

June 28, 1932.

B. DEMPSTER ET AL

1,864,809

LOUD SPEAKER

Filed Jan. 8, 1930

2 Sheets-Sheet 1

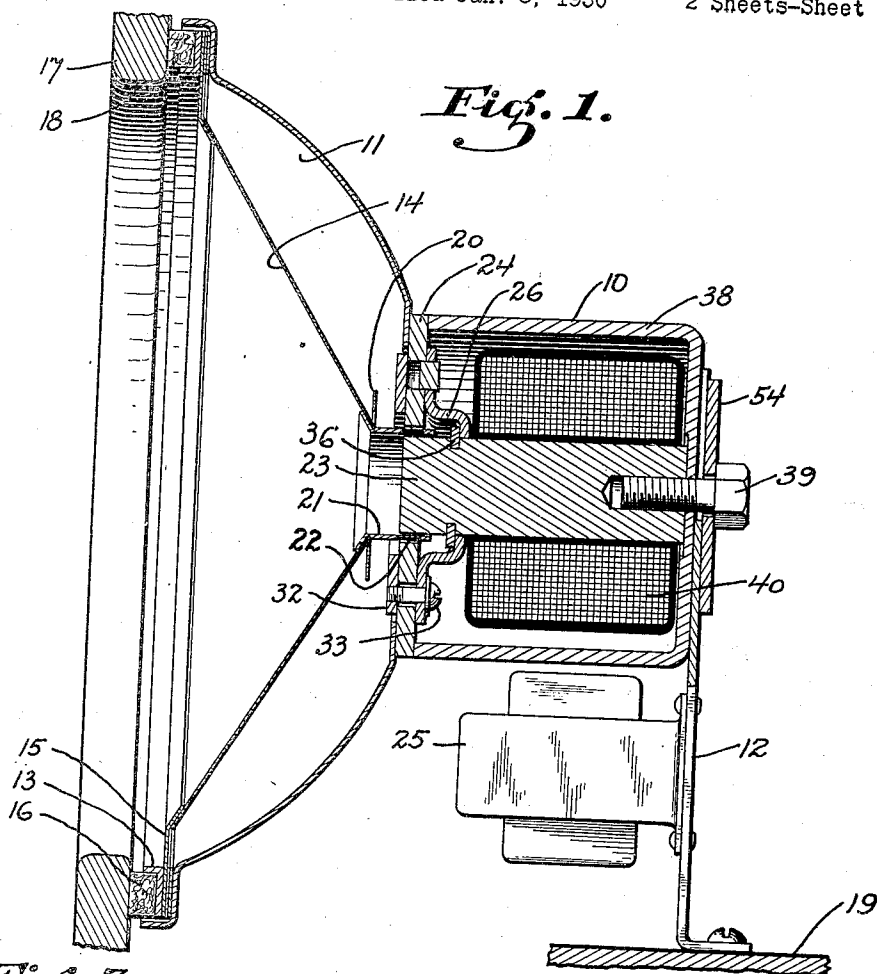


Fig. 3.

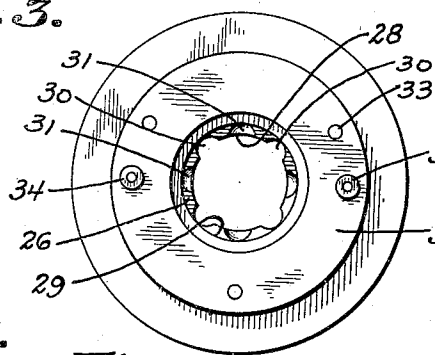
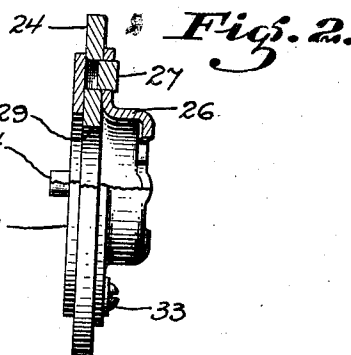


Fig. 5.

