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FLUIDTIGHT CLOSURE FOR WATCHCASES

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Fig. 1

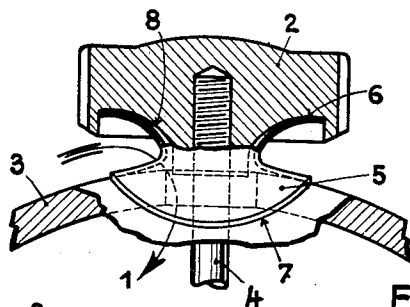


Fig. 2

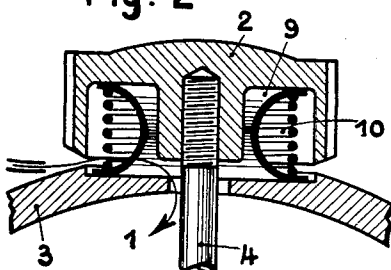


Fig. 3

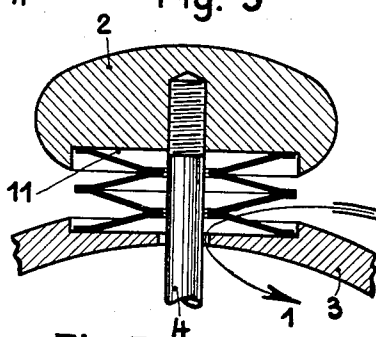


Fig. 4

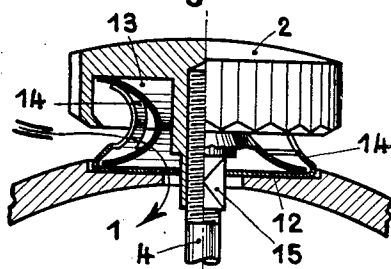


Fig. 5

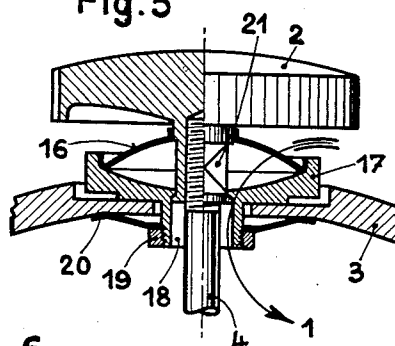
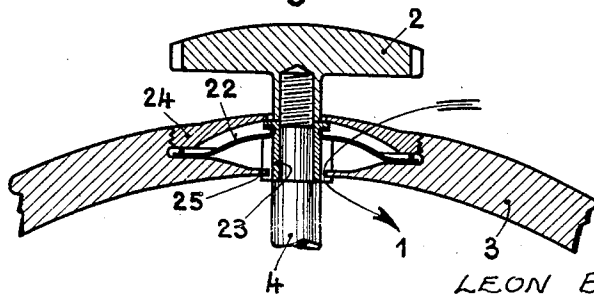


Fig. 6



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FLUIDTIGHT CLOSURE FOR WATCHCASES

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6 Claims. (Cl. 58—90)

This invention relates to fluid-tight closures for watchcases, and more particularly to improved means associated with the stem and case for the purpose of effectively excluding water and foreign matter under all conditions of use. In view of the fact that the stem and its associated knob must be rotated during winding of the watch spring, and also that the stem must be moved longitudinally or axially for setting the hands, it is essential that means be provided which will not only provide an effective seal while the stem is motionless but also when it moves in the manner described to perform the functions indicated.

Accordingly the present invention has for its principal object a fluid-tight closure device for watchcases which is characterized by the provision of a deformable fluid-tight member surrounding the stem and located generally between the knob of the stem and the casing, said member being in the form of an impermeable and pliable partition of substantially sheet-like form in the sense that it consists of a deformable wall of relatively thin section which not only effectively closes the opening between the stem and the case, but at the same time permits of the stem being rotated and axially shifted as required.

Several embodiment of the invention are shown in the accompanying drawing, in which—

Figure 1 is a detail sectional view, partly in elevation, illustrating one form of the invention.

