

DESCRIPTION

This invention concerns a watch case and a mounting method of said case comprising a back cover, a caseband provided with a housing intended to receive a movement surmounted by a dial, a crystal the peripheral zone of which covers at least partially the caseband, a casing ring arranged between the movement and the caseband and including a moisture resistant packing at least on its upper surface, at least two supports fixed to the caseband and forming therewith a slot in which the crystal may be engaged and means for displacing the casing ring operable from the case exterior in order to compress said packing against the internal surface of the crystal and block said crystal against said supports.

A watch case having the characteristics which have just been listed is known from patent CH-A-643 425 (= US-A-4 490 052). It comprises in particular a caseband on the upper surface of which is fastened a planar crystal by means of fixation means forming slots in which the edges of the crystal are held after having been laterally engaged therein and a seal placed against the periphery of the lower surface of the crystal. The slots in the fixation means are defined by two surfaces facing one another between which the crystal is engaged, the upper surface of the slots bearing against the upper surface of the crystal. The case includes moreover means for urging the seal against the lower surface of the crystal only after engagement of the crystal in the slots.

It is evident that the invention described in the cited patent is confined to watch cases equipped with a planar crystal. Indeed the caseband exhibits a planar surface as well as the lower surface of the supports in such a way that in the slots may be introduced only a

planar crystal which remains in a plane during this introduction. Therefore, the cited document gives no teaching which would enable the replacement of the planar crystal by a crystal having a spherical cap.

Document DE-U-1 837 081 proposes the fastening of a spherical crystal on a planar caseband. For this purpose, the crystal is surrounded with a resilient band which rests on the caseband such as an articulated cover maintained on said caseband by means of a notch. The band is like a transition piece in order to adapt the spherical form of the crystal to the planar form of the caseband.

Patent GB-A-814 187 also shows adaptation means of a spherical crystal to a planar caseband, said means maintaining the crystal on the caseband with a bezel hooked by clips on said caseband.

Patent CH-A-283 122 shows a crystal the upper surface of which is formed according to a spherical cap. This crystal is provided with a peripheral heel which is sandwiched between a casing ring and a bezel. In this construction the crystal is placed from above, then the bezel is put in place.

A crystal having the form of a spherical cap is interesting since on the one hand it gives the impression that the watch is very thin, on the condition that said crystal is mounted having its edges matching the edges of the caseband at least on a major portion of the periphery, and on the other hand it exhibits better shock resistance than when a planar crystal is employed.

Thus, the main objective of the invention is to provide a watch case the crystal supports of which are integrally formed with the caseband, the crystal exhibiting, at

least in its peripheral zone a spherical form, the thickness of the crystal being substantially constant in said zone and the caseband having the form of a part of a sphere the radius of which is substantially equal to the radius exhibited by the internal surface of the crystal in said peripheral zone in such a way that, in order to mount the crystal on the caseband, the crystal is slid laterally on the upper surface of the caseband with a rotational movement about the center of curvature presented by said upper surface until the peripheral zone of said crystal is engaged in said slots then covers at least partially said caseband. In addition, the manner of fastening the crystal to the caseband remains the same as that which has been described in respect of the cited patent and which presents the same advantages already mentioned.

The invention will be now understood in the light of the following description and the drawings which illustrate it and which give by way of example some forms of said invention in which :

- Figure 1 is a top view of a watch case according to the invention in a first form of execution thereof;

- figures 2 and 3 are cross-sections of the case of figure 1 respectively along lines II-II and III-III;

- figure 4 is a perspective view which shows the assembly of the crystal on the caseband of the watch shown in figure 1;

- figure 5 is a variant in the execution of the construction shown on figure 2;

- figure 6 is a perspective view of a watch case according to the invention and in a second form of execution;

- figure 7 is a top view of a watch case partially assembled according to a third form of execution of the invention.

