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MULTIPLE INLET HORN

Filed May 8, 1925

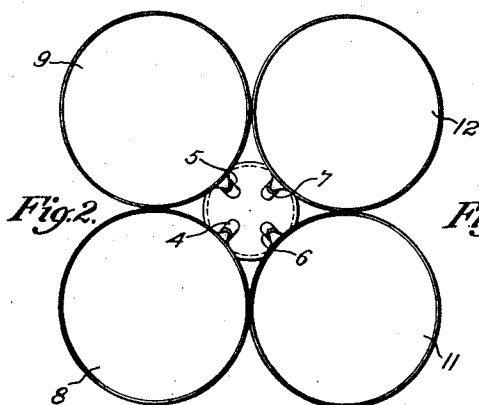


Fig. 2.

Fig. 4.

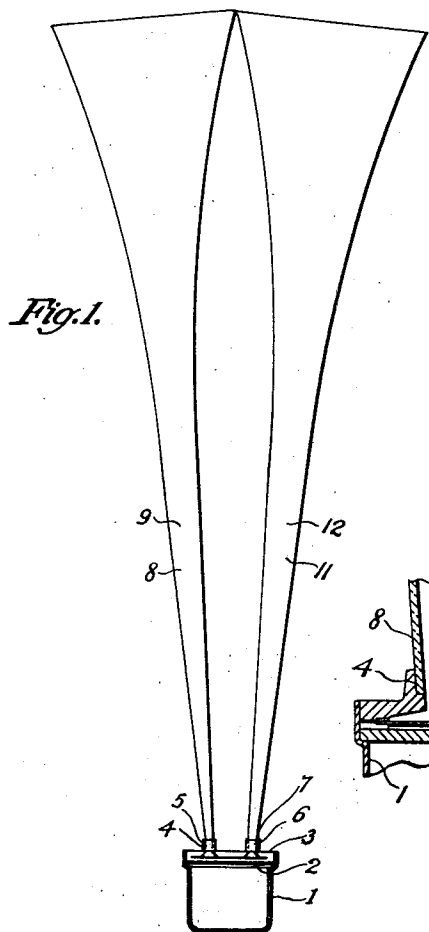
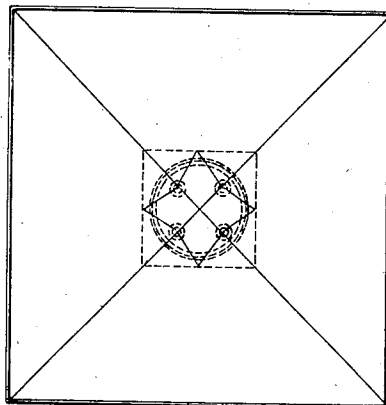


Fig. 1.

Fig. 3.

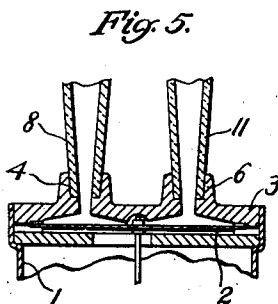
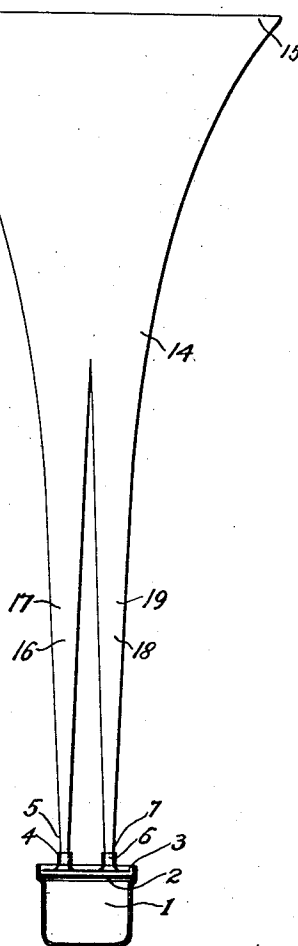


Fig. 5.



WITNESSES:

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MULTIPLE-INLET HORN.

Application filed May 8, 1925. Serial No. 28,793.

My invention relates to sound-translating devices, and particularly to such devices that are adapted for utilization with large amounts of sound energy.

5 An object of my invention is to produce a sound-producing device of the diaphragm type that is adapted for the development and accurate reproduction of sounds of substantial magnitude.

10 Another object of my invention is to provide a horn adapted to cooperate with a large diaphragm.

Another object of my invention is to provide a multiple inlet horn.

15 Another object of my invention is to provide a horn and diaphragm construction, in which the maximum effective distance of travel radially across the diaphragm shall be less than one-quarter wave length of the highest frequency to be reproduced, and which is simultaneously capable of the translation of large amounts of vibratory energy.

20 In prior construction of sound-producing devices utilizing a diaphragm and a horn, it has been customary to use a single horn having a single small opening cooperating with the diaphragm and usually positioned at or near the center line thereof. It is also usually provided with an oppositely positioned single large bell. This construction has been found inadequate for the translation of relatively very large amounts of vibratory energy.

25 The amount of energy which can be translated by a diaphragm is a function of the diameter thereof. When attempts have been made to enlarge the diaphragm in order to translate larger quantities of vibratory energy, difficulty has been experienced due to the fact that the higher vibration frequencies were lost in the diaphragm chamber. This was found to occur because the distance of travel across the face of the diaphragm was greater than one-quarter wave length of sound.

30 My invention provides means whereby a single large diaphragm may be combined with a sound resonant means, and the effective distance of travel across the face of the diaphragm kept sufficiently short to avoid the loss of high-frequency vibrations such as involved in the translation of intelligible speech and in the accurate reproduction of sounds.

