June 5, 1934. B. A. ENGHOLM ET AL 1,961,286

LOUD SPEAKER

Filed Nov. 11, 1932

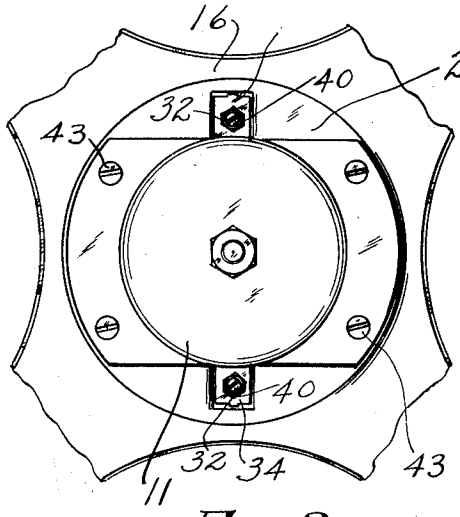


FIG. 2

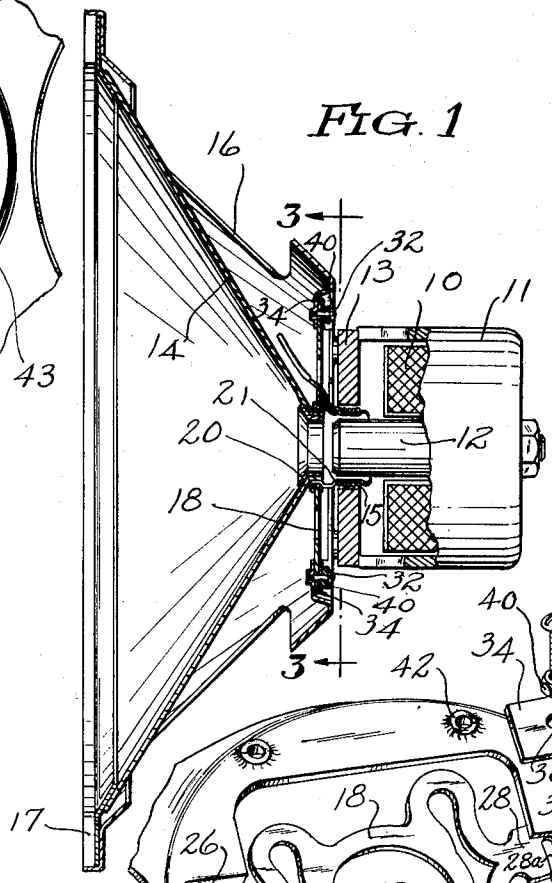


FIG. 1

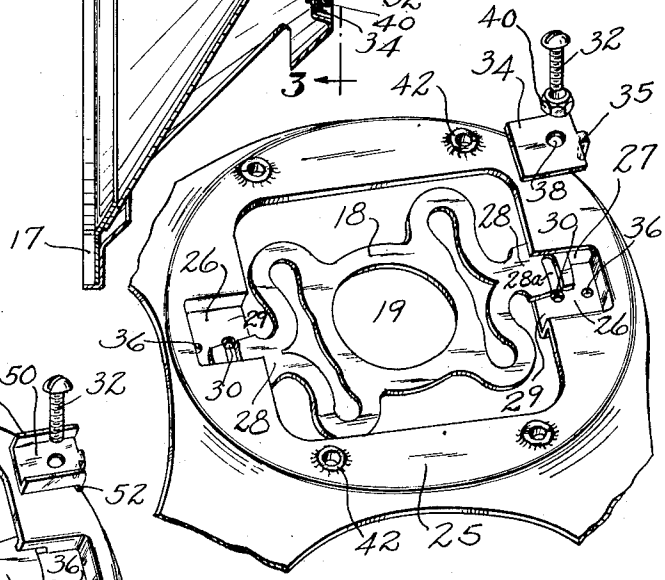


FIG. 3

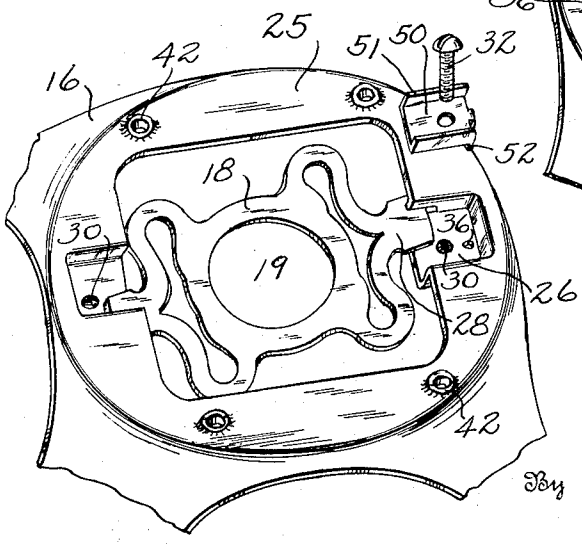


FIG. 4

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UNITED STATES PATENT OFFICE

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LOUD SPEAKER

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5 Claims. (Cl. 179—115.5)

This invention relates to electro-dynamic devices of the type wherein a moving voice coil is connected to a diaphragm. Heretofore, considerable difficulty has been experienced in supporting both the coil and diaphragm, while obtaining proper axial alignment between the moving coil and the pole pieces of the stationary coil when the device is in use.

The inner end of a conical diaphragm is usually supported by a flexible spider, which is attached to the neck of the diaphragm or the associated moving coil form, the spider being supported usually by the housing of the field coil assembly. This construction comprises an assembly of the diaphragm housing, front plate, coil shell and field core assembly, an intermediate assembly of the diaphragm, the moving coil and the spider, and a final assembly of the first two named assemblies, screws and nuts being used to combine the sub-assemblies into a complete unit. The use of such fastening means for the spider however, has a tendency to distort and twist it.

Difficulty has been experienced in maintaining proper axial relationship between the moving coil and the inner and outer pole pieces, and so in centering the unit, the practice has been to center the moving coil with reference to the outer pole piece and thereafter to center the inner pole piece to the coil. This necessitated the use of an adjustable inner pole piece tip, but final adjustment of the inner pole piece is apt to be incorrect with reference to the outer pole piece, for any error in its adjustments is progressive in its nature.

An object of the present invention is to eliminate the objections heretofore noted, to provide a unit which may be assembled more expeditiously, and to construct a spider which may be secured to the supporting medium in such manner as to minimize the distortion thereof during the assembly. Furthermore, our invention is directed toward a construction wherein the spider clamping members are readily accessible from a point exterior of the shell and housing assembly.

