

PATENT SPECIFICATION (11)

1 555 633

1 555 633

- (21) Application No. 14339/77 / (22) Filed 5 April 1977 / (19)
 (31) Convention Application: No. 51/047 012 (32) Filed 23 April 1976 in
 (33) Japan (JP)
 (44) Complete Specification published 14 Nov. 1979
 (51) INT. CL.² G04B 39/00
 (52) Index at acceptance
 G3T A2B A2C A2D



(54) DIGITAL ELECTRONIC WATCH

(71) We, KABUSHIKI KAISHA SUWA SEIKOSHA, a Japanese Company, of 3-4, 4-chome, Ginza, Chuo-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns a digital electronic watch.

According to the present invention, there is provided a digital watch having a digital display and a circuit block for controlling the digital display both mounted within a watch case comprising a tubular casing member which forms part of the external surface of the watch case, a back cover which is sealed to said tubular casing member, and a watch glass which is supported by the tubular casing member by way of at least one intermediate member mounted in an internal recess in the tubular casing member; the shape of the internal recess permitting the watch glass and intermediate member to have been introduced into the internal recess from above the latter when the watch case was in a disposition such that the internal recess was at the top of the watch case; the tubular casing member being sealed to the watch glass by means comprising a first sealing member having a portion contacting both the periphery of the watch glass and an axially extending wall of said internal recess, and the tubular casing member being sealed to the back cover by a second sealing member which extends throughout the radial extent of the said portion of the first sealing member, the first sealing member being integral with or separate from, the or a intermediate member.

Preferably also at least a portion of the said intermediate member, or of one of the intermediate members, underlies the watch glass and overlies a part of the circuit block when the watch case is in the said disposition, the said one intermediate member having a window through which time-

indicating indicia of the digital display are visible.

The watch glass may be non-circular in shape.

In one embodiment of the invention, a single intermediate member is employed, said single intermediate member being L-shaped in cross-section.

In another embodiment of the invention, the watch glass is supported on a plate which is itself supported in an L-section sealing member mounted in the said internal recess.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:—

Figure 1 is a broken-away cross-sectional view of a known digital watch.

Figure 2 is a plan view of the digital watch of Figure 1, and

Figures 3 to 5 are broken-away cross-sectional views which respectively illustrate three different embodiments of a digital watch according to the present invention.

Terms such as "upper" and "lower" as used in the description below are to be understood to refer to directions as seen in the accompanying drawings.

In Figures 1 and 2 there is shown a known digital electronic watch, the watch case comprising a tubular casing member 1 which forms part of the external surface of the watch case. Mounted radially inwardly of the tubular casing member 1 is a non-circular watch glass 3. The tubular casing member 1 has an internal surface 1a which is engaged by a sealing member 2, the sealing member 2 being both axially and radially compressed and serving to seal the watch glass 3 to the tubular casing member 1. The tubular casing member 1 is also provided at its upper end with a flange 2a which overlies the sealing member 2 and also overlies the radially outermost portion of the watch glass 3.

The watch glass 3 is mounted on an L-section member 4, one surface of the member 4 engaging the internal surface 1a of the tubular casing member 1. The portion of the member 4 which underlies the watch

50

55

60

65

70

75

80

85

90

95

glass 3 is provided with a window 4a through which are visible time-indicating indicia 7a of a circuit block or watch module 7 of the digital electronic watch.

5 The watch glass 3, sealing member 2, and member 4 are introduced into position within the tubular casing member 1 from below, the flange 2a limiting upward movement of these members.

10 A back cover 5 is connected to the tubular casing member 1 by means of a spring 8, the spring 8 being disposed in grooves 1c, 5b of the tubular casing member 1 and back cover 5 respectively. The circuit block 7 is provided with a flange 7b which is seated on an internal shoulder 5c of the back cover 5, the back cover 5 also having an internal shoulder 5d on which is seated a frame member 6, the flange 7b being clamped between the frame member 6 and the back cover 5.

