July 7, 1936. P. L. JENSEN 2,046,515

SOUND REPRODUCER

Original Filed June 27, 1930 2 Sheets-Sheet 1

Fig. 1

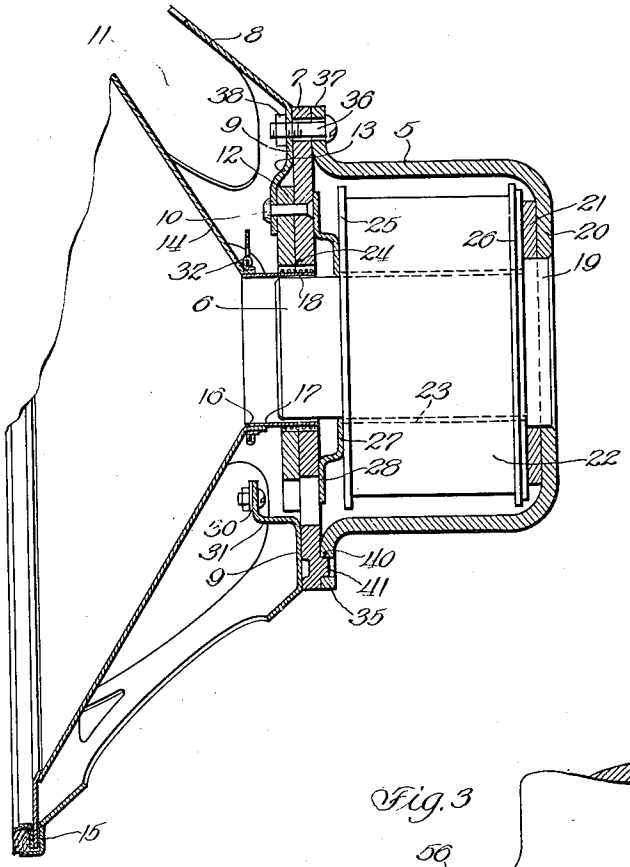


Fig. 2

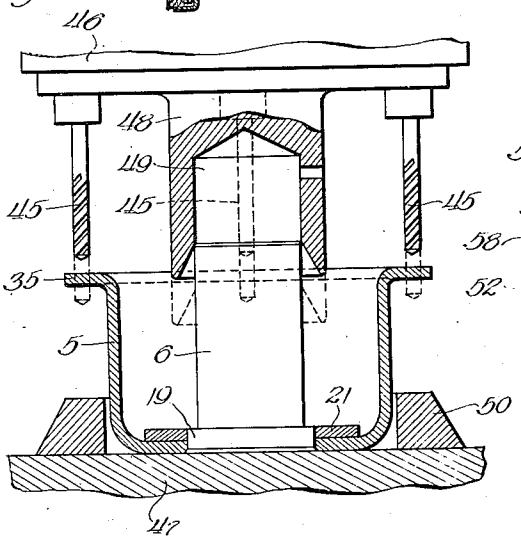
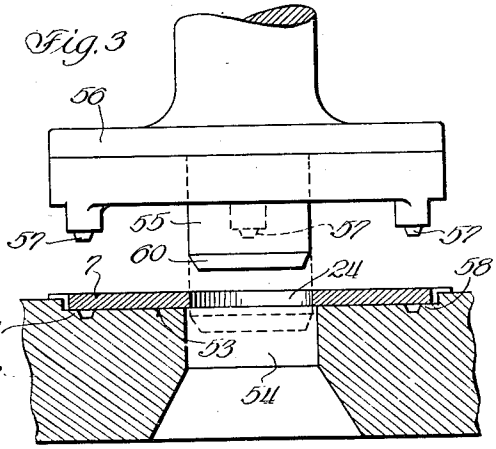


