Dec. 26, 1961 C. A. SWANSON 3,014,996

SPEAKER CONSTRUCTION

Filed May 18, 1956 2 Sheets-Sheet 1

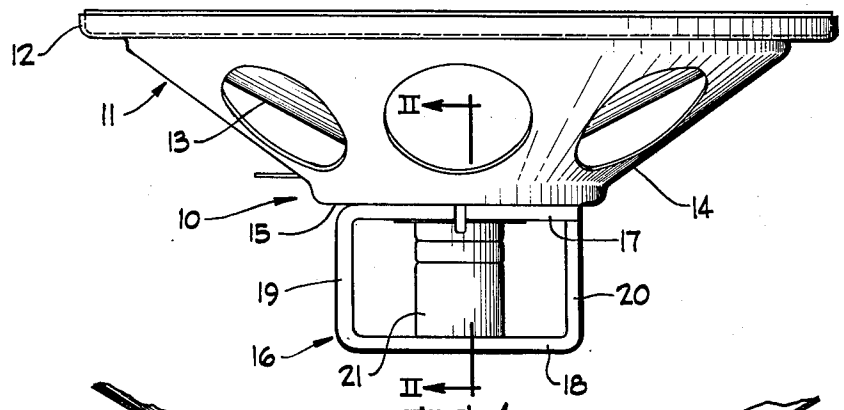


FIG. 1

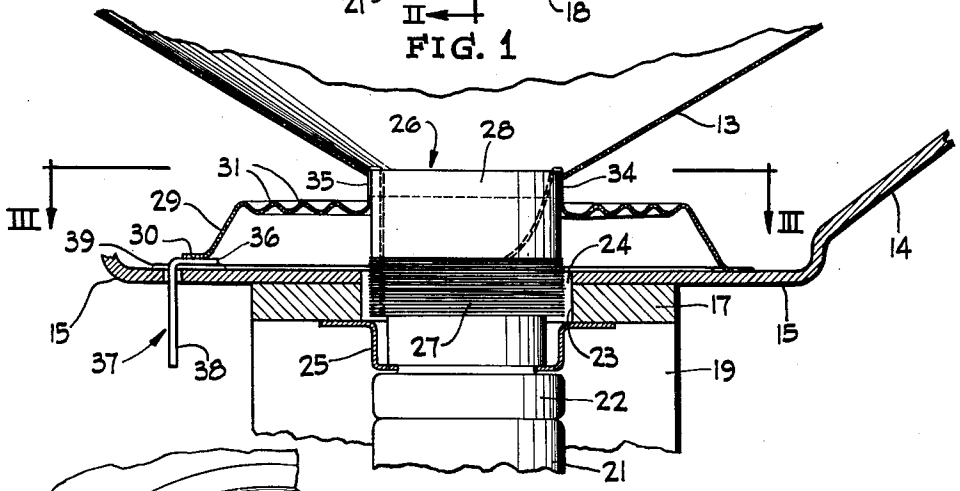


FIG. 2

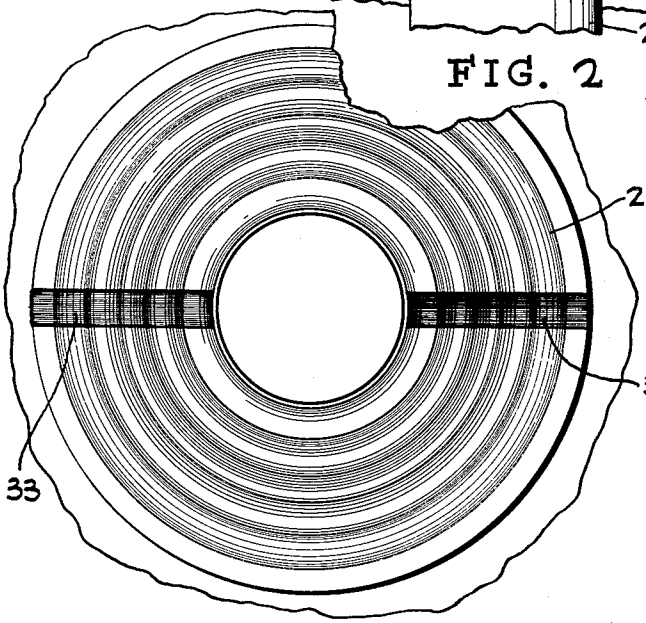


FIG. 3

INVENTOR.
CARL A. SWANSON

BY Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

Dec. 26, 1961 C. A. SWANSON 3,014,996

SPEAKER CONSTRUCTION

Filed May 18, 1956 2 Sheets-Sheet 2

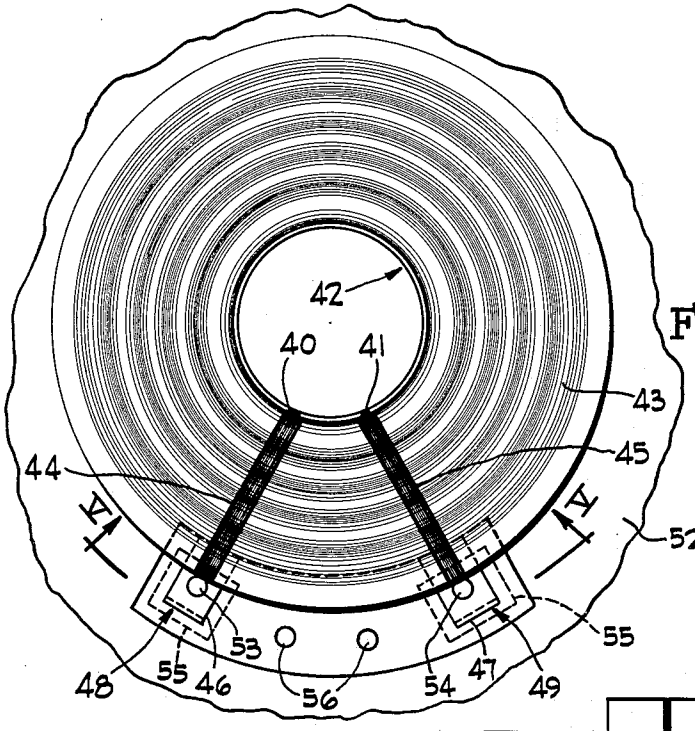


FIG. 4

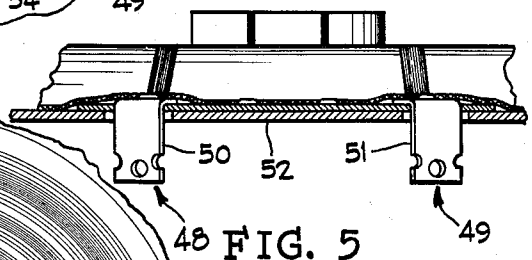


FIG. 5

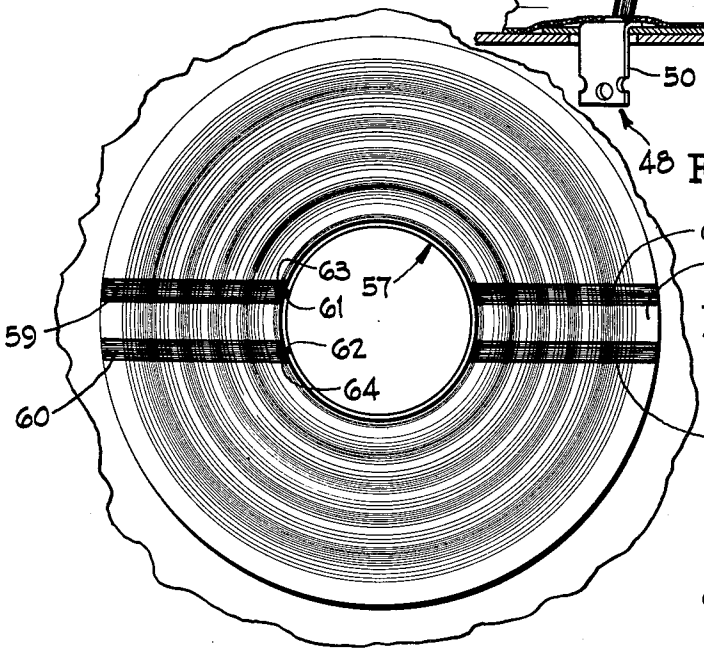


FIG. 6

INVENTOR.
CARL A. SWANSON

BY Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

United States Patent Office 3,014,996
Patented Dec. 26, 1961

3,014,996

SPEAKER CONSTRUCTION

Carl Axel Swanson, 3638 W. 80th St., Chicago, Ill.

Filed May 18, 1956, Ser. No. 585,693
3 Claims. (Cl. 179—115.5)

This invention relates to a speaker construction and more particularly, to the construction of a speaker of the type in which a voice coil is movable in an annular air gap of a magnetic structure and is connected to a cone or diaphragm. The voice coil is connected to an external circuit which may supply electrical power to cause vibration of the voice coil and generation of compression waves, or in the alternative, the external circuit may respond to an electrical signal generated in the voice coil by vibration of the diaphragm in response to sound waves.

