

July 26, 1932.

J. S. TIMMONS
ELECTRICAL ELEMENT
Filed Aug. 16, 1929

1,869,230

2 Sheets-Sheet 1

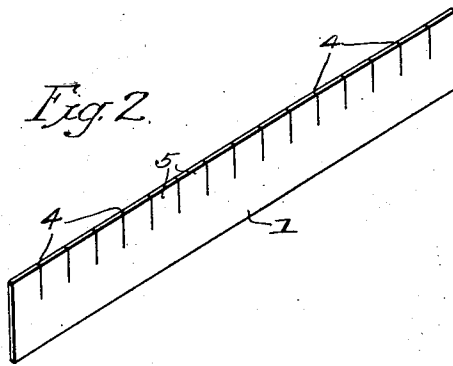


Fig. 3.

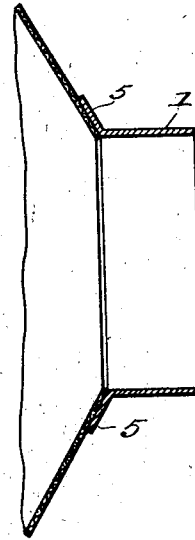
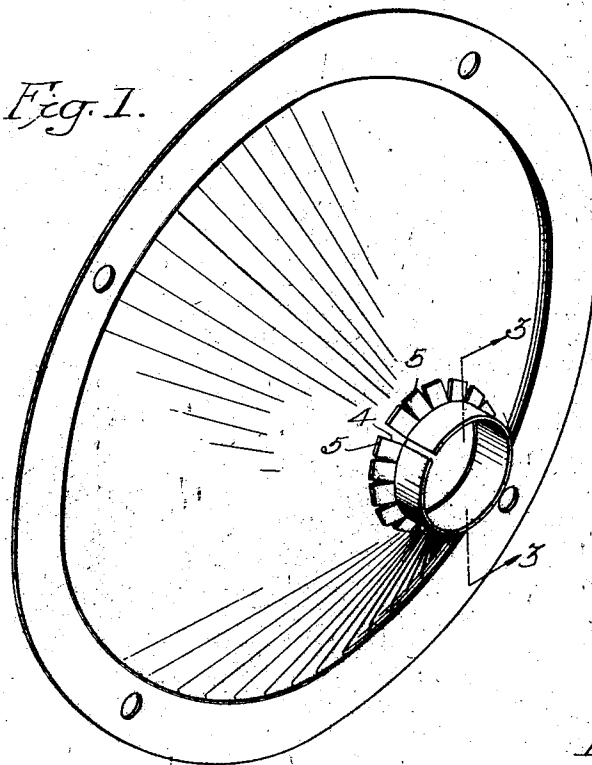


Fig. 1.



Inventor:
John S. Timmons
by his Attorneys
Hewson & Hewson

July 26, 1932.