Fig. 3



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Fig. 4

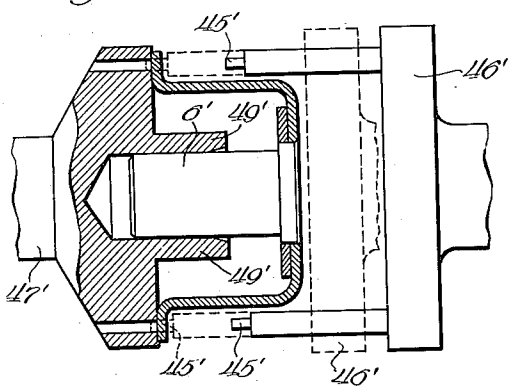


Fig. 5

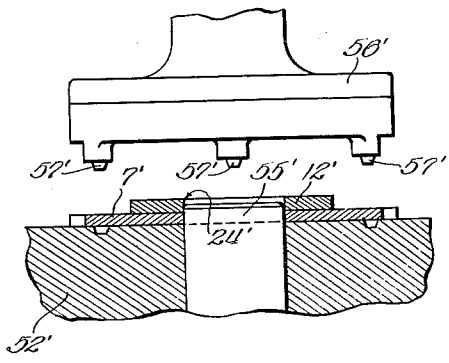


Fig. 6

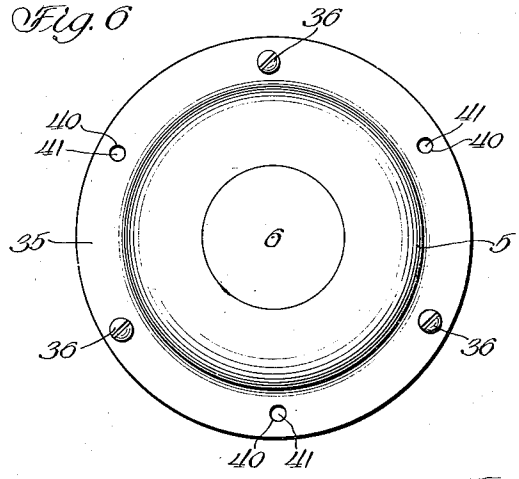


Fig. 7

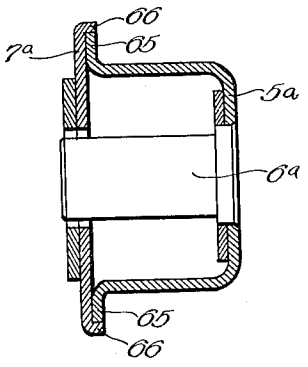


Fig. 8

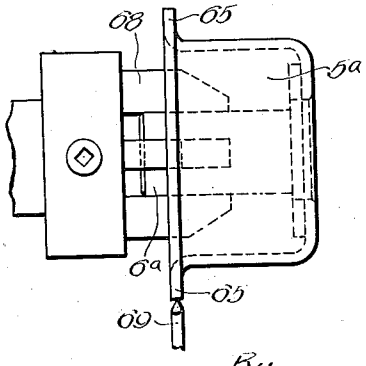
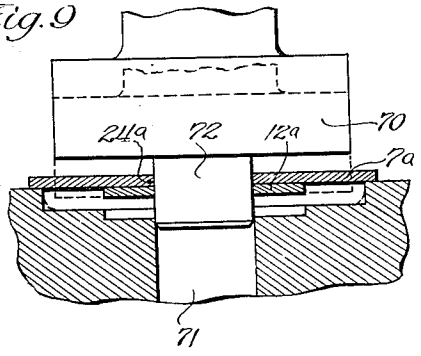


Fig. 9



Inventor:
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Patented July 7, 1936

2,046,515

UNITED STATES PATENT OFFICE

2,046,515

SOUND REPRODUCER

Peter L. Jensen, La Grange, Ill., assignor to Jensen Radio Manufacturing Company, Chicago, Ill., a corporation of Nevada

Original application June 27, 1930, Serial No. 464,275, now Patent No. 1,941,476, January 2, 1934. Divided and this application June 17, 1931, Serial No. 544,987

1 Claim. (Cl. 179—115.5)

My invention relates to sound reproducers, particularly of the electro-dynamic or moving coil type, in which the coil is disposed so as to be freely movable in an annular field between the inner and outer pole pieces.

The present application is a division of my copending application Serial No. 464,275, filed June 27, 1930, and relates to improved means for concentrically disposing the pole pieces with respect to each other.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a fragmentary section taken longitudinally along the axis of a device embodying the invention;

Figures 2 and 3 are more or less diagrammatic sectional views partially in elevation, and showing the steps of forming the positioning means on the case and end plate parts, respectively;

Figure 4 is a more or less diagrammatic view similar to Figure 2, showing an alternative manner of forming the positioning means on the case part;

Figure 5 is a more or less diagrammatic view similar to Figure 3, showing an alternative manner of forming the positioning means on the end plate part;

Figure 6 is an end view on a reduced scale of the device shown in Figure 1;

Figure 7 is a longitudinal axial section through the case and end plate parts, showing a modified form of positioning means on the parts; and

Figures 8 and 9 are more or less diagrammatic views showing the steps of forming the positioning means shown in Figure 7.

