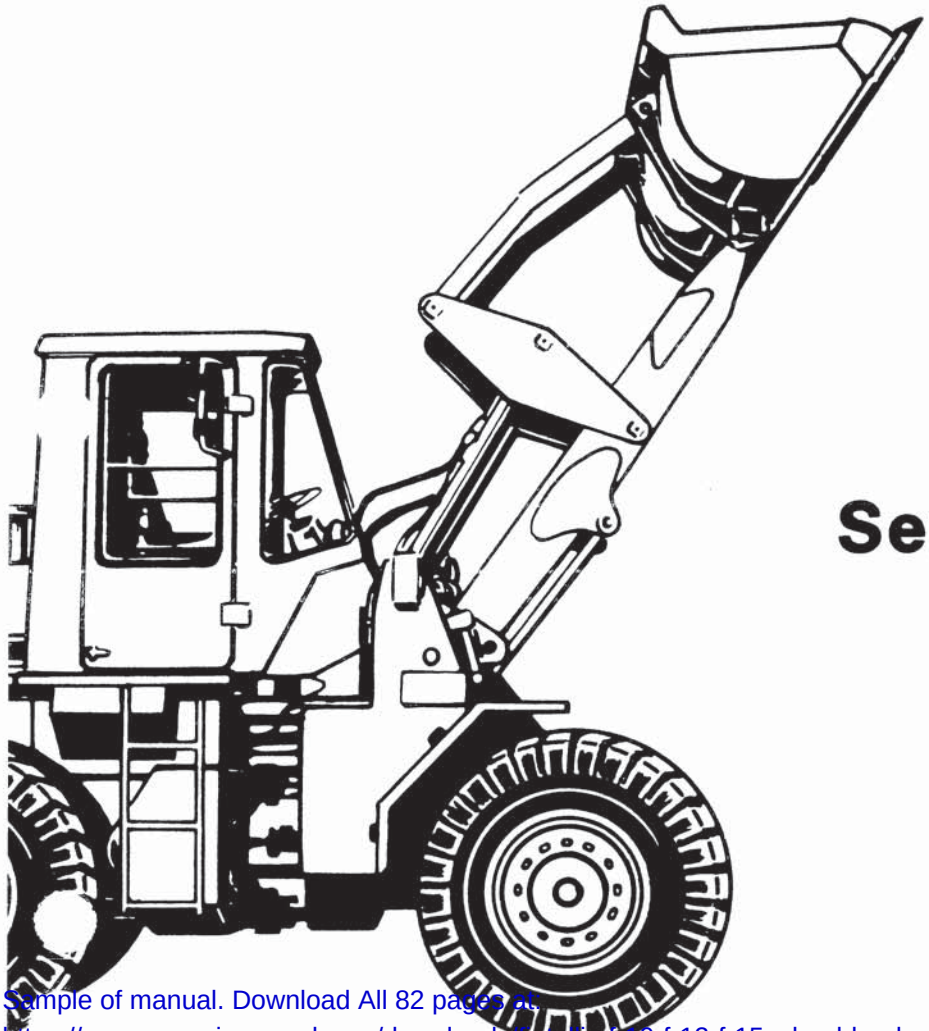
FIATALLIS

FR10
FR12
FR15

WHEEL LOADERS



Axles and drive shafts

Service manual

Form 73148731 English
10/85

AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home or on the highway, are caused by the failure of some individual to follow simple and fundamental safety rules or precautions. For this reason MOST ACCIDENTS CAN BE PREVENTED by recognizing the real cause and doing something about it before the accident occurs.

Regardless of the care used in the design and construction of any type of equipment there are conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.

A careful operator is the best insurance against an accident.
The complete observance of one simple rule would prevent many thousand serious injuries each year.
That rule is:

Never attempt to clean, oil or adjust a machine while it is in motion.

WARNING

On machines having hydraulically, mechanically, and/or cable controlled equipment (such as shovels, loaders, dozers, scrapers, etc.) be certain the equipment is lowered to the ground before servicing, adjusting and/or repairing. If it is necessary to have the hydraulically, mechanically, and/or cable controlled equipment partially or fully raised to gain access to certain items, be sure the equipment is suitably supported by means other than the hydraulic lift cylinders, cable and/or mechanical devices used for controlling the equipment.

FR10,FR12,FR15

wheel loaders

service manual

axles and drive shafts

S/N 78Y00101–UP
S/N 46C00101–UP
S/N 58M00101–UP
S/N 79M00101–UP
S/N 59U00101–UP
S/N 80U00101–UP

Form 73148731 English

⚠ WARNING

STUDY THE OPERATION AND MAINTENANCE INSTRUCTION MANUAL THROUGH BEFORE STARTING, OPERATING, MAINTAINING, FUELING OR SERVICING THIS MACHINE.

⚠ The Operation and Maintenance Instruction Manual provides the instructions and procedures for starting, operating, maintaining, fueling, shutdown and servicing that are necessary for properly conducting the procedures for overhaul of the related components outlined in this Service Manual.

⚠ This symbol is your safety alert sign. It means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**

⚠ Read and heed all safety instructions carrying the signal words **WARNING** and **DANGER.**

⚠ Machine mounted safety signs have been color coded yellow with black borders and lettering for **WARNING** and red with white borders and lettering for **DANGER** points.

SAFETY RULES

GENERAL

Study the Operation and Maintenance Instruction Manual before starting, operating, maintaining, fueling, or servicing machine.

Read and heed all machine-mounted safety signs before starting, operating, maintaining, fueling or servicing machine.

Machine-mounted safety signs have been color coded yellow with black border and lettering for WARNING and red with white border and lettering for DANGER points.

Never attempt to operate the machine or its tools from any position other than seated in the operator's seat. Keep head, body, limbs, hands and feet inside operator's compartment at all times to reduce exposure to hazards outside the operator's compartment.

Do not allow unauthorized personnel to operate, service or maintain this machine.

Always check work area for dangerous features. The following are examples of dangerous work areas: slopes, overhangs, timber, demolitions, fire, high walls, dropoff, backfills, rough terrain, ditches, ridges, excavations, heavy traffic, crowded parking, crowded maintenance and closed areas. Use extreme care when in areas such as these.

An operator must know the machine's capabilities. When working on slopes or near dropoffs be alert to avoid loose or soft conditions that could cause sudden tipping or loss of control.

Do not jump on or off machine. Keep two hands and one foot, or two feet and one hand, in contact with steps, grab rails and handles at all times.

Do not use controls or hoses as handholds when climbing on or off machine. Hoses and controls are movable and do not provide a solid support. Controls also may be inadvertently moved causing accidental machine or equipment movement.

Keep operator's compartment, stepping points, grab-rails and handles clear of foreign objects, oil, grease, mud or snow accumulation to minimize the danger of slipping or stumbling. Clean mud or grease from shoes before attempting to mount or operate the machine.

Be careful of slippery conditions on stepping points, hand rails, and on the ground. Wear safety boots or shoes that have a high slip resistant sole material.

For your personal protection, do not attempt to climb on or off machine while machine is in motion.

Never leave the machine unattended with the engine running.

Always lock up machine when leaving it unattended. Return keys to authorized security. Heed all shutdown procedures of the Operation and Maintenance Instruction Manual. Always set the parking brake when leaving the machine for any reason.

Do not wear rings, wrist watches, jewelry, loose or hanging apparel, such as ties, torn clothing, scarves, unbuttoned, or unzipped jackets that can catch on moving parts. Wear proper safety equipment as authorized for the job. Examples: hard hats, safety shoes, heavy gloves, ear protectors, safety glasses or goggles, reflector vests, or respirators. Consult your employer for specific safety equipment requirements.

Do not carry loose objects in pockets that might fall unnoticed into open compartments.

Do not use machine to carry loose objects by means other than attachments for carrying such objects.

DO NOT CARRY RIDERS unless the machine is equipped for carrying people to reduce personal exposure to being thrown off.

Do not operate machinery in a condition of extreme fatigue or illness. Be especially careful towards the end of the shift.

Roll Over Protective Structures are required on wheel loaders, dozer tractors, track type loaders, graders and scrapers by local or national requirements. DO NOT operate this machine without a Roll over Protective Structure.

Do not operate a machine without a falling object protective structure (FOPS).

Do not operate this machine without a rear canopy screen when machine is equipped with rear mounted towing winch.

Seat belts are required to be provided with roll over protective structures or roll protection cabs by local or national regulations. Keep the safety belt fastened around you during operation.

