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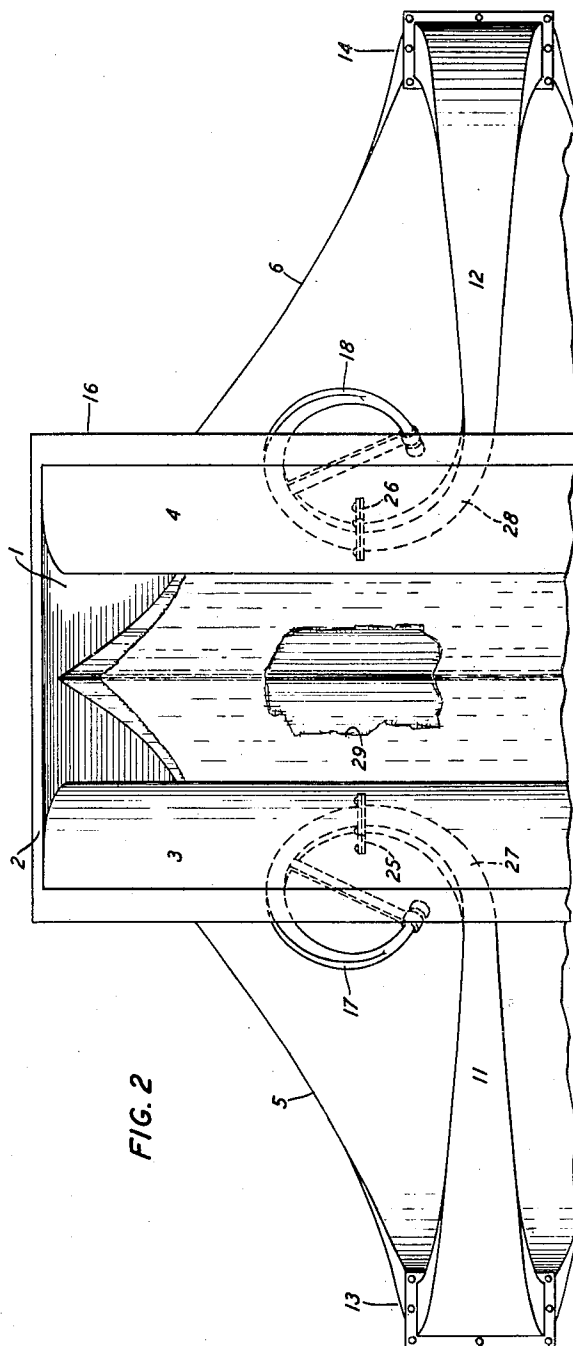
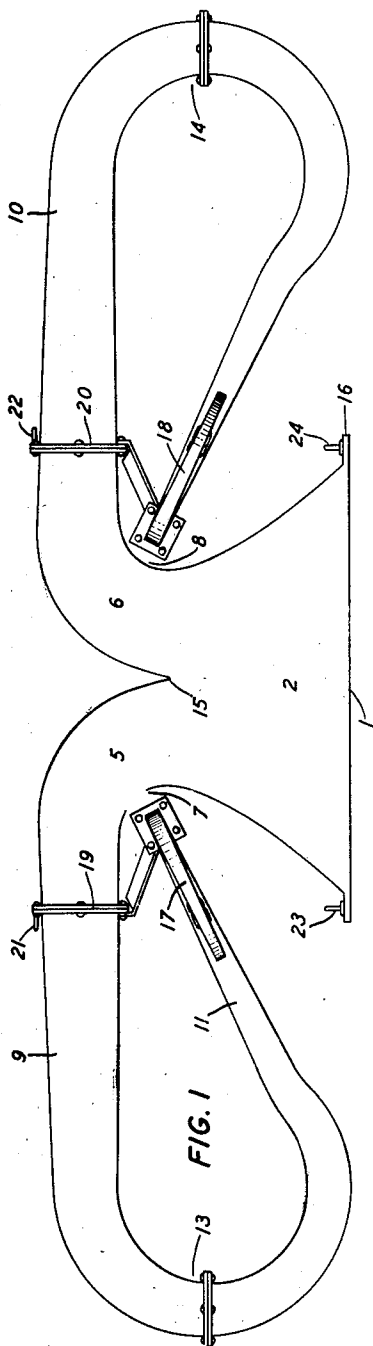
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ACOUSTIC DEVICE

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2 Sheets-Sheet 1



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ACOUSTIC DEVICE

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This invention relates to acoustic horns, and more specifically to those horns which are used as loud speaking units in theatres.

The object of this invention is to provide
 5 a compact shallow horn capable of faithfully transmitting sound vibrations at high energy levels and suitable for mounting in relatively narrow spaces, such as between the screen and back wall or drops of a theatre
 10 stage.