25 The back cover 5 is sealed to the tubular casing member 1 by way of a sealing member 9 which is disposed on an upper surface 5e of the back cover 5. The sealing member 9 is axially compressed by the action of the spring 8.

30 In digital watches having the known watch case shown in Figures 1 and 2, it is necessary to arrange that at least substantially the whole of the sealing member 9 is disposed radially outwardly of the surface 1a of the tubular casing member 1 in order to effect the required degree of seal. By reason of this fact, the distance Z between the outer diameter 1d of the tubular casing member 1 and the outer diameter of the watch glass 3 depends very largely on the combined radial thickness of the sealing members 2, 9. Consequently, the dimension Z cannot be made small and therefore in the case of the construction shown in Figure 1 it is difficult to make a small watch case.

45 Moreover, it was felt undesirable for the member 4 to be small, and in order to make the member 4 larger it was necessary to enlarge the size of the tubular casing member 1, so involving design difficulties. If such design difficulties are to be overcome as much as possible, it is necessary to arrange that the internal surface 1a of the tubular casing member 1 which is contacted by the sealing member 2, and an internal surface 1b of the tubular casing 1 which is disposed adjacent to the back cover 5, as well as a peripheral surface 5a of the back cover 5, are of non-circular form matching the non-circular form of the watch glass 3, but this involves an increased number of manufacturing steps and consequently high cost.

60 Furthermore, if the shape of the watch glass 3 is designed to match that of the internal surfaces of the tubular casing member 1 and back cover 5, the parts so produced will be non-standard and this

causes difficulties in manufacture and in after-service.

If the watch is to be manufactured economically the internal surface 1b of the tubular casing member 1 and the peripheral surface 5a of the back cover 5 should be circular notwithstanding the fact that the external surface 1d of the tubular casing members 1, the member 4, and the internal surface 1a of the tubular casing member 1 are all non-circular. However, in this case it is necessary to arrange that the internal surface 1a of the tubular casing member 1 is disposed radially inwardly of the peripheral surface 5a of the back cover 5 and radially inwardly of the sealing member 9 as clearly shown in Figure 2, and this will make the member 4 look narrow, while increasing the overall dimensions of the tubular casing member 1, and consequently result in a watch case of poor appearance.

In Figure 3 there is therefore shown a first embodiment of a digital watch according to the present invention. This embodiment comprises a tubular casing member 10 which forms part of the external surface of the watch case, the tubular casing member 10 being sealed to a non-circular (e.g. rectangular) watch glass 11 by means of a radially resilient sealing member 12 of inorganic material. Alternatively, the sealing member 12 may be composed of synthetic resin or soft metal or synthetic rubber such as to provide a good seal against the periphery of the watch glass 11 and such as to be compressed in the radial direction. The sealing member 12 engages an internal surface 10a of the tubular casing member 10, the internal surface 10a being of non-circular form.

The tubular casing member 10 is also provided with an internal surface 10b which, together with the internal surface 10a, constitutes an internal recess of the tubular casing member 10. The internal surface 10b engages a surface of the sealing member 12 and also engages a surface of an annular member 13 which underlies the watch glass 11 and supports the latter.

The tubular casing member 10 is also provided with a downwardly facing internal surface 10c which is engaged by a sealing member 17 seated on an upper surface 14a of a back cover 14, the sealing member 17 serving to seal the tubular casing member 10 to the back cover 14. As will be seen in Figure 3, the sealing member 17 extends throughout the radial extent of the sealing member 12.

The watch glass 11 is thus supported by the tubular casing member 10 by way of the sealing member 12 and annular member 13 which constitute intermediate members mounted in the internal recess formed by the surfaces 10a, 10b.

15

The tubular casing member 10 is also provided adjacent its lower end with an internal surface 10d which is disposed adjacent a side wall portion of the back cover 14, the surface 10d having a recess 10e therein in which is disposed one portion of a spring 18 another portion of which is disposed in a recess 14b of the back cover 14.

