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Non-Transposing Mute

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Gossick et al.

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[54] **NON-TRANSPOSING MUTE**

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[52] **U.S. Cl.** **84/400**

[51] **Int. Cl.** **G10d 9/06**

[58] **Field of Search** 84/400, 387

[56] **References Cited**

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Assistant Examiner—John F. Gonzales
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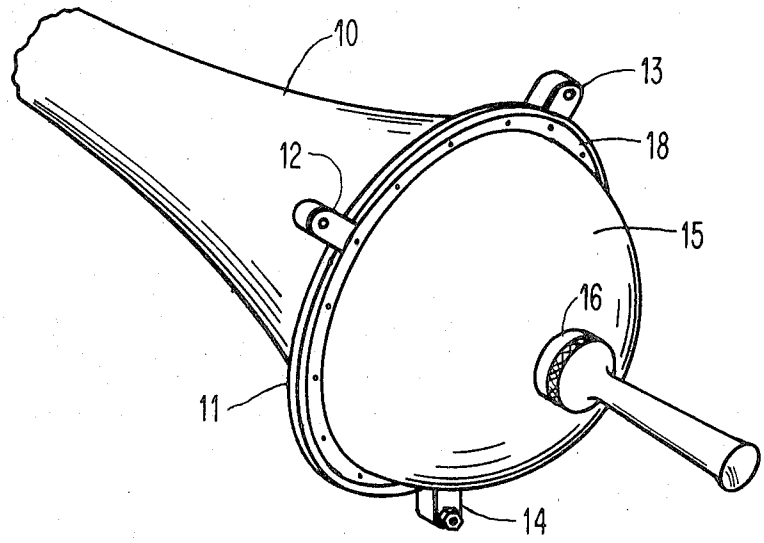
[57] **ABSTRACT**

A non-transposing mute having a metallic hemispherical resonator with a hollow acoustic filter attached thereto is provided for detachably fitting upon the rim of a brass musical instrument. A variety of tonal quality is available by choice of the particular filter selected by the musician.

