

June 8, 1954

G. D. WOODY

2,680,422

AIR HORN

Filed Jan. 26, 1951

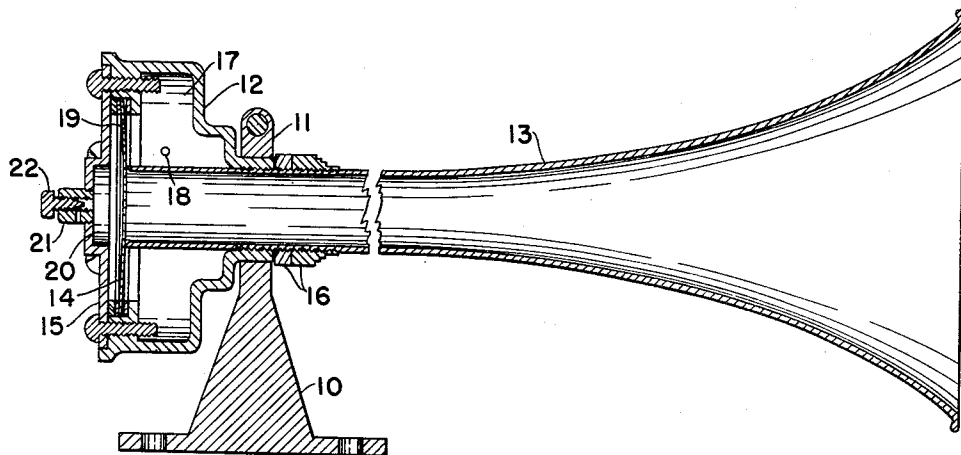


FIG. 1

FIG. 4

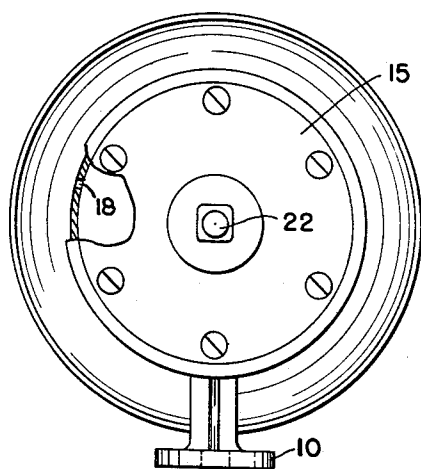
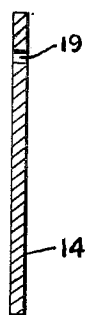


FIG. 2

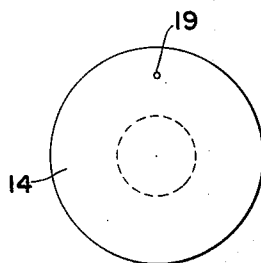


FIG. 3

INVENTOR.
GEORGE D. WOODY
BY *Edw. J. Newton*

ATTORNEY

UNITED STATES PATENT OFFICE

2,680,422

AIR HORN

George D. Woody, Atlanta, Ga.

Application January 26, 1951, Serial No. 207,931

3 Claims. (Cl. 116-142)

1

My invention relates to an air horn and more particularly to an improved diaphragm and exhaust chamber for the horn.

The value of a signal for marine, automotive and other industries cannot be overemphasized since the safe operation of such industries depends, many times, upon an audible warning signal. It is highly important, therefore, that in the construction of the signal the emphasis be placed on dependability of operation and intensity or carrying power of the sound produced. Next of importance should be the pitch or tone, the economy of operation, and finally the actual structural design of the mechanism itself.

While considerable effort has been put forth to produce a horn both pleasing in design and tone quality and to keep the structure compact, it has been found that only a certain intensity is available from a given size diaphragm, and also according to the amount of air pressure used. Several of the horns made require air pressure from 60 to 160 pounds per square inch which necessitates a special compressor, particularly for automotive use. It is apparent, therefore, that a customer purchasing and installing such a system would desire a horn of rugged construction and with the greatest intensity possible. A further requirement would be some adjustment to the tone quality and to provide the greatest intensity of sound at the least possible amount of initial air pressure.

