Feb. 19, 1929. 1,702,399

F. E. BEIDLER

LOUD SPEAKER

Filed Sept. 2, 1926 2 Sheets-Sheet 1

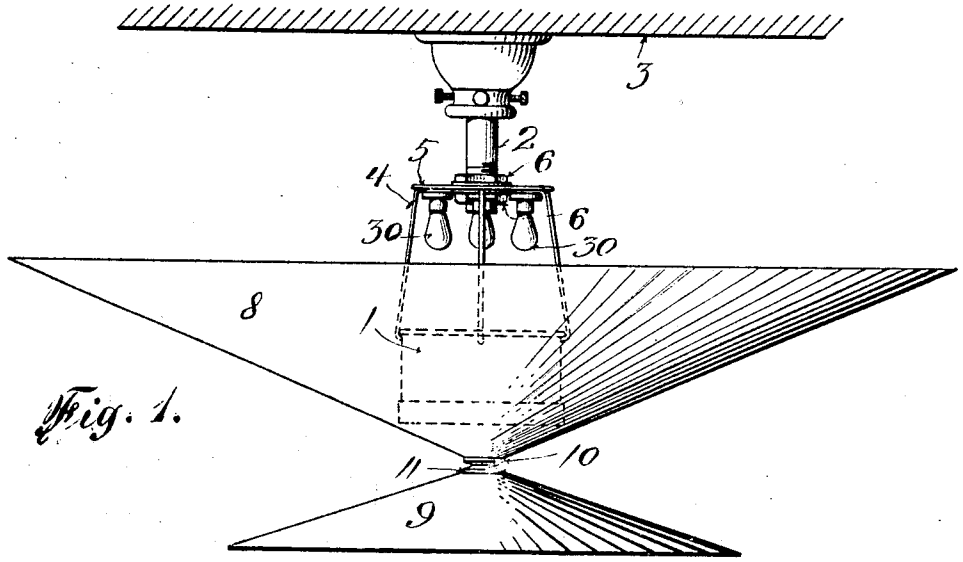
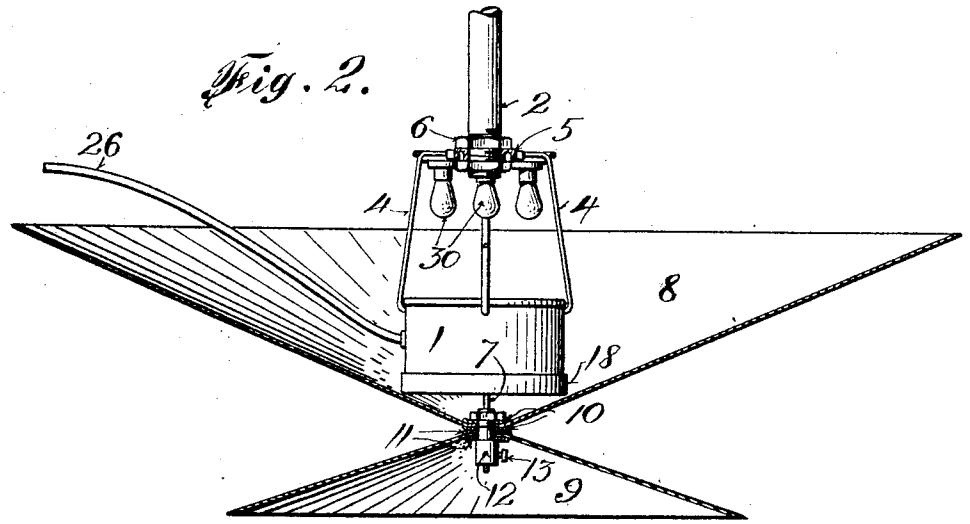


Fig. 1.

Fig. 2.



Ford E. Beidler INVENTOR

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Fig. 3.

