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3,200,900

LOUDSPEAKER

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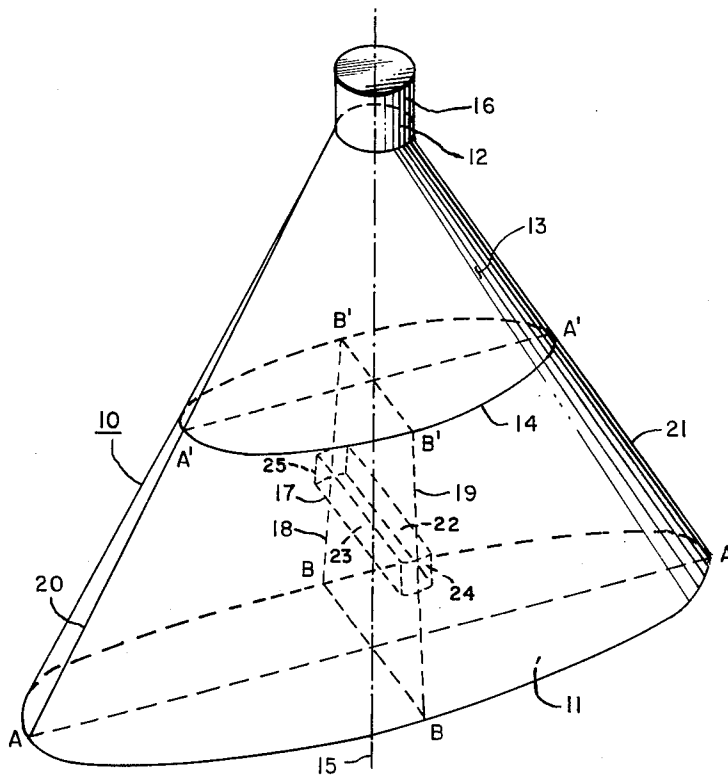


FIG. 1

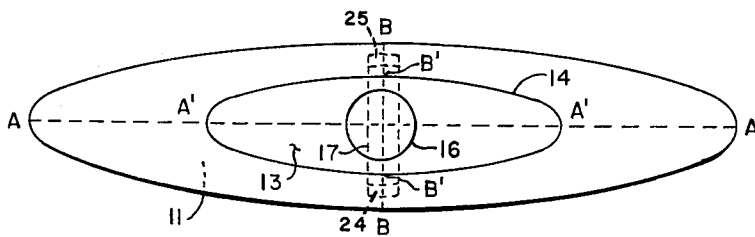


FIG. 2

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LOUDSPEAKER

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3 Claims. (Cl. 181—32)

This invention relates to loudspeakers and more particularly, to loudspeakers of the kind having a conical diaphragm at least the major part of which is paper.

Hitherto, a difficulty has been experienced with loudspeakers of the kind specified in that distortion may appear in the output of such a loudspeaker at low frequencies, for example, at frequencies less than 2,000 cycles per second, due to the buckling of the slant elements of the paper portion of the loudspeaker diaphragm at these low frequencies.

It is an object of the present invention to provide a loudspeaker of the kind specified wherein the difficulty referred to above is alleviated.

Thus, in accordance with the present invention, there is provided in a loudspeaker of the kind having a conical diaphragm of substantially elliptical cross-section, the major part of which is paper, in which the slant elements of the paper portion are capable of buckling at low frequency input signals, thereby introducing distortion into the loudspeaker output, a rod-like stiffening member, secured to the inner surface of the paper portion interjacent those slant elements corresponding to the loci of ends of the minor axes of cross-sectional elements of the diaphragm to produce stiffening of at least those elements while producing negligible other effects on the acoustic characteristics of the speaker. In this manner the low frequency distortion introduced into the loudspeaker output due to the buckling of those slant elements is minimized.

For a better understanding of the present invention, together with other and further objects thereof, reference is had to the following description, taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

Referring to the drawing:

FIG. 1 is an isometric drawing of a moving coil loudspeaker constructed in accordance with one form of the present invention, and

FIG. 2 represents the plan view of the loudspeaker of FIG. 1.

Referring to FIGS. 1 and 2, the diaphragm of the loudspeaker 10 is substantially in the form of a truncated conical surface of elliptical cross-section, the mouth of the diaphragm 11 being in the form of an ellipse having a major axis A—A and a minor axis B—B, and the narrow end of the diaphragm 12 being in the form of a circle. The diaphragm is of paper except for a metal zone 13 adjacent the narrow end of the diaphragm. The join between the metal and paper portions of the diaphragm 14 lies in a plane perpendicular to the axis of the diaphragm 15 and spaced from the narrow end of the diaphragm 12 by a distance equal to about one third the axial length of the diaphragm. The narrow end of the metal portion of the diaphragm 12 is contiguous with one end of a circular cylindrical metal member 16 which serves as a support for the moving coil of the loudspeaker.