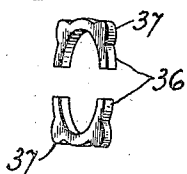
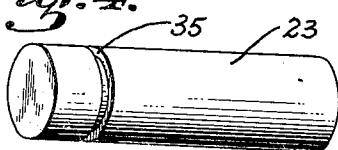


Fig. 4.



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2 Sheets-Sheet 2

Fig. 6.

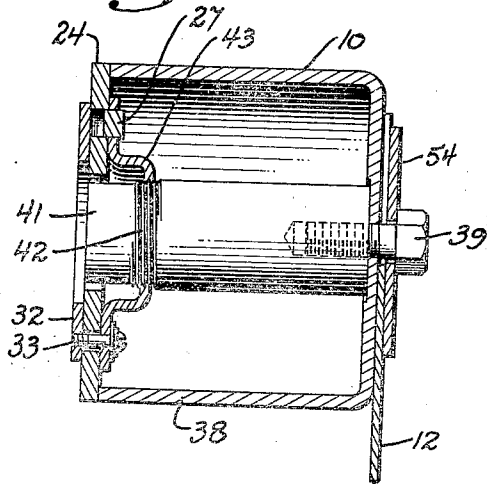


Fig. 7.

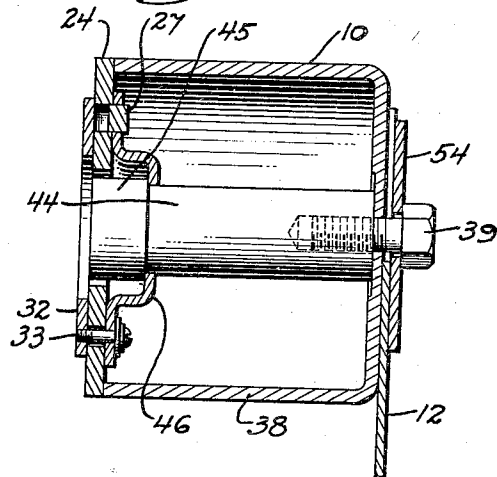


Fig. 8.

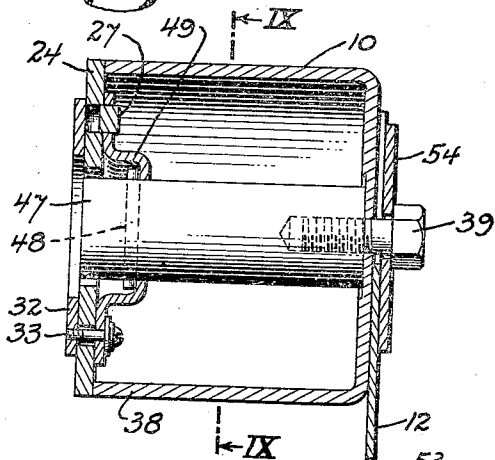


Fig. 9.

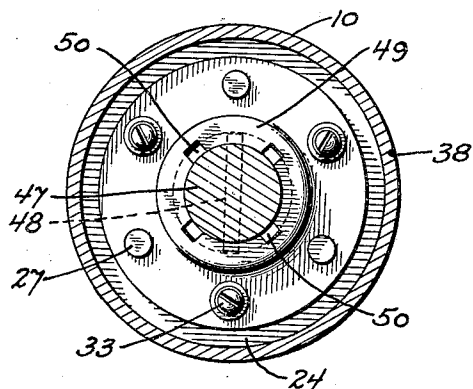


Fig. 10.

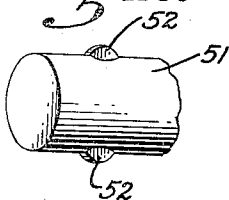
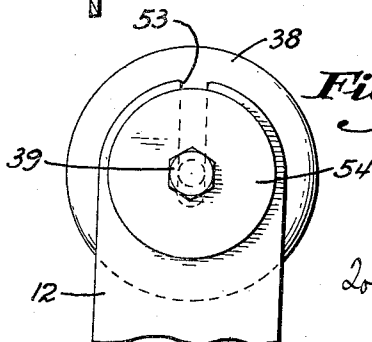


Fig. 11.



