

Dec. 2, 1958

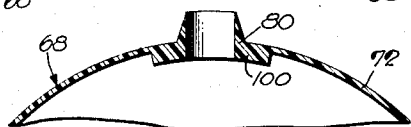
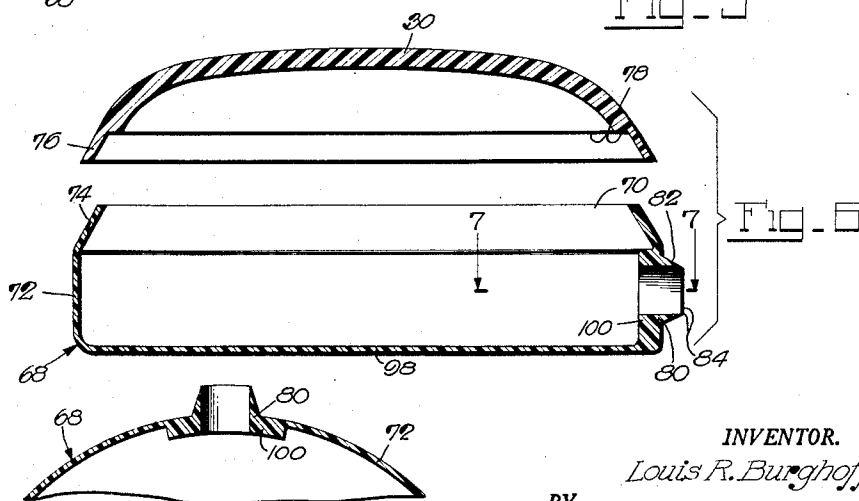
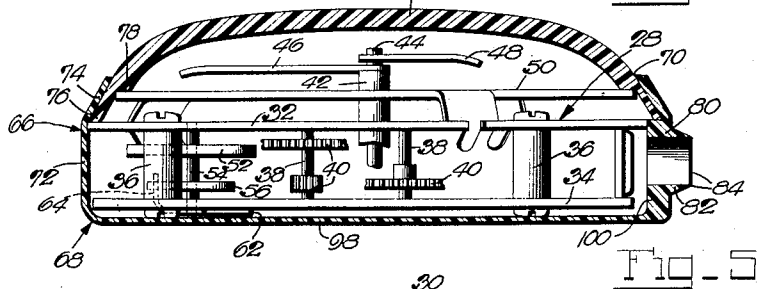
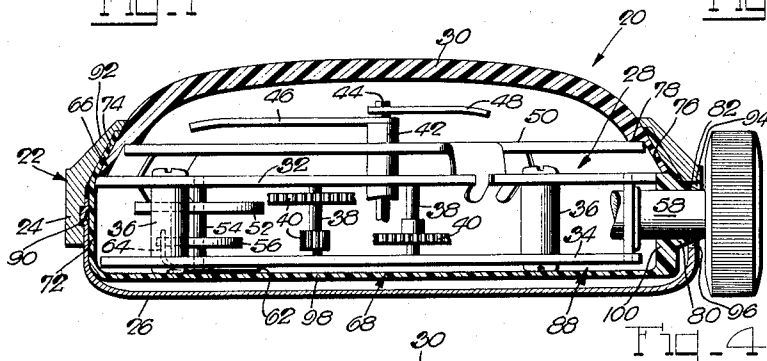
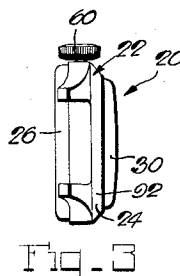
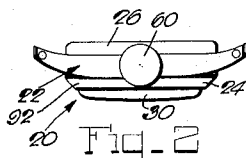
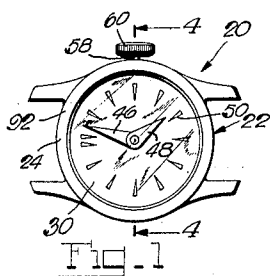
L. R. BURGHOFF

2,862,352

WATERPROOF WATCH

Filed May 4, 1956

2 Sheets-Sheet 1



INVENTOR.
Louis R. Burghoff
BY
Kella Sprague
Attorney.

