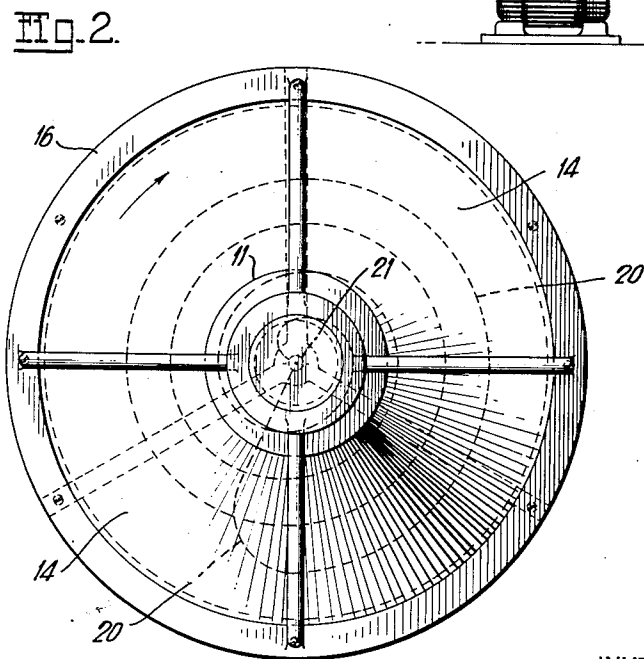
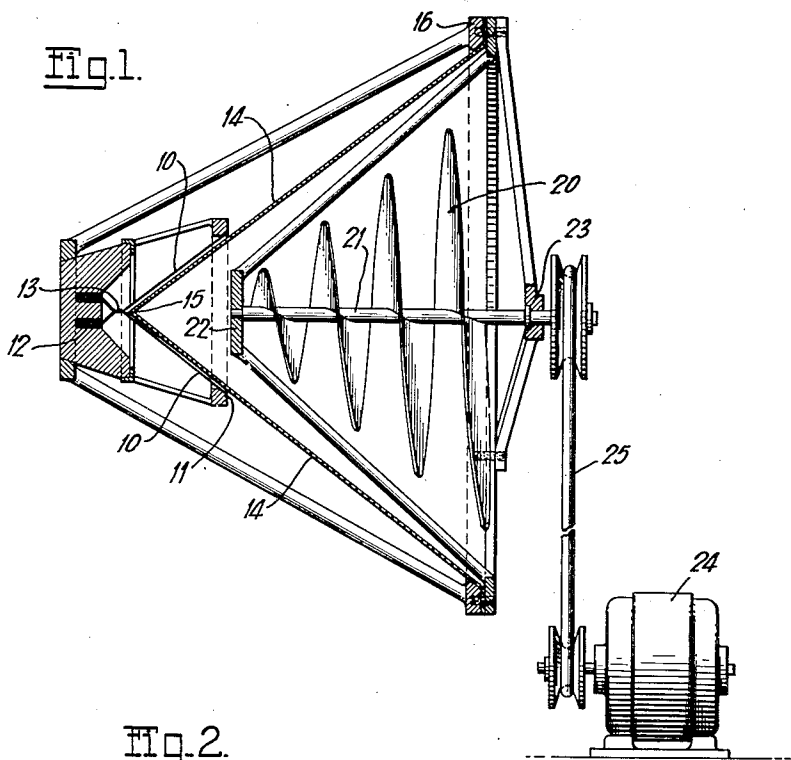


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LOUDSPEAKER AND THE LIKE

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LOUDSPEAKER AND THE LIKE

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This invention relates to loudspeakers and the like, and particularly to loudspeakers of the types employed in conjunction with wireless receiving sets, loudspeaker telephones, and the relatively large loudspeakers employed in cinemas or moving picture houses.

The invention has for its object generally the provision of means for modifying the sound reproducing characteristics of loudspeakers, and particularly of loudspeakers of the types indicated, whereby objectionable noise and overtones may be reduced.

It is also an object to reduce objectionable defects in the sounds, which are normally magnified in the reproduction of large loudspeakers, to a point where such defects are negligible.

It is also an object to associate suitable means with loudspeakers having vibrating cone-type diaphragms, which compensates in a desired measure, the unequal distribution of the sound vibrations over such diaphragms.

Still another object is to provide suitable means in association with a cone-type loudspeaker for dynamically controlling the air pressure in the vicinity of the vibrating surface, such means preferably being capable of producing zones of different air pressures.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is a view, partly in section and partly in elevation, showing a loudspeaker of the cone-type constructed in accordance with the invention; and

Fig. 2 is a view in front elevation showing the loudspeaker illustrated in Fig. 1 without the belted connections to the motor.

