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(54) TIMEPIECE CASE ASSEMBLY

(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 relates to timepiece case assemblies.

According to one aspect of the present invention, there is provided a timepiece case assembly comprising a glass-carrying ring having a depending, annular resilient flange, a case body, and a resilient sealing ring disposed therebetween and in engagement with a surface of the flange and a surface of the case body, the sealing ring being substantially I-shaped or L-shaped in cross-section.

When the sealing ring is substantially L-shaped in cross-section, a part of said sealing ring may be disposed between the base of said glass-carrying ring and the case body.

Alternatively, the sealing ring may be substantially I-shaped in cross-section and may have a projection engaging with a part of said case body.

Thus, in one embodiment of the present invention the said surface of the case body is disposed radially outwardly of the said surface of the flange.

In another embodiment of the present invention the said surface of the base body is disposed radially inwardly of the said surface of the flange.

A groove may be formed in the said surface of the flange and a groove may be formed in said surface of the case body, parts of said sealing ring being engaged in said grooves respectively.

Said surface of the resilient part and the said surface of the case body may be inclined to the central axis of the case body.

Preferably said sealing ring is made of plastic material or soft metal.

According to a further aspect of the present

invention there is provided a waterproof watch having a timepiece case assembly as recited above.

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

Figure 1 is a cross-section of part of one embodiment of a timepiece case assembly according to the present invention;

Figure 2 is a cross-sectional view of part of a further embodiment of a timepiece case assembly according to the present invention;

Figure 3 is a cross-sectional view of part of a yet further embodiment of a timepiece case assembly according to the present invention;

Figure 4 is a magnification of part of the timepiece case assembly shown in Figure 1;

Figure 5 is a cross-sectional view of part of a still further embodiment of a timepiece case assembly according to the present invention;

Figures 6 and 7 show modifications of the timepiece case assembly shown in Figure 5;

Figure 8 is a cross-sectional view of part another embodiment of a timepiece case assembly according to the present invention; and

Figure 9 is a cross-sectional view of part of a further embodiment of a timepiece case assembly according to the present invention.

In a conventional construction of a timepiece case assembly for a waterproof watch, a synthetic rubber packing element is inserted between the radially outer surface of a glass and a case band or body, or between a glass and a glass-carrying ring. Therefore, as the packing element is flexible it is deformable with the result that when the watch is subject to a high pressure the packing element will be deformed and the watch may not be completely waterproof. In order to elimin-

ate this defect of the conventional timepiece case assembly, a case body and a glass or a case body and a glass-carrying ring are united by adhesive without the use of a packing element. However, difficulties arise if the glass is broken because, when a strong adhesive is used, it is impossible merely to replace the glass and it is very expensive to replace the whole case body. As explained above, a synthetic rubber packing element is deformed under high pressure so a packing element of soft metal or plastics material, which is difficult to deform, has been experimentally used. However, on assembly a conventional timepiece case assembly with such a packing element it has been found that the packing element is easily broken or deformed and so such a timepiece cases assembly is not really practical.

Referring to Figures 1 to 4 of the accompanying drawings there is shown various embodiments of timepiece case assemblies for waterproof watches according to the present invention. Each timepiece case assembly comprises a glass 1 fixed by adhesive to a metallic glass-carrying ring 2 having an integral resilient depending, annular flange 3 which is elastic in the radial direction. A radially outer surface 7 of the flange 3 is smooth and has a guide surface 7a. A case band or body 4 has a smooth radially inner surface 6 which is at an angle θ to the horizontal (θ being less than 90°) as clearly shown in Figure 4.

An I-shaped sealing ring 5 is provided and is made of synthetic resin or plastics material or of soft metal which is constructed to be resilient in the radial direction. The sealing ring has a guide surface 5a and the radially inner surface of the sealing ring is designed to be compressed against the radially outer surface 7 of the flange 3 and the radially outer surface of the sealing ring 5 is designed to be compressed against the radially inner surface 6 of the case body 4.

To assemble the above timepiece case assembly, the sealing ring 5, provided with a guide surface 5a, is positioned with the guide surfaces 5a, 7a abutting and the glass-carrying ring is pressed home into the case body. As the flange 3 is elastic in the radial direction, whilst the glass-carrying ring is being pressed home it is deformed in such a manner that a force is not applied to the sealing ring 5. Due to the elasticity of the sealing ring 5 it is positioned adjacent the radially inner surface 6 of the case body and the radially outer surface 7 of the flange 3. Thus, the watch is made waterproof. The resiliency of the flange 3 in the radial direction may be increased by providing an undercut portion 8 as shown in the Figure 2 embodiment. Furthermore, the shape of the glass-carrying ring may be simplified by disposing the sealing ring 5 in a groove 9 in the radially inner surface 6 of the case body 4 as shown in the

Figure 3 embodiment. To assemble this timepiece case assembly the glass-carrying ring, which is connected to the glass 1, is pressed home and the flange 3, due to its elasticity in the radial direction is deformed as the glass-carrying ring is pressed home so that no unnecessary force is applied to the sealing ring 5. Due to its resiliency, the sealing ring 5 is positioned adjacent the radially inner surface 6 of the case body 4 and the radially outer surface 7 of the flange 3. Thus, the watch is made waterproof.

In view of the fact that the radially inner surface 6a is at an angle which is less than 90° to the horizontal axis of the case body, when the glass-carrying ring is pressed home the sealing ring extends radially outwardly so it is difficult to dislodge the glass-carrying ring from the case body so the case body and the glass-carrying ring are rigidly connected together.

