Nov. 12, 1929. W. E. CLIFTON 1,735,378

SOUND PROJECTOR

Filed Nov. 3, 1927

Fig. 1.

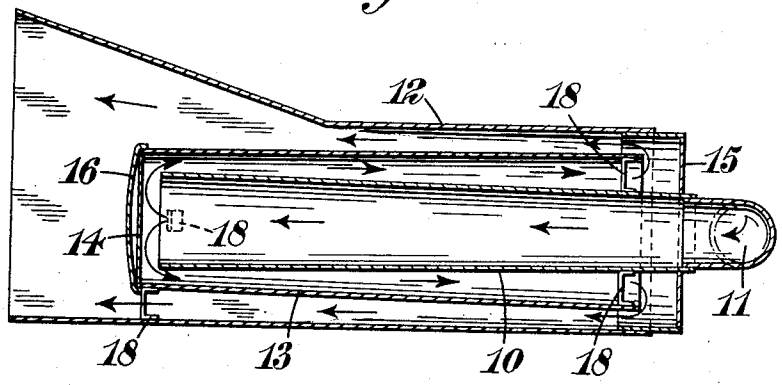
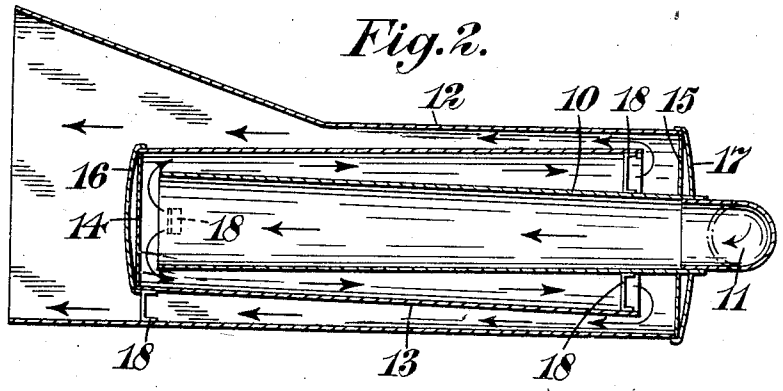


Fig. 2.



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UNITED STATES PATENT OFFICE

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SOUND PROJECTOR

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This invention consists in improvements in or relating to sound-projectors, sometimes termed "sound chambers" or "tone chambers" or horns, and these devices will be referred to hereinafter, for brevity, by the term "sound-projector." The invention is applied to that type of sound-projector which comprises a plurality of tubes arranged one within the other with the outlet of one tube directed towards a closed end of the next tube in succession, so that the air column, from the inlet to the outlet of the projector, follows a circuitous path zigzagging backwards and forwards in the direction of the axial length of the projector.

The invention is particularly applicable for use with gramophone instruments, loud-speaking telephones and the like.

According to the present invention, in a sound-projector of the kind described, an end closure member for a tube constitutes one wall of a closed chamber which is mechanically secured to the wall of the tube, and the end closure member is capable of vibrating under the influence of sound waves directed upon it, whereas the other walls of the chamber are relatively stiff and non-vibratory in comparison therewith.

The invention will be more clearly described with reference to two specific embodiments thereof which are diagrammatically illustrated respectively in longitudinal cross-section in Figures 1 and 2 of the accompanying drawings.

In both figures of the drawings there are shown three tubes, of which the innermost one 10 is in connection at its end 11, or is intended to be so placed in connection, with the sound-box of a gramophone or other sound-producing or sound-reproducing device with which the projector is to be employed. The outermost tube 12 is in the form of a flared horn extremity, the flared end being of any preferred shape and dimension. The end of the tube 10 that is remote from the extremity 11 is open and faces an end closure member of the intermediate tube 13, and the opposite end of the latter is directed towards a closed end of the outermost tube 12.

The end closure members for the intermediate tube 13 and the outermost tube 12 consist respectively of the disc 14 and an annulus 15 formed of material that will be capable of vibrating under the influence of sound waves directed upon them or imparted to them. All the tubes, for instance, may be of resilient metal, such as that known in the trade as sheet tin, or some of them may be of metal and some of them (for example the outermost one) of wood. The end closure members, such as 14 and 15, however, will generally be of metal and will thus constitute sound vibratory diaphragms. The disc 14 is mechanically secured firmly around its margin to the wall of the tube 13, and the annulus 15 is similarly secured at its inner and outer margins mechancally to the tubes 10 and 12 respectively.