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UNITED STATES PATENT OFFICE

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LOUD SPEAKER

Application filed January 8, 1930. Serial No. 419,308.

Our present invention relates to sound reproducers and more particularly to sound reproducers of the so-called loud speaker type such as are extensively used in the reproduction of radio and phonograph programs.

In the art to which our invention appertains there has been a demand for a practical, simple and inexpensive loud speaker. This is particularly true since the adoption of the so-called cone type of diaphragm to which there is attached a moving coil operating in an annular air-gap across which a magnetic flux generated in a co-operating magnetic field structure is passed. In the past, loud speakers of this general character have for mechanical reasons been constructed of relatively large dimensions and, due to mechanical difficulties in the assembly of the various devices, their cost is relatively high. It is, therefore, an object of our invention to overcome the above objectionable features by providing a loud speaker which will be of light and simple construction and one in which a minimum of parts is provided. More specifically, our invention may be stated to be in the provision of a new, novel, and effective construction of the magnetic field structure, wherein the co-operating parts thereof may be assembled in proper co-operating relation in a simple and economical manner.

Other objects and advantages of our invention will be in part pointed out and in part evident from the following description.

For the purpose of illustrating our invention, we have shown by way of illustration and not of limitation several embodiments of our invention as applied to loud speakers of the so-called pot magnet type. We desire to have it understood, however, that our invention is not limited to electro-magnetic field structures of the so-called pot type, as it will be readily appreciated that it is equally applicable to a magnetic field structure of the so-called shell and other types.

For a better understanding of our invention, reference should be had to the accompanying drawings wherein like numerals refer to like parts throughout the several views.

In the drawings—

Fig. 1 is a partial sectional view in eleva-

tion showing one embodiment of our invention,

Fig. 2 is a fragmentary side elevation, partially in section, showing the outer pole assembly of our improved speaker,

Fig. 3 is a front elevation of the pole structure shown in Fig. 2,

Fig. 4 is a perspective view showing an inner pole of the type illustrated in Fig. 1,

Fig. 5 is a perspective view showing securing means carried by the inner pole illustrated in Fig. 4,

Figs. 6, 7 and 8 are partial sectional views similar to Fig. 1, showing several different modified forms of construction,

Fig. 9 is an end view in section taken along the line IX—IX of Fig. 8,

Fig. 10 is a perspective view of a further modified form of inner pole piece, and

Fig. 11 is a partial end elevation, looking at the rear of our improved speaker, showing the manner of attaching the rear support thereto.

Upon referring to Sheet 1 of the drawings, it will be seen that our improved loud speaker comprises a magnetic frame structure 10, which is to be described in greater detail hereinafter, upon one end of which there is provided a diaphragm or cone housing 11, and at the other end a suitable supporting foot 12 which is adapted to co-operate with the cone housing 11 in supporting the speaker in its operative position. At the outer end of the cone housing 11 there is provided a suitable clamping ring 13 which serves to secure the outer or large end of a cone diaphragm 14 thereupon, the diaphragm 14 being provided with a skiver 15 of leather or other limp material so that it may move freely when in operation. Secured to the clamping ring 13 there is also provided an annular felt pad 16 which is adapted to engage the surface of any suitable baffle 17. The baffle 17 in this instance will be understood to be the front panel of a radio speaker cabinet, the baffle 17 having an opening there-through for the passage of sound waves produced by the speaker. Radio and loud speaker cabinets of the type generally used with these devices are generally provided

with a suitable shelf 19 upon which the speaker proper may rest. These shelves 19 in the various radio sets and speaker cabinets are generally arranged at different elevations with respect to the opening 18 through the baffle. We have therefore provided for an adjustment of the foot or support 12 so that the elevation of the cone 14 above the shelf 19 may be varied to adapt our speaker to various radio sets and cabinets irrespective of the distance of the opening 18 in the baffle above the shelf 19.

