Feb. 19, 1935. C. M. TICHENOR ET AL 1,991,526

SOUND REPRODUCING DEVICE

Filed July 9, 1932 4 Sheets-Sheet 1

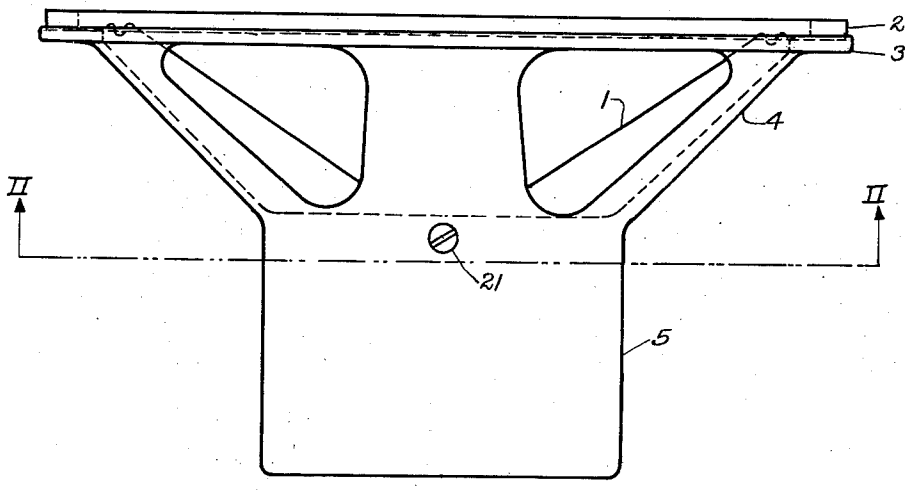


FIG. 1.

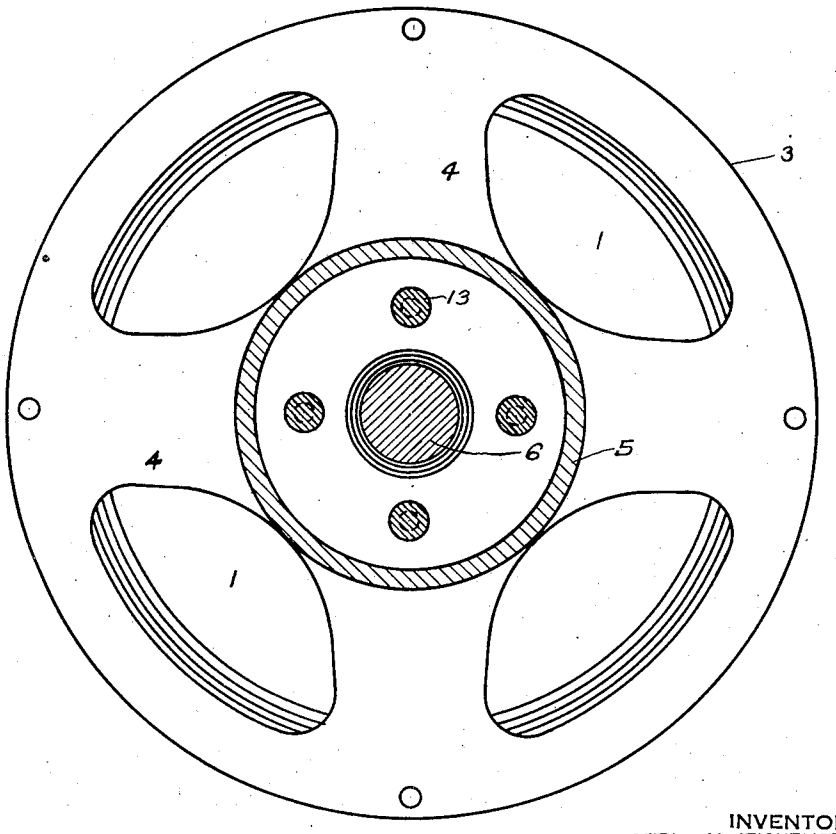


FIG. 2.

