

Description

The present invention concerns timepieces including a case formed at least partially from a hard natural or artificial mineral material such as granite or semi-precious stones, or, such as carbides or nitrides of certain metals as for instance tungsten or titanium.

In Swiss patent 517 963 there is described a timepiece the case of which includes an inner metal caseband to which are fitted a crystal and a back cover surmounted by a protective cap. The latter is formed from a hard material by sintering a powder based on a metallic carbide. The inner caseband is glued to the cap basically in order to compensate for variations in the cap tolerances, it being well known that the dimensions thereof cannot be obtained precisely in view of the considerable shrinkage which occurs during the sintering operation.

Should it be wished to replace the cap of sintered material in this particular case by a cap of hard stone there must be machined in the latter a central opening to enable assembly of the crystal onto the inner metallic caseband and evidently likewise to enable observation of the dial which is also fastened onto this inner caseband. This arrangement renders such a substitution extremely difficult since machining of hard stone is obtained by grinding, this being a machining operation during which only relatively small amounts of material may be removed in a given time period. To this must be added that the central opening weakens substantially the cap from whence there arises major risks of breakage during the machining and assembly operations of the timepiece. Thus should one undertake such a substitution one may also be confronted with a high rate of rejects having as consequence a relatively high manufacturing price.

On the other hand in view of the presence of the metallic ring forming the inner caseband one finally obtains a timepiece of high rigidity with effective protection of the case against wear by virtue of the cap.

In sum from this analysis of Swiss patent 517 963 it may be determined that the case described therein is mediocre as to its rigidity during the course of manufacture while such rigidity is satisfactory to the timepiece user.

Finally it may be noted that the weakness of the cap will be felt during manufacture whether it be formed of sintered material or machined stone.

Swiss patent 583 439 provides a teaching which contributes to improving the assembly described in CH 517 963 in the sense that it recommends employment of a piece of machined semi-precious material including a caseband lacking a central opening, which in this case is filled up by a wall portion formed entirely in one piece with the caseband and serving as a dial for the timepiece. This part which is of relatively simple form requires however machining of the movement housing, of the space between the attachment lugs and above all of several through holes intended to accommodate the fastening feet. Effectively it is by such feet that a bezel intended for fastening the crystal and a back cover is applied to the caseband, the feet cooperating with nuts screwed thereon and embedded in the thickness of the back cover. Anti-moisture packings are squeezed against the two faces of the caseband respectively by the bezel and the back cover.

Although this arrangement provides certain advantages in respect of manufacture of the part forming as one single piece the caseband and the dial, it nevertheless remains necessary to carry out a delicate machining operation on the stone, namely piercing the passage holes for the fastening feet. The presence of these holes can moreover also cause cracks leading to breakage in the stone either during machining or when worn, whenever the part undergoes shocks. Such difficulty evidently may be overcome but only at the price of increasing the thickness of the stone part which in turn increases the overall thickness of the timepiece.

Furthermore, in the arrangement of this patent the movement is held in its housing by a lateral groove formed in

the wall of the housing. This groove likewise necessitates a delicate machining operation in the stone. Such fastening method also implies that the movement be elastically supported against the bottom of the housing (i.e. on the central face of the central wall portion opposite the dial). Consequently when the timepiece undergoes shocks while being worn the inertia of the movement acting against this central wall portion brings about a risk of starting ruptures at the junction point thereof with the caseband.

Finally, it is to be noted that this assembly comprises numerous components and employs packings applied to the faces of the stone whereby it is not possible to guarantee perfect anti-moisture sealing in view of the nature of the stone material.

The invention has thus as its object to provide a timepiece comprising a case having an inner caseband made from a rigid, but easily machinable material housing the movement and rigid with a back cover, and an outer caseband surrounding the inner caseband and made from a hard natural or artificial mineral material, the inner caseband and the outer caseband being assembled together by gluing, said timepiece being characterized in that said outer caseband is integrally formed with a hub member providing a dial, and in that it comprises means for positioning and fastening the crystal girdling said hub member and made in the body of the outer caseband.

Thanks to these characteristics, there is obtained a timepiece in which the portion of the case formed in one single piece from hard mineral material has a simple form with a minimum of discontinuities and lacks through-holes with the exception of those to permit passage of the axles for the hands and the stem in a manner such that the resistance of the timepiece is improved as much during manufacture as during wear.

Owing to the present invention, it is possible to provide a timepiece in which the sealing problem is solved in a simple and efficient manner.

