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ASSEMBLY USING ULTRASONICS

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This invention relates to a method of and apparatus for the assembly of a multi-component device.

According to the invention there is provided a method of assembling a device, which includes one or more components located inside a two or more piece structure, in which the internal component or components is or are assembled within a shell which forms part of the structure and are accurately located therein, in which a cover member which also forms part of the structure is provided for the device, which cover member has studs which extend inwardly when the cover member is in use, and in which the assembly involves the steps of placing the cover member over the shell with the internal component or components in position, the studs then being in engagement with the inside of the shell and with at least one internally-located component, and subjecting the cover member to ultrasonic vibrations and pressure, which causes the studs to deform due to the pressure and to the effect of the ultrasonic vibrations, which deformation causes the studs to collapse so that the cover member is moved inwardly of the device and the studs collapse against the inside of the shell and around part of a said internally-located component or components.

An example of the sort of device which may be assembled by the above method is an electro-acoustic transducer, and the invention is further described as applied to the assembly of parts of a moving coil

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transducer such as described in our Application No. 8203650 (Serial No. 2114855).

Thus the invention also provides a method of assembling an electro-acoustic transducer assembly, which includes a magnet assembly accurately located within a shell which forms part of a two-piece structure, in which the structure also includes a cover member having studs which extend inwardly when the cover member is in use, and in which the assembly involves the steps of placing the cover member over the shell with the studs each in engagement with the inside of the shell and with part of the magnet assembly, and subjecting the cover member to ultrasonic vibrations and to pressure as a result of which the studs deform due to the pressure and to the effect of the ultrasonic vibrations, which deformation causes the studs to collapse so that the cover member is moved inwardly of the device and the studs collapse against the inside of the shell and around part of the magnet assembly to secure the magnet assembly in place within the shell.

An embodiment of the invention will now be described with reference to the accompanying drawing, which shows in Figures 1 and 2 two stages of the novel assembly technique.

Referring now to the drawing, Figure 1 is a cross section of a circular component assembly, in the present case an electro-acoustic transducer. An outer plastics shell 1, supports three components 2, 3 and 4, which have been prepositioned with a controlled gap 5. In the case of the transducer, these three components are the transducer's magnetic circuit, these being a ring-shaped magnet 2, disc-shaped pole-piece 3 and yoke plus polepiece 4. The controlled gap 5 receives the moving coil of the transducer. A plastics cover 6, has six circular studs such as 7, moulded integral with it. To complete the assembly, the above components are supported on a solid base 8, and pressure and ultrasonic vibrations are applied thereto by means of a transducer 9. This

causes the studs 7 to deform due to the vibration and to collapse around the components 2 and 4, thus retaining them in the preset position. At the same time an energy concentrator 11, which is part of the shell, (Figure 1) fuses into the cover and completes the seal.

Thus the now collapsed studs retain the components of the microphone in the correct relative positions, while the joint formed by the energy concentrator holds the microphone together.

After the assembly described above, the transducer is completed by assembling to it the diaphragm and moving coil, plus the front cover. Thus the final product in the present example is a transducer of the type described in the above application. Although the method has been described as applied to the assembly of an electro-acoustic transducer, it should be noted that it is not so limited. Further, the number of components involved is not critical; any number of components can be secured. Further, the plastics parts, such as the cover 6, can be any shape. The studs such as 7, need not be circular in cross-section and can be of any number. The only critical factor is that their total strength is significantly less than the strength of the main structure.

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CLAIMS :

1. A method of assembling a device, which includes one or more components located inside a two or more piece structure, in which the internal component or components is or are assembled within a shell which forms part of the structure and are accurately located therein, in which a cover member which also forms part of the structure is provided for the device, which cover member has studs which extend inwardly when the cover member is in use, and in which the assembly involves the steps of placing the cover member over the shell with the internal component or components in position, the studs then being in engagement with the inside of the shell and with at least one internally-located component, and subjecting the cover member to ultrasonic vibrations and pressure, which causes the studs to deform due to the pressure and to the effect of the ultrasonic vibrations, which deformation causes the studs to collapse so that the cover member is moved inwardly of the device and the studs collapse against the inside of the shell and around part of a said internally-located component or components.

2. A method of assembling an electro-acoustic transducer assembly, which includes a magnet assembly accurately located within a shell which forms part of a two-piece structure, in which the structure also includes a cover member having studs which extend inwardly when the cover member is in use, and in which the assembly involves the steps of placing the cover member over the shell with the studs each in engagement with the inside of the shell and with part of the magnet assembly, and subjecting the cover member to ultrasonic vibrations and to pressure as a result of which the studs deform due to the pressure and to the effect of the ultrasonic vibrations, which deformation causes the studs to collapse so that the cover member is moved inwardly of the device and the studs collapse against the inside of the shell and around part of the magnet assembly to locate the magnet assembly within the shell.



3. A method as claimed in claim 1 or 2, in which the region of the shell to be secured to the cover has a portion therein which forms an energy concentrator, and in which the heating causes the energy concentrator to fuse to complete the seal of the cover to the shell.
- 5 4. A method of assembling an electro-acoustic transducer assembly, substantially as described with reference to the accompanying drawing.
- 10 5. An electro-acoustic transducer assembly assembled by the method of claims 1, 2, 3 or 4.
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