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F. A. MANLEY
LOUDSPEAKER

2,761,913

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2 Sheets-Sheet 1

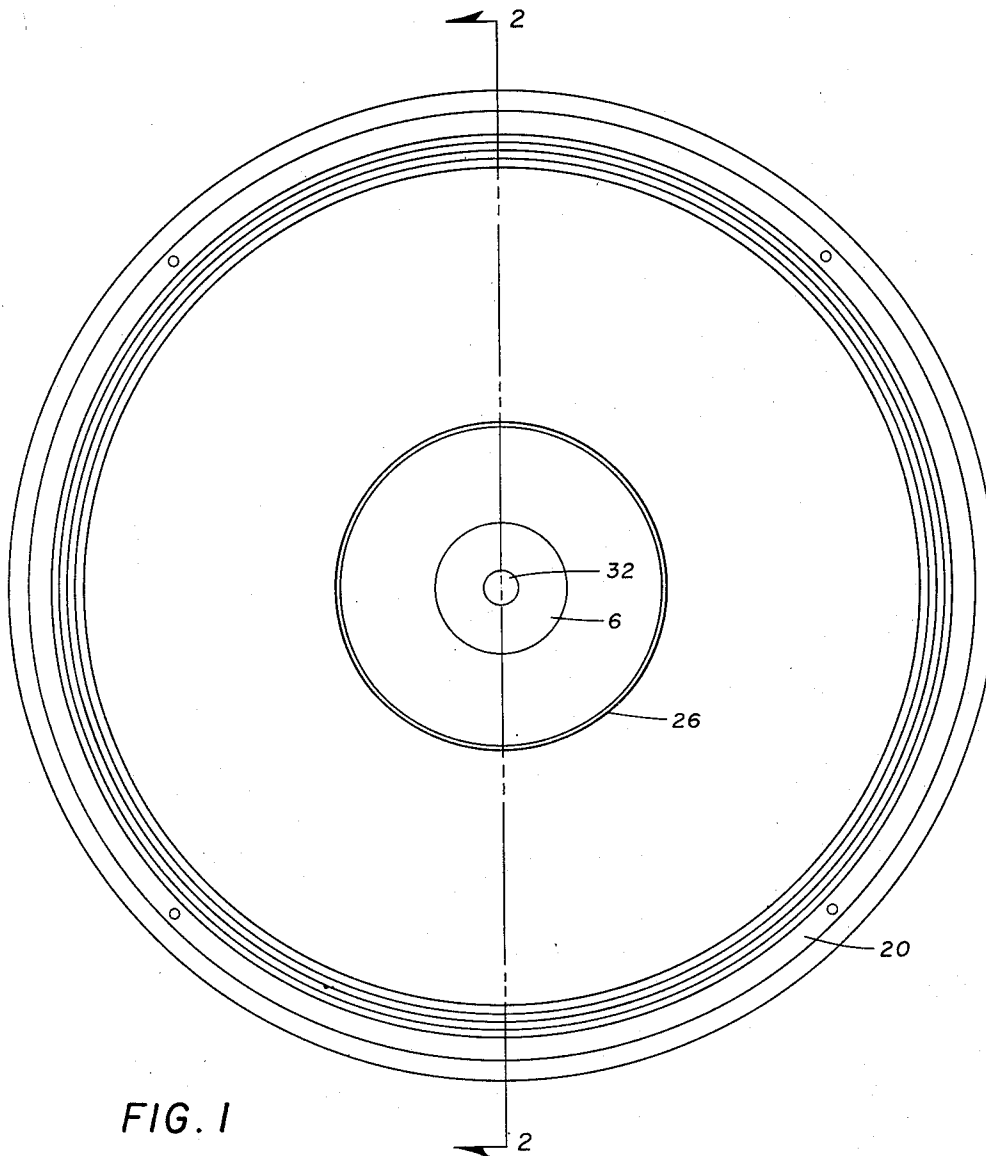


FIG. 1

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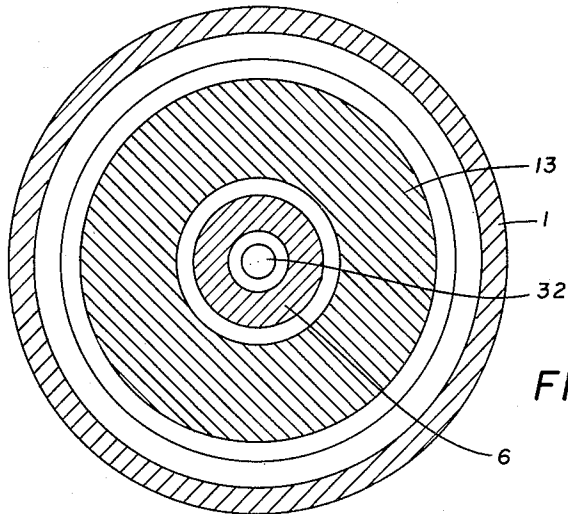