In speaker constructions heretofore used, the ends of the voice coil wire extend radially outwardly from the voice coil and are cemented or otherwise secured to the diaphragm with flexible leads extending from the ends of the voice coil wires to terminals supported from the speaker frame. This manner of connection requires great care and skill and is a time-consuming operation. The flexible leads are particularly troublesome because they cause generation of spurious sounds which can be reduced to a satisfactory level only with great care and accuracy in the installation of the leads.

This invention was evolved with the object of providing a simple, easily effected method and arrangement of connecting the voice coil to an external circuit.

A further object of the invention is to provide a voice coil connection arrangement which is reliable in operation and in which the generation of spurious sounds is eliminated.

In brief, this invention provides a method and means for connection of the voice coil to an external circuit in which conductors extend along a voice coil centering disk in a manner by which the connections can be much more easily and reliably effected and by which the generation of spurious sounds is eliminated.

Other objects, features and advantages will become more fully apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate preferred embodiments, and in which:

FIGURE 1 is a side elevational view of a speaker constructed in accordance with the principles of this invention;

FIGURE 2 is an enlarged sectional view taken substantially along line II—II of FIGURE 1;

FIGURE 3 is a view taken substantially along line III—III of FIGURE 2;

FIGURE 4 is a view similar to FIGURE 3 but illustrating a modified arrangement;

FIGURE 5 is a sectional view taken substantially along line V—V of FIGURE 4; and

FIGURE 6 is a plan view of a voice coil and centering disk sub-assembly using a modified connection arrangement.

As shown on the drawings:

Reference numeral **10** generally designates a speaker constructed according to the principles of this invention. The speaker **10** comprises a frame **11** having an annular rim portion **12** from which the peripheral edge of a cone or diaphragm **13** is flexibly supported. The frame **11** has an apertured generally conical portion **14** which converges from the rim **12** to a circular plate portion **15** on which a magnetic structure **16** is supported.

The magnetic structure **16** comprises a generally rectangular frame of magnetic material including a wall portion **17** secured against the plate portion **15** of the frame **11**, a wall portion **18** in spaced parallel relation to the

portion **17**, and wall portions **19** and **20** connecting the adjacent ends of the portions **17** and **18**. A cylindrical permanent magnet **21** has one pole in engagement with the portion **18** with its other pole engaging a generally cylindrical pole piece **22**, preferably of soft iron or the like, which extends into a circular opening **23** in the portion **17** to define an annular air gap **24**. A dust cap or ring **25** of non-magnetic material such as brass, is supported by the pole piece **22** to engage the outer surface of the portion **17** about the opening **23**.

A voice coil assembly **26** is secured in a central opening of the cone or diaphragm **13** and extends into the air gap **24**. The illustrated voice coil assembly comprises a voice coil **27** which is wound on a bobbin or cylinder **28** of paper or other insulating material. In the alternative, the wire could be of square cross-section or of a ribbon shape which might be wound either on a tubular form or might be cemented in a manner to be self-supporting.

The voice coil **26** is also secured in a central opening of a centering disk **29** having a peripheral edge portion **30** secured to the surface of the circular plate portion **15** of the frame **11**. The centering disk **29** is of somewhat flexible material and may have annular corrugations **31** to increase the flexibility thereof with respect to axial movement of the voice coil **28** while maintaining sufficient rigidity with respect to radial displacement of the voice coil.

According to this invention, strips **32** and **33** of conductive material project along the centering disk **29** from the voice coil **26** to spaced points at the peripheral edge of the centering disk **29**. The strips **32** and **33** are respectively connected to end portions **34** and **35** of the voice coil wire **27**. The outer end of the strip **32** engages a portion **36** of a terminal **37** having a portion **38** projecting through an opening in the plate portion **15** of the frame **11**, to be connected to an external circuit. The outer end of the strip **33** directly engages the plate portion **15** of the frame **11** so as to be electrically connected thereto, the frame being connectable to the external circuit. It will be appreciated, of course, that the strip **33** could be connected to a terminal similar to the terminal **37** insulated from the frame, if desired.

The strips **32** and **33** are formed by applying a conductive paint to the centering disk **29** which is of a porous material such as a fabric material. With this arrangement, the strips are effectively integral with the centering disk **29** so that they will flex therewith, to prevent the generation of spurious sounds.

