

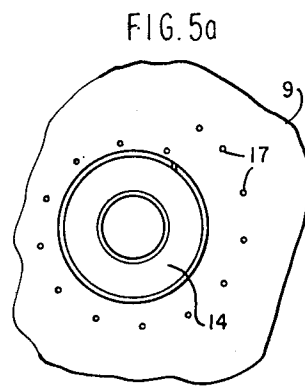
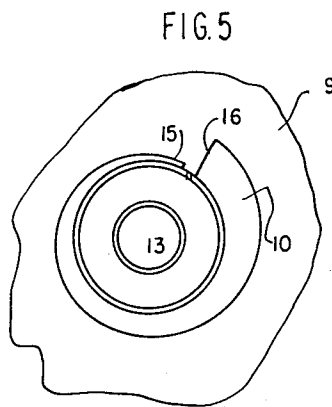
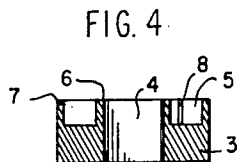
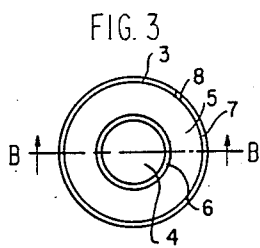
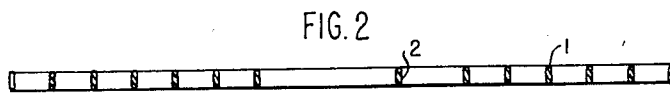
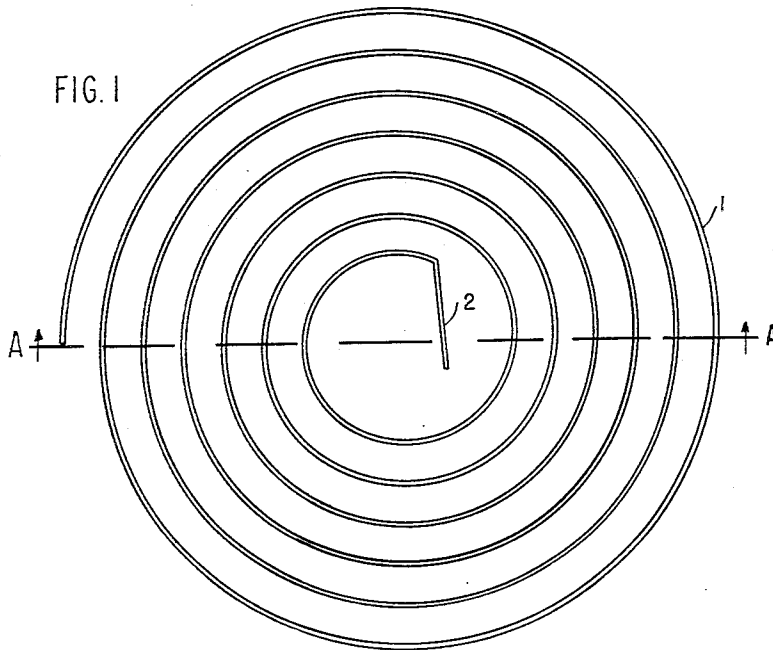
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T. P. DOLBY
HAIRSPRING ASSEMBLY

