

[54] **DEVICE FOR INSULATEDLY ASSEMBLING
A COMPONENT FOR ELECTRICALLY
DRIVEN TIMEPIECES**

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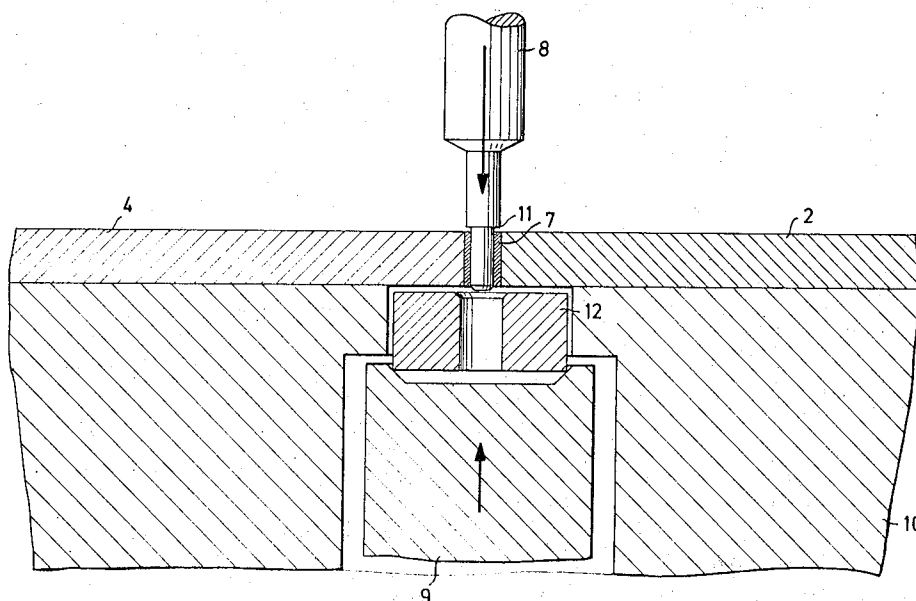
Assistant Examiner—K. J. Ramsey

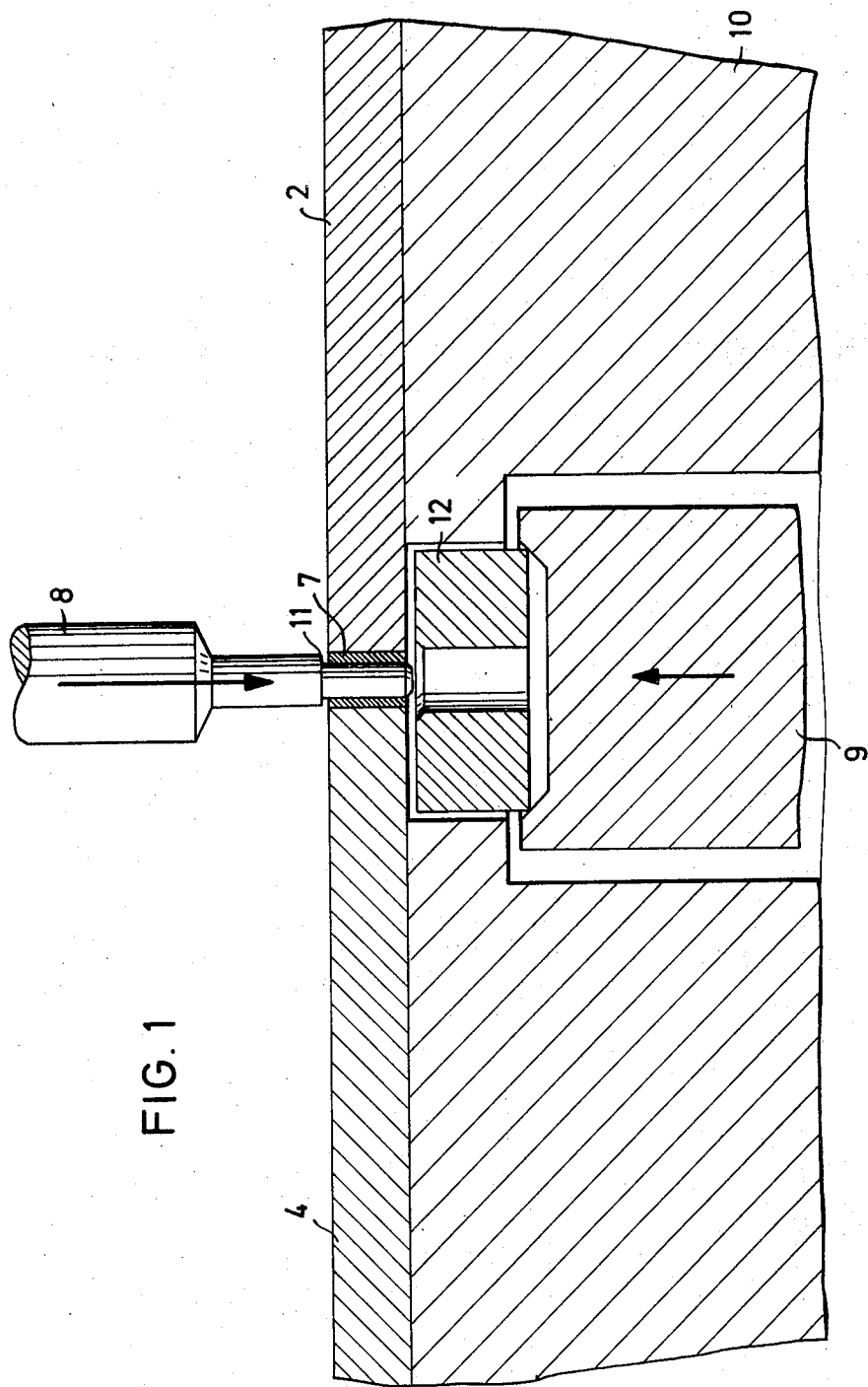
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[57] **ABSTRACT**