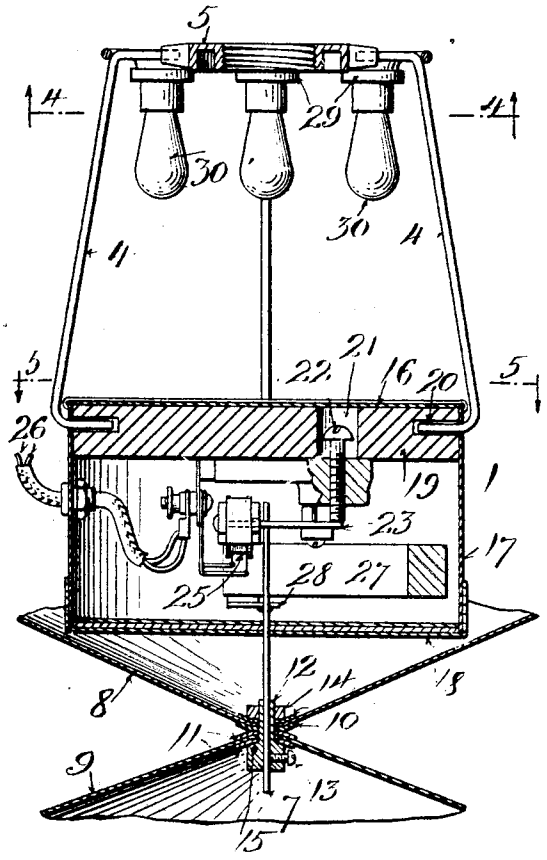


Fig. 4

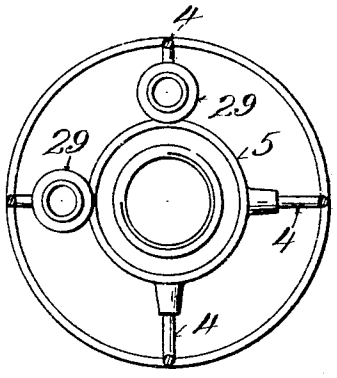
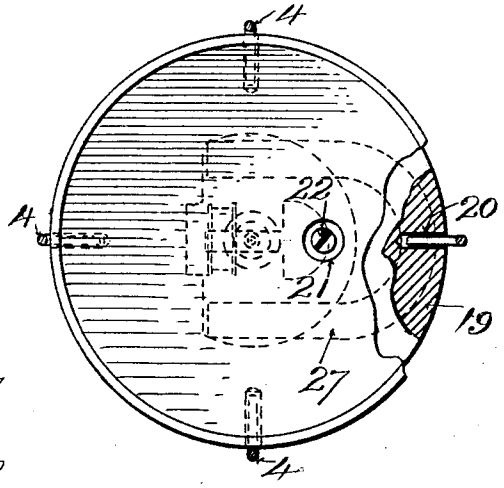


Fig. 5.



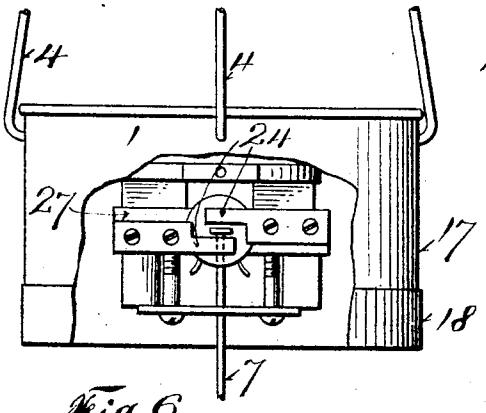


Fig. 6

Ford E. Beidler INVENTOR

BY Charles G. Hawley

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Patented Feb. 19, 1929. 1,702,399

UNITED STATES PATENT OFFICE.

FORD E. BEIDLER, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO GRANT WILLIAMS, OF PATCHOGUE, NEW YORK.

LOUD-SPEAKER.

Application filed September 2, 1926. Serial No. 133,282.

My invention relates to loud speakers such as may be used in connection with radio receiving sets, although the same is adapted to be used for phonographs or any other instruments where electrical or mechanical impulses are converted into sound waves. One of the principal objects of the present invention is to provide a loud speaker in which the vibratory member is in the form of one or more cones supported entirely by the member which conducts the vibrations to the apex of the cone or cones in order that the vibratory member may move as near as possible like a piston. By supporting the cone from an overhead support and in a horizontal position, it is possible to have the cone maintained in position by the member which transmits vibrations thereto, so that I am enabled to eliminate even the flexible means heretofore employed in certain types of speakers for holding the cone in position. While I provide means acting as a guide to prevent the cone from tilting beyond certain desired limits, this member only acts as a guide and does not necessarily come in contact with the cone during normal operation.