Where noise exposure exceeds 90 dBA for 8 hours, wear authorized ear protective equipment per local or national requirements that apply.

Keep clutches and brakes on machine and attachments such as power control units, winches and master clutches adjusted according to Operation and Maintenance Instruction Manuals of the manufacturers at all times. DO NOT adjust machine with engine running except as specified.

Do not operate a machine with brakes out of adjustment. See the Operation and Maintenance Instruction Manual.

Move carefully when under, in or near machine or implements. Wear required protective equipment, such as hard hat, safety glasses , safety shoes, ear protectors.

To move a disabled machine, use a trailer or low boy truck if available. If towing is necessary, provide warning signals as required by local rules and regulations and follow Operation and Maintenance Instruction Manual recommendations. Load and unload on a level area that gives full support to the trailer wheels. Use ramps of adequate strength, low angle and proper height. Keep trailer bed clean of clay, oil and all materials that become slippery. Tie machine down securely to truck or trailer bed and block tracks (or wheels) as required by the carrier.

To prevent entrapment in cabs or mounted enclosures, observe and know the mechanics of alternate exit routes.

On machines equipped with suction radiator fans, be sure to periodically check all engine exhaust parts fcr leaks as exhaust gases are dangerous to the operator. Keep a vent open to outside air at all times when operating within a closed cab.

STARTING FLUID IS FLAMMABLE. Follow the recommendations as outlined in the Operation and Maintenance Instruction Manual and as marked on the containers. Store containers in cool, well-ventilated place secure from unauthorized personnel. DO NOT PUNCTURE OR BURN CONTAINERS. Follow the recommendations of the manufacturer for storage and disposal.

Wire rope develops steel slivers. Use authorized protective equipment such as heavy gloves, safety glasses when handling.

SAFETY RULES

OPERATION

Before starting machine, check, adjust and lock the operator's seat for maximum comfort and control of the machine.

DO NOT START OR OPERATE AN UNSAFE MACHINE. Before working the machine, be sure that any unsafe condition has been satisfactorily remedied Check brakes, steering and attachment controls before moving Advise the proper maintenance authority of any malfunctioning part or system Be sure all protective guards or panels are in place, and all safety devices provided are in place and in good operating condition

Check instruments at start-up and frequently during operation

Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases

Be sure exposed personnel in the area of operation are clear of the machine before moving the machine or its attachments WALK COMPLETELY AROUND machine before mounting Sound horn. Obey flagman safety signals and signs

Know the principles of cross steering of crawler tractors Read section in Operation and Maintenance Instruction Manual on cross steering.

Keep engine exhaust system and exhaust manifolds clear of combustible material Equip machine with screens and guards when working under conditions of flying combustible material

If engine has a tendency to stall for any reason under load or idle, report this for adjustment to a proper maintenance authority immediately. Do not continue to operate machine until condition has been corrected

Never use bucket as a man-lift

Use recommended bucket for machine and material loadability and heaping characteristics of material, terrain, and other pertinent job conditions

Avoid abrupt starts and stops when transporting a loaded bucket.

Inspect your seat belt webbing and hardware at least twice a year for signs of fraying, wear or other weakness that could lead to failure

Use only designated towing or pulling attachment points Use care in making attachment Be sure pins and locks as provided are secure before pulling. Stay clear of drawbars, cables or chains under load

When pulling or towing through a cable or chain, do not start suddenly at full throttle. Take up slack carefully Guard against kinking chains or cables Inspect carefully for flaws before using Do not pull through a kinked chain or cable due to the high stresses and possibility of failure of the kinked area Aways wear heavy gloves when handling chain or cable

Be sure cables are anchored and the anchor point is strong enough to handle the expected load. Keep exposed personnel clear of anchor point and cable or chain DO NOT PULL OR TOW UNLESS OPERATORS COMPARTMENTS OF MACHINES INVOLVED ARE PROPERLY GUARDED AGAINST POTENTIAL CABLE OR CHAIN BACKLASH

During operation always carry ripper in full raised position when not in use and lower to ground when parked

When counterweights have been provided, do not work machine if they have been removed unless their equivalent weight has been replaced See the Operation and Maintenance Instruction Manual

When operating a machine know what clearances will be encountered, overhead doors, wires, pipes, aisles, roadways, also the weight limitations of ground, floor, and ramps

Know bridge and culvert load limits and do not exceed them Know machine's height, width, and weight Use a signal person when clearance is close

Be sure that the exact location of gas lines, utility lines, sewers, overhead and buried power lines, and other obstructions or hazards are known. Such locations should be precisely marked by the proper authorities to reduce the risk of accidents Obtain shut-down or relocation of any such facilities before starting work, if necessary.

Be certain to comply with all local, state, and federal regulations regarding working in the vicinity of power lines.

When roading find out what conditions are likely to be met - clearances, congestion, type of surface, etc. Be aware of fog, smoke or dust elements that obscure visibility

When backing, always look to where the machine is to be moved Be alert to the position of exposed personnel. DO NOT OPERATE if exposed personnel enter the immediate work area

Never travel a machine on a job site, in a congested area, or around people without a signal person to guide the operator.

In darkness, check area of operation carefully before moving in with machine. Use all lights provided Do not move into area of restricted visibility.

Maintain clear vision of all areas of travel or work. Keep cab windows clean and repaired. Carry blade low for maximum visibility while traveling. Obtain and use fan blast deflectors where tractors are used as pusher tractors in tandem.

Transport a loaded bucket with the bucket as far tipped back and in as low a position as possible for maximum visibility, stability, and safest transport of the machine Carry it at a proper speed for the load and ground conditions.

Carry the bucket low when traveling with a load.

Maintain a safe distance from other machines. Provide sufficient clearance for ground and visibility conditions Yield right-of-way to loaded machines.

Avoid going over obstacles such as rough terrain, rocks, logs, curbs, ditches, ridges, and railroad tracks whenever possible When obstructions must be crossed, do so with extreme care at an angle if possible Reduce speed - down-shift Ease up to the breakover point - pass the balance point slowly on the obstruction and ease down on the other side

Cross gullies or ditches at an angle with reduced speed after insuring ground conditions will permit a safe traverse.

Be alert to soft ground conditions close to newly constructed walls The fill material and weight of machine may cause the wall to collapse under the machine

Operate at speeds slow enough to insure complete control at all times Travel slowly over rough ground, on slopes or near dropoffs, in congested areas or on ice or slippery surfaces

SAFETY RULES

Be alert to avoid changes in traction conditions that could cause loss of control DO NOT drive on ice or frozen ground conditions when working the machine on steep slopes or near dropoffs

Keep the machine well back from the edge of an excavation

Be especially careful when traveling up or down slopes Position the bucket in such a way as to provide a possible anchorage on the ground in case of a slide

When proceeding across a hillside proceed slowly Never turn sharply uphill or downhill

Avoid sidehill travel whenever possible Drive up and down the slope Should the machine start slipping sideways on a grade, turn it immediately downhill

In steep downhill operation, do not allow engine to overspeed Select proper gear before starting downgrade

There is no substitute for good judgement when working on slopes

The grade of slope you should attempt will be limited by such factors as condition of the ground, load being handled, the type of machine, speed of machine and visibility

NEVER COAST the machine down grades and slopes with the transmission in neutral on power shift machines, or clutch disengaged on manually shifted machines

To reduce the danger of an uncontrolled machine, choose a gear speed before proceeding down grade that will hold machine to proper speeds for conditions

Operating in virgin rough terrain that includes previously mentioned hazards is called pioneering Be sure you know how this is done Danger from falling branches and upturning roots is acute in these areas

When pushing over trees, the machine must be equipped with proper overhead guarding Never allow a machine to climb up on the root structure particularly while the tree is being felled Use extreme care when pushing over any tree with dead branches

Avoid brushpiles, logs or rocks DO NOT DRIVE THE MACHINE ONTO BRUSHPILES, LOGS, LARGE ROCKS or other surface irregularities that break traction with the ground especially when on slopes or near dropoffs

Avoid operating equipment too close to an overhang or highwall either above or below the machine Be on the lookout for caving edges falling objects and slides Beware of concealment by brush and undergrowth of these dangers

Park in a non-operating and non traffic area or as instructed Park on firm level ground if possible Where not possible, position machine at a right angle to the slope, making sure there is no danger of uncontrolled sliding movement Set the parking brake

