March 4, 1930. R. M. CRITCHFIELD 1,749,325

WARNING SIGNAL

Filed Sept. 23, 1927

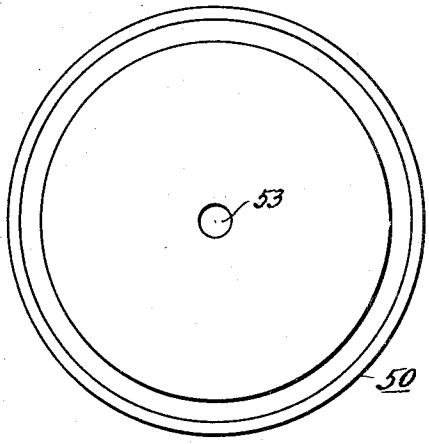


Fig. 1

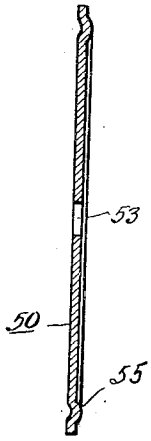


Fig. 2

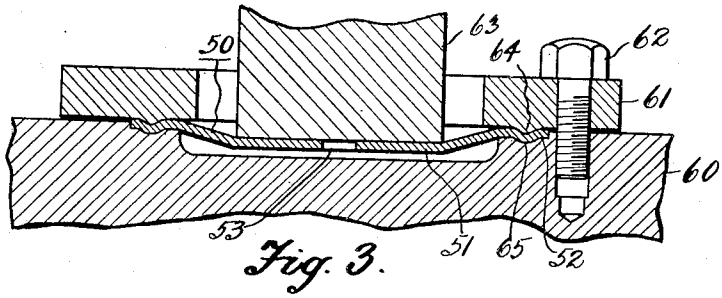


Fig. 3.

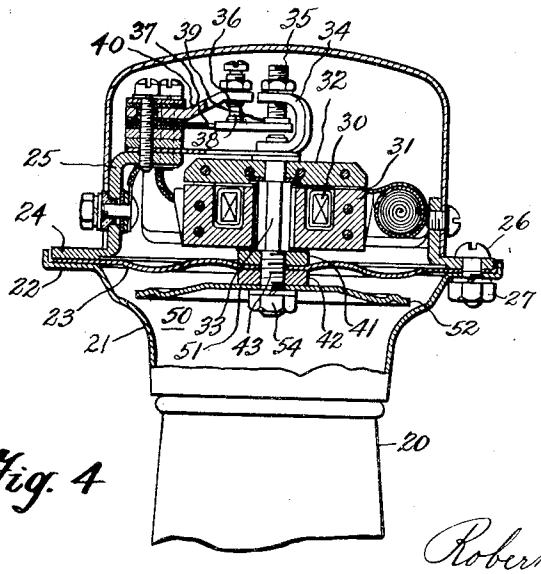


Fig. 4

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UNITED STATES PATENT OFFICE

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WARNING SIGNAL

Application filed September 23, 1927. Serial No. 221,473.

This invention relates to the type of vehicle warning signals in which a vibratory diaphragm is employed for producing a fundamental tone of medium pitch and in which a resonator disc is employed for producing a penetrating tone of relatively high pitch, which tone is superposed upon the tone produced by the diaphragm. A warning signal of this type is disclosed in the patent to H. Horig No. 1,523,964 patented January 20, 1925, which shows a vibratory diaphragm enclosing a sound chamber at the throat of the projector, and a resonator disc mounted coaxially of the diaphragm and connected therewith so as to vibrate with the diaphragm. The vibrations of the diaphragm cause the resonator disc to vibrate in such a manner that the disc will produce a penetrating tone of higher pitch than that produced by the diaphragm.

It is desirable that the edge of the disc lie relatively close to the throat wall of the horn projector so that the disc will be effective as a piston to transmit to the air column within the projector the motion of the central part of the diaphragm. In this way the vibration of the air column is the most vigorous. The frequency of the diaphragm is lowered, so that it will cause a fundamental tone of medium pitch to be produced, by reason of the weighting of it by the disc and by reason of the retarding of its movements due to the operation of the disc as a piston in the manner described. For example, the diaphragm may have a frequency of 300 vibrations per second when vibrating the disc, and the disc may have a frequency of 2400 vibrations per second for satisfactory operation.

In selecting a material for the disc consideration is given to the fact that the diameter of the disc should be such that the edge of the disc will lie closely adjacent the wall defining the entrance to the projector, that the thickness of the disc should be such that its frequency will be sufficiently high and that the weight of the disc will not be so great as to unduly lower the frequency of the diaphragm when vibrating the disc. Also, the material must be such that a ringing sound will be produced. Magnesium has been found suitable, and it has been the practice to make these discs from magnesium castings.

