Aug. 21, 1934. E. C. WENTE 1,970,926

SOUND RADIATOR

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FIG. 1

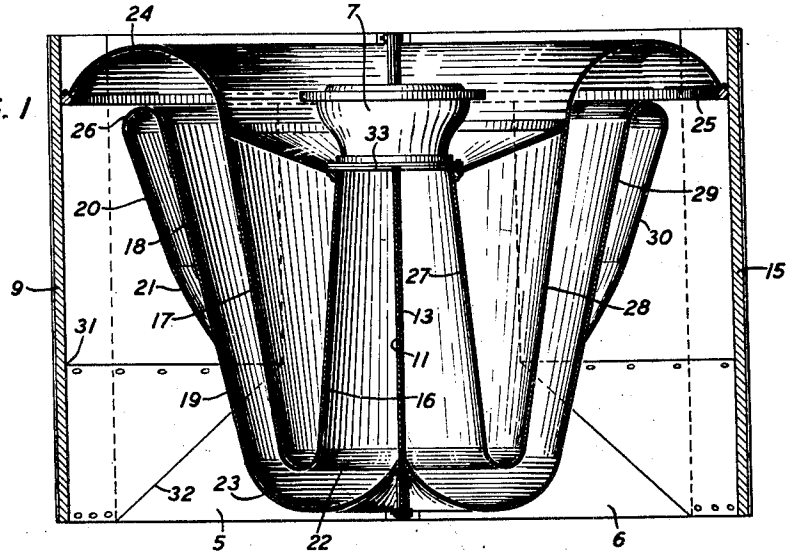
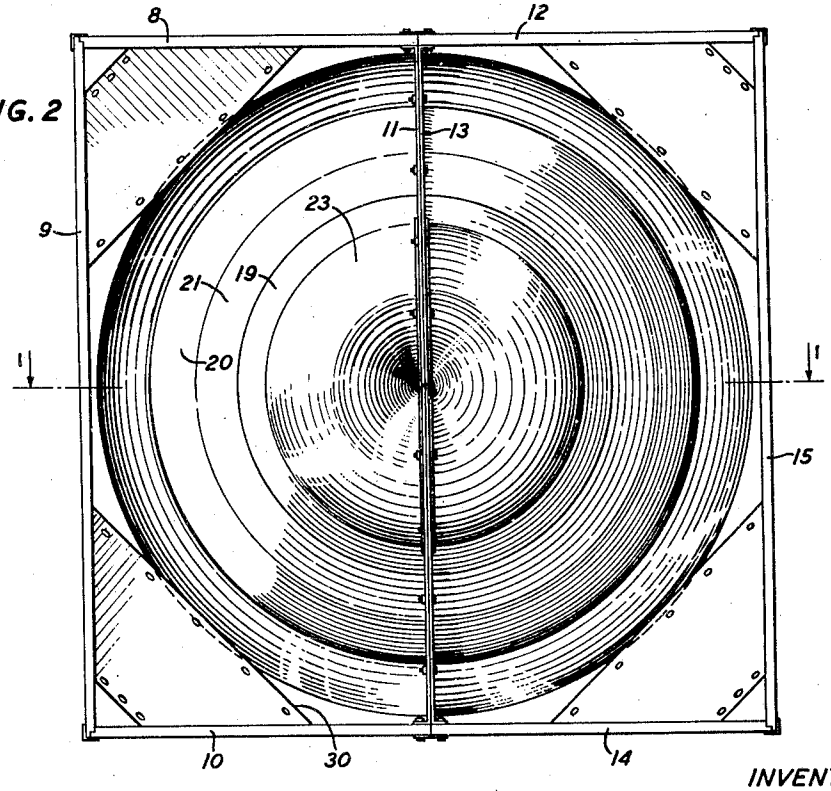


