Jan. 17, 1928.

1,656,579

C. L FARRAND ET AL

LOUD SPEAKER

Filed Nov. 5, 1926

3 Sheets-Sheet 1

Fig. 1.

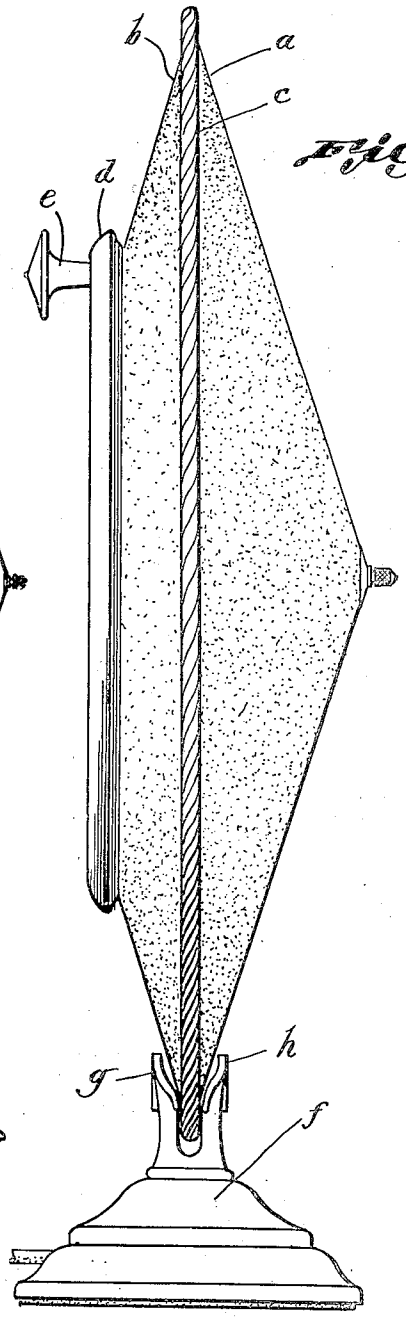
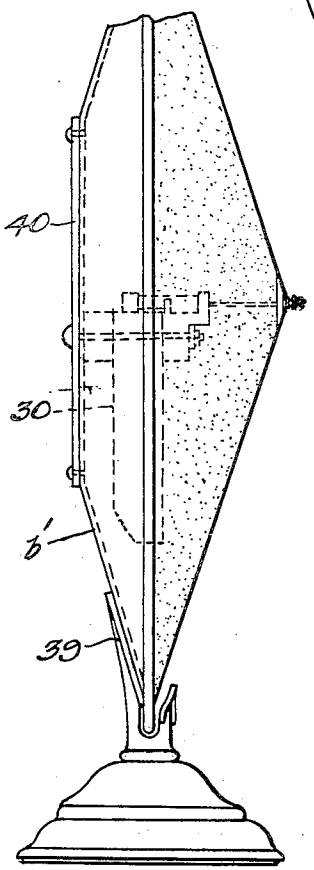


Fig. 3.