Figures 1, 2 and 3 show a watch case according to a first form of the invention. This case comprises a case band 1 on the interior of which is housed a movement 2 surmounted by a dial 3. Above the dial appear hands 4. The case comprises further a crystal 5 the peripheral zone 6 of which covers entirely the caseband 1. A casing ring 7 is disposed between the movement 2 and the caseband 1. The casing ring 7 bears on its upper portion a moisture resisting packing 8. As shown in figure 2, the casing ring is arranged to include further a second packing 9. The case further includes two supports 10 and 11 which face one another and which are fixed to the caseband 1. The supports 10 and 11 each exhibit a portion 12 which projects beyond the lateral walls of the caseband. In this portion 12 is provided a hole 13 in which a lug 14 is threaded to maintain in place a bracelet 15. Supports 10 and 11 form with the caseband 1 slots 16 in which the crystal 5 may be engaged by its peripheral zone 6. The crystal 5 further bears on its lower surface metallization 29 intended to hide from view the upper edge 19 of the caseband, the packing 8 and the flange 30.

Figure 2 shows a support 10 integrally formed with the caseband 1 having a portion 12 serving to attach a bracelet. It will however be noted that support 10 could be fixed to the caseband without being integral therewith. It could for instance be fastened by means of screws.

- 5 -

In the same manner, support 10 might not necessarily include portion 12 and hole 13 but provide a simple joining member for uniting the support to the case band.

The case further includes means for displacing the casing ring 7 which are operable from outside the case in order to compress the packing 8 against the internal surface of crystal 5. It may be seen in figure 2 that the case includes a back cover 17 screwed to the caseband 1 by screws 18.

It will be understood that when one screws on the back cover 17 the casing ring 7 is displaced upwardly and thus compresses the packing 8 against the internal surface of the crystal, thus to block the crystal against supports 10 and 11 and at the same time render the case water resistant from above and about its entire periphery, the seal 8 exhibiting the form of a ring running entirely around the case.

According to the construction shown on figure 2, the casing ring 7 is independent from the back cover. It is then necessary in order to render the case water resistant from below, to provide the second packing 9. On the other hand, if the casing ring 7 were to be manufactured integrally with the back cover 17, packing 9 would be superfluous.

According to the construction shown on figure 3, it is noted that the edge of crystal 6 is flush with the edge of caseband 1. This situation is not necessary for practicing the invention and one may have arrangements where the crystal is slightly retracted relative to the caseband to provide the watch with a special aesthetic effect. In this case the peripheral zone 6 of the crystal only partially covers the caseband.

There will now be described the essential characteristic of the invention. As may readily be seen on figures 2 and 3, the crystal 5 exhibits at least in its peripheral zone 6 a spherical form of substantially constant thickness. In the drawings, this sphericity is continued over the entire crystal. One could however provide other realizations where within the peripheral zone 6 towards the center of the watch the crystal would have another radius of curvature.

In accordance with the invention and as may be seen on figures 2 and 3, the upper surface 19 of the caseband provides the form of a portion of a sphere of which the radius is substantially equal to the radius of the internal surface 25 forming part of the peripheral zone 6 of the crystal.

In other words, the crystal, once in place but not yet fastened, rests with its spherical interior surface on the top of the caseband, itself likewise having a spherical curvature of the same radius as that of the interior surface 25 of the crystal.

Reference will now be had to figure 4 in order to understand how one assembles the watch case according to the invention. In this figure there has been shown only the caseband 1 with supports 10 and 11 which are integral therewith. The upper surface 19 of the caseband exhibits the form of a portion of a sphere and forms with supports 10 and 11 slots 16. The crystal 5 is shown separated from the caseband. Initially, the internal surface 25 of crystal 5 is caused to slide over the upper surface 19 of the caseband in the direction of arrow 20. The crystal is then given a rotational movement which naturally results from

- 7 -

sliding of the spherical surface presented by the lower surface of the crystal on the portion of the sphere shown by the top of the caseband 19. By continuing the same movement, the peripheral zones 6 of crystal 5 are made to penetrate into slots 16 and this continues until the periphery of the crystal coincides with the edge of the caseband. Thereafter, the packing is compressed (not shown on this drawing) against the internal surface of the crystal by operating the displacement means of the casing ring (not shown) in order to block the crystal 5 against supports 10 and 11.

