May 6, 1941. A. E. WOODRUFF 2,241,106

SOUND TRANSLATING DEVICE

Filed May 24, 1938

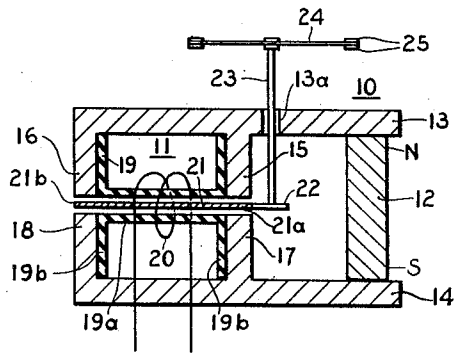


FIG. 1

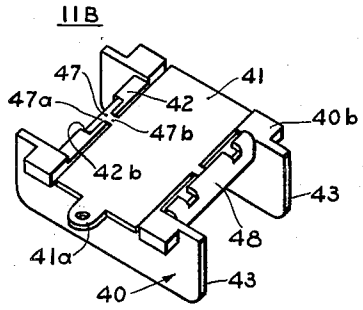


FIG. 2

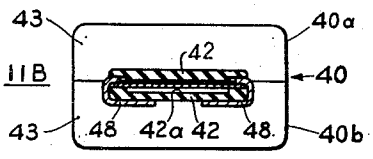


FIG. 3

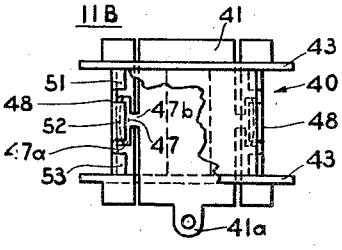


FIG. 4

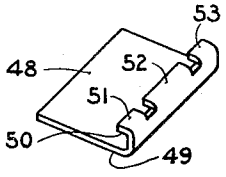


FIG. 5

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Patented May 6, 1941 2,241,106

# UNITED STATES PATENT OFFICE

2,241,106

## SOUND TRANSLATING DEVICE

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Application May 24, 1938, Serial No. 209,803

5 Claims. (Cl. 175—336)

The present invention relates to sound translating devices and particularly to a winding spool and armature assembly for a sound translating device of the magnetic or sound powered type. More particularly, the invention relates to an improved winding spool and armature assembly of the type of that disclosed and claimed in the copending application of Harold C. Pye, Serial No. 209,805, filed May 24, 1938.

In a telephone transmitter of this type, a magnetic field structure is provided which conventionally comprises a permanent magnet and two sets of adjacent pole pieces, the adjacent pole pieces of each set being of opposite polarity. A pivotally mounted magnetic armature is associated with the magnetic field structure, the opposite ends of the armature being disposed between the pole pieces of the respective sets. A sound wave responsive diaphragm is connected and arranged to subject the ends of the armature to vibratory movements between the pole pieces of the respective sets and corresponding to the sound to be transmitted. A winding or voice coil carried by a winding spool is electromagnetically coupled to the armature, whereby an electromotive force is generated in the winding corresponding to the vibratory movements of the armature with respect to the adjacent pole pieces of the two sets, in a known manner. In prior telephone transmitters of this type, the vibratory armature is pivotally mounted on brackets or the like carried by the field structure or by an external supporting member. While armature mountings of this character are reasonably satisfactory, they are expensive to manufacture and require delicate adjustments in order properly to align the armature with respect to the sets of adjacent pole pieces of the field structure.

Accordingly, it is an object of the present invention to provide a sound translating device of the type described having embodied therein an improved winding spool and armature assembly in which the armature is pivotally mounted on the winding spool and requires no external support.

Another object of the invention is to provide an improved winding spool and armature assembly which is of extremely simple and rugged construction, and which is compact and economical to manufacture.

In general, the objects as set forth above are attained in accordance with the present invention by providing an assembly of the character noted, comprising a longitudinally split winding spool, including two complementary sections of similar construction, each of the sections being provided with a body. The body of one of the sections has a longitudinally extending recess therein disposed adjacent the joint between the sections and an armature is arranged in the recess in the body of the one section. Also, means is provided for securing the armature to the body of the one section, whereby the armature is mounted for vibratory movements out of contact with the walls of the bodies of the sections. More particularly the armature is provided with two transversely extending lugs which are secured by resilient clips to the body of the one section of the winding spool. Furthermore, the armature is formed of magnetic stock, while the sections of the winding spool are formed of insulating material.

