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G. W. COWLEY ET AL.

2,233,886

ACOUSTIC DEVICE

Filed May 5, 1938

FIG. 1

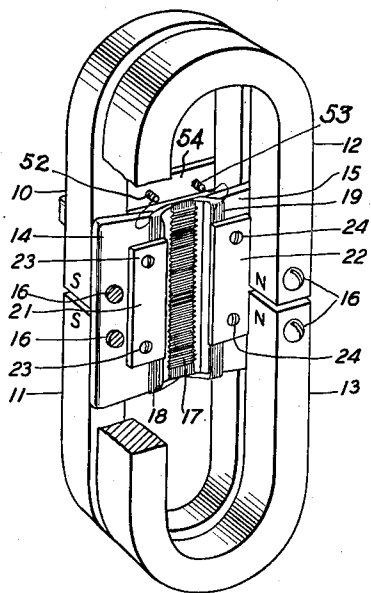


FIG. 2

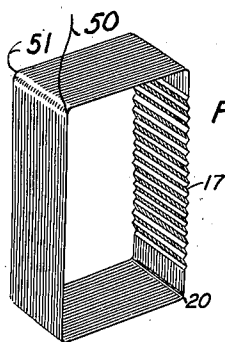


FIG. 3

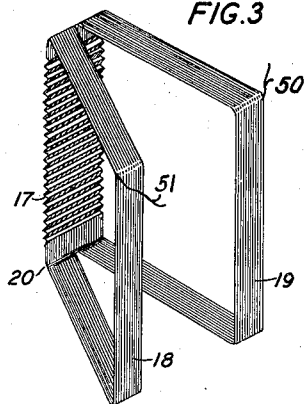


FIG. 4

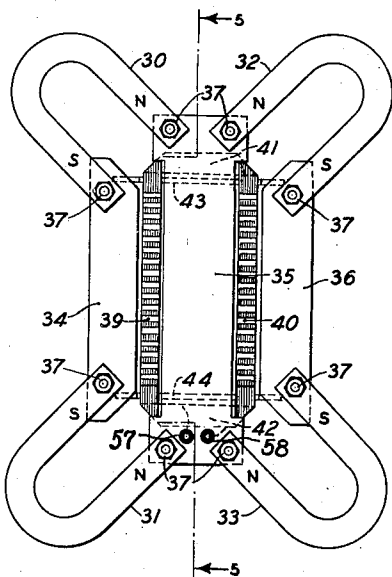


FIG. 5

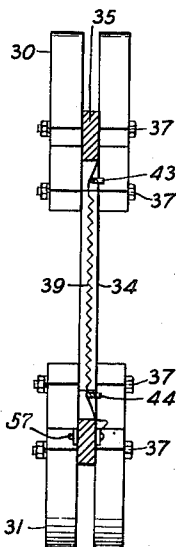
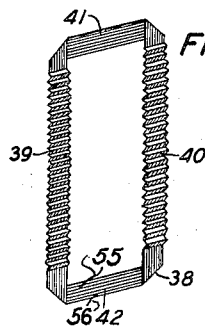


FIG. 6



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ACOUSTIC DEVICE

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Application May 5, 1938, Serial No. 206,162

9 Claims. (Cl. 179—115.5)

This invention relates to acoustic devices and more particularly to transmitters or microphones of the ribbon diaphragm type.

Among the difficulties encountered in the operation of ribbon diaphragm transmitters, two practical ones are (1) low output level and (2) high transformer ratio required to match the inherently low impedance ribbon to the grid circuit of an amplifier.

An object of this invention is to reduce the above-noted difficulties by means of a novel transmitter design.

A further object is a ribbon diaphragm transmitter having a high impedance and high output level.

A feature of the transmitter is a ribbon type diaphragm comprising a plurality of strands of very fine wire.

A further feature comprises a multiconductor ribbon that in form and acoustic characteristics is the substantial equivalent of a single conductor ribbon.

Another feature of the invention is a diaphragm of many parallel strands of fine wire bound into a ribbon by means of a suitable adhesive or binder.

An additional feature is a multiconductor ribbon diaphragm comprising one side of an elongated continuous coil of wire, the remaining side of which is divided to form ribbon supporting portions.

A still further feature of the invention is an elongated continuous coil of fine wire so formed that each side comprises one of two cooperating ribbon diaphragms.