72

To this end the crystal, according to the invention, is advantageously fastened to the outer caseband by gluing.

Thereby, sealing of the interfaces including the surfaces of mineral material is obtained by means of glue, while sealing of the metal-to-metal interfaces is obtained by means of packings. There results therefrom that the mineral material does not undergo any permanent stress in assuring fastening of the different parts of the watch to the caseband.

Owing to the present invention, it is also possible to obtain a timepiece in which all parts of the case visible to the wearer, with the exception of the bracelet attachment lugs, are formed of the mineral material.

This is attained by virtue of the fact that, in one embodiment of the invention, the outer edge of the inner caseband is entirely covered by the outer caseband.

The timepiece thus obtained exhibits a notable aesthetic effect with optimum protection of the parts susceptible to wear.

The invention will be better understood by reading the following description of an example made with reference to the accompanying drawing in which the single figure shows a broken diametral cross-section of a timepiece according to the invention.

In accordance with the example shown in the single figure the timepiece includes a case 1 including a part 2 formed of hard natural or artificial material such as granite, a semi-precious stone, a metallic carbide, a mono-crystalline metallic oxyde or the like. This part which is formed in a single piece includes a ring forming an outer caseband 3 of the case and hub member 4 which closes the ring at approximately $3/4$ of its height, such hub member forming the timepiece dial 5 on its upper face.

It is thus that part 2 bounds a circular central housing 6 which here is coaxial with the outer form of caseband 3. The latter exhibits a periphery of semi-toroidal form. However, it should be observed that the form of caseband 3



and placing of housing 6 are not to be considered as limiting and are only determined by the desired aesthetic of the timepiece, the housing 6 being capable of off-center location relative to the general form of the stone caseband 3 which itself may take on greatly varied external forms likewise determined by aesthetic considerations.

The face of the hub member 4 which forms dial 5 is concave while it is bordered by a raised peripheral portion 7 of the outer caseband 3. This portion 7 determines by its form positioning and fastening means 8 for a crystal 9. In the embodiment shown, such means comprise an annular step 10 defining a shoulder 11 on which may be applied crystal 9 by means of a glue joint. The crystal 9 is thus embedded in the thickness of the outer caseband.

The hub member 4 is pierced at its center by a hole 12 to enable passage of axles 13 and 14 for the hands. Furthermore, its central zone includes a stiffening portion 15 to give the hub member rigidity at this place. This stiffening portion is obtained by continuing machining of housing 6 at the end of such operation only at the periphery of the bottom thereof. Thus, the stiffening portion 15 is surrounded by an annular clearance.

A metallic inner caseband 16 is placed in housing 6 and abuts against the bottom of the annular clearance. This caseband includes an annular ring 17a from which extends flange 17b towards the interior and which is glued to the outer caseband 2 by glue joints interposed between the respective peripheral exterior and interior walls of the casebands and likewise (although not indispensable) between the face of the upper extremity of the inner caseband 16 and the portion of the corresponding lower face of the hub member 4.

The inner caseband 16 is initially intended to receive movement 18 of the timepiece by an interposed member in the form of a casing ring 19. In the example as shown, movement 18 is supposed to be of the barrel type, the casing ring 19 thus not exhibiting a constant radial cross-section over its entire periphery as may be seen to the left and the right of

3

the figure. The casing ring includes a shoulder 20 cooperating with a collar provided in a standard manner on the movement periphery.

An annular groove 21 is provided in the lower face of the inner caseband to accommodate an anti-moisture packing 22. Furthermore, several threaded holes 23 are provided in this caseband in order to enable its assembly with a back cover 24 by means of screws 25. The back cover 24 is formed by a circular plate of which the form may be adapted to the aesthetic of the whole and which is placed almost entirely in the opening of housing 6. Such plate bears attachment lugs 26 at noon and at six o'clock intended to fasten a bracelet (not shown on the drawing).

It may thus be determined that for sealing thereof the timepiece requires only one packing at the bottom acting efficiently through contact with metal, the packing moreover being surrounded in all its parts by the rectangular section bounded by the back cover and groove 21.

One may likewise note that the inner caseband 16 exhibits an outer diameter d_1 greater than the diameter d_2 of the crystal. This choice is intentional in order to give the inner caseband 16 the function of supporting the fragile zone located at the junction between the hub member 4 and the outer caseband 3. In case of shock during wear the risks of breakage at this place are thus substantially reduced.