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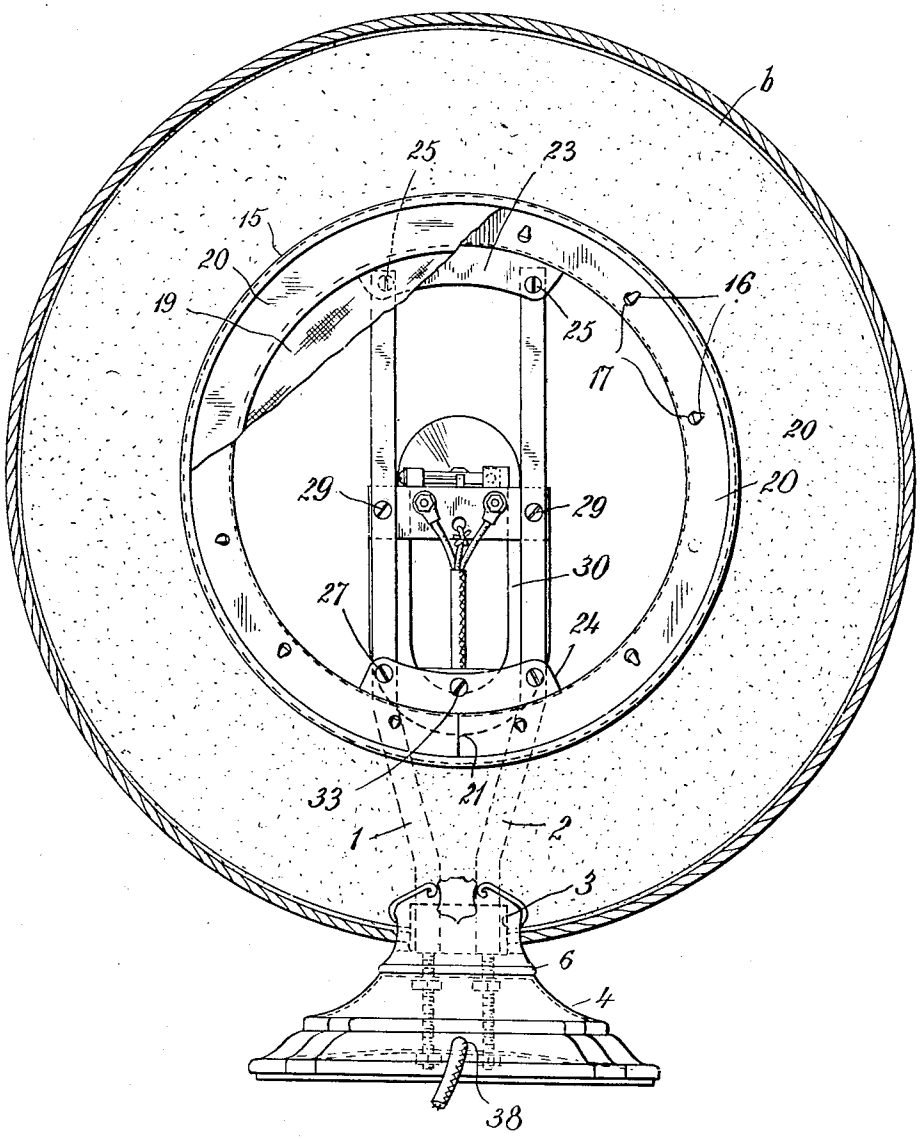
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Fig. 2,



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3 Sheets-Sheet 3

Fig. 3.