Other and further objects and features of this invention will be evident from the following description.

Illustrative embodiments of the invention are shown in the accompanying drawing in which:

Fig. 1 is a perspective view of a single-ribbon transmitter with parts broken away to show details of the ribbon and its mounting;

Figs. 2 and 3 are perspective views, on a larger scale than Fig. 1, of the ribbon structure in the course of formation;

Fig. 4 is a front elevation of a two-ribbon embodiment of the transmitter;

Fig. 5 is a section on line 5—5 of Fig. 4; and

Fig. 6 is a perspective view of a coil comprising the double-ribbon structure of Fig. 4.

The transmitter illustrated in Fig. 1 comprises a magnetic structure including permanent magnets 10, 11, 12 and 13 and pole-pieces 14 and 15.

The magnets, which may be of horseshoe form,

are arranged in pairs 10—11 and 12—13 with corresponding poles together. The pole-pieces 14 and 15 are sandwiched between adjacent sides of the magnet pairs and the parts are secured together with fastening means such as bolts 16. The pole-pieces 14 and 15 are positioned to form an elongated air-gap therebetween.

The coil 20, comprising many turns of fine wire wound in a single layer, includes the ribbon portion 17 and supporting portions 18 and 19. The coil is supported on the magnetic structure by plates 21 and 22 and screws 23 and 24, which clamp the supporting portions 18 and 19 to pole-pieces 14 and 15, respectively. The coil 20 is so formed that the portions 18 and 19 are parallel to the ribbon portion 17 and offset therefrom sufficiently to locate the ribbon 17 centrally in the air-gap.

The coil 20 may be formed of fifty or more turns of fine insulated wire such as Nos. 40 to 56 B. and S. gauge, wound on a mandrel or form to a rectangular shape as shown in Fig. 2. The wire insulation may be enamel or other suitable covering. While the coil is still on the form it is impregnated with an adhesive or binder, such as cellulose cement or the like. A cellulose cement thinned with amyl acetate and containing a powder filler, such as finely divided aluminum, is preferred. In an alternative construction, the wires may be wound over a layer of cellulose ribbon or the like which is first applied to the winding form. The wire may be wound directly on the form and the ribbon applied to its outer surface. A self-adhesive or non-adhesive type of ribbon may be employed. If the latter is used a cellulose solvent is applied after winding in order that the wires may become embedded in the softened ribbon.

After a suitable drying time has elapsed the coil is removed from the form. One long side is transversely corrugated to form the ribbon portion 17. The other side and the ends of the coil are slit into equal portions and separated as shown in Fig. 3. The coil is then shaped to the form shown in Fig. 1. The portions 18 and 19 are kept in the same plane, which is parallel to that of the ribbon 17. The distance between the planes is half the thickness of the pole-piece members 14 and 15. This is to locate the ribbon 17 centrally in the air-gap when the supporting portions are clamped to one side of the pole-pieces. The beginning and end portions 50 and 51 of the winding are brought out to terminals 52 and 53 on terminal block 54.

The modification illustrated in Figs. 4 and 5

comprises a double air-gap transmitter having a ribbon in each gap. Employing a variation of the structure defined in the foregoing, both ribbons may be conveniently formed from the same coil. By suitably arranging the field magnets as to polarity an additive effect of the ribbons is obtained.

A plurality of magnets, the front four of which are shown at 30, 31, 32 and 33 in Fig. 4, are secured to pole-piece members 34, 35 and 36 by bolts or the like 37. The pole-pieces are sandwiched between a front and rear set of magnets, somewhat in the manner of the transmitter of Fig. 1.

The coil 38 having ribbon portions 39 and 40 is attached by its end portions 41 and 42 to the magnet structure by an adhesive or other suitable means. The area of attachment may conveniently be adjacent the ends of pole-piece 35, on the back side as viewed in Fig. 4. The ribbon portions 39 and 40 are supported centrally in the air-gap between bridge members 43 and 44. The ends 55 and 56 of the winding may be brought out to suitable terminal means 57 and 58.

Either of the illustrative embodiments of the transmitter may be enclosed by a suitable, conventional, wind screen and protective means and mounted on a convenient standard.

Although the transmitters specifically disclosed are of the velocity or pressure gradient type, the multiconductor ribbon may also be employed in a pressure type transmitter.