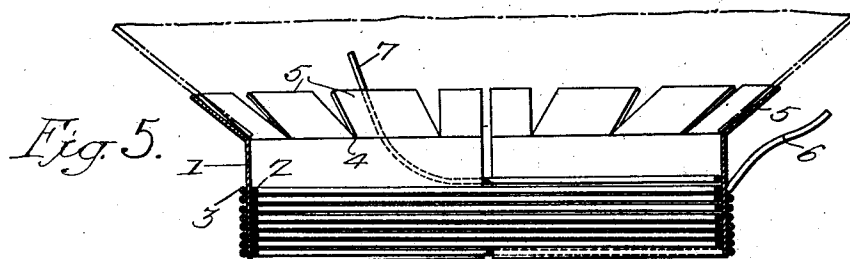
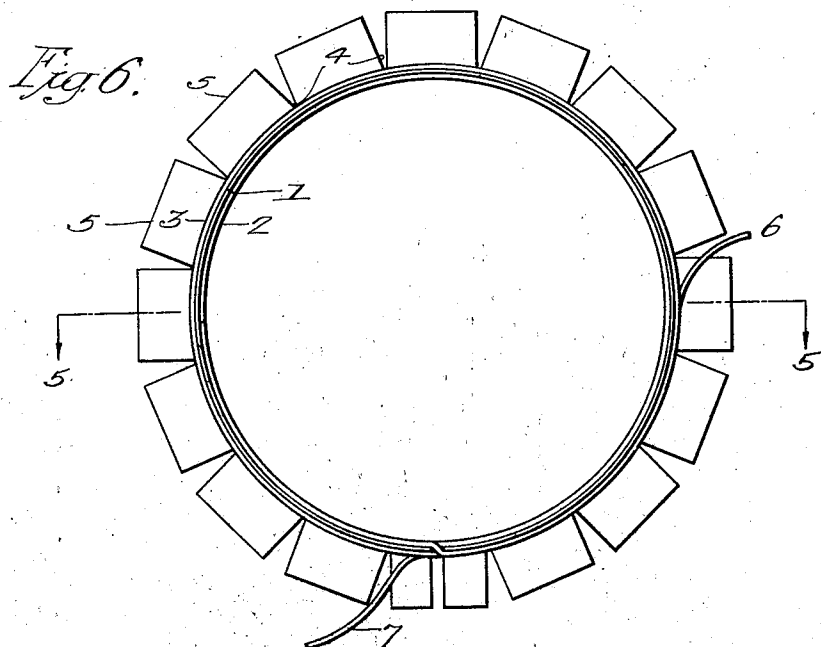
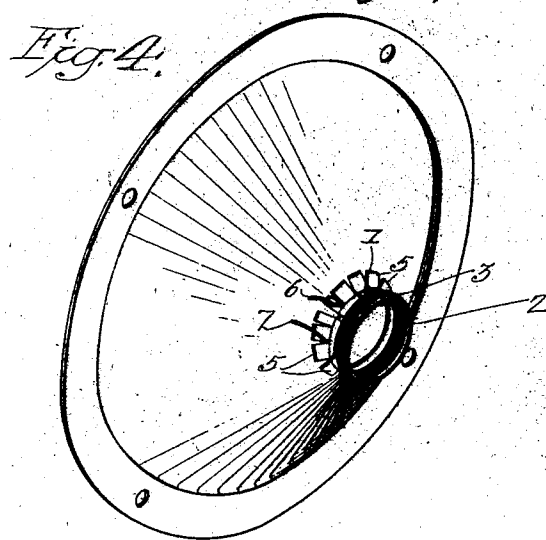
J. S. TIMMONS

1,869,230

ELECTRICAL ELEMENT

Filed Aug. 16, 1929

2 Sheets-Sheet 2



Inventor:
John S. Timmons.
by his Attorneys,
Hudson & Hudson

UNITED STATES PATENT OFFICE

JOHN S. TIMMONS, OF WYNCOTE, PENNSYLVANIA, ASSIGNOR TO PHILADELPHIA STORAGE BATTERY COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

ELECTRICAL ELEMENT

Application filed August 16, 1929. Serial No. 386,382.

This invention relates to improvements in sound reproducers of the so-called "electrodynamic" type, and relates more particularly to improvements in the construction of the voice coil of such speakers.

In sound reproducers of the "electrodynamic" type, a diaphragm is actuated through the medium of a coil wire attached to the diaphragm and freely suspended in a magnetic field, the variable voice currents being applied to the coil and causing it to move in the magnetic field. It is desirable that the coil shall have the characteristics of stiffness, lightness of weight and thinness, and should be so constructed that it is not liable to change its shape under varying conditions of temperature and humidity.

It is the principal object of the present invention to provide a voice coil of novel construction having in marked degree the aforesaid desirable characteristics.

The invention also contemplates the provision of a voice coil of extreme simplicity of construction capable of being manufactured easily and cheaply, and the invention also resides in the novel method of manufacture.

A further object of the invention is to provide simple, inexpensive and highly efficient means for attaching the coil to the diaphragm.

Still another object of the invention is to provide a foundation for the coil which also includes novel means for attaching the coil to the diaphragm.

In the attached drawings:

Fig. 1 is a view in perspective of a cone diaphragm equipped with a coil foundation made in accordance with my invention;

Fig. 2 is a view in perspective of the blank from which the voice coil foundation is made;

Fig. 3 is a section on the line 3—3, Fig. 1;

Fig. 4 is a view in perspective of the diaphragm with the finished coil;

Fig. 5 is an enlarged transverse sectional view of the coil taken on the line 5—5, Fig. 6, and

Fig. 6 is an end view of the coil.

