EMD MAINTENANCE INSTRUCTION

LOCOMOTIVE SIGNAL HORNS

DESCRIPTION

The different types of single or multiple bell horns used on locomotives all operate on the same principle. Fig. 1 illustrates a typical multiple bell horn. High pressure air impinges against the center of the diaphragm flexing it away from the discharge nozzle. As soon as the diaphragm is forced away from the nozzle the pressure in the chamber drops due to escaping air. The tension of the diaphragm forces it back against the nozzle and stops the escaping air. Air entering through the restricted supply nozzle builds up pressure which again forces the diaphragm away from the discharge nozzle. This results in the diaphragm vibrating which sets up sound waves in the horn bell.

The horn bell confines the waves to give directional quality to the sound. The amount of deflection of the diaphragm controls the size, or amplitude, of the sound waves and affects the loudness of the horn. Thus the amount of air pressure is responsible for this quality.

The tension of the diaphragm affects the speed, or frequency, of vibration and therefore the pitch. The greater the tension on the diaphragm the higher will be the pitch of the horn.

The physical characteristics of the diaphragm control the frequency and amplitude of the vibrations to rather close limits. Thus the horn should be adjusted carefully to give the best results.

Too tight a diaphragm will give a very high pitch and will result also in loss of volume of sound, while too low a tension on the diaphragm will give a low rasping quality to the pitch and will result in loss of volume due to the lack of tension to pull the diaphragm back against its seat.

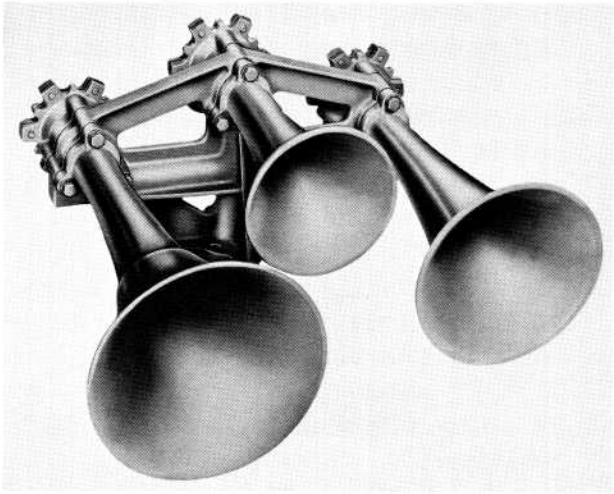

Fig. 1 - Three Chime Air Horn

Low air pressure will result in a weak horn, whereas high pressure will not materially affect the horn except to make it louder.

MAINTENANCE

A regular program of periodical maintenance of the following locomotive horns can go a long way towards insuring satisfactory performance and full equipment life.

A. Leslie Tyfon Air Horn
(Reference Fig. 2)

1. To inspect and clean the diaphragm, first loosen, but do not remove, the

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lock bolt. Then unscrew the back cover while horn is blowing. The use of a hammer, bar or wrench on back cover lugs should be avoided as the cover can easily be removed by hand while the horn is blowing.

2. Clean the diaphragm and wash threads of the back cover and diaphragm housing with kerosene or equivalent.

3. Make certain that the face of the nozzle is free of dents or high spots. Use fine emery cloth with face plate to lap in nozzle if necessary.

4. Before replacing the diaphragm, screw in back cover all the way to make sure that threads are free.

5. Make certain that drain port is clean and open.

6. Screw up the back cover until it contacts the diaphragm. Do not overstress.

7. While horn is blowing, adjust for proper sound, then tighten the lock bolt.

8. Test horn again for sound after locking back cover. Also see that the back cover is securely locked by trying to turn it by hand while horn is blowing.

