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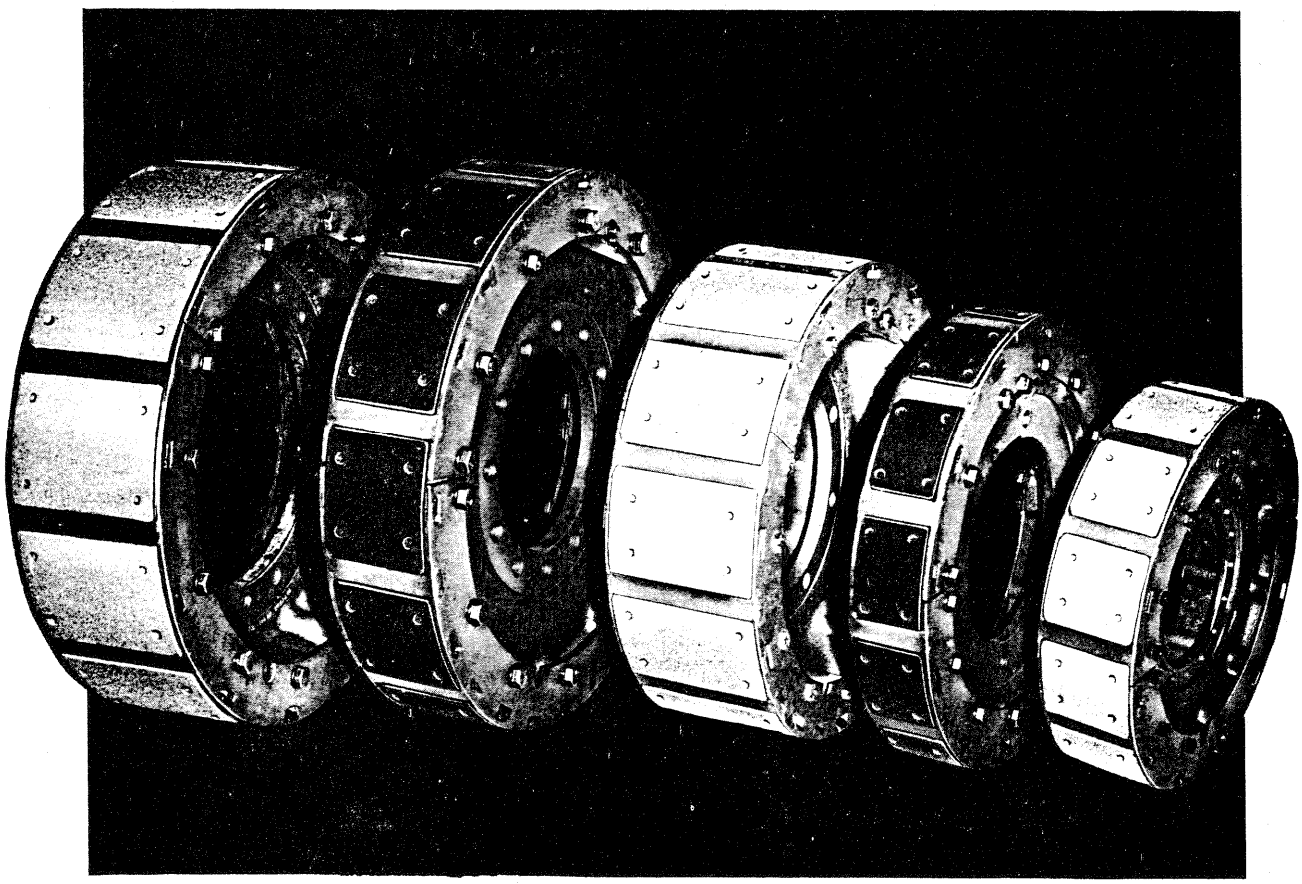
a division of allied systems company

FORM #80-121

OPERATION/MAINTENANCE/TROUBLESHOOTING THE B.F.G. EXPANDER TUBE BRAKE



OPERATION/MAINTENANCE/TROUBLE SHOOTING THE B.F.G. EXPANDER TUBE BRAKE

DESCRIPTION;

The expander tube brake is of the 360° segmented, shoe type, actuated by an expander tube, FIG. 1. Its components include a cast torque plate (7) upon which the expander tube (4) is mounted and an inlet connection (6) into which the nozzle of the expander tube is inserted. Steel side frames with welded steel torque bars (8) are attached to both sides of the torque plate. Brake linings mounted on steel shoes (1) are inserted between the torque bars and side frames and held in position by retracting springs (3). Steel shields (2) are used to bridge the gap between shoes and protect the expander tube. The springs inserted under the center of the linings and over the steel brake shoes withdraw the block and shoe assemblies from the surface of the brake drum after the actuation pressure has been released.

