

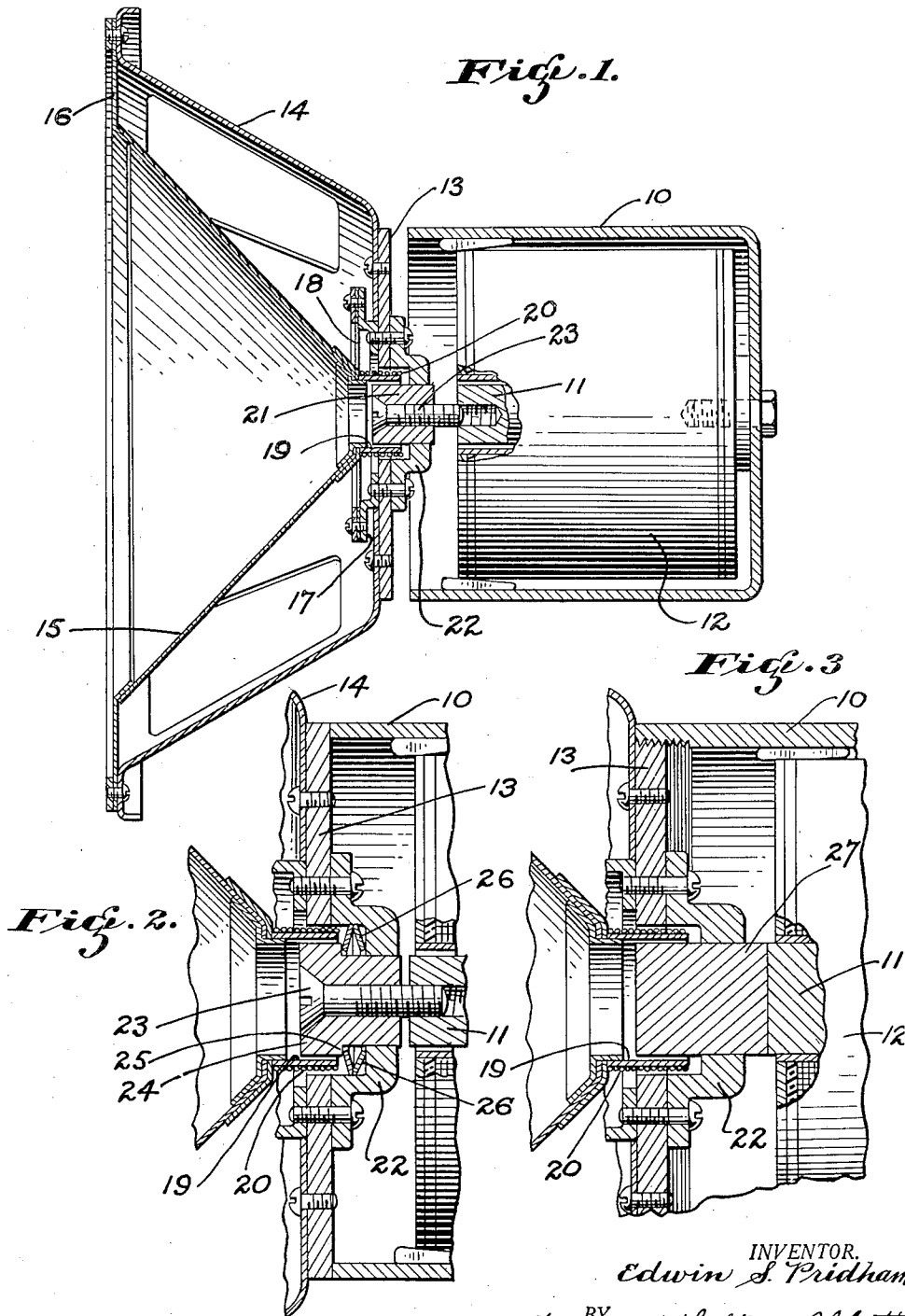
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LOUD SPEAKER

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LOUD SPEAKER

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My present invention relates to an improvement in loud speakers and more particularly relates to an improvement in loud speakers of the moving coil type such as is disclosed in my prior Patent Number 1,448,279.