2,649,684

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3 Sheets-Sheet 1



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FIG. 6

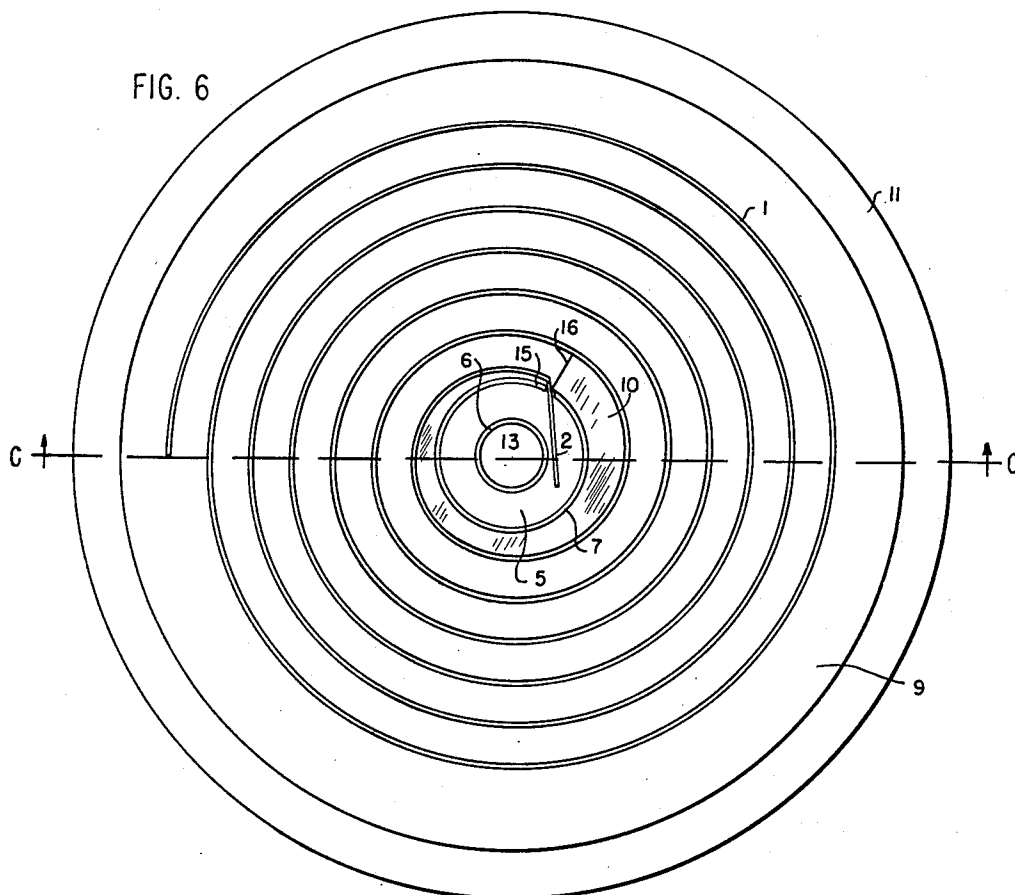
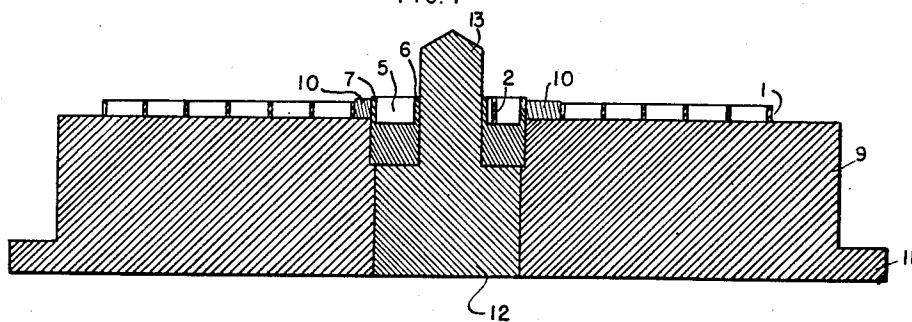