The annular member 13 overlies a peripheral portion of a circuit block or watch module 16 and has a window 13a through which substantially only the time-indicating indicia of a digital display (not shown) of the circuit block 16 are visible. The annular member 13 is made of metal or synthetic resin and is provided with a specific pattern or mark for the purpose described below. The external diameter of the annular member 13 engages the internal diameter of the sealing member 12 so as to prevent radial inward deformation of the latter. As clearly shown in Figure 3, the shape of the internal recess 10a, 10b is such as to permit the introduction therinto of the watch glass 11, sealing member 12 and annular member 13 from above, all these parts being supported on the surface 10b.

The back cover 14 supports a middle frame 15, the circuit block 16 having a flange 16a which is clamped in position between the middle frame 15 and the back cover 14.

The sealing member 17 is axially compressed between, on the one hand, the surface 10c and, on the other hand, a middle frame 15 and the upper surface 14a of the back cover 14.

By providing a projection or notch on the circuit block 16 and also providing a projection or notch on the back cover 14, the parts 14, 16 may easily be assembled in the correct relative angular positions. When the back cover 14 and the tubular casing member 10 have been appropriately positioned, the parts 11 to 13 may also be positioned, and by arranging that the annular member 13 and circuit block 16 are respectively provided with suitable patterns, projections, notches or other marks, it is simple to ensure that they are set in the correct relative angular positions.

Since the parts 11 to 13 can be positioned in the tubular casing member 10 from above, the internal surface 10a may be provided at any convenient position without reference to the disposition of the surface 10c. Consequently the watch case may have a design which was not possible in the prior art, and the distance between the external diameter of the watch glass and that of the tubular casing member 10 can be reduced.

Moreover, the annular member 13 does not need to be as narrow as in the prior art, thus enabling one to finish the surface of this member in a number of different

ways and thus improve the variety of different designs available. The shape of the annular member 13, moreover, is simpler than in the prior art, it is easier to fix in position and it is easier to manufacture.

The parts at the rear of the watch are also not affected by the planar surfaces of the parts at the front of the watch.

Even if the external shape of the watch glass 11 or of the annular member 13 is varied, it is not necessary to vary the radial position of the surface 10c nor is it necessary to vary the shape of the sealing members 12, 17, the shape of the middle frame 15, or of the back cover 14. Similarly, no variation is required of the position of the internal surface 10d, while the external surface of the back cover 14 may be of circular form. Thus there can be considerable variation in design while maintaining a large degree of standardisation of parts, and this is of considerable advantage in after-service and manufacture.

The embodiment of each of Figures 4 and 5 is generally similar to that of Figure 3 and for this reason will not be described in detail.

In the construction of Figure 4, however, the sealing member 12 and annular member 13 of Figure 3 are replaced by a single member, namely a sealing member 19 which is L-shaped in cross-section. The lower surface of the sealing member 19 extends over a circuit block 20 to cover the parts thereof other than the time-indicating indicia (not shown). The sealing member 19, which is set in an internal recess 21a of a tubular casing member 21, is appropriately marked to enable it to be angularly set in relation to the circuit block 20. The tubular casing member 21 is sealed to a back cover 21b by way of a sealing member 21c and it will be noted that the sealing member 21c extends throughout the radial extent of that portion 19a of the sealing member 19 which contacts both the periphery of the watch glass 18a and an axially extending wall 21b of the recess 21a in the tubular casing member 21.

In the embodiment of Figure 4, since the sealing member 19 performs the function of the parts 12, 13 of Figure 3, the number of parts is reduced by comparison with that of Figure 3.

In the embodiment of Figure 5, a watch glass 24 is supported on an annular plate 23 which is itself supported in an L-section sealing member 22. The L-section sealing member 22 is mounted in an internal recess 22b of a tubular casing member 22c. The sealing member 22 has a flange 24a which underlies and supports the plate 23. A sealing member 25 seals the tubular casing member 22c to the back cover 26. Once again it can be seen that the sealing member 25

extends throughout the radial extent of that portion 22d of the first sealing member 22 which contacts both the periphery of the watch glass 24 and an axially extending wall 22e of the recess 22b in the tubular casing member 22c.