In accordance with this object one embodiment of the invention contemplates a sound amplifying horn which divides into two sound passages just back of the bell portion,
 15 each passage extending outwardly in opposite directions substantially at right angles to a medial plane through the axis of the bell portion and then curving forwardly through 180° toward the plane of the mouth
 20 of the bell portion.

In accordance with another feature the invention provides a horn of rectangular cross section, the major portion of which consists of two horizontally disposed equal
 25 sound passages symmetrically arranged with respect to a common bell portion having substantially parallel horizontal walls and diverging side walls, the distance between the parallel walls being substantially greater
 30 than the distance between the diverging walls at the mouth of the horn in order to provide for a wide distribution of sound waves at substantially all frequencies of importance in music and speech.

In one embodiment, a horn in accordance with this invention is so dimensioned that the cross sectional area varies according to the exponential law, that is, the ratio of the areas at axial points a given distance apart is
 40 the same for all portions of the horn.

In another embodiment, the portions of the divided passage may pierce the side wall of the bell portion on their respective sides and be brought together inside the bell portion into a single throat which pierces and
 45 extends through the rear of the bell portion. At the end of the throat portion exterior to the horn is mounted the receiver.

Previous to the invention of the above described horns considerable difficulty was met
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in theatres which employed large type horns because of the very limited space between the screen and the back wall or drop. Horns of the type described here overcome this difficulty and make it possible in theatres to
 55 use larger horns and in the case of large theatres to reduce the number of units. Also, by reason of their structure the horns provided in this invention may be mounted on the screen or separate drop to be moved with
 60 the screen thus making it a more convenient unit to handle.

Referring to the accompanying drawings, Fig. 1 is a top view of one embodiment of a sound amplifying horn in accordance with
 65 the invention;

Fig. 2 is a partial front view of the sound amplifying horn shown in Fig. 1;

Fig. 3 is a top view of a modified form of the sound amplifying horn shown in Figs.
 70 1 and 2, partially in cross-section;

Fig. 4 is a partial front view of the sound amplifying horn shown in Fig. 3.

Referring particularly to Figs. 1 and 2, a common bell portion 1 having substantially
 75 parallel horizontal walls 2 and diverging side walls 3 and 4 is divided into two sound passages 5 and 6 at the rear of said bell portion. The distance between the parallel walls 2 is substantially greater than the distance
 80 between the diverging walls 3 and 4 at the mouth of the horn in order to provide for a wide distribution of sound waves at substantially all frequencies of importance in music and speech.

The two sound passages 5 and 6 are bent outwardly in opposite directions just back of the bell portion at 7 and 8 respectively substantially at right angles to a medial plane through the axis of the bell portion.
 90 Both passages then have a straight portion 9 and 10 respectively which may be several feet in length, after which straight portion they then curve forward at 13 and 14 respectively through at least 180° toward the plane
 95 of the mouth of the bell portion, the radius of the bend being such, however, that the passages do not intersect the plane of the mouth of the bell portion. The two passages thereafter have straight portions 11 and 12 re-
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spectively which return toward the bell portion 1 and end near said bell portion. These latter straight portions 11 and 12 respectively may return in a plane parallel to the plane of the mouth of the bell portion or as shown in Figure 1, the second mentioned bends 13 and 14 may be more than 180°, in which case, the straight portions 11 and 12 would turn in at an angle to the plane of the mouth of the bell portion and the passages 5 and 6 would end near the centers of curvature of the first mentioned bends 7 and 8. It will be appreciated, therefore, that these straight portions 11 and 12 may be turned in at any desired angle depending upon the particular requirements of the place where the horn is to be used. The sound passages 5 and 6 are thereafter bent at 27 and 28 respectively in a plane at right angles to the general plane in which their axes lie through about 60° or 70°, whereafter the passages proper each terminate with a flange 25 and 26 respectively to which may be bolted a horn throat 17 and 18 carrying a sound generating unit (not shown).

From the flanges 25 and 26 the section of the passages 5 and 6 increases in both their dimensions but in one dimension more rapidly than in the other dimension. The dimension of the passages parallel to the plane of the mouth of the bell portion and perpendicular to the plane of the axes of the passages becoming considerably greater than the dimension in the general plane of the axes of the passages. From the point 15 at which the two passages intersect the dimension perpendicular to the general plane of the axes of the passages remains constant until the mouth opening is reached. The other dimension, however, increases rapidly over this length.

The horn should be so dimensioned that the cross-sectional area varies according to the exponential law, that is, the ratio of the areas at axial points a given distance apart is the same for all portions of the horn.