FIG. 2



INVENTOR
E. C. WENTE
BY
Edgar W. Adams
ATTORNEY

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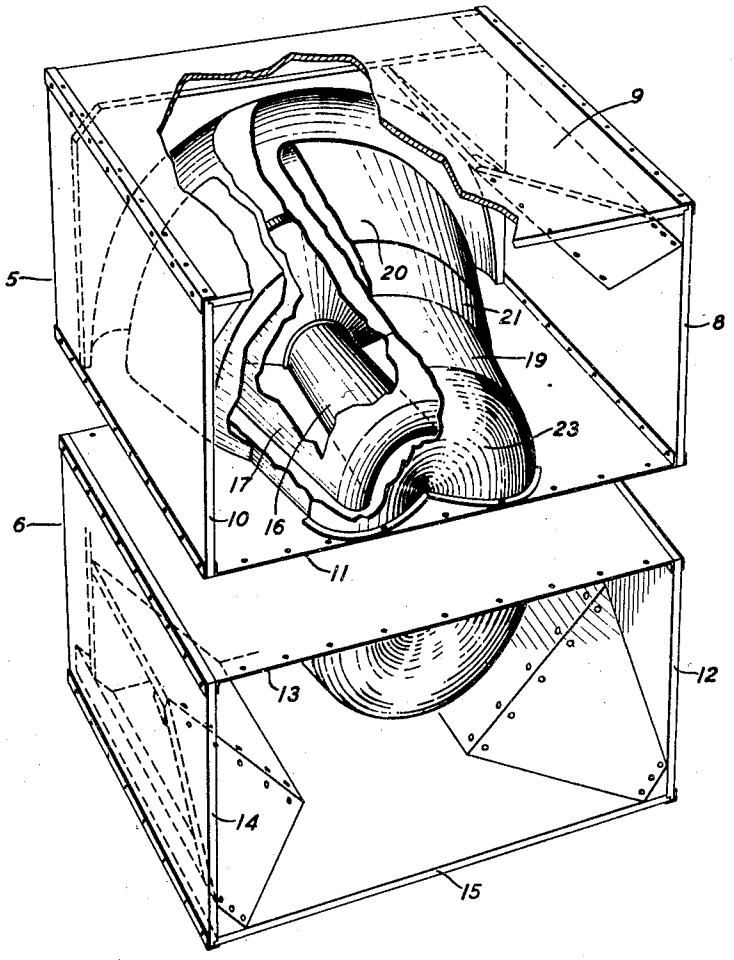
FIG. 3



INVENTOR
E. C. WENTE
BY
Edgar W. Adams
ATTORNEY

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1,970,926

SOUND RADIATOR

Edward C. Wente, New York, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application April 11, 1933, Serial No. 665,548

8 Claims. (Cl. 181—27)

This invention relates to horns and more particularly to horns suitable for the transmission of the lower range of frequencies of importance in speech or music, such horns, for example, as are used with phonograph reproducers and loudspeakers.

An object of the invention is to increase the portability of horns designed particularly for low frequency transmission at high volume levels.

If a horn is to function properly at frequencies as low as 40 cycles, for example, it must necessarily be of large dimensions, but a horn with a large mouth opening is very directive at the higher speech frequencies if constructed in the usual manner. It is, therefore, frequently desirable to employ two horns in combination, one for the low frequencies and the other for the high frequencies. The present invention is concerned with the construction of a horn for the low frequency range such as between 40 cycles and 300 cycles. Due to the large size required for the efficient transmission of such low frequencies a horn of the folded type is advantageous of it is not to be so unwieldy that it cannot be used on a shallow stage.

In accordance with this invention the horn is sectionalized to provide separate units which may be readily transported and subsequently assembled to give the same high quality reproduction as the unitary folded horn. It will generally be sufficient to construct the horn so that it may be separated into two equal parts and when the horn is box shaped the plane of separation should be perpendicular to two opposite sides, the plane passing through the horn axis. When such parts are assembled an important problem is to avoid air leakage from one section to another section along the axis of the horn which would occur if all the edges of the walls of the two halves are not joined by a substantially air-tight connection. This assembly problem may be most readily solved by having each half along the plane of separation closed by a plate permanently attached as by soldering or welding to the edges of the walls of all sections of the sound channel. Each half is then an entirely independent sound channel with permanently joined side walls from throat to mouth opening and neither half of the horn has a boundary wall which is disturbed by the junction or separation of the two halves of the horn.

Referring to the drawings,

Fig. 1 is a sectional view of the double horn construction of this invention with the section taken parallel to the axis of the horn;

Fig. 2 is an end view of the horn of Fig. 1 looking into the horn mouth; and

Fig. 3 is a view in perspective of the double horn of Fig. 1 with its two parts separated slightly for explanatory reasons.

The form of this invention chosen for illustration is a horn of the type where the continuous sound passage from inlet to outlet comprises a plurality of folded or telescoping sections and is shown as comprising two sound channels 5 and 6 with independent side walls but capable of being attached to a common loudspeaking receiver 7. One channel 5 has outer side walls 8, 9, 10 and 11 while the other channel 6 has outer side walls 12 to 15. Walls 11 and 13 are adapted to be superimposed one on the other and joined by bolts or other fastening means at their edges at the front and the rear of the horn (Figs. 1 and 2) so that the two sound channels 5 and 6 will operate effectively as a single horn unit.

The sound passage of channel 5 has an innermost section defined by a portion of plate 11 and the semi-cylindrical wall 16, an intermediate section defined by the semi-annular space between plate 11 and the semi-cylindrical walls 17 and 18, and an outer section defined by outer walls 8, 9 and 11, semi-cylindrical portion 19 of wall 18 and semi-cylindrical walls 20 and 21. Walls 16, 17, 18, 20 and 21 at their bottom edges are welded or otherwise permanently fastened to plate 11 to prevent air leakage from any part of the sound channel. The front edges of walls 16 and 17 are joined by a curved member 22 while the front end of wall 18 is joined to plate 11 by curved member 23 so that the space between these two members serves to join the inner section of the sound channel with the intermediate section. Similarly a curved member 24 joins the rear edge of wall 17 to the edge of a large aperture in a vertical plate 25 while walls 18 and 20 are joined by a curved member 26, members 24 and 26 thus serving to join the intermediate section of the sound channel with the outer section. The front edge of wall 21 may be soldered or welded to the outer surface of wall 18 along the line of contact.