The novel features believed to be characteristic of the invention are set forth with particularity in the appended claims. The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawing, in which Figure 1 is a side elevational view, partly in section, of a telephone transmitter of the magnetic or sound powered type provided with a winding spool and armature assembly constructed in accordance with the present invention; Fig. 2 is a perspective view of one of the complementary sections of a winding spool and armature assembly embodying the present invention; Fig. 3 is a sectional view of a complete assembly; Fig. 4 is a plan view, partly broken away, of the assembly shown in Fig. 3; and Fig. 5 is a perspective view of a mounting clip embodied in the assembly.

Referring now more particularly to Fig. 1 of the drawing, there is illustrated a sound translating device in the form of a telephone transmitter of the magnetic or sound powered type embodying a winding spool and armature assembly constructed in accordance with the present invention and comprising a field structure 10 and a winding spool and armature assembly 11. The field structure 10 includes a permanent magnet 12 and two field members 13 and 14 rigidly secured to the opposite ends thereof, the field member 13 being secured to the north pole of the permanent magnet 12, and the field member 14 being secured to the south pole of the permanent magnet 12. The field members 13 and 14 are each provided with two pole pieces

15, 16 and 17, 18, respectively, the pole pieces 15 and 17 being arranged in spaced-apart relation adjacent each other and constituting a set, and the pole pieces 16 and 18 being arranged in a similar manner and constituting a set.

The assembly 11 comprises a winding spool 19 provided with a body 19a, carrying two spaced-apart winding retaining heads 19b, and a winding 20 arranged about the body 19a between the retaining heads 19b. An armature 21 is pivotally mounted on the winding spool 19 in a manner more fully described subsequently and is supported by the winding spool 19 between the two sets of pole pieces, one end 21a of the armature 21 being disposed between the oppositely disposed pole faces of the set of adjacent pole pieces 15 and 17 and the other end 21b of the armature 21 being disposed between the oppositely disposed pole faces of the set of adjacent pole pieces 16 and 18. The armature 21 is arranged within a longitudinally extending opening provided in the winding spool 19, and the ends 21a and 21b thereof are adapted to vibrate between the associated sets of adjacent pole pieces 15, 17 and 16, 18, respectively, and out of contact with the wall of the body of the winding spool 19. The end 21a of the armature 21 is provided with a projecting operating lug 22 having an opening therein in which one end of a rod 23 is secured, the rod 23 extending through an opening 13a formed in the field member 13, and the other end thereof being secured to a sound wave responsive diaphragm 24 supported about its periphery by suitable clamping means 25. Normally, the armature 21 occupies a position wherein the opposite ends thereof are disposed intermediate the adjacent pole pieces of the two sets and is adapted to be vibrated by the rod 23 when the diaphragm 24 is vibrated by sound waves impinging thereon. Thus, the movement of the armature 21 is controlled in accordance with the vibratory movements of the diaphragm 24, the vibratory movements of the diaphragm 24 corresponding to the vibrations of the air produced by the sound to be transmitted. As the armature 21 is moved in a clockwise direction about its pivot, the magnetic field of the field structure 10 transverses a path extending from the north pole of the permanent magnet 12 by way of the field member 13, the pole piece 16, the armature 21, the pole piece 17, and the field member 14 to the south pole of the permanent magnet 12. On the other hand, when the armature is moved in a counterclockwise direction about its pivot, the magnetic field of the field structure 10 traverses a path extending from the north pole of the permanent magnet 12 by way of the field member 13, the pole piece 15, the armature 21, the pole piece 18, and the field member 14 to the south pole of the permanent magnet 12. Thus, during the vibratory movements of the armature 21, the magnetic field of the field structure 10 traverses the armature 21 in opposite directions, causing a corresponding electromotive force to be generated in the winding 20 electromagnetically coupled thereto. The electromotive force generated in the winding 20 is transmitted to a distant point where it is utilized in a suitable receiver or other translating device to reproduce the sound transmitted in a well-known manner.

