Aug. 23, 1932. J. SWALLOW 1,873,360

LOUD SPEAKER CONSTRUCTION

Filed June 15, 1929

Fig. 1.

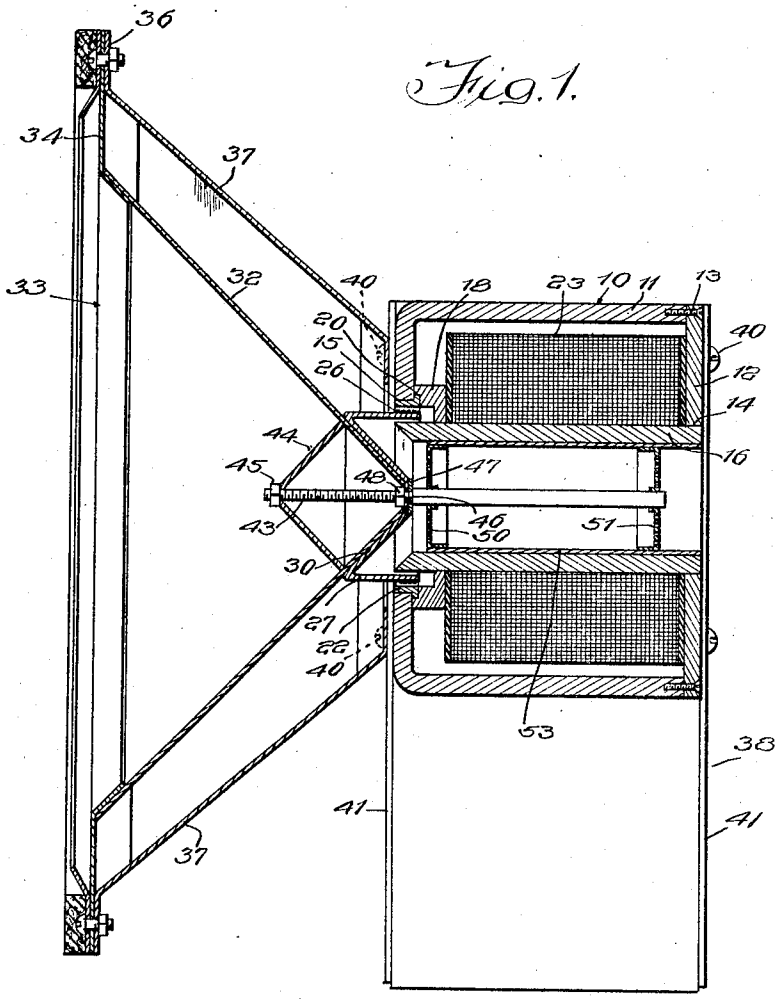
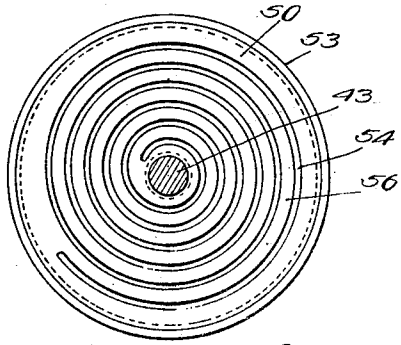


Fig. 2.



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UNITED STATES PATENT OFFICE

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LOUD-SPEAKER CONSTRUCTION

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My invention relates broadly to loud speakers, and has among its other objects the production of devices of the kind described that are efficient, durable, compact and simple in construction.

A particular object of the invention is to provide improved means for supporting the diaphragm of a loud speaker.

Another particular object of the invention is to provide improved means for supporting a movable armature or winding in a loud speaker, the armature or winding being one subjected to telephonic currents and operatively connected to a diaphragm.

Still another particular object of the invention is to provide an improved magnetizing structure for loud speakers.

A preferred form of the invention is embodied in a loud speaker which comprises a magnetizing structure fabricated from parts securely held in alinement and formed to provide an annular magnetic field in which a winding is disposed, the winding being subjected to telephonic currents delivered to it from a radio-receiving set, or the like. The winding is preferably supported upon an annular member secured to a diaphragm and a rod projecting through the magnetizing structure supports the winding, the annular member and the diaphragm. The rod is supported by spaced spiral spring members which exert sufficient tension upon the diaphragm and the winding to hold them in their normal positions, as shown in the drawing, when the winding is not being subjected to telephonic currents.

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

Figure 1 is a central section taken through a loud speaker embodying my invention, and

Fig. 2 is a front elevation of a spiral spring member which forms part of the loud speaker shown in Fig. 1.

Referring for the present to Fig. 1 wherein I have shown a loud speaker embodying a preferred form of the invention, the reference character 10 designates generally a magnetizing structure which preferably comprises a U-shaped magnet member 11, the ends of the magnet member 11 having a rectangular plate 12 secured to them by screws 13, or the equivalent. A relatively large aperture 14 formed in the rectangular plate 12 is co-axially disposed with respect to an aperture 15 formed in the magnet member 11. Disposed in the aperture 14 is one end of a pole piece 16 which is preferably tubular in form and projects into the aperture 15. Disposed around the pole piece 16 is a ring 18 formed from non-magnetic material and mounted in a recess 24 formed in the ring 18 is an annular pole piece 22 spaced from the pole piece 16 to provide an annular magnetic field. The annular pole piece is preferably fitted snugly in the aperture 15. Disposed around the pole piece 16 is a winding 23, whereby the magnet member, the rectangular plate 12 and the pole pieces 16 and 22 may be magnetized. Obviously, the magnetizing current may be of such magnitude that the field between the pole pieces 16 and 22 will be relatively intense, the magnetizing electric current being derived from any suitable source.

