Nov. 6, 1956 J. A. HASSAN 2,769,942

VOICE COIL FOR LOUD SPEAKERS

Filed Nov. 26, 1954

2 Sheets-Sheet 1

FIG. 1.

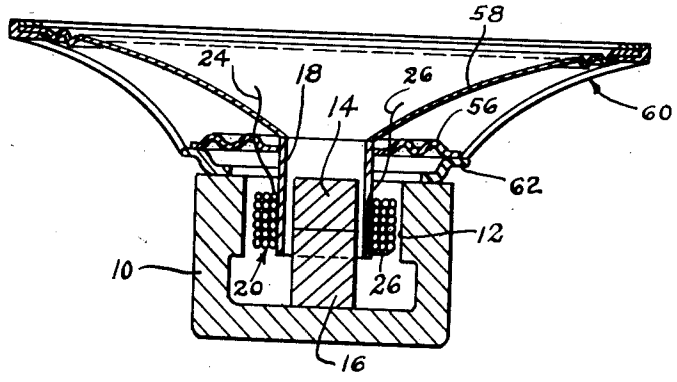


FIG. 2.

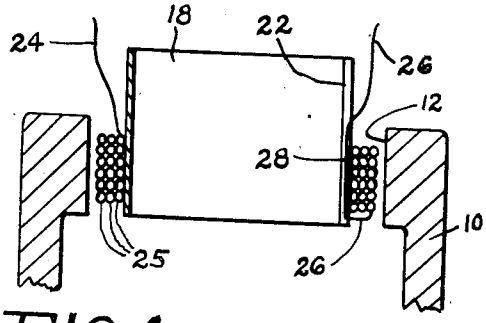


FIG. 3.

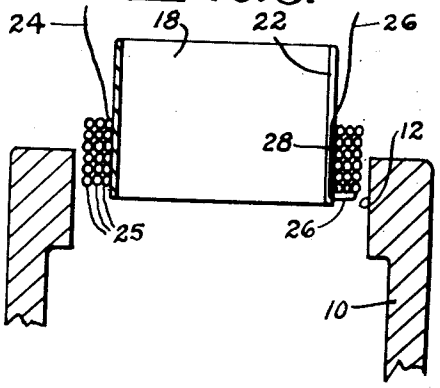


FIG. 4.

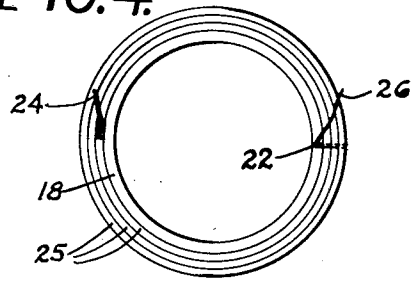
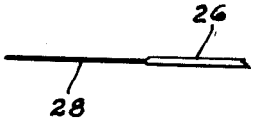


FIG. 5.



INVENTOR.
Joseph A. Hassan
BY Harold E. Cole
Attorney

Nov. 6, 1956 J. A. HASSAN 2,769,942

VOICE COIL FOR LOUD SPEAKERS

Filed Nov. 26, 1954

2 Sheets-Sheet 2

FIG. 6.

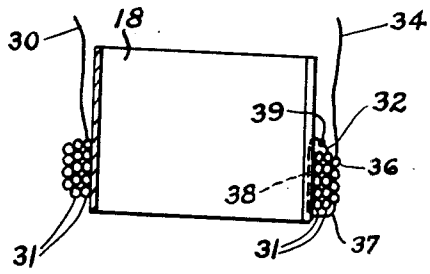


FIG. 7.

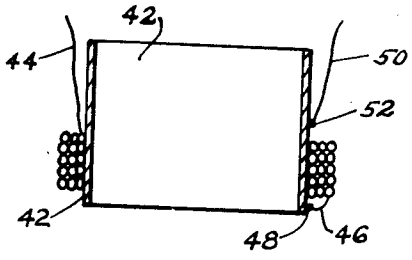


FIG. 8.

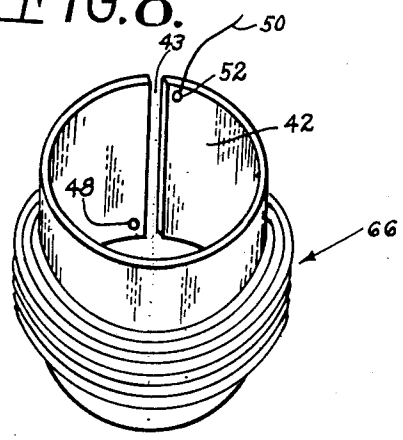


FIG. 9.