Devices of this character include a magnetic field producing structure consisting of a frame of magnetic material, a central pole piece of magnetic material and a suitable coil for energizing the magnetic structure so formed. The energizing coil is generally placed upon the core and is enclosed by the above frame which is usually in the form of a pot, open at one end. In addition to the above structure, speakers of the type under consideration also have an additional magnetic member or pole piece which is mounted over the open end of the frame or pot. This additional magnetic member or pole piece has a central opening into which a projecting end of the above referred to core projects. The central opening in this member is slightly larger than the diameter of the core at this point so as to leave a narrow annular air gap between the core and this pole piece, in which the voice or moving coil of the speaker may be disposed.

In addition to the above parts, the complete speaker also has a diaphragm or tympanum to which a voice coil is attached. This voice coil, as stated above, is adapted to be disposed in the air gap formed about the projecting end of the core where it may freely move under the influence of varying currents and the diaphragm is mounted upon the magnetic structure so that it can move freely in an axial direction in response to forces exerted thereupon by reason of magnetic attraction and repulsion exerted upon the voice coil as the varying currents flow therethrough. With this construction, it is essential that the voice coil be exactly centered in the air gap and that the elements of the magnetic structure forming the air gap be also exactly centered so that a uniform air gap will be obtained. At the present time the voice coil is mounted directly upon the diaphragm and in the case of a conical diaphragm, the coil is mounted

upon the apex thereof. With a diaphragm of this latter character, it will be readily seen that there can be no flexing such as is present in a perfectly flat diaphragm and, as a result of this condition, special mountings must be provided for the diaphragm which will permit its free movement. This is accomplished by securing the outer rim to a rigid support by means of flexible material such as leather and the like, a rigid support for these flexible members being secured to the magnetic structure of the speaker. Conical diaphragms or cones of the type generally used in speakers of this class are, for the purpose of obtaining lightness, made of paper. Cones constructed in this manner are, as will be readily appreciated, very fragile and may therefore be easily damaged, either by crumpling or puncturing, and, because of this fact, it is very desirable to provide a means whereby a damaged diaphragm may be readily and conveniently replaced by another and perfect diaphragm in an accurate manner without returning the speaker to the factory or resorting to factory methods and fixtures for exactly centering the magnetic poles and the coil in the narrow air gap. In other words, it is highly desirable that a structure be provided in which interchangeability of the parts is readily possible so that the diaphragm assembly of one speaker unit will fit the magnetic structure of any other such unit.

In addition, it has become the general practice in the trade for a manufacturer of radio receiving sets to obtain loud speakers from some distant source and, in such a case, one of the largest items of cost in the shipping of these complete speaker units is due to the field coil or winding, which of itself weighs almost as much as the remainder of the structure. It is therefore desirable to provide a speaker of such construction that the delicately adjusted and essential parts thereof may be assembled in a factory where every facility for obtaining accurate adjustment is present and with which the less delicate and simpler parts to manufacture may be incorporated without interfering in any way with the accurate operative adjustment of the

more sensitive parts, as, for instance, in the present case the complete speaker unit should preferably be made in what might be termed two distinct parts: one part being the speaker head assembly, which includes the diaphragm, its coil, and the magnetic pole pieces; and the other part being the magnetic frame, core and coil.

In a copending application, Serial Number 341,231, filed February 19, 1929, I have disclosed a construction which is aimed to overcome this difficulty. This construction has met with signal success in the trade, but in this construction the problem of effecting a centering of the poles and the voice coil still requires careful attention. In order to completely overcome these difficulties, I propose by my present invention to provide a speaker head element which can be completely assembled at the factory with the air gap incorporated therein as a component part so that when replacements or assembling is required as, for instance, when a new head is to be placed upon the magnetic structure, it will only be necessary to secure the head assembly upon the pot or magnetic frame, and, in the preferred embodiment of my invention, this operation is carried out by means of a single screw which projects axially into the central pole piece or core.

For a better understanding of my invention, reference should be had to the accompanying drawing, wherein I have shown by way of illustration and not of limitation, speaker units embodying my invention.