A sound generating unit with an appropriate throat may be connected to each of the two flanges 25 and 26. Alternatively, divided throats may be connected to each of the two flanges and any number of receivers may be used depending upon the amount of sound energy desired.

The horn may be made of sections of steel provided with flanges of angle iron by which the sections may be bolted together. A flange 16 of angle iron may be affixed by riveting, welding or the like, to the margin of the mouth of the bell portion, thus reinforcing the margin and furnishing a means by which the horn may be mounted to some means of support. The horn may be suspended by attaching chains to suitable eye bolts 21, 22, 23 and 24 shown on flanges 16, 19 and 20. Damping strips or sheets 29 of flannel or like

material may be affixed by adhesive to the surface of the horns where required.

In a modified form of this invention as shown in Figures 3 and 4 there is provided a bell portion similar to that shown in Figures 1 and 2 having substantially parallel horizontal walls 40 and diverging side walls 41 and 42; said bell portion being divided into two sound passages 43 and 44 at its rear.

The two sound passages 43 and 44 are bent outwardly in opposite directions at 45 and 46 respectively just back of the bell portion substantially at right angles to a medial plane through the axis of the bell portion. They then have a straight portion 47 and 48 respectively which may be several feet in length, after which straight portion they then curve forward at 49 and 50 respectively through 180° toward the plane of the mouth of the bell portion; the radius of the bend being such, however, that the passages do not intersect the plane of the mouth of the bell portion. The two passages thereafter have straight portions 51 and 52 respectively which return toward the bell portion. These second straight portions 51 and 52 may return in a plane parallel to the plane of the mouth of the bell portion as shown in Figures 3 and 4. The passages 43 and 44 then pierce the side walls 41, and 42 respectively of the bell portion and after entering the interior of the bell portion bend inward at 55 and 56 respectively to join in a common portion 57 which terminates with a flange 58. Attached to the flange 58 by bolts is a horn throat 59 which pierces and extends horizontally through the rear of the bell portion at 60, the axis of said throat portion lying substantially in a medial plane through the axis of the bell portion. On emerging from the rear of the bell portion the throat portion 59 is then bent upward through 90° at 61 in a plane at right angles to the general plane in which the axes of the sound passages 43 and 44 lie and extends upward in a straight portion 62 which lies between the front and rear of the horn in a space formed by the curvature of the first mentioned bends 45 and 46 of the sound passages 43 and 44 respectively. At the end of the throat portion exterior to the horn is mounted a sound unit (not shown).

The horn may be made of wood, steel or any other desirable material. Suitable eye bolts 63, 64, 65 and 66 may be attached at various places with which to suspend the horn.

It will be appreciated that many modifications of the above forms shown may be made without departing from the scope of the invention.

What is claimed is:

1. A horn comprising a bell portion having inlet and outlet openings, two sound passages communicating with said inlet opening, said passages extending laterally in opposite di-

reactions at right angles to a medial plane through the axis of the bell portion and curving forward through an angle of 180° at a substantial distance from each side of the outlet opening of said bell portion.

2. A horn comprising a bell portion of rectangular cross section, a throat portion, and an intermediate portion joining said throat and bell portions and having two similar looped sound passages of rectangular cross section and rigidly secured to said bell portion, each of said looped sound passages extending in opposite directions at right angles to a medial plane through the axis of the bell portion.

3. A horn comprising a bell portion, two looped sound passages communicating with the rear of said bell portion, said passages piercing opposite walls of said bell portion and a throat portion common to said sound passages extending through the rear of said bell portion.

4. A horn comprising a bell portion of rectangular cross section, two similar sound passages of rectangular cross section communicating with the rear of said bell portion and rigidly secured thereto, said sound passages extending outwardly in opposite directions at right angles to the vertical medial plane through said bell portion and curving forward through an angle of 180° , the length of said sound passages being substantially greater than the length of said bell portion.

5. A horn comprising a bell portion of rectangular cross section, the horizontal dimension of the mouth of said bell portion being substantially less than its vertical dimension and two conduits curving horizontally through 90° from the back of said bell and extending in opposite directions, said conduits having rectangular cross sections, the vertical dimensions of which increase rapidly, their horizontal dimensions increasing only slightly toward the bell portion whereby the sound wave expansion is substantially all in the vertical dimension in the conduits and greater in the horizontal dimension than in the vertical dimensions in the bell.

6. A horn comprising a bell portion of rectangular cross section having opposite parallel walls and opposite diverging walls, a pair of similar rectangular sound conduits communicating with the rear of said bell portion and extending in opposite directions between the projected planes of the parallel walls of said bell portion, then curving forwardly through 180° and continuing for a substantial distance toward said bell portion, said conduits each having a length substantially greater than the length of said bell portion, and a taper such that the ratio of the areas at axial points a given distance apart is the same for all portions of the horn.