Never park on an incline without carefully blocking the machine to prevent movement

If parking in traffic lanes cannot be avoided, provide appropriate flags, barriers, flares and warning signals as required Also provide advance warning signals in the traffic lane for approaching traffic

Move the machine away from pits, trenches, overhangs and overhead power lines before shutting down for the day

When stopping operation of the machine for any reason, always return the transmission or hydrostatic drive control to neutral and engage the control lock to secure the machine for a safe start up Set parking brake, if so equipped

Never lower attachments or tools from any position other than seated in operator's seat Sound the horn Make sure the area near the attachment is clear Lower the attachment slowly DO NOT USE float position to lower hydraulic equipment

Always before leaving the operator's seat and after making certain all people are clear of the machine, slowly lower the attachments or tools flat to the ground in a positive ground support position Move any multipurpose tool to positive closed position Return the controls to hold Place transmission control in neutral and move engine controls to off position Engage all control locks, set parking brake, and open and lock the master (key, if so equipped) switch Consult Operation and Maintenance Instruction Manual

Always follow the shut-down instructions as outlined in the Operation and Maintenance Instruction Manual

MAINTENANCE

Do not perform any work on equipment that is not authorized Follow the Maintenance or Service Manual Procedures

Machine should not be serviced with anyone in the operator's seat unless they are qualified to operate the machine and are assisting in the servicing

Shut off engine and disengage the Power Take-Off lever if so equipped before attempting adjustments or service

Always turn the master switch (key switch if so equipped) to the off position before cleaning, repairing, or servicing and when parking machine to forestall unintended or unauthorized starting

Disconnect batteries and TAG all controls according to local or national requirements to warn that work is in progress Block the machine and all attachments that must be raised per local or national requirements

Never lubricate, service or adjust a machine with the engine running, except as called for in the Operation and Maintenance Instruction Manuals Do not wear loose clothing or jewelry near moving parts

Do not run engine when refueling and use care if engine is hot due to the increased possibility of a fire if fuel is spilled

Do not smoke or permit any open flame or spark near when refueling, or handling highly flammable materials

Always place the fuel nozzle against the side of the filler opening before starting and during fuel flow To reduce the chance of a static electricity spark, keep contact until after fuel flow is shut off

Do not adjust engine fuel pump when the machine is in motion

Never attempt to check or adjust fan belts when engine is running

When making equipment checks that require running of the engine, have an operator in the operator's seat at all times with the mechanic in sight Place the transmission in neutral and set the brakes and lock KEEP HANDS AND CLOTHING AWAY FROM MOVING PARTS

SAFETY RULES

Avoid running engine with open unprotected air inlets If such running is unavoidable for service reasons, place protective screens over all inlet openings before servicing engine

Do not place head, body, limbs, feet, fingers, or hands near rotating fan or belts Be especially alert around a pusher fan

Keep head, body, limbs, feet, hands, and fingers away from bucket, blade or ripper when in raised position

If movement of an attachment by means of machine's hydraulic system or winches is required for service or maintenance, do not raise or lower attachments from any position other than when seated in the operator's seat Before starting machine or moving attachments or tools, set brakes, sound horn and call for an all clear Raise attachments slowly

Never place head, body, limbs, fingers, feet or hands into an exposed portion between uncontrolled or unguarded scissor points of machine without first providing secure blocking

Never align holes with fingers or hands - Use the proper aligning tool

Disconnect batteries before working on electrical system or repair work of any kind

Check for fuel or battery electrolyte leaks before starting service or maintenance work Eliminate leaks before proceeding

BATTERY GAS IS HIGHLY FLAMMABLE. Leave battery box open to improve ventilation when charging batteries. Never check charge by placing metal objects across the posts Keep sparks or open flame away from batteries Do not smoke near battery to guard against the possibility of an accidental explosion

Do not charge batteries in a closed area. Provide proper ventilation to guard against an accidental explosion from an accumulation of explosive gases given off in the charging process.

Be sure to connect the booster cables to the proper terminals (+ to +) and (− to −) at both ends Avoid shorting clamps Follow the Operation and Maintenance Instruction Manual procedure.

Due to the presence of flammable fluid, never check or fill fuel tanks, storage batteries, or use starter fluid near lighted smoking materials or open flame or sparks.

Rust inhibitors are volatile and flammable Prepare parts in well ventilated place. Keep open flame away - DO NOT SMOKE. Store containers in a cool well-ventilated place secured against unauthorized personnel.

Do not use an open flame as a light source to look for leaks or for inspection anywhere on the machine.

DO NOT pile oily or greasy rags - they are a fire hazard. Store in a closed metal container

Never use gasoline or solvent or other flammable fluid to clean parts. Use authorized commercial, non-flammable, non-toxic solvents

Never place gasoline or diesel fuel in an open pan.

Shut off engine and be sure all pressure in system has been relieved before removing panels, housings, covers, and caps. See Operation and Maintenance Instruction Manual

Do not remove hoses or check valves in the hydraulic system without first removing load and relieving pressure on the supporting cylinders

Turn radiator cap slowly to relieve pressure before removing Add coolant only with engine stopped or idling if hot See Operation and Maintenance Instruction Manual

Fluid escaping under pressure from a very small hole can almost be invisible and can have sufficient force to penetrate the skin Use a piece of cardboard or wood to search for suspected pressure leaks DO NOT USE HANDS If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately

Never use any gas other than dry nitrogen to charge accumulators See Operation and Maintenance Instruction Manual

When making pressure checks use the correct gauge for expected pressure. See the Operation and Maintenance Instruction Manual or Service Manuals for guidance

For field service, move machine to level ground if possible and block machine If work is absolutely necessary on an incline, block machine and its attachments securely. Move the machine to level ground as soon as possible.

Brakes are inoperative when manually released for servicing. Provision must be made to maintain control of the machine by blocking or other means.

Block all wheels before bleeding or disconnecting any brake system lines and cylinders

Never use makeshift jacks when adjusting track tension. Follow the Undercarriage Service Manual.

Know your jacking equipment and its capacity. Be sure the jacking point used on the machine is appropriate for the load to be applied. Be sure the support of the jack at the machine and under the jack is appropriate and stable. Any equipment up on a jack is dangerous. Transfer load to appropriate blocking as a safety measure before proceeding with service or maintenance work according to local or national requirements.

Always block with external support any linkage or part on machine that requires work under the raised linkage, parts, or machine per local or national requirements. Never allow anyone to walk under or be near unblocked raised equipment. Avoid working or walking under raised blocked equipment unless you are assured of your safety.

When servicing or maintenance requires access to areas that cannot be reached from the ground, use a ladder or step platform that meets local or national requirements to reach the service point. If such ladders or platforms are not available, use the machine handholds and steps as provided. Perform all service or maintenance carefully.

Shop or field service platforms and ladders used to maintain or service machinery should be constructed and maintained according to local or national requirements

Lift and handle all heavy parts with a lifting device of proper capacity Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch out for people in the vicinity.

SAFETY RULES

In lifting and handling heavy parts, slings must be of adequate strength for the purpose intended and must be in good condition

Handle all parts with extreme care Keep hands and fingers from between parts Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.

When using compressed air for cleaning parts use safety glasses with side shields or goggles Limit the pressure to 207 kPa (30psi) according to local or national requirements

Wear welders protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes when welding or burning Wear dark safety glasses near welding DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION

Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hat, safety shoes, heavy gloves when metal or other particles are apt to fly or fall

Use only grounded auxiliary power source for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shock.

Keep maintenance area CLEAN and DRY. Remove water or oil slicks immediately.

Remove sharp edges and burrs from reworked parts.

Be sure all mechanics tools are in good condition. DO NOT use tools with mushroomed heads. Always wear safety glasses with side shields.

Do not strike hardened steel parts with anything other than a soft iron or non-ferrous hammer.

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FOREWORD

Always furnish serial number if making an inquiry to dealer or factory about this machine.

Many equipment owners employ the Dealer's Service Department for all work other than routine lubrication and minor service. This practice is encouraged, as our Dealers are well informed and equipped to render efficient service by factory trained mechanics.

Illustrations show standard and optional items.

IMPORTANT

The information in this manual was current at the time of publication. It is our policy to constantly improve our product and to make available additional optional items. These changes may affect procedures outlined in this manual. If variances are observed, verify the information through your Dealer.