5 Claims, 8 Drawing Figures



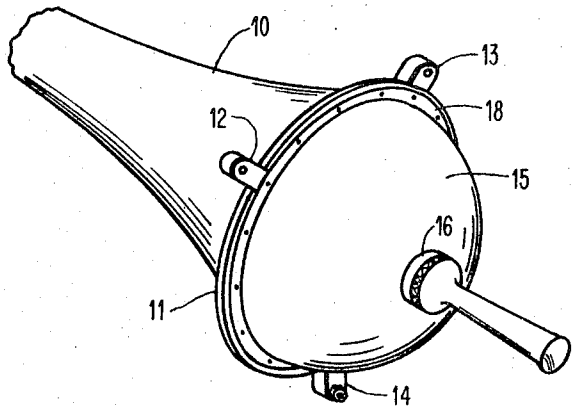


FIG. 1

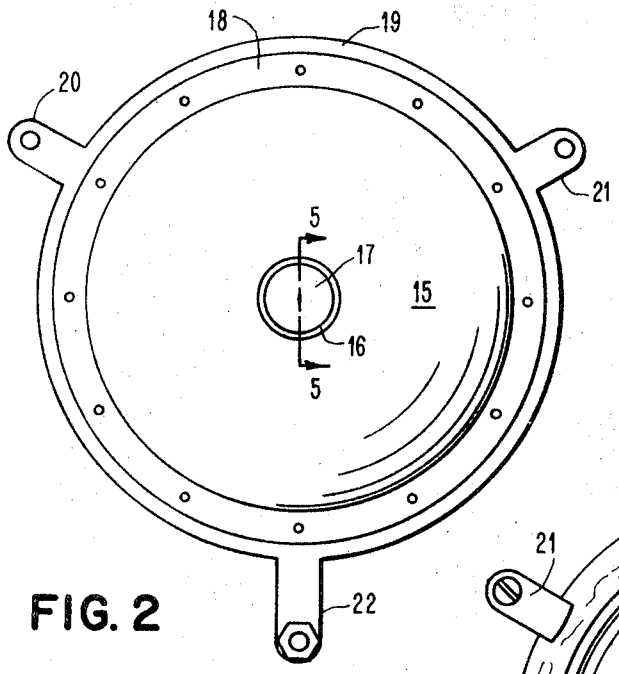


FIG. 2

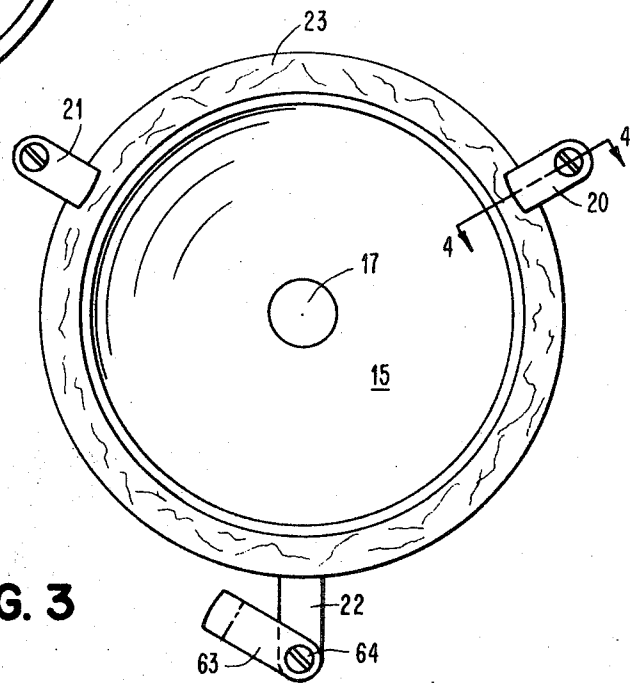


FIG. 3

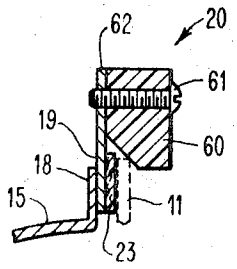


FIG. 4

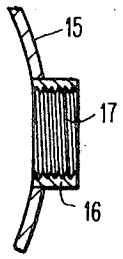


FIG. 5

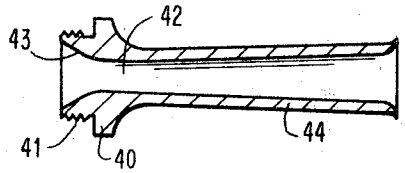


FIG. 7

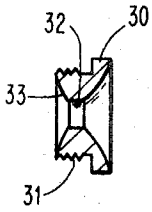


FIG. 6

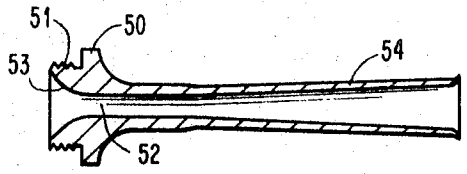


FIG. 8

NON-TRANSPOSING MUTE

BACKGROUND OF THE INVENTION

The use of acoustic attenuators, such as mutes, employed with brass musical instruments has long been known, and many forms of the same have been proposed. Often such devices include acoustic absorbing or damping materials serving essentially to muffle or reduce the intensity of sound at the expense of the tonal quality. It has now been discovered, however, that if a properly designed Helmholtz resonator is provided by the mute (when attached to the rim of the bell of the instrument and having an acoustic filter associated therewith) no disturbing of the pitch of the sound will occur, no sound damping material is required in the mute construction, and depending upon the structure of the acoustic filter the spectrum of sound emitted may be widely varied to suit the artistic range of expression of the musician.