7. A horn comprising a bifurcated sound passage, branches thereof extending in align-

ment in opposite directions, then curving forwardly through an angle of 180° and extending toward each other for a substantial distance and terminating on opposite sides of a portion of the sound passage.

8. A horn comprising a bell portion and two reversely curved conduits communicating with the rear of said bell portion and symmetrically disposed on each side thereof, a substantial portion of each of said conduits lying between the planes of front and rear of said bell portion and the areas of the sound passage increasing at a rate such that the ratio of the areas at axial points a given distance apart is the same for all portions of the horn.

9. A horn comprising two similar reversely curved conduits of rectangular cross-section having slightly diverging side walls about which said conduits are curved and widely diverging upper and lower walls, said walls defining openings lying in the same plane, the outer walls meeting at a common edge, said conduits being symmetrically disposed with respect to a plane bisector of the angle formed by said joining walls.

10. A horn comprising two similar reversely curved conduits of rectangular cross section having slightly diverging side walls about which said conduits are curved and widely diverging upper and lower walls, said walls defining openings lying in the same plane, the outer walls meeting at a common edge, said conduits being symmetrically disposed with respect to a plane bisector of the angle formed by said joining walls, and a bell portion having diverging vertical walls forming continuation of the inner walls respectively of said conduits and parallel horizontal walls one forming a continuation of both upper walls and the other a continuation of both lower walls of said conduits.

11. A horn comprising a bell portion of rectangular cross section having parallel horizontal walls, diverging vertical walls, two similar rectangular conduits communicating with the rear of said bell portion, the sum of the areas of openings in said conduits being substantially equal to the cross sectional area of the rear of the bell portion, each of said conduits having a 90° bend in opposite directions immediately adjacent the rear of said bell portion, said conduits lying between the projected planes of said parallel walls and being further curved forwardly through an angle of 180° at a substantial distance from the side walls of said bell portion.

12. A horn comprising a bell portion having inlet and outlet openings, two sound passages communicating with said inlet opening, said passages extending laterally in opposite directions at right angles to a medial plane through the axis of the bell portion and curving forward through an angle of at least 180° at a substantial distance from each

- side of the outlet opening of said bell portion, said last mentioned bend being of such radius that said sound passages do not intersect the plane of the mouth of the bell portion.
13. A horn comprising a bell portion having inlet and outlet openings, two sound passages communicating with said inlet openings, said passages extending laterally in opposite directions at right angles to a medial plane through the axis of the bell portion and curving forward through an angle of more than 180° at a substantial distance from each side of the outlet opening of said bell portion and continuing for a substantial distance toward said bell portion in such manner that a vertical plane through the axis of said portion is at an angle to the plane of the mouth of the bell portion.
14. A horn comprising a bell portion having inlet and outlet openings, two sound passages communicating with said inlet opening, said passages being bent outwardly in opposite directions just back of said bell portion substantially at right angles to a medial plane through the axis of the bell portion and curving forward through an angle of more than 180° at a substantial distance from each side of the outlet opening of said bell portion and continuing toward said bell portion, said second mentioned bend being of such curvature that said passages terminate near the centers of curvature of said first mentioned bends.
15. A horn comprising a bell portion having inlet and outlet openings, two sound passages communicating with said inlet opening, said passages being bent horizontally outward in opposite directions just back of said bell portion substantially at right angles to a medial plane through the axis of the bell portion and curving forward through an angle of more than 180° at a substantial distance from each side of the outlet opening of said bell portion and continuing toward said bell portion, said second mentioned bend being of such radius that said sound passages do not intersect the plane of the mouth of the bell portion and of such an angle that said sound passages terminate near the centers of curvature of said first mentioned bends.
16. A horn comprising a bell portion, two sound passages communicating with the rear of said bell portion, said sound passages extending in opposite directions to a distance from the medial plane through said bell portion substantially greater than the overall depth of the horn, then curving forward through an angle of 180° and returning to reunite in a common throat within said bell portion, the axis of said throat and said bell portion being substantially coincident.
17. A horn comprising a bell portion, two sound passages communicating with the rear of said bell portion, said passages extending laterally in opposite directions at right angles to a medial plane through the axis of the bell portion and curving forward through an angle of 180° at a substantial distance from each side of the outlet opening of said bell portion and returning to reunite in a common throat portion, the loops of said sound passages having their major axes substantially perpendicular to the axis of said bell portion and their minor axes parallel thereto, thus forming substantially a figure 8.
- In witness whereof, I hereunto subscribe my name this 19th day of June, 1930.
- DAVID G. BLATTNER.