FIG. 7



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FIG. 8

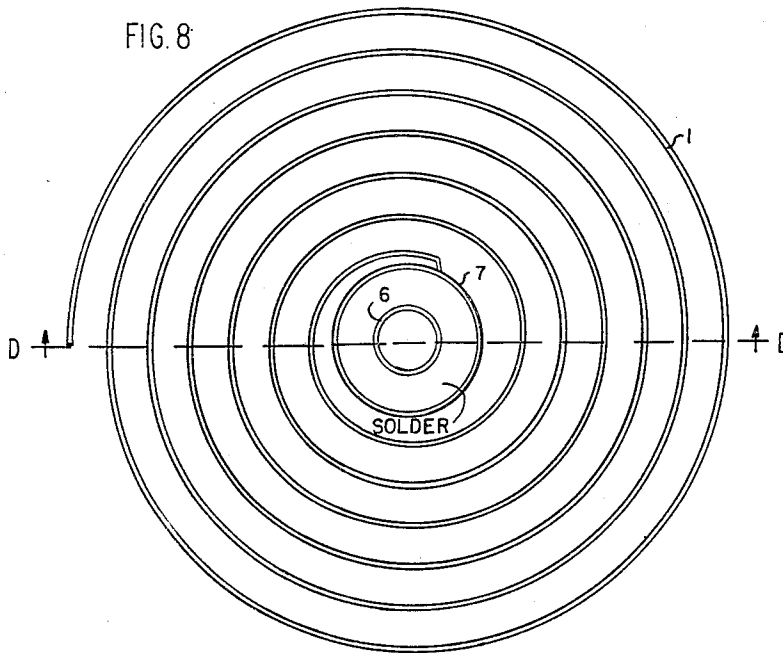


FIG. 9

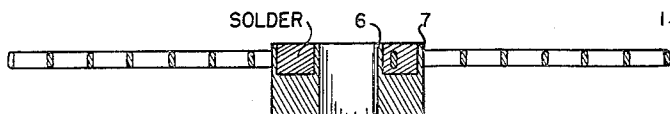
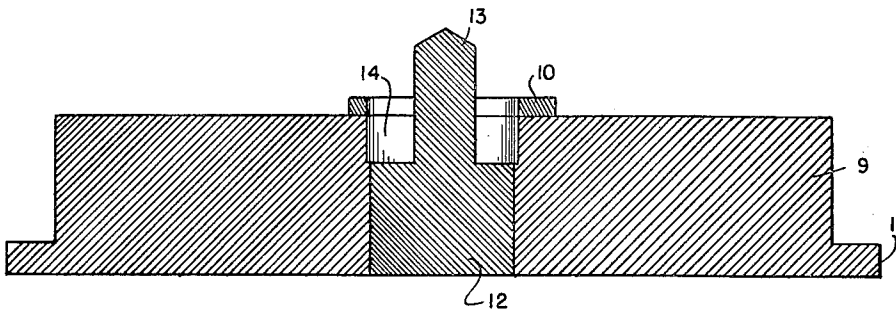


FIG. 10



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HAIRSPRING ASSEMBLY

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Application February 10, 1949, Serial No. 75,593

4 Claims. (Cl. 58—115)

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My invention relates in general to an improved hair spring assembly for time pieces and more specifically to a novel method of securing the end section of the hair spring of a time piece to the collet.

All timing units include a balance staff with a collet or hub to which one end of a hair spring must be secured while the other end of the spring is fastened to a rigid point. This spring is the heart of the timing movement and must be perfectly true and lie in a plane horizontal to the axis of the shaft.

Several methods have been practiced and proposed for securing the inner end of a hair spring to the collet. In most of these previous methods the spring end was secured to the collet by being clamped in a slot in the outer edge thereof. Such methods usually require "leveling" or "truing" operations due to the liability of a slight twist or variation in assembly, and such operations are costly and require great skill and patience.

An object of my invention, therefore, is to provide a hair spring assembly which is always uniform and requires no expert craftsmen to true the same after assembly.

A further object is to provide a novel method of securing the hair spring to the collet so as to provide the above uniformity and produce the completed assembly at much less cost of manufacture.

A feature of the invention is the provision of a method of securing a hairspring to its collet in such a manner that the spring will always be properly centered relative to the collet and also be in the same horizontal plane with the collet and which plane is at right angles to the axis of the balance shaft when the collet is mounted thereon. In horological terms the spring would be true "in the round" and "in the flat" without further operations.

This result is accomplished by using an assembly tool and a spiral shaped centering form to hold the spring in its proper position and then filling an opening in the collet, into which the end of the spring is inserted, with a molten metal which when hardened holds the spring and collet in true relationship.

Further details of the invention will be understood from the following detailed description in conjunction with the accompanying drawings in which:

Fig. 1 is a top view of the usual hair spring showing the form of the spirals and bends therein;

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Fig. 2 is a sectional view thereof taken on line A—A of Fig. 1;

Fig. 3 is a top view of the collet;

Fig. 4 is a sectional view of the collet taken on line B—B of Fig. 3;

Fig. 5 is a top view of the spiral shaped centering form lying in place on the assembly tool;

Fig. 5a is a modified form of centering arrangement;

Fig. 6 is a top view of the collet, spring and form in place on the assembly tool;

Fig. 7 is a sectional view taken along line C—C in Fig. 6;

Fig. 8 is a top view of the hair spring assembly after removal from the tool and form.

Fig. 9 is a sectional view of the complete assembly taken along line D—D in Fig. 8;

Fig. 10 is a sectional view of the tool and form after removal of the assembly.

Referring now to Fig. 1, I have shown the hair spring and it will be seen that such springs when formed have the spiral coil arrangement shown and have a tail portion 2 bent at a particular angle to the body of the spring. The collet 3 is formed as shown in Figs. 3 and 4 with a center opening 4 designed to fit tightly on the balance staff of the timing unit. A cup-like recess 5 is formed as shown with a thin inner wall 6 and a thin outer wall 7. There is a narrow saw slot 8 cut at an angle through the outer wall. This slot is slightly wider than the thickness of the hair spring 1. Fig. 4 shows the collet in section showing the cup shaped portion which is deeper than the width of the spring.

