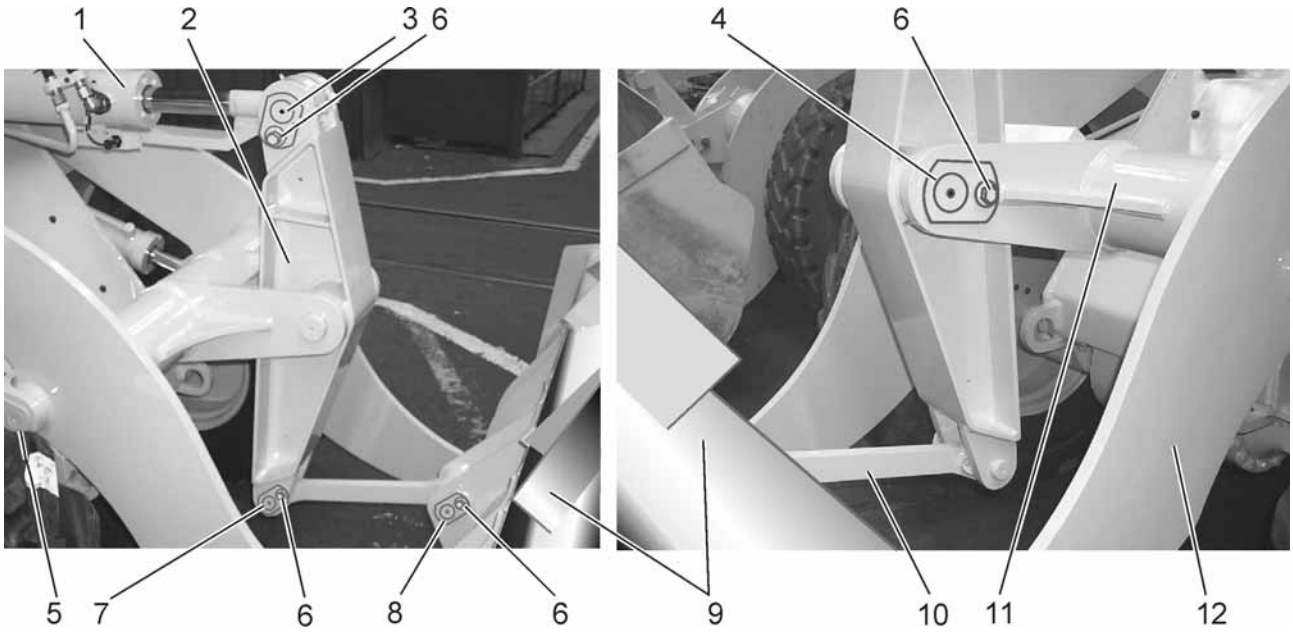


Fig. 17.6. Lever and Bucket Link Disconnect Points

1. Bucket Cylinder
2. Lever
3. Pin
4. Pin
5. Pin
6. Bolt with Washer
7. Pin
8. Pin
9. Bucket
10. Bucket Link Assy
11. Bellcrank
12. Boom