

METHOD AND MEANS FOR FITTING A CELL IN A WATCH CASE
IN A FLUIDTIGHT MANNER

The present invention relates to a method and means for fitting a cell in a watch case in a fluid tight manner, the case being made of thermoplastic synthetic material. The invention is concerned with the problem of fitting the cell in such a way as to achieve fluid-tightness with respect to the outside of the case of the watch. This is to protect the wearer of the watch against possible leakage of the electrolyte from the cell.

It is well known to make one-piece watch cases of thermoplastic synthetic material. These cases are produced in general by injection moulding. This enables the cost of manufacture of the cases to be very considerably reduced since all the shaped parts of the case are defined during the injection moulding operation.

Moreover, it is well known that one of the principal limitations of the length of life of watches is the length of time for which the cells remain operative. It is therefore particularly important to be able to gain easy access to the cell with a view to its replacement. In the case of one-piece watch cases, that is to say watches in which the back and the rest of the body of the case are made in only one piece, access to the interior of the case can be obtained only by removing the glass and the dial. In order to avoid this complicated operation and to enable the cell to be easily replaced, it is known in such watches to provide in the back of the case an opening or passage for the insertion and removal of the cell which opening or passage is closed by a cover. It is sufficient to remove this cover in order to gain access from the outside to the cavity in which the cell is housed.

Swiss Patent No 552 241 published on the 31st July 1974 describes a watch which has a one-piece case made of synthetic material in which the back of the case is formed with an opening for the insertion and removal of the cell, which opening is closed by a cover. The cover is held in the cell opening by the cooperation of a flange formed in the periphery of the opening with a corresponding groove in the periphery of the cover. The cover is therefore fixed by means of a catch in the cell opening. This

solution has the advantage of being simple, but it has the major disadvantage that it does not ensure a degree of fluid-tightness which conforms to the present standard requirements or at least does not ensure this degree of fluid-tightness throughout the required period of time.

In order to overcome these disadvantages, a first object of the invention is to provide means for closing the opening for the cell which ensure a high degree of fluid-tightness.

A second object of the invention is to provide a fluid-tight closure of the opening for the cell with means that are compatible with the production of the watch case by injection moulding.

A third object of the invention is to provide means for closing the opening for the cell in which the positioning of the closure during the initial assembly of the watch does not necessitate any complicated opening and is easily compatible with assembly line production of the corresponding watches.

The invention is defined in the claims below. In carrying the invention into effect we may start with a watch case having a circular opening which provides communication between the cavity for the cell and the outside of the watch, and with a circular metal cover. The external surface of the back of the case also has an annular groove surrounding the opening and at least two recesses opening into the groove and extending radially from the same. The recesses have a depth which is less than the thickness of the back of the case. The closure has a flange in the form of a skirt of small depth, which is provided with radially projecting lugs, one for each recess, the lugs having a thickness smaller than the depth of the recesses. To instal the cell, it is inserted in the cell cavity and the cover is positioned so that its flange drops into the groove and the lugs drop freely into the recesses. Then torque and energy are applied to the cover so that, as the cover rotates, the lugs bite into the thick portions of the back separating the recesses and penetrate at least partly into these solid portions so as to ensure the fixing of the closure on the back of the case.

In other words the fixing of the closure in one entrance opening for the cell is obtained by a bayonet joint system, the male portion of which is constituted by the lugs on the cover and

the female portion is constituted partly by the annular groove but particularly by the radial recesses. The female portion of the bayonet joint system is completed by an undercutting of the thick portions separating the recesses, which undercutting is produced
5 by the lugs themselves, thus acting like a tool for cutting and shaping the thermoplastic synthetic material. It is this undercutting which ensures the fixing of the cover.

This particular technique on the one hand solves the problem of the respective manufacturing tolerances for the lugs on the
10 cover and the undercuts to be formed in the periphery of the cell-insertion opening, since these undercuts are produced by the lugs themselves. The second advantage is that of enabling a fixing of the cover on the back of the case to be obtained which is effective thanks to the bayonet joint system which makes
15 possible a high degree of fluid-tightness between the cover and the back of the case, while at the same time being compatible with production of the watch case by injection moulding. It will be clearly apparent to the man skilled in the art that the formation of the undercuts would be impossible by injection
20 moulding.

Preferably, the supply of energy is provided at the same time as the rotation of the cover by the application of ultrasonic vibrations to the cover. These ultrasonic vibrations are transmitted
to the lugs, the resulting vibrations of which permit the deformation
25 of the thermoplastic material and hence the production of the undercuts.

The invention is obviously concerned not only with the assembly procedure, but also with the watch case provided with shaped parts which make this assembly possible and the combination
30 of means which make the said assembly possible, that is to say the particular shaped parts of the case, the particular shape of the cover and the implements that enable the torque and the necessary energy, for example ultrasonic vibrations, to be applied to the cover, all as set out in the claims below.