Starting at the throat with an area semi-circular in cross-section, sound passage 5, therefore, comprises a confined and continuous air column until the mouth of the horn is reached. The sound passage is preferably designed to follow approximately an exponential taper from throat to mouth but because of the low frequencies involved the exponential tapering law need not strictly be followed in order to obtain satisfactory

coupling between the receiver unit 7 and free space.

The sound channel 6 is identical in construction with channel 5 and, therefore, needs only a brief description. The inner section of channel 6 between walls 13 and 27 is semi-cylindrical, the intermediate section between walls 28 and 29 is semi-annular while the outer section lies between wall 30 and the outer walls 12, 14 and 15.

Each sound channel 5 and 6 for convenience in handling in transportation has an outer section which has outer walls defining a rectangle. In order to give a better approximation to the exponential taper and in order to make each outer section have an outer confining surface more nearly approximating a circle it will generally be advisable to eliminate from the air passage the angular space adjacent the contacting edges of the two adjacent side walls. Thus the angle defined by the junction of walls 9 and 10 is closed by a board 30 which extends between walls 9 and 10 from the rear of the horn up to the point 31. This space under the board 30 is then closed by a board 32 which is placed at an angle of about 45° to the axis of the horn and to the plane of wall 9. A similar construction is disclosed for taking the angular space between walls 8 and 9, between walls 14 and 15 and between walls 12 and 16 out of the sound passage and making the outer sound section of each channel roughly circular in cross-section with increasing area from the point 31 to the mouth opening.

In order to dismantle the horn unit the receiver unit 7 is first removed from the throat at the point 33 since the unit 7 is not sectionalized. The bolts joining sections 5 and 6 along the front and rear edges of plates 11 and 13 may then be removed, after which sections 5 and 6 may be moved or transported separately.

The form of the invention just described has been found principally suitable for transmission of a frequency range between 40 cycles and 300 cycles and for that purpose the combined opening was about 5 feet square with a depth of about 3 feet, 8 inches, outside dimensions. Such a horn, of course, for most purposes will need to be associated with another horn which will transmit efficiently the frequency range above 300 cycles. While this horn may be made of a variety of materials it will generally be found convenient to make the outer walls 8 to 10 and 12, 14 and 15 of wood with the inner walls and walls 11 and 13 of thin metal.

While only one form of this invention has been illustrated it is to be understood that the invention may possess widely different embodiments without departing in any wise from the spirit of this invention as defined in the appended claims.

What is claimed is:

1. A sound radiator comprising a plurality of horns each horn having independent side walls and having a continuous sound passage from throat to mouth of said radiator formed by a plurality of telescoping sections, each of said horns projecting sound in a direction generally parallel to the axis of its throat section, and a common loudspeaking receiver connected to said horns.

2. A sound radiator having a continuous sound passage formed from inlet to outlet of said radiator of walls arranged in a plurality of telescoping sections, one wall of each of said sections from inlet to outlet of said radiator lying in a common plane.

3. A sound radiator comprising a continuous sound channel formed from inlet to outlet of said radiator by a plurality of telescoping sections and a flat wall extending from the inlet to the outlet of said radiator and constituting a part of the enclosure for the sound passage for each of a plurality of said channels.

4. A sound radiator comprising a continuous sound channel formed from inlet to outlet of said radiator by a plurality of telescoping sections and a flat wall extending longitudinally the length of the axis of each section and defining a portion of the sound passage of each of said sections from the inlet of said radiator to the outlet of said radiator.

5. In combination a plurality of sound radiators, one radiator comprising a continuous sound channel formed by a plurality of telescoping sections and a flat wall extending longitudinally the length of the axis of each section and defining a portion of the sound passage of each of said sections, a second sound radiator comprising a continuous sound channel formed by a plurality of telescoping sections and a flat wall extending longitudinally the length of the axis of each section and defining a portion of the sound passage of each of said sections, said flat walls being juxtaposed, means for fastening said flat walls together and a common loudspeaking receiver connected to both said radiators.

6. In combination, a sound radiator comprising a continuous sound channel formed by a plurality of telescoping sections and a flat plate constituting an outer wall for said channel, a portion of said plate constituting a portion of the enclosure for each of said sections, a second sound radiator comprising a continuous sound channel formed by a plurality of telescoping sections and a flat plate constituting an outer wall for said channel, a portion of said plate constituting a part of the enclosure for the air column in each of said sections, and means for securing said plates together.

7. A sound radiator comprising a plurality of horns each horn having independent side walls and having a continuous sound passage from throat to mouth of said radiator formed by a plurality of telescoping sections, the mouth of each horn being on a side of said radiator opposite its throat.

8. A sound radiator having a continuous sound passage formed of walls arranged in a plurality of telescoping sections, one wall of each of said sections lying in a common plane one of said sections surrounding a second section through an angle of approximately 180 degrees measured in a plane at right angles to the axis of said second section.

EDWARD C. WENTE.