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SOUND REPRODUCING DEVICE

Filed July 9, 1932 4 Sheets-Sheet 2

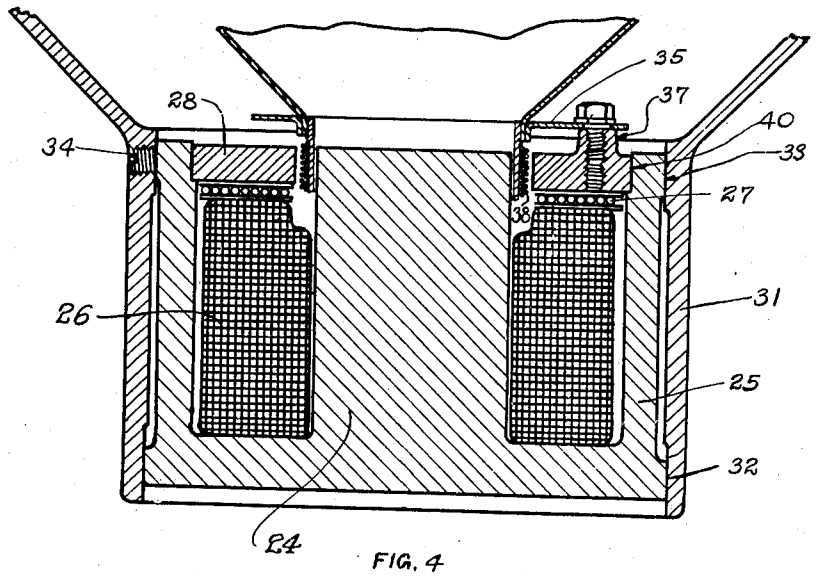


FIG. 4

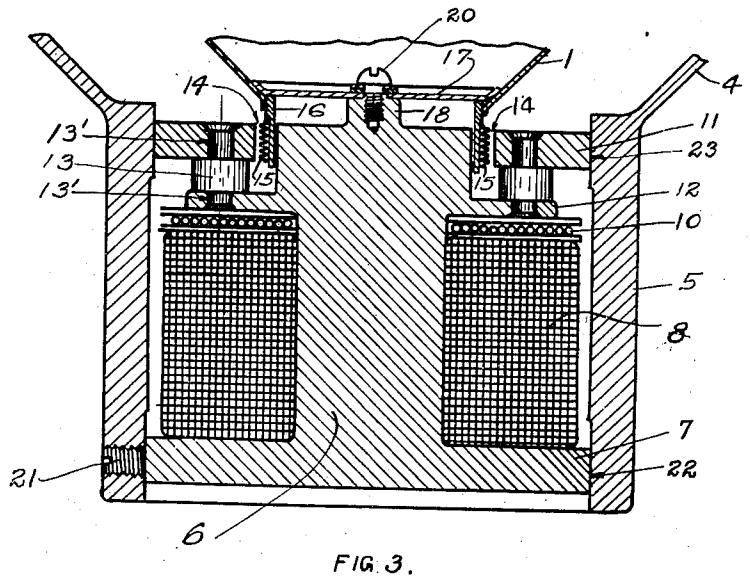


FIG. 3.