TOPIC 1 GENERAL DESCRIPTION

1.1SCOPE OF MANUAL

1.1.1
The purpose of this manual is to guide you by use of pictures and supporting instructions through the operation and maintenance of the FR10,FR12 and FR15 Wheel Loader Axles and Drive Shafts.

1.1.2
The manual contains a troubleshooting chart and instructions for the removal, disassembly and installation of the axle. In addition, miscellaneous information such as lubrication requirements (Topic 12), torque values and wear limits (Topic 11) are also included.

1.1.3
Instructions pretaining to the wheels (Topic 3) and drive shafts (Topics 7,7A) are also included. Special instructions for the optional NoSpin Differential are contained in (Topic 6).

1.2 EQUIPMENT DESCRIPTION

1.2.1
The planetary axle, as illustrated in Fig.1, is comprised of these major groups of parts: hypoid bevel gear and pinion set, differential assembly, two axle shafts and two planetary gear sets. Also see Fig.2.

1.2.2
The wheel end or planetary hub basically consists of a floating ring gear, a sun gear and three planetary pinions which rotate on tapered roller bearings.

1.2.3
The axle assembly also consists of the wheel assembly on which the tires will be directly mounted. A common oil level exists between the wheel end and the differential.

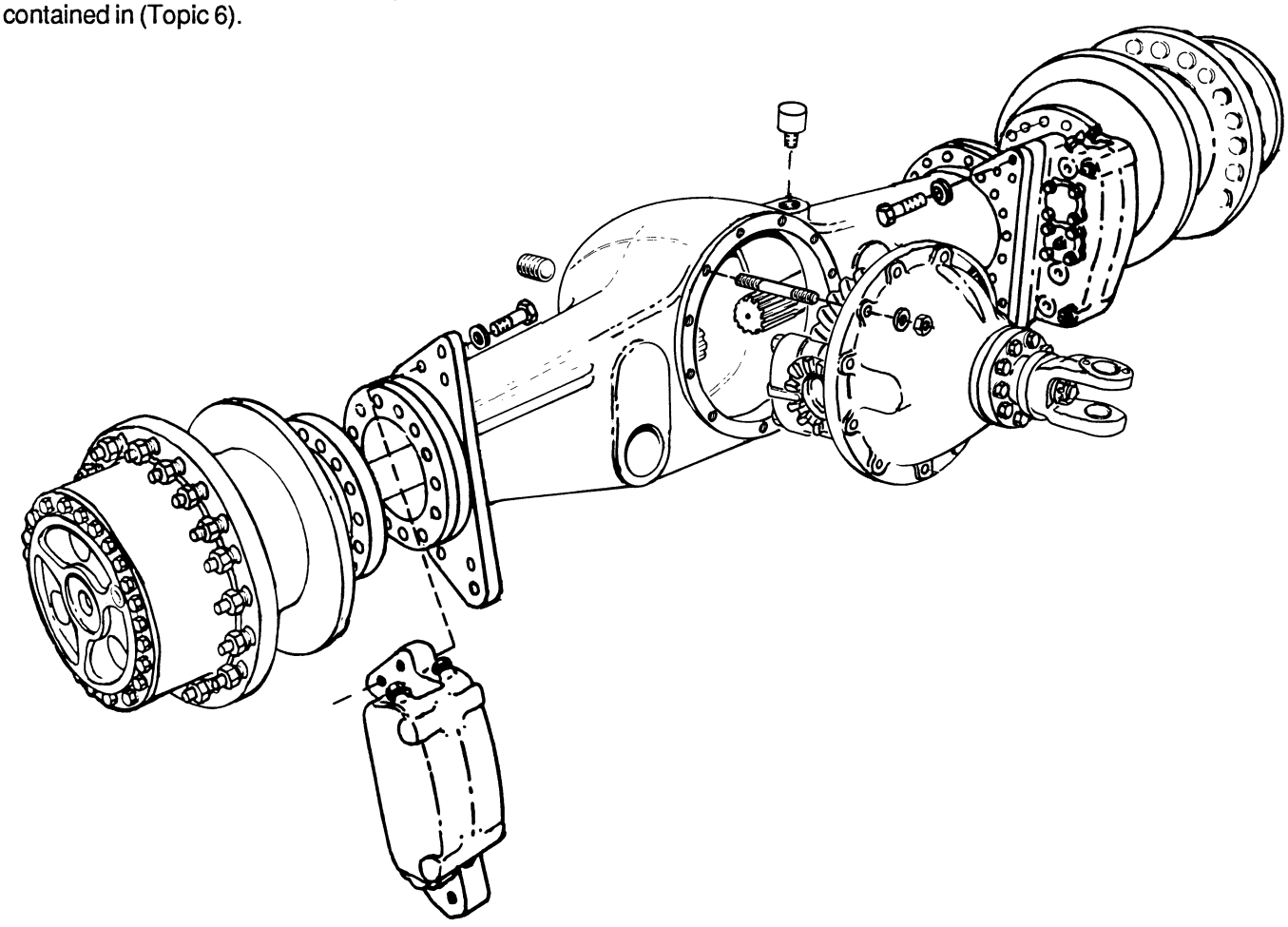

FIG.1 PLANETARY AXLE T-80384

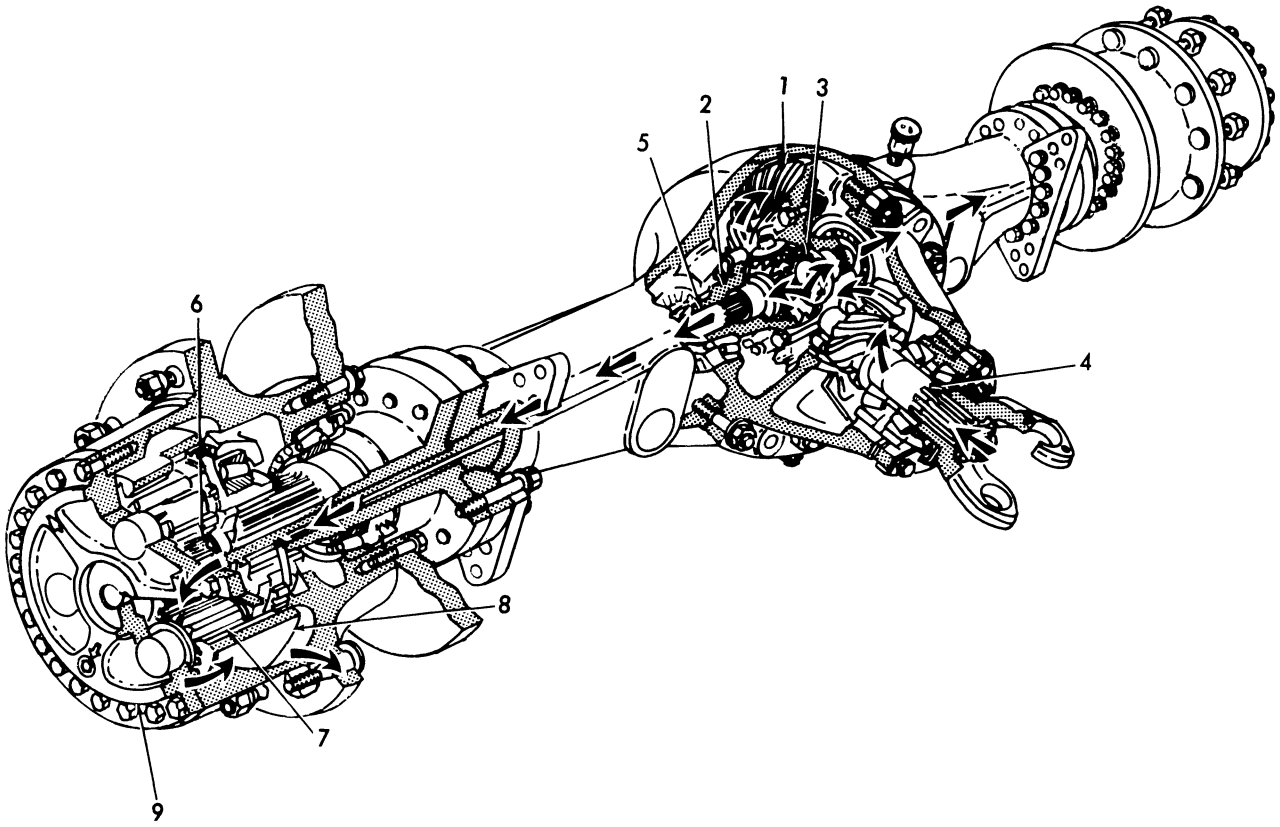

FIG.2 PLANETARY AXLE (Cross-section) T-84958

1.Ring gear
2.Case
3.Spider assy.
4.Pinion
5.Axle shaft
6.Sun gear
7.Planet gears
8.Ring gear
9.Carrier

1.3 FUNCTIONAL DESCRIPTION

1.3.1
Follow the arrows in Fig.2 to trace the power distribution from the drive shafts to the wheels.

1.3.2
The engine power is transferred through the transmission down the drive lines to the bevel pinion. The pinion, in turn, drives the ring gear (1). The ring gear, differential case (2), spider assembly (3) and pinion (4) rotate and interact with each other to deliver power to both axle shafts (5).

