Sept. 25, 1934. B. A. ENGHOLM 1,974,770

LOUD SPEAKER

Filed Jan. 13, 1933

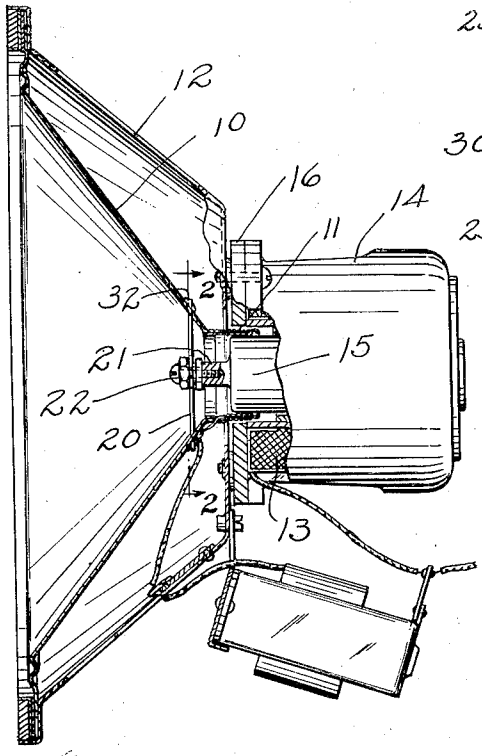


FIG. 1

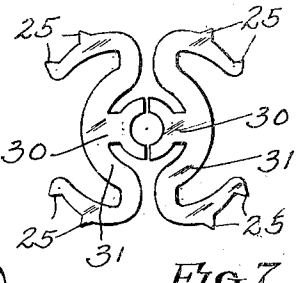


FIG. 7

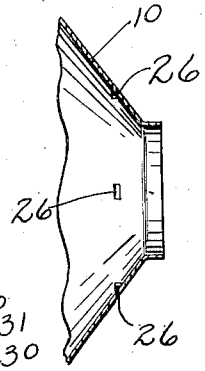


FIG. 3

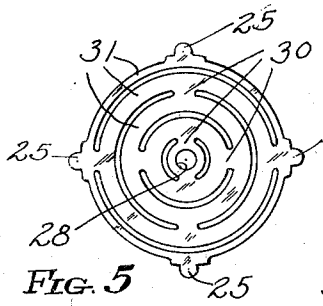


FIG. 5

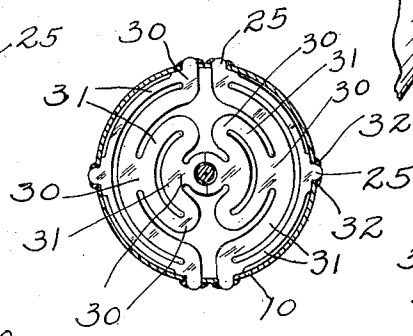


FIG. 2

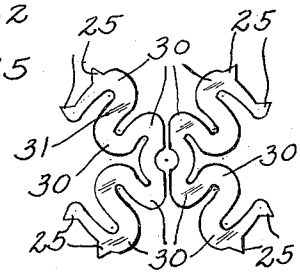


FIG. 6

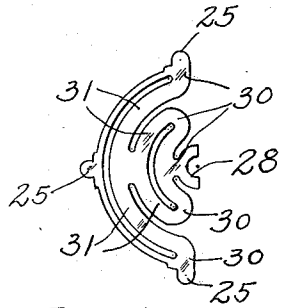


FIG. 4

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Patented Sept. 25, 1934 1,974,770

UNITED STATES PATENT OFFICE

1,974,770

LOUD SPEAKER

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Application January 13, 1933, Serial No. 651,549

3 Claims. (Cl. 179—115.5)

This invention relates to loud speakers, and particularly to devices for centering the diaphragm and its associated voice coil in proper position with relation to the air gap between the inner and outer magnetic pole pieces. A device for this purpose is commonly called a spider, and is positioned either outside the voice coil or inside the diaphragm. In the first instance, it is called an outside spider, and in the second, an inside spider. The spider to be satisfactory must have sufficient rigidity to hold the diaphragm and associated voice coil in accurate position, and at the same time, must have sufficient flexibility to permit the necessary piston action of the coil and diaphragm.