Figure 2 is a detail vertical sectional view illustrating another form of the invention.

Figure 3 is a detail vertical sectional view illustrating a further embodiment of the invention.

Figure 4 is a detail vertical sectional view, partly in elevation, illustrating another form of the invention.

Figure 5 is a detail sectional view, partly in elevation illustrating a further constructional embodiment.

Figure 6 is a detail vertical sectional view illustrating a still further form of construction.

Similar reference characters designate corresponding parts throughout the several figures of the drawing, and, therefore, the arrow 1 indicates the path which would be followed by water or other foreign particles in entering the watch case through the stem opening, while 2 indicates the stem knob, 3 the case, and 4 the stem or winding shaft.

In the form of construction shown in Fig. 1, the annular deformable fluid-tight member 5, which provides a thin impermeable partition, is

of resilient material, for example, rubber, and may be generally referred to as a mask. In Fig. 1, the natural elasticity of the said mask causes the opposite edge portions 6 and 7 constantly to engage respectively with the underside of the knob 2 and the portion of the case adjacent the stem. By reason of the pliability of the rubber mask, it will be observed that the edge 7 closely grips or engages the case 3, to insure fluid-tight contact therewith. In this form of the invention, the mask 5 does not rotate and at its upper edge 6 is naturally subjected to rubbing contact when the knob 2 is rotated. Owing to the elasticity of the mask 5, however, a fluid-tight seal is insured between the stem and the case even when the knob is rotated or when the stem is moved axially or longitudinally.

It will also be seen that the shape of the mask 5 is such that extraneous pressure, for example, hydrostatic pressure, exerted on the outside of the mask will increase the pressure of the mask at its edges against the portions of the knob and the case with which they are in contact. In that connection, the knob is provided with a lower profile 8 of such shape that when outer hydrostatic pressure is exerted on the mask in the winding position shown, the mask will stretch or yield so as to conform with the profile 8, the latter thereby providing a supplementary base or support for the mask. If desired, the edge 7 of the mask may be secured to the case 3 with the aid of an adhesive.

In the form of construction shown in Fig. 2, the mask 9 is preferably of a material which has less natural elasticity than rubber, for example, impregnated fabric, Cellophane, or the like. For insuring fluid-tight contact of the upper and lower edges of the mask, respectively with the knob and the casing, a coil spring 10 is provided, the ends of the mask being preferably attached to the ends of the spring. The spring, of course, presses the opposite ends or opposite edges of the annular mask into fluid-tight engagement with the knob and the case and supplements the pliability of the mask to such a degree that the desired fluid-tightness is assured.

Instead of making the mask in one piece, it may also be subdivided into a number of elements, as shown for example, in Fig. 3. Accordingly, in this form of the invention the mask is made of a number of parts or sections 11 of elastic material assembled so as to constitute a fluid-tight and deformable bellows. The elements forming this mask may be soldered or glued in pairs along their lines of contact. A mask formed

in this manner possesses great pliability even when using a material only slightly deformable, such as for example, Celluloid or even metal.

In the three forms of construction shown in Figs. 1 to 3 inclusive, the opposite edges of the mask are directly in contact with separate parts of the watch, namely the case and the underside of the knob carried by the stem. Therefore, one of these edges at least will have a sliding or movable engagement with its adjacent part when winding or setting the same. This relative movement between either the knob or the case and the mask may dislodge dust or other foreign particles which might enter the watchcase. In order to remedy this disadvantage, the mask may be made to rotate with the stem, and to that end there may be introduced at least one intermediate part between one edge of the mask and the portion of the watch with which it is adapted to contact. For example, a so-called intermediate part or washer, which turns with the stem, may be so arranged as to engage one edge of the mask while the opposite end is engaged by the underside of the knob on the stem. Thus, the mask will rotate with the knob and stem and its edges will not be subjected to any abrasive wear, but due to the pliability of the mask, it will be apparent that axial movement of the stem will be readily permitted without opening up the mask to permit the entrance of foreign matter. In this case, if desired, the two edges of the mask may be secured respectively to the underside of the knob, or to a portion of the stem, and to the intermediate part or washer which rotates with the stem by means of an adhesive.