The invention has been described with respect to specific embodiments thereof but it is to be understood that it is not limited thereby but by the appended claims only.

What is claimed is:

1. An acoustic device comprising a magnetic structure having spaced parallel pole-pieces defining an air-gap, and a conductive diaphragm in said air-gap, said diaphragm comprising a plurality of parallel conductors, said parallel conductors being a portion of a multiturn, single layer coil, consisting of one continuous wire, two other portions of said coil substantially parallel to said diaphragm and to each other being secured to the magnet structure to support the diaphragm in the air-gap.

2. An acoustic transmitter comprising a magnetic structure including two pairs of U-shaped permanent magnets, each pair having their corresponding poles in contact and extending in opposite directions from said poles, a pair of parallel pole-pieces clamped between said magnet pairs and defining an elongated air-gap, a multiturn, single layer, elongated coil of fine, insulated wire, one side of said coil comprising a ribbon diaphragm, and the opposite side comprising two parallel portions lying in the same plane for mounting said coil on the magnetic structure, with the ribbon diaphragm in the air-gap.

3. The method of forming a multiconductor acoustic diaphragm which comprises winding a single layer coil of fine insulated wire on a form, binding the turns of said coil together with adhesive means, while it is on the form, removing the coil from the form after the adhesive has set, transversely corrugating one portion of said coil to form a diaphragm, splitting the rest of the coil in a direction substantially parallel to the turns into two portions and shaping said portions into support means for the diaphragm.

4. An electro-acoustic device comprising a magnetic structure defining an air-gap, and a multiturn, single layer coil of fine wire, said coil hav-

ing a plurality of linear elements, each including a plurality of substantially parallel portions of said wire, one of said elements being impregnated with adhesive material binding the parallel wire portions together to form a ribbon-like diaphragm and two other of said elements being mutually parallel and connected to portions of the magnetic structure lying in a plane parallel to the plane of the diaphragm to support said diaphragm in the air-gap.

5. An electro-acoustic device comprising a magnetic structure including spaced parallel pole-pieces defining an air-gap, and a multiturn, single layer coil of fine wire, said coil having a plurality of linear elements, each including a plurality of substantially parallel portions of said wire, one of said elements being impregnated with adhesive material binding the parallel wire portions together to form a ribbon-like diaphragm, and two other of said elements being parallel to said diaphragm, lying in a plane parallel thereto and secured to the pole-pieces to support the diaphragm in the air-gap.

6. An electro-acoustic device comprising a magnetic structure including spaced parallel pole-pieces defining two parallel air-gaps, and a multiturn, single layer coil of fine wire, said coil having a plurality of pairs of linear elements, the elements of each pair being mutually parallel, each element including a plurality of substantially parallel portions of said wire, the elements of one pair being impregnated with adhesive material binding the parallel wire portions of each together to form two ribbon-like diaphragms lying in the same plane, and the elements of another pair offset from said plane and connected to the magnetic structure to support a diaphragm in each air-gap.

7. A conductive diaphragm means for an electro-acoustic device comprising a single layer, multiturn coil of fine wire, said coil having a plurality of linear elements, each including a plurality of substantially parallel portions of said wire, two of said elements being mutually parallel and lying in the same plane and at least one of said elements impregnated with an adhesive material binding the parallel wire portions together to form a ribbon-like diaphragm.

8. A conductive diaphragm means for an electro-acoustic device comprising a single layer, multiturn coil of fine wire, said coil having a plurality of linear elements, each including a plurality of substantially parallel portions of said wire, one of said elements being impregnated with an adhesive material binding the parallel wire portions together to form a ribbon-like diaphragm, and two other of said elements being mutually parallel and offset in a plane parallel to that of the diaphragm to serve as diaphragm support means.

9. A conductive diaphragm means for an electro-acoustic device comprising a single layer, multiturn coil of fine wire, said coil having a plurality of pairs of linear elements, the elements of each pair being mutually parallel, each element including a plurality of substantially parallel portions of said wire, the elements of one pair lying in the same plane and each impregnated with an adhesive material binding the parallel wire portions together to form ribbon-like diaphragms, and the elements of another pair offset in a plane parallel to that of the diaphragms to serve as diaphragm supporting means.

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