Device which allows to position an insulated roller on the staff of a balance wheel oscillator of a timepiece. The insulation itself is achieved by a small plate of plastic material which is formed into a tube-like part and is inserted into the hole of the aforementioned insulated roller by the help of the special tool.

9 Claims, 2 Drawing Figures





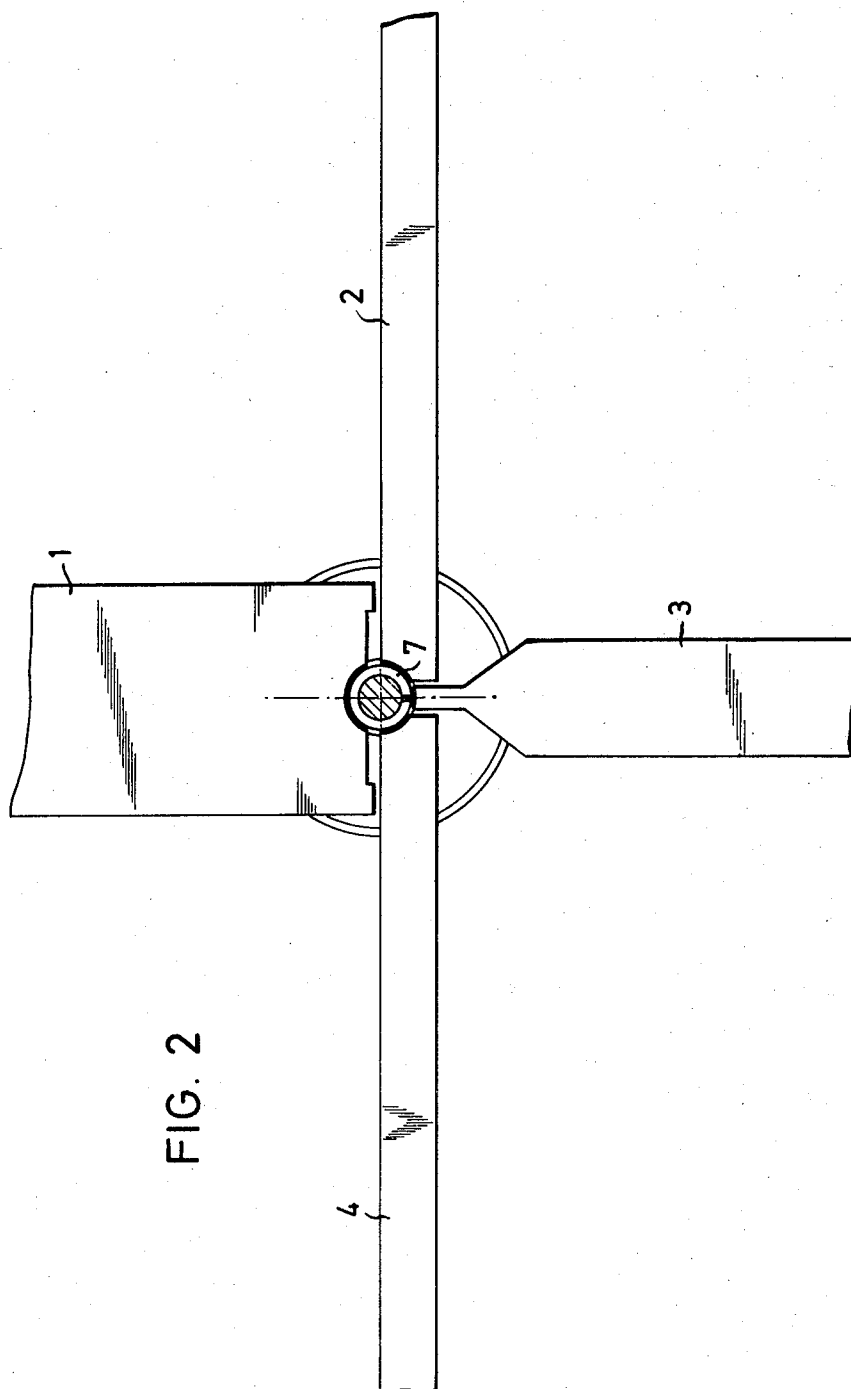


FIG. 2

DEVICE FOR INSULATEDLY ASSEMBLING A COMPONENT FOR ELECTRICALLY DRIVEN TIMEPIECES

BACKGROUND OF THE INVENTION

This application constitutes the subject matter of my copending German application, Ser. No. 21 64 677, filed Dec. 27, 1971.

It is required in electrically driven timepieces that various, current-carrying components be positioned insulatedly from the movement frame. Difficulties principally arise when the insulated component is to be assembled to a balance wheel oscillator, for example. Insulated positioning of components on balance wheels is especially necessary in electrically driven timepieces with movable coil. In the latter case at least two coil terminals must permanently be bonded together with the electric switching circuit and be insulated from each other. This requires that a spring element being fastened on the balance wheel be connected to one coil terminal as well as to the switching circuit and thereby remain insulated from the other movement frame.

In the past, this task was solved by connecting the inner tail of a hairspring with a roller being insulatedly positioned on the staff of the balance wheel oscillator. The other hairspring tail was insulated from the movement frame and bonded together with the electric switching circuit. The roller being insulatedly positioned on the staff of the balance wheel oscillator was connected to one coil terminal. Insulation