In Fig. 5 I have shown a broken out section of the top of the assembly tool 9 with the centering form 10 in place thereon. The form as shown is of a spiral shape and is designed to hold the hair spring in its correct relationship to the collet when the tail piece 2 is inserted in the saw slot 8 and the spring laid around the form. The assembly tool 9 is better shown in Figures 6, 7 and 9. It consists of a heavy body portion with a flange 11 and a center piece 12 having an upward projecting stud 13 with a cup-shaped space 14 into which the collet fits snugly with the walls 6 and 7 projecting above the upper surface of tool 9 and with the bottom of cup 5 lying slightly below the upper surface of tool 9 as shown in Fig. 7.

The spiral form is now placed as shown in Figures 5, 6 and 7 around the collet on top surface of tool 9 with the opening between points 15 and 16 of the centering form opposite the saw slot 8. The hair spring is now placed as shown in Fig-

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ures 6 and 7 with the inner coil adjacent the outer edge of form 10 with the tail piece 2 passing through slot 8. In this position the piece 2 does not touch the sides of slot 8 nor does it touch the bottom of opening 5 in the collet and the bottom edges of all the coils of the spring lie flat on the upper surface of tool 9.

With the parts in this position the spring and collet are in the exact relationship in which they are to be when finally fastened together. At this time the tool 9 may be heated to a temperature sufficient to melt soft solder or other like material with a low melting point. The melted solder is then poured into the cup shaped opening 5 in the collet to a point where it covers the tail piece 2 of the hair spring and the tool is then cooled to harden the solder and thus rigidly bond the spring and collet together in the proper relationship.

In Figures 8, 9 and 10 I have shown the parts after cooling. Fig. 8 is a top view of the assembled spring and collet as removed from the assembly tool with the solder in the cup of the collet holding the spring rigid therewith. Figure 9 is a sectional view taken along lines D—D of Fig. 8 showing how the solder has the tail piece 2 of spring 1 embedded therein and the parts thus secured. Fig. 10 merely shows again the relationship of the centering form 10 as it lies on the top of tool 9 around the opening from which the assembled collet has been withdrawn.

In Figure 5a I have shown a modified arrangement in which a series of pins 17 are secured in the top surface of tool 9 to form the spiral centering form. The pins are so arranged that they form a spiral of the shape exactly the same in contour as the outer surface of form 10 so that a hair spring may be placed with its inner coil around these pins in the same manner as it is placed around form 10 in Fig. 6.

It will thus be seen that I have provided a novel method of assembling the spring and collet of a timing unit in such a manner that a predetermined relationship is insured by a simple operation and that the old tedious and expensive truing operations can be dispensed with. Further, although I have shown a detailed construction of parts and described a certain process, it will be understood that certain variations in operation or materials and in the shape of the parts will fall within the scope of the invention as set forth in the appended claims.

What is claimed is:

1. In a hair spring assembly, a spiral hair spring, a collet having an opening for assembling it to a balance staff, a ring shaped opening having thin outer and inner walls, a slot through the outer wall through which the inner end of the spring extends, and a mass of low melting point material hardened around the end of said spring in said ring-shaped opening around said end and

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thereby rigidly securing said inner end of the spring within said slot with the coils of the spring in a predetermined proper relationship with the axis of the collet.

2. A hair spring assembly comprising a spiral coiled hair spring having its inner end bent at an angle to the coils, a collet having a center opening for assembling it on a balance staff of a timing unit, an opening around the center opening, a slot extending into said opening, and a mass of low melting point material hardened within said opening around the inner end of said spring to hold the spring and collet in horizontal and centered relationship.

3. In a hair spring assembly, a collet having an opening in the upper surface thereof with a slot through which the inner end of a hair spring is inserted, means for holding the spring in fixed centered and horizontal relation with the collet with said inner end spaced from the edges of the slot and the surfaces of the opening, consisting of a melted material hardened within said opening to bond the collet and spring.

4. In a hair spring assembly for use in a timing unit, a collet having a center opening for attaching the assembly to a balance staff, a ring shaped recess extending around the opening having thin inner and outer walls, a slot extending through the outer wall of the recess, a flat spiral hair spring having a tail piece on its inner spiral, said tail piece inserted through the slot and into the recess, and a low melting point hardened material within said recess and holding the spring and collet rigidly in position with the end of the spring in said slot and the spirals thereof in a predetermined position relative the collet.

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