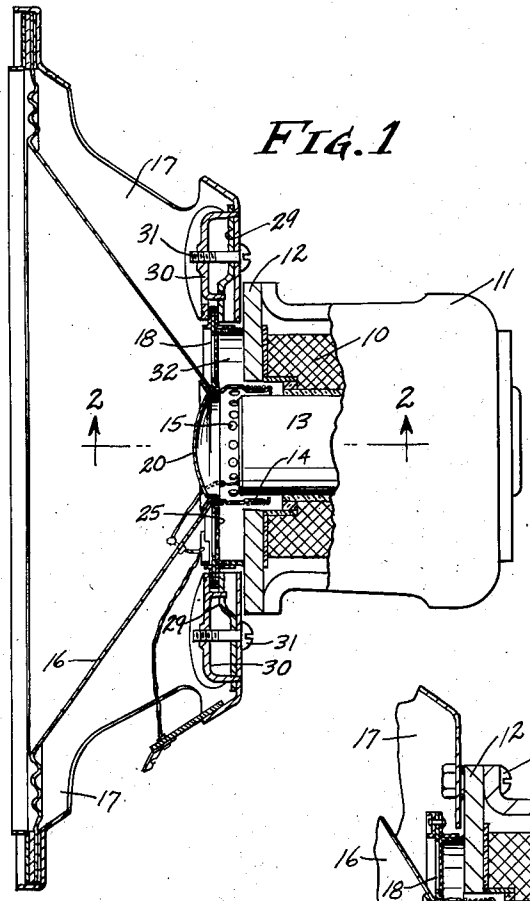
April 9, 1935. B. A. ENGHOLM 1,997,051

LOUD SPEAKER

Filed Sept. 1, 1934

FIG. 1



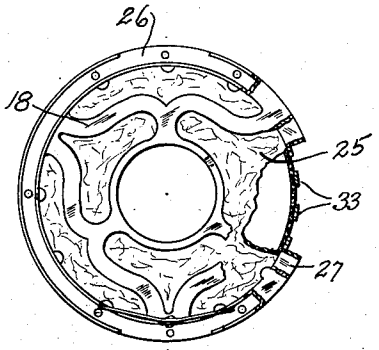
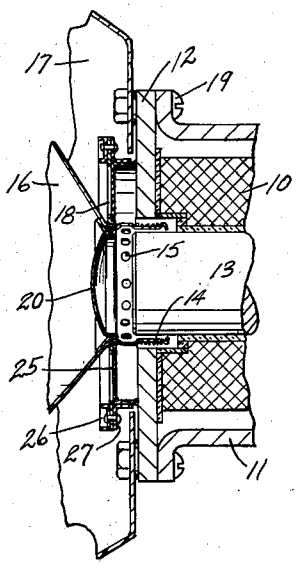


FIG. 4



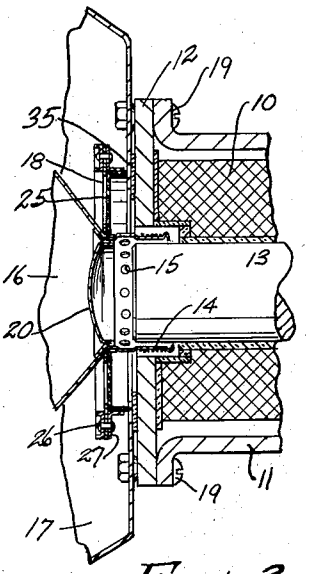


FIG. 3

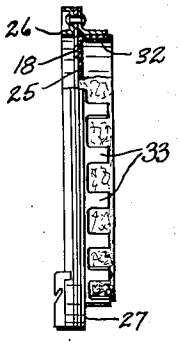


FIG. 5

FIG. 2

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LOUD SPEAKER

Bernard A. Engholm, Shaker Heights, Ohio, assignor to The Rola Company, Cleveland, Ohio, a corporation of Ohio

Application September 1, 1934, Serial No. 742,463

7 Claims. (Cl. 179—115.5)

This invention relates to loud speakers and particularly to those which utilize a moving coil that operates in an air gap across a magnetic field.