OPERATION:

The brake is actuated by hydraulic pressure which enters through the hole of the inlet connection (6) and flows through the nozzle into the expander tube (4). Pressure is exerted 360° around the expander tube, forcing the block and shoe assemblies (1) which are bearing against the expander tube, to move radially against the inside diameter of the brake drum. At the release of actuation pressure, the retracting springs (3) force the hydraulic fluid from the expander tube and insure fast positive retraction of the block and shoe assemblies.

To disassemble proceed as follows:

1. Hold the brake either vertically or horizontally so that both frames are exposed.

2. Place a screwdriver against the hook of the retracting spring and, with a sharp blow, disengage the spring from the frame. Drive the springs through the brake and out of the assembly.

3. After all retracting springs have been removed, lift the block and shoe assemblies from their position. NOTE: Brakes may be relined without further disassembly. Relining should be done in full sets of (12) linings only, and each block should be installed with a new retracting spring and shield. If old springs are reused, they may break because of fatigue. Before relining brakes, remove all dirt from between the expander tube and the side frames so that the tube will have space to flatten out again.

4. Remove nuts, bolts, and washers or bushings if used. Bushings may be removed by driving with a drift pin. Disassembly the frame assemblies from the torque plate.

5. Slip the expander tube and inlet connection from the torque plate.

6. Remove the inlet connection from the nozzle of the expander tube.

INSPECTION:

Inspect the expander tube for signs of leakage, excessive heat as shown by brittleness, or loose fabric or rubber around the base of the nozzle that might permit leakage of fluid. Discard expander tube nozzle packings. Inspect the brake block and shoe assemblies for damage and separation of lining from shoe. The friction or braking surface of the lining may develop ridges and grooves. The leading edge, that which is in the direction of rotation, tends to wear slightly uneven. Either of these conditions is normal.