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L. R. BURGHOFF
WATERPROOF WATCH

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2 Sheets-Sheet 2

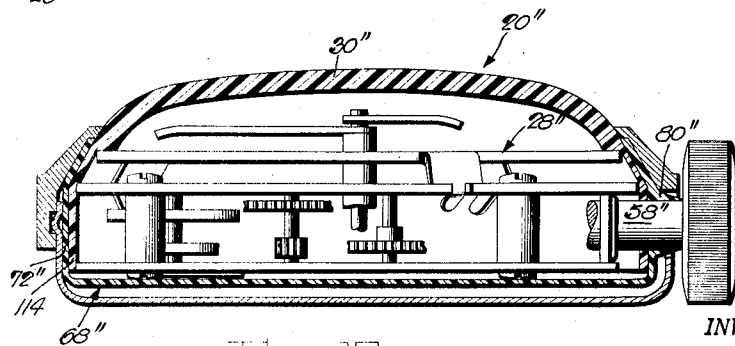
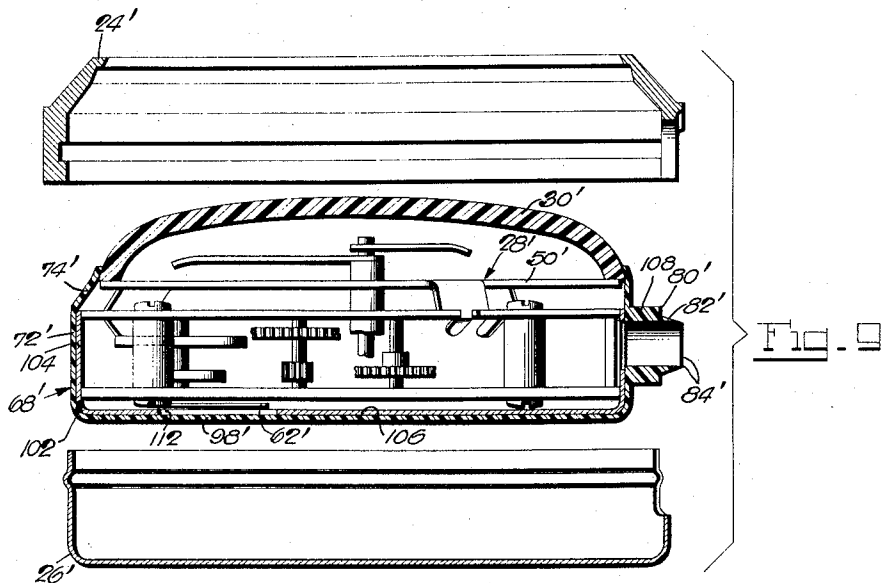
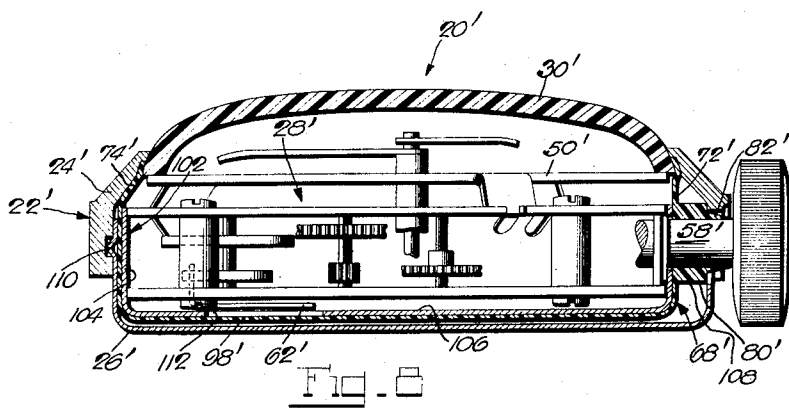


Fig. 10

INVENTOR.
Louis R. Burghoff
BY
Nathan Sprung
Attorney.

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2,862,352

WATERPROOF WATCH

Louis Rodney Burghoff, Bristol, Conn., assignor to The E. Ingraham Company, Bristol, Conn., a corporation of Connecticut

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4 Claims. (Cl. 58—90)

This invention relates to waterproof watches in general, and to concealed secondary waterproof watchcases in the outer primary watchcases in particular.

While secondary watchcases of this type are known, they are not being used extensively despite the obvious desirability of affording watch movements their intended protection from water and also dust and other impurities. This is primarily due to the fact that these prior secondary watchcases leave much to be desired in the matter of their seals along the conventional winding stems of watches, for frequent turning and also axial shifting of the very thin winding stems makes it inherently difficult adequately to maintain the seals thereon, with the result that the latter are either unreliable, or so complicated or large as to be prohibitive in cost or unsightly, or both.