A phenolic condensation product similar to bakelite may be used for this purpose, for it can be pressed in sheet form and cut to the desired shape. Due to its inherent characteristics however, it cannot be satisfactorily formed to provide a flange for anchoring it in place, as has been the practice with a paper spider. The flange however, is objectionable since it has a certain amount of mass, which necessarily results in a lowered efficiency of the reproducer. Furthermore, since the flange is a solid annulus, it has objectionable circumferential resonance. These considerations have limited the use of a phenolic condensation product to outside spiders, where the material can be cemented to the voice coil form, and secured at the marginal edges to a support.

An object of my invention therefore, is to provide a spider mounting, which can be used satisfactorily for an inside spider, and which will permit the use of a material, such as a phenolic condensation product without requiring the utilization of a flange for attaching the spider to a diaphragm. An additional object is to provide an arrangement, whereby the spider may be readily inserted into the assembly, and attached or locked in a convenient and inexpensive manner.

Referring now to the drawing, Fig. 1 is a side elevation, partly in section, of a loud speaker embodying my invention; Fig. 2 is a section taken through the speaker diaphragm on the line 2—2 in Fig. 1; Fig. 3 is a section taken on the diaphragm with the spider removed; Fig. 4 is a front view of one of the spider sections illustrated in Fig. 2, while Figs. 5, 6 and 7 are front views of modified forms of spider construction.

I have shown my invention in connection with a loud speaker, which has a diaphragm 10, a voice coil 11, a diaphragm housing 12, a field coil 13 and a field coil shell 14. The voice coil is disposed within an air gap, as for instance between an inner pole piece 15 and an outer pole piece 16, while the diaphragm which is attached to the voice coil form is supported adjacent its outer end by the housing and adjacent its inner end by the spider indicated in general at 20. This is shown as an inside spider, which is fastened at its central portion to a projection 21 of the inner pole piece by a fastening member 22.

To permit the spider to be made of a phenolic condensation product and at the same time to facilitate its attachment to the diaphragm, I provide tabs 25 on the spider which project through spaced slots 26 in the diaphragm and which can be cemented to the back of the diaphragm, as at 32. In the form shown, the spider comprises two similarly shaped sections, each of which is provided with a semi-circular recess as at 28 which extends around the threaded shank of the fastening member 22. The two recesses coact to provide a circular opening, which is larger than the diameter of the screw shank, so as to provide adequate clearance for any lateral adjustment that may have to be made to center the voice coil in the air gap.

In Fig. 5, the spider is shown as one piece unit but in the preferred arrangement two pieces are used for this purpose. This facilitates the assembly without requiring either the diaphragm to be distorted or the spider to be bent to insert the tabs during the assembly operation. In each case however, the spider preferably has radial portions 30, which are connected by circular segmental portions 31. This arrangement may take various forms, as is observable from an inspection of Fig. 6 and Fig. 7 in comparison with Fig. 2. It is also apparent that the number of radial portions and connecting circular segmental portions may be varied in accordance with the size of the diaphragm with which the spider is to be used. In Fig. 2 for example, each section of the spider has an inner and outer and two intermediate circular segmental portions, while the spider of Fig. 6 has an inner and outer and one intermediate circular segmental portion, and the spider of Fig. 7 has inner and outer segmental portions only.

From the foregoing description, it will be apparent that this invention provides a spider construction which may be readily attached and which permits the use of a phenolic condensation product on an inside spider assembly. While I have illustrated and described the shape of the spider as being preferably concerned with

radially extending portions that are connected by circular extending segmental portions, it is to be readily understood that such shapes may be varied without departing from the spirit of my invention.

I claim:—

1. In combination, a loud speaker diaphragm and an inside spider associated therewith, said spider comprising two similarly formed sections disposed in substantially the same plane and means on the spider for piercing a diaphragm and locking it thereto.

2. In combination, a loud speaker diaphragm, having a plurality of openings therein in substantially the same plane, a spider associated with the diaphragm and having tabs thereon that project through the openings, and having a relatively tight fit therewith for locking the spider and diaphragm together as a unit, and means for supporting the spider within the diaphragm.

3. In combination, a loud speaker diaphragm having spaced openings therein disposed in substantially the same plane, a voice coil form associated therewith, an inner and an outer pole structure providing an air gap in which the voice coil is positioned, a spider, means for supporting the midportion of the spider on the inner pole piece within the diaphragm, and said spider having tabs that project through the openings in the diaphragm, and make a tight fit therewith for locking the spider and diaphragm together as a unit.

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