FIG. 3

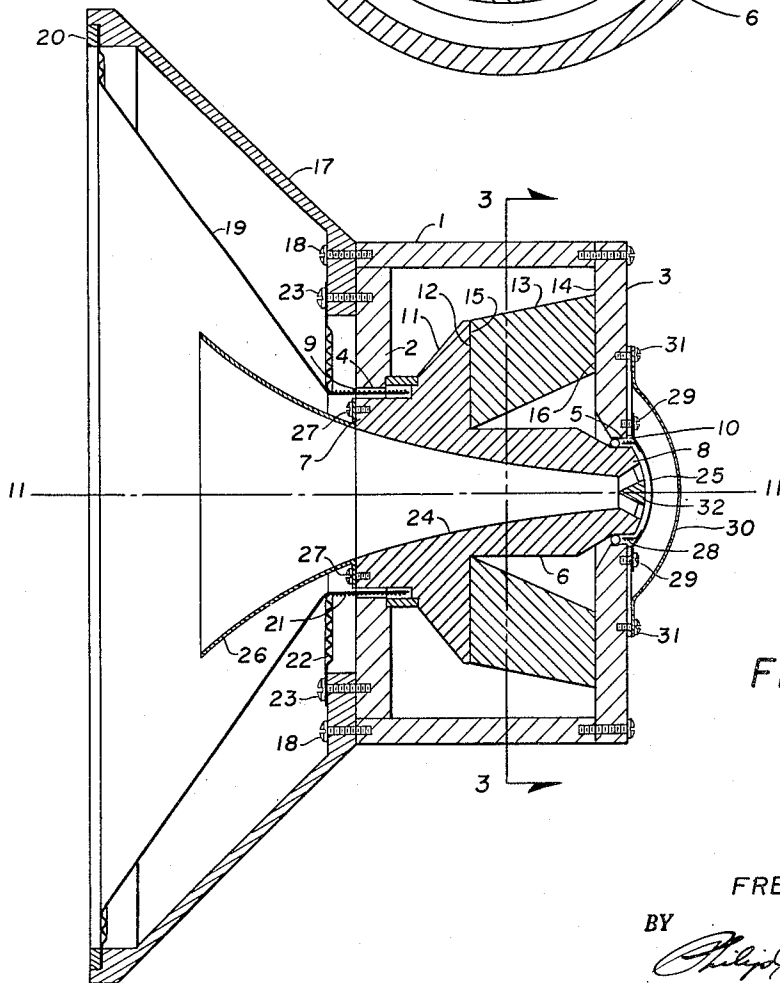


FIG. 2

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2,761,913

LOUDSPEAKER

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4 Claims. (Cl. 179—115.5)

My invention relates to a magnetic structure for a loudspeaker and more particularly to a magnetic structure for a loudspeaker of the coaxial type.

It is an object of my invention to provide a magnetic structure for a loudspeaker of the coaxial type which provides maximum compactness.

It is also an object of my invention to provide a magnetic structure for a loudspeaker of the coaxial type in which maximum clearance exists between surfaces of high magnetomotive potential difference.

It is a further object of my invention to provide a magnetic structure for a loudspeaker of the coaxial type which has minimum magnetic path length.

It is still another object of my invention to provide a magnetic structure for a loudspeaker of the coaxial type which requires a minimum of magnetic material.

Specifically, it is an object of my invention to provide an improved magnetic structure for the loudspeaker disclosed and claimed in copending patent application Serial Number 330,692, filed January 12, 1953, of Fred A. Manley and Frank H. Slaymaker, and assigned to the assignee of the present application.

In general, I accomplish these and other objects of my invention by employing a magnet of frusto-conical shape whose walls are of trapezoidal cross-section.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention, reference may be had to the accompanying drawing in which

Fig. 1 is a front view of a loudspeaker including one embodiment of my invention;

Fig. 2 is a sectional view taken along line 2—2 in Fig. 1; and

Fig. 3 is a sectional view taken along line 3—3 in Fig. 2.

Figs. 1 and 3 have been included herein to establish the circularly symmetrical nature of the parts shown in the exemplified embodiment of my invention. The novelty and usefulness of my invention are best seen from an examination of Fig. 2, which shows a yoke 1 of generally cylindrical configuration having a front cover plate portion 2 and a rear cover plate portion 3. Front cover plate 2 has a cut-out portion 4 centrally located therein, and rear cover plate portion 3 has a cut-out portion 5 centrally located therein.

Further in accordance with my invention, I provide a center pole piece 6 having a front end 7 and a rear end 8, which respectively extend into cut-out portions 4 and 5. Ends 7 and 8 are so proportioned that a front airgap 9 is defined between the outer circumference of end 7 and the inner circumference of cut-out portion 4, and a rear airgap 10 is defined between the outer circumference of end 8 and the inner circumference of cut-out portion 5. Central pole piece 6 is provided, in accordance with my invention, with a radially-outwardly extending portion 11. Portion 11 has a plane surface 12 concentrically arranged around the pole piece, such that

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the plane surface is substantially perpendicular to the central axis 11—11 of the assembly.