It is an object of the present invention to provide an improved structure for an air horn which permits a greater intensity of sound with the same amount of air pressure used without the present invention, such object being accomplished by providing a means of pushing the vibrating diaphragm completely against the trumpet at any pressure, thus causing great sound pressure differentials in the trumpet.

Another object of the invention is to provide means for controlling the amount of differential pressure existing on the sides of the horn diaphragm during a blast, such differential permitting smaller vibrational amplitude in the diaphragm, thus increasing its life.

Another object of the invention is to provide an improved structure for an existing air horn which decreases the volume of used air at the same time increasing the intensity of sound, said object being accomplished by providing a means of pushing the vibrating diaphragm completely against the trumpet at any pressure, thus causing less loss of high pressure air which would normally blow out through the trumpet.

2

Another object of the invention is to provide a deliberate passageway for air coming from the high pressure side of the diaphragm to the low pressure side thereof, and to provide a bleed-off valve to maintain a desired differential of pressure on the two sides of the diaphragm.

Another object of the invention is to provide an air passageway through the diaphragm of an air horn, which passageway is positioned outside of the actual high pressure exhaust chamber through the trumpet tube so that a constant differential of pressure may be maintained across the diaphragm during the length of blast.

Another object of my invention is to provide a diaphragm type air horn in which the back pressure is proportional to the applied pressure.

A further object of the invention is to provide means causing a differential of pressures against the sides of a horn diaphragm, wherein both pressures are built up simultaneously to permit the diaphragm to vibrate immediately upon the entrance of air into the high pressure chamber.

Further objects and advantages of the invention will become apparent in the course of the following detailed description when viewed together with the accompanying drawing in which:

Fig. 1 is a cross-sectional view of an existing air horn embodying the features of the present invention.

Fig. 2 is a rear view of the device illustrated in Fig. 1.

Fig. 3 is a view of the improved horn diaphragm.

In the drawing, numeral 10 designates the mounting base of a horn such as that made by the Strombos Company of Michigan and marketed as the "Simplex" model. The base 10 is extended upwardly forming a standard 11 which supports the air chamber housing 12 and the trumpet 13 in the manner shown. The rear face of the housing is prepared to receive the horn diaphragm 14 which is held rigidly around its peripheral edge by a rear plate 15 in such manner that the diaphragm is slightly dish.

By means of lock nuts 16, the trumpet 13 is positioned through the standard 11 and the front of the housing 12 and brought to a position just touching the front face of the diaphragm 14. The high pressure chamber 17 is provided with an inlet hole 18 to receive air coming from the air compressor.

In prior art constructions, the back plate 15 of the horn is provided with a hole (not shown) open to the atmosphere. Thus, when air is admitted into the high pressure chamber, the pressure must

be allowed to build up sufficiently to move the diaphragm 14 away from the end of the trumpet 13 in order for the air to exhaust through the trumpet. As soon as the pressure is relieved, the diaphragm returns to its neutral position against the trumpet end until the pressure builds up again. These successive bursts of air produce waves resulting in the sound of the horn. In such constructions, it is readily seen that if the air entering the high pressure chamber is not of the exact desired pressure or is too high, the pressure will force the diaphragm rearwardly and hold the same in this position until the pressure decreases to such an amount that the diaphragm will begin to vibrate. This defect found in horns of the prior art is the cause of the initial "swishing" sound of air coming from the horn just prior to hearing the sound when high pressure air is applied. Thus, should the pressure be extremely high, the diaphragm will be held completely away from the trumpet end and there will be no sound at all, other than the rush of escaping air. It is apparent, therefore, that the intensity of sound from a given size diaphragm bears a definite relationship to the amount of air pressure used to actuate it, and this intensity is not in proportion to applied pressure but rather depends on a critical pressure which is determined by the diaphragm strength.