The loudspeaker includes a stiffening member for the diaphragm in the form of a flat generally rectangular member 17, which may be of a relatively rigid foamed synthetic resin. In this regard, it is to be understood that the stiffening member 17 could be composed of two or more separate parts.

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The stiffening member 17 is secured by means of a suitable adhesive to the inner surface of the paper portion of the diaphragm interjacent those slant elements of the diaphragm corresponding to the two loci of ends of the minor axes of cross-sectional elements of the diaphragm 18, 19 with its main faces 22, 23 perpendicular to the axis of the diaphragm 15 and with its long dimension parallel to the minor axes of the cross-sectional elements of the diaphragm. In order to mate with the corresponding portions of the inner surface of the diaphragm, the narrower edges 24, 25 of the stiffening member are curved. The arrangement is such that the plane midway between the main faces of the stiffening member 17 is also about midway between the planes defining the axial length of the paper portion of the diaphragm.

It will be understood that the provision of the stiffening member in the loudspeaker described above serves to produce stiffening of those slant elements 18, 19 and also of those slant elements lying in regions immediately on either side of the first-mentioned slant elements. With such an arrangement, the quality of the output of the loudspeaker at frequencies of less than 2000 cycles per second is considerably improved. It will be understood that slant elements of the diaphragm in the region of those slant elements corresponding to the two loci of ends of the major axes of the cross-sectional elements of the diaphragm 20, 21 are sufficiently stiff to inhibit significant buckling of these elements at low frequencies by virtue of the fact that in the region of these last-mentioned slant elements the diaphragm is relatively sharply curved. Also, it will be appreciated that the metal portion of the diaphragm 13 serves to stiffen to some extent the paper portion of the diaphragm.

In an alternative arrangement to that described above, the plane midway between the main faces of the stiffening member 17 could be nearer to the mouth of the diaphragm 11 than to the join between the metal and paper portions of the diaphragm 14.

In a further alternative arrangement to that described above, the stiffening member 17 could be arranged so that its main faces are inclined with respect to the axis of the diaphragm 15.

While there has been described what is at present considered to be the preferred embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and it is, therefore, aimed to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In a loudspeaker:

a conical diaphragm of substantially elliptical cross-section the major part of which is paper, in which the slant elements of said paper portion are capable of buckling at low frequency input signals, thereby introducing distortion into the loudspeaker output; and a rod-like stiffening member secured to the inner surface of said paper portion interjacent those slant elements corresponding to the loci of ends of the minor axes of cross-sectional elements of the diaphragm to produce stiffening of at least those elements while producing negligible other effects on the acoustic characteristics of the speaker; whereby the low frequency distortion introduced into the loudspeaker output due to the buckling of those slant elements is minimized.

2. In a loudspeaker:

a conical diaphragm of substantially elliptical cross-section the major part of which is paper, in which the slant elements of said paper portion are capable of buckling at low frequency input signals thereby introducing distortion into the loudspeaker output;

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and a stiffening member of rectangular cross-section having its main faces perpendicular to the axes of the diaphragm secured to the inner surface of said paper portion interjacent those slant elements corresponding to the loci of ends of the minor axes of cross-sectional elements of the diaphragm to produce stiffening of at least those elements while producing negligible other effects on the acoustic characteristics of the speaker;

whereby the low frequency distortion introduced into the loudspeaker output due to the buckling of those slant elements is minimized.

3. In a loudspeaker:

a conical diaphragm of substantially elliptical cross-section the major part of which is paper, in which the slant elements of said paper portion are capable of buckling at low frequency input signals thereby introducing distortion into the loudspeaker output;

and a stiffening member of rectangular cross-section having its main faces perpendicular to the axes of the diaphragm secured to the inner surface of said paper portion interjacent those slant elements corresponding to the loci of ends of the minor axes of

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cross-sectional elements of the diaphragm to produce stiffening of at least those elements while producing negligible other effects on the acoustic characteristics of the speaker, the cross-sectional dimensions of the stiffening member being small compared to its length between the points at which it is secured to the paper portion of the diaphragm;

whereby the low frequency distortion introduced into the loudspeaker output due to the buckling of those slant elements is minimized.

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