of this roller was performed by means of a plastic bushing that was driven in between the balance staff and the roller. The bushing was made either in cutting operations (turning operations) or in die-casting processes. Turning of such very small plastic bushings, as they are needed for electrically driven wrist-watches, causes considerable difficulties and costs due to the unfavourable chip formation of plastics and the prescribed high centricity of hole and outside diameter. When die-casting plastic parts chips also occur at the point of injection which cause high expenses when removing them. Besides, the required centricity is only reached when putting up with considerable expense. Using an eccentric bushing means that the spring element being assembled after having poised the oscillator, would cause a dependence on positions for the oscillating frequency of the balance wheel oscillator due to the resulting dispoise.

SUMMARY OF THE INVENTION

According to the present invention the device makes possible to position a roller on the staff of a balance wheel oscillator in a simple and cheap way without encountering problems dealing with the eccentricity of the said roller.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1 and 2 illustrate an embodiment of the instant invention. Other objects and advantages may be more clearly seen when viewed in conjunction with the accompanying drawings wherein:

FIG. 1 is a sectional view of the device pursuant to the invention.

FIG. 2 shows the device with the slides 1 to 4 after the third and last operation.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 shows the roller 12 being inserted in the tool. Above the center hole of roller 12, there is a punch 8 serving for inserting the insulating bushing being made by the tool.