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SOUND REPRODUCING DEVICE

Filed July 9, 1932 4 Sheets-Sheet 3

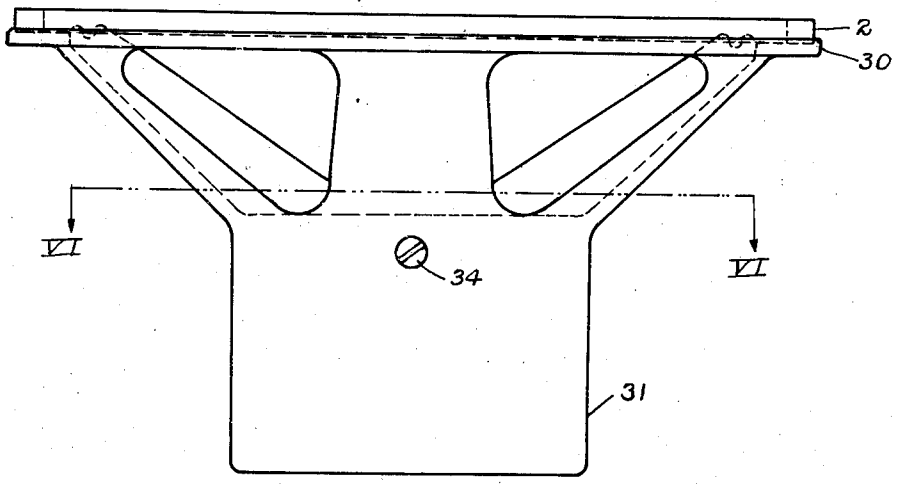


FIG. 5

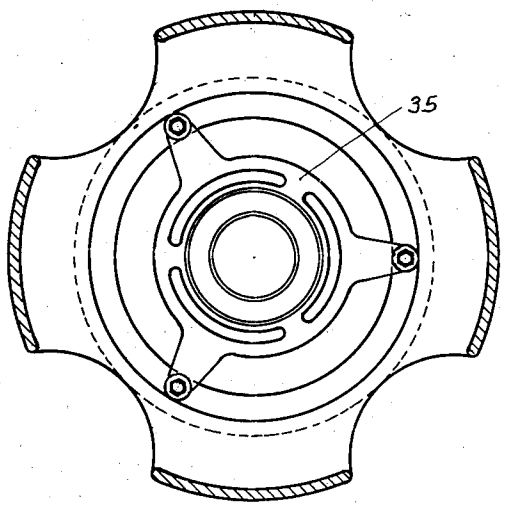


FIG. 6

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Filed July 9, 1932 4 Sheets-Sheet 4

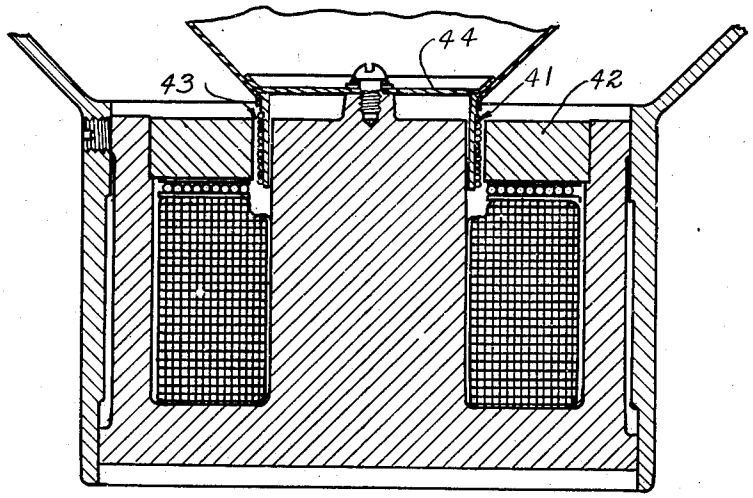


FIG. 7.

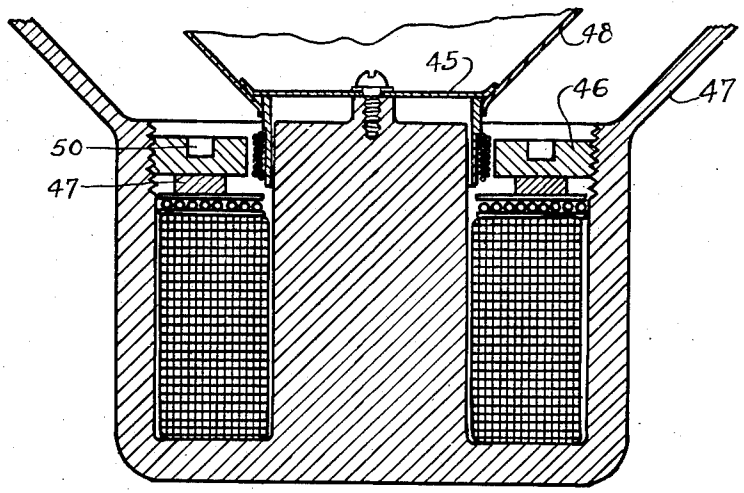


FIG. 8

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Patented Feb. 19, 1935 1,991,526

UNITED STATES PATENT OFFICE

1,991,526

SOUND REPRODUCING DEVICE

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Application July 9, 1932, Serial No. 621,672

2 Claims. (Cl. 179—115.5)

Our invention relates to loud speakers and has especial relation to those of the moving coil type.

