May 21, 1935. H. J. ROUND 2,002,190

ACOUSTIC DEVICE

Filed Dec. 31, 1928

Fig. 1

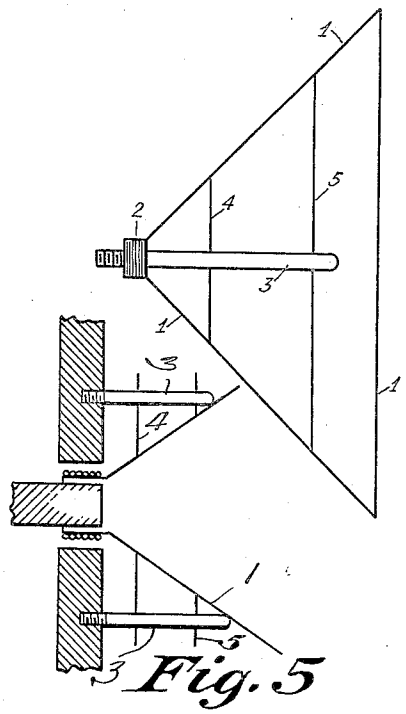


Fig. 2

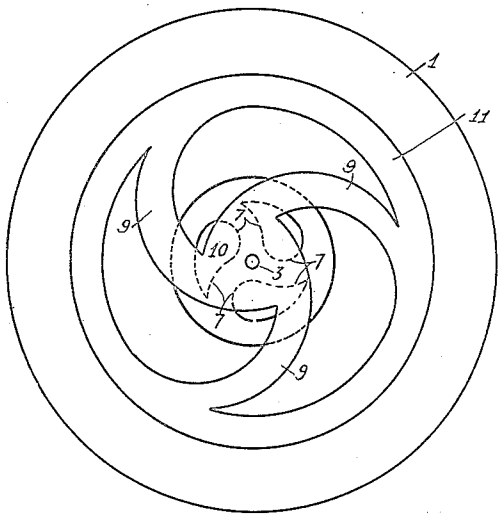


Fig. 5

Fig. 4

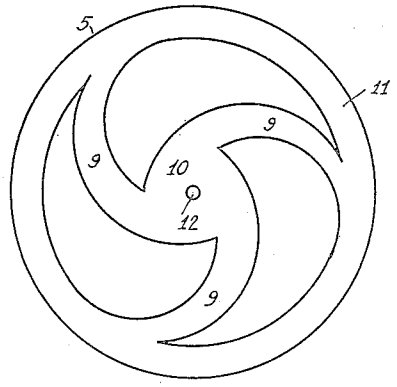


Fig. 3

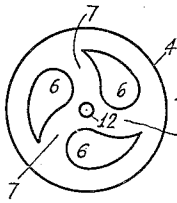
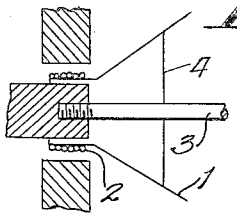


Fig. 1a



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2,002,190

UNITED STATES PATENT OFFICE

2,002,190

ACOUSTIC DEVICE

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Application December 31, 1928, Serial No. 329,467
In Great Britain January 7, 1928

9 Claims. (Cl. 179—115.5)

This invention relates to acoustic devices such as loudspeakers, microphones and the like. More particularly it relates to devices of this nature which are provided with conical or similarly shaped diaphragms having relatively large areas.

In such electro-acoustic instruments it is frequently desirable to provide a diaphragm motion which is substantially parallel to the direction in which the diaphragm supporting member extends so that the coil or other driving mechanism for the diaphragm may be free to move in the magnetic air gap of the instrument.

The principal object of the present invention is to provide means whereby a conical or other shaped diaphragm having a relatively large area may be carried by a support by means of material of good mechanical strength, and yet be mounted so as to permit relatively free motion of the diaphragm in the directions in which it is required to move.

According to this invention the conical or similarly shaped diaphragm of an acoustic device is supported by means of one or more spiders having substantially spiral arms, whereby good radial strength and comparative freedom for axial movement is obtained.

The spider or spiders may be formed of fairly stiff material, such as sheet metal, while the arms should be so proportioned as to give good radial strength and at the same time be flexible so as to permit easy axial movements of the diaphragm.