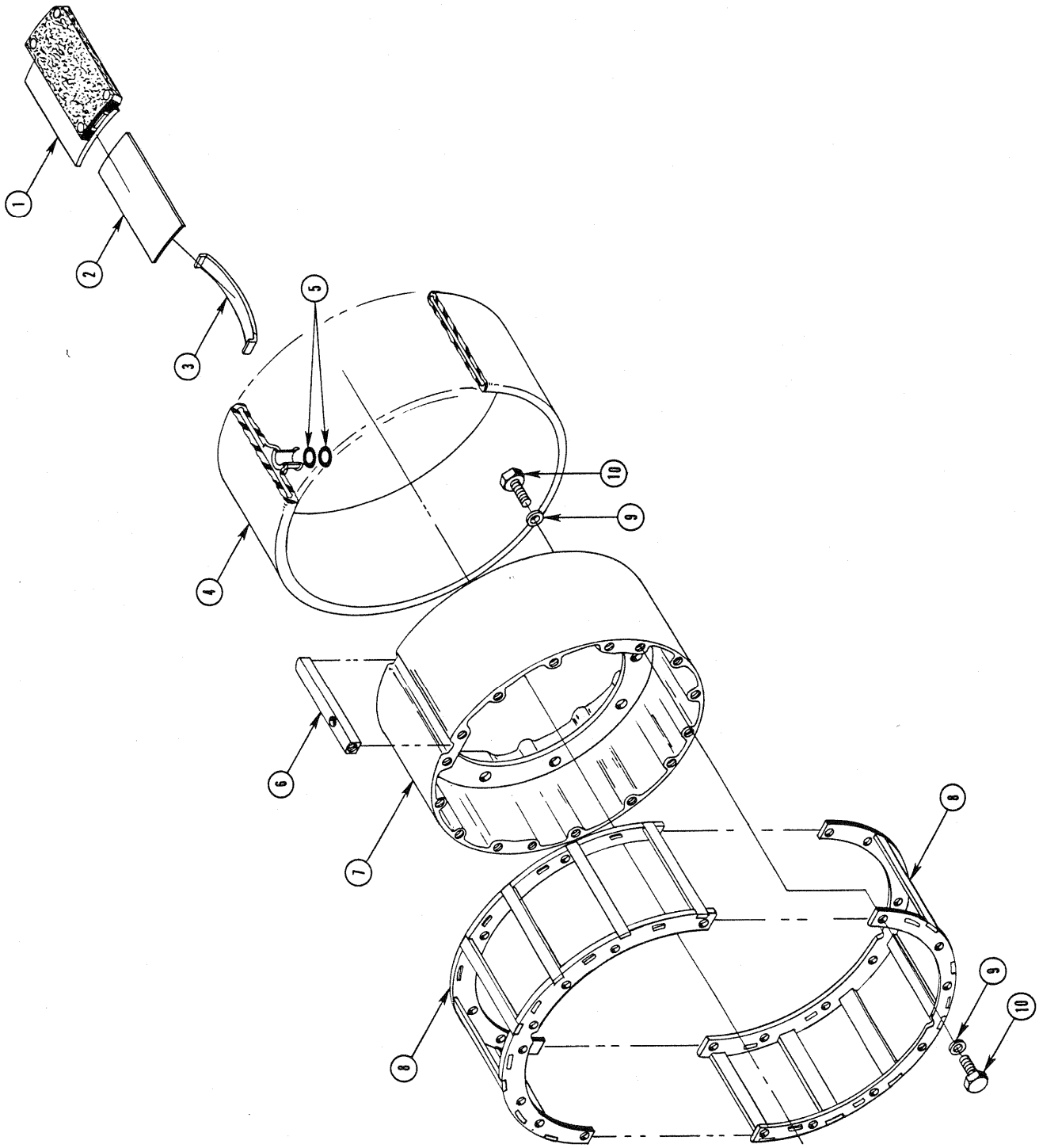
Inspect frame assembly for unusual wear or distortion on the torque bars, cracks at the welds of the torque bars, and for cracks or elongation of the frame bolt holes. Frame bolt hole elongation is an indication that frame bolts have not remained tight during operation. Check frame bolt torque carefully during brake reassembly.

Check for broken or distorted retracting springs. Inspect the inlet connection block bore (where packings seal) for scratches and grooves. Replace if bore is scratched or grooved. Replace frame assembly if cracked, broken, or distorted. In an emergency, end drill and V the crack; weld with AWS7016 rod. Replace repaired frames at first opportunity.

REASSEMBLY REPLACEMENT PROCEDURES:

1. Replace expander tube if cracked, charred, or if the nozzle has been leaking. Expander tubes are expendable parts and they will not last the life of the vehicle. Life is a function of the service conditions as with a tire. Through experience with each vehicle, operators can determine the useful service life of the expander tubes. To avoid excessive down time, it is suggested that the tubes be replaced on a schedule established by service experience.

2. Replace brake lining if worn beyond the usable thickness as specified in Step (2) Maintenance. If the torque bar forms ridges on the face of the lining it may cause the block and shoe assemblies to hang up, or, if excessive cracking or chipping is evident. Do not intermix new and used linings.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3. Replace the frames if inspection indicates replacement.

4. Replace retracting springs if they are broken or distorted or when new linings are installed. Replace all twelve springs to insure uniform retraction.

5. Replace the packing in the expander tube nozzle.

6. Replace expander tube shields if cracked or broken or if lining is being renewed.

REASSEMBLY:

1. Install two new packings on the expander tube nozzle, lubricating them with vaseline before installation to avoid damaging the packing.

2. Lubricate inlet connection nozzle bore and insert the nozzle of the expander tube. CAUTION: Be sure that the inlet connection faces the vehicle and that the inlet connection drum bolt clearance notch where applicable, faces the wheel side of the torque plate.