In general, the sustained tone within a musical wind instrument, such as a cornet, is developed by the establishing of standing waves within the pipe through the coherence of the periodic pulses produced at the mouthpiece coinciding with pulses reflected from the outer end of the instrument. A pressure wave, of course, will be reflected in a pipe having an open end with the phase reversed, whereas with the end closed, the wave will be reflected in the same phase.

In accordance with the present invention a hemispherical Helmholtz resonator of sufficient size with, for example, an iris aperture therein serves to close the bell of the instrument and the incident wave is then reflected in phase substantially the same as if the bell were open. Accordingly, with the present type of non-transposing mute the effect on the pitch of the various notes of the instrument is substantially negligible, but the sound output is greatly suppressed. The only sound emitted is that which escapes through the small iris aperture together with that which is carried away by the vibrations of the walls of the instrument. Furthermore, the hollow acoustic filter device attached to the resonator in communication with the iris aperture forms a passive acoustical network, while the active acoustical network or tone generator, is meanwhile confined to the bell which is being terminated in the resonator.

One feature of this construction embodies a decoupling action which separates the active brass instrument from the passive acoustic filter. This function is accomplished by providing sufficient acoustic impedance, as by employment of the small iris aperture. Thus the spectrum of sound emitted through the iris can be varied merely by changing the filter device, and with assurance that such device will not interact upon the tone generator itself or disturb its pitch.

SUMMARY OF THE INVENTION

The invention employs a Helmholtz resonator member of metallic material of generally hemispherical shape with means at its periphery for attachment to the rim of the bell of the musical instrument and with a ferrule projecting outwardly from the resonator along the axis of the same. A hollow acoustic filter is detachably secured to the ferrule and has an iris aperture smaller than the diameter of the ferrule. Fastening members spaced along the periphery of the resonator serve to detachably secure the mute to the rim of the instrument.

Among the objects of the invention are the provision of an improved non-transposing mute which permits a greater variety of tone quality and which extends the artistic range of expression of the musician; the provision of a mute in which the tones are distinct and uniform in quality and in which rapid passages are not blurred; the provision of a mute in which the 'feel' of the instrument to the lips of the musician is substantially similar to the 'feel' of an un-muted instrument; and the provision of a mute requiring substantially no acoustical sound absorbing material in its construction.

These and other objects and advantages of the invention will become more apparent as the description proceeds and when considered in conjunction with the accompanying drawing in which

FIG. 1 is a perspective view of the mute attached to the wind instrument.

FIG. 2 is an elevation view to a larger scale showing the exterior of the mute with the acoustic filter removed.

FIG. 3 is an elevation view similar to FIG. 2 showing the interior of the mute.

FIG. 4 is a sectional view taken on line 4—4 of FIG. 3.

FIG. 5 is a sectional view taken on line 5—5 of FIG. 2.

FIG. 6 is a longitudinal sectional view to a larger scale showing one form of filter adapted for attachment at the ferrule shown in FIG. 5.

FIG. 7 is a longitudinal sectional view of a second form of filter; and

FIG. 8 is a longitudinal sectional view of a third form of filter.

Referring now to FIG. 1, the bell portion 10 of a brass musical instrument, here shown as a cornet, includes a rim 11 over which the mute is adapted to slip and to be detachably secured by fastening 12, 13 and 14 later to be described. A substantially hemispherical member 15 is provided with an axially aligned ferrule 16 or boss on its convex surface and which ferrule has an aperture 17 therein of relatively small size as compared to the diameter of said member. The member serves as the resonator and is of metallic material, preferably brass. At its periphery the member terminates in an outwardly extending planar flange 18 to which is secured, as by spot welding, an annular metallic supporting ring 19. Fasteners 20, 21 and 22 project radially from the ring and on the outer surface of the ring a suitable gasket 23 of soft material, such as felt, is secured.

The inner diameter of the ferrule is relatively small and, as an example, a diameter of five-eighths inch when used with a resonator member 15 having a diameter of 4 inches has proven to be satisfactory. Conveniently, the ferrule may be interiorly threaded and projects a suitable distance outwardly of the member 15 to give a secure attachment to the chosen acoustic filter now to be described.