9. Test horn with air pressure 10-25 psi below that normally carried.

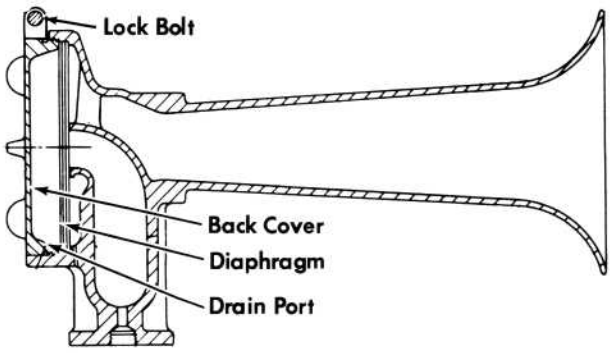


Fig. 2 - Cross-Section Leslie Tyfon Air Horn

B. Leslie Supertyfon Chime Horns (Reference Fig. 3)

1. To clean and inspect the diaphragm, first remove the back cover. Then remove the diaphragm ring and diaphragm by taking out the diaphragm ring screws.

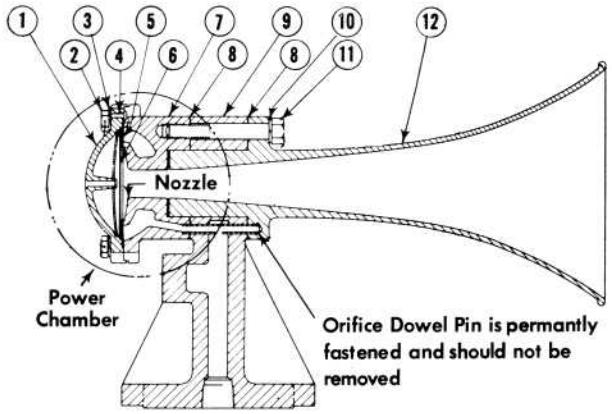
2. Nozzle, diaphragm and diaphragm ring should be wiped clean.

3. With back cover off, it is a good practice to blow out the air lines with the operating valve wide open; this will also clean out the orifice dowel pin.

NOTE: If it is ever necessary to replace orifice dowel pin, insert it into horn with orifice facing outward and in line with rib of horn.

4. Replace the diaphragm ring and the diaphragm. Install cover and tighten cap screws firmly. No adjustment is necessary.

5. When replacing or reversing horn, remove cap screws that hold bell and pull out carefully. Before replacing or reversing bell, the outer surface of the small end should be coated with varnish.



1. Back Cover
2. Cap Screw - (Cover)
3. Lock Washer
4. Diaphragm Ring Screw
5. Diaphragm Ring
6. Diaphragm
7. Diaphragm Housing
8. Gasket
9. Horn Base
10. Lock Washer
11. Cap Screw - (Horn)
12. Bell

Fig. 3 - Cross-Section Leslie Supertyfon Air Horn

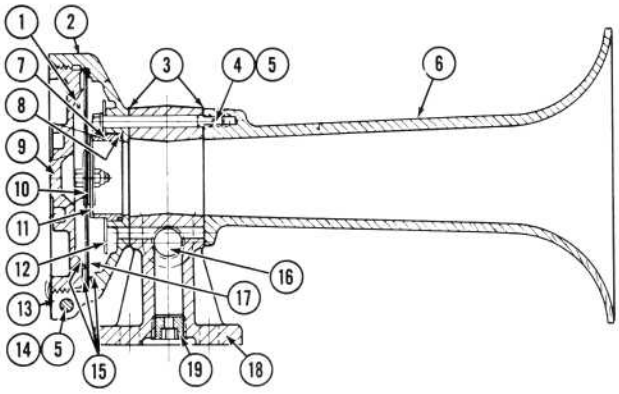
6. Clean the gasket surface of horn and diaphragm housing and replace the gaskets. Install lockwashers and cap screws and tighten horns in place firmly.

   All parts in power chamber are fully interchangeable in all horns — single or chime tone.

C. Nathan Chime Horns - "M" Series (Reference Fig. 4)

1. Disassembly Procedure

   a. Wash outside of horn thoroughly, then cut and remove sealing wires. Using a hex box wrench, loosen the adjusting cap clamp screw 2 or 3 turns. This will free the adjusting cap. Unscrew the adjusting cap and pick out the diaphragm assembly. Care should be taken to keep the adjusting cap and diaphragm assembly clean. Avoid nicking the clamp rings on either cap or head.