It is, therefore, the primary aim and object of the present invention to provide a secondary watchcase of this type which is exceedingly simple in its overall structure and accordingly low in cost, and the winding stem seal of which is so small in size that it is fully concealed in the watch, yet performs its sealing function reliably and efficiently for the longest time, even for the life of the watch, thereby overcoming the major obstacle to standard use of these secondary watchcases in all watches, including those in the lowest price field.

It is another object of the present invention to provide a secondary watchcase of this type of which the seal for the winding stem of a watch responds immediately to water under pressure to which the latter may be exposed, by forming with the stem an increasingly tighter bond which in any event is sufficient to prevent leakage of the water thereat, thereby permitting the seal to contact the winding stem with a normal fit which, in ordinary circumstances, is sufficiently tight to prevent leakage of moisture and dust into the watch movement, yet sufficiently loose not only to prevent destruction or even weakening of the seal despite frequent turning and also axial shifting of the stem, but also to facilitate the assembly of the seal with the stem without danger of damaging the former.

It is a further object of the present invention to provide a secondary watchcase of this type which completely seals a watch movement therein to the inclusion of the enclosed part of the winding stem thereof, without any assistance whatever from the outer or primary case of the watch and even when it is removed therefrom, thereby not only facilitating the assembly of the secondary case and movement into a self-contained unit and inspection and possible leak testing of the latter, but also permitting quick and facile assembly of this unit with an entirely conventional outer watchcase requiring neither any special structural provisions nor any special dimensions for this purpose.

Another object of the present invention is to form the aforementioned winding stem seal of a secondary watchcase of this type as a short outer ring or sleeve projection thereon which is resilient and also externally tapered all the way to its inner diameter so as to terminate in a relatively thin outer edge, thereby not only

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lending the seal flexibility which is adequate to permit its ready and safe stretching for the passage of the winding stem therethrough and its subsequent self-contraction into relatively light, but nevertheless uniform and ordinarily sealing, contact with the inserted stem, as well as to keep its sealing contact with the stem intact for the longest time despite frequent turning and axial shifting of the latter, but also compelling the seal, on accidental or deliberate immersion of the watch under water, to hug the winding stem with a tightness which increases with the pressure of the water, so that the seal is under all circumstances sufficiently tight to prevent leakage thereat.

A further object of the present invention is to form a secondary watchcase of this type in two parts of which one is, conveniently and advantageously, the watch crystal, and the other is a molded, preferably plastic, cup-like case part of some resiliency having the aforementioned winding stem seal formed integrally therewith laterally thereof and readily receiving the watch movement through the open top thereof with the winding stem passed through the lateral seal thereof, and both of these parts are conveniently and expeditiously joined after placement of the watch movement, preferably in snug fashion, in the case part.

It is another object of the present invention to provide a secondary watchcase of this type of which the aforementioned molded case part is, for the sake of economy, minimum bulk, and flexibility for its ready self-fit to the shape of the watch movement, of relatively small wall-thickness, but is locally reenforced and stiffened adjacent the aforementioned externally tapered winding stem seal sufficiently to prevent excessive distortion of and possible damage to the latter on passing the winding stem there-through or turning and axially moving the same therein.

Other objects and advantages will appear to those skilled in the art from the following, considered in conjunction with the accompanying drawings.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Figs. 1, 2 and 3 are front, end and side views, respectively, of a watch embodying the present invention;

Fig. 4 is an enlarged section through the watch as taken on the line 4—4 of Fig. 1;

Fig. 5 is a section through a prominent unit of the watch shown in Fig. 4;

Fig. 6 shows, in section, the parts of the unit of Fig. 5 in disassembled relation;

Fig. 7 is a fragmentary section taken on the line 7—7 of Fig. 6;

Fig. 8 is an enlarged section through a watch embodying the present invention in a modified manner;

Fig. 9 shows, in section, a prominent unit and parts of the modified watch of Fig. 8 in disassembled relation; and

Fig. 10 is an enlarged section through a watch embodying the present invention in another modified manner.

