June 13, 1933. E. H. BEDELL 1,914,099

ACOUSTIC DEVICE

Filed March 11, 1932

FIG. 1

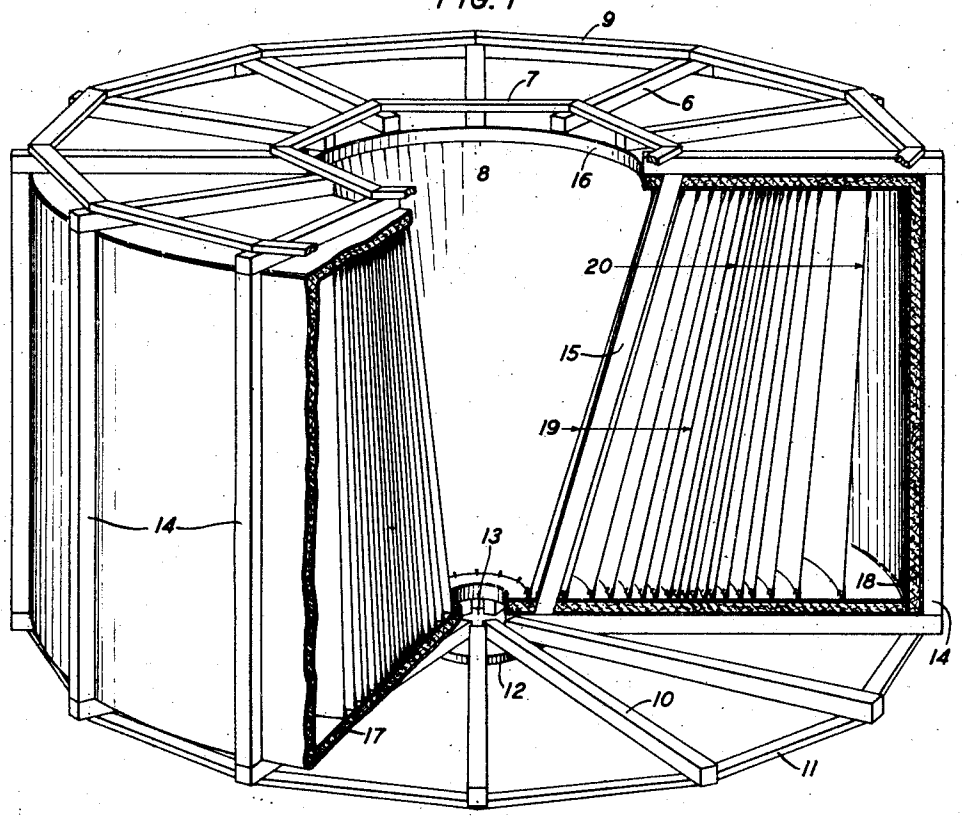


FIG. 2

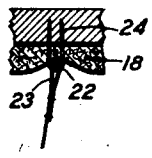


FIG. 3

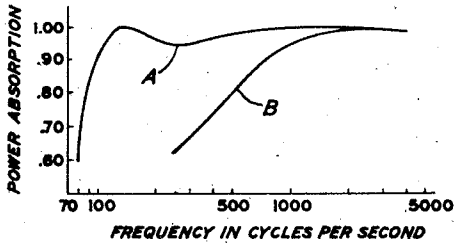
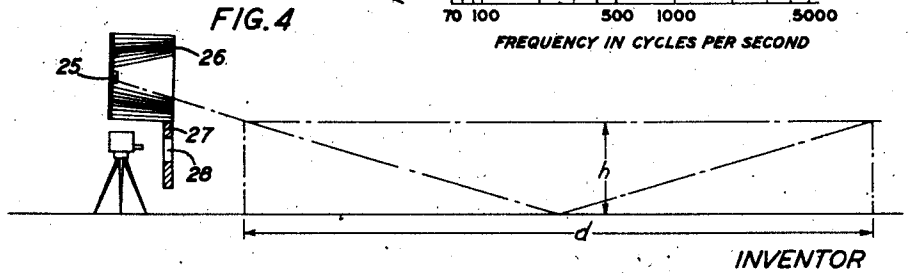


FIG. 4



INVENTOR
E.H.BEDELL

BY

ATTORNEY

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UNITED STATES PATENT OFFICE

EUAL H. BEDELL, OF SUMMIT, NEW JERSEY, ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

ACOUSTIC DEVICE

Application filed March 11, 1932. Serial No. 598,118.

