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CHOKEN SUZUKI

3,306,028

SHOCK-PROOF DEVICE FOR WATCHES

Filed Jan. 4, 1966

FIG. 1

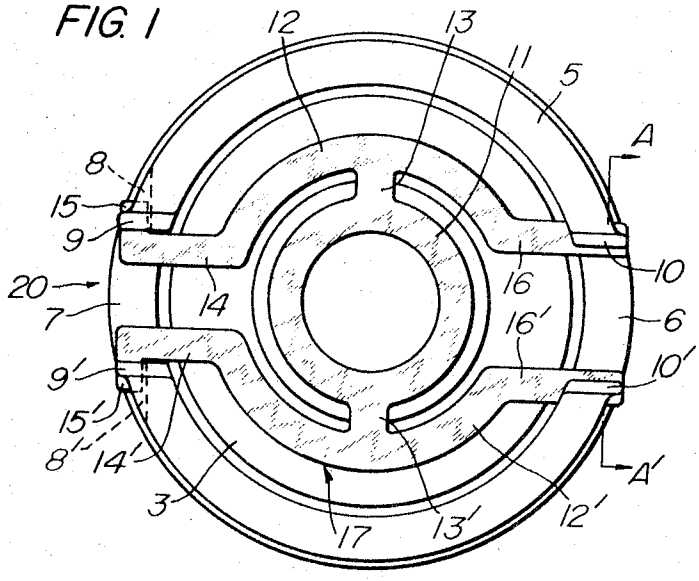


FIG. 2

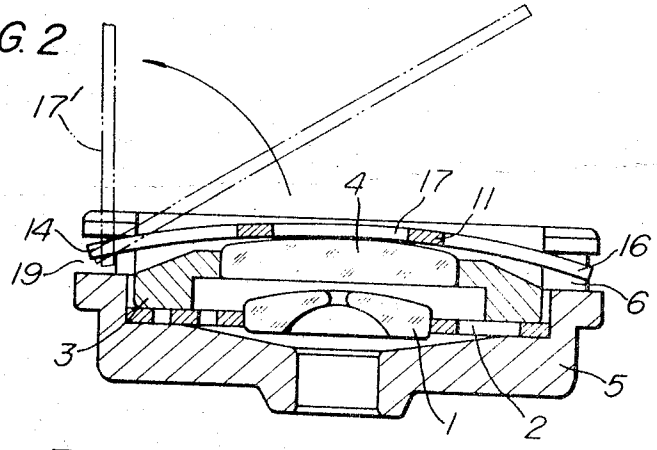
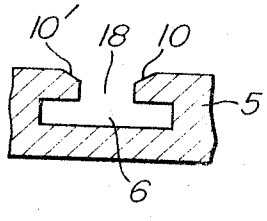


FIG. 3



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SHOCK-PROOF DEVICE FOR WATCHES

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The present invention relates to a shock-proof device for use in watches. Fixing the frame of a shock-proof device to the plate and/or the balance cock of a watch has been effected, in conventional shock-proof devices, either by the use of prong springs or screws or by the force-fit procedure. The latter procedure enables the frame to be placed in the right position, but the former technique which uses prong springs or screws could not avoid the development of a play or gap to be formed at such portion where the frame was inserted between the plate and the balance cock and hence the disadvantage that exact positioning of the frame was not guaranteed.

Also, it has been the practice in conventional shock-proof devices that the attachment and the detachment of a cap jewel spring were accomplished, in the device of one type, by rotating the spring in a horizontal plane with in an annular groove provided on the internal circumference of the upper wall of the frame, whereas in the device of another type, one end of the cap jewel spring was adapted to engage the frame all the time while the other end of the spring was adapted to make pivotal movement in a direction perpendicular to said frame about the portion where the spring engaged with the frame. The device of this former type in which the cap jewel spring was adapted to be detached altogether from the frame as a result of the rotation of the spring had such shortcomings that a greater number of parts were required, plus the fear that the spring might be lost due to its casual disengagement from the frame, and further that the spring which was arranged to be rotated within the groove of the frame caused the frame body to be scraped by the frictions of the spring and the dust of the frame thus produced intruded into the interstice formed around the periphery of the balance staff which was to be protected by the shock-proof device, and affected the sound movement of the balance staff.

From the foregoing discussion, it is clear that the preferred arrangement of the spring for the cap jewel is one wherein one end of the spring is adapted to permanently engage the frame at normal times, as has been described in connection with said device of another type in the preceding paragraph. In the shock-proof devices of the conventional type, it was impossible to engage or disengage a cap jewel spring with or from the frame unless said frame is previously separated from either the plate or from the balance cock. For the purpose of replacing a cap jewel spring due to possible breaking of the cap jewel spring, it was necessary for the conventional devices of such kind to use a pair of frames both of which were undesirably secured to the plate or to a balance cock by said prong springs or screws to effect, when required, separation of the frames from either the plate or the balance cock.