Referring to the drawings, the device shown in Figure 1 comprises a case 5, inner pole piece or core 6, and an end plate 7 constituting the circumferential outer pole piece.

A frame 8 has a radial portion 9 secured to the plate 7 by rivets 10, and from the radial portion 9 the frame 8 extends generally conically and is of open work formation at 11. For increasing the magnetic area or depth in the outer pole piece 7 a supplemental outer pole piece ring 12 is secured to the pole piece 7 by the rivets 10, the radial portion 9 of the frame 8 being offset at 13 to accommodate it to the interposed ring 12.

The generally conical diaphragm 14 is yieldingly attached around its outer periphery at 15 to the frame 8, and its inner truncated end is rigidly secured at 16 to an insulating coil carrying sleeve 17. The movable coil 18 is wound upon and preferably firmly cemented to the outer surface of the sleeve 17.

The inner pole or core piece 6 is riveted or rigidly secured at 19 to the end 20 of the case 5, which end 20 may be provided with a ring piece 21 for increasing the magnetic area. A magnetizing coil 22 may be placed around the core 6, being insulated therefrom by an annular layer of insulation 23.

The pole piece 7, 12 is provided with a circular opening 24 through which the adjacent end of the core 6 extends in the assembled relation of the parts, the diameter of the opening 24 being sufficiently great to admit the coil 18 and sleeve 17 which surround the core 6 and which are freely movable in the annular field between the inner and outer pole pieces. Insulating rings 25 and 26 are disposed at the opposite ends of the coil 22, a brass spacing ring 27 offset marginally at 28 being loosely interposed between the ring 25 and the pole piece 7.

The inner truncated end 16 of the diaphragm 14 is anchored for free movement with the coil 22 by non-radial spring arms 30 secured at their outer ends to lugs 31 struck up from the frame 8, and at their inner ends to a ring element 32 surrounding the sleeve 17, and between which and the sleeve 17 the adjacent end of the diaphragm 14 may be secured.

The case 5 is flanged radially at 35 and may be secured to the pole piece 7 and frame 8 by screws 36 passing loosely through registering openings 37 and having threaded engagement in nuts 38.

Now, in order to dispose pole pieces 6 and 7 concentrically with respect to each other, I provide the flange 35 of one pole piece part, namely, the casing 5 with positioning means 40 and the other pole piece part, namely, the pole piece 7 itself is provided with positioning means 41 which engage with the positioning means 40 and dispose the pole pieces 6 and 7 concentrically, thereby forming a uniform annular space between the inner and outer pole pieces and assuring a uniformity of the field by the simple expedient of assembling the parts.

In the embodiment of Figures 1, 2 and 3 the positioning means 40 is in the form of a plurality of dowel sockets or openings preferably equidistant apart circumferentially around the flange 35, the positioning means 41 comprising cooperating and similarly positioned dowel pins on the pole piece 7. The dowel pins 41 are shown as being pressed or extruded out of the metal of the pole piece 7, but separate pins may be at-

tached to the pole piece 7 within the scope of the present invention.

In Figure 2 is shown the step of forming the positioning sockets 40 on the case 5, these sockets being shown as opening entirely through the flange 35, although it is to be understood that they may be only depressed therein if desired. The forming elements, therefore, may be in the form of drills 45, one being shown for each socket or opening 40, and these drills 45 are carried by a carriage 46 having movement toward and from the case support 47. The forming elements are spaced according to the desired spacing and arrangement of positioning means 40. A centering element 48 also carried by the carriage 46 has a socket 49, the axis of which is equidistant from the axes of the drills or socket forming elements 45. The internal diameter of the socket 49 is equal to the external diameter of the pole piece 6, and the lower end of the socket 49 flares outwardly and projects below or beyond the ends of the forming elements 45 sufficiently to take over the pole or core piece 6 and center the same with respect to the socket forming elements 45 ahead of the operation of these elements 45 upon the flange 35. A ring 50 on the support positions the case 5 for centering cooperation of the centering element 48 with the core 6.

With the case 5 centered by means of the core 6 with respect to the elements 45 for forming the positioning means 40, this means 40 is formed by the elements 45 upon continued movement of the carrier 46 toward the support 47. Upon forming the positioning means the forming elements may be withdrawn and the next case arranged in place and similarly operated upon.

While I have shown and described the forming means 45 as a plurality of elements, it is to be understood that one element might be employed and the carriage arranged to be turned to bring it into position for successively forming the several positioning sockets. This also applies to the means for forming the cooperating positioning means 41 on the outer pole piece 7.