The invention is illustrated in the accompanying drawing, in which

Figures 1 and 2 show a sectional view and a front view, respectively, of a conical diaphragm supported by means of spiders carried upon a central supporting rod, and in which

Fig. 1*a* is a sectional view similar to Fig. 1 showing the manner in which the central supporting rod is connected to the magnet structure.

Figures 3 and 4 show the supporting spiders.

Fig. 5 is a view similar to Fig. 1*a* showing a modification in which the supporting spider is positioned outside of the conical diaphragm.

Referring to Figures 1 and 2, a conical diaphragm 1, adapted to be impulsed at its small end by means of an annular coil 2, adapted to project into a ring-shaped magnetic air gap, not shown, is supported upon a fixed central shaft 3 by means of two spiders 4 and 5 of different size. The smaller spider 4 is preferably of thin metal and is constituted by a disc having three spiral-like slots 6, extending each from one of three equi-distant points on a circle near to and having as its centre the centre of the disc, to one of three equi-distant points in a circle near to and concentric with the periphery of the disc. The slots form parallel-sided arms 7, as shown. The larger spider 5 may be of paper or of very light sheet material and it comprises a plurality of radial, or, as shown, spiral, arms 8, extending from a common hub 10 to a common rim 11.

The spiders are secured at their circumference to the inner face of the diaphragm and are coaxially mounted upon and secured to the central shaft 3 which passes through holes 12 in the centres of the said spiders. The holes 12 are preferably made such a size that the spiders are frictionally secured on the shaft.

The shaft 3 may be supported in any desired manner such as by being screwed into any convenient part of the magnetic structure, for example, a pole piece. In this way the diaphragm and supports therefore are rendered readily detachable.

In another form of construction, the spiral arms of the spiders are arranged outside the diaphragm and extend therefrom to a fixed member, such as an extension of the case of the loudspeaker driving motor, to which the outer edge or edges of the said spider or spiders are secured.

Obviously, if desired, the spider or spiders may be rimless and hubless—i. e. the spiral arms only may be retained, the functions of hub and rim being performed by the supporting and supported bodies.

It will be seen that with constructions in accordance with this invention, the diaphragm is able to move easily in the required directions for acoustic operations, but it is substantially constrained in directions at right angles thereto.

It is to be understood that the modification illustrated herewith is only an approved form of my invention and that various other forms of supporting means can be devised without departing from the spirit of my invention. Accordingly, I do not wish to be limited by the modification shown but only by the scope of the appended claims.

As the novel features of my invention, I claim:

1. An acoustic device comprising a large area conical diaphragm, a plurality of spiders having substantially spiral arms for supporting said diaphragm.

2. A device as claimed in claim 1, comprising two spiders of different sizes.

3. A device as claimed in claim 1 in which the spiders are arranged within the diaphragm.

4. A device as claimed in claim 1 in which the

spiders are carried upon an axial supporting shaft.

5. In an acoustic device, a conical diaphragm, a supporting rod extending into said diaphragm, and a pair of members positioned on said rod for supporting said diaphragm, one of said members being of metal and the other of said members being of paper.

6. A spider member for supporting a conical diaphragm from a supporting member comprising a flat sheet of flexible material having an annular portion adapted to engage a circumference on the conical diaphragm, a hub portion adapted to engage the supporting member, and a plurality of spiral arms interconnecting said hub portion and said annular portion whereby the length of said arms will be longer than the shortest distance between said annular portion and said hub portion.

7. A spider member for supporting a diaphragm from a supporting structure comprising a flexible sheet metal member provided with an inner portion for engaging said supporting structure, an outer portion for engaging said diaphragm, and a plurality of arms interconnecting said portions.

8. A spider member for supporting a conical diaphragm from a supporting rod positioned within said diaphragm comprising a flat member of fairly stiff but flexible material which is provided with a rim portion and a hub portion, said hub portion having an opening therein of sufficient size to receive said supporting rod, and a plurality of spiral arms extending between said rim portion and said hub portion.

9. Acoustic apparatus comprising a conical diaphragm, a driving coil connected for movement with said diaphragm, a member extending through said driving coil, and a circular flexible member connected between said diaphragm and said member, said circular flexible member having arcuate openings therein which extend from points adjacent its center to points adjacent its periphery and which overlap adjacent openings.

HENRY JOSEPH ROUND.