35 The invention will be described in more detail, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a portion of the back of a one-piece case having the shaped parts according to the invention;

Figure 2 is a sectional view of the back of the case taken on line II-II in Figure 1;

Figure 3 is a top plan view of a cover for closing the entrance to the cell cavity;

5 Figure 4 is a sectional view taken on the line IV-IV in Figure 3 showing the cover;

Figure 5 is a view in vertical section similar to Figure 2, but showing, in addition, the cell located in the cavity provided for it and the cover in the closed position;

10 Figures 6a and 6c illustrate different stages in the closing of the entrance opening for the cell and makes clear how the undercuts are formed by the lugs.

Figures 1 and 2 show a portion of a one-piece watch case 2 made of a thermoplastic synthetic material. This case has a back 4 with an external surface 4a. The back 4 has a circular opening 15 6 which provides communication between a cell-cavity 7 and the outside of the watch. The external surface 4a of the back of the case is also provided with an annular groove 8 surrounding the opening 6. The groove 8 and the opening 6 are separated by a land 10 having an outer supporting surface 10a of annular shape and parallel to the external surface 4a. The groove 8 is completed by three recesses 12, separately identified as 12a, 12b and 12c extending radially outwardly from the groove 8 and communicating with the latter. The groove 8 and the recesses 12 20 are preferably of the same depth e which is less than the thickness E of the back of the case. These recesses 12 are preferably of semi-cylindrical shape as shown in Figure 1. The cell cavity 7 is moreover delimited by a side wall 8a and a base 7c formed by integral parts of the one-piece case. In Figure 1 it is clearly apparent that the case has between the recesses 12 25 solid parts 14 which separate the recesses 12.

Figures 3 and 4 show a possible constructional form for the cover which serves for closing the entrance opening for the cell. This cover 20 is of generally circular shape and has on its 35 periphery a flange 22 in the form of a skirt of small depth. In the centre of the crown portion 24 of the cover there is formed a groove 26. This groove 26 serves, as will be explained later in detail, for the removal of the cover to enable the cell to be

withdrawn. The flange 22 of the cover is provided with three lugs 28 (28a, 28b and 28c) which project outwardly from the cover along radii of the latter. These lugs 28 have a thickness e' which is in any case less than the depth e of the groove 8. The width
5 of the lugs 28 is less than the width of the recesses 12 so as to enable the lugs 28 to be inserted freely into the recesses 12. The lugs have a semi-circular shape as shown in Figures 3 and 4. The cover also has three recesses or notches 30a, 30b and 30c located opposite the lugs 28a, 28b and 28c. As will be explained
10 later, these notches serve for the fixing of the cover on the back of the case.

Figure 5 shows the positioning of the cell in its housing and the closing of the opening leading to the cell cavity. The cell 32 is provided in known manner with a first surface 32a
15 which for example forms the negative electrode and a second substantially flat surface. The cell 32 is positioned in its cavity 7 in such a manner that its negative electrode 32a is either opposite an electrical contact 34 mounted in the inner surface 7d of the base 7c of the cavity. A deformable sealing
20 disk 36 is then placed over the upper surface 10a of the flange 10. In a subsequent step, the cover 20 is positioned in such a manner that the lugs 28a, 28b and 28c project freely into the recesses 12a, 12b and 12c and that the flange 22 of the cover projects into the groove 8. The sealing disk 36 is thus located between the
25 inner surface of the cover on the one hand and the surface 32b of the cell 32 and the supporting surface 10a of the flange 10 on the other hand.

In order to ensure the fluid-tight fixing of the cover 20, a tool 38 (Fig 5) is used. Preferably this tool is an ultrasonic
30 bit to which a vibratory movement along the axis X-X' is imparted by means of an ultrasonic generator. For example, the tool 38 can vibrate at a frequency of 40 kHz with an amplitude of the order of 5 microns. The operative portion of the tool 38 consists of three fingers 38' which are arranged so that they can
35 project into the notches 30a, 30b and 30c. This tool performs a triple function. First of all, it enables a certain amount of pressure to be applied to the cover 20 in order to produce a slight compression of the sealing disk 36 which is preferably composed of a

silicone material. Its second function is to act as a screw-driver in order to produce a rotation of the cover 20 by cooperation between the fingers 38' and the cut-away parts 30. Finally, the fingers transmit the vibrations to the cover 20 and hence in particular to the lugs 28.

As has already been explained, the cooperation of the torque with the transmission of ultra high frequency sound waves to the lugs enables the undercuts to be produced in the solid parts 14 in order to provide for the fixing of the cover in the back of the case.

Figures 6a to 6c illustrate the various different stages. In the stage shown in Figure 6a, the cover has not yet been positioned. In the next stage, shown in Figure 6b, the cover is positioned and in particular the lug 28c is freely engaged in the radial recess 12c. On the simultaneous application of the torque and of the vibrations to the lugs, the leading edge 28'c of the lugs 28c produces a local deformation of the lateral wall 12'c of the recess 12c so as to form in the solid part 14 an undercut indicated by the reference 40 by local heating of the back of the case. This undercut 40 is then produced bit-by-bit by penetration of the lugs 28c into the solid part 14 until a substantial part of the width of the lugs 28c has penetrated into the thick part 14. Obviously, having regard to the relative thickness of the lugs 28c and of the solid part 14, a substantial portion 14' of the solid part 14 remains undeformed above the lugs 28c, thus ensuring the fixing of the cover on the back of the case.