The winding spool and armature assembly 11B illustrated in Figs. 2, 3 and 4, comprises a winding spool 40 formed of insulating material such as "Bakelite" and an armature 41 formed of flat magnetic stock. The winding spool 40 is split longitudinally and comprises two complementary upper and lower sections 40a and 40b, respectively, of similar construction. Each of the sections includes a body 42 carrying two spaced-apart winding retaining heads 43. The wall of the body 42 of the lower section 40b is provided with a longitudinally extending recess 42a therein, which is disposed adjacent the joint between the upper and lower sections 40a and 40b, respectively. The wall of the body of the upper section 40a is substantially flat adjacent the joint between the upper and lower sections 40a and 40b, respectively. The armature 41 is provided with a longitudinally extending operating lug 41a and two transversely extending spaced-apart lugs 47 intermediate the ends thereof. Each of the lugs 47 projects from one side of the armature 41 and is provided with a head 47a connected by a length 47b to the armature 41, the length 47b being of reduced cross-sectional area. The armature 41 is arranged in a recess 42a provided in the wall of the body 42 of the lower section 40b, the armature 41 being retained in position by spaced-apart and aligned recesses 42b in the lower section 40b and receiving the heads 47a on the lugs 47. The lugs 47 are retained in the recesses 42b provided in the body 42 of the lower section 40b by two mounting clips 48. As best shown in Fig. 5, each of the clips 48 is of substantially U-shape, comprising two flanges 49 and 50, the flange 50 being provided with three spaced-apart fingers 51, 52 and 53. Each of the clips 48 embraces one side of the body 42 of the lower section 40b, the clip 48 being retained in place by the clamping action between the two outside fingers 51 and 53 and the flange 49 upon the body 42. The intermediate finger 52 on the clip 48 engages the head 47a on one of the lugs 47, thereby rigidly securing the lug to the body 42 of the lower section 40b. The clips 48 mount the armature 41 on the body 42 of the lower section 40b for vibratory movements about an axis extending between the lugs 47 transversely of the winding spool 40.

In constructing the assembly 11B the armature 41 is brought into position with respect to the recess 42a provided in the body 42 of the pre-formed lower section 40b of the winding spool 40 and lowered into place, the heads 47a on the lugs 47 being received in the recesses 42b formed in the body 42. The clips 48 are then placed upon the sides of the body 42 and the outside fingers 51 and 53 and the flange 49 are bent into engagement with the body 42 in order securely to fasten the clips 48 thereto. The armature 41 is then aligned and the intermediate fingers 52 are then bent into engagement with the heads 47a on the lugs 47, in order securely to retain the armature 41 in position. The preformed upper section 40a is then brought into superimposed relation with the lower section 40b to complete the assembly 11B, the upper and lower sections 40a and 40b, respectively, being retained together by the field structure of the telephone transmitter in any suitable manner.

The armature 41 vibrates out of contact with the walls of the bodies 42 of the upper and lower sections 40a and 40b, respectively, due to the recess 42a provided in the body 42 of the lower section 40b and the fact that the substantially flat wall of the body of the upper section 40a adjacent the joint between the upper and lower sections 40a and 40b, respectively, is spaced a short distance from the upper surface of the

armature 41 by the flanges 50 on the clips 48, the wall of the body of the upper section 40a being recessed only partially to receive the flanges 50 on the clips 48. Thus, the composite body of the assembled upper and lower sections 40a and 40b, respectively, of the winding spool 40 is hollow, the walls of the individual bodies 42 of the upper and lower sections constituting a wall surrounding a narrow opening extending longitudinally therethrough; and the armature 41 is arranged within the opening in the composite body. The armature 41 is supported by the lugs 47 for vibratory movements out of contact with the wall of the composite body and about an axis extending between the lugs 47 transversely of the winding spool 40.

This torsional mounting of the armature 41 is very advantageous, as it causes the armature to be deflected an amount precisely corresponding to the force exerted upon the operating lug 41a, the deflection of the armature 41 being directly proportional to the force exerted upon the operating lug 41a over a wide range. Also the mounting clips 48 retain the armature in place on the lower section 40b of the winding spool 40 in a very satisfactory manner, as these clips being resilient compensate for any expansion or contraction of the winding spool due to temperature changes or aging. Furthermore, these clips are not included in a metallic circuit, thereby eliminating eddy current losses.