This invention relates to acoustic apparatus and particularly to a directional baffle, or shield, for use with sound receiving devices.

An object of the invention is to provide a directive sound baffle of sound absorbing material for shielding sound receiving devices against reflected and extraneous sound.

In accordance with one feature of the invention the absorption power of the walls of the baffle, or shield, is approximately unity for frequencies above 100 cycles per second.

In one embodiment of the invention there is provided a horn-like sound baffle or screen for sound receiving devices having sound absorbing walls comprising a plurality of unevenly spaced layers of sound absorbing material.

Specifically, the invention provides a sound shield for sound receivers having a sound absorbing wall comprising a multiplicity of unevenly spaced layers of cloth having a total thickness of approximately ¼ the wave length of the lowest frequency to be absorbed.

Referring to the drawing;

Fig. 1 is a perspective view partly in section showing a sound baffle for microphones in accordance with the invention;

Fig. 2 shows a detail of construction;

Fig. 3 shows the power absorption versus frequency characteristics of a baffle in accordance with the invention; and

Fig. 4 illustrates diagrammatically a use of the device in connection with sound picture recording.

In general appearance the baffle, in the embodiment shown in the drawing, is cylindrical with a longitudinal conical passage therethrough. It consists of a skeleton or lattice framework on which the sound absorbing material is arranged as hereinafter described. One end of the framework comprises a plurality of radially extending strips 6 of any suitable material, such as wood, connected together at their inner ends by light cord members 7 leaving a comparatively large central opening 8 and also connected together at their outer ends by similar cord members 9. The frame at the opposite end is similar in structure and comprises radial members 10 connected at their outer ends by cord members 11 and secured together at their inner ends by an annular disc 12 leaving an opening 13 substantially smaller than opening 8. Joining the outer ends of the radial members 6 and 10 are longitudinal strips 14 which define practically a cylindrical surface and joining the inner end of the same radial members 6 and 10 are longitudinal strips 15 which define a conical surface. Secured to the inside of the frame to members 6 is a disc shaped pad 16, of rock wool or other suitable material, having a central opening therein corresponding to opening 8, and supported on the opposite end is a similar pad 17 having a central opening therein corresponding to opening 13. A pad, or lining, 18 of similar sound absorbing material is also secured to members 14 forming with the end pads 16 and 17 an annular chamber wherein are stretched between the pad 16 and 17 a plurality of concentric frusto-conical walls, or layers, of cloth 19 and 20, the innermost layer of which defines a conical sound receiving chamber. These walls are supported by wires 22, in the hems 23 thereof, stapled to the radial members 6 and 10.

In the embodiment shown in the drawing there are nineteen walls, or layers of cloth, the inner seven layers 19 of which are muslin having a mass of approximately .013 grams per square centimeter and an acoustic resistance of approximately 6 ohms per square centimeter and the outer twelve layers 20 of which are canton flannel having a mass of approximately .017 grams per square centimeter and an acoustic resistance of approximately 12 ohms per square centimeter.

The spacing between the walls is varied increasing outwardly for about the first seven and then decreasing. The overall dimensions of a suitable structure is approximately three feet long and six feet in diameter.

In Fig. 3 is shown a typical curve A which represents the absorption of a baffle in accordance with the invention and B represents a typical curve of one made of other

well-known material. It will be noted that the absorption for the structure in accordance with the invention is practically unity for all frequencies above 100 cycles per second. This type of baffle has a very high directive selectivity since it absorbs substantially all sounds outside of the solid angles subtended by the opening therein.

