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COIL ASSEMBLY

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This invention relates to the manufacture of the diaphragm and coil assembly for an electro-acoustic transducer of the moving coil type.

According to the invention there is provided a method of assembling the diaphragm unit of an electro-acoustic transducer of the moving coil type, wherein the unit includes a two part diaphragm one part which is an outer annulus while the other part is a central circular part, wherein the two parts have at their adjacent edges cylindrical skirts which are close together when the unit is assembled and together define a nest for the coil, and wherein the method includes the steps of

- (a) supporting the outer annular part and its support member about a cylindrical collet, whereafter the central circular part is applied to the collet so that the outer end of the collet supports and grips the central circular part;
- (b) moving the collet through the annular part to a coil-winding position;
- (c) winding the coil on the outer surface of the skirt on the central circular part and connecting its two ends to a pair of coil terminals;
- (d) moving the outer annular part towards the central circular part so that the skirt on the outer part and the skirt on the central circular part together define a nest for the reception of the coil, and
- (e) securing the two parts of the diaphragm together.

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An embodiment of the invention will now be described with reference to the accompanying drawing, in which Figure 1 is a side view and Figure 2 and end-on view of a first stage in the assembly, while Figures 3 and 4 are similar views of a later stage of the assembly.

We have described the invention in its application to the assembly of a part of the diaphragm and coil unit of a transducer such as that described and claimed in our Application No. 8203560 (F. Taylor et al 7-7-3-1-1-25). That application describes and claims a moving coil transducer intended for use in a telephone handset as the transmitter. The diaphragm is in two parts, one being a domed central part and the other an outer annulus. These two parts have cylindrical flanges between which the coil is located. What we describe herein is the assembly of the coil to the diaphragm.

In the first stage of the assembly, see Figures 1 and 2, the diaphragm 1 (Figure 1) terminals 2 and its support ring 1A and the terminals 2 to which the coil is to be connected are mounted on a sleeve 3, the end of which is profiled to support the diaphragm, and is bored to slide on a collet 4. The end of the collet 4 is split and sprung outwards to grip the aluminium dome 5, which forms the central portion of the diaphragm. This dome also has a cylindrical skirt. The action of sliding the sleeve 3 forwards compresses the collet 4 so that it releases the dome 5.

The collet is attached or is part of, the spindle of a coil-winding machine. Mounted within the collet are two retractable wire guides 6 which retract when the sleeve 3 is moved forward.

During the normal operation, the wire 7 to be wound on the skirt to form the speech coil is attached to an anchor pin 8 and passes through a winding nozzle 9, the position of which is determined by a three-axis numerical control system, i.e. it can have imparted to it x, y and z motions.

With the winding spindle in a preset fixed position, as shown in Figure 1, the nozzle 9 is programmed to follow a circular path several times around one of the terminals 2 and is then routed behind one of the wire guides 6 to a point on the traverse path for winding the coil 11 (Figure 2), which when wound is on the skirt.

Coil-winding then takes place in the conventional way with the collet assembly rotating and the nozzle controlled by a numerical control arrangement to cause layering of the wire to give a multi-layer coil. A jet of hot air 10 (Figure 4) bonds the wire together.

Upon completion of the winding, the sleeve 3, plus the coil, is brought to rest in the predetermined position, and the nozzle 9 (Figure 2) is programmed to direct the wire around the other one of the two wire guides 6 (Figure 2), then several times round the other terminal 2 (Figure 2) and finally several times round the anchor pin 8 (Figure 2) coming to rest in the parking position to await the next sequence. A breaker arm severs the wire between the anchor pin 8 and each of the terminals.

A tailstock (not shown) supports the dome with its coil while the sleeve 3 (Figure 3) is slid forward until the coil is seated in its nest between the outer annular part of the diaphragm and the dome. Note that as the sleeve 3 (Figure 3) moves forward, the wire guides 6 retract, leaving slack in the wire to accommodate relative movement between the terminals 2 and the coil 11.

The terminals are then pressed home into tunnel-like recesses in the support member for the outer annular part of the diaphragm. The complete assembly is then removed from the machine.

After assembly as just described, a spot of solvent and or adhesive is dropped on to the edge of the coil to ensure a positive bond between the coil and the diaphragm.

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A special feature of the above is the method of manufacturing the diaphragm and the coil, is that accurate control of the concentricity of the coil to the datum surface on the support ring can be achieved. This support ring is the end face of a cylindrical shell the inner face of which is the datum surface and which defines the relative positions of elements of the transducer. This ensures an accurate alignment with the magnetic polegap in the subsequent assembly. Another merit of the above method is that a strong bond is achieved between the coil and the diaphragm. The coil former, i.e. the cylindrical skirt on the dome is of a relatively rigid material such as aluminium. This winding of the coil on a rigid former ensures excellent stability of the coil. Finally, the method described above is compatible with fully automated assembly.

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CLAIMS :

1. A method of assembling the diaphragm unit of an electro-acoustic transducer of the moving coil type, wherein the unit includes a two part diaphragm one part
5 which is an outer annulus while the other part is a central circular part, wherein the two parts have at their adjacent edges cylindrical skirts which are close together when the unit is assembled and together define a nest for the coil, and wherein the method includes the
10 steps of
 - (a) supporting the outer annular part and its support member about a cylindrical collet, whereafter the central circular part is applied to the collet so that the outer end of the collet supports and grips the
15 central circular part;
 - (b) moving the collet through the annular part to a coil-winding position;
 - (c) winding the coil on the outer surface of the skirt on the central circular part and connecting its two
20 ends to a pair of coil terminals;
 - (d) moving the outer annular part towards the central circular part so that the skirt on the outer part and the skirt on the central circular part together define a nest for the reception of the coil, and
25 (e) securing the two parts of the diaphragm together.
 2. A method as claimed in claim 1, wherein the collet includes guide members which are extended to guide the wire between the coil and terminals to which the ends of the wires are secured, and are retracted after the
30 coil winding and the securing have been effected.
 3. A method of assembly the diaphragm unit of an electro-acoustic transducer substantially as described with reference to the accompanying drawings.
 4. A diaphragm unit for an electro-acoustic
35 transducer made by the method of claims 1, 2 or 3.
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