From the foregoing description it is apparent that a unitary winding spool and armature assembly for a telephone transmitter is provided, which is of rugged construction and comprises a minimum number of parts. Moreover, the assembly is compact and the pivotally mounted armature therein requires no external support. While the features of the present invention have been illustrated as being embodied in a telephone transmitter, it is apparent that they may be readily embodied in a telephone receiver or other sound translating device.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is contemplated to cover in the appended claims all such modifications as fall within the true spirit and scope of the present invention.

What is claimed is:

1. An assembly for a sound translating device comprising, in combination, a longitudinally split winding spool including two complementary sections of similar construction, each of said sections being provided with a body, an armature provided with two spaced-apart transversely extending lugs, and means including a clip for securing each of said lugs to the body of one of said sections, whereby said armature is mounted for vibratory movements about an axis extending transversely of said winding spool and out of contact with the bodies of said sections and said lugs are subjected to torsional strains when said armature is moved, each of said clips being of substantially U-shape comprising two flanges one of which is provided with three spaced-apart fingers, the two outside fingers and the other flange of said clip being arranged to clamp the body of said one section therebetween, and the intermediate finger of said clip being arranged to clamp one of said lugs to the body of said one section.

2. An assembly for a sound translating device comprising, in combination, a longitudinally split winding spool including two complementary sections of similar construction, a continuous longitudinally extending winding surrounding said sections, said sections being so constructed and arranged that there is provided adjacent the joint therebetween an opening extending longitudinally through said winding spool, and a flat plate-like armature arranged between said sections in the opening extending through said winding spool and provided with lugs extending transversely of the longitudinal axis of said winding spool and substantially in the plane of said armature, said lugs being supported entirely between said sections and entirely within said winding, whereby said armature is mounted for vibratory movements about an axis extending between said lugs transversely of the longitudinal axis of said winding spool and out of contact with said sections.

3. An assembly for a sound translating device comprising, in combination, a longitudinally split winding spool including two complementary sections of similar construction, a continuous longitudinally extending winding surrounding said sections, said sections being so constructed and arranged that there is provided adjacent the joint therebetween an opening extending longitudinally through said winding spool, a flat plate-like armature arranged between said sections in the opening extending through said winding spool and provided with lugs extending transversely of the longitudinal axis of said winding spool and substantially in the plane of said armature, and means including a clip carried by one of said sections for securing said lugs in place entirely between said sections and entirely within said winding, whereby said armature is mounted for vibratory movements about an axis extending between said lugs transversely of the longitudinal axis of said winding spool and out of contact with said sections.

4. An assembly for a sound translating device comprising, in combination, a longitudinally split winding spool including two complementary sections of similar construction, each of said sections being provided with a longitudinally extending body, a continuous longitudinally extending winding surrounding the bodies of said sections, the body of one of said sections having a longitudinally extending recess disposed therein adjacent the joint between said sections, a flat plate-like armature arranged in the recess in the body of said one section and provided with lugs extending transversely of the longitudinal axis of said winding spool and substantially in the plane of said armature, and means for securing said lugs to the body of said one section, whereby said armature is mounted entirely between said sections and entirely within said winding for vibratory movements about an axis extending between said lugs transversely of the longitudinal axis of said winding spool and out of contact with the bodies of said sections and said lugs are subjected to torsional strains when said armature is moved.

5. An assembly for a sound translating device comprising, in combination, a longitudinally split winding spool formed of insulating material and including two complementary sections of similar construction, a continuous longitudinally extending winding surrounding said sections, said sections being so constructed and arranged that there is provided adjacent the joint therebetween an opening extending longitudinally through said winding spool, a flat plate-like

armature formed of magnetic stock and arranged between said sections in the opening extending through said winding spool, said armature being provided with integral lugs extending transversely of the longitudinal axis of said winding spool and substantially in the plane of said armature, and means including resilient clips carried by one of said sections and engaging said lugs for supporting said lugs entirely between said sections and entirely within said winding, whereby said armature is mounted for vibratory movements about an axis extending between said lugs transversely of the longitudinal axis of said winding spool and out of contact with said sections and said lugs are subjected to torsional strains when said armature is moved.

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