3. Slip the expander tube and the inlet connection over the torque plate.

4. Slide the frames over the expander tube and torque plate, making sure that the inlet connection lines up with the frame cut-out and all frame bolt holes line up. If misalignment occurs, the frame is on backward and should be turned around.

5. Install the frame bolts and washers or bushings where used. Dry torque self-locking place bolts in accordance with the chart shown. If through bolts and nuts are used, the nuts should be torqued to the torque values listed in the chart, and the threads lubricated with engine oil.

BOLT DIA.	DRY TORQUE (FT/LB) Self Locking With or Without Washer	NUT TORQUE (FT/LB) (Threads Lubricated With Engine Oil)
3/8	38 to 42	23 to 26
1/2	95 to 100	56 to 60
1/2	95 to 100	56 to 60
5/8	170 to 185	115 to 125

6. Clean removed shields with M.E.K. or acetone. CAUTION: Do not use petroleum base solvents.

7. Place one shoe in position on the expander tube and mark the location of the end of the shoe, using a pencil or similar marking tool, on the tube. Note the position of the mark in relation to the brake torque bar and mark the location of the remaining eleven shields on the expander tube.

8. Coat the inside (or concave) surface of the shields with adhesive. Allow the adhesive to dry in accordance with the manufacturers instructions (usually 5 minutes).

NOTE: Use a good neoprene base adhesive compound as instructed. The following brands have been tested and approved by B.F. Goodrich.

COMPOUND NO.	COMPANY
1300L.....	Minnesota Mining & Manufacturing Co. St. Paul, MN
Gasgacinch 440-P or 325NP...	Porter Manufacturing & Supply Co. Los Angeles, CA
77-138.....	General Adhesives & Chemical Co. Nashville, TN
5H2471 or 7F2770.....	Caterpillar Tractor Co. Peoria, IL

10. Using a shoe, center a shield between the sides of the brake frames and install shield on the adhesive coated spot on the expander tube.

11. Align shield so that one half protrudes from under the end of shoe. Press the shield firmly in place to the expander tube, and remove the block and shoe assembly used to align the shield.

12. Install the next shield in accordance with the procedure as stated above and assemble a block and shoe on the shield so that one half of the shield protrudes from under the end of the shoe.

13. Insert retracting spring inserting tool (Part #114-38) through the frame assembly spring window. Insert a retracting spring through the opposite window so that the tool blade is between the spring and the lining material of the block and shoe assembly. Drive the spring into place with a mallet, then pull spring inserting tool out.

14. Install the remaining expander tube shields, block and shoe assemblies and springs.

BRAKE SYSTEM BLEEDING PROCEDURES

1. Fill reservoir with hydraulic oil. NOTE: Keep reservoir full throughout the bleeding procedure.

2. Hold brake pedal down and open bleeder valve to vent air from the master cylinder. Close bleeder valve after fluid stops draining and release brake pedal.

3. Repeat cycle after waiting 2 minutes to let master cylinder replenish the fluid supply.

4. Actuate brake pedal with bleeder valve closed, hold pressure for 10 seconds, then release pedal. Allow 2 minutes for replenishing fluid supply then repeat the cycle.

5. Repeat Step (2) to vent air from the brake side of the automatic adjuster in the master cylinder and from the expander tube. Repeat venting cycle until no air can be detected escaping from the bleeder valve. Allow two minutes between cycles to replenish fluid supply.

6. If after repeated bleeding from bleed port, there is still no contact of brake shoe drum, with brake pedal depressed, loosen flex hose at point of connection with brake inlet fitting, allowing sufficient fluid to drain until it becomes clear and free of air.

7. Again check fluid level at reservoir, fill if needed. Actuate brakes approximately 3 times, holding brake pedal down on the third application. Again open bleed port to insure that all possible air has been expelled.

8. After operating vehicle for approximately one hour, open bleeder valve with brakes released, this is to vent any remaining air which may have been trapped due to heat expansion.

9. If Step (8) is followed, this should remove all air bubbles inside and adjacent to the expander tube, which, during a high temp soak will cause hot spots and possible premature tube failure.

SUGGESTIONS:

To follow bleeding procedure both on initial installation and when an expander tube has to be replaced. Also, to rebleed system after vehicle has been out in operation, to eliminate expanded trapped air or oil vapors.