One variety of filter is seen in FIG. 6 and comprises a metallic article having a knurled rim portion 30 with a longitudinally extending shank 31 threaded for engagement within the threaded ferrule. Significantly, an axial passage 32, therein called the iris aperture, extends through the filter and is flared at each end. The diameter of this aperture is thus smaller than the diameter of the ferrule and, for the example given, may be about one-eighth inch. The inner end of the shank is formed with a cavity 33 whose curvature may approxi-

mate the curvature of the resonator member **15** so that when the filter is fully inserted the desired wave reflection within the mute is improved.

A second form of filter is shown in FIG. 7 and comprises a similar rim portion **40,** shank **41** and iris aperture **42.** However, in order to secure a different tonal quality the diameter of the aperture is increased, for example, to about one-fourth inch, the curvature **43** of the cavity is changed, and a hollow stem **44** is added.

A third form of filter is illustrated in FIG. **8** and comprises a rim portion **50,** shank **51,** and iris aperture **52,** for example about one-eighth inch in diameter. However, in order to secure still another tonal quality the curvature **53** is different, the length of the hollow stem **54** is longer than in FIG. **7** and terminates in a flared opening smaller in diameter than the corresponding flared opening of stem **44.** Other designs of the passive acoustical filter may be employed without departing from the invention but in each form the pitch of the instrument is not changed.

Passing now to FIGS. **3** and **4,** after the musician selects the particular filter which he intends to use and has attached it to the resonator of the mute he will wish to attach the assembled mute quickly and easily to the bell of the instrument. One arrangement to serve this purpose comprises a pair of fasteners **20** and **21** each of which includes a plastic block **60** rigidly secured as by a screw **61** to an ear **62** projecting radially from the supporting ring **19.** The lower side of the block is bevelled to provide a space into which the rim **11** of the brass instrument bell is slipped when the mute is installed, and the felt gasket **23** is then compressed by the rim of that bell. It is to be noted that the gasket is entirely out of the resonator space and does not constitute acoustical absorbing material. However, if the aperture **17** were completely stopped with a plug the gasket would have a limited sound absorbing action.

By contrast with the described fastenings **20** and **21** the fastening **22** (FIG. **3**) includes a longer block **63** pivoted as by means of a bolt **64,** to a longer ear of the ring **19** and which may be swung into and out of engagement with the lower portion of the rim **11** of the instrument following the attachment of the fasteners **20** and **21** to that rim. Other means for detachably joining the mute to the instrument may, of course, be employed, as for example spring-loaded fasteners, or cam fasteners in which the mute is rotated into and out of fastened position.

Having thus described preferred forms of coordinated parts of the improved mute by means of which the invention may be practiced, it will be understood that the invention may be embodied in other forms without departing from the scope defined by the appended claims.

What is claimed is:

1. A non-transposing mute for a brass musical instrument having a bell portion comprising, a generally hemispherical metallic member including a relatively small ferrule at its axis and projecting outwardly therefrom, means for detachably securing the periphery of said member closely adjacent the rim of the bell portion and with said member positioned outwardly of the bell portion, and a hollow acoustic filter detachably secured to said ferrule and projecting outwardly therefrom, said filter serving to communicate the interior of said member with the ambient air and having a decoupling aperture therein smaller than the inner diameter of said ferrule.

2. A mute as defined in claim **1** wherein said filter includes a concave surface facing into said resonator member and leading to the entrance of said decoupling aperture.

3. A mute as defined in claim **1** substantially devoid of acoustical absorbing materials.

4. A mute as defined in claim **1** including a planar flange on said member, said flange providing a support for said securing means.

5. A mute as defined in claim **4** including a compressible gasket in contact with the rim of the bell portion and interposed between said flange and the bell portion when the mute is mounted on the instrument.

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