In the drawing—

Fig. 1 is a side elevation in section of a speaker unit with the head assembly slightly removed from the magnetic structure,

Fig. 2 is a fragmentary view in section of a modified form of my invention showing the speaker head assembly about to be drawn into its final position, and

Fig. 3 is a fragmentary view in section showing a further modification of my invention.

In the drawings, I have illustrated my invention as applied to loud speakers of the type now most commonly used. In Fig. 1, 10 designates a frame or pot of magnetic material in which there is mounted centrally a core 11, about which an energizing coil 12 is mounted. These three elements constitute what I term the magnetic field structure. The end of the pot 10 is adapted to be closed by an annular member 13 of magnetic material. This member 13 forms one of the poles of the magnetic field and it serves to support the various elements of my improved speaker head assembly, as will hereinafter appear. Attached to the pole piece 13, there is shown a flared metallic member 14 which is adapted to support the outer end of a cone diaphragm 15, the diaphragm 15 being attached to the member 14 at its outer edge by

means of flexible material 16 which is preferably of some soft material such as leather. Mounted upon the member 13 and near the apex of the cone diaphragm 15 I also show an outwardly projecting support 17. This support 17 carries a flexible means 18 which extends to and supports the apex of the cone. The cone is shown as provided with a cylindrical member 19, about which a voice coil 20 is wound, and arranged within the coil 20 in spaced relation therewith I show a detachable pole piece 21 of magnetic material. This pole piece 21 is adapted to be supported upon the member 13 by means of a support 22 which is of non-magnetic material, the pole piece 21 being fitted tightly within the support 22 so that it can not be dislodged therefrom accidentally, the tightness of this fit, however, being so provided that the member 21 may be drawn through the support 22 and into close engagement with the core 11 by means of a screw 23. With this construction, the pole piece 21 will be so assembled at the factory within its support 22 that it will draw the cover member 13 into close magnetic contact with the frame 10 as the screw 23 is turned up into its final position. With this construction it will be seen that the speaker head assembly may be readily attached in an operative manner to the magnetic field structure by means of the screw 23. It should be understood, however, that while I have shown only the screw 23 as a means of securing the head and frame together, resort may be had to other clamping means in extreme cases, if such are thought to be necessary.

In Fig. 2 of the drawing I have illustrated a modified form of my invention in which means are provided for positively insuring a close magnetic fit between the pole pieces and the magnetic structure of my speaker. In this embodiment, the cover or other annular pole piece 13 functions as in the case of the modification shown in Fig. 1. A central pole piece 24 of somewhat different construction is, however, provided. This pole piece 24 is provided with a shoulder 25 which cooperates with a yielding spring or other means 26, the spring 26 being interposed between the shoulder 25 upon the pole piece 24 and the inner face of the pole piece support 22. With this arrangement, the fit of the pole piece 24 is sufficiently tight within its support 22 to hold it in place when the yielding means 26 is uncompressed. With this construction, it will be seen that, when the parts are assembled and the pole piece 24 drawn down into intimate contact with the core 11, the spring means 26 will be compressed and the spring 26 will then tend to hold the plate or annular pole piece 13 into magnetic contact with the frame 10. The provision of the spring means 26 also insures against a parting of the magnetic structure, both at the frame 10 and at

the pole piece 11, should there be any unequal expansion or contraction which would affect the length of the frame 10 or the core 11. With this arrangement it will also be seen that the provision of additional clamping means will not be necessary.

A further modification of my invention is illustrated in Fig. 3, wherein, instead of providing the screw 23 passing through the pole piece, I thread the outer edge of the member 13 so that it can be screwed into the frame 10. In this instance, I provide an inner pole piece 27 which has no hole through the center. With this construction, the pole piece 27 will be mounted in tight frictional engagement with its support 22 and when shipped, it will project slightly beyond the position which it has assumed, as illustrated in this figure of the drawings. With such an arrangement, in assembling the speaker head to the magnetic structure, the operator will simply screw the annular pole piece or cover 13 upon the magnetic frame or pot 10 until the pole piece 27 contacts with the core 11. He will then, by continuing to screw the member 13 into the pot, force the auxiliary pole piece 27 outwardly and at the same time into intimate contact with the core 11.

