April 18, 1933. H. J. ROUND ET AL 1,904,538

LOUD SPEAKER

Original Filed Nov. 19, 1925

Fig. 1

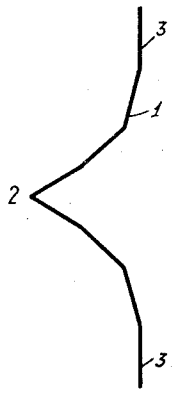


Fig. 2

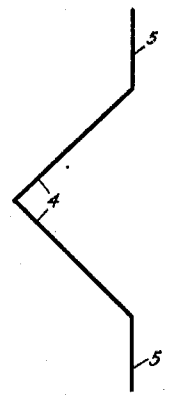
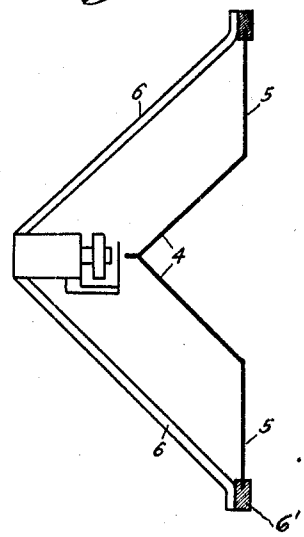


Fig. 3



INVENTORS
HENRY JOSEPH ROUND
JOHN GLOVER ROBB
BY
ATTORNEY

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UNITED STATES PATENT OFFICE

HENRY JOSEPH ROUND, OF MUSWELL HILL, LONDON, AND JOHN GLOVER ROBB, OF HENDON, LONDON, ENGLAND, ASSIGNORS TO RADIO CORPORATION OF AMERICA, A CORPORATION OF DELAWARE

LOUD SPEAKER

Original application filed November 19, 1925, Serial No. 69,980, and in Great Britain November 26, 1924. Divided and this application filed April 1, 1930. Serial No. 440,668.

This application is a division of our co-pending application filed Nov. 19, 1925, Serial No. 69,980.

This invention relates to loud speakers, of the type in which the sound is generated by the movement of a diaphragm of comparatively large area, and in which horns are dispensed with.

Loud speakers without horns are known, in which the rigidity of the diaphragm is greatest at the centre and decreases from the centre to the circumference.

According to this invention the diaphragm of a loud speaker is so constructed that the alteration of the radial rigidity is adjusted to correct for the non-uniform radiation of the various frequencies.

The adjustment for the correction of non-uniform radiation may be obtained in various ways. For example, in the case of a conical diaphragm the cone angle is varied.

The variation of the angle of the cone is governed by the law of the moving electro-magnet system, by the size of the diaphragm required, and by the quality of the material used.

The angle of the cone may at the apex be comparatively small, and then gradually enlarged until at the rim of the cone it is 180° or approximately so. It may be increased to 180° and then beyond this angle.

In one suitable construction, a conoidal diaphragm is made in two parts, one part being conical and with a constant cone angle, and the second part being an annulus.

Any suitably shaped diaphragm may be used, for example, it may be circular or oval, or it may even be a structure where energy is delivered at one edge and travels in a parallel path across the radiator, as for instance, in the shape of a strip possessing a V section, the angle of which increases continuously or in steps, from one end of the strip to the other.

The diaphragms may be freely suspended, as by elastic bands, attached at several points, or by a ring of rubber, linen or other soft material; or they may be gripped round the edge and if necessary slightly stretched, and some damping material, such as felt or spongy rubber, applied at the edge.

Preferably the diaphragms are suspended by mass action. For example, in the case of a cone diaphragm there is provided around the periphery of the said diaphragm an annular ring, connected to a relatively heavy fixed ring loosely suspended from a rigid framework. This construction has several advantages, one of them being that additional adjustment of the low tones can be effected during manufacture by adjusting the mass of the heavy ring.

The invention is illustrated in the accompanying drawing, which shows diagrammatically various embodiments. In the drawing Fig. 1 illustrates diagrammatically an approved form of the invention; Fig. 2 illustrates a modification thereof, and Fig. 3 illustrates the manner in which the diaphragm is supported.

Referring to Figure 1, 1 is a conical diaphragm whose angle is varied in steps from the apex 2 to the periphery 3. The diaphragm is actuated by any known movement, such as a reed telephone (see Fig. 3), attached to the apex 2.

In the modification shown in Figure 2 the variation of the cone angle is affected in a single step, to a flat edge, so that in effect the diaphragm comprises a constant angle cone 4, attached at its periphery to the inner circumference of an annulus 5. This diaphragm can be made in two parts, one the conical portion and the other the annulus. The outer edge of the annulus may be gripped by a fixed ring 6', attached to or forming part of a frame 6, as shown in Figure 3.

Having described our invention what we claim is:—

1. A diaphragm comprising a central con-

ical portion, an outer annular portion and a portion having the shape of a frustum of a cone interposed between said conical portion and said annular portion.

2. A diaphragm consisting of a plurality of portions, the central portion having the form of a cone and other portions each having the form of a frustum of a cone and being connected in sequence to continuously increase the cone angle.

3. A diaphragm consisting of a plurality of portions, the central portion having the form of a cone and other portions each having the form of a frustum of a cone and being connected in sequence to continuously increase the cone angle to approximately 180°.

4. A vibratile element for an acoustic device consisting of a generally tapering surface, comprising a cone shaped surface and one or more distinct surfaces or frustra of different cones.

HENRY JOSEPH ROUND.
JOHN GLOVER ROBB.