In the embodiment of Figure 5, the elasticity of the sealing member 22 protects the watch glass 24 from shock.

WHAT WE CLAIM IS:—

1. A digital watch having a digital display and a circuit block for controlling the digital display both mounted within a watch case comprising a tubular casing member which forms part of the external surface of the watch case; a back cover which is sealed to said tubular casing member, and a watch glass which is supported by the tubular casing member by way of at least one intermediate member mounted in an internal recess in the tubular casing member, the shape of the internal recess permitting the watch glass and intermediate member to have been introduced into the internal recess from above the latter when the watch case was in a disposition such that the internal recess was at the top of the watch case, the tubular casing member being sealed to the watch glass by means comprising a first sealing member having a portion contacting both the periphery of the watch glass and an axially extending wall of said internal recess, and the tubular casing member being sealed to the back cover by a second sealing

member which extends throughout the radial extent of the said portion of the first sealing member, the first sealing member being integral with or separate from, the or a intermediate member.

2. A watch as claimed in claim 1 in which at least a portion of the said intermediate member, or of one of the intermediate members, underlies the watch glass and overlies a part of the circuit block when the watch case is in the said disposition, the said one intermediate member having a window through which time-indicating indicia of the digital display are visible.

3. A watch as claimed in any preceding claim in which the watch glass is non-circular in shape.

4. A watch as claimed in any preceding claim in which a single intermediate member is employed, said single intermediate member being L-shaped in cross-section.

5. A watch as claimed in any of claims 1 to 3 in which the watch glass is supported on a plate which is itself supported in an L-section sealing member mounted in the said internal recess.

6. A watch substantially as hereinbefore described with reference to and as shown in any of Figures 3 to 5 of the accompanying drawings.

J. MILLER & CO.,

Agents for the Applicants,

Chartered Patent Agents,

Lincoln House, 296—302 High Holborn, London, WC1V 7JH.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1979.

Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY.

from which copies may be obtained.



4
extends throughout the radial extent of that portion 22d of the first sealing member 22 which contacts both the periphery of the watch glass 24 and an axially extending wall 5 22e of the recess 22b in the tubular casing member 22c.

In the embodiment of Figure 5, the elasticity of the sealing member 22 protects the watch glass 24 from shock.

10 WHAT WE CLAIM IS:—

1. A digital watch having a digital display and a circuit block for controlling the digital display both mounted within a watch case comprising a tubular casing member which forms part of the external surface of the watch case, a back cover which is sealed to said tubular casing member, and a watch glass which is supported by the tubular casing member by way of at least one intermediate member mounted in an internal recess in the tubular casing member, the shape of the internal recess permitting the watch glass and intermediate member to 25 have been introduced into the internal recess from above the latter when the watch case was in a disposition such that the internal recess was at the top of the watch case, the tubular casing member being sealed to the watch glass by means comprising a first sealing member having a portion contacting both the periphery of the watch glass and an axially extending wall of said internal recess, and the tubular casing member being 35 sealed to the back cover by a second sealing

member which extends throughout the radial extent of the said portion of the first sealing member, the first sealing member being integral with or separate from, the or a intermediate member.

2. A watch as claimed in claim 1 in which at least a portion of the said intermediate member, or of one of the intermediate members, underlies the watch glass and overlies a part of the circuit block when the watch case is in the said disposition, the said one intermediate member having a window through which time-indicating indicia of the digital display are visible.

3. A watch as claimed in any preceding claim in which the watch glass is non-circular in shape.

4. A watch as claimed in any preceding claim in which a single intermediate member is employed, said single intermediate member being L-shaped in cross-section.

5. A watch as claimed in any of claims 1 to 3 in which the watch glass is supported on a plate which is itself supported in an L-section sealing member mounted in the said internal recess.

6. A watch substantially as hereinbefore described with reference to and as shown in any of Figures 3 to 5 of the accompanying drawings.

J. MILLER & CO.,
Agents for the Applicants,
Chartered Patent Agents,
Lincoln House, 296—302 High Holborn,
London, WC1V 7JH.