As may be further seen on figures 1 and 2, supports 10 and 11 extend over the upper surface of the crystal at least until they are aligned with the packing 8. In this manner, one may employ very thin crystals on the order of 0.5 to 0.8 mm of thickness since deformations are avoided which might take place at the contact surfaces and which could have as a consequence poor sealing at the edges of the crystal not covered by the supports.

The watch case shown on figures 1 to 4 likewise shows that one may employ a case of non-circular form where the crystal is a spherical cap truncated in accordance with a rectangular configuration cut in order to match the form of the case. Supports 10 and 11 are located at rectilinear portions along the periphery of the crystal. Other forms might be envisaged for the periphery of the case. One could for example provide a form having two rounded portions and two linear portions or further a hexagonal form. In all these variants it is possible to employ a spherical crystal if use is made of the claimed means.

In the special construction shown on figures 1 to 4 are employed supports 10 and 11 which extend over a large

part of the rectilinear portions shown by the periphery of the case. In this case it will be understood that it is necessary that the internal surface 21 of supports 10 and 11 likewise exhibit the form of a portion of a sphere of which the radius is substantially equal to the radius of the peripheral external zone of the crystal cap. In this manner one is enabled to obtain a good distribution of the blocking forces acting on the crystal. It likewise permits to bestow on the object a desirable aesthetic form.

Figure 5 is a variant of the construction shown on figure 2. It is distinguished therefrom only by the form of the slots 22 formed on the one hand by the support 23 of which the internal surface is cut in a bevel and on the other hand by the portion of the sphere shown by the top of the caseband 19 such as was already used in the construction shown on figure 2. In the construction of figure 5, the edge of crystal 5 is angled to form bevel 24. When the back cover 17 is applied to the caseband by means of screw 18, the casing ring 7 is displaced upwardly and the packing 8 is compressed against the internal surface of the crystal thereby to block the bevelled glass against the bevel of the support 23. In this variant the assembly of the case is the same as that which has been described in respect of the preceding figures where in a first operation the internal surface of the crystal is slid over the upper surface of the caseband with a rotational movement until the periphery of the crystal coincides with the edge of the caseband and thereafter the crystal is blocked against the supports of the caseband.

Figure 6 is a perspective view of a watch case according to the invention and in accordance with a second form thereof. Herein there is a round case on which is arranged

a crystal having the form of a spherical cap with a circular periphery 26. One will recognize on the drawing the caseband 1, the casing ring 7 in which is provided a groove receiving packing 8, back cover 17 fixed to the caseband by means of screws 18, the crystal 5, the movement 2 and the two supports facing one another which are in the form of claws 27 and 28. The peripheral zone 6 entirely covers caseband 1. In order to introduce the crystal into slot 16 it will be understood that supports 26 and 27 must be of small width and that the bottom of slot 16 must be rectilinear to enable passage of the full diameter of the crystal during the introduction of the latter.

Figure 6 will show readily the very thin aspect of the watch case realized according to the means proposed by this invention. This impression of thinness is given on the one hand by the fact that the crystal covers the caseband and on the other hand since the crystal is convex this permits placing the peripheral zone of the crystal below the level of dial 3.

Figure 7 is a top view of a watch case partially assembled according to a third form of the invention. It has been said in respect of figure 6 that the supports must be of small width if one wishes to be able to introduce the crystal. The construction shown on figure 7 shows two supports 37 and 38 extending over a substantial arc of a circle which would render impossible the assembly of the crystal as explained in respect of figure 6. To overcome this difficulty there is employed a caseband made in two parts 30 and 31. For the assembly of the case initially the internal surface of the crystal 5 is caused to slide on the upper surface of the caseband 30 according to the rotation movement already mentioned until the crystal

is lodged at the bottom of the slot 16 formed by support 37 and caseband 30. Next by the same rotational movement the upper surface of the caseband 31 is caused to slide under the crystal in the sense of arrow 39 until said crystal penetrates entirely into the slot formed from caseband 31 and support 38. At this time the two portions 30 and 31 are juxtaposed and contact one another at their edges 40 and 41. One continues the assembly in introducing from below the casing ring, packing and movement, the assembly being completed by screwing the back cover onto the caseband as has already been explained in respect of the preceding figures.