Fig. 4 represents graphically an application of the invention to sound picture recording. The microphone 25 is supported in the small end of the sound receiving baffle 26 by any suitable means, not shown, and a second baffle 27 of suitable material depends from the front of baffle 26. Baffle 27 has a window of glass 28 for the picture machine. With this combination of baffles it is unnecessary to either damp the studio walls or to enclose the picture machine in a sound proof booth for only sounds reaching the microphone directly or reflected from surfaces within the solid angle subtended by the opening in the baffle 26 are transmitted, all other sounds impinge on the baffle and are absorbed. If h is the height of the speaker or some source above the floor then d is the distance the source can move to and fro in the effective area of the baffle and still prevent the sound from being reflected from the floor to the transmitter. Obviously this may be made relatively large. One great advantage of the invention therefore is that it permits artists to perform in acoustic surroundings and with the same freedom of movement to which they are accustomed for binaural listening.

What is claimed is:

1. A directive sound baffle for a sound receiving device comprising a tubular sound duct open at one end for receiving sound to actuate a sound receiver at the other end, said duct consisting of a plurality of substantially concentric layers of non-resonant material spaced to form a multiplicity of chambers therebetween.

2. A directive sound baffle in accordance with claim 1, characterized in this that the layers are unevenly spaced transversely.

3. A directive sound baffle in accordance with claim 1, characterized in this that the layers are unevenly spaced, the spacing increasing inwardly.

4. A directive sound baffle in accordance with claim 1, characterized in that the layers are unevenly spaced, the spacings increasing outwardly.

5. A directive sound baffle in accordance with claim 1, characterized in this that the spacing increases outwardly and inwardly from a medial layer.

6. A directive sound baffle in accordance with claim 1, characterized in this that the thickness of the wall is approximately one quarter the wave length of the lowest frequency to be absorbed.

7. A directive sound baffle in accordance with claim 1, characterized in this that the layers are substantially pyramidal of different slopes.

8. A directive sound baffle in accordance with claim 1, characterized in this that the layers have different slopes increasing outwardly, the exterior layer having a substantially constant cross-section.

9. A directive sound baffle in accordance with claim 1, characterized in this that the elements have different coefficients of absorption.

10. A directive sound baffle in accordance with claim 1, characterized in this that the elements are cloth.

11. A directive sound baffle for a sound receiver comprising sound absorbing walls forming a conduit tapering from an opening at one end to a relatively larger opening at the other, said walls being substantially thicker at the ends having the smaller opening.

12. A directive baffle for a sound receiver comprising a plurality of tubes of cloth, a wire frame secured to the ends of each tube and means associated with said wire frames to support said tubes in concentric relation.

13. A directive sound baffle for a sound receiving device comprising a tubular sound duct having a tapered passage open at its larger end for receiving sound to actuate a sound receiver at the smaller end, said duct being defined by a plurality of substantially concentric layers of sound penetrable material separated to form air spaces therebetween.

14. A directive sound baffle for a sound receiving device comprising a tubular sound duct having a multiplicity of nested tubular elements of sound absorbing material, means for supporting said elements in spaced relation to form air chambers between adjacent elements.

15. A directive sound baffle for a sound receiving device comprising a tubular duct having a tapered sound passage open at its larger end for receiving sound to operate a sound receiver at the smaller end, said duct consisting of a plurality of tubular substantially concentric walls of sound absorbing material, means for supporting said walls in spaced relation to form air chambers therebetween, and means for closing the ends of said air chambers without obstructing the sound entrance in said duct.

16. A directive sound baffle for a sound receiving device comprising a tubular duct defining a sound passage open at one end for receiving sound to actuate a sound receiver at the other end, said duct consisting of a plurality of substantially coextensive layers of sound penetrable material sur-

rounding said passage, each layer surrounding the adjacent inner layer, and means supporting said layers in spaced relation to provide air spaces therebetween.

In witness whereof, I hereunto subscribe my name this 9th day of March, 1932.

EUAL H. BEDELL.