The present invention contemplates elimination of such shortcomings of the conventional devices as have been discussed. According to the device of the present invention, the frame not only is positioned exactly at the right place but also it is disposed so as to be kept free from movement due to the insertion of the frame under tension into the plate or the balance cock, and in addition, the ends of both the cap jewel spring and the frame which are adapted to engage with each other permanently are divided into two legs to permit an easy attachment or detachment of the cap jewel spring without the need to separate the frame from either the plate or the balance cock and further without the necessity of rotating the cap jewel spring. Therefore, such hazards as possible missing of the cap jewel spring due to its casual disengagement from the frame and the production of dust from the friction of the frame can be completely eliminated.

The present invention will be illustrated with reference to the accompanying drawings, partly in section, showing one of the various forms of device which may be used in practicing the invention, wherein:

FIG. 1 is a plane view of the device of the present invention;

FIG. 2 is a cross-sectional view taken along the center line of the device in FIG. 1, concurrently illustrating the behaviour of the spring; and

FIG. 3 is a cross-sectional view taken along the line indicated by A–A′ in FIG. 1.

Description will now be made with respect to the drawings. In the interior portion of a base frame **5** which is inserted under tension into a plate or a balance cock (not shown), there is inserted a hole jewel spring **2** having a hole jewel **1** inserted under tension in the middle portion thereof. Above said hole jewel **1** is disposed a cap jewel **4** which is inserted under tension in the middle portion of an inner frame **3** having a channel-shaped cross-section and resting upon said hole jewel spring **2** in such manner that there is left a small clearance between the lower face of the cap jewel and the upper surface of said hole jewel.

At the upper portion of said base frame **5** are provided side grooves or slots at the bottom of the vertical slots **6** and **7** in which the legs **14** and **16** of said cap jewel spring **17** for suppressing said cap jewel **4** are adapted to be inserted. The dovetail groove **20** is defined by the vertical slot **7** extending radially to engage permanently with one end of the cap jewel spring **17** and by the side slots **8** and **8′** which intersect with the vertical slot **7** at right angles and thereby forming a dovetail groove. Also, at the portion of the base frame **5** in line with and on the side opposite to said dovetail groove **20** and in the opposite direction of said groove **20** is provided an inverted T-shaped slot **6** as shown in FIG. 3 for detachably engaging the other end **16** of the cap jewel spring **17**. Furthermore, the upper edges **9**, **9′**, **10** and **10′** of the slots **6** and **7** are provided with tapered surfaces, respectively, which are formed in radial directions and so as to face the adjacent tapered surface for the sake of facilitating the attachment and the detachment of the cap jewel spring **17**.

The cap jewel spring **17** which is inserted in the frame **5** has an annular ring portion **11** located at its middle portion for contacting the surface of the cap jewel **4**. Along the external circumference of said annular ring portion **11** are disposed semi-circular portions **12** and **12′** which are, respectively, symmetrically shaped with respect to the center of the annular ring portion **11** and these semi-circular portions **12** and **12′** are connected, respectively, to said annular ring portion **11** by branch bars **13** and **13′**. From the opposite ends of these semi-circular portions **12** and **12′** extend a pair of legs **14**, **14′** and another pair **16**, **16′** to opposite directions respectively, and in such manner that the legs extending from the opposite ends of one of the semi-circular portions are in parallel relationship relative to the legs extending from the opposite ends of the other semi-circular bar. Said pair of legs **14** and **14′** are provided with L-shaped ends **15** and **15′** extending in opposite directions relative to each other and engaging the dovetail groove **20** of said frame **5** so that said pair of legs **14** and **14′** are not detachable therefrom during normal use. Said dovetail groove **20** is provided with a space **19** which is sufficient for said L-shaped ends **15** and **15′** to effect rotation within said base frame **5**.

In view of such structure of the device of the present

invention as has been described above, in the case where a cap jewel spring 17 is inserted into a base frame 5, for engagement therewith, and where the base frame 5 is inserted under tension into a plate or a balance cock, or in the case it is required that a cap jewel spring 17 be replaced for such reason as the occurrence of the breaking of said spring, one end 15 of the L-shaped ends 15 and 15' of the legs of the cap jewel spring 17 is first inserted into the dovetail groove 20, and then the adjacent other L-shaped end 15' is placed on the tapered surface of the upper edge 9' of the dovetail groove 20 and the upper surface of said end 15' is pressed downwards with forceps or like means. The leg 15' of the cap jewel spring 17 will then develop elastic deformation while sliding along the tapered surface of the frame 5 and will be urged against the inner surface of the dovetail groove to be held at the predetermined position therein.

