Oct. 10, 1933. J. SWALLOW 1,930,186

SOUND REPRODUCING DEVICE

Filed June 15, 1929 2 Sheets-Sheet 1

Fig. 1.

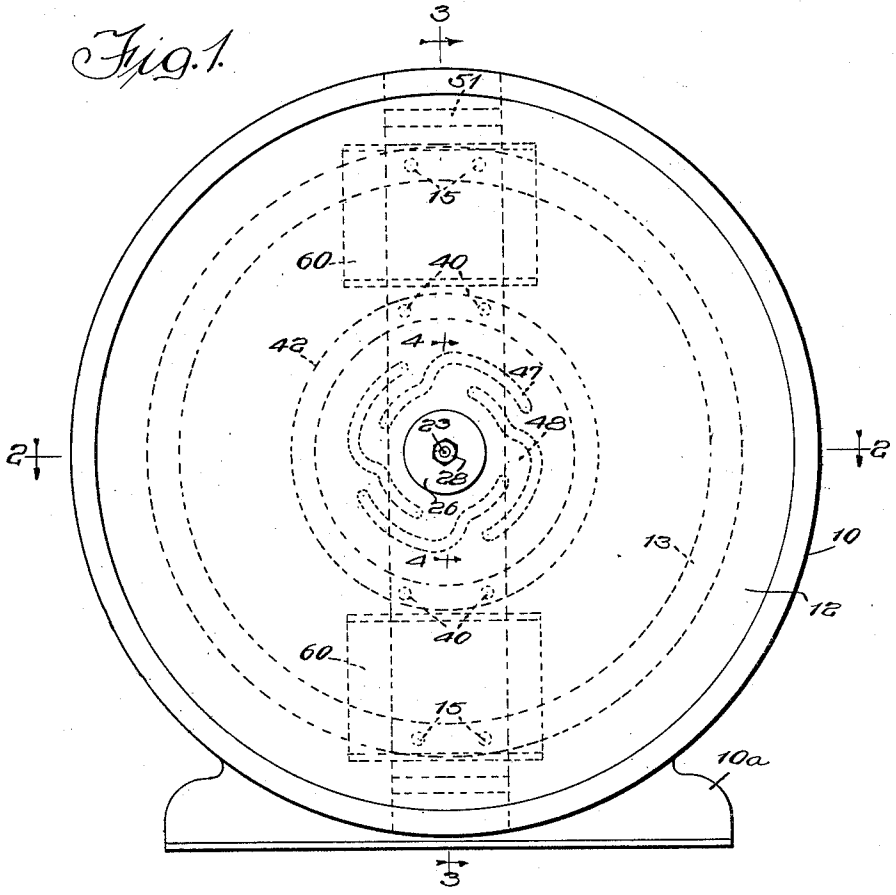
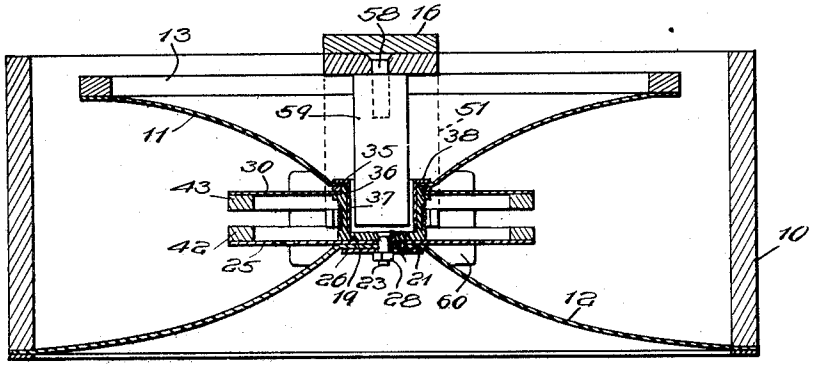


Fig. 2.



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Fig. 3.