1.3.3
At the end of the axle shaft is located the planetary sun gear (6) which drives three planetary gears (7). The pinions ride inside of the floating ring gear (8), causing the planet carrier (9) to turn. The planet carrier is attached directly to the wheel assembly which transmits the final driving torque to the ground. The planetary ring gear transfers a reaction torque to the spindle through the ring gear hub.

1.4 THE DIFFERENTIAL ASSEMBLY

1.4.1.
To better understand this brief description of the differential assembly, remember that the driving torque, goes from the bevel pinion (4), Fig.2, through the differential assembly (3) to the axle shafts (5). As the power passes through the differential, the differential assembly compensates for the DIFFERENT relative speeds of the wheels. That is, while the loader is turning or traveling over uneven terrain, it is necessary for one wheel to travel faster than the other wheel on the same axle. The differential assembly will allow one wheel to rotate faster than the other while delivering power to both wheels.

1.5 PREVENTIVE MAINTENANCE

1.5.1
Possibly the best way to avoid costly equipment "down time" is to always keep in mind these two points: (1) Proper and safe equipment handling and (2) Preventive maintenance.

1.5.2
Always make sure that the axle has a sufficient level of the recommended lubricant. Refer to Topic 12 for lubrication instructions.

1.5.3
Periodic inspection for indications of wear or stress, and the replacement of parts as necessary, can eliminate breakdowns and costly repairs.

TOPIC 2 TROUBLESHOOTING

2.1 GENERAL

2.1.1
Troubleshooting the axle is the logical step-by-step isolation of axle malfunction.

2.1.2
Study of the equipment description provided in Topic 1 will aid in determining where trouble exists.

2.2 TROUBLESHOOTING

2.2.1
The chart below has been developed to aid you in troubleshooting the axle.

2.2.2
Once trouble has been isolated to the axle it will be easier to set-up the loader as follows:

2.2.2.1
Elevate the loader so that the wheels on the axle suspected of damage are off the ground. Make sure these wheels are free to rotate.

2.2.2.2
Disconnect the drive shaft of the other axle. This will prevent the axle from moving and also eliminate noise.

2.2.2.3
Start the loader engine and operate with the transmission in Low Forward Range (LF) at a moderate speed.

2.2.2.4
Use extreme care to avoid getting clothing caught in the rotating wheels. Listen to the axle for unusual or excessive noise.

2.2.2.5
There may be a very slight rattle in the wheels. This is normal and should not be considered trouble unless the noise is excessive.

NOTE: If trouble is isolated to the differential, immediately shut off engine and determine cause.

2.2.3
If a problem is suspected in the axle assembly, remove and check the magnetic drain plugs. Chips or metal fragments indicate damage to internal components. Determine the source and replace parts as needed.

⚠ WARNING

When any supporting machine component must be removed or installed and jacks are used, be sure the support for the jack at the machine an on the ground are appropriate to the load to be applied. Transfer the load to authorized blocking or jack stands immediately. Do not work on or under the machine or its components while supported only on a jack or other lifting device, per local and national requirements.

⚠ WARNING

This machine and its attachments are to be operated only by qualified operator seated in the operator's seat.

⚠ WARNING

Warn all people who may be servicing or working around machine before starting engine.

Always shut off engine when leaving operator's seat.

⚠ WARNING

Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.

TOPIC 2 TROUBLESHOOTING

TROUBLE	POSSIBLE CAUSE	REMEDY
EXCESSIVE NOISE	1.Incorrect lubricant.	1.Drain and fill with correct lubricant.
	2.Oil level too low.	2.Fill with correct lubricant.
	3.Improperly adjusted wheel bearings in the planetaries.	3.Correct to proper adjustment.
	4.Worn or damaged wheel bearing races in the hubs.	4.Replace bearings and bearing races.
	5.Excessive wear or damage to gear teeth in the planetaries.	5.Replace sun gear and pinions. If necessary,replace ring gear.
	6.Worn or damaged side and pinion gears in the differential.	6.Replace gears as set.
	7.Pinion gear assembly adjusted too tight in the differential.	7.Correct to proper adjustment.
	8.Loose or worn bearings, loose capscrews or stripped splines.	8.Replace or tighten.
	9.Poor wear pattern between pinion and ring gear in the differential.	9.Correct shimming of pinion cage and/or readjust differential bearing cap nuts.
	10.Bevel gears worn or damaged.	10.Replace gears.
LUBRICANT LOSS	1.Lubricant leakage at any flange.	1.Tighten capscrews or replace O-ring.
	2.Lubricant level too high.	2.Drain to correct level.
	3.Excessive foaming of lubricant.	3.Drain and fill with correct lubricant.
	4.Axle breather plugged or damaged.	4.Replace or clean breather.
	5.Damaged or worn seals.	5.Replace seal.
	6.Worn or damaged yoke splines at the differential.	6.Replace yoke and seal and differential pinion if spline is worn.
	7.Damaged or worn differential lip seal.	7.Replace seal.
	8.Loose differential pinion bearings.	8.Properly adjust bearings.
OVER-HEATING	1.Incorrect lubricant or level.	1.Check level,fill with correct lubricant.
	2.Excessive wear of gears.	2.Replace gears.
	3.Bearings adjusted too tight or damaged.	3.Correct to proper adjustment or replace bearings.
	4.Differential pinion assembly adjusted too tight.	4.Correct to proper adjustment.

TOPIC 3 TIRES AND WHEELS

⚠ WARNING

Never begin to inflate a tapered bead tire unless bead seat band is securely in place over the lock ring.

⚠ WARNING

Always use an inflation cage, safety cables or chains when removing tire lock rings or inflating deflated tires. Always deflate tires before removing lock rings according to local or national requirements.

⚠ WARNING

Do not inflate tires with flammable gases or with air from systems utilizing alcohol injectors. Explosion and personal injury could result.

⚠ WARNING

When any supporting machine component must be removed or installed and jacks are used, be sure the support of the jack at the machine and on the ground are appropriate to the load to be applied. Transfer the load to authorized blocking or jack stands immediately. Do not work on or under the machine or its components while supported only on a jack or other lifting device, according to local or national requirements.

3.1 GENERAL

3.1.1
The loader is equipped with heavy duty tubeless type tires. Tires should be checked frequently for cuts, bruises, defective valve stem or other damage. It is important to always maintain proper tire pressure.