Embodiments of the invention carrying out the foregoing features will now be described in detail.

In Fig. 4, there is provided an intermediate member 12 in the form of a washer fitted in a recess of the watch case, and placed between the annular mask 13 and the case 3. In this construction, the mask preferably has sufficient inherent elasticity to press the washer 12 against the case 3. The said washer or intermediate member may be provided with a plurality of upstanding lugs or fingers 14 which extend upwardly toward the underside of the knob to provide means for protecting the mask against damage to which it may be subjected, as for example, by the finger nails when the knob is pulled to move the stem for setting. Thus, these lugs form a cage which surrounds and protects the mask. The washer 12 is in fluid-tight contact, by considerable friction, with the case 3. It therefore becomes necessary to provide means for rotating the washer 12 when the stem is rotated for winding. For example, the washer is provided with a square or non-circular central opening for receiving the square or equivalent portion 15 on the stem. Thus, the stem and washer are interlocked for rotary movement but the stem and knob can move axially relative to the washer. Since the mask 13 is held between the upper face of the washer 12 and the underside of the knob 1, it will be apparent that the mask rotates with the knob so that its opposite edges are not subjected to abrasive wear but the stem can move axially while maintaining a fluid-tight seal due to the pliability of the mask 13.

According to Fig. 5, the annular mask 16 may be only slightly elastic or even inelastic, in view of the special construction provided. That is to say, a special intermediate member or washer 17 having a machined lower surface is intended to engage a machined surface of the case 3, the said

member 17 being provided with a tubular portion 18 which fits, with proper clearance, through the opening in the case and receives on its screw-threaded end portion a suitable nut 19 which clamps a resilient washer 20 against the inner face of the case 3. Thus, the intermediate member 17 is caused to frictionally bear against the machined surface of the case. The presence of this resilient member 20 does not in any way prevent the intermediate member 17 from participating in the rotary movement of the stem because, although the frictional contact is sufficient to contribute to the effectiveness of the seal, it is not sufficient to impede the rotary movement of the stem 4 which is interlocked therewith by reason of the fact that the central part of the washer 17 is provided with a square opening to receive the square portion 21 of the stem. The mask 16 has its lower edge bearing against the upper face of the washer 17 while its upper edge engages a portion of the stem adjacent the underside of the knob 2.

In the form of construction shown in Figs. 4 and 5, it will be apparent that the mask rotates with the stem so that the opposite edges thereof are not subjected to abrasive wear. In other words, the mask has its lower edge bearing on a cup-like sheath or guard washer which rotates with the stem. In each instance, however, axial or longitudinal movement of the stem is made possible.

In Fig. 6, the annular mask is located within a cavity formed in the casing 3 at the location of the opening for the stem 4. A tubular portion or sleeve 23 is mounted in a fluid-tight manner with considerable friction on the winding stem 4. This tubular member is provided with projections or ribs 25 which engage with cooperating portions in the casing so that the member 23 cannot rotate with the stem. The upper rolled edge of the mask 22 engages with the shouldered upper portion of the sleeve 23 while the outer or lower edge thereof engages with the base of the cavity in the watchcase 3. The said outer or lower edge of the mask 22 is clamped in place by a threaded washer 24 which forms a closed chamber concealing the mask 22. The mask 22 is sufficiently pliable to permit longitudinal or axial movement of the stem 4. Fig. 6 shows the stem 4 in the elevated position, that is, in the position of setting the hands. When the knob 2 is in this position, the mask 22 will be flexed upwardly to the position shown. On the other hand, when the knob 2 is depressed, the mask will become deformed and thus flex downwardly from the full line position shown to bear with greater force against the wall of the cavity and thus form a seal which is capable of resisting the highest hydrostatic pressure. The mask may be constructed of any suitable resilient or deformable material, even a material of low resistance, as the washer 24 constitutes a most effective protection against foreign matter entering under the knob.