1. Vent Hole
2. Diaphragm Head
3. Gasket
4. Cap Screw
5. Lock Washer
6. Bell
7. Seat
8. "O" Ring Packing
9. Adjusting Cap
10. Diaphragm Assembly
11. Clapper Disc
12. Diffuser
13. Seal Wire
14. Clamping Screw
15. Clamp Rings On Diaphragm Head And Adjusting Cap
16. Pipe Plug (Countersunk Head)
17. First Ply
18. Base
19. Restrictor

Fig. 4 - Cross-Section Nathan "M" Type Air Horn

   b. Using a socket wrench, remove the three screws that hold the head, base and bell together. Care should be taken to prevent tearing gasket between base, bell and head. The diffuser ring should now be loose and may be picked out, Fig. 4.

   c. The seat can be removed by hand, but it will be snug due to "O" ring seal. Avoid using a tool that would burr the diaphragm contact surface or its edges. Diaphragm should not be disassembled.

   d. The various plugs can be removed for blowing out the channels in the event that scale, rust or dirt is found in the base.

2. Parts Inspection

   a. Reject any diaphragms which have cracked plies or cracked clapper discs.

   b. Bend diaphragm assembly each way from flat and look for popping action. Discard any with this condition.

   c. Look for loose bolts or rivets; tighten bolts to 4-1/2 ft-lbs. torque. Rerivet the rivet on No. 5 diaphragm only enough to make assembly snug.

   d. Diaphragms worn more than .010" deep at point of contact with cap and head clamp rings should be discarded.

3. Clamp Rings - Adjusting Cap And Heads

   a. Check the three clamp rings, two on cap and one on head, for nicks and wear. Deep nicks may affect horn tone and waste air, thus clamp rings having nicks over 1/16" should be replaced. Check large diameter threads, gasket surfaces matching the base and counterbore that receives the seat, for damage which will prevent a complete air seal.

b. Make sure 1/8" diameter vent holes in cap are open.

4. Seat

a. If finish on seat is rough, lap with suitable compound, or replace.

b. The dimension from the head clamp ring to the seat and from the clapper disc face to the first ply is important. If these parts wear uniformly, considerable wear can be tolerated. If in reassembly of the horn, it is difficult to make the bell speak, check for wear at these points and replace parts as necessary.

5. Assembly

a. Wash all parts if not previously cleaned. Assemble all plugs in base.

b. Put the "O" rings on seat and push both parts in head until solid against bottom of counterbore.

c. Put the diffuser disc in place and put the cap screws with lock washers in place through the holes in the head.

d. Place gasket over ends of screws.

NOTE: Holes are not equally spaced.

e. Put head into place against base and place gasket over screws protruding through base.

NOTE: Make sure #1 head is assembled to the #1 bore at the base, etc. See cast numbers on base, head, and bell.

f. Hold bell in place and tighten three cap screws using socket wrench to 12-15 ft-lbs. torque.

g. Repeat preceding steps for all bells.

h. Put the diaphragm in place and assemble adjusting cap hand tight. Make sure threads are clean. A wire brush may be used for this purpose if required.

6. Test

a. Tighten all caps slightly greater than working tightness (experience will indicate proper setting).

b. Mute all but the largest bell. Back off cap until bell sounds properly. See bell speaking pressure chart below.

Speaking Pressures

No. 1 - 14-15 psi (longest and lowest pitch)
No. 2 - 15-16 psi
No. 3 - 16-17 psi
No. 4 - 17-18 psi
No. 5 - 18-19 psi (shortest and highest pitch)

c. Repeat this process for all other bells, muting all but the one being tested.

d. Recheck speaking pressures in same order and make minor corrections as necessary.

e. Redrill lock wire holes in cap and apply seal. This will not affect the tone of the horn, but will prevent unauthorized tampering. If the horn is going to be stored, plug or tape the inlet hole.

D. Nathan Chime Horns - "P" Series (Reference Fig. 5)

1. Disassembly procedures for the "P" series air chime horn are similar to those for the preceding "M" type series except for application of diaphragm.

2. Normal test should be made to see that all horns are blowing. If not, a quick check can be made by removing diaphragm cap for inspection of assembly, air passages and, if necessary, replacement of assembly should be made from a diaphragm kit.