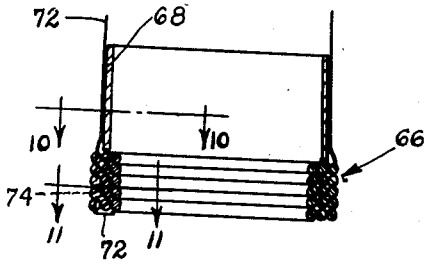


FIG. 10.

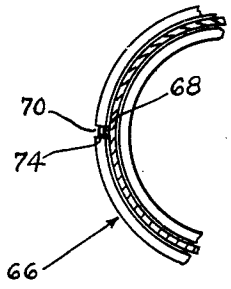
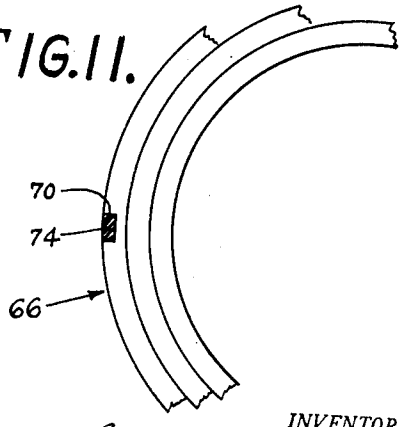


FIG. 11.



INVENTOR.
Joseph A. Hassan
BY Harold E. Cole
Attorney

United States Patent Office

2,769,942

Patented Nov. 6, 1956

2,769,942

VOICE COIL FOR LOUD SPEAKERS

Joseph A. Hassan, Weymouth, Mass., assignor of one-half to Fauthal A. Hassan, Weymouth, Mass.

Application November 26, 1954, Serial No. 471,202

2 Claims. (Cl. 317—158)

This invention relates to a voice coil for loud speakers.

The principal object of my invention is to increase the range of sound reproduction in all frequencies, by an improved voice coil which serves to make the diaphragm more sensitive and stronger in its movements.

Another object is to provide a voice coil, which, during its excursion, keeps within an effective influence of the magnetic flux, especially when a low frequency current reaches the voice coil. Since the low frequency current tends to move said voice coil the greatest distance, my invention is particularly effective in this respect.

To accomplish this, said coil winding, extending along the length of the coil form, is shorter than that commonly used; while the wire in the winding is approximately the same length, being three layers thick, hence the resistance remains, at least, the same as in a two-layer, coil winding of greater length on said form.

The foregoing and other objects which will appear as the nature of the invention is better understood, may be accomplished by a construction, combination and arrangement of parts such as is disclosed by the drawings. The nature of the invention is such as to render it susceptible to various changes and modifications, and therefore, I am not to be limited to the construction disclosed by the drawing nor to the particular parts described in the specification; but am entitled to all such changes therefrom as fall within the scope of my claims.

In the drawings:

Fig. 1 is a longitudinal, sectional view of a sound producing device having my voice coil.

Fig. 2 is an enlarged, fragmentary, sectional view showing the voice coil in normal position in said device.

Fig. 3 is a view similar to Fig. 2; but showing the voice coil in an actuated position therein.

Fig. 4 is a top plan view of my voice coil.

Fig. 5 is a fragmentary, elevational view, showing a free end of the voice coil wire with a flattened portion.

Fig. 6 is a longitudinal, sectional view of a modified form of voice coil.

Fig. 7 is a longitudinal, sectional view of another modified form of voice coil.

Fig. 8 is a perspective view of the voice coil shown in Fig. 7.

Fig. 9 is a longitudinal sectional view of another modified form of voice coil.

Fig. 10 is a sectional view taken on line **10—10** of Fig. 9.

Fig. 11 is an enlarged, sectional view taken on line **11—11** of Fig. 9.

As illustrated, my device has the usual instrumentalities to actuate or vibrate the diaphragm. These include the usual magnetic frame **10** embodying at its upper part an inwardly extending portion **12**. A field pole **14**, having a base portion **16**, is attached to said frame **10** and extends upwardly therefrom. A voice coil has a form **18** around which is a coil winding **20**. This form **18** is split or separated as at **22**.

Said coil winding starts with a free end **24**, then the

wire is wound around said form **18** until three layers of wire **25** are provided. At the completion of this third and outside layer this leaves another free end **26** at the lower or opposite end of the voice coil from that of said free end **24**. A portion of this free end **26** is then flattened, as at **28**, until it is of no more thickness, and preferably of lesser thickness, than that of the coil form **18**, hence its two thinner sides of said flattened portion are placed next to the two ends of said form **18** at said split **22**. Since the thickness of the flat wire portion **28** is less than that of the coil form **18**, it is within both the inner and outer peripheral surfaces thereof, hence it takes no space outside the voice coil and has no effect on the magnetic flux.