3.2 REMOVAL

3.2.1
Park the loader on a firm level surface. Lower and rest the bucket on the ground or suitable blocks.

3.2.2
Apply the parking brake and secure the locking bar as shown in Fig.4.

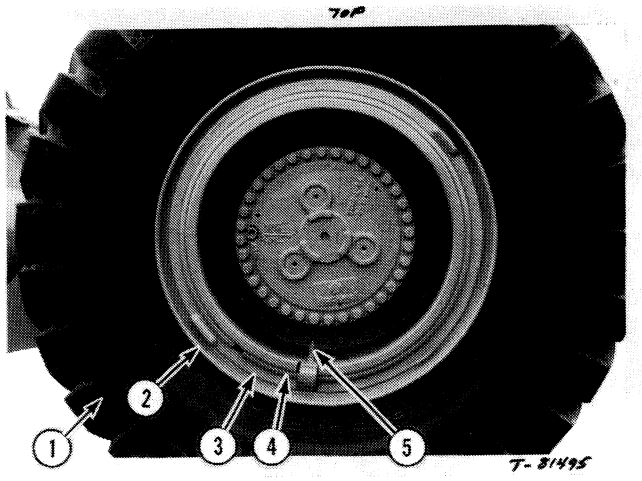

FIG.3 MOUNTED TIRE T-81495

1.Tire
2.Flange
3.Band
4.Lockring
5.Valve stem

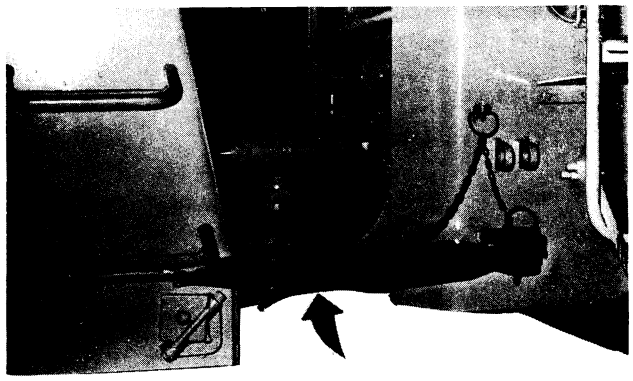

FIG.4 LOCKING BAR T-78138

3.2.3
Place blocks under tires not being removed.

3.2.4
Attach a sling or eyebolts to the fender above the wheel to be removed. Remove the attaching hardware from the fender. Using a hoist of suitable capacity, remove the fender. Front fenders for the FR10 and FR12 weight approximately 32.2 kgs(71 lbs) and for the FR15, 39.9 kgs(88 lbs). Rear fenders for the FR10 and FR12 weight approximately 15.8 kgs(35 lbs) and for the FR15, 27.2 kgs(60 lbs).

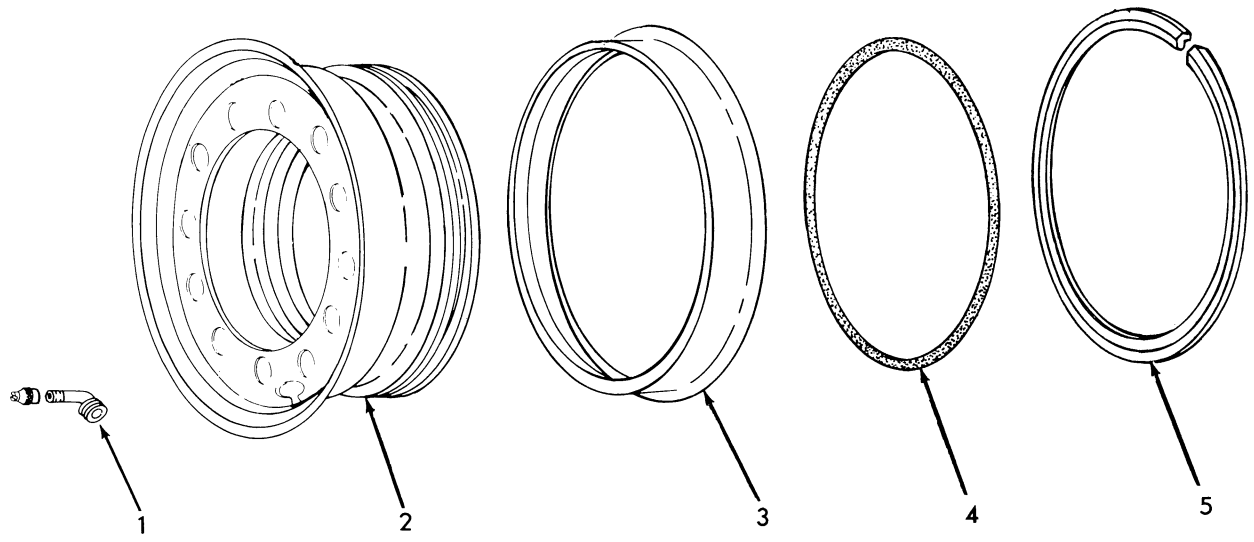

FIG.5 TIRE AND WHEEL GROUP(FR10,FR12) T-84238

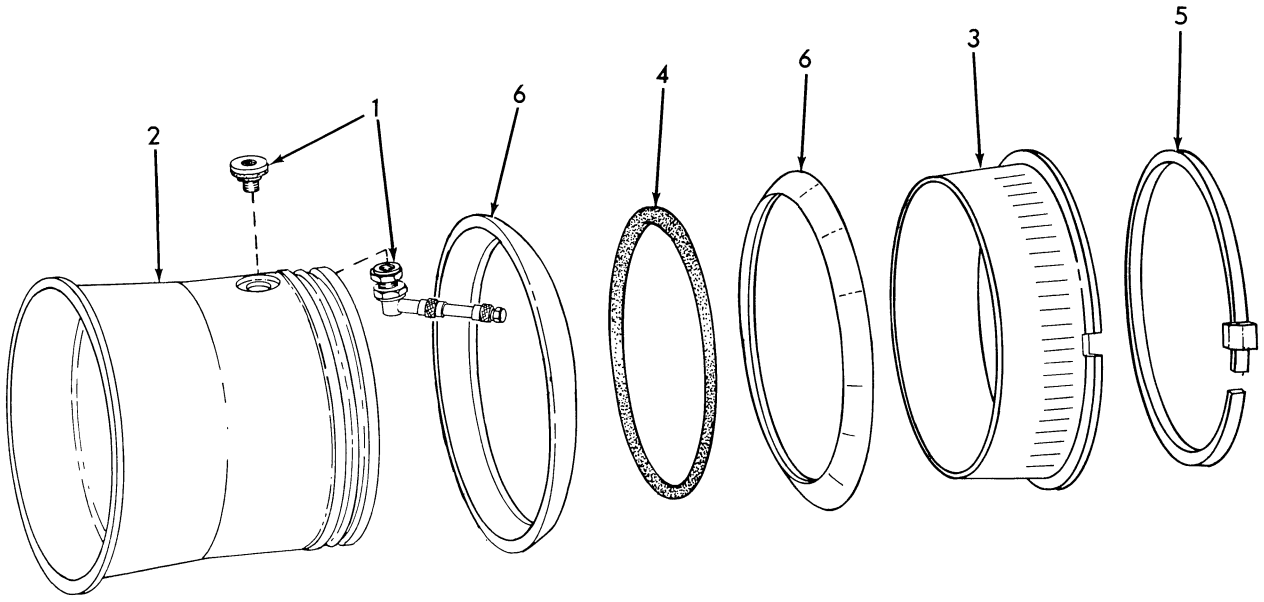

FIG.6 TIRE AND WHEEL GROUP(FR15) T-39682

Legend for Figs.5 and 6

1.Air valve	4.O-ring
2.Wheel	5.Lockring
3.Band	6.Flange

3.2.5
Using a jack or hoist of at least 10 ton capacity, raise the wheel to be removed approximately 50 mm (2 inches) off the ground. Place hardwood blocks or jack stands under the axle housing immediately.

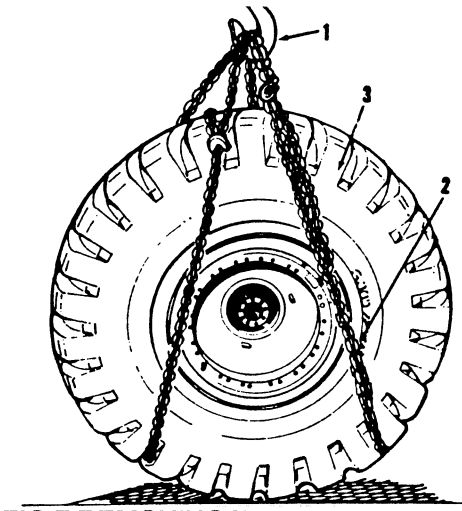

FIG.7 REMOVING WHEEL T-78620

1.Hoist
2.Chain
3.Wheel
4.Position chain between wheel lugs

3.2.6
Attach a suitable sling or hoist to the wheel, Fig.7. Remove the wheel-to-hub lug nuts and remove the wheel and rim assembly from the hub. Wheel assemblies weigh approximately as follows: FR10 - 151.5 kgs (334 lbs); FR12 - 223 kgs (492 lbs); FR15 - 465 kgs (1025 lbs).

⚠ WARNING

Lift and handle all heavy parts with a lifting device or proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch out for people in the vicinity.

3.2.7
Remove the tire as follows:

3.2.7.1
Remove the valve cap and valve core to deflate the tire.

⚠ WARNING

Stand to one side of tire (Fig.8) to avoid injury in case lockring slips off wheel assembly.