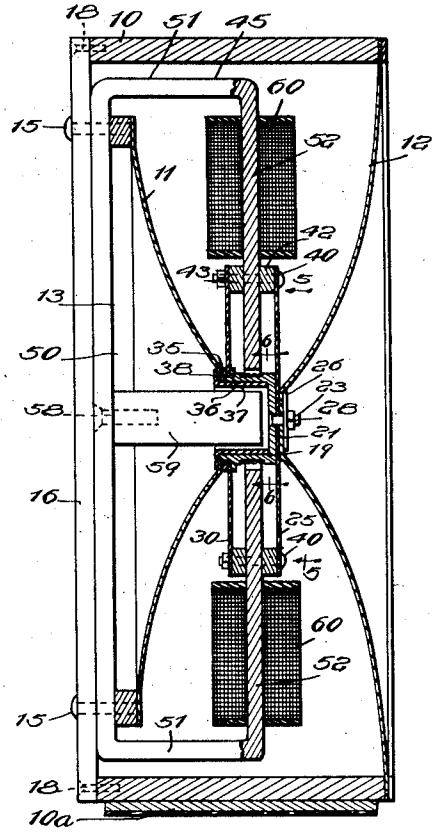


Fig. 5.

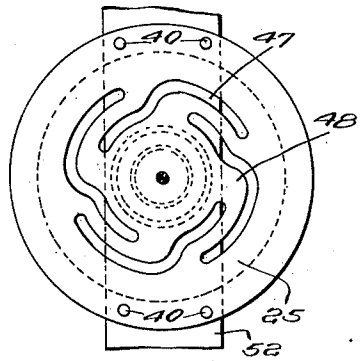


Fig. 4.

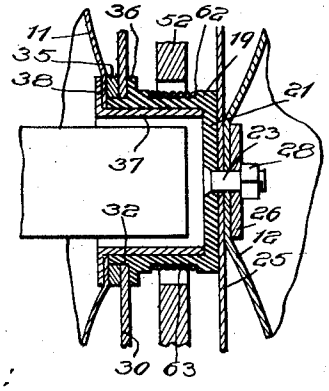
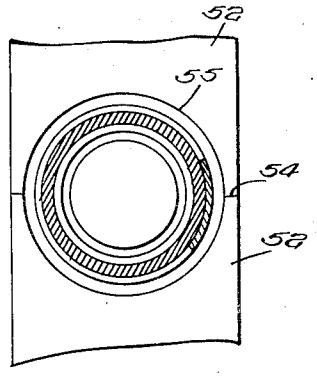


Fig. 6.



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Patented Oct. 10, 1933

1,930,186

UNITED STATES PATENT OFFICE

1,930,186

SOUND REPRODUCING DEVICE

Joseph Swallow, Berwyn, Ill., assignor to Temple Corporation, Chicago, Ill., a corporation of Delaware

Application June 15, 1929. Serial No. 371,208

9 Claims. (Cl. 179—115.5)

My invention relates to sound reproducing devices of a type commonly employed in connection with radio-receiving sets, and the invention has among its other objects the production of devices of the kind described which will reproduce sounds efficiently without distortion thereof.

Particular objects of my invention are to provide improved means for actuating the diaphragm of a sound reproducer; to provide an improved magnetizing structure which co-operates with an armature or winding operatively connected to and adapted to actuate the diaphragm of a sound reproducing device; to provide improved means for supporting a winding or armature which is operatively connected to the diaphragm of a sound reproducing device and is arranged to co-operate with a magnetizing structure to actuate the diaphragm; to provide improved means for actuating a sound reproducing device which comprises a plurality of diaphragms, and to provide an improved compact magnetizing structure for sound reproducing devices which comprise a plurality of diaphragms actuated by an electrical conductor arranged to cooperate with the magnetizing structure to actuate the diaphragm.

Many other objects and advantages will appear as this description progresses, reference being had to the accompanying drawings, wherein:

Figure 1 is a front elevation of a reproducing device or a loud speaker which embodies the invention.

Fig. 2 is a section taken on line 2—2 of Fig. 1.

Fig. 3 is a section taken on line 3—3 of Fig. 1.