It is clear that, since the undercut is formed by the lug itself which effects the securing, the securement is of very good quality and the cover is held perfectly against rotation with a substantial securing force. This securement consequently ensures the application of the negative electrode 32a of the cell 32 against the contact 34 and the application of the cover against the sealing disk 36. Accordingly, there is obtained effectively a very good fluid-tightness between the cover 20 and the back of the case via the sealing disk 36.

It must be added that the sealing disk 36 not only ensures fluid-tightness but also enables the vibrations produced by the tool 38 to be absorbed so that these vibrations are not transmitted as a whole to the cell. Moreover, since the notches parts 30, which

are in direct contact with the fingers 38' are adjacent the lugs 28, the path traversed by the vibrations between the source of vibration and the lugs is minimal, which limits the loss of energy.

5 In the embodiment so far described, the groove 8 is separated from the opening 6 by a land 10 which permits the positioning of the sealing disk 36. It is, however, clear that the land 10 need not be provided, in which case the groove 8 would debouch directly into the opening 6. Obviously, the recesses 12a, 12b,
10 12c would be retained. In such a construction, the sealing disk 36 could be located directly on the base 8' of the annular groove 8. The fluid-tightness would then be obtained by the cooperation of the sealing disk 36 with the end 22a of the flange 22 of the cover or with the lugs 28a at the locations where the latter are
15 provided.

In order to remove the cell 32, it is sufficient to introduce the end of a tool into the groove 26 so as to cause the cover to rotate in the opposite direction, thereby loosening the cover from the case.

20 It should be added that, although the use of ultrasonic waves for providing the lugs of the cover with sufficient energy for forming the undercuts would appear to be the procedure best suited for carrying out this operation, it would also be possible to envisage heating the cover at the same time as causing it to
25 rotate, in order to enable the undercuts to be formed.

CLAIMS



1. A method of fitting a cell in a watch case of thermoplastic material in a fluid-tight manner, wherein the back of the case is formed with an open cell cavity surrounded on the external surface of the back by an annular groove from which extend a plurality of radial recesses, wherein the cavity is closed with a circular metal cover having a flange and lugs received in the groove and radial recesses respectively, and wherein the cover is subjected to torque to cause the lugs to bite into the thermoplastic material while imparting energy to the cover so as to promote the biting of the lugs.

2. A method according to claim 1, wherein the energy imparted to the cover is ultrasonic energy.

3. A method according to claim 2, wherein the ultrasonic energy is imparted by way of a tool engaged with the cover to apply the torque thereto.

4. A method according to claim 1, 2 or 3, wherein a sealing element is compressed between the cover and a land between the groove and the cavity opening.

5. Means for fitting a cell in a watch case of thermoplastic material in a fluid-tight manner, wherein the back of the case is formed with an open cell cavity surrounded on the external surface of the back by an annular groove from which extend a plurality of radial recesses, comprising a circular metal cover having a flange and lugs adapted to drop into the groove and recesses respectively, a tool engageable with the cover to apply torque thereto such as to cause the lugs to bite into the thermoplastic material, and energising means for simultaneously imparting energy to the cover so as to promote the biting of the lugs.



6. Means for fitting a cell in a watch case according to claim 5, further comprising a sealing element which can be compressed between the cover and a land between the groove and the cavity opening.
- 5 7. Means for fitting a cell in a watch case according to claim 5 or 6, wherein the energising means transmit ultrasonic energy to the cover through the tool.
8. Means for fitting a cell in a watch case according to claim 7, wherein the cover has recesses adjacent the lugs and the tool has
10 fingers adapted to enter the recesses to transmit the ultrasonic energy to the cover.
9. Means for fitting a cell in a watch case according to any of claims 5 to 8, wherein the cell cavity is formed entirely in the thickness of the back of the case.
- 15 10. A watch comprising a case of thermoplastic material with a back, a cell cavity formed entirely in the thickness of the back of the case, an annular groove surrounding the cell cavity on the external surface of the back of the case and a plurality of radial recesses extending from the groove, and a circular cover
20 fitted over the cell cavity with a flange received in the groove and lugs received in the recesses but biting into the thermoplastic material so as to retain the cover in place, by virtue of a rotational displacement of the cover relative to a position in which the lugs register fully with the recesses.
- 25 11. A watch case for use in carrying out the method according to claim 1, the casing being formed of thermoplastic material and having a cell cavity formed entirely in the thickness of the back of the case, an annular groove surrounding the cell cavity on the external surface of the back of the case and a plurality of radial recesses extending from the groove.

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12. A watch case according to claim 11, wherein an annular land surface lies between the groove and the cavity opening.

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