One aim of the present invention is to reduce the cost of making the resonator disc, and this aim is accomplished by a novel method permitting the use of a metal which is relatively inexpensive and which is obtainable in sheet form capable of being shaped into a resonator disc.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of embodiment of the present invention is clearly shown.

In the drawings:

Figs. 1 and 2 are plan and cross sectional views, respectively, of a sheet metal disc before it is formed to provide a resonator disc.

Fig. 3 is a sectional view of the disc and apparatus for changing its shape from that shown in Fig. 2 to that shown in Fig. 3 in order to produce a resonator disc of the required frequency.

Fig. 4 is a fragmentary view, partly in section, of a sound signal employing a disc constructed in accordance with the present invention.

Referring to Fig. 4, 20 designates the sound projector of the warning signal or horn and 21 is a throat member attached to the projector 20 and provided with a flange 22. Screws 26 and nuts 27 secure the flange 22 and the edge portion of a diaphragm 23 to the flange 24 of the frame 25 which supports an electromagnetic motor. The electromagnetic motor may be of the type disclosed in my copending application, Serial No. 210,879, filed August 5, 1927, and comprises in the main an electromagnet winding 30 supported by core 31 which is supported by the frame 25, and a movable armature 32 connected with a rod 33 and a yoke 34 carrying a screw 35. The screw 35 cooperates with an insulated button 36 carried by a leaf spring member 37 in order to separate a circuit breaker contact 38 carried by the member 37 from a circuit breaker contact 39 carried by a bracket 40. It will be understood that the circuit

breaker contacts 38 and 39 are connected in series with the electromagnet coil 30 and with a suitable switch (not shown) for connecting the signal with a current source (not shown); and that the closing of such a switch will result in the rapid reciprocation of the rod 33 and hence the diaphragm 23, which is connected with the rod 33 by means including nuts 41 and 42 engaging the threaded end 43 of the rod 33 and clamping between them the central portion of the diaphragm 23.

The resonator disc 50 which is attached to the rod 34 and moves with the diaphragm 23 includes a central portion 51 which has been displaced from the plane of the annular edge or peripheral portion 52 which may be referred to as a flange. The central portion 51 is provided with an aperture 53 for receiving the threaded portion 43 of the rod 33. A nut 54 threaded on the portion 43 clamps the disc 50 against the nut 42 which serves to space the disc 50 from the diahragm 23 and to locate the flange 52 of the disc 50 relatively close to the throat 21 of the horn.

The first step in the manufacture of the disc 50 is to form a flat disc as shown in Figs. 1 and 2 from a sheet of relatively light weight ductile metal obtainable in sheet form and capable of producing a ringing sound. An aluminum alloy of any preferred or desired proportions is suitable for this purpose. The thickness of the disc is of course limited by the permissible loading of the diaphragm, the diameter of the disc being fixed by the requirement that the edge of the disc lie relatively close to the throat wall of the projector as previously explained. It has been found that a sheet aluminum-alloy disc having the correct mass and diameter will be too thin to produce a tone of the required high pitch. I have discovered that the pitch or frequency of such a disc can be raised by placing at least a part of its structural fibers under tension; and I accomplish this result by a drawing process illustrated in Fig. 3.

The peripheral edge portion 52 of the disc 50 is clamped between a block 60 and a ring 61 by tightening screws, one of which is shown at 62. The central portion 51 of the disc is engaged by a relatively movable plunger 63 which displaces the central portion from the plane of the peripheral portion and thus places the structural fibers of the central portion under tension, radially and circumferentially.

In order to assist in preventing movement of the peripheral portion 52 of the disc relative to the clamping members 60 and 61 while the central portion 51 is being stretched by the plunger 63, the disc may be provided with a bead 55 adapted to be clamped between a bead 64 of the member 61 and a correspondingly grooved part 65 of the member 60.

I have discovered that the pitch of the disc will be increased according to the depth of the draw or to the amount of stretching of the fibres of the disc. The deeper the draw, the higher the pitch.

By my novel process of manufacture, a relatively thin sheet metal disc may be drawn sufficiently to raise its tone to the desired pitch, thus permitting the use of sheet metals which are less expensive though somewhat heavier than metals which must be shaped by casting.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A resonator disc for a sound signal comprising a sheet metal body having the fibers of the central circular area concentric with its peripheral edge under tension.

2. A resonator disc for a sound signal comprising a sheet metal body having all but its peripheral edge portion under tension.

3. A resonator disc for a sound signal comprising a sheet metal body having its central portion stretched from its peripheral portion.

4. A resonator disc for a sound signal comprising a sheet metal body having its central portion displaced rom the plane of its outer annular portion, the fibers of the central portion being under tension.

In testimony whereof I hereto affix my signature.

ROBERT M. CRITCHFIELD.