In assembling the speaker, the voice coil **26** may be first cemented in the central opening of the centering disk **29**. The end portions **34** and **35** of the voice coil wire **27** are then freed of insulating material and are bent down on the outside of the cylinder **28** to extend to a point adjacent the outer surface of the centering disk **29**. The conductive paint may then be applied to form the strips **32** and **33** and to connect the inner ends of the strips **32** and **33** to the end portions **34** and **35** of the voice coil wire **27** in a single operation. Since the centering disk is of porous material, the conductive paint will extend to the other surface of the disk, to be engageable with the portion **36** of the terminal **37** or with the frame portion **15**.

Prior to installation of the voice coil and centering disk, a strip **39** of insulating material is mounted on the frame portion **13** and the terminal **37** is mounted thereon to thus be insulated from the frame. The centering disk and voice coil are then positioned to engage the outer end of the strip **32** with the portion **36** of the terminal **37**. Cement may then be used to secure the peripheral edge of the disk **29** to the frame portion **15**. The voice coil **26** may be cemented in the center opening of the cone

or diaphragm 13 either before or after installation of the centering disk 29.

FIGURES 4 and 5 illustrate a modified arrangement in which the terminal ends 40 and 41 of the wire of the voice coil 42 are brought out on one side of the voice coil and bent down to the surface of a centering disk 43 cemented to the voice coil 42. A pair of conductive strips 44 and 45 are electrically connected at their inner ends to the voice coil wire end portions 40 and 41 and extend radially outwardly to the peripheral edge of the centering disk 43. The outer ends of the strips 44 and 45 engage legs 46 and 47 of L-shaped members 48 and 49 having legs 50 and 51 extending through openings in a frame plate 52, the legs 50 and 51 forming terminals for connection to an external circuit. The legs 46 and 47 may be secured by rivets 53 and 54 to a strip 55 of insulating material which may be secured to the frame plate portion 52 by a pair of rivets 56.

With this arrangement, a terminal sub-assembly may be formed by securing the members 48 and 49 to the strip 55, and the sub-assembly may then be secured on the frame plate portion 52. The centering disk 43 together with the voice coil 42 are assembled and installed to engage the outer ends of the strips 44 and 45 with the legs 46 and 47, and the peripheral edge portion of the disk 43 may be then cemented to the frame plate portion 52.

FIGURE 6 is a plan view of the sub-assembly of a voice coil 57 and a centering disk 58. In this arrangement, the disk 58 is of a woven material and very thin wires are woven into the material to form strips 59 and 60 which extend generally radially. The ends 61 and 62 of the wire of the voice coil 57 are freed of insulating material and bent down to points adjacent the inner ends of the strips 59 and 60, after which they are electrically connected thereto by applying solder 63 and 64. The wires which form the strips 59 and 60 are preferably woven into the fabric prior to formation of the fabric into the centering disk configuration. In this case, there will be another pair of strips 65 and 66 in line with the strips 59 and 60, but such are not electrically connected to anything and have no effect on operation. In the formation of the centering disk 58, a binding substance is preferably applied to integrally join the threads of the fabric at the crossing points, to prevent relative movement of the threads and generation of spurious sounds. The wires forming the strips 59, 60, 65 and 66, are, of course, integrally bonded to the fabric of the disk in the same operation.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the novel concepts of this invention.

I claim as my invention:

1. In a transducer including a magnetic structure having an annular air gap, a voice coil assembly movable in said air gap, and a centering disc of a fabric material supporting said voice coil assembly for movement in said air gap, a strip of conductive material integrally embedded in said fabric material of said centering disc to extend radially from said voice coil assembly to the peripheral edge of said centering disc, a contact insulatingly supported on said magnetic structure, and cement means securing the periphery of said centering disc in fixed relation to said magnetic structure and arranged to hold the outer end portion of said strip of conductive material in firm engagement with said contact.

2. A transducer as defined in claim 1, wherein said strip of conductive material is formed by conductive paint applied to said disc.

3. A transducer as defined by claim 1 wherein said strip of conductive material is formed by wires woven into said fabric material of said disc.

References Cited in the file of this patent

UNITED STATES PATENTS

1,907,687	Van Lis	May 9, 1933
1,941,476	Jensen	Jan. 2, 1934
2,046,515	Jensen	July 7, 1936
2,221,068	Alons	Nov. 12, 1946
2,524,836	Russell	Oct. 10, 1950
2,538,621	Hopkins	Jan. 17, 1951
2,554,859	Hoekstra et al.	May 29, 1951
2,666,980	Russell	Jan. 26, 1954

FOREIGN PATENTS

638,080	Great Britain	May 31, 1950
686,934	Great Britain	Feb. 4, 1953