Referring now to the drawing, Fig. 1 is a side elevation, partly in cross-section of an electro-dynamic device embodying our invention; Fig. 2 is a back view of the device; Fig. 3 is a perspective view of the spider which is intended for holding the diaphragm; Fig. 4 is a perspective view similar to Fig. 3, showing a slight modification of the spider and securing means therefor.

The electro-dynamic device shown in the drawing comprises a loud speaker having a field coil 10, a shell 11, an inner pole piece 12, an outer pole piece 13, a diaphragm 14, a moving coil 15, a diaphragm supporting housing 16, a clamping ring 17 and a spider 18. The spider comprises a flexible member which may have a central opening 19 that embraces the neck 20 of the diaphragm and that is fastened thereto by cement. The neck of the diaphragm in turn is shown as embracing the forward end of the moving coil form 21.

The present invention is more particularly concerned with the spider mounting. To this end, the spider is shown as being supported by the cone housing, which in turn may be formed at its inner end to permit a free movement of the outer ends of the spider until proper adjustment between the moving coil and the pole structure is obtained. The preferred form of clamping arrangement is designed to exert clamping pressure on the spider in a direction normal to the clamped surface. To accomplish this we provide an inner flange 25 on the housing 16 of sufficient diameter to extend substantially outside of the perimeter of the field shell 11, and in the flange we arrange two oppositely disposed pockets or shelves 26. A slot 27 may be formed in one of the walls of each of the pockets, whereby lugs 28 on the spider may pass through the slots when the spider, voice coil form and the diaphragm are assembled on the housing and field coil assembly. The bottom walls 29 of each pocket thus provide clamping surfaces which are disposed in a common plane, which is normal to the axis of the total assembly.

To lock the spider in place, we have shown the bottom walls 29 of the pockets as having threaded apertures 30, for the reception of clamping screws 32. In addition, we provide flat clamping plates 34, of substantially the same size as the pockets. Thus, there will be no turning movement of the clamping plate when the screws 32 are brought to bear against the spider. An arcuate slot 28*a* at each end of the spider enables it to be turned into clamping position before the screws are tightened.