Referring to the drawings, and more particularly to Figs. 1 to 4 thereof, the reference numeral 20 designates a watch, in this instance a wrist watch, having an outer case 22 with its usual separable front and rear sections 24 and 26, a movement 28 therein, and a crystal 30. The movement 28, which may in all respects be conventional, has the usual end plates 32 and 34 which are held in spaced relation to pillars 36 and in which are suitably journaled the shafts 38 of the various gears 40 that constitute the usual gear train of the movement for the drive from the mainspring (not shown) of the minute and hour shafts 42 and 44 and respective minute and hour hands 46 and 48 thereon. The movement 28

is further provided with a dial plate 50 that is visible behind the crystal 30, and also with a conventional escapement including a balance wheel 52 on a staff 54 and a hairspring 56 anchored to the latter with its inner end and fixedly mounted with its outer end in any suitable manner (not shown). A stem 58 with a knob 60 is turnable, in the position shown and in axially retracted position, to wind the mainspring and set the hour and minute hands 48 and 46, respectively, in the usual manner. The stem 58 may, in the present instance, be axially removable from the movement in any suitable manner. The movement 28 further provides a regulating arm or lever 62 which may conveniently pivot about the staff 54 and has the customary depending fork 64 for straddling the outermost turn of the hairspring 56.

In accordance with the present invention, the instant watch is rendered waterproof by the provision of an inner or secondary protective case 66 for the movement 28. This protective case 66 is made in two parts of which one is a cup or receptacle 68 for the movement 28, and the other is the crystal 30 (see also Fig. 6). The cup 68 is made, preferably molded, from any suitable plastic or rubber to which the usual plastic crystal 30 may securely be attached by bonding or cementing, for instance. Furthermore, the cup 68 is, with one exception to be described hereinafter, made preferably of uniform wall-thickness throughout which is sufficiently thin to lend considerable flexibility to the cup, and preferably also some resiliency.

In assembling the protective case 66, the movement 28 is placed into the cup 68 through the open top 70 thereof, the cup being to this end suitably stretched sufficiently for ready admission of the movement. Furthermore, the rim 72 of the cup 68 is preferably so dimensioned that the latter will remain slightly but permanently stretched on placement of the movement 28 therein so as snugly to hold the same in place. Retention of the movement 28 in the cup 68 is further assured by a top portion 74 of the cup rim 72 which for a reason described hereinbelow advantageously tapers inwardly, and is in the present example frusto-conical in shape.

On placement of the movement 28 into the cup 68, as described, the crystal 30 is applied and attached to the rim of the cup to close and seal its open end 70. To this end, the crystal 30 has a peripheral margin 76 which is preferably formed to approximate the exemplary frusto-conical shape of the top portion 74 of the cup rim 72 and, hence, has a considerable continuous contact area with the cup throughout which the latter is firmly attached to the crystal either by fusion on applying heat or a suitable solvent thereat, or by means of a suitable cement. The secure attachment of the crystal 30 to the cup 68 is considerably enhanced by the described frusto-conical shapes of the interfitted top rim portion 74 of the cup and peripheral margin 76 of the crystal of which the cup rim portion 74 is preferably held stretched, slightly but permanently, on the adjacent crystal margin 76 so that the former holds the crystal in place with some resilient force, with the result that the engaging surfaces of the cup and crystal are in intimate contact with each other and smooth and free of any possible wrinkles, all of which makes for a reliable and lasting seal thereat on their attachment to each other. The slight resilient stretch imparted to the cup rim portion 74 on its engagement with the crystal margin 76 is further advantageous in that the former not only holds the crystal firmly seated with its internal annular shoulder 78 on the dial plate 50, but also centers the crystal quite accurately with respect to the dial plate (Fig. 5), thus greatly facilitating the assembly of the crystal with the cup, including its attachment to the latter.

In accordance with another important aspect of the present invention, the cup 68 is provided with a lateral sleeve formation 80 which serves as a seal for the winding and/or setting stem 58 of the movement. The sleeve 80,

being preferably and advantageously formed integrally with the cup 68, receives the stem 58 with a fit which preferably is not very tight, but adequate to seal the cup along the stem against seepage of moisture and dust thereinto under ordinary circumstances. To achieve an adequate fit of the stem 58 in the sleeve 80 for this purpose, the latter may advantageously be held resiliently stretched, though only slightly, by the stem extending therethrough. Ready control over the slight resilient stretch of the sleeve 80 on the stem 58 is obtained by forming a substantial length of the sleeve of smaller wall-thickness than the remaining length thereof and, hence, rendering it more flexible than the latter, thereby effectively keeping the overall resilient binding force of the sleeve on the stem within the desired limits despite the overall length required of the sleeve for practical reasons. To this end, the sleeve length 82 which projects outwardly from the cup rim 72 is made of smaller wall-thickness than the cup itself, this by externally tapering the sleeve length 82 and thus rendering it more flexible than the remaining sleeve length within the body of the cup. The greater flexibility of the outer sleeve length 82 is further advantageous in that it may, for ready passage of the stem 58 therethrough for its described assembly with the movement 28 from the outside, be momentarily stretched without sustaining any damage.