FIG.8 CORRECT INFLATION POSITION
T-77389

3.2.7.2
Using a tire tool (Topic 13), pry off the lockring (5), Fig. 5 and 6.

3.2.7.3
Remove the O-ring (4) and band (3). On FR15, remove the flanges (6).

3.2.7.4
Remove the tire.

3.3 CLEANING AND INSPECTION

3.3.1
Cleaning

3.3.1.1
Clean inside and outside of tire of debris and dirt.

3.3.1.2
Clean the wheel assembly and all parts of the tire assembly.

⚠ WARNING

Never use gasoline solvent or other flammable fluids to clean element. Use authorized commerical, non-flammable, non-toxic solvents.

3.3.2
Inspection

3.3.2.1
Inspect the interior and exterior of the tire for bad cuts, rot or abrasions.

3.3.2.2
Inspect the wheel, band and flanges for cracks or sharp edges.

3.3.2.3
Inspect the valve stem and core for dirt or damage. If in doubt of its condition, replace the valve assembly.

3.3.2.4
Inspect all tires for possible mismatch. Mismatched tires can cause veering when roading; wheel spin-out when loading; planetary or differential overheating; and unlevel bucket cutting.

3.3.2.5
Tires must be within 1.5 percent of each other when measuring tire Rolling Radius. Refer to the following procedures to measure Rolling Radius:

3.3.2.5.1
Inflate tires to proper pressure.

3.3.2.5.2
Position the machine on a hard flat surface.

3.3.2.5.3
Determine the center point of the wheel end.

3.3.2.5.4
Measure the rolling radii (distance from the center point of each wheel to the pavement) and record each dimension.

3.3.2.5.5
The formula for figuring percent of mismatch is:

$$\frac{\text{Largest wheel radius}}{\text{Smallest wheel radius}} - 1 \times 100 = \%\text{Mismatch}$$

Example: Rolling radii of a machine are 25.8"; 25.3"; 25.5" and 25.6"

$$\frac{25.8}{25.3} - 1 \times 100 - 1.97\% \text{ (Exceeds 1.5\% max.)}$$

$$\frac{25.8}{25.8} - 1 \times 100 - 1.17\% \text{ (O.K.)}$$

$$\frac{25.8}{25.6} - 1 \times 100 = 0.78\% \text{ (O.K.)}$$

3.4 ASSEMBLY

3.4.1
Install the tire and flanges (6) onto the wheel (2), Figs.5 and 6. Position the tire so that it seats properly during inflation. To facilitate installation of a new tire, use a mechanic or hydraulic "come along" to better seat the tire bead. Pry bars may be necessary to move the bead of the tire closer to the rim.

3.4.2
Install the band (3) and a new O-ring (4). Install the lockring (5).

3.4.3
Insert the valve stem (1).

⚠ WARNING

Stand to one side of the tire, Fig.8, to avoid injury in case lockring slips off of the wheel assembly.

3.4.4
Refer to the Operation and Maintenance Instruction Manual to determine the proper inflation value. Inflate the tire to 1.38 bar (20 psi) over the recommended pressure to properly seat the tire bead on the wheel or flange.

3.4.5
Depress the valve stem and deflate the tire to the proper level. Replace the valve cap.

3.4.6
Attach a suitable sling and hoist to the wheel, Fig. 7 and install the wheel and tire assembly over the hub. Install the lug nuts and tighten to 542 - 610 Nm (400 - 450 lbs.ft).

⚠ WARNING

Lift and handle all heavy parts with a lifting device or proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch out for people in the vicinity.

3.4.7
Install and secure fenders with capscrews. Refer to Bucket and Chassis service manual for torques.

3.4.8
Remove hoist from wheel, then remove blocks or jacks.

TOPIC 4 PLANETARY HUB AND WHEEL BRAKES

4.1 GENERAL

4.1.1
The planetary hub consists of a ring gear, a sun gear, three planet gears mounted in a carrier, a hub and a spindle. The moving parts are lubricated by oil inside the planet carrier. Power is delivered to the wheel through the axle shaft and sun gear which turns the planet gears. Since the ring gear is locked, the planet gears rotate within the ring gear, thereby turning the planet gear carrier. The wheel is bolted to the planet carrier; therefore, the wheel turns when the planet gear carrier turns.

4.1.2
The disc brake assemblies are of the fixed-caliper type designed for use with automatic type brake fluid meeting SAE J1703 requirements. The loader brake head assemblies are bolted to the mounting flange for the spindle. The brake is actuated by the air-over-hydraulic intensifier; by converting air pressure into brake fluid pressure, the brake fluid entering the brake head through the threaded inlet cover forces the pistons against the carrier and lining assemblies, which in turn are forced against the disc, creating the braking action. The reaction to the braking action is supplied by the pins resisting the carrier and linings. The pins also retain the carrier and lining assemblies when the brake pressure is released.

NOTE: The following procedures pretain to each loader (FR10,FR12,FR15) unless otherwise indicated.

4.2 REMOVAL AND DISASSEMBLY

⚠ WARNING

Do not work under or near an unblocked or unsupported linkage, parts or machine.

⚠ WARNING

When any supporting machine component must be rmeoved or installed and jacks are used, be sure the support of the jack at the machine and on the ground are appropriate to the load to be applied. Transfer the load to authorized blocking or jack stands immediately. Do not work on or under the machine or its components while supported only on a jack or other lifting device, according to local or national requirements.

⚠ WARNING

It is unsafe to strike hardened steel parts with anything other than a soft iron or non-ferrous hammer. When installing or removing such parts wear safety glasses with side shields and heavy gloves, etc., to reduce the possibility of injury.

⚠ WARNING

Lift and handle all heavy parts with a lifting device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch out for people in the vicinity.

4.2.1(Tire and Wheel)
Remove the fender over the wheel to be removed. Using a jack or hoist of suitable capacity, raise the tire approximately 50 mm (2 inches) off the ground. Place hardwood blocks or jack stands under the axle housing.

4.2.2
Attach a sling and hoist to the wheel and tire assembly, Fig. 7 to support its weight. Remove the wheel retaining the nuts. Remove the wheel and tire assembly. Wheel assemblies weigh approximately as follows: FR10 - 151 kgs (334 lbs); FR12 - 223 kgs (492 lbs); FR15 - 465 kgs (1025 lbs). Disassemble tires and wheels as outlined in Topic 3.

4.2.3(Brake Head Assembly)
Wipe mud, dirt and oil from the brake head assembly and lines with a clean rag. Remove and cap the hydraulic lines to the brake head.

TOPIC 4 PLANETARY HUB AND WHEEL BRAKES

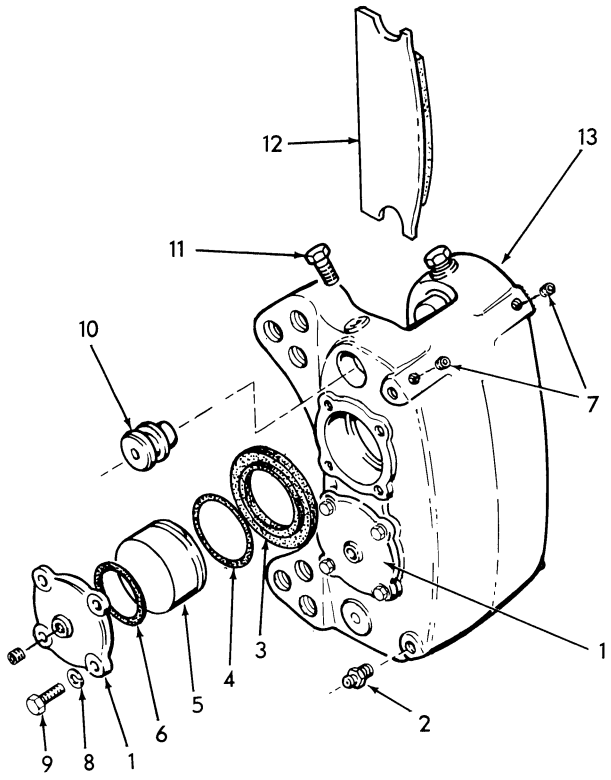

FIG.9 BRAKE HEAD ASSEMBLY T-80386

1.Cap
2.Bleeding valve
3.Boot
4.Packing set
5.Piston
6.O-ring
7.Plug
8.Washer
9.Capscrew
10.Pin
11.Bolt
12.Lining assy.
13.Housing

4.2.4
Remove capscrews and washers securing the brake head,Fig.9, to the mounting flange for the axle housing. Remove the brake head assembly.