In Figure 1, the chamber of which the diaphragm 14 forms a part, is constituted in addition by an end cap 16 which can be slipped on to the end tube much in the same way in which a canister lid is applied. The cap 16 is then secured to the walls of the tube by soldering, brazing or other means whereby a firm mechanical connection can be obtained.

In Figure 1, the end annulus or diaphragm 15 is not provided with a cap similar to 16, and the thickness of the diaphragm 15 may be somewhat greater than that of the diaphragm 14. In Figure 2, however, the diaphragm 15 is associated with a cap 17 in a similar manner to the association of the cap 16 with the diaphragm 14. The caps 14 and 17, of whatever material they may be composed, as compared with the end closure members or diaphragms such as 14 and 15, considerably less resilient. It is obvious that the members 16 and 17 need not be made in the form of flanged caps and can be of any shape to suit the configuration of the tube end to which they are applied.

The tubes forming the component parts of the horn may be steadied or secured in their relative positions by any preferred means, and in the example illustrated brackets, such as 18, are employed for this purpose. The arrows shown on the drawings

indicate the throughway or zigzag air passage through the sound-projector.

Instead of arranging the parts so that the end of the innermost tube projects substantially centrally through the closed end of the outermost tube as illustrated, the parts may be so arranged that the closed end of the outermost tube encloses or extends beyond the end, such as 11, of the innermost tube. In such a case, the end 11 of the tube where it is to be connected with the sound-producing or reproducing device will pass out laterally through the side wall of the outermost tube and also, if necessary or desirable, through a corresponding wall of the intermediate tube. In the example illustrated, the end 11 is to be understood as turned round at right-angles to the general plane of the section.

It is believed that with the aid of these end caps or end chambers extending beyond the diaphragms or end closure members 14 and 15, the energy imparted to the end closure members by the sound wave directed upon one face is not dissipated, as formerly, to the surrounding air in contact with the opposite face. The closed chamber prevents such dissipation and the bulk of the energy imparted to the closure member or diaphragm is transmitted radially to the wall of the tube.

Although this theory is advanced in order to aid in the understanding of the invention, it is to be understood that the invention is not limited thereto.

Whatever may be the explanation, it is certainly found that by the present invention a very considerable benefit is obtained in the quality and volume of the sound transmitted through the sound-projector, in the proper balance between treble and bass registers, and, in speech, clear diction and enunciation.

I claim:

1. A sound-projector of the kind described comprising in combination a plurality of tubes arranged one within the other with the outlet of one tube directed towards a closed end of the next tube in succession, an end closure member for said closed end capable of vibrating under the influence of sound waves directed upon it and constituting one wall of a closed chamber, and a closed chamber which has its other walls relatively stiff and non-vibratory and which is mechanically secured to the wall of the tube.

2. A sound-projector of the kind described comprising in combination a plurality of tubes arranged one within the other with the outlet of one tube directed towards a closed end of the next tube in succession, an end closure member for said closed end capable of vibrating under the influence of sound waves directed upon it and constituting one wall of a closed chamber, and a closed chamber whereof the other walls are relatively stiff and non-vibratory and are constituted by a cap which encloses the vibratory member and is secured to the tube.

3. A sound-projector of the kind described comprising in combination a plurality of tubes arranged one within the other with the outlet of one tube directed towards a closed end of the next tube in succession, an end closure member for said closed end capable of vibrating under the influence of sound waves directed upon it and constituting one wall of a closed chamber, and a closed chamber whereof the other walls are relatively stiff and non-vibratory and are constituted by a slip-on cap which encloses the vibratory member and is secured to the tube.

4. A sound-projector of the kind described comprising in combination a plurality of tubes arranged one within the other with the outlet of one tube directed towards a closed end of the next tube in succession, an end closure member for said closed end capable of vibrating under the influence of sound waves directed upon it and constituting one wall of a closed chamber, and a closed chamber whereof the other walls are relatively stiff and non-vibratory and are constituted by a slip-on cap which encloses the vibratory member and is secured around its rim by a sealing operation, such as a soldering operation, to the wall of the tube.

In testimony whereof I affix my signature.

WILLIAM ERNEST CLIFTON.