My invention provides means comprising

a plurality of outlets symmetrically spaced 55 with respect to a diaphragm and a diaphragm chamber and cooperating with a plurality of horn structures adapted to form a single sound radiator unit.

Other objects and structural details of my invention will be apparent from the following description when read in connection with the following drawing, wherein,

Figure 1 is a side view of an embodiment of my invention;

Fig. 2 is an end view of the same;

Fig. 3 is a side view of a modification;

Fig. 4 is an end view of the modification, and

Fig. 5 is a sectional view of the diaphragm 60 chamber thereof.

Referring to Fig. 1, an electromagnetic translating device 1 is provided having a diaphragm 2 which may preferably have a diameter of 3 to 6 inches. The diaphragm is held 75 in place by a recessed plate 3. The recess formed thereby constitutes the diaphragm chamber. A plurality of openings 4, 5, 6 and 7 symmetrically disposed with reference to the diaphragm, and which are shown as 80 four in number, are formed in the recessed plate 3 of the sound chamber. Mounted over the openings 4, 5, 6 and 7, are a plurality of horns 8, 9, 11 and 12 which may be of similar shape and of equal length, and may have their 85 large ends tangentially positioned.

Referring to Fig. 3, a similar electromagnetic translating unit 1 may be provided having a diaphragm 2 and a recessed plate 3 as in the first described embodiment. The recessed plate 3 similarly has a plurality of openings 4, 5, 6 and 7. A compound horn 14 having a plurality of horn portions 16, 17, 18 and 19 is provided, cooperating with the openings 4, 5, 6 and 7, and the outlet ends 95 of which are combined into a single bell portion 15.

In the operation of my device, vibration of the diaphragm 2 produces pressure pulses at regular intervals corresponding to sound 100 which pulses are transmitted through the horn structure and directed and radiated thereby. By means of the construction, as described, the distance from the edge of the vibratory diaphragm to the center of any effective sound outlet from the diaphragm chamber may be kept less than approximately one or two inches. This distance cor-

responds to one-quarter wave length of a sound-vibration frequency which is sufficiently high to cover the necessary sound frequencies for the accurate translation of intelligible speech. The shortness of this distance minimizes the development of anti-resonant phenomena which would reduce desired vibrations. The increased size of the diaphragm permits of the translation of much greater vibratory electrical energy into greater sound volumes without the loss of the important high-vibration frequencies.

By means of this construction, I am enabled to translate much greater quantities of electrical energy into sounds of much greater volume. Simultaneously I am enabled to retain the true sound character required for the natural translation of music and speech.

While I have shown only two embodiments of my invention, it is capable of various modifications therefrom and it is desired, therefore, that only such limitations shall be imposed thereon as are required by the prior art or indicated in the appended claims.

I claim as my invention:

1. In a sound producing device, a diaphragm, actuating means therefor, a sound chamber one wall of which is constituted by said diaphragm, and a plurality of horns so disposed that their smaller ends open into said chamber at a plurality of separated points closely adjacent to said diaphragm, the distance from the edge of said diaphragm to the one of said smaller ends that is nearest to the point on said edge from which said distance is measured being less than one quarter of a wave length of the highest frequency the device is intended to produce.

2. In a sound producing device, a diaphragm, actuating means therefor, a sound chamber one wall of which is constituted by said diaphragm, and a plurality of horns so disposed that their smaller ends open into said chamber through another wall thereof at a plurality of points symmetrically distributed in said wall between the center and the periphery thereof, the distance from the edge of said diaphragm to the one of said smaller ends that is nearest to the point on said edge from which said distance is measured being less than one quarter of a wave length of the highest frequency the device is intended to produce.

3. In a sound producing device, a diaphragm, actuating means therefor, a sound chamber one wall of which is constituted by said diaphragm, and a plurality of horns

having a common bell and individual throats so disposed that their smaller ends open into said chamber through another wall thereof at a plurality of points distributed in said wall between the center and the periphery thereof, the distance from the edge of said diaphragm to the one of said smaller ends that is nearest to the point on said edge from which said distance is measured being less than one quarter of a wave length of the highest frequency the device is intended to produce.

4. A sound-reproducing means comprising a diaphragm having a diameter greater than three inches, and means for minimizing the occurrence of space anti-resonance phenomena therewith.

5. A sound-reproducing means comprising a diaphragm having a diameter greater than three inches, a cooperating backing plate having perforations therein symmetrically located between the center and the circumference of said diaphragm, and a plurality of horns attached thereto in register with said openings.

6. In a sound-producing apparatus, a diaphragm, means for vibrating the same and a chamber enclosing the diaphragm, said diaphragm and chamber having a diameter approximating the wave-length of the highest note the apparatus is intended to produce and said chamber having openings so spaced that the distance from any part of the diaphragm to the nearest opening is less than one quarter of said shortest wave-length.

7. In a sound-producing apparatus, a diaphragm, means for vibrating the same, and a chamber having a plurality of outlets enclosing the diaphragm, the distance from any part of said diaphragm to the outlet nearest said part being short enough to prevent resonance within said chamber at the shortest wave-length at which said apparatus is designed and intended to operate.

8. In a sound producing device, a single vibratory diaphragm, and a plurality of horns having individual throats and a common bell so disposed that their inner ends are closely adjacent to said diaphragm, the distance from the edge of said diaphragm to the one of said inner ends that is nearest to the point on said edge from which said distance is measured being less than one quarter of a wave length of the highest frequency the device is intended to produce.

In testimony whereof, I have hereunto subscribed my name this 29th day of April, 1925.

CLINTON R. HANNA.