In accordance with my invention, I provide a magnet 13 of generally frusto-conical configuration. Magnet 13 extends from plane 12 to the front surface 14 of rear cover plate portion 13, with its smaller diameter end 15 adjacent plane 12.

I prefer that the magnet 13 have a trapezoidal cross-section for its walls with the narrower base diameter 16 of the trapezoidal shape adjacent to surface 14. From an inspection of the resulting configuration of the magnetic structure, it can be seen that maximum separation is provided between points of high magnetomotive potential difference and points of lesser potential difference have a correspondingly smaller separation thereby making economical use of the space within the yoke assembly. This feature of spacing points of different potential difference according to their potential difference results in the cross-sectional area of the magnet normal to the flux path being increased and therefore the flux produced being increased. In addition, the slant height of the trapezoidal cross-sectional area of the magnet is longer than the perpendicular distances between surfaces 12 and 14 and consequently a magnet of larger magnetomotive force can be fit between the two surfaces since the magnetomotive force of a permanent magnet is a function of its length.

Using a magnet of this configuration, therefore allows a given volume of magnetic material to be positioned within a yoke assembly of smaller dimensions than was possible when using a cylindrical magnet of the same volume as shown in the above noted copending application, without any increase of flux leakage. This minimizing of the size of the yoke assembly results in a more compact magnetic circuit and minimizes the magnetic path length and consequently the reluctance of the path and also minimizes the amount of material needed for the yoke assembly.

Fig. 2 illustrates how the magnetic structure of my invention may be assembled in a loudspeaker. A basket 17 is secured, as by means of screws 18, to yoke 1. Basket 17 supports, at its outer circumference, a conical diaphragm 19, which may be held in place by mounting ring 20. A voice coil 21 at the smaller diameter end of diaphragm 19 is suspended in the front airgap and may be held centered by spider 22 in accordance with conventional loudspeaker practice. Screws 23 serve to hold spider 22 in fixed position relative to basket 17 and at the same time secure front cover portion 2 in place.

Center pole piece 6 has a hollowed-out center portion 24 which is contoured to form an exponential horn for high-frequency diaphragm 25. The horn portion may be extended by extension section 26 which is secured to center pole piece 6, as by means of screws 27. High-frequency diaphragm 25 has attached thereto a voice coil 28 which is suspended in back airgap 10. Diaphragm 25 is held in position by screws 29. A cover 30, which may be held in place on the rear surface of rear cover portion 3 by means of screws 31, serves to protect the high-frequency diaphragm from damage and dust. Connection may be made to voice coils 21 and 28 by any convenient and conventional means not shown, but which are well known to those skilled in the art. A plug 32 may be placed in front of diaphragm 25 to insure proper sound pressure distribution.

While I have shown and described my invention as applied to a specific embodiment thereof, other modifications will readily occur to those skilled in the art. I do not, therefore, desire my invention to be limited to the specific arrangement shown and described, and I intend in the appended claims to cover all modifications within the spirit and scope of my invention.

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What I claim is:

1. In a magnetic structure for a loudspeaker of the coaxial type, a yoke of generally cylindrical configuration having front and rear cover plate portions at the ends thereof, said front and rear cover plate portions each having a cut-out portion centrally located therein; a central pole piece having front and rear ends respectively extending into said cut-out portions in said front and rear cover plate portions, said ends being proportioned to define front and rear airgaps between said ends and the surrounding edges of said cover plate portions, said pole piece having a radially-outwardly extending portion intermediate said front and rear ends of said pole piece; and a magnet of generally frusto-conical configuration extending from said radially-outwardly extending portion to the front surface of said rear cover plate portion, with the smaller diameter end of said magnet adjacent said radially-outwardly extending portion.

2. The combination of claim 1 in which said magnet has a wall of trapezoidal cross-section with the narrow base dimension of said trapezoidal shape adjacent the front surface of said rear cover plate portion.

3. In a magnetic structure for a loudspeaker of the coaxial type, a yoke of generally cylindrical configuration having a central axis and having front and rear cover plate portions at the ends thereof, said front and rear cover plate portions each having a cut-out portion centrally located therein; a central pole piece having front

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and rear ends respectively extending into said cut-out portions in said front and rear cover plate portions, said ends being proportioned to define front and rear airgaps between said ends and the surrounding edges of said cover plate portions, said pole piece having a radially-outwardly extending portion intermediate said front and rear ends of said pole piece, said radially-outwardly extending portion having a plane surface concentrically arranged around said pole piece, said plane surface being substantially perpendicular to said axis of said yoke; and a magnet of generally frusto-conical configuration extending from said plane surface to the front surface of said rear cover plate portion, with the smaller diameter end of said magnet adjacent said radially-outwardly extending portion.

4. The combination of claim 3 in which said magnet has a wall of trapezoidal cross-section with the narrower base dimension of said trapezoidal shape adjacent the front surface of said rear cover plate portion.

References Cited in the file of this patent

UNITED STATES PATENTS

2,295,527	Bowley	Sept. 15, 1942
2,496,589	Marquis	Feb. 7, 1950
2,501,032	Harbaugh	Mar. 21, 1950
2,638,510	Brami	May 12, 1953