Heretofore loud speakers have had the magnetic pole surfaces adjacent the air gap and which form the air gap completely exposed to the entry of foreign particles. Where these particles are of a material, which is susceptible to magnetic attraction, it has been found by experiment that the powerful magnetic flux across the air gap inevitably causes them to be drawn directly into the gap, where they impede the free movement of the driving coil. This is particularly true in the case of chips, which are flaked or torn off from screws in the assembly of the loud speaker, or in fastening it in place, as in the assembly of the radio set. Such particles, particularly if of a magnetic nature, readily destroy the normal efficiency of the loud speaker, usually by generating harsh, rasping sounds, by rubbing against the moving coil and form, and sometimes render the loud speaker inoperative by cutting the wire on the moving coil. The ability of even very minute particles to so disrupt the functioning of the speaker is enhanced by the extremely small clearance between the air gap and coil surfaces, particularly as the gap clearance is usually between only five to ten thousandths of an inch.

An object of my invention therefore, is to so enclose the moving coil and air gap that the introduction and accumulation of small particles of foreign material in the region of the air gap is prevented. In addition, my invention contemplates a construction which will provide an enclosed chamber in which the voice coil operates, and which, though impervious to the passage of foreign particles, is pervious to the passage of air, wherefore the proper movement and displacement of the confined air is not restricted so as to interfere with the normal piston action of the diaphragm.

An additional object of the present invention is to make a closure, which when used with a spider that has spaced arms, enables the assembly to be accomplished in an expeditious manner.

Referring now to the drawing, Fig. 1 is a side elevation of a loud speaker, partly in section embodying my invention; Fig. 2 is a section taken on the line 2—2 in Fig. 1, and Fig. 3 is a section on the line shown in Fig. 2 and illustrating a modification of the invention; Fig. 4 is a front view of the centering and filter members, mounted as a unit, and removed from the member, and Fig. 5 is a side elevation, partly in section, of the filter unit shown in Fig. 4.

The speaker with which I have illustrated my invention has a field coil 10, a shell 11, a front plate or outer pole piece 12, a core or inner pole piece 13, a voice coil 14, a voice coil form 15, a diaphragm 16, a diaphragm housing 17, and a centering member or spider 18. The housing and associated diaphragm are fastened by securing members 19.

The region adjacent the voice coil has heretofore been exposed to the entrance of foreign particles and so the present invention seeks to enclose it in a particle proof chamber, that will not confine the air to an extent that will restrict the movement of the diaphragm. I accomplish this result by closing the inner end of the diaphragm with a cap 20 which is shaped to conform to the inner wall of the diaphragm and the voice coil form, and so that when cementitious material is applied to it, and it is pressed into place, it will serve to reinforce the diaphragm and voice coil form, and yet to enclose the inner part of the air gap. If desired I may make the cap either of porous material or of solid material. In the case of porous material it is sufficiently porous to admit air but to exclude foreign particles.

The outer part of the air gap is preferably closed by a layer 25 of loosely woven fabric that may be cemented to the arms of the spider on the inner side thereof. The spider in turn may be held in place by two clamping members preferably in the form of rings 26 and 27 which rest upon seats 29 on the housing 17. Bridge pieces 30 then engage the housing and the rings and in turn are locked to the housing by securing members 31.

To close the space between the spider and the pole piece I prefer to extend the marginal portion of the fabric 25 toward the pole piece in the form of a flange 32 and to use sufficient fabric to make the edge of it engage the pole piece when the spider is locked in place. The clamping member 27 is shown as having spaced tongues 33, which extend laterally therefrom and are arranged in the form of a circle to act as a backing for the flange 32.