The cone 14, in addition to being supported at its outer end by the skiver 15, is also supported at its apex by a relatively flexible centering member 20 which is attached to stationary projections upon the magnetic frame 10. At this latter point upon the cone, there is mounted thereupon an axially extending coil support 21 upon which the customary voice coil 22 is wound. The voice coil 22 is so disposed upon the coil support 21 that it lies in an air-gap formed between an inner or central pole piece 23 and an outer annular pole piece 24 carried by the magnetic field structure 10. In order to provide for a suitable connection between the voice coil 22 and the radio or phonograph out-put circuit, we propose to provide a transformer 25. This transformer, as illustrated in the drawings, is preferably mounted upon the support 12 below the magnetic field structure.

In order to simplify the construction of our speaker and thereby produce a speaker which may be economically manufactured, we propose to provide a novel arrangement of co-operating and interlocking parts which will maintain the speaker in its assembled position and the poles in their proper relation with respect to each other and the magnetic frame in a simple and effective manner. In carrying out this aspect of our invention we provide an outer pole piece of special construction which is better illustrated in Figs. 2 and 3 of the drawings. This outer pole piece assembly consists of a cupped and inwardly projecting centering and interlocking ring 26 which is secured upon the outer pole piece 24 so that it projects inwardly toward the magnetic frame. This centering member 26, it will be understood, if of non-magnetic material such as brass or copper. In the drawings this centering member 26 is shown as secured upon the outer pole piece 24 by riveting, the rivets being formed by partially punching out plugs 27 at equally spaced points around the pole piece, the plugs being then peened over as a rivet. The spacing member 26 is provided with a central opening 28, as shown in Fig. 3, which is adapted to fit snugly over the projecting end of the inner pole 23 so that when the inner pole is engaged thereby it will be held accurately spaced with respect to a central opening 29 extending through the outer pole piece 24.

The opening 28 in the centering member 26 is mutilated by the provision of alternately arranged and equally spaced indentations 30 and recesses 31 which are provided for the purpose which will immediately appear. In this latter figure of the drawings, attention is directed to the mode of supporting the cone apex centering means 20. This support consists of a plate 32 secured on the outside of the annular pole 24 by means of suitable screws 33 and upon which there are provided two oppositely disposed outwardly projecting supports 34 upon which the centering device is mounted.

By referring now to Fig. 4, it will be seen that the inner or central pole piece 23 is provided with a groove 35 extending completely thereabout near one end thereof. This groove 35 is provided in this embodiment of our invention for the reception of suitable keying pieces 36 which are illustrated in Fig. 5. These keying pieces 36 are of a thickness slightly larger than the width of the groove 35 so that when the keying pieces are forced into the groove 35, they will be held securely upon the pole piece 23. The keying pieces 36 are each shown as having a pair of outwardly projecting ears 37 which are so disposed that they will align with the indentations 30 and recesses 31 upon the centering member 26 when the two pole pieces are being assembled in their operative position in the magnetic structure.

In constructing a loud speaker in accordance with the embodiment above described, we provide a pot-like magnetic frame member 38 of a certain predetermined depth. We then so locate the keying members 36 upon the inner pole piece 23 and proportion the spacing member 26 that when the two pole pieces with their co-operating parts are assembled as shown in Fig. 1 and the inner pole piece 23 drawn into its final position by means of a screw 39, the pole pieces 23 and 24 will be placed under stress and firmly held in co-operative relation both with respect to each other and with respect to the balance of the magnetic frame structure. For the purpose of exciting the magnetic frame structure 10, we also show an energizing coil 40 which is disposed about the central pole piece 23, it being understood that suitable leads extend from the coil 40 for the purpose of connecting it with an external exciting circuit.