Another object of my invention is to provide a speaker of the cone type which is adapted to be mounted in a horizontal position adjacent the ceiling of a room, so that the sound is deflected from the cone against the ceiling in order to disburse the sound in all directions. Another object of my invention is to provide a plurality of cones of relatively different diameter, which are vibrated by a common vibrating means, the apexes of the cones being toward each other. I find that by employing the double cone herein described, the speaker is adapted to reproduce sounds over a greater range of frequencies than with a single cone, and that the reproductions more nearly correspond in character with the original sound waves. In the fullest embodiment of my invention I prefer to make two cones of different materials, whereby one cone is somewhat more rigid in character than the other as I find this also has a tendency to extend the range of the instrument and thus permit the reproduction of high treble notes as well as low bass notes, together with everything intermediate the two. The present device is adapted to be used as a loud speaker and also as a shade or reflector for the lighting lamps in a room, thus performing a double function. The electric lamp disposed adjacent the cone speaker seems to improve the results because the heat from the lamp or lamps keeps the material of the cone speaker in dry condition and this prevents distortion of the cone or cones. Other objects and advantages of the invention will be set forth in the following detailed description of one embodiment of my invention.

In the drawings forming part of this application,

Figure 1 is an elevation of a loud speaker embodying my invention in the preferred form,

Figure 2 is a vertical sectional view thereof,

Figure 3 is an enlarged vertical sectional view through the vibratory members on the operating unit,

Figure 4 is a sectional view taken on the line 4—4 of Figure 3,

Figure 5 is a sectional view taken on the line 5—5 of Figure 3, and

Figure 6 is a view of the electrical unit with a portion of the casing broken away to show the interior.

In Figures 1 and 2 I have shown the invention embodied in the preferred form. It comprises an electrical unit contained within the casing 1 and this casing is adapted to be suspended from an overhead support which is preferably a pipe 2 or other outlet member through which electric wires are usually led through the ceiling 3 of a room. While this method of supporting the loud speaker is not the only one which may be employed, I prefer it where the device is to serve the double purpose of a loud speaker and a lamp shade or reflector. In any event the loud speaker is preferably suspended from a support. The casing 1 containing the electrical unit is shown as hung from the arms 4 which extend upwardly and thence inwardly to a central annular plate 5 which latter is provided with suitable threads to be screwed upon the lower end of the outlet pipe 2; and, if desired, lock nuts 6 may be employed to retain the annular plate securely upon the end of the pipe. The transmitting rod 7 which is operated by the electrical unit, as will be hereinafter described, projects from the bottom of the casing 1 and it serves the purpose of support-

ing the vibratory member or cone as well as transmitting to it vibrations which are reproduced as sound waves by the vibratory member. As stated above, the preferred embodiment of my invention comprises a plurality of cones of relatively different diameters operated by this transmitting rod. In the drawings I have shown an upper cone 8 composed of light weight material, and for this cone I prefer to employ parchment which, for lighting effects, may be translucent. This cone is positioned in a horizontal position with the convex side disposed upwardly or toward the ceiling 3 and with its apex connected with the transmitting rod. The second cone I have shown at 9 and this is inverted in relation to the first cone 8; that is to say, it is placed preferably in a horizontal position with its convex side directed away from the upper cone 8. The cones are connected at their apexes with each other and with the transmitting rod, preferably as follows: Conical washers 10 are placed against the apex of the upper cone 8 to engage the inner and outer surfaces thereof; and similar washers 11 are applied to the apex of the cone 9 to engage the inner and outer surfaces thereof; all of the washers being conical in shape to conform with the angles of the cones. Both cones and their apexes, as well as the several washers, are provided with a central aperture through which the transmitting rod extends. On the lower end of the rod there is attached a sleeve 12 by means of a set screw 13; and above the same the sleeve is threaded to receive a lock nut 14 which is adapted to be screwed down upon the sleeve to clamp the several washers and the apexes of the cones between the nut and the shoulder 15. This makes a tight connection between the apexes of the cones and the transmitting rod.

The lower or smaller cone 9 is preferably made of a stiffer material than the upper cone, and for this purpose I prefer to use a fibre paper which will make the smaller cone less flexible than the upper one, where the latter is made of parchment. Preferably both cones are made on the same angle and I have found that if they are made on an angle of twenty degrees very satisfactory results may be obtained. I have found that by making the upper cone with a diameter of thirty-four inches and making the lower cone with a diameter of eighteen inches, that most satisfactory results may be obtained, although I do not wish to be understood as limiting my invention to the proportions herein stated.

