

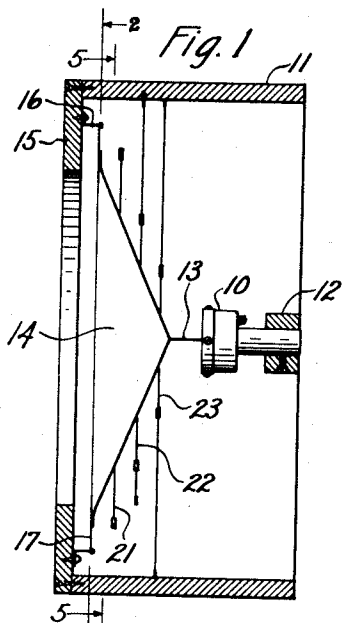
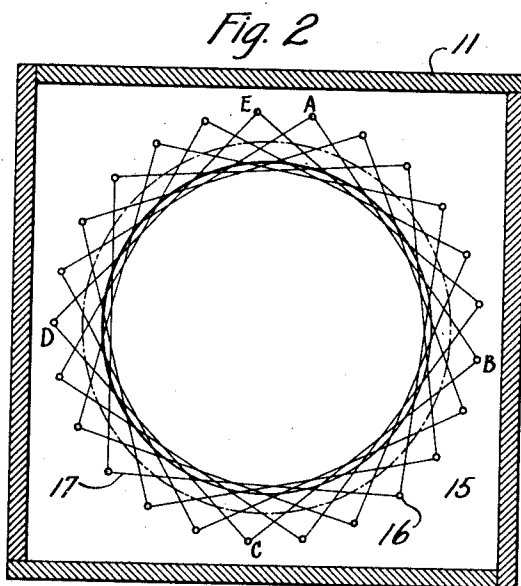
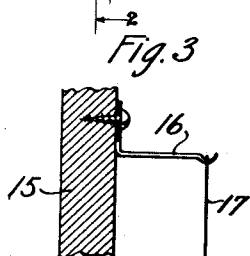
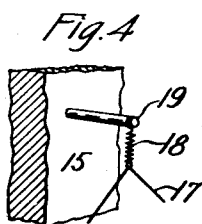
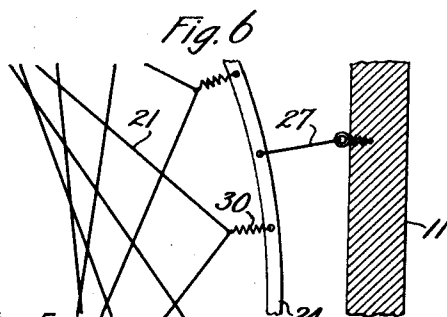
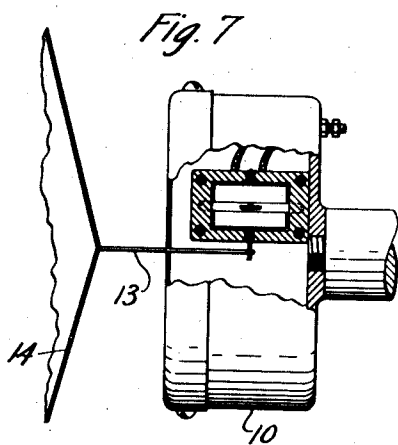
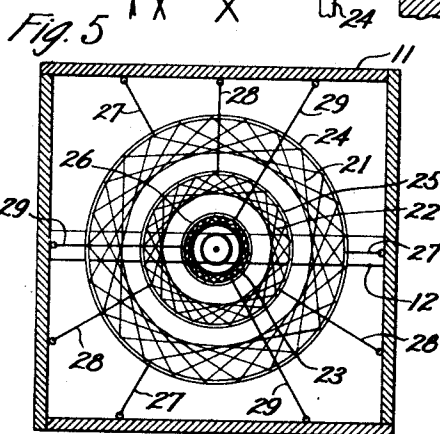
Jan. 11, 1927.

H. C. HARRISON

1,613,609

ACOUSTIC DEVICE

Filed June 5, 1923



Inventor:
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UNITED STATES PATENT OFFICE.

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ACOUSTIC DEVICE.

Application filed June 5, 1923. Serial No. 643,577.

This invention relates to acoustic devices and has for its object improvements in such devices, whereby sound vibrations in the audible range will be faithfully and efficiently transmitted.

In accordance with the general features of the invention there is provided a diaphragm substantially free at its periphery and a mounting therefor whereby the symmetry of the diaphragm is preserved by the application of uniformly distributed forces. In one of its embodiments the invention provides a large diaphragm, preferably of light elastic material of conoidal form supported against one or more cushions or networks of textile or other suitable material uniformly tensioned, whereby the circular symmetry of the diaphragm is maintained through the application of uniformly distributed forces without substantially changing its mass.

Referring to the drawing:

Fig. 1 is a cross-sectional view of an acoustic device embodying the invention;

Fig. 2 is a rear view of the device on the line 2—2, showing a resilient cushion for the diaphragm;

Fig. 3 is a detail view of the support for the cushion;

Fig. 4 shows in detail a modification which may be used in place of the support shown in Fig. 3;

Fig. 5 is a sectional view of the device on the line 5—5. Fig. 1, showing additional means for adding stiffness to the diaphragm;

Fig. 6 shows an arrangement for supporting the networks shown in Fig. 5;

Fig. 7 shows an actuating device which may be used.