In Sheet 2 of the drawings we have illustrated several additional modifications of our invention. In Fig. 6 we show a central pole piece 41 upon which there is provided a series of screw threads 42. These screw threads 42 are adapted to co-operate with similar threads provided upon a modified centering and spacing member 43 which in other respects is similar to the spacing member 26 previously described. Because of the

adjustability of the threaded connection between the inner pole 41 and the centering means 43, it will be evident that this particular construction will lend itself to the production of inexpensive speakers as the machining operations will not need be as exact as is necessary in the previous construction to provide a tight fit between the different parts.

In Fig. 7 we show an inner pole piece 44 having an outer enlarged head 45 which is adapted to engage a modified form of centering means 46. In this construction the centering means 46 is provided with a single central opening of a diameter equal to the smaller portion of the inner pole 44 and the head 45 is so located upon the inner pole that when the pole 44 is drawn tightly into place by means of the screw 39, the parts will be firmly held together.

In Figs. 8 and 9, which illustrate a further modification, the inner pole piece designated by the numeral 47 is shown as having a pin 48 extending diametrically therethrough and the centering ring designated by the numeral 49 is provided with oppositely disposed cut-away portions 50 which are adapted to permit the assembly of the pole pieces by passing the end of the pole therethrough, the pin 48 being then turned through a slight angle to bring it out of alignment with the cut-away portions 50 where, when the inner pole piece 47 is drawn into place by the screw 39, the parts will be firmly held together under stress.

In Fig. 10 we show an inner pole piece 51 having ears 52 pinched out thereupon. These ears 52, it will be understood, co-operate with a centering means similar to the centering means 49 illustrated in Fig. 8.

By referring now to Fig. 11, it will be seen that the supporting foot 12 is provided at its upper end with a downwardly projecting slot 53 through which the retaining screw 39 is adapted to pass. This figure of the drawings also shows a relatively large washer or disc 54 arranged immediately thereover so that when the foot 12 is properly adjusted it will be secured in clamped engagement between the magnetic frame or pot 38 and the washer 54, and be adjustable vertically therebetween when the screw 39 is released.

While we have, for the sake of clearness and in order to disclose our invention so that the same can be readily understood, described and illustrated specific devices and arrangements, we desire to have it understood that this invention is not limited to the specific means disclosed but may be embodied in other ways that will suggest themselves, in view of this broad disclosure, to persons skilled in the art. It is believed that this invention is broadly new and it is desired to claim it as such so that all such changes as come within the scope of the appended claims

are to be considered as part of this invention. Having thus described our invention, what we claim and desire to secure by Letters Patent is:—

1. In a second reproducing device, the combination of a magnetic frame member having a central pole piece, an outer pole piece adapted to be associated with said magnetic frame and surround the projecting end of said central pole piece to provide an air-gap between said central pole and said outer pole piece, a centering means carried by said outer pole piece adapted to retain said pole pieces in concentric relation, said centering means having a slot formed in the surface which engages the central pole piece, and a projecting key upon said central pole adapted to pass through said slot and interlock with said centering means to hold the parts together when turned out of alignment with said slot.

2. In a sound reproducing device, the combination of a magnetic frame member having a central pole about which an energizing coil may be disposed, an annular pole member adapted to be associated with said magnetic frame and surround the projecting end of said pole to provide an annular air-gap between said pole and said annular member in which a current carrying coil may be disposed, and co-operating means carried by said annular pole member and said central pole adapted to retain said parts in operative relation when said pole is secured upon said frame member, said means comprising radially spaced projections around said central pole and a collar upon said annular pole member having slots through which said projections may pass when assembling the parts.

3. A magnetic structure for loud speakers of the moving coil type comprising a frame member, a central pole piece having radially extending projections adjacent its end adapted to be mounted upon said frame and support a magnetizing coil, an outer pole piece adapted to co-operate with said central pole piece to form a magnetic air-gap thereabout, and means carried by said outer pole piece having an irregular opening through which the end of the central pole and its projections when in one position may pass and adapted when said central pole is in another position to co-operate with the projections upon said central pole piece to maintain said parts together and said air-gap uniform.