4.2.5
Remove the bleeder valves (2) and drain as much fluid from the brake head as possible.

4.2.6
Loosen the guide pin retaining bolt (11) and remove the guide pin (10) and lining assemblies (12).

4.2.7
Remove the capscrews (9) and washers (8) that retain the cap (1) and remove the cap and o-ring (6)

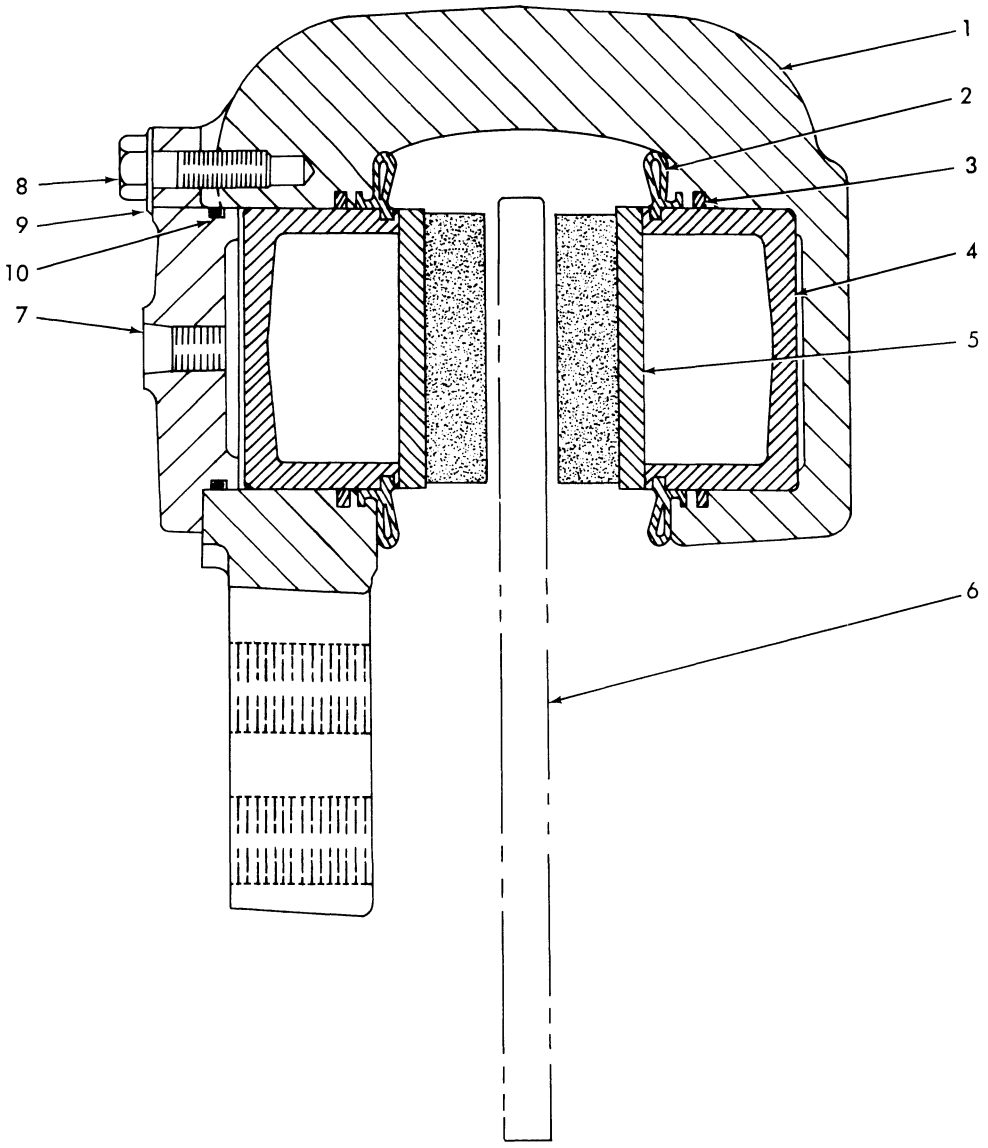

FIG.10 BRAKE HEAD ASSEMBLY(Cross-section) T-80348

1.Housing
2.Boot
3.Packing set
4.Piston
5.Lining assembly
6.Brake disk
7.Cap
8.Capscrew
9.Washer
10.O-ring

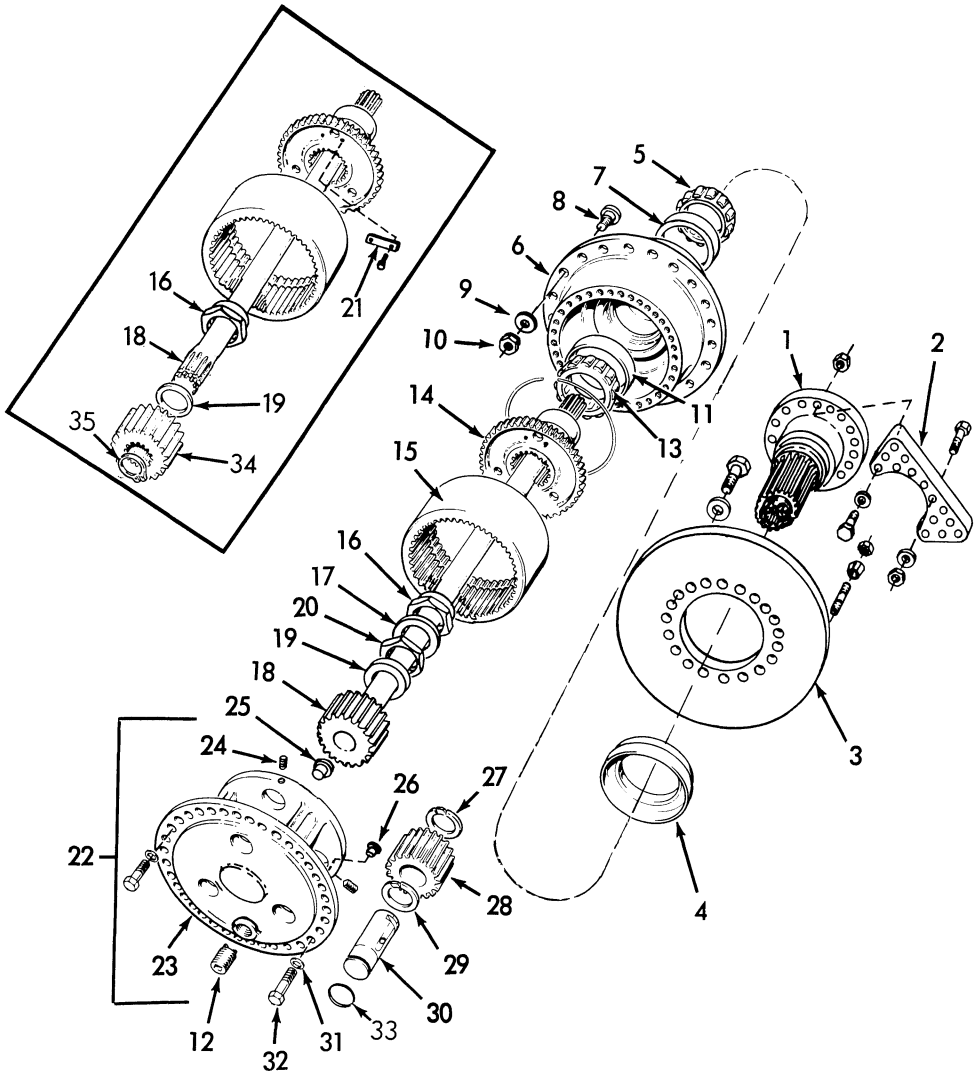

FIG.11 SHAFT AND HUB T-80385

1.Spindle
2.Adapter plate
3.Brake disc
4.Seal
5.Cone
6.Hub assy.
7.Race
8.Stud
9.Washer
10.Lug nut
11.Race
12.Plug
13.Cone
14.Ring gear hub
15.Ring gear
16.Hub nut
17.Washer
18.Axle assy.
19.Thrust washer
20.Jam nut
21.Lock plate
22.Spider assy.
23.Spider
24.Setscrew
25.Thrust button
26.Thrust button
27.Thrust washer
28.Planet gear
29.Thrust washer
30.Shaft
31.Washer
32.Capscrew
33.O-ring
34.Sun gear
35.Snap ring