In my improvements to the presently constructed horn, I have overcome the abovementioned defects very inexpensively by providing a hole 19 through the diaphragm 14 to permit air from the high pressure chamber 17 to pass through the diaphragm 14 and into a rear low pressure chamber 20 defined by the rear of the diaphragm and the back plate 15. I have furthermore provided a fitting 21 constituting an exhaust for the low pressure chamber 20, the fitting including an adjustable needle valve 22. Thus, when air is admitted into the high pressure chamber 17, there is also an instantaneous build-up of air pressure in the chamber 20, so that when the diaphragm 14 is moved rearwardly, it is pushed against a cushion created by the back pressure existing in the low pressure chamber 20. By adjusting the needle valve 22, any amount of actual back pressure may be created. It is understood also, that if the exhaust from the back pressure chamber were cut off altogether, the pressures on each side of the diaphragm would soon equalize, and the horn would fail to sound. The diameter of the hole 19 in the diaphragm is of such relationship to the volume of air in the high pressure chamber that an even differential of pressure is maintained, such differential being further adjustable by means of the needle valve 22.

With the diaphragm being pushed rearwardly by the high pressure air against a slight cushion or back pressure, it will naturally return to its plane of rest against the trumpet and more completely and in a shorter length of time thus permitting less vibrational amplitude and greater intensity of sound. By actual experimentation it has been found that the above improvement applied to an existing horn has substantially doubled its intensity of sound. Moreover, because the back pressure behind my diaphragm is proportional to the applied pressure, the effective diaphragm strength will decrease as the air pressure in small storage tanks decreases during a blast, so that the horn will blow continuously

with a maximum of efficiency at any pressure. Such construction further adds to the life of the diaphragm since it reduces the actual amplitude which causes stress and fatigue to the molecular structure of the material of which it is made.

Moreover, the invention permits the diaphragm to vibrate immediately upon entrance of air to the high pressure chamber and actually uses less air in its operation due to the diaphragm movement described above.

While being of great value to existing air horns, the invention adds but very little to their cost of manufacture nor does it detract from the actual appearance of the design as presently being marketed. The device may be made to conform to the operation of various designs of air horns whether for marine use, the automotive field or in other industries, and can be sold as an improved repair part for horns now in use.

I claim:

1. In a fluid operated horn having a diaphragm releasably pressed against a fluid outlet, a high pressure chamber on the side of said diaphragm adjacent said outlet, a low pressure chamber on the other side of said diaphragm, means for admitting fluid under pressure to said high pressure chamber, and means for venting fluid from said low pressure chamber, characterized by restrictive means uninterruptedly interconnecting said high pressure chamber with said low pressure chamber for the restricted flow of fluid therebetween so that pressure will build up in said high pressure chamber to a value greater than the pressure in said low pressure chamber.

2. In a fluid operated horn having a diaphragm releasably pressed against a fluid outlet, a high pressure chamber on the side of said diaphragm adjacent said outlet, a low pressure chamber on the other side of said diaphragm, means for admitting fluid under pressure to said high pressure chamber, and means for venting fluid from said low pressure chamber, characterized by restrictive means permanently interconnecting said high pressure chamber with said low pressure chamber for the restricted flow of fluid therebetween, and means for selectively controlling the venting of fluid from said low pressure chamber so that pressure will build up in said high pressure chamber to a value greater than the pressure in said low pressure chamber.

3. In a fluid operated horn having a diaphragm releasably pressed against a fluid outlet, a high pressure chamber on the side of said diaphragm adjacent said outlet, a low pressure chamber on the other side of said diaphragm, means for admitting fluid under pressure to said high pressure chamber, and means for venting fluid from said low pressure chamber, characterized by said diaphragm being provided with a restrictive hole therethrough permanently interconnecting said high pressure chamber with said low pressure chamber for the restricted flow of fluid therebetween so that pressure will build up in said high pressure chamber to a value greater than the pressure in said low pressure chamber.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,663,648	Cooper	Mar. 27, 1928
1,676,528	Critchfield	July 10, 1926
2,177,594	Eaves	Oct. 24, 1939
2,371,949	Bjergel	Mar. 20, 1945