The cap jewel spring 17 which has been thus placed in the dovetail groove 20 is restricted with respect to the movement in vertical as well as radial directions by the slotted portion of the dovetail groove 20. The cap jewel spring 17 is restricted further with respect to its outward movement by the regulator or by the plate. Therefore, an attempt to move the cap jewel spring 17 to any arbitrary direction will never cause the L-shaped portions 15 and 15' to slip out of the dovetail groove 20. After the insertion of the legs 15 and 15' has been completed, the cap jewel spring 17 is brought to a position as shown at 17' in FIG. 2. While the spring 17 is held at such position, such parts as the hole jewel 1 and the cap jewel 4 are inserted in the base frame 5. After their insertion has been finished, the cap jewel spring 17 is swung about the L-shaped portions 15 and 15' to place the legs 16 and 16' on the tapered surfaces of the upper edges 10 and 10' of the dovetail groove, after which a pressure force is exerted onto the legs 16 and 16' from above thereof. Then, the legs 16 and 16' will readily engage the inverted T-shaped slot 6.

When it is required to clean such parts as the hole jewel 1 and the cap jewel 4, it is only necessary to displace one of the legs 16 and 16' of the cap jewel spring 17 inserted in the inverted T-shaped slot 6 inwardly thereof by the use of such means as forceps. By such exertion of force, the leg 16 will develop elastic deformation and will spring out from the notch or cut-out 18 which is provided at the upper portion of the inverted T-shaped slot 6. Subsequently, the same operation is exercised on the other leg 16', and as a result, both legs 16 and 16' are now detached from the inverted T-shaped slot 6. The cap jewel spring 17 is then displaced to a position indicated by the broken lines at 17' so that the parts as the hole jewel 1 and the cap jewel 4 may be removed from within the frame 5.

At such time, the legs 14 and 14' of the cap jewel spring 17 having L-shaped portions 15 and 15' are held in engaged relation with the dovetail groove 20, and this prevents the spring from being lost due to, for example, its casual disengagement from the groove. In view of the fact that, according to the present invention, the cap jewel spring 17 is provided with a substantially symmetrical concentric configuration, a shock which is imparted to the cap jewel 4 can be absorbed with substantial uniformity. Also, the fact that the cap jewel spring 17 contacts the cap jewel 4 along the elongated surfaces of the former permits the smooth action of the spring. In addition, the fact that the spring 17 has a lengthy area of effective

elasticity allows the engagement and the disengagement of the spring 17 with or from the frame 5 to be performed without a difficulty. Furthermore, since the cap jewel spring 17 is never rotated within the annular groove as in the case of conventional devices at the time when said spring is to be attached to or detached from the annular groove of the frame, there is no development of dust resulting from the friction between the spring and the groove, and therefore, the balance staff is not subjected to any harmful effect accruing from possible intrusion of the dust thereto. In normal handling, both legs 14 and 14' of the cap jewel spring 17 are always held in contact with the frame 5 and this eliminates the fear that the cap jewel spring 17 may be lost.

It should be understood that the embodiment of the present invention illustrated with reference to the drawings is intended to merely show the principle of the present invention and that the scope of the invention is not restricted thereto but that various modifications are possible without departing from the spirit of the present invention.

What is claimed is:

A shock-proof device for use in watches comprising a base frame having a circular peripheral wall, a hole jewel securely held by a spiral spring centrally thereof, said spring being mounted within said frame, an inner frame resting on the peripheral portion of said spiral spring within said base frame, a cap jewel inserted in said inner frame centrally thereof in such manner that the under surface of said cap jewel is spaced from the upper surface of said hole jewel, and a cap jewel spring disposed on said cap jewel for resiliently pressing said cap jewel, characterized in that said base frame is provided with a dovetail groove defined by a vertical slot extending radially of said frame and side slots, and also provided a dovetailed slot disposed on said base frame in line with and on the side opposite to said vertical slot; and that said cap jewel spring comprises a central circular ring portion for resiliently pressing said cap jewel, semi-circular portions having a symmetrical concentric shape relative to said ring portion, portions connecting said ring portion to said semi-circular portions, legs extending from one end of each of said semi-circular portions in substantially parallel relation relative to each other, L-shaped ends provided for said legs and extending in opposite directions relative to each other so that said L-shaped ends are inserted in said side slots, said side slots being provided with space therein for permitting rotation of the L-shaped ends, other legs extending from the opposite ends of each of said semi-circular portions in such fashion that said legs are parallel to each other, and the end portions of said legs are insertable into the groove disposed on said opposite side of said base frame.

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