Quite significant is the further formation of the projecting sleeve length 82 so that its outer taper is continued to its inner diameter, leaving its outer end in the form of an edge 84, even a feather edge. Thus, this edge 84 and continuing outer taper surface of the projecting sleeve length 82 will not only have a tendency to divert moisture, dust and other impurities away from the extended length of the stem 58 in the sleeve, but will, quite significantly, react with water under pressure in becoming more firmly or tightly bound to the stem so as to prevent leakage of the water therealong into the interior of the movement when the watch is accidentally or knowingly immersed in water.

After the stem 58 has been assembled, as described, with the movement 28 in the protective case 66 (Fig. 5) into a sealed unit 88 (Fig. 4), the latter is placed in the front section 24 of the outer case 22, whereupon the rear section 26 is applied thereto, being conveniently snapped in place thereon as at 90, to complete the assembly of the watch. The outer case 22 may be entirely conventional and requires no special provisions for achieving the waterproof aspect of the watch, the aforementioned watch unit 88, without the outer case 22, being in itself waterproof. Nevertheless, the usual bezel formation 92 on the front section 24 of the outer watchcase 22 will, by its cover relation with the joined cup rim portion 74 and crystal margin 76, protect the seal between the cup and crystal for the longest time. On the other hand, the complementary recesses 94 and 96 in the front and rear case sections 24 and 26, respectively, for the passage of the stem 58 through the outer watchcase may be dimensioned without regard to the adjacent projecting sleeve length 82 on the cup 68.

The aforementioned preferred flexibility of the cup 68, including its bottomwall 98, is also advantageous in that, on mere removal of the rear section 26 of the outer case 22 from the watch, the regulating lever 62 (Fig. 5) may be manipulated through the flexible bottomwall of the cup without any danger of rupturing the sealed watch unit 88.

It is also preferable to stiffen the cup 68 in the vicinity of the inner end of the sleeve formation 80 thereon, at least sufficiently to avoid considerable distortion or give of the sleeve and also of the cup immediately adjacent thereto on passing the stem 58 through the former and thereby facilitate the stem passage therethrough without danger of rupturing the sleeve or the cup, or both. Stiffening to some extent of the cup 68 in the vicinity of the inner end of the sleeve formation

80 thereon is further advantageous in permitting the aforementioned advantageous thin wall thickness, and hence considerable flexibility, of the cup throughout its remainder without incurring excessive twisting of the sleeve on the cup and a possible rupture of either on frequent turning of the stem in the sleeve. To these ends, the rim 72 of the cup 68 is in the vicinity of the sleeve formation 80 reenforced, in the present instance, by being provided thereat with a thickened wall formation 100 which extends inwardly of the cup (see also Fig. 7).

While it has previously been mentioned that the cup 68 and crystal 30 may be attached to each other by fusion or by cementing, a satisfactorily sealing attachment of the cup rim portion 74 to the crystal margin 76 may also be achieved by providing an oil film therebetween and relying on capillary attraction for their joinder.

It follows from the preceding that the instant protective case 66 is not only highly reliable in its waterproofing, and also dustproofing, function, but may be manufactured at exceedingly low cost and assembled with a watch rapidly and without any special skill, wherefore the same is ideally suited for its standard use in all watches, including those in the lowest price field. Thus, the crystal 30 which forms part of the protective case 66, may be entirely conventional and requires no extra cost for its adaptation as a part of the protective case. Its counterpart of the protective case, namely the cup 68 is, as already mentioned, very low in cost, and its assembly with the movement 28 and crystal 30 adds very little to the overall assembly task and cost of the watch. More importantly, the provision of the present stem seal 80 overcomes the aforementioned hitherto greatest obstacle to the wide use of waterproof cases for movements. Especially noteworthy in this respect is the permissible relatively non-tight fit of the stem in the sleeve 80 which makes for least wear and, hence, optimum sealing life of the latter despite frequent turning and axial shifting of the former therein, and the tapered sleeve length 82 together with its outer end edge formation 84 which by its aforementioned unique reaction with water under pressure hugs the stem with increased tightness which in any event is sufficient to prevent leakage of the water therealong.