In Figure 3 is shown the step of forming the positioning dowels 41 on the pole piece 7, these dowels 41 being shown as pressed or extruded from the metal of the pole piece 7, but may be in the form of separate pins applied according to this invention to form the dowel means. In the embodiment shown the forming means comprises a die-like block 52 recessed at 53 to receive the pole piece 7 and provided with an axial opening 54 to admit the centering element 55 of the plunger 56 which is movable toward and from the block 52 and has extrusion elements 57 for cooperating with extrusion recesses 58 in the block 52 so that upon movement of the plunger 56 toward the block 52 these elements will by their engagement with the pole piece 7 and by their cooperation with the recesses 58 extrude the dowel pin means 41 from the metal of the pole piece 7.

The axes of the extrusion elements 57 are equidistant from the axis of the centering element 55, and the external diameter of the centering element 55 is equal to the internal diameter of the opening 24 in the pole piece 7, and its lower end is tapered at 60 and projects below the elements 57 sufficiently to enter the opening 24 and center the pole piece 7 with respect to the elements 57 ahead of the operation of these elements upon the piece 7. Clearance is shown in the block 52 around the piece 7 to permit this centering, and a slight clearance is shown between the case 5 and the ring 50 of Figure 2 to permit the centering of that part of the device.

The forming elements 57 are not only spaced equidistantly from the axis of the centering element 55, but the spacing is equal to the spacing of the axes of the forming elements 45 from the axis of the centering element 48 so that when the parts are brought together the entry of the dowel pin element 41 into the dowel socket 40 will accurately dispose the pole pieces in concentric relation without adjustment and by the simple expedient of assembling the parts.

In Figure 4 the means 49' for centering the forming elements 45' by means of the inner pole piece 6' is associated with the support 47' instead of with the carriage 46', as in Figure 2, it being understood that the elements 45' are centered equidistantly from the axis of the member 49'.

In Figure 5 the centering element 55' for centering the forming elements 57' by means of the pole piece opening 24' is associated with the block 52' instead of with the plunger 56' as in Figure 3, it being understood that the elements 57' are centered equidistantly from the axis of the member 55'.

In the embodiment illustrated in Figure 7 the positioning means on the case 5a comprises the radial flange 65, the periphery of which is turned down about the inner pole piece 6a carried by the case 5a as a center, and the cooperating positioning means on the pole piece 7a is formed by turning the marginal edge of the pole piece 7a over marginally at 66 to embrace the periphery of the flange 65 to thereby dispose the pole pieces of these parts concentrically with respect to each other.

In Figure 8 the case 5a is shown more or less diagrammatically as supported at 68 in a suitable chuck, for example, and a tool is shown at 69 for turning the periphery of the flange 65 down about the pole piece 6a as a center. A lathe is contemplated for this purpose.

In Figure 9 is shown the step of turning the marginal edge of the pole piece 7a over at 66. This may be done by die elements or by centering the pole piece 7a by means of the opening 24a and with a suitable tool 70 drawing the marginal edge of the pole piece laterally to turn it over so that it will marginally receive and embrace the periphery of the flange 65 of the case 50 upon assembly of the parts, thereby accurately disposing the pole piece 6a concentrically with respect to the pole piece 7a. It is to be understood, of course, that the external diameter of the member 70 for turning over the marginal edge of the pole piece 7a is equal to the radius of the flange 65 of the casing, the member 70 being centered with respect to the opening 24a in the pole piece by engagement of the centering element 72 carried thereby in the pole piece opening 24a, the external diameter of the centering element 72, and the internal diameter of the opening 71 being equal.

In Figure 5 the pole pieces 7' and 12' are shown secured together before the formation of the positioning means. This is also true in Figure 9, but in Figure 3 the positioning means is shown as being formed before joining the pole pieces 7 and 12. This may vary.

I do not intend to be limited to the precise details shown or described.

I claim:

In a loud speaker of the moving coil type, the combination of a diaphragm, an annular coil attached to said diaphragm, a casing part, an inner

pole piece attached to said casing part and extending into the annular coil and spaced therefrom, a circumferential pole piece surrounding said coil and spaced therefrom, means for attaching said circumferential pole piece and casing parts together and means on one of said parts and cooperable with the other part for positioning the inner pole piece and the circumferential pole piece concentrically disposed independently of the attachment of said parts together, said positioning means comprising an annular flange on one part and the marginal edge of the other part being turned over laterally for telescopic engagement with said flange.

PETER L. JENSEN.