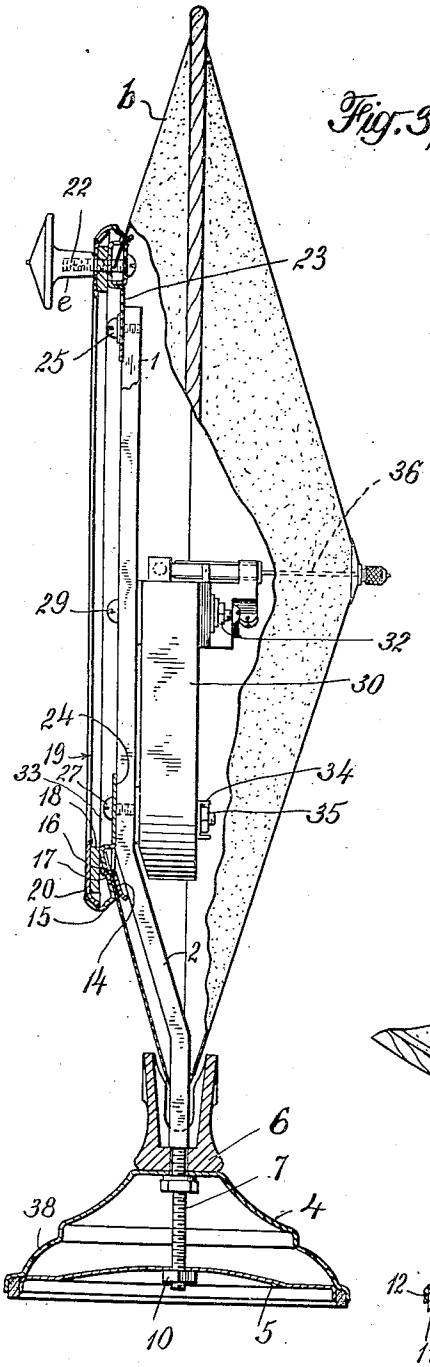
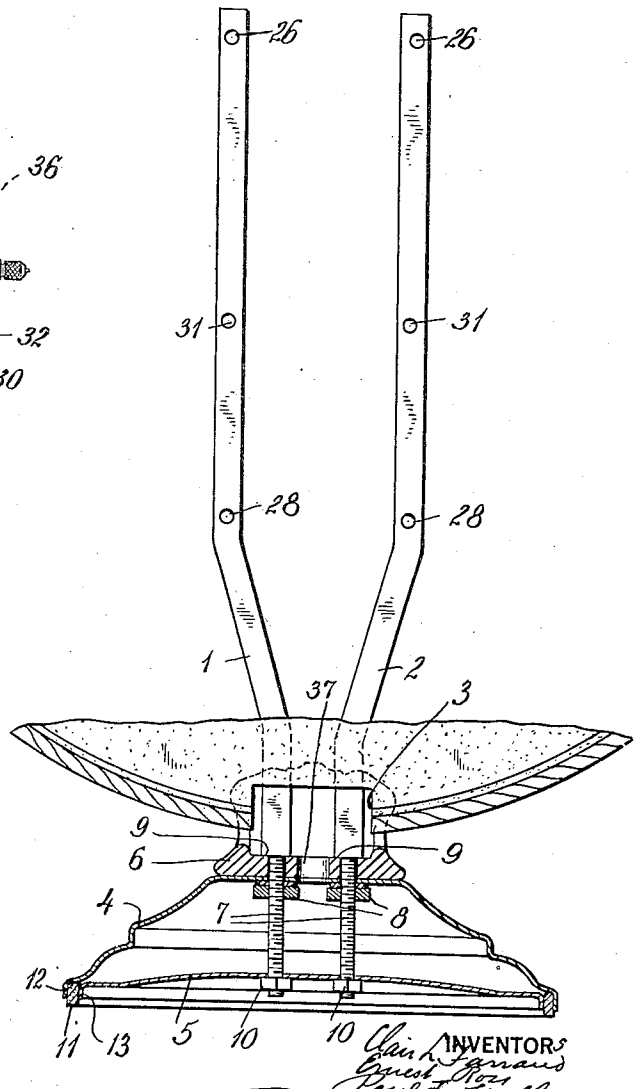


Fig. 4.



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UNITED STATES PATENT OFFICE.

CLAIR L. FARRAND, OF FOREST HILLS, NEW YORK, AND ERNEST ROSS, OF EAST ORANGE, AND PAUL F. GODLEY, OF UPPER MONTCLAIR, NEW JERSEY; SAID ROSS AND SAID GODLEY ASSIGNORS TO FARRAND MFG. CO. INC., OF LONG ISLAND CITY, NEW YORK, A CORPORATION OF NEW JERSEY.

LOUD SPEAKER.

Application filed November 5, 1926. Serial No. 146,348.

This invention relates to loud speakers of the type which employ a large conical diaphragm, and more particularly to loud speakers of that type which employ a so-called double cone diaphragm, that is, a diaphragm having two cones secured together at their bases, or one complete cone and a frustum of a cone secured together in such manner.

The principal object of the invention is to provide a loud speaker of the foregoing type having novel and improved supporting means for supporting the diaphragm and the electrical actuating mechanism.

Loud speakers of the general type of that herein disclosed, as heretofore constructed, have usually included a supporting base or pedestal, a ring structure of some kind for supporting the diaphragm, and some means such as arms or rods passing upwardly from the base to one or more points where they directly or indirectly support the ring structure and actuating mechanism. The rods or the like passing upwardly from the base are usually located exteriorly of the double cone. In accordance with the present invention the rods or other means which extend upwardly from the base for supporting the ring structure and actuating mechanism pass through an opening in the lowest part of the diaphragm and are located within and housed by the double cone and are entirely concealed thereby. The supporting base and the lower portion of the diaphragm are contiguous and the base is so designed as to give the impression that the double cone is supported at its lowermost portion directly by the base without the use of any additional parts, but as a matter of fact the base does not directly support the diaphragm at this point, the entire weight of the diaphragm being supported by the ring structure, which in turn is supported by the rods that extend from the ring structure to the base through the interior of the double cone.