An actuating device 10 is supported in a cabinet 11 by means of a bar 12. On a rod 13 carried by the vibrating system of the actuating element 10, is supported a diaphragm 14, which is preferably conical in shape and made of a light elastic material such as paper and of any size suitable for use in loud speaking apparatus, for example, between nine and thirty-six inches in diameter. A wall 15, having a circular opening therein of substantially the same diameter as that of the diaphragm 14 and coaxial therewith, carries on the rear thereof a plurality of supports 16 equally spaced on a circle concentric with the opening of the

wall 15. Preferably an odd number of supports 16 are provided, for example, twenty-five, and a thread 17, of any suitable material, preferably of silk, is woven around the supports, engaging each once and terminating at the starting support. Starting with the support A, for example, the thread 17 is passed around B, C, D and E and maintained taut. This is repeated until all of the supports have been used, falling back one step each revolution, and finally terminating at the support A. This forms a resilient bridge, against which the periphery of the diaphragm 14 may be supported. In one form the elements of a network so formed lie substantially in the same plane and are uniformly tensioned chords of substantially equal length of the same circle. The diaphragm 14 may be held against this network by applying a slight pressure, or tension in case the network is applied to the back of the diaphragm, at the apex of the diaphragm through the actuating device 10 or other suitable means. The pressure or the tension may be regulated by adjusting in any well known manner the actuating device 10 in the support 12. By this arrangement uniformly distributed forces are applied in the same plane to the diaphragm thereby preserving the shape of the diaphragm without increasing the mass of the vibrating system. The supports 16 are preferably of resilient material so as to compensate for any changes in the length of the thread 17 due to changes in atmospheric conditions.

Fig. 4 shows an alternative supporting arrangement employing a light spiral spring 18 for connecting the thread 17 to the stud 19.

A plurality of similarly formed networks 21, 22 and 23, having respectively graduated central openings therein, may also be supported in spaced relation against the outer surface of the diaphragm 14. Through these networks additional symmetrically disposed forces are applied to the diaphragm and assist in maintaining its symmetry without increasing the mass of the vibrating system. If desired, these networks may also be used to support the diaphragm in operative relation to the actuating device 10. The networks 21, 22 and 23 may be formed in the same manner as the network 17

and may be supported in rings 24, 25 and 26, respectively, each of which may be supported in the case 11 by means of members 27, 28 and 29, respectively, in a manner such
5 that each of the elements of the network presses slightly against the outer surface of the diaphragm.

Fig. 6 shows an arrangement employing springs 30 for supporting the networks 21,
10 22 and 23 in their respective frames.

The actuating device shown in Fig. 7 is preferably of the type shown in Patent No. 1,365,898 of January 18, 1921, to H. C. Egerton.

15 Although the network 17 in the form described herein is preferable, as it gives a bridge of very slight mass, good results may be obtained by using a piece of fabric such as silk or linen stretched to form a bridge
20 against which the diaphragm may be supported.

The invention claimed is:

1. An acoustic device comprising a large direct acting conical diaphragm of light flexible material, and tensioned means disposed
25 against the outside surface of said diaphragm for introducing a compressional strain therein.

2. An acoustic device comprising a large direct acting conical diaphragm of light flexible material, and light resilient means operating against the face of said diaphragm at its base to introduce a compressional strain therein and thereby preserve
30 its symmetry while vibrating.

3. An acoustic device comprising a large conical diaphragm, a network of thread-like material, and means supporting said diaphragm against said network introducing a
40 compressional strain in said diaphragm.

4. An acoustic device comprising a large conical diaphragm substantially free at its outside surface, a resilient bridge of circular form and of low mass, resilient means supporting said bridge and exerting tension
45 therein, and means for holding said diaphragm in contact with said bridge thereby introducing a compressional strain in said diaphragm.

5. An acoustic device comprising a large conical diaphragm, a network of thread-like material, and means supporting said diaphragm against said network.

6. An acoustic device comprising a large
55 conical diaphragm, a network of uniformly

tensioned material and means supporting said diaphragm against said network.

7. An acoustic device comprising an apertured face, a network in space relation with said face, a conical diaphragm peripherally
60 disposed against said network, and an actuating device operatively associated with and supporting said diaphragm.

8. An acoustic device comprising a conical diaphragm of light, flexible material substantially free at its periphery, a resilient cushion disposed against the concave side of said diaphragm and at the base thereof, and resilient means spaced from the base for supporting said diaphragm against said
70 cushion.

9. An acoustic device comprising a large direct acting conical diaphragm of light flexible material having substantially a free edge and a plurality of spaced supports of
75 substantially no mass having co-axial openings therein for receiving said diaphragm.

10. A acoustic device comprising a conical diaphragm, and a plurality of supporting networks having coaxial openings therein
80 for receiving said diaphragm and holding it in shape.

11. An acoustic device comprising a conical diaphragm, a resilient cushion disposed against the base of said diaphragm, a plurality of networks of textile material having
85 graduated central openings therein and means for holding said networks in contact with said diaphragm.

12. An acoustic device comprising a frame
90 having an opening therein, a web, means supporting said web adjacent said opening and exerting tension therein, a conical diaphragm having its concave side disposed against said web, and means spaced from the
95 base of said diaphragm for exerting a slight pressure thereon and thereby preserving the symmetry of the diaphragm while vibrating.

13. The method of preserving the symmetry of a conical diaphragm while vibrating which consists in applying to the concave side of the diaphragm and parallel to the axis thereof a system of forces which are substantially without associated mass or elasticity for giving rigidity to the surface
100 of the diaphragm.

In witness whereof, I hereunto subscribe my name this 1st day of June A. D., 1923.

HENRY C. HARRISON.