Aug. 17, 1937. J. B. BRENNAN 2,090,025

SOUND REPRODUCING DEVICE

Filed March 27, 1933

Fig. 1.

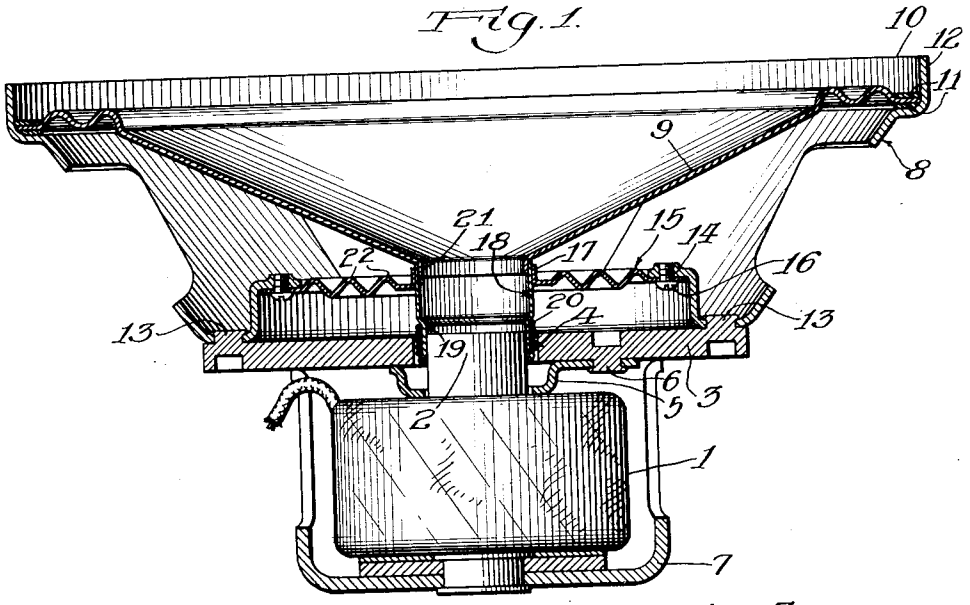


Fig. 2.

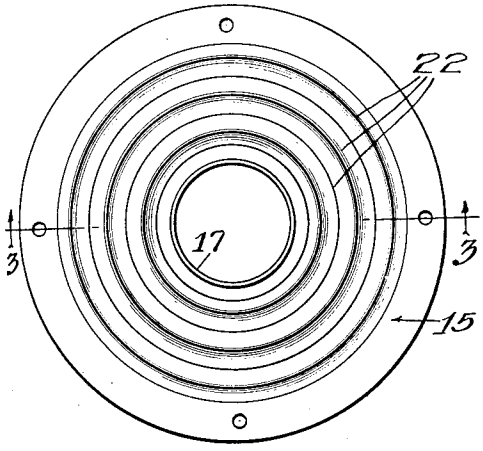


Fig. 4.

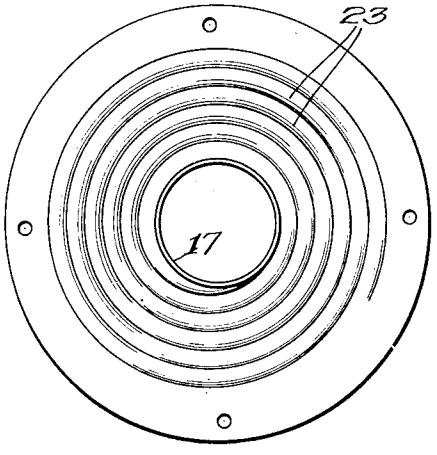


Fig. 3.

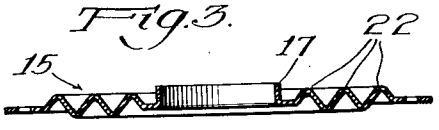


Fig. 5.

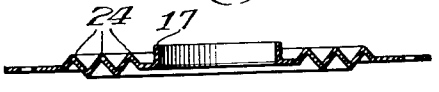
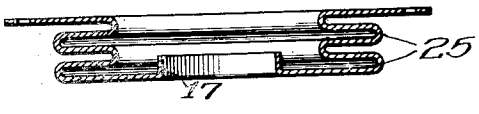


Fig. 6.