While I have shown the preferred form of my invention as now known to me, it is to be understood that various changes may be made in its construction without departing from the spirit of the invention as defined in the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In a loud speaker of the moving coil type, the combination of a magnetic frame, a core mounted in said frame, an electro-magnetic field producing coil upon said core, and a removable speaker head assembly adapted to cooperate with the magnetic field produced by said coil having an outer pole piece adapted to support a diaphragm in spaced relation therewith and engage the magnetic frame, a diaphragm having an opening at its center, an inner pole piece adapted to engage the core, means for securing said outer and inner pole pieces in spaced relation to provide a fixed air gap therebetween in which a diaphragm operating coil may be disposed, and means accessible through the opening in said diaphragm associated with said inner pole piece for securing said head assembly in magnetic engagement with the frame and core of the electro-magnetic structure.

2. The combination with a moving coil speaker of the type having a magnetic field producing coil, an outer frame and a core, of a removable speaker head assembly adapted to cooperate with the magnetic field produced by said coil having an annular pole piece adapted to contact with the frame, a

central pole piece mounted upon and out of magnetic contact with said annular pole piece adapted to contact with the core of said magnetic field, said central pole piece having a shoulder at one end and being adapted to adjust itself with respect to said annular pole piece to maintain a close magnetic contact with the core and between the frame and annular pole piece, a yielding means engaging the shoulder upon said central pole piece, and threaded means cooperating with said shoulder upon the central pole piece for securing the removable speaker head assembly in magnetic engagement with the magnetic field producing structure.

3. The combination with a moving coil speaker of the type having a magnetic field producing coil, an outer frame and a core, of a removable speaker head assembly adapted to cooperate with the magnetic field produced by said coil having an annular pole piece adapted to contact with the frame, a central pole piece mounted upon and out of magnetic contact with said annular pole piece adapted to contact with the core of said magnetic field, said second pole piece being adapted to adjust itself with respect to said annular pole piece to maintain a close magnetic contact with the core and between the frame and annular pole piece and provide an annular air gap between said annular pole piece and said central pole piece, a coil disposed in said air gap, a diaphragm having a central opening adapted to be actuated by said coil, and means accessible through the opening in said diaphragm cooperating with said central pole piece for securing the removable speaker head assembly in magnetic engagement with the magnetic field producing structure.

4. A removable head assembly for loud speakers of the moving coil type having an electro-magnetic field structure, comprising the combination of an outer annular pole piece, an open ended conical diaphragm supported upon said annular pole piece, an inner pole piece, means carried by said outer pole piece for holding said inner pole piece in radially spaced relation therewith without interfering with a limited axial movement thereof, and means accessible through the open end of said diaphragm cooperating with said inner pole piece for holding each of said pole pieces in magnetic engagement with the magnetic field producing structure.

5. A removable head assembly for loud speakers of the moving coil type having an electro-magnetic field structure, comprising the combination of an outer annular pole piece, an inner pole piece having a shoulder thereupon, spacing means carried by said outer pole piece for holding said inner pole piece in radially spaced relation therewith without interfering with a limited axial

movement thereof, yielding means interposed between said spacing means and a shoulder upon said inner pole piece tending to limit any axial movement between said pole pieces, and means cooperating with said inner pole piece and said yielding means for holding each of the pole pieces of said head assembly in magnetic engagement with the magnetic field producing structure.

6. The method of manufacturing loud speakers which comprises forming the speaker in two major parts, one part comprising the magnetic field structure and the other comprising a removable pole piece and an open ended conical diaphragm head assembly, and securing the two parts together in operative relation by a single securing means which is accessible only through the opening in said diaphragm.

7. In a loud speaker of the moving coil type, the combination of a magnetic frame, a core mounted in said frame, an electromagnetic field producing coil upon said core, a speaker head assembly adapted to cooperate with the magnetic field produced by said coil having an outer pole piece, a conical diaphragm having an opening at its apex, a coil attached to said diaphragm, an inner pole piece arranged within said coil adapted to contact with the end of said core, and means accessible through the opening at the apex of the diaphragm for securing said inner pole piece to the end of said core.

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