Disposed in the annular magnetic field provided between the pole pieces 16 and 22 is an electrical conductor, armature or winding 26 adapted to be subjected to telephonic currents obtained from a radio-receiving set, or the like. The winding 26 is mounted upon an annular member 27 which may be formed from any suitable material, such as paper, or a phenolic condensation product.

Formed integral with the annular member 27 is a conical flange 30 in which the apex of a conical member 32 is seated, the conical member 32 being part of the diaphragm which is designated generally by reference character 33 and also comprises an annulus 34 attached to the base of the conical portion 32. The conical portion 32 is preferably formed from paper, or the equivalent, but the annulus 34 is preferably formed from relatively flexible leather, or the equivalent. The outer edge of the annulus 34 is preferably rigidly secured to a ring 36 formed from sheet metal, or the like, and the ring is sup-

ported by a plurality of arms 37 which have their outer ends spot-welded to the ring 36 and have their inner ends secured to the magnet member 11 and to frame members 38 by screws 40, or the equivalent. The frame members 38 may be of any suitable construction and are preferably formed from sheet metal. They are preferably provided with flanges 41 which may be secured to the magnet member 11 and to the rectangular plate 12 by the aforementioned screws 40.

It will be noted that the apex of the conical portion 32 of the diaphragm 33 is apertured to accommodate a rod 43 which passes through the aperture and extends into the conical portion. Carried by the rod 43 is a conical washer 44, the construction being such that the edge of the conical washer 44 clamps the conical portion 32 against the conical flange 30. A nut 45 screw-threaded upon the rod 43 may be manipulated to urge the washer against the conical portion 32.

A portion of the rod 43 projects into tubular pole piece 16 and is preferably enlarged in diameter to provide an annular shoulder 46 against which a washer 47 is positioned. A nut 48 screw-threaded upon the rod 43 clamps the central portion of the conical portion 32 against the washer 47. Obviously, the conical portion 32 of the diaphragm 33 is supported by the rod 43. The rod 43 projects through and is secured to spaced spiral spring members 50 and 51 which are preferably rigidly secured in a tube 53 preferably formed from non-magnetic material. The tube 53 preferably has a press-fit engagement with the interior surface of the hollow pole piece 16 and the spiral spring members 50 and 51 are preferably cup-shaped and are preferably soldered or otherwise secured within the tube 53. The metal from which the spiral spring members are formed is preferably thin and relatively flexible.

The spiral spring members 50 and 51 are preferably identical in construction, and I have shown one of them in detail in Fig. 2. It will be noted that each of the spiral spring members is preferably formed from a sheet metal stamping, and that each is provided with a spiral slot 54 to provide a spring 56 having a plurality of convolutions, the construction being such that the springs 56 do not exert sufficient tension on the diaphragm at any time to distort the sound emitted therefrom. Thus, it is readily understood that the spiral springs 56 are not adapted to subject the diaphragm 33 to such tension, but that they are adapted to hold the conical portion 32 of the diaphragm and the winding 26 in neutral positions when the winding 26 is not being subjected to telephonic currents. It might be said that the springs 56 provide a restoring force of a magnitude corresponding to the magnitude of the electrical currents to which the winding 26 is subjected.

A feature of the invention is the manner in which the spiral spring members 50 and 51 hold the winding 26 and the annular member 27 in concentric relation with the pole pieces 16 and 22, it being well known to those skilled in the art that because of the relatively small clearance allowed between the several parts of the loud speaker at this point, it is absolutely essential that the winding and its support shall be retained in concentric relation with respect to the inner and outer pole pieces. To prevent frictional engagement between the fixed and moving parts, which frictional engagement would distort the sounds reproduced by the diaphragm.

Another feature of the invention is the construction of the magnet members and pole pieces and the manner in which they are assembled to remain in permanent alinement even when the speaker is subjected to rough handling, etc.

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 claim as new is:

1. In a loud speaker of the electromagnetic type, the combination with a magnet including a tubular pole piece, of a coil adapted to move in the magnetic field of said magnet, and supporting means for said coil comprising flexible members disposed in said pole piece and extending outwardly with respect to the longitudinal axis of said coil, said flexible members extending in a non-radial direction between said longitudinal axis and a support, said flexible members being disposed substantially at right angles to the direction of movement of the coil and having a length greater than the radial distance between said longitudinal axis and said support.

2. In a signal transmitting device, means including a tubular pole piece forming a magnetic air gap, a current-carrying coil adapted to move in said air gap, and a yielding support for said coil comprising flat strips of non-elastic flexible material disposed in said pole piece and extending outwardly with respect to the longitudinal axis of said coil, said flat strips extending to fixed points, said strips being positioned with respect to the coil and fixed points so that a twisting strain will be imposed upon said strips as the coil moves axially in said gap.

In testimony whereof, I have hereunto set my hand this 17th day of May, 1929.

JOSEPH SWALLOW.