In the embodiment of the invention illustrated in the drawing, the loudspeaker unit comprises a small cone 10, which serves as a driving diaphragm and is fixed around its outer edge to a support 11 and has suitable vibrating means, such as an electromagnetic device 12 attached to its apex 13. A large cone 14 is arranged with the part near its apex 15 inside and parallel to the small cone from which it is separated by only a thin layer of air,

for example, of a thickness of the order of 0.4 mm. The larger cone is held rigidly at its outer edge by holding means 16 attached to its outer edge and constituting the sole support. Loudspeakers of this character are described and claimed in my copending application, now Patent No. 2,071,828, issued February 23, 1937.

In the practice of the present invention, a means for controlling the air pressure is provided. Such means may advantageously comprise a rotatable helical screw 20 mounted on a spindle 21, which is disposed in bearings 22 and 23 which are supported from the holding means 16 and are arranged so that the spindle lies along the axis of the cone; the diameter of the screw diminishing in a manner corresponding to the diminishing diameter of the cone. Such a screw, when projected on a plane, has the contour of an Archimedian spiral. The terminal portions of the screw are fashioned to pass through the air, when revolving with a relatively little resistance and acoustic disturbance. The boundaries of such portions may in general have the form of some species of trochoid. The screw 20 is driven by any convenient means, for example, by a variable speed electric motor, as shown at 24, which may be mounted on the spindle itself and located a short distance beyond the mouth of the loudspeaker, or coupled through a belted pulley 25, as shown, which is driven from the electric motor. The speed at which the screw is rotated may vary over relatively wide limits. Normally, a speed of about 2200 revolutions per minute is the upper limit; suitable average speeds, however, obtain between 1200 and 1860 revolutions per minute. The screw may be driven in either direction; that is, in one direction, it may act as a compressor; when rotated in the other direction, it serves as an evacuator.

The theoretical considerations, which account for the important improvement in the quality and tone of the sounds transmitted by a loudspeaker constructed in accordance with the present invention are not at present fully understood, but it is thought that the advantages obtained are due to the varying air pressures modifying the sound waves arising from the varying ways in which particular zones of the vibrating surface vibrate. It is well known that with loudspeakers having large vibrating surfaces the sound transmissions are not due to a precise piston-like action of the surface, which would be its ideal method of vibration, but are due to the highly complex oscillations of the various parts of the vibrating surface. The form of the vibrations in

any particular part of the vibrating surface can be fairly readily determined at any particular frequency, and with the apparatus of the present invention the air pressure in one zone in the vicinity of the vibrating surface may be made apparent from the air pressure in another zone in the vicinity of the vibrating surface, for example, by suitably adjusting the diameter or pitch of the various portions of the screw so that with some loudspeakers it may be found desirable not to have a helical screw having a constantly diminishing diameter or constant pitch, but one in which the diameter or pitch varies to correspond to the various zones of pressure it is desired to create. It will be appreciated that similar considerations apply both to the case where the screw acts as a compressor and to the case where the screw acts as an evacuator.

In practice, it is found that the pitch of the sound transmitted may vary slightly with the speed of rotation of the screw, and with the direction of turn of the screw.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In loudspeakers and the like, the combination with a vibratory diaphragm having means for actuating the same, of air propelling means operatively disposed adjacent a central point of said diaphragm and adapted to propel air for changing the air pressure adjacent said dia-

phragm, and means for driving said air propelling means.

2. In loudspeakers and the like, the combination with a conical vibratory diaphragm having means for actuating the same, of a screw propeller rotatively mounted adjacent the axis of said diaphragm in a manner adapted to move air to or from said diaphragm, and a driving motor coupled to revolve said screw propeller.

3. In loudspeakers and the like, the combination with a conical diaphragm mounted from the edge and provided with electrodynamic actuating means, of a screw propeller mounted to have its axis coincident with that of said cone and arranged to extend into the conical cavity, and an electric motor coupled to drive said propeller at will whereby the air pressure in said conical cavity may be modified.

4. In loudspeakers and the like, the combination with a conical diaphragm mounted from the edge and provided with electrodynamic actuating means, of a screw propeller mounted to extend into the cavity of said cone and having convolutions increasing radially in accordance with the law of increase of an Archimedian spiral and terminating inwardly and outwardly with contours having relatively little air resistance, and a variable speed electric motor coupled to drive said propeller at will.

5. In loudspeakers and the like, the combination with a conical vibratory diaphragm having means for actuating the same, of air propelling means disposed and nested in the conical cavity of said diaphragm and arranged to propel air toward or away from said diaphragm, and a driving motor coupled for driving said air propelling means at will.

ROBERT R. GLEN.