

DESCRIPTION

The invention concerns a push-button mounted in a wall for the transmission of a mechanical force through the wall which latter could in particular be the wall of a watch case.

Already known from Swiss patent CH 594 924 is a push-button for timepiece comprising a stem, a return spring and a moisture seal, the whole being inserted in a guide socket intended to be secured in the case of a timepiece. The portion of the socket situated on the interior of such case ends with an opening bounded by an annular flange of tapered form. This flange is elastic and permits the passage through the opening of the end portion of the stem. Such end portion exhibits an outer diameter substantially greater than the diameter of the opening. Thus the stem may be axially positioned in the socket, the return spring being concentrically arranged on the stem and being directly supported on the moisture seal, the latter being confined between the spring and the end flange of the socket.

This construction operates in a satisfactory manner but exhibits in particular the difficulties of requiring a number of manipulations and pre-assembly operations which render impossible the manufacture of such push-buttons at a low price.

The push-button described in the patent CH 621 453 constitutes an attempt to overcome the difficulty cited above.

This push-button includes a stem in three parts, a return spring and a moisture seal arranged directly in a hole provided in a wall of a support receiving the push-

button. The hole opens into the interior of the support through a constriction. The inner portion of the stem passes through such constriction and terminates with a flange having a cylindrical exterior surface with a diameter substantially greater than the diameter of the constriction this inner portion being axially split. Thus, when the stem is inserted in the hole in the wall, the inner portion with its flange is radially deformed by elastic squeezing at the passage of the constriction, after which it reassumes its initial form, the flange assuring axial maintenance of the stem.

This construction has the advantage of eliminating the utilization of the guiding socket provided in the construction proposed in Swiss patent CH 594 924. Nevertheless, it still presents certain difficulties. Effectively, a stem in three portions as in the Swiss patent CH 621 453 must be machined on a profiling lathe and in order thereafter to machine the axial slot in the inner portion of the stem, it is necessary to stop the lathe and to employ a special tool. There thus results an increase in the time and the cost of manufacture.

Furthermore, the machining of such a slot brings the risk of forming burrs which may hinder the putting into place of the stem such that there must be provided an additional operation of burr removal.

The invention thus has as its purpose to overcome the difficulties brought about by the prior art and to furnish a push-button which is simple to obtain and easy to assemble.

To this end, the invention has as its object a push-button mounted in a wall to set off an action from a first side of the wall originating from a second side of the

latter, the wall adapted to be in particular that of a watch case, said wall exhibiting a hole having at least a first portion of a first diameter opening from said first side and extending over a limited length in order to define a neck and a second portion of a second diameter greater than said first diameter and opening from said second side, said push button comprising a stem ending with a bulge at the first side of the wall and means for returning said stem to a rest position.

In conformity with the invention, the wall is formed of synthetic material, the neck is elastically deformable and the bulge on the stem is non-deformable, and exhibits a diameter in between that of the first and second diameters of the hole so that when the stem is introduced into the hole in the wall, the bulge elastically deforms the neck which, following passage of the bulge, reassumes its initial form thus assuring an axial positioning of the stem in the wall.

Thanks to these characteristics, one may advantageously employ the intrinsic elastic properties of the synthetic material in order to obtain a push-button which may not be removed and which unites reliability to simplicity of production, this whilst diminishing its cost price.

According to an advantageous characteristic of the invention, the bulge on the stem is connected via a portion of the stem of small diameter to another portion of the stem adjusted to sliding fit in the second portion of the hole in order to assure guiding of the stem in the wall.

Thanks to this characteristic, one avoids the creation of lateral clearance of the stem in the wall so that one eliminates all risk of enlarging the neck following prolonged utilization of the push-button under poor

conditions of stem guidance. There accordingly results therefrom that an untimely separation of the push-button from the wall is avoided and consequently the life expectancy of the push-button is increased.

Other characteristics and advantages will appear from the description to follow of a non-limiting embodiment of the invention taken together with the single figure which represents a partial cross-section of an example of an embodiment of a push-button according to the invention applied to a watch case.

Referring to the figure, one will see a watch case generally designated by reference 1. This watch case comprises a caseband 2 integrally formed with the case. The wall of the caseband 2 is provided with a hole 3 opening into the interior of the case. This hole 3 comprises a first portion 4 having a first diameter D_1 which opens directly to the interior of the case and a second portion 5 having a second diameter D_2 greater than the first and opening to the outer side of the case.

Furthermore, the caseband 2 is provided with a push-button 6 enabling the transmission of mechanical force from the exterior of the case towards the interior, for example in order to operate a contact C for controlling the display of information such as the date or the like.

This push-button essentially comprises a stem 7, a crown 8, a return spring 9 for returning the push-button to a rest position (shown on the figure) and a moisture seal 10.

According to the invention, the caseband is formed of synthetic material and preferably the material employed has a structure exhibiting a large zone of elastic

deformation. One may refer advantageously among materials possessing these characteristics to the amorphous type of synthetic materials and more particularly the acrylic butadiene styrene family designated currently as ABS.