From the foregoing, it will be apparent that all forms of the invention provide a fluid-tight closure between the stem and knob and the case, while at the same time permitting free rotary movement of the stem for winding, and, likewise, free axial or longitudinal movement, for setting.

Any impermeable and deformable material will be used to make the fluid-tight annular mask, for example, rubber, metals, or other materials, such as resins, Cellophane or the like. The shape and the thickness of the wall of the mask may be altered to suit various conditions of use, but, in

all cases the relatively thin walled annular characteristic of the mask is preserved.

I claim:

1. A device for rendering a watchcase fluid-tight at the point where the longitudinally shiftable winding and setting stem enters the case, comprising an annular thin walled deformable fluid-tight member of sheet material surrounding said stem and having the medial portion thereof standing free of the stem, said member forming an impermeable and pliant partition between the stem and the case, and the opposite edges of said member yieldingly engaging with the stem and the case to provide an axially compressible fluid-tight joint between the stem and the case.

2. In a watch, the combination with a watchcase having an opening and a stem provided with a knob, said stem and knob being rotatable and axially movable relative to said opening, of an annular deformable member surrounding said stem and in sealing relation to the stem and case when the stem is moved during winding and during setting, said annular deformable member comprising a flexible sheet-like wall portion which is yieldable when the stem is moved longitudinally in the direction of its axis to maintain the opening in the case sealed against the entrance of foreign matter during setting.

3. In a watch, the combination with a watchcase having an opening, a stem rotatable and axially shiftable relative to said opening, a knob having a shank for receiving said stem, a washer having a stem receiving opening and frictionally engaging the case in fluid-tight relation thereto about the stem opening in the case, cooperating means on the shaft of the knob and at the opening in the washer for causing the knob, stem, and washer to rotate together and yet be capable of relative sliding movement between the stem and washer, and an annular mask of resilient sheet-like material having its edge portions respectively engaging the washer and the knob, said mask being rotatable with the knob and washer and compressible upon relative axial movement between the washer and the knob.

4. In a watch, the combination with a watchcase having an opening, a stem rotatable and axially shiftable relative to said opening, a knob having a shank portion for receiving said stem, a washer having a stem receiving opening and frictionally engaging the case in fluid-tight relation thereto about the stem opening in the case,

said washer having a plurality of integral offset resilient fingers at the outer edge thereof, cooperating means on the shank of the knob and the washer for compelling the washer to rotate with the knob and stem, and an annular mask of resilient sheet material having its opposite edge portions respectively engaging the washer and the knob, and one of said edge portions being urged toward the knob by said resilient fingers, said mask being rotatable with the knob and washer and compressible upon relative axial movement between the washer and the knob.

5. In a watch, the combination with a watchcase having an opening, a stem rotatable and axially shiftable relative to said opening, a knob having a shank for receiving said stem, a cup-like washer member having a stem receiving opening and frictionally engaging the case in fluid-tight relation thereto about the stem opening in the case, said washer member having a tubular portion fitting in the stem opening of the case and provided with exterior threads, a nut for said threads, a resilient clamping washer surrounding said tubular portion and pressed against the inner side of the case by said nut, an annular mask having its lower edge seated in the cup-like washer member and the upper edge of said mask being in sealing engagement with a portion of the knob on said stem.

6. In a watch, the combination with a watchcase having a recess and a stem receiving opening, the edge of said recess being threaded, a stem rotatable and axially shifting relative to said opening, a sleeve having a fluid-tight frictional engagement with said stem, cooperating means on the sleeve and the case for preventing relative rotation between the sleeve and the case, an annular deformable mask of resilient sheet-like material having one edge engaging said sleeve and the opposite edge engaging the bottom of the recess in the watchcase, and a washer having a peripherally threaded portion for engaging with the threaded portion of the recess in the case, and also having a central opening for receiving the stem, said washer overlying and engaging the edge of the annular mask which engages the bottom of the recess in the case, and said annular mask being deformable upon axial shifting of the stem and remaining stationary during rotary winding movement of the stem.

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