3. Periodically, air channels of horns and manifold should be cleaned. Remove restrictor in base of horn, clean and reapply. Examine all gaskets for leaks and renew when necessary. Horns are then to be bolted securely to manifold.

4. When replacing any one part of the diaphragm assembly, discard all other parts of this assembly and replace with the new parts contained in the diaphragm subassembly kit 8223339.

NOTE: To insure the proper functioning of the horn, it is important that the rubber seat and the two (2) rubber gaskets be located in the horn assembly as shown in Fig. 6.

5. The proper sequence in assembly of gaskets and diaphragms using kit 8223339 is as follows:

   a. Place rubber seat firmly against the small counterbore inside of bell and secure firmly in place with seat retainer (garter spring) 8223338, Fig. 6. This seat retainer is not furnished in the kit and should be ordered separately.

   b. Place rubber gasket (thin) against the large counterbore inside of bell.

   c. The diaphragm should be next placed firmly against the rubber gasket.

   d. Rubber gasket (thick) should then be placed firmly against diaphragm.

   e. Finally, bell cap should be bolted firmly in place. The bell will then be ready to be mounted to base. No adjustment is necessary.

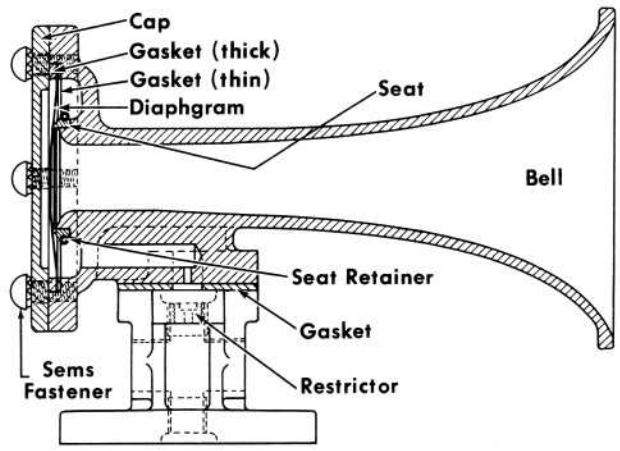


Fig. 5 - Cross-Section Nathan "P" Type Air Horn

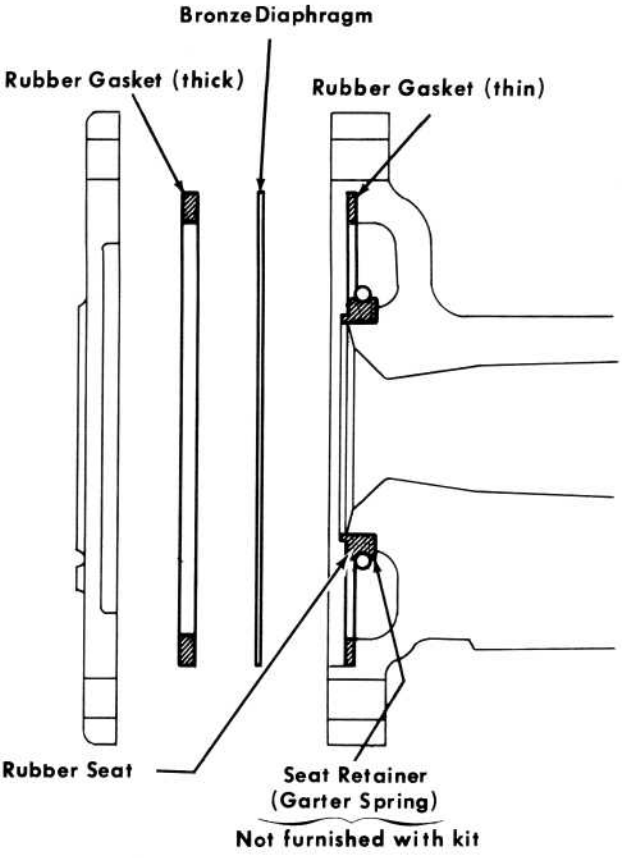


Fig. 6 - Horn Subassembly Kit