One object of our invention is to provide a loud speaker in which the diaphragm may be conveniently adjusted during manufacture to vary the location of the voice coil longitudinally of the core, whereby the voice coil may be accurately located in the air gap.

Another object of our invention is to provide a mounting for a loud speaker of the type mentioned, which supports the diaphragm freely in an unrestrained and undeformed condition, whereby it is adapted to effect a more faithful translation of the voice currents into sound.

A further object of our invention is to provide an especially efficient loud speaker of the type mentioned.

A further object of our invention is to provide a loud speaker of the type mentioned which is especially easy to assemble and economical to manufacture.

A further object of our invention is to provide a loud speaker of the movable coil type in which an adjustment is provided between the support for the periphery of the diaphragm, or cone, and the support for the spider at the apex of the cone, whereby variations in the altitudes of cones as experienced in quantity manufacture may be compensated for.

A further object of the invention, as exemplified in one of its various embodiments, is to provide a movable coil type of speaker in which a pole piece surrounding the core is adjustable relative to the rest of the magnet longitudinally of the axis of the core so that it may be accurately located with respect to the voice coil.

A further object of our invention is to provide a loud speaker that is especially adapted for quantity manufacture, yet is of such precision that the voice coil may advantageously be made of a single layer of turns of wire.

A still further object of our invention is to provide a speaker of the movable coil type in which a pole piece surrounding the core has a threaded relation to the magnet so that the former may be adjusted along the axis of the core to a desired position with respect to the voice coil.

Other objects and advantages will appear as the description proceeds.

In the accompanying drawings, Figure 1 is a side elevational view of a loud speaker embodying the invention.

Figure 2 is a sectional view on the line II—II of Figure 1.

Figure 3 is a central sectional view of the speaker shown in Figures 1 and 2.

Figure 4 is a central sectional view of speaker embodying a modified form of the invention.

Figure 5 is a side elevational view of the speaker shown in Figure 4.

Figure 6 is a sectional view taken on the line VI—VI of Figure 5; and

Figures 7 and 8 are central sectional views of other speakers embodying modifications of the invention.

Figures 3, 4, 6, 7 and 8 are on an enlarged scale.

Referring in more detail to the drawings and particularly to Figures 1, 2 and 3, a diaphragm 1 may be of the usual conical form, and may be secured by an adhesive at its periphery between a cushion 2 and a rigid support.

The support comprises a rim 3 and a plurality of arms 4 which are preferably cast integral with a cylindrical casing 5.

A core 6 has at one end a flange 7 fitting closely within the casing and extending through a field coil 8 which preferably is wound directly on the core so as to reduce as much as possible losses of magnetic flux induced by the coil. A "bucking" coil 10 may be interposed between the core 6 and the flange 7.

A pole piece 11, which may be in the form of a ring, is secured to a second flange 12 on the core 6 by means of a plurality of spacers 13 which may be of brass or other materials not adapted to conduct the magnetic flux. The spacers 13 have reduced ends riveted in holes 13' in the pole piece 11 and the flange 12.

The core 6, the casing 5, and the pole piece 11 constitute a magnet.

The pole piece 11 has an opening 14 therein defining an air gap which receives a voice coil 15 mounted on a collar 16 secured to the diaphragm 1. A yieldable support 17, which may be of the spider type well known in the art, secures this portion of the diaphragm to a nipple 18 on the core 6, a screw 20 holding the support 17 on the nipple.

In assembling the parts, the pole piece 11 is preferably secured to the flange 25 and the coils 8 and 10 wound on the core. The diaphragm 1 may be secured to the support as a separate unit which may then be assembled with the core 6 and associated parts. The support may be shifted longitudinally of the core 6 until the voice coil 15 is located properly in position in the air gap. The flexibility of the support 17 permits this placement of the voice coil. The support is then se-

cured in position by a set screw 21 or other suitable means.

In the manufacture of speakers the accurate positioning of the voice coil in the air gap is a matter of extreme importance as it is desired that the greatest density of flux be directed through the windings of the coil for most efficient operation.