INVENTOR.

Joseph B. Brennan

BY Clarence J. Loftus

ATTORNEY.

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SOUND REPRODUCING DEVICE

Joseph B. Brennan, Fort Wayne, Ind.

Application March 27, 1933, Serial No. 662,949

5 Claims. (Cl. 179—115.5)

The present invention relates to a sound-reproducing device utilizing a diaphragm of a comparatively wide range of movement or amplitude with a moving coil connected thereto for driving the diaphragm so that when voice currents pass therethrough the coil will move transversely of magnetic lines in one direction and when the direction of current is reversed the movement of the coil will be reversed, the driving coil being disposed between inner and outer magnetic pole pieces within a very narrow air gap.

In such devices it is important that the coil be positioned in such a narrow air gap with but a slight clearance and yet so mounted as to permit a wide range of movement or amplitude while at the same time be properly centered throughout its wide range of movement.

Therefore, the present invention is to provide in combination with such devices a coil-centering diaphragm or supporting disc so designed and constructed as to permit a wide range of movement or amplitude of the driving coil in the narrow air gap but which will at the same time properly center the coil against transverse movement in the gap throughout its wide range of amplitude.

A further object of the invention is the provision of a novel type of flexible disc for accurately centering the movable coil in the air gap.

A still further object of the invention is the provision of novel form of centering device or disc or washer constructed of corrugated yieldable material. These corrugations may be concentric or in various other forms whereby to increase the flexibility of the washer longitudinally of the coil without unduly reducing or decreasing the lateral stiffness or rigidity. Thus the cone diaphragm may be vibrated freely and at the same time the coil will be accurately centered.

Further objects of the invention are to provide a construction of maximum simplicity, economy and ease of assembly and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

The invention further resides in the combination, construction and arrangements of parts illustrated in the accompanying drawing, and while there is shown therein a preferred embodiment, it is to be understood that the same is susceptible of modification and change, and comprehends other details, arrangements of parts, features and constructions, without departing from the spirit of the invention.

Referring to the drawing:

Fig. 1 is a longitudinal central section of a loud speaker;

Fig. 2 is a plan view of the novel washer or centering member;

Fig. 3 is a cross sectional view of Fig. 2 taken on the line 3—3 of Fig. 2;

Fig. 4 is a plan view of an alternate construction of centering member provided with spiral corrugations;

Fig. 5 is a fragmentary vertical cross sectional view of a further modification of centering member;

Fig. 6 is a fragmentary vertical cross sectional view of another alternate construction.

Referring more particularly to the disclosure in the drawing, the embodiment selected to illustrate the invention comprises an electro-magnet having a field coil 1 provided with a core 2, and pole piece 3 provided with an opening 4 to receive the core 2. A centering plate 5 encompasses the core 2 and is suitably connected to the pole piece 3 by means of studs 6 whereby to maintain the pole piece in centered position. The electro-magnet is housed within the casing or housing 7.

Mounted within the casing or pan 8 is a diaphragm 9. This diaphragm is shown in the form of a cone having its outer periphery or flange 10 flexibly seated intermediate annular members are rings 11 mounted in the outer edge or periphery 12 of the pan. This pan is suitably secured to the magnet 3 by means of studs 13.

The reduced or inwardly extending portion of the pan forms an annular support 14 to which is connected the flexible disc or coil-centering diaphragm 15 as by means of bolts or other suitable retaining means 16. The interior portion of this coil-centering diaphragm is bent upwardly or outwardly to form an annular flange or collar 17 for receiving a coil-supporting cylinder 18. This cylinder is provided with a reduced portion 19 upon which is mounted a driving coil 20.

The cylinder 18 at its outer end is adapted to receive a reduced flange or collar 21 of the cone or diaphragm 9. Any suitable attaching means such as cement or the like may be employed in connecting the flange 21, cylinder 18, and the flange 17 of the coil-centering means or disc 15 together, so that these members may move as a unit.