There will now be described in detail how the passage for the time setting stem 27 is obtained. The latter passes through a radial hole 28 pierced in the outer caseband 3 as well as a radial hole 29 formed in the inner caseband 16, this latter being adjusted to the diameter of stem 27 to enable rotation thereof while assuring its guidance. The stem 27 itself is provided with a groove 30 which is located approximately midway along the radial hole 29 and which is intended to accommodate a seal 31. It constitutes thus once again a seal acting against metallic surfaces which here assures moisture sealing in respect of the exterior. A crown 32 formed from the same material as part 2 may cap the outer

end of stem 27 being retained on the latter by gluing for example.

It will be noted that the hole in the inner caseband 16 for passage of stem 27 is almost tangent to the radial plane containing the upper face of movement 18. This is due to the fact that stem 27 must have a relatively large diameter in order to permit forming groove 30 for seal 31. If the lower face of the hub member 4 were flat there would result therefrom that the thickness of material between hole 29 and the upper face of inner caseband 16 would be very small which could lead to hole 27 becoming of oval form thus no longer guarantee good contact with seal 31 and a loss of sealing capacity.

Thanks to the fact that housing 6 includes in the periphery of its bottom a groove which surrounds stiffening portion 15 and which enables use of a thicker inner caseband 16 one may guarantee sealing of the watch without increasing the thickness thereof.

This special solution has been made possible in view of the fact that the face of the hub member 4 which forms the dial 5 is concave and that the housing is initially machined over its entire surface and thereafter only over the surface of the groove. It thus results that the cross-section of the hub member at the level of step 10 remains sufficient to withstand the pressure applied thereto during the machining operations.

Machining of part 2 in hard material is preferably obtained through a process of abrasion with a diamond grinder well known to specialists. Within the framework of the invention, such machining does not demand any particular precision in view of the presence of the inner caseband which here is the timepiece element assuring all functions requiring precision, among which may be cited, positioning of the movement, tightening of the packings 22 and 31 and positioning of screws 23 relative to the back cover.



Claims

1. Timepiece comprising a case (1) comprising an inner caseband (16) made from a rigid, but easily machinable material housing the movement (18) and rigid with a back cover (24) and an outer caseband (3) surrounding the inner caseband and made from a hard natural or artificial mineral material, the inner caseband (16) and the outer caseband (3) being assembled together by gluing, said timepiece being characterized in that said outer caseband (3) is integrally formed with a hub member (4) providing a dial (5) and in that it comprises means (8) for positioning and fastening the crystal (9) girdling said hub member and made in the body of the outer caseband (3).

2. Timepiece according to claim 1, characterized in that the crystal (9) positioning and fastening means (8) comprises an annular step (10) arranged in the body of the outer caseband (3) around said hub member (4) on the dial side thereof, said step (10) defining a radial shoulder (11) against which the crystal is fastened.

3. Timepiece according to claim 1, characterized in that the crystal (9) is fastened to the outer caseband (3) by gluing.

4. Timepiece according to any one of claims 1 - 3, characterized in that the hub member (4) is concave on the dial side thereof.

5. Timepiece according to any one of claims 1 - 4, characterized in that the inner face of the hub member (4) comprises in its central portion, a stiffening portion (15) and at its periphery an annular clearance surrounding said stiffening portion and forming an abutment for said inner caseband (16).

6. Timepiece according to any one of claims 1 - 5, characterized in that the inner caseband (16) exhibits an outer diameter (d_1) greater than the outer diameter (d_2) of the crystal (9).



29

7. Timepiece according to any one of the preceding claims, characterized in that the inner caseband (16) comprises a radial flange (17b) located in the annular clearance of the inner face of the hub member (4).

8. Timepiece according to any one of the preceding claims, characterized in that, for the mounting of the time setting stem (27), the outer (3) and inner (16) casebands are respectively pierced with aligned radial holes (28, 29), in that said stem (27) includes a groove (30) midway along the portion thereof intended to traverse the hole (29) in the inner caseband (16), and in that a moisture seal (31) which assure moisture resistance of the timepiece by cooperation with the inner caseband (16) is mounted in said groove (30).

9. Timepiece according to any one of claims 1 - 8 including a bracelet, characterized in that the back cover includes means (26) for fastening the bracelet to the case.

10. Timepiece according to any one of claims 1 - 9, characterized in that the edge of the inner caseband (16) is entirely covered by the outer caseband (3).