One form of loud speaker constructed in accordance with the present invention is illustrated in the accompanying drawings, in which,

Fig. 1 is a side elevation of the speaker;

Fig. 2 is a rear elevation thereof;

Fig. 3 is a side elevation partly in section; and

Fig. 4 is a detail view partly in section of the supporting base and the rods which extend upwardly therefrom through the interior of the double cone.

Fig. 5 is a side elevation showing a modification of certain features of the invention.

Referring first to Fig. 1 those parts of the loud speaker which are normally visible will be mentioned briefly. The diaphragm comprises a cone *a* and a frustum of a cone *b* united at their bases to form a diaphragm of the so-called double cone type. The cone *a* and the cone frustum *b* may be made of any suitable material such as paper. An ornamental cord *c* is placed around the diaphragm at the meeting edges of the cone *a* and the frustum *b*. A portion of the clamping ring structure is shown at *d* and a knob or handle *e* is preferably attached to the speaker for convenience in moving it from one place to another. The supporting base is shown at *f*. The upper portion of the base is bifurcated to provide two upstanding lips *g* and *h*. The space or pocket formed between the lips *g* and *h* receives the extreme lower edge portion of the double cone, but as hereinafter pointed out the diaphragm is not supported by this pocket. However, as the support *f* and the lips *g* and *h* are the only visible means of support for the diaphragm, as will be noted from Figs. 1 and 2, the impression is immediately obtained that the diaphragm is supported directly by and between lips *g* and *h*. The diaphragm is seated far enough within the pocket formed by the lips *g* and *h* to carry out the illusion that the parts *g* and *h* actually support the diaphragm. Another function of the lips *g* and *h* is to cover and obscure an opening which is provided in the lower part of the diaphragm and through which the supporting rods pass as hereinafter described. The supporting base, together with the lips *g* and *h*, may be given an ornamental and attractive appearance as shown in the drawing.

Figs. 2, 3 and 4 show the actual construction and arrangement of the effective means which support the diaphragm on the base. These means in their preferred form comprise a pair of rods 1 and 2 both of which, near their lower ends, pass through an opening 3 provided in that portion of the diaphragm which is located in the pocket formed

by the lips *g* and *h* of the base. The rods at their lower ends are connected to the base, but before describing the manner in which this is accomplished the mechanical construction of the base should first be noted. The base includes a sheet metal member 4 stamped to the proper configuration and a stamped sheet metal bottom member 5. That part of the base on which the lips *g* and *h* are formed comprises a casting 6 supported by the sheet metal member 4.

The lower ends of the rods 1 and 2 are reduced and are threaded as shown at 7. The reduced ends of the rods are inserted through openings provided in the bottom of the casting 6 and through corresponding openings provided in the sheet metal member 4. Nuts 8 threaded on to the reduced ends of the rods serve to clamp the casting 6 to the sheet metal member 4 and also serve to attach the rods to these two parts. When the nuts 8 are tightened they serve to clamp the sheet metal member 4 and the casting 6 against shoulders 9 on the rods which are formed as a result of reducing the end portions of the rods. The bottom sheet metal member 5 is provided with two openings to receive the lower ends of the rods 1 and 2 and this member is held in place by means of two additional nuts 10 threaded on the extreme lower ends of the rods. Before the sheet metal bottom member 5 is clamped in place a strip of felt 11 is inserted between marginal flanges 12 and 13 on the sheet metal members 4 and 5 respectively and this strip of felt is automatically clamped in place when the nuts 10 are tightened. The lowest surface of the strip of felt constitutes a soft supporting surface for the entire speaker to prevent scratching or marring of any surface upon which the speaker might be supported.