The tongues 33 are sufficiently short that they do not engage the outer pole piece when the spider is fastened into proper position. Moreover, they are slightly shorter than the depth of the flange wherefore, the fabric alone engages the pole piece, and thereby insures a complete

closure for the region immediately adjacent the air gap and voice coil.

In Figs. 1 and 2, I have shown the filter in engagement with the outer pole plate. I may, if desired, however, extend the flange of the housing inwardly, as is shown in Fig. 3, in which case the edge of the filter will engage the housing, while the space between the housing and pole piece may be sealed by a fibrous washer **35**. In all other respects the two illustrations are identical.

The fabric, which I utilize is sufficiently porous to cause it to be impervious to the passage of objectionable foreign particles and yet to be pervious to the passage of air. Thus, there is no confined air which can dampen the action of the diaphragm and interfere with the normal action thereof. Moreover, inasmuch as the fabric is a one piece cup-shaped layer of material, it may be readily attached to the spider and handled with it, as a unit, during the assembly operation.

I claim:—

1. In a loud speaker, the combination of an inner, and an outer pole piece, having an annular air gap therebetween, a voice coil movable in said air gap, a centering member for the voice coil, the centering member having spaced arms, a support for the centering member, and a layer of porous material attached to the centering member, and having the marginal edges thereof engaging the outer pole piece, said fabric being pervious to the passage of air, but impervious to the passage of objectionable particles.

2. In a loud speaker, the combination of a diaphragm, a voice coil form associated therewith, a voice coil mounted on the form, a centering member associated with the diaphragm and form, a housing for the diaphragm, means for clamping the centering member to the housing, and a layer of fabric attached to the centering member, and having the free edges thereof in contact with the outer pole piece so as to provide a chamber that excludes the entrance of foreign particles, but permits the passage of air.

3. In a loud speaker the combination of a magnetic structure, which includes an outer pole piece, and an inner pole piece, the pole pieces being spaced apart and providing an air gap therebetween, a voice coil movable within the air gap, a form for the coil, a diaphragm associated with the form, a housing for the diaphragm, and a centering member extending radially with respect to the form and cooperating with the housing to provide a support for the form, and a cup-shaped layer of porous material disposed behind the centering member, and cooperating with the outer pole piece, to enclose the space behind the centering member, said material being pervious to the passage of air, but impervious to the passage of foreign particles.

4. In a loud speaker, a spider assembly, comprising a spider, a member attached to the rim thereof, and having spaced tongues extending laterally thereof, said tongues being spaced in the form of a circle, and a layer of fabric attached to the spider, and having a peripheral flanged portion that bears against the tongues and terminates near the ends thereof.

5. In a loud speaker, a spider assembly comprising in combination, a spider having spaced arms, a pair of clamping members arranged back to back for positioning the spider therebetween, one of the members having tongues extending therefrom, the tongues being arranged in the form of a circle, and a disc of fabric fastened to the spider, said disc having a peripheral flange that bears against the tongues and provides a cup-shaped closure for the space behind the spider.

6. In a loud speaker, the combination of a field structure which includes an inner and an outer pole piece that cooperate to form an air gap, a voice coil movable within the air gap, a form for the coil, a diaphragm associated with the form, a housing for the diaphragm, means for centering the voice coil form within the air gap, said means including a spider having spaced arms, means for clamping the spider to the housing and an uninterrupted layer of porous material attached to the spider adjacent its inner end and bearing against the housing at its outer end so as to provide a closure for the space behind the spider, said material being pervious to the passage of air but impervious to the passage of foreign particles.

7. In a loud speaker, a spider assembly comprising a spider having spaced arms, and a support for the spider adjacent the outer end thereof, there being porous material attached to the spider, and having a flanged portion adjacent the support, said material providing a cup-shaped closure for the space behind the spider, so as to exclude foreign particles but to permit the passage of air therethrough.

BERNARD A. ENGHOLM.