It will be noted that this procedure also permits assembly of a caseband having more than two supports. For instance, in the case of figure 7, in addition to supports 37 and 38, one may have two further supports located in quadrature at the place of joints 40, 41. These further supports could then each be made in two parts, one belonging to the caseband 30 and the other to caseband 31. This manner of assembly may also be employed for rectangular form watch cases where each of the four edges of the crystal is retained by a support, two thereof serving to attach a bracelet and the other two serving as decoration.

From the description of the forms which have just been given, it will be noted that this system of assembly as well as fixing of the crystal permits an easy assembly of the watch case.

In the case where the supports are realized integrally with the caseband, the assembly of the crystal by sliding according to a circular arc is the most appropriate means. In the case where the supports are fixed to the caseband by screws for instance, one could initially apply the crystal to the caseband from above, then fix the supports there-

- 11 -

after. Such however requires two simultaneous actions which complicates the assembly and which may cause breakage or deformation of the crystal since it will then be necessary to bear down on the latter during the fastening of the supports to the caseband. According to this invention, the supports are initially fastened and only thereafter one proceeds to place the crystal and the fixation thereof by the displacement means as described.

CLAIMS

1. Watch case comprising a back cover (17), a caseband (1; 30, 31) provided with a housing intended to receive a movement (2) surmounted by a dial (3), a crystal (5) the peripheral zone (6) of which covers at least partially the caseband, a casing ring (7) arranged between the movement and the caseband and including a moisture resistant packing (8) at least on its upper surface, at least two supports (10, 11; 23; 27, 28) fixed to the caseband, each of said supports with said caseband forming a slot (16) in which the crystal may be engaged and means (17, 18) for displacing the casing ring operable from the case exterior in order to compress said packing against the internal surface of the crystal and block said crystal against said supports, characterized in that said supports (10, 11) are integrally formed with the caseband (1; 30, 31), in that the crystal exhibits a spherical form at least in its peripheral zone (6), the thickness of the crystal being substantially constant in said zone and in that the upper surface (19) of the caseband has the form of a part of a sphere the radius of which is substantially equal to the radius exhibited by the internal surface (25) of the crystal in said peripheral zone in such a way that, in order to mount the crystal on the caseband, the crystal is slid laterally on the upper surface of the caseband with a rotational movement about the center of curvature presented by said upper surface until the peripheral zone of said crystal is engaged in said slots then covers at least partially said caseband.

2. Watch case according to claim 1, characterized by the fact that the edge of the crystal is angled to form a bevel (24) cooperating with the supports (23), the inner surface of which is cut in a bevel.



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3. Watch case according to claim 1, characterized by the fact that the supports (10, 11) extend a sufficient distance over the upper surface of the crystal to be in line with the packing.

4. Watch case according to claim 1, characterized by the fact that it has a rounded form, that the crystal is in the form of a spherical cap with a circular periphery (26) and that the supports are in the form of claws (27, 28) of small width.

5. Watch case according to claim 1, characterized by the fact that it is of non-circular form, that the crystal is in the form of a spherical cap with a periphery truncated to match the form of the case, and that the supports (10, 11) are located at rectilinear portions presented by the periphery of the crystal.

6. Watch case according to claim 5, characterized by the fact that the supports (10, 11) extend over a major part of the rectilinear parts of the case periphery, and that the internal surface (21) of the support has the form of part of a sphere the radius of which is substantially equal to the radius of the external periphery zone of the cap.

7. Watch case according to claim 1, characterized by the fact that the caseband is formed by two juxtaposed members (30, 31).

8. Method of assembling a watch case according to claim 1 including the following steps :

- sliding the internal surface (25) of the crystal (5) over the upper surface (19) of the caseband with a rotational motion resulting from the sliding of a spherical surface over a portion of a sphere;



- continuing said sliding movement so as to effect penetration of the peripheral zones (6) of the crystal into the slots (16) formed by the supports (10, 11) and the caseband (1) until the periphery of the crystal coincides with the edge of the caseband, and

- compressing the packing (8) against the internal surface of the crystal by the operation of the casing ring (7) displacement means (17, 18) thereby to block the crystal against the supports.