The foregoing arrangement enables the use of a shorter voice coil while using the same length of winding wire, thus keeping the whole voice coil, during actuation, within effective influence of said flux. This maintains the volume satisfactorily constant and the sounds distinctive.

In Figure 6 of the drawings, I show a modified form of voice coil in which the coil winding of wire starts with a free end **30** and the winding continues for two layers of wire terminating in another free end **32** extending from the second layer. Then a separate wire **36**, starting with a free end **34** is wound outside the other two layers, this latter wire being placed so that a portion lies in the dip or shallow space left between the outer parts of the encircling wire portions that lie alongside and in contact with each other. Said wires are, of course, circular in cross section. This enables the use of three layers of wire; without taking as much space as the three layers shown in Figures 1, 2 and 3, so that the voice coil is of somewhat reduced thickness.

A free end **37** of the wire of the third layer extends beyond an end of the coil winding and a flattened portion **38** thereof extends between the two ends of said form **18** in the manner previously explained, being within the inner and outer peripheral surfaces thereof. This free end **37** is soldered, as at **39**, to said free end **32** that extends from said second layer, thus connecting the second and third layers.

In Figure 7 of the drawings another modified form of voice coil is shown in which the coil form **42** is made of an electricity conducting material such as aluminum or other metal, being split as at **43**. The winding starts with the usual free end **44** and the other free end **46** from the third layer of wire is soldered, as at **48**, to said conductive coil form beyond the coil winding at one side of said split **43**. Another length of wire **50** is soldered, as at **52**, to said coil form **42** beyond said coil winding at an opposite end of the coil winding to said soldering point **48**. Said soldering point **52** is located at an opposite side of said split from said point **48** so that the metal coil form **42** between said solder points provides the maximum travel for the electrical current while serving as a conductor in place of wire.

My device has the usual parts, including a compliance spider **56** surrounding and attached to the upper part of said coil form **18**. A conical diaphragm **58** is attached at its smaller end to said voice coil form **18**. Outside said diaphragm **58** is the usual diaphragm support **60** of general frusto-conical shape, which has a base portion attached to said magnetic frame **10** and to which one end of said spider **56** is attached.

In Fig. 9 of the drawings, instead of a voice coil form, I provide a combination of an independent voice coil winding **66** and a connector **68**, the latter commencing where the coil winding **66** ends, being attached to an end of said winding by cement. The diaphragm **58** will connect to the opposite end of said connector **68**. The coil winding **66** is similar to that shown in Fig. 1; but without a coil form. This assembly of a plurality of layers of

wire, having an interior space, preferably has an indentation 70 forcibly made therein, commencing at the outer surface of the coil winding 66 and extending inwardly from one end to the other.

A portion of a free end 72 of the voice coil winding 66 is flattened as at 74, and laid in said indentation 70 and cemented thereto. The size of the indentation 70 relative to said flattened portion 74 is such that the latter is wholly received within said indentation, thus not occupying any space in the magnetic gap. The free end 72 is then attached to said connector 68, as by cement, or laid alongside thereof, and extends between opposite ends thereof and beyond.

This arrangement eliminates the voice coil form within the coil winding 66, hence use of a smaller magnetic gap is possible to movably receive said coil winding 66 and said connector 68 beyond it. This reduction in the size of the magnetic gap results in a stronger magnetic flux, for a given magnet size.

What I claim is:

1. A voice coil comprising a non-magnetic form having a split therein extending the length thereof, and a coil winding embodying wire extending around said form in two layers, said coil winding having a free end extending from an inner said layer and another free end extending from the second of said layers, a separate wire, providing a third layer, outside said second layer embodying a free end extending between two portions of said form opposite said split and beyond, and electricity conducting means uniting both said latter free ends, said wire forming said three layers being substantially circular in cross section, said separate wire lying partly in the dips between two portions of wire that are alongside of and in contact with each other and that form said first two layers.

2. A voice coil comprising a non-magnetic form having a split therein extending the length thereof, and a coil winding embodying wire extending around said form in two layers, said coil winding having a free end extending from an inner said layer and another free end extending from the second of said layers, a separate wire, providing a third layer, outside said second layer embodying a free end extending between two portions of said form opposite said split and beyond and within the interior and exterior peripheral surfaces thereof, and electricity conducting means uniting both said latter free ends, said wire forming said three layers being substantially circular in cross section, said separate wire lying partly in the dips between two portions of wire that are alongside of and in contact with each other and that form said first two layers.

References Cited in the file of this patent

UNITED STATES PATENTS

1,869,230	Timmons	July 26, 1932
1,976,895	Snell	Oct. 16, 1934
2,084,945	Cornwell	June 22, 1937
2,503,243	Cohen	Apr. 11, 1950