4. A magnetic structure for loud speakers of the moving coil type comprising a cylindrical frame member, a central pole piece adapted to be mounted within said cylindrical member and support a magnetizing coil, an outer annular pole piece adapted to co-operate with said cylindrical frame member and said central pole piece to form an annular air-gap, means carried by said annular pole piece having keyways cut therein, and a plurality of key pieces upon said central

pole piece adapted to pass through said keyways and interlock with said means when turned out of alignment with said keyways to maintain said parts together when said central pole piece is secured in place.

5 5. In a magnetic structure for loud speakers of the moving coil type, the combination of an inner pole piece adapted to support a magnetizing coil, a frame upon which said
10 inner pole piece may be mounted, an outer pole piece adapted to surround the end of said inner pole piece and co-operate with said frame, a centering means carried by said
15 outer pole piece adapted to engage said inner pole piece for maintaining said pole pieces in proper relation with respect to each other, said centering means having spaced keyways extending along the surface which engages the inner pole piece, and a plurality of spaced
20 projections upon said inner pole piece adapted to pass through said keyways in either direction and interlock with said centering means to hold the parts together when the inner pole is secured in place.

25 6. A pole piece assembly for loud speakers of the moving coil type comprising a central pole piece, said pole piece having key pieces projecting outwardly therefrom adjacent its projecting end, and an outer pole piece having spacing means of non-magnetic material for holding said outer pole piece concentric with respect to the projecting end of said central pole piece adapted to engage with said
30 projections upon said central pole piece for retaining the two poles in spaced and operative relation with respect to each other when assembled, said spacing means having keyways complementary to the projecting members upon said central pole whereby the outer pole and spacing means may pass thereover when assembling the parts.

7. A magnetic field assembly for loud speakers of the moving coil type comprising a frame member having a U-shaped cross-section, a central pole piece adapted to be secured at the base of said frame member and project outwardly between the sides thereof, an outer pole piece adapted to contact with the open end of said frame member, a spacing
35 member secured to said outer pole piece adapted to engage said inner pole piece and maintain a uniform air-gap between the pole pieces, and means carried by said inner pole piece adapted when in one position to pass
40 through said spacing member and interlock with said spacing member when in another position to hold said outer pole piece in co-operative relation with said frame member when said inner pole piece is secured upon
45 said frame member.

50 8. In a loud speaker of the moving coil type, the combination of a magnetic frame, an outer pole piece adapted to be mounted upon one end of said frame, an inner pole
55 piece adapted to be mounted upon said frame

and co-operate with said outer pole piece, a spacing member of non-magnetic material secured upon said outer pole piece having a threaded portion adapted to surround said inner pole piece, a screw thread upon said inner pole piece adapted to engage with the threaded portion of said non-magnetic member, and means for securing said inner pole piece upon said frame, whereby said outer pole piece will be held upon said magnetic frame by the threaded portions of said inner pole and said spacing member.

9. A magnetic structure for loud speakers of the moving coil type comprising a frame member, a central pole piece having a screw thread adjacent its projecting end adapted to be mounted upon said frame and support a magnetizing coil, an outer pole piece adapted to co-operate with said central pole piece to form a magnetic air-gap thereabout, and means carried by said outer pole piece having a screw threaded opening through which the end of the central pole may pass adapted to co-operate with the screw thread upon said central pole piece to maintain said parts
90 against both axial and radial displacement and said air-gap uniform.

10. In a magnetic structure for loud speakers of the moving coil type, the combination of an inner pole piece adapted to support a magnetizing coil, a frame upon which said inner pole piece may be mounted, an outer pole piece adapted to surround the end of said inner pole piece and co-operate with said
100 outer pole piece adapted to engage said inner pole piece for maintaining said pole pieces in proper relation with respect to each other, and means carried by said inner pole piece and said centering means adapted to interlock and secure the parts together in operative relation when the inner pole piece is turned in said centering means.

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