MAINTENANCE

1. Inspect daily to assure that visible frame bolts have not loosened to check for broken retracting springs. At the end of each shift, check drums for overheating and open the bleeders to check for trapped air or vaporizing oil. If these conditions exict, refer to the troubleshooting chart.

2. Frequent inspection should also be made to check lining wear. To check wear, apply brakes and look into the spring openings in the brake frames. If the brake shoes tend to shear the springs at a point between the frame and shoes (approximately 1/8" space between the top of the spring opening and the ledge of the shoe upon whish the spring rests), travel is at a maximum. Replace linings and springs before this condition is reached. Continued operation in this condition will damage the brake structure.

3. Use only mineral oils to specifications outlined to actuate B.F. Goodrich expander tube brakes.

   WARNING: Do not use other fluids, especially avoid using automotive brake fluid as it is destructive to brakes, master cylinders, and adjusters.

PHYSICAL PROPERTIES

Saybolt Universal Viscosity at 210°F	43 seconds
Saybolt Universal Viscosity at 100°F	145 to 155 seconds
Viscosity Index (Dean & Davis)	90 minimum
Pour Point (ASTM)	25°F minimum
Color (ASTM)	No. 2 or lighter
Neutralization Number (ASTM)	0.10 or less
Copper Strip Test (Corrosion) 3 Hours at 212°F	Negative
Flash Point	370°F minimum
Additives	Additives Harmful To Buna N and neoprene rubber compounds will not be used.

This chart covers trouble shooting for master cylinders and in-line adjusters used with expander tube brakes as well as the expander tube brakes covered in this manual:

TROUBLE	POSSIBLE CAUSE	CORRECTION
Brakes dragging or running hot.	Air trapped in hydraulic system.	Bleed system and brakes.
	Residual air pressure at rotochamber.	Check air system to insure zero pressure at rotochamber.
	Rotochamber retraction obstructed.	Inspect rotochamber to insure full retraction.
	Master cylinder power piston not retracting.	Inspect cylinder bore and power piston OD for burrs, chips, or other obstruction and correct.
	Master cylinder floating piston not retracting.	Inspect cylinder bore and floating piston OD for burrs, chips, or other obstruction and correct.
	Return spring between master cylinder pistons out of engagement.	Seat spring in groove on end of each piston.
	Broken or flattened brake retracting spring.	Compare spring arch with new spring and replace flattened or broken springs with complete set of twelve.
	Improper oil in system causing vaporization in brake.	Purge system, replace all rubber parts and refill with hydraulic oil as specified.
	Master cylinder adjuster not working.	Remove floating piston assembly and insert blunt tool into small hole in face of piston and push inward. If definite movement cannot be obtained, replace with new part.
	Residual hydraulic pressure trapped in brake system.	Inspect control valve to insure complete release.
Brakes will not apply.	Brakes not bled of air allowing master cylinder to bottom.	Bleed system and brakes.
	Master cylinder power piston not retracting to seat, closing off inlet.	Adjust rotochamber push rod attachment.
	Master cylinder power piston stuck in cylinder bore.	Free piston by removing obstruction. If cylinder wall or piston OD is excessively damaged, replace with new part.
	Vacuum trapped in reservoir.	Insure vent air passage in reservoir.
	Insufficient oil reserve.	Keep reservoir filled with hydraulic oil as specified.
	Check valve in master cylinder power piston not closing.	Insure free motion of ball in check valve and remove all foreign particles.
	Master cylinder adjuster not working.	Remove floating piston assembly and blow with mouth into small hole in face of piston. If air passes, replace with new part.
	Packing on master cylinder power piston not sealing.	Replace packing with new B.F. Goodrich replacement part.
	Supply line leaking.	Check lines and fittings to insure sealing.
	Air pressure inadequate.	Air pressure at rotochamber should be not less than 80 psi with brakes applied. Correct air system as required.
Master cylinder leaking.	Packing not sealing.	Replace all master cylinder packings.
Brake leaking.	Expander tube nozzle packing not sealing.	Replace packings and inspect connector block nozzle hole for surface damage. If surface does not appear satisfactory for sealing, replace connector with new part.
	Expander tube leaking.	If tube shows definite leak, replace with new tube.