When there is a lack of uniformity in the altitudes of the cones the adjustability of their peripheries permits the proper placement of the voice coil without distorting the supports or spider 17, or straining, or in any way limiting the free movability of the diaphragms in the operation of the speakers.

It will be understood that the cost of manufacture of the described speaker is especially low. The assembly of parts is especially easy and they are quite easy and simple to make. The casing 5 and the support may be a simple unmachined casting or if the greatest accuracy is desired the casing 5 may be bored at the surfaces 22 and 23 where it engages the pole piece 11 and the flange 7 respectively.

In the modified form of loud speaker shown in Figures 4, 5 and 6 a magnet comprises a core 24 and an outer wall 25 preferably in one piece, the wall surrounding a field coil 26 and a bucking coil 27. A pole piece 28 fits tightly within the wall and is thus held in place. The support 30 for the periphery of the diaphragm is similar to that previously described and is preferably integral with a casing 31 which is adjustable longitudinally of the magnet in the same manner as the support in Figures 1, 2 and 3 and engages the magnet throughout spaced circular areas 32 and 33. A set screw 34 holds the casing 31 in adjusted position. A spider, or support 35, is secured to the apex of the cone 36 and by means of screws to a plurality of bosses 37 on the pole piece 28.

It will be apparent that when the casing 31 is shifted longitudinally, the position of the voice coil 38 will be adjusted as in the previously described modification.

The pole piece 28 and the outer wall 25 of the magnet are preferably machined on their surfaces which meet at 40 and these parts are assembled by merely pressing the former into the opening provided by the latter.

It will be apparent that with our invention, extreme precision is obtainable. In the embodiment shown in Figure 7 this is taken advantage of and the voice coil 41 instead of being made of two layers of coils, as has been common heretofore, consists of a single layer of a length greater than the voice coils now used. The pole piece 42 also is made quite thick and the air gap 43 is very small, consequently the speaker is highly efficient—yet, owing to the precise location of parts, there is no rubbing of the voice coil when operated, notwithstanding its length. With the exceptions mentioned and also the provision of an internal spider 44, modification shown in Figure 7 is the same as that shown in Figures 4, 5 and 6.

The embodiment shown in Figure 8 is similar to that shown in Figures 4, 5 and 6 except that an internal spider 45 is provided and the pole piece 46 is threaded in the outer wall of the magnet which is preferably integral with a support 47 for the diaphragm or cone 48. Sockets 50 are provided to receive the ends of a wrench for adjusting the position of the pole piece 46 in correspondence with the location of the voice coil. Preferably also a cushion 47 such as a ring of sponge rubber is interposed between the pole piece and the bucking coil to prevent rattling.

Our invention is not limited to the specific details of the constructions illustrated and described which may be modified extensively without departing from the spirit of the invention, for instance, the casing 5 in Figures 1, 2 and 3 need not be cylindrical but may be rectangular or of other desired shape and in fact need not entirely surround the field coil. A substantial range of equivalents is contemplated within the scope of the appended claims.

We claim:

1. In a speaker of the movable coil type, the combination of a diaphragm, a coil on said diaphragm, a support for the periphery of said diaphragm, a core having one end adjacent said diaphragm, a field coil surrounding said core, a pole piece permanently secured to said core adjacent said end thereof and magnetically connected to the other end, said piece having an opening receiving said core and defining an air gap receiving the first mentioned coil, said support being adjustable with respect to said piece in a direction along the axis of said core to locate said first mentioned coil accurately in said air gap and releasable means for securing said support with respect to said piece.

2. In a speaker of the movable coil type, the combination of a diaphragm, a coil on said diaphragm, a support for the periphery of said diaphragm, a magnet comprising a core having one end adjacent said diaphragm, a field coil surrounding said core, a pole piece permanently secured to said core adjacent said end thereof and having an opening receiving said core and defining an air gap receiving the first mentioned coil, said support having a portion between and engaging said pole piece and the other end of said core and constituting a portion of said magnet and being adjustable longitudinally to locate said first mentioned coil accurately in said air gap and releasable means for securing said support with respect to said pole piece.

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