The rods 1 and 2 serve to support the ring structure which in turn supports the diaphragm but before describing how this is accomplished it will be necessary to describe briefly the construction of the ring structure. This includes an inner ring 14 (Fig. 3) and an outer ring 15 between which the edge portion of the cone frustum *b* is clamped. The clamping is accomplished by providing a series of small tongues 16 on the inner ring 14 which are inserted through the corresponding openings 17 in the outer ring and then bent over as shown in Fig. 2 to clamp the two rings together and to clamp between them the edge portion of the diaphragm. The outer ring 15 is so shaped as to provide an annular recess which receives an annular ring 18 of cardboard or the like which supports a fabric covering 19 which serves to conceal the mechanism housed within the double cone. The ring 18 is held in place by means of an annular ring 20 which is split at 21 (Fig. 2) to make it expansible and contractible. This ring is positioned by contracting it and then positioning it in the annular pocket formed by the ring 15 and thereafter allowing it to expand to lock it in place.

The knob *e* may be held in place by means of a screw 22 which may pass through the inner and outer rings 14 and 15. The cardboard ring 18 and the expansible ring 20 are provided with openings which slip over the projecting end of the screw 22 when these rings are positioned in place and thereafter the knob *e* may be threaded on to the end of the screw. The outer ring 15 at its upper portion is provided with a short depending flange 23 (Figs. 2 and 3) and near its lower portion the ring 15 is provided with a corresponding upstanding flange 24. The upper flange 23 is secured to the upper ends of the rods 1 and 2 by means of machine screws or the like 25 passing through suitable openings in the flange 23 and threaded in the openings 26 near the upper ends of the rods. Likewise the lowermost flange 24 is secured to the rods 1 and 2 in a similar manner by means of machine screws or the like 27 received by threaded openings 28 in the rods 1 and 2. It will now be seen that the ring structure is supported by the rods 1 and 2 because the flanges 23 and 24 are secured to the rods and the flanges form a mechanical part of the ring structure which in turn supports the diaphragm.

The rods 1 and 2 also serve to support the electromagnetic actuating mechanism for the diaphragm. This is accomplished by passing two bolts 29 through the two legs of the magnet 30 and through corresponding holes 31 in the rods 1 and 2. The magnet is clamped against the rods 1 and 2 by means of nuts 32 threaded on to the extremities of the bolts. The lower end of the magnet may, if desired, be clamped against the rods 1 and 2 by means of a bolt 33 passing through the flange 24 of the ring structure and through a bridge piece 34 disposed across the inner face of the lower portion of the magnet. A nut 35 on the bolt tends to draw the bridge piece 34 against the magnet, and therefore, clamp the magnet against the rods 1 and 2. The electromagnetic actuating mechanism includes a rod 36 which is secured to the apex of the diaphragm as shown in Fig. 3. The wires leading to the electromagnetic actuating mechanism are omitted in Figs. 3 and 4 for the sake of clearness, but these may extend downwardly through the interior of the double cone and may pass through an opening 38 in the base (Figs. 2 and 3).

In assembling the loud speaker the clamping rings are first secured to the edge of the cone frustum and then the two cones are cemented together and the cord *c* cemented in place. Ordinarily the electromagnetic actuating mechanism will be clamped to the two

rods before the latter are secured to the base structure. After the actuating means is so clamped to the rods the lower ends of the rods are inserted through the opening at the back of the speaker and then through the opening 3 at the lower part of the diaphragm and thereafter through the openings in the base structure designed to receive them. The procedure in clamping the rods to the base structure and of assembling the parts of the base is then as described above. The ring structure may then be secured to the rods or this may be done before the ends of the rods are inserted into the base structure and secured in place. Of course, the exact sequence of steps employed in assembling the speaker is immaterial so far as the present invention is concerned.

It will now be seen that the rods 1 and 2 which are mechanically connected with the base structure constitute the actual and effective supporting means for the diaphragm and for the electromagnetic actuating mechanism. These being entirely concealed within the double cone, the visual effect is that the diaphragm is supported directly in the pocket in the casting 6. By locating the rods 1 and 2 within the double cone they may be made relatively cheap and inexpensive as no special finishing for the sake of good appearance is necessary. Moreover, the reduction to a minimum of metal and mechanical parts located exteriorly of the double cone greatly improves the appearance of the speaker as a whole.