To facilitate the assembling of the clamping plates 34, we provide lugs 35 thereon, which are adapted to extend into apertures 36, formed in the bottom walls of the pockets to radially align apertures 38 in the plates with the threaded apertures 30. The side edges of the clamping plates 34 are guided by the side walls of the

pockets to align the apertures 38 with the threaded aperture 30 in the transverse direction.

A hexagonally shaped washer 40, when held with a wrench, serves the further purpose of decreasing the tendency of the head of the screw 32 to turn or twist the clamping plate 34 relative to the spider lugs 28 during the final tightening movement.

The flange 25 of the housing 16 may also be provided with upset perforated embossings 42, through which the assembly screws 43 may pass to connect the housing 16 in assembled relation to the pole piece 13.

In Fig. 4, we show a slight modification of the clamping means. In such illustration, the ends of the spider are not slotted, as shown in Fig. 3. Each clamping plate 50 however, is provided with a downwardly extending flange 52 at its outer end, the depth of the flange being substantially equal to the thickness of the spider. The width of each clamping plate is substantially equal to the width of the socket 26, while side flanges 51 on the plate cooperate with the side walls of the socket to prevent any turning movement of the clamping plate when the screw 32 is tightened.

In both forms, it will be apparent that the field coil assembly, together with inner and outer poles, and the diaphragm supporting housing 16, may comprise one assembly, while the more delicate assembly comprising the diaphragm, the voice coil form, the voice coil and the spider may constitute the second assembly. This second assembly may be conveniently and accurately brought into cooperative assembly relation with the first assembly by the use of a spacing templet placed upon the inner pole and over which the voice coil form may be slipped to center the same. The voice coil assembly may then be turned axially to bring the spider lugs 28 through the slots 27, whereupon the clamping plates may be tightened onto the spider lugs by the screws 32. The arrangement is such that the clamping means is completely exposed on the outer rear side of the housing 16 while the final tightening of the screws 32 will not impart any torsional strains to the spider. The outer clamping ring 17 may then be tightened on the outer flange of the diaphragm, whereupon the templet may then be withdrawn, leaving the voice coil in axial alignment relative to the inner pole and the aperture of the outer pole.

We claim:—

1. An electro-dynamic device comprising in combination, an electro-magnetic structure, a diaphragm, a voice coil carried thereby, a housing attached to the outer end of the diaphragm and to the electro-magnetic structure, a spider rigid with the diaphragm adjacent the inner end thereof, the housing having spaced depressed portions into which the spider may be inserted, a plate engaging the spider and the housing, and means for locking the spider between the plate and the housing.

2. A locking device for a loud speaker, comprising in combination, a diaphragm, a voice coil attached thereto, a housing for the diaphragm, a spider rigidly mounted on the diaphragm, a bridge piece extending across the spider and having a portion thereof extending into the housing, and means extending through the bridge piece and spider for locking the spider to the housing.

3. In an electro-dynamic device, the combination with a diaphragm, of a voice coil attached thereto, a housing for the diaphragm, a spider attached to the diaphragm, the housing having an opening extending therethrough, a bridge piece having a tongue extending into the opening and projecting across part of the spider and means extending through the bridge piece and spider for locking the spider to the housing.

4. In an electro-dynamic device, the combination with a diaphragm, of a voice coil movable as a unit therewith, a spider rigid with the diaphragm, a housing for the diaphragm, said housing having a portion thereof struck inwardly therefrom to provide a shelf upon which the spider may be positioned, a bridge piece having an opening therein, and superimposed on the spider, means for preventing the bridge piece from turning with reference to the housing, and other means for clamping the bridge piece and spider to the shelf.

5. In an electro-dynamic device, the combination with a diaphragm, of a voice coil associated therewith, a housing for the diaphragm, a spider rigid with the diaphragm and adjacent the voice coil, the housing having a pair of oppositely disposed shelves thereon, the spider having tongues that are adapted to be positioned on the shelves, each shelf having two openings therein, a bridge piece for each shelf having an opening corresponding to one of the openings in the shelf, and having a tongue adapted to be inserted in the other opening, and threaded means for locking each tongue between the associated bridge piece and shelf.

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