Fig. 8 shows a waterproof watch 20' which in many respects is similar to the described watch 20 of Figs. 1 to 4, but differs from the latter in a few essential respects. Thus, the movement 28' is enclosed and firmly mounted in a metal cup or casing 102 of which the rim 104 and bottom 106 present smooth surfaces on which the protective cup 68' is on its application thereto held in preferably slightly resiliently stretched condition, wherefore the latter need not conform itself to such tolerances in dimensions and shape of the movement as will commonly occur. Also, since the flexible cup 68' is backed against the rather rigid metal casing 102 (see also Fig. 9), it is not necessary to stiffen the cup rim 72' in the vicinity of the stem sleeve 80' with its outer tapered end length 82' and edge-like outer end 84'. However, the remaining rear length 108 of the sleeve 80' may, if desired, be stiffened somewhat by having greater wall-thickness thereat, primarily to prevent, on turning of the stem 58', undue and possibly harmful twisting of the sleeve due to its somewhat greater length than that of the described watch 20. Further, the crystal 30' lacks in this instance an extended frusto-conical peripheral margin and is, instead, fully seated on the dial plate 50' of the movement, the top of the frusto-conical cup rim portion 74' being suitably attached to the smoothly rounded periphery of the crystal 30'. The outer watch-case 22' may generally be like that of the described watch 20, having front and rear sections 24' and 26' which on closing may conveniently be snapped into releasable interlock with each other as at 110 (Fig. 8). On

removing the rear section 26' of the outer case 22' from the watch, the regulating lever 62' may be manipulated from the outside of the cup 68' through the flexible bottomwall 98' of the latter and an appropriate cut-out 112 in the bottom of the metal casing 102 in which the movement is directly mounted.

Reference is now had to Fig. 10 which shows another waterproof watch 20'' that is in all respects like the described watch of Figs. 1 to 4, except that the rim 72'' of the protective cup 68'' bears, preferably in slightly resiliently stretched condition, against a fairly rigid skirt extension 114 of the crystal 30'' in which the movement 28'' may be directly mounted. Also, since the flexible rim 72'' of the protective cup 68'' is resiliently backed against the rather rigid crystal skirt 114, the former need not be reenforced or stiffened in the vicinity of the stem sleeve 80'', the resilient back-up of the cup rim 72'' against the crystal skirt 114 also serving to steady the sleeve 80'' sufficiently to prevent undue and possibly harmful twisting of the same when the stem 58'' is turned therein.

While the exemplary forms of a waterproof watch shown and described herein are round, it is fully within the purview of the present invention to apply the present protective case with equal advantage to watches of other shapes, it being merely necessary to shape the protective case, and especially the protective cup, to approximate that of the watch, the crystal being always shaped to approximate the shape of the watch in any event.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

What is claimed is:

1. In a watch, the combination with an outer case and a movement having a winding stem, of an inner case in and removable from said outer case enclosing and sealing said movement and having a resilient sleeve through which said stem extends with a sealing fit and which is externally tapered to its outer end and terminates thereat in an endless edge.

2. In a watch, the combination with an outer case and a movement having a winding stem, of an inner case in and removable from said outer case enclosing and sealing said movement and comprising a resilient cup with an open top and a crystal attached to and sealing the latter, and said cup having an integral lateral sleeve through which said stem extends with a sealing fit and which is externally tapered to its outer end and terminates thereat in an endless edge.

3. In a watch, the combination with an outer case and a movement having a winding stem, of an inner case in and removable from said outer case and enclosing and sealing said movement, said inner case comprising a resilient cup of substantially uniform wall thickness throughout having an open top and an integral lateral sleeve through which said stem extends with a sealing fit, and a crystal attached to and sealing said open cup top, of which said sleeve has an outer flexible length externally tapered to the outer end thereof and terminating thereat in an endless edge, while the remaining inner length of said sleeve is stiffened by being of greater wall thickness than said cup.

4. A part of a waterproof case for a watch movement having a dial and a winding stem, comprising a resilient cup of substantially uniform wall thickness throughout having an open top and being adapted to receive said movement with its dial exposed at said top, said cup having also an integral lateral sleeve through which said stem is adapted to extend with a sealing fit and of which an outer flexible length is externally tapered to the outer

end thereof and terminates thereat in an endless edge, while the remaining inner sleeve length is stiffened by being of greater wall thickness than said cup.

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