As clearly disclosed in Fig. 1, the coil 20 is disposed in the air gap between the core and pole piece of the magnet. In order that this type of speaker may operate efficiently, it is desirable that the air gap 4 between the core and pole piece be reduced to a minimum and that the coil 20 be accurately centered with respect to said core, while at the same time permitting a wide range of longitudinal movement of the coil 20. In order to permit such wide range of amplitude and at the same time prevent any transverse movement of the coil in such air gap, I have provided the disc or coil-centering means 15. In its preferred form, this disc or centering device is made of a thin flexible material such as parchment, glazed paper or other material or

fabric which has been provided with corrugations. It is also highly desirable that this material be non-hydroscopic.

Various forms of corrugations may be provided as disclosed in the several figures. In Figures 1, 2, and 3, such corrugations 22 are shown as concentric, while in Fig. 4 the corrugations 23 are shown as spiral. In Fig. 5, the angular corrugations 24 may be either concentric or spiral, while in Fig. 6 the corrugations 25 are shown in the form of overlapping or superimposed folds or corrugations rather than as radially or concentric corrugations as in the previous figures. However, it is to be understood that since the purpose of these corrugations is to increase the flexibility of the coil-centering member or disc longitudinally without unduly reducing the lateral stiffness or rigidity thereof, various forms or shapes of corrugations or the like may be provided for effecting the desired results.

In the figures, the disc or coil-centering member is disclosed as of substantial thickness, although it is to be understood that this thickness in the disclosure is exaggerated and that the washer, disc or centering means is formed of a thin, non-porous material. By reason of the flexibility of this coil-centering means or disc, the driving coil 20 for the cone diaphragm has a free and wide range of movement longitudinally in the air gap, while at the same time, it is prevented from moving transversely within such gap. These corrugations also increase the life of the coil-centering disc or diaphragm since it may be subjected to a much wider range of vibration and for a much greater period of time without damage thereto.

Having thus disclosed the invention,

I claim:

1. In an apparatus for sound reproduction, a diaphragm flexibly supported at its base, a coil supporting portion connected therewith, an actuating coil mounted on the coil supporting portion, and a coil-centering member engaging the coil supporting portion and provided with corrugations of approximately uniform diameter arranged concentric with the axis of the coil for permitting free longitudinal movement of said coil in such manner as to permit a wide range of movement of the coil while at the same time preventing lateral movement thereof.

2. In an apparatus for sound reproduction, a diaphragm flexibly supported at its base, a coil-supporting portion connected therewith, an actuating coil mounted on the coil-supporting portion, and a coil-centering member engaging the coil-supporting portion and provided with overlapping folds of uniform diameter concentric with the axis of the coil for permitting free longitudinal movement of the coil-centering member and coil and thereby permitting a wide range of movement of the actuating coil while maintaining said coil centered.

3. In an apparatus for sound reproduction, a diaphragm flexibly supported at its base for free longitudinal movement, a coil-supporting portion secured to said diaphragm, an actuating coil mounted on the coil-supporting portion and adapted to receive the voice currents, and a member constructed of flexible material with axially spaced corrugations connected with the coil-supporting portion in such manner as to permit free longitudinal movement of said member and coil and a wide range of amplitude of the coil, but possessing sufficient stiffness to center the coil and prevent lateral movement thereof.

4. In a sound producing device having an acoustical diaphragm flexibly supported at its base, and a wound actuating coil secured thereto, a coil-centering member having a circular portion at its outer edge for securing the said member in place in the sound producing device, said coil-centering member being provided with a coaxial flange adapted to support and center the actuating coil and a relatively deep well concentric with said flange, substantially as and for the purpose set forth.

5. In a sound producing device having a hollow acoustical diaphragm and a wound actuating coil therefor, a coil-centering member having a supported portion at its outer periphery adapted to be supported in the sound producing device, a central flange-like supporting portion adapted to support and center an actuating coil, a relatively deep well concentric with and adapted to surround the supporting coil, and corrugations interposed in the coil-centering member between the supported and flange-like supporting portions.

JOSEPH B. BRENNAN.