Fig. 4 is an enlarged section taken on line 4—4 of Fig. 1.

Fig. 5 is a section taken on line 5—5 of Fig. 3, and

Fig. 6 is an enlarged section taken on line 6—6 of Fig. 3.

Referring to the drawings wherein I have illustrated a preferred form of the invention, the reference character 10 designates a cylindrical housing member mounted upon a suitable base 10*a*. Disposed within the housing 10 are diaphragms 11 and 12 which are preferably formed from fabric, but which may be formed from any suitable material. The diaphragm 12 has its periphery rigidly secured to the front edge of the cylindrical housing member 10 by any suitable means and suitable means is also employed to secure the periphery of the diaphragm 11 to a ring 13 which is rigidly secured by bolts 15, or the equivalent, to a bar 16, the bar 16 being rigidly secured to the rear edge of the housing 10 by screws 18, or the equivalent.

The diaphragms 11 and 12 are preferably tensioned by drawing their central portions toward each other as best illustrated in Fig. 3, the central portions being rigidly secured to a sleeve 19 by means hereinafter described. I also prefer to apply a substance to the diaphragms 11 and 12 which will cause them to shrink and thus place them under additional tension.

The sleeve 19 is preferably formed from paper or a phenolic condensation product, although it may be formed from any suitable material. At its front end the sleeve 19 is preferably provided with an integral wall 21 and projecting from the wall is a bolt 23, or the equivalent. The bolt 23 secures a sheet 25, the diaphragm 12 and a washer 26 to the sleeve 19, the bolt 23 being provided with a nut 28. As shown, the sheet 25 is clamped between the wall 21 and the central portion of the diaphragm 12 and the central portion of the diaphragm 12 is clamped between the sheet 25 and the washer 26.

Secured to the rear end of the sleeve 19 is a sheet 30 which is preferably identical with the sheet 25 with the exception that it has a relatively large aperture 32 therein to accommodate the sleeve 19. It will be noted that the material of the sheet 30 bounding the aperture 32 is clamped between a washer 35 and an annular flange 36 preferably formed integral with the sleeve 19. Projecting into the sleeve 19, and secured thereto by adhesive, or any other suitable means, is a sleeve 37 having an outwardly extending flange 38 which clamps the central portion of the diaphragm 11 between it and the washer 35, the central portion of the diaphragm 11 being provided with an aperture of a diameter substantially equal to the external diameter of the sleeve 37.

The sheets 25 and 30 are preferably circular in form and their outer margins are preferably rigidly secured by bolts 40, or the equivalent, to rings 42 and 43, respectively, which are, in turn, rigidly secured by the bolts 40 to a magnet member 45. The sheets 25 and 30 may be made of any suitable material, such as fabric or the equivalent, but I preferably form them of the substance known as "formica", or a similar substance, the sheets being relatively flexible and being preferably provided with a plurality of grooves 47 which form flexible arms 48 in the sheets. Obviously, the sleeve 19 is supported by the diaphragms 11 and 12 and by the flexible arms 48 formed in the sheets 25 and 30.

The improved speaker includes a magnetizing structure which preferably comprises the magnet member 45 and the magnet member 45 is preferably formed from a bar bent to provide a relatively long straight portion 50, at the ends of which are shorter straight portions 51 arranged at right angles to the portion 50. The portion 50 is secured to the bar 16 by the bolts 15. At the ends of the portion 51 are inwardly extending portions 52, the ends of which preferably abut each other, as indicated at 54 in Fig. 6. A relatively large aperture 55 is formed in the abutting ends of the magnet member portions 52 and this aperture is concentric with the sleeve 19. Secured to the magnet member portion 50 by a screw 58, or the equivalent, is a pole piece 59 which projects into the sleeve 19 and into the aperture 55 so that an annular magnetic field is provided between the cylindrical surface of the aperture 55 and the outer end of the pole piece 59. Mounted upon the magnet member portion 52 are windings 60, whereby the magnet member 45 and the pole piece 59 may be energized, it being readily understood that the windings 60 may be connected to any suitable source of electrical energy.