In Figures 3, 5 and 6 I have shown the construction of the shell 1 together with parts of the electrical unit. The shell 1 is shown as composed of the top wall 16 with a depending circular wall 17 and with a bottom cover 18 which slides snugly over the open, lower end of the casing. Within the upper end of the casing as viewed in Figure 3, I have provided a wooden block or filler 19 which is provided with apertures 20 to receive the inturned ends of the arms 4. This block is provided with an aperture 21 to provide access to an adjusting screw 22 which is adapted to regulate the position of the armature 23 in relation to the magnet poles 24. The electrical unit preferably includes suitable coils of wire 25 to which the current is led by means of the feed wires 26 which may be connected with the terminals of a wireless receiving set (not shown). The coils 25 will therefore be energized by a pulsating current which will act upon the permanent magnet 27 the pole pieces of which are placed on opposite sides of the pivoted armature 23. The transmitting rod 7 is attached at one end to this armature and it extends downwardly through a plate 28 to which it is soldered and which plate is flexible and serves to steady the rod. At its lower end the rod is connected with the apexes of the cones as above described. The adjusting screw 22 is adapted to act on the free end of the armature for the purpose of regulating its position so that the armature, when inactive, remains centrally balanced between the pole pieces after the cones have been attached to the transmitting rod.

When the device is to be used both as a loud speaker and as a reflector or shade, the supporting frame may be provided with the sockets 29 to receive the electric lighting lamps 30 in inverted position, as shown in Figures 1, 3 and 4; and these lamps may be supplied with current from wires led in through the pipe 2. The lamps will throw their light downwardly against the inner surface of the upper cone 8 and if this is made of translucent material, part of the light rays will pass through the cone and part will be reflected upwardly from the cone against the ceiling and from there reflected downwardly into the room. The heat from these electric lamps, while not excessive, will serve to keep the material of the cones dry in order that they shall not become distorted or warped by the absorption of moisture.

When a pulsating current is fed from a radio receiving set through the wires 26 of the electrical unit, the armature 23 is set into vibration in a vertical direction, and this will cause the transmitting rod 7 to be vibrated vertically. These vibrations are transmitted through the rod to the cones, so that both of the cones move in unison and set up pulsations in the surrounding air. The tendency is for the cones to move bodily rather than to bend, because the vibrations are transmitted through the rod 7 which is their sole support. The shell 1 is of

such diameter at its lower end and is so located that in the ordinary operation of the device the upper cone 8 does not quite touch the bottom edge of the shell and the shell simply serves to prevent the cone from tipping excessively. I have found that by employing a plurality of cones connected at their apexes and directed in opposite directions, it is possible to reproduce sound waves of every character and throughout the range of audibility. Unlike the single cone, the treble notes are reproduced as accurately as the bass notes. I believe that in the operation of the device the cone of smaller diameter reproduces more perfectly sound waves of high frequency, whereas the larger cone reproduces more accurately the sound waves of lower frequency, and that the combined action of the two cones extends the range of reproduction to include everything within audible frequency.

Having described my invention, what I claim is:

1. A loud speaker comprising a plurality of cone shaped vibratory members of relatively different diameters directed in opposite directions with their apexes adjacent and connected at their apexes, a support connected with the apexes of said cones and forming the sole support for the vibratory members, and means for applying vibratory motion to said cone shaped members through said support.

2. A loud speaker comprising a plurality of coned shaped vibratory members of relatively different diameters and having walls of relatively different rigidity, said cones being arranged in opposed directions and connected at their apexes, and means for applying vibratory motion to the apexes of said cone shaped members.

3. A loud speaker comprising a casing adapted to be suspended from an overhead support, an actuating unit contained within said casing and having a transmitting rod depending therefrom, a plurality of reversely positioned cone shaped vibratory members to which said transmitting rod is connected at the apexes of said cone shaped members, said transmitting rod forming the sole support for said vibratory members, and adapted to transmit vibrations thereto.

Signed the 25th day of August, 1926, at the city, county and State of New York.

FORD E. BEIDLER.