Prior to my invention, it was general practice in forming voice coils for electrodynamic

speakers to wind the wire on a molded core or spool or upon spools built up of wrapped paper. Both of these methods are relatively expensive, and the finished article is relatively thick and heavy, and particularly in the case of the molded form is liable to warp.

In manufacturing voice coils in accordance with my invention, a layer of insulated wire is first wound directly on a suitable mandrel, a sufficient number of convolutions being placed thereon to afford a coil of desired length. Over this base coil and while still upon the mandrel, we wrap a piece of strong paper or the like, this paper immediately before application to the coil being dipped in or otherwise coated with a quick-drying lacquer, bakelite solution, or other suitable cementing medium preferably having insulating properties. The paper strip preferably is just long enough to make one complete turn around the initial or base coil, and after application, the wire, passed between the ends of the paper strip, is wound upon the outer surface, thereby forming a double coil the layers of which are separated by the paper. By reason of the use of the lacquer or other cementing agent, both the base and outer coils are caused to adhere to the paper foundation, thus affording a self-sustaining coil which may readily be slipped from the mandrel. The entire coil may then be further insulated and unified if necessary by dipping it into an insulating lacquer or other suitable substance. Such a coil is shown in Figs. 4, 5 and 6, in which the paper or other foundation is designated by the reference numeral 1, the inner or base coil-element by 2, and the outer coil-element by 3.

Some difficulty has been experienced in the past in attaching the voice coil to the diaphragm in an efficient manner. In general, the requirements for such attaching means are that it shall be light and strong and shall interfere to a minimum degree with the physical characteristics of the diaphragm. It should also be adaptable to different types of diaphragm such as conical and flat. In accordance with the present invention, the attaching means is made an integral part of the coil foundation, this device meeting all

the theoretical requirements in an exceptional manner.

With reference to Fig. 2 of the drawings, the foundation blank which may consist of
 5 light cardboard, paper or the like in the form of a rectangular strip and which as set forth corresponds in length substantially to the circumference of the voice coil, is made somewhat greater in width than the length of
 10 the coil. As shown in Fig. 2, this blank is provided along one longitudinal edge with a series of transverse slits 4 which preferably are of such length as to leave sufficient of the blank uncut to afford an ample solid foundation
 15 for the coils.

Following formation of the coil as described above, the tongues 5 formed by the slits 4 are brought into contact with the diaphragm, the said tongues lying flat against
 20 the surface of the latter and being secured thereto by adhesive in a manner readily understood by reference to Figs. 1 and 3. In this manner, the cylindrical foundation and the coil-elements associated therewith are secured to the diaphragm with uniform
 25 strength around the entire circumference. The leads 6 and 7 from the wound coil or coils may be passed under or between the tongues 5 and are thereby secured in position.
 30

While the coil foundation is illustrated herein as applied to a cone diaphragm, it will be apparent that by spreading the tongues 5 at right angles to the rest of the
 35 blank, the foundation may as readily be attached to diaphragms of the disk type. In fact, the device in principle is adaptable to diaphragms of practically any form.

A voice coil made as set forth above has
 40 been found to possess in marked degree all the desirable characteristics outlined, is relatively inexpensive to manufacture, and may be readily and rigidly applied to the diaphragm. The coil also has the advantage
 45 of insulation in the form of the paper strip between the concentric coil-elements. The advantage of lightness in a coil of this class will be apparent. By providing a coil that is rigid and not subject to warping, the gap
 50 in which the voice coil operates can be reduced safely to a minimum, thereby increasing the strength of the magnetic field in which the coil operates and correspondingly increasing the efficiency of the device as a
 55 whole.

I claim:

1. A voice coil for electrodynamic speakers comprising a thin substantially annular strip and a continuous coil in two layers respectively engaging the inner and outer faces of said annular strip, said strip extending beyond one end of the coil to constitute means for operatively connecting the coil to a diaphragm.

65 2. A voice coil for electrodynamic speak-

ers comprising a thin substantially annular strip and a continuous coil in a plurality of layers, two of which layers respectively engage the inner and outer faces of said annular strip, said strip extending beyond one end of the coil to constitute means for operatively connecting the coil to a diaphragm.

JOHN S. TIMMONS.

70

75

80

85

90

95

100

105

110

115

120

125

130