

DESCRIPTION

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

One of the difficulties encountered in the realization of a timepiece of this type consists of assuring the fluid tightness thereof where the time setting stem traverses the case. In effect, it is known that fluid tight sealing on the surface of a hard material such as stone can only be mediocre.

For this reason there has already been proposed an assembly arrangement for the time setting stem which includes a tube radially driven into the base plate of the movement and traversed by the time setting stem. The latter receives at its outer extremity the crown which in turn is rendered fluid tight on the outer end of the tube by a packing fixed between an annular flange on the crown and the outer surface of the stem.

This arrangement has not proven satisfactory for several reasons.

Firstly, it necessitates the presence of the tube which must be manufactured and assembled, this increasing the price of fabrication of the timepiece.

However, if the case is fashioned at least partially of hard material, i.e. includes most frequently an outer caseband manufactured from this material (in order to render the case wear resistant), it is necessary to provide where the tube traverses this caseband, a clearance opening downwardly and extending to above the tube. This clearance is necessary to enable placing the movement provided with its tube.

It is known that the machining of hard materials gives rise to serious problems since the risks of rupture of the workpiece in the course of being machined are very high. The clearance in question considerably weakens the workpiece at the place where it must be provided in a manner that said risks increase still further. Furthermore, when the timepiece is worn, the clearance may form a starting place for ruptures in case of shocks.

There has been furthermore proposed (EP-A-0 150 746), in a watch case including an outer caseband of hard material and an inner caseband of rigid but readily machinable material, to provide in the inner caseband a clearance for the crown, this clearance being closed on the outer side by the corresponding part of the outer caseband, but which opens downwardly in order to render the crown accessible. The stem fixed to the crown then traverses a radial hole pierced in the inner caseband in which sealing is assured by means of an annular packing placed in a groove machined in the stem. This packing is pressed against the wall of the radial hole.

This arrangement naturally guarantees a very satisfactory sealing since the packing acts on metallic surfaces, but it leads to a rather mediocre operability of the crown since the latter must be operated via the back face of the watch.

The purpose of the invention is to provide a watch equipped with a mounting arrangement of the type described above which avoids these difficulties.

Thus, the object of the invention is a watch the case of which is at least partially formed from a hard material, such case being of the type including an outer caseband formed of hard material and an inner caseband formed of rigid but easily machinable material, said inner caseband including a radial hole for accomodating a setting stem, said stem being engaged therein in a fluid tight manner by

means of a packing lodged in a peripheral groove on the stem so as to be applied against the wall of the hole, characterized in that the outer caseband is fashioned integrally with a central hub portion serving as a dial and includes a radial hole aligned with the hole in the inner caseband and through which freely passes the setting stem towards the exterior, the diameter of such radial hole being greater than that of the stem in the portion of the latter corresponding to such hole.

Furthermore, the outer caseband of hard material includes a radial hole which certainly weakens the caseband at this place, but to a substantially lesser degree than if one were to provide a downwardly opening clearing. Effectively, in the caseband conceived according to the invention, there remains material completely surrounding the passage of the stem, this leading to decreased fragility as much during the manufacture (fewer rejects) as during the wearing (better shock resistance). This advantage is particularly notable when the outer caseband is machined from a block of hard material such as natural stone or a monocrystalline oxide. It is to be further noted that with the seal placed on the stem, one may realize a crown manufactured entirely from the same material as the outer caseband.

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 oxide 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 approxi-

mately 3/4 of its height, such hub member forming the time-piece 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.

A metallic inner caseband 16 is placed in housing 6. 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 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 accomodate 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 25 relative to the back cover.



CLAIMS

1. A watch the case (1) of which is at least partially formed from a hard material, such case being of the type including an outer caseband (3) formed of hard material and an inner caseband (16) formed of rigid but easily machinable material, said inner caseband (16) including a radial hole (29) for accomodating a setting stem (27) said stem being engaged therein in a fluid tight manner by means of a packing (31) lodged in a peripheral groove (30) on the stem so as to be applied against the wall of the hole (29), characterized in that the outer caseband (3) is fashioned integrally with a central hub portion (4) serving as a dial (5) and includes a radial hole (28) aligned with the hole (29) in the inner caseband (16) and through which freely passes the setting stem (27) towards the exterior, the diameter of such radial hole (28) being greater than that of the stem (27) in the portion of the latter corresponding to such hole.

2. A watch as in claim 1 characterized in that at the exterior of the outer caseband (3) the setting stem (27) is capped with a crown (32) formed of the same material as the outer caseband.

3. A watch as in either of claims 1 and 2 characterized in that the housing (6) bounded by the outer caseband (3) and the central hub portion (4) and intended to house the watch movement (18) includes an annular sump surrounding a stiffening portion (15) provided in the central part of the hub portion (4), the inner caseband (16) being applied against said sump, the radial width of such annular sump correponding approximately to the length of the radial hole (29) through the inner caseband (16).

4. A watch as in any of claims 1 to 3 characterized in that said hub portion (4) is surrounded by means (8) for positioning and fixing a crystal, (9) said means being machined in the body of the outer caseband (3).



5. A watch as in any of claims 1 to 4 characterized in that said outer caseband is formed from natural stone material.

6. A watch as in any of claims 1 to 4 characterized in that said outer caseband is formed from a monocrystalline oxide material.