Disposed in an annular groove 62 formed in the sleeve 19 is an electrical conductor, armature or winding 63 which may be connected to any suitable source of telephonic currents, such as, for instance, the output circuit of a radio-receiving set. When the winding 63 is connected to such a source of telephonic currents and the windings 60 are operatively connected to a suitable source of electrical energy, the telephonic currents flowing into the winding 63 will react with the annular magnetic field obtaining between the pole piece 59 and the surrounding portion of the magnet member 45. The reaction causes the winding 63 and the sleeve 19 to vibrate and this vibration is transmitted to the diaphragms 11 and 12 which translate it into sound.

It is readily understood that flexible arms 48 provided in the sheets 25 and 30 permit vibration of the sleeve 19 and that they hold the sleeve 19 and the winding 63 concentrically with respect to the pole piece 59, and the cylindrical surface of the aperture 55 so that a relatively small clearance may be provided between the pole piece 59 and the interior surface of the sleeve 37 and relatively little clearance may be provided between the winding 63 and the cylindrical surface of the aperture 65. Of course, the material surrounding the aperture 55 is the outer pole piece with respect to the pole piece 59, which may be termed the "inner" pole piece.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as possible, in view of the prior art.

What I regard as new, and desire to secure by Letters Patent is:

1. A device of the kind described comprising a plurality of diaphragms, a magnet forming a magnetic field, an electrical conductor disposed in said magnetic field and interposed between the diaphragms, and a support for said electrical conductor operatively connected to said diaphragms to vibrate therewith.

2. A device of the kind described comprising a plurality of diaphragms, a magnet forming a magnetic field, an electrical conductor disposed in said magnetic field, a support for said conductor operatively connected to said diaphragms to vibrate therewith, and flexible means for maintaining said support in alinement with said magnet.

3. A device of the kind described comprising a plurality of diaphragms, a magnet forming a magnetic field, an electrical conductor disposed in said magnetic field, a support for said conductor operatively connected to said diaphragms to vibrate therewith, and flexible means between said diaphragms for maintaining said support in alinement with said magnet.

4. A device of the kind described comprising a plurality of diaphragms, a magnet forming a magnetic field, an electrical conductor disposed in said magnetic field and interposed between the diaphragms, a support for said electrical conductor operatively connected to said diaphragms to vibrate therewith, and flexible means for maintaining said support in alinement with said magnet.

5. A device of the kind described comprising a plurality of diaphragms, a magnet forming a magnetic field, an electrical conductor disposed in said magnetic field and interposed between the diaphragms, a support for said electrical conductor operatively connected to said diaphragms to vibrate therewith, and flexible means between said diaphragms for maintaining said support in alinement with said magnet.

6. A device of the kind described comprising a plurality of diaphragms, a magnet having an annular magnetic field, a member attached to the central portions of the diaphragms and movable therewith, a winding carried by said member and disposed in said magnetic field, flexible means at one end of said member for maintaining it in alinement with the magnet, and flexible means at the other end of said member for maintaining it in alinement with said magnet.

7. A device of the kind described comprising a plurality of diaphragms, a magnet having one portion thereof disposed to one side of the diaphragms and another portion thereof disposed between the diaphragms, said magnet having poles providing an annular magnetic field, and an annular electrical conductor disposed in said field and operatively connected to said diaphragms.

8. A device of the kind described comprising two diaphragms, a member secured to said diaphragms and tensioning them, a magnet providing a magnetic field, and an electrical conductor carried by said member and operatively disposed to react with said magnetic field.

9. A device of the kind described comprising a plurality of diaphragms having their peripheries spaced from each other, said diaphragms being provided with alined apertures, a magnet forming a magnetic field between said diaphragms and comprising a pole piece alined with said apertures, an electrical conductor disposed in said magnetic field and interposed between said diaphragms, and a support for said electrical conductor operatively connected to said diaphragms to vibrate therewith.

JOSEPH SWALLOW.