FIG. 2 shows the tube-like shape of the small plate 7 being achieved by the help of the slides 1 to 4 in the tool. The small plate 7 is first positioned on slide 1 and fixed there by vacuum channels. Slide 1 is provided with a recess into which the rectangular small plate 7 is inserted. Slide 1 furthermore has a center groove which allows the small plate 7 to later adapt to the roundness of punch 8 in FIG. 1. As soon as slide 1 moves to the center of the tool, the small plate 7 is bent around the punch 8, the slides 2 and 4 move to their inner final position and bend the small plate 7 around the punch 8. Finally the slide 3 moves to the center of the tool and forms the small plate 7 into a closed tube. As soon as the working position according to FIG. 2 is reached, the component 9 is lifted in the direction of arrow, as shown in FIG. 1, whereby the roller 12 is pressed against the slides. Now, small plate 7 can be driven in the center hole of roller 12 by means of shoulder 11 of punch 8. In order to allow this process, it is required that the outside diameter of the small plate 7 being formed by the slides, be about 0.000394 inch (0.01 mm) smaller than the diameter of the center hole of roller 12. As shown in FIG. 2, the connection point of the tube where the two ends of the small plate 7 meet, does not coincide with a point of abutment between slides 1 to 4. This avoids that fibers projecting from the ends of the small plate 7 may get jammed between the slides and may have disturbing effects when driving the small plate 7 in the center hole of roller 12. Besides, such fibers may adhere to the workpiece after the assembly of the small plate 7 as more or less loose particles and would later interfere with the function of the timepiece movement unless they are removed in the course of a careful control.

Besides the advantages mentioned above, the instant invention allows to make the small plate 7 being transformed into an insulating tube out of every elastic plastic or other insulating material. The economical machinability or the die-casting property of various materials need not be taken into account. The designer is in a position of using heat-resisting insulating materials. The use of heat-resisting insulating materials for this application is advantageous as the electrically driven balance wheel oscillator with movable coil is considerably heated in the course of subsequent operations, for example when fastening the coil. The eccentricity resulting between the inside diameter of the insulator and the inside diameter of roller 12 is small as the material thickness of small plate 7 changes very slightly only in its length. The roller 12 is forced on the staff of the balance wheel oscillator in the known way, whereby the insulating small plate 7 is positioned between the staff of the balance wheel oscillator and the roller 12. The thickness and the length of the small plate 7 are calculated according to the following formulae:

$$L = \pi(D^2 - (d-2p)^2) / 4S$$

$$S = D - d/2 + p$$

L = length of small plate 7

S = thickness of small plate 7

D = hole diameter of roller 12

d = diameter of the staff to which the roller 12 is assembled

p = press thickness

It is to be understood that the above described arrangement is an illustration example of the application only. Numerous other arrangements may readily be devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

I claim:

1. In a method for insulating and assembling an apertured component upon a staff of an electric timepiece, the steps comprising:

- a. providing a plate of deformable insulating material;
- b. forming the plate into tubular form about a mandrel by pressing the plate to the mandrel with a plurality of forming slides arranged circumferentially of the mandrel;
- c. orienting the apertured component so that its aperture is immediately adjacent one end of the formed tube and is aligned with the tube; and
- d. forcing the formed tube from supportive contact with the forming slides directly into the aperture in the component, whereby deformation of the tubular configuration of the tube during insertion of the tube into the aperture is avoided.

2. The method of claim 1 wherein the deformable plate is formed into a completely closed tube.

3. The method of claim 1 wherein the forming process of the tube is effected by four forming slides.

4. The method of claim 3 wherein adjacent slides are movable at right angles to each other.

5. The method of claim 1, the deformable plate and the slides are mutually oriented so that adjacent or abutting ends of the subsequently formed plate do not coincide with points of abutment of adjacent slides.

6. The method of claim 1 wherein the thickness of the deformable plate is less than a third of the inside diameter of the subsequently formed tube.

7. The method of claim 1 wherein the diameter of the aperture in the component is less than one millimeter.

8. The method of claim 1 including the step of assembling the thus insulated, apertured component about a staff of a balance wheel oscillator of an electrically driven timepiece.

9. A method for insulatingly assembling an apertured component upon the staff of a balance wheel oscillator of an electrically driven timepiece, comprising:

- a. providing a plate of deformable insulating material;
- b. providing a mandrel having a forming length, the forming length terminating at one end in a shoulder of greater diameter than the forming length but of lesser diameter than the aperture of the apertured component;
- c. forming the plate into tubular form about the forming length of the mandrel by pressing the plate to the mandrel with a plurality of forming slides arranged circumferentially of the mandrel, the plate being pre-oriented with respect to the slides so that adjacent or abutting ends of the resultant tube are misaligned with points of abutment between adjacent slides;
- d. orienting the apertured component and mandrel so that the aperture of the component is aligned with the formed tube and immediately adjacent one end of the tube;
- e. forcing the mandrel into the aperture of the component, the shoulder of the mandrel contacting the formed tube and forcing the formed tube from its supportive contact with the forming slides directly into the aperture in the component, whereby deformation of the tube during insertion thereof into the component is avoided; and
- f. removing the mandrel and assembling the apertured, insulated component about the staff of a balance wheel oscillator.

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