Furthermore, the first portion 4 of the hole 3 extends over a limited length L and defines a neck 11. According to the invention, the stem 7 comprises an intermediate portion 12 which is solid and undeformable and terminates with a bulge 13 having a diameter greater than the diameter $D1$ of the first portion 4 of the hole 3 and less than the diameter $D2$ of the second portion 5. The intermediate portion 12 has a diameter $D3$ less than the diameter $D1$ of the first portion 4.

Thus, when the stem 7 is introduced into hole 3 in the caseband 2, the bulge 13 exerts pressure on the neck 11 so that this is elastically deformed and permits passage of the bulge, following which the neck reassumes its initial form whilst assuring axial positioning of the stem.

It will be noted that the limited length of the first portion 4 defining the neck is chosen as a function of the diameter of the latter and preferably the ratio $L/D1$ will be comprised between 0.3 and 0.4.

According to an advantageous characteristic of the invention, the intermediate portion 12 of stem 7 is connected to a portion of stem 14 adjusted to slide on the second portion 5 of the hole 3 in order to assure correct guiding of the stem 7 and consequently of the push-button in the caseband.

This portion of stem 14 comprises an annular housing 15 which receives the moisture seal 10 of the "O ring"

type in the example as shown. It is noted that in this embodiment and in an advantageous manner the moisture seal is not subjected to compression stresses as is the case in the prior art cited where it is interposed between two movable elements and where it participates in the transmission of the force exerted on the push button. There thus results that its life expectancy is substantially increased.

It will be likewise noted in this case that in order to facilitate fabrication of the stem as well as its setting into place in the caseband, the bulge will be provided with a diameter identical to that of the portion of the stem 14 serving as guide.

In the embodiment shown, the caseband 2 comprises furthermore an annular groove 16 centered around hole 3. This groove 16 partially receives the crown 8 in its rest position, in order to avoid that the crown be removed from its housing and consequently that the push button 6 be disconnected from caseband 2 in the case of untimely application of force to the base of crown 8.

Furthermore, the bottom 17 of groove 16 defines a support surface for an end 18 of the return spring 9. The opposite end 19 of this latter is supported against the bottom 20 of an annular groove 21 provided in the crown 8 and defining an annular skirt and forming thus a housing for receiving the return spring.

Finally, in the example shown on the figure, crown 8 is driven onto a shank 22 of stem 7 and is supported on a flange 23 defining a support surface 24. It is well understood that the crown and the stem may be formed integrally in order to diminish the number of parts of the whole.

It is well understood that the invention is not limited to application of the push button to a watch case. It may effectively and advantageously find application in all cases where a mechanical effort must be transmitted through a wall of synthetic material by a push button.



CLAIMS

1. Push-button mounted in a wall to set off an action taking place from a first side of the wall (2) originating from a second side of the latter, the wall (2) adapted to be in particular that of a watch case (1), said wall exhibiting a hole (3) having at least a first portion (4) of a first diameter opening from said first side and extending over a limited length in order to define a neck (11) and a second portion (5) of a second diameter greater than said first diameter and opening from said second side, said push-button comprising a stem (7) ending with a bulge (13) at the first side of the wall (2) and means (9) for returning the stem to a rest position, characterized in that said wall is formed from synthetic material, in that the neck (11) is elastically deformable, and in that the bulge (13) on the stem (7) is non-deformable and exhibits an intermediate diameter in between that of the first and second diameters of the hole (3) so that, when the stem (7) is introduced into the hole (3) in the wall (2), the bulge (13) elastically deforms the neck (11) which, following passage of the bulge (13), reassumes its initial form thus assuring an axial positioning of the stem in the wall.

2. Push-button according to claim 1, characterized in that the bulge (13) on the stem (7) is connected through a portion of the stem (12) of small diameter to another portion of the stem (14) which is adjusted to sliding fit in the second portion (5) of the hole so as to assure guiding of the stem (7) in the wall (2).

3. Push-button according to claim 1 or 2, characterized in that the stem is capped with a crown (8) and in that the wall (2) further comprises an annular groove (16) centered on the hole (3) defining, together with an



annular groove (21) formed in the crown (8) facing the wall (2), a housing for receiving the returning means (9).

4. Push-button according to claim 3, characterized in that the annular groove (21) formed in the crown (8) at its base defines a skirt penetrating partially into the annular groove (16) in the wall (2) in the rest state of the push-button.

5. Push-button according to one of claims 2 or 3, characterized in that the bottom (17, 20) of each annular groove (16, 21) respectively forms a support surface for the ends (18, 19) of the returning means (9).

6. Push-button according to any one of claims 3 to 5, characterized in that the crown (8) is driven onto a shank (22) on the stem (7) and supported on a flange (23) defining a supporting surface (24).

7. Push-button according to any one of claims 3 to 6, characterized in that it further comprises a moisture seal arranged in an annular housing (15) provided in the portion (14) of the stem serving for guiding.

8. Push-button according to any one of the preceding claims, characterized in that the wall (2) is formed from a synthetic material forming part of the acrylic butadiene styrene family.

9. Push-button according to any one of the preceding claims, characterized in that the returning means comprises a helical spring.

10. Push-button according to any one of the preceding claims, characterized in that the wall (2) forms part of the caseband of a watch case (1).