While the diaphragm has been described as being of the double cone type having a frusto-conical part *b*, it is obvious that the part *b* might be any member whether made of paper, metal or other material which forms with the cone at least a partial enclosure into which the supporting rods 1 and 2 or their equivalent extend.

If the rear member *b* be made of metal as shown at *b'* in Fig. 5 or any other material which furnishes the necessary rigidity to the diaphragm structure the pocket may be so constructed as to actually support the diaphragm structure as shown at 39 in which case the rods 1 and 2 may be omitted if some other means such as a plate 40 on the metal back *b'* be provided for supporting the actuating mechanism.

Certain other details of the loud speaker disclosed but not claimed herein are claimed in other copending applications. The construction of the pedestal is claimed in an application of Clair L. Farrand and Ernest Ross, Serial No. 146,353, filed November 5, 1926, and the edge construction of the diaphragm including the ornamental cord *c* or its equivalent is claimed in our application Serial No. 146,847.

We claim:

1. A loud speaker comprising a double cone diaphragm, a ring structure to which the diaphragm is secured, a base, and means passing from the base to the ring structure through the interior of the double cone for supporting the ring structure on the base.

2. A loud speaker comprising a double cone diaphragm, a mounting therefor, a base, and means passing through the interior of the double cone for supporting said mounting on the base.

3. A loud speaker comprising a double cone diaphragm, a mounting to which the diaphragm is secured, a base, and means concealed by the double cone for supporting said mounting on the base.

4. A loud speaker comprising a cone and a frusto-conical member secured together at their bases, actuating mechanism for the cone housed within the space between the cone and said frusto-conical member, and means for supporting the actuating mechanism on the base comprising means extending from the base to the actuating mechanism through the space between the cone and said frusto-conical member.

5. A loud speaker comprising a cone, a member extending at least part way across the base of the cone and forming therewith at least a partial enclosure, actuating mechanism for the cone located in said enclosure, a base, and means located in said enclosure for supporting the actuating means on the base.

6. A loud speaker comprising a cone, a member extending at least part way across the base of the cone and forming therewith at least a partial enclosure, a mounting secured to said member, a base, and means located in said enclosure and extending from the base to said mounting for supporting the latter on the base.

7. A loud speaker comprising a cone, a member extending at least part way across the base of the cone and forming with the cone at least a partial enclosure, a mounting for said member, actuating means for the cone located in said enclosure, a base, and means extending from the base into said enclosure for supporting said mounting and the actuating means.

8. A loud speaker comprising a double cone diaphragm, a member to which the diaphragm is secured, a base the upper portion of which forms a pocket to receive the lower edge of the double cone, said double cone having an opening in its lower part, and at least one rod secured to the base and extending through said opening to said member, and means for attaching said member to said rod or rods.

9. A loud speaker comprising a double cone diaphragm, a ring structure to which said diaphragm is secured, a base having a pocket to receive the lower edge of the double cone, the diaphragm having an opening

adjacent said pocket, supporting means secured to the base and passing upwardly through said opening in the diaphragm to the ring structure and means for securing said ring structure to said supporting means.

10. A loud speaker comprising a double cone diaphragm, a base and means extending from the base into the interior of the double cone for supporting the diaphragm.

11. A loud speaker comprising a double cone diaphragm, a base, actuating mechanism housed within the double cone, and means extending from the base into the interior of the double cone for supporting the diaphragm and said actuating mechanism.

12. A loud speaker comprising a double cone diaphragm, a base member including three main parts, namely a casting having a pocket to receive the lower edge of the double cone, a sheet metal member supporting the casting, and a sheet metal bottom member, supporting rods passing from the base into the interior of the double cone for supporting the diaphragm, and means for clamping said rods to said three parts of the base and for clamping said parts of the base together.

13. A loud speaker comprising a diaphragm structure including a cone and a member extending at least part way across the base of the cone, a base the upper portion of which is provided with a pocket to receive the lower edge of said diaphragm structure, and means independent of said pocket for supporting the diaphragm structure.

14. A loud speaker comprising a diaphragm structure including a cone and a member extending at least part way across the base of the cone and a base having a pocket to receive the lower edge portion of said diaphragm structure.

In testimony whereof we affix our signatures.

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PAUL F. GODLEY.
ERNEST ROSS.