As explained above, the flange 3 is resilient in the radial direction and the radially inner surface of the case body is at an angle which is less than 90° to the horizontal axis of the case body. The radially inner surface 6 of the case body is positioned so that it does not extend outwardly of the radially outer surface 7 of the flange 3 in the direction of the central axis of the case body. The sealing ring 5, which is made of soft metal or plastics material, is inserted between the case body and the glass-carrying ring. With this construction the watch is made waterproof even when it is subjected to ultra high pressures.

A further embodiment of the present invention is illustrated in Figure 5, in which a timepiece case assembly comprises a glass 1', a glass-carrying ring 2' fixed to the glass 1' by an adhesive. The glass-carrying ring 2' has a depending annular resilient flange 3' having a radially outer surface 7' and a base 8' disposed beneath the radially outer surface 7'. A case band or body 4' has a radially inner surface 6' which has a high precision finish and the radially outer surface 7' of the flange 3' is disposed opposite to the radially inner surface 6' of the case body. A sealing ring 5' made of synthetic resin or plastics material such as polycarbonate or soft metal such as copper or silver, is provided, the sealing ring being L-shaped in cross-section. The radial width of the sealing ring 5' is greater than the radial distance between the radially inner surface 6' of the case body and the radially outer surface 7' of the flange 3'. The sealing ring 5' and the case body 4' are provided with guide surfaces 5a' and 9' respectively in order to facilitate assembly of the timepiece case assembly. The height a of the guide surface 5a' is smaller than the height of the corresponding part of the sealing ring, i.e. the height of the base 8'.

In order to assemble the above timepiece

case assembly, the sealing ring 5' is fixed to the radially outer surface 7' of the glass-carrying ring 2' which in turn is connected to the glass 1'. For this reason it is more effective to fix the sealing ring to the glass-carrying ring by an adhesive. The sealing ring 5' is guided into position by the guide surfaces 5a', 9' and engages the radially inner surface 6' of the case body. It has been found that the construction of the guide surfaces 5a', 9' and, in particular, the construction of the guide surface 5a', is important. If the guide surface 5a' is too large, the contact between the radially inner surface 6' of the case body would be insufficient for ensuring that the watch is completely waterproof and the sealing ring 5' would be broken when the timepiece case assembly is assembled. If the guide surface 5a' is too small, the sealing ring 5' cannot engage the radially inner surface 6' and will be deformed to an unacceptable extent. Therefore, the construction of the guide surface 5a' must be made so that it is smaller than the height of the base 8 of the sealing ring 5'. In the timepiece case assembly illustrated in Figure 5 the sealing ring is compressed between the radially outer surface 7' of the glass-carrying ring and the radially inner surface 6' of the flange 3' and abuts each surface. As the sealing ring 5' is harder than a corresponding rubber packing element, the glass-carrying ring 2' is rigidly fixed to the case body by means of the sealing ring 5' due to the strong frictional forces acting between the radially inner surface 6' of the case body and the radially outer surface 7' of the flange 3'.

As modifications of the timepiece case assembly illustrated in Figure 5 reference is made to Figures 6 and 7. In the timepiece case assembly shown in Figure 6, a radially inner surface 6b of the case body and a radially outer surface 7c of the flange 3' are inclined to the central axis of the case body. In the timepiece case assembly illustrated in Figure 7 grooves 6c, 7d are provided in the radially outer surface and the radially inner surface of the case body and flange 3' respectively.

In the embodiments of the present invention illustrated in Figures 6 and 7, the base 8' of the sealing ring is disposed adjacent the radially outer surface of the flange 3'. The sealing ring 5' is guided into position on assembly by the guide surface 5a' and positioned between the radially outer surface of the flange 3' and the radially inner surface 6b, 6c of the case body. The sealing ring 5' is made of resilient material such as plastics material or soft metal and can be inserted in position without it being permanently deformed so that the assembled watch case is waterproof. Moreover, the sealing ring is harder than the conventional rubber packing element so that it is not deformed when

the watch is subjected to a high pressure and so the watch is still waterproof. It will be appreciated that by virtue of this construction the conventional bezel is unnecessary and, furthermore, the timepiece case assembly is of simple construction and the whole watch may be made thinner and at lower cost.

A further timepiece case assembly according to the present invention is illustrated in Figure 8 and comprises a glass 11, a glass-carrying ring 12 fixed to the glass 11 by adhesive and a case band or body 14. A radially inner surface 16 of the case band 14 and a radially outer surface 17 of a depending annular resilient flange 13 of the glass-carrying ring have disposed therebetween an L-shaped resilient sealing ring 15 which is made of synthetic resin or plastics material or soft metal. The radial width of the sealing ring 15 is greater than the distance between the radially inner surface 17 of the flange 13 and the radially outer surface 16 of the case body. A projection 15b is provided on the upper part of the sealing ring 15 and this projection is supported by an upper part 20 of the radially inner surface 16 of the case body. Guide surfaces 15a, 17a are provided on the sealing ring and the glass-carrying ring 12 respectively.

To assemble the above timepiece case assembly, the sealing ring 15 is attached to the radially inner surface 16 of the case body so that the projection 15b is supported on the upper part 20 (at this time the sealing ring and the case body may be united by adhesive). The guide surface 17a and the guide surface 15a are placed in abutment as the the radially outer surface 17 of the flange 13 is slid over the radially inner surface of the sealing ring 15 and pressed home the base of the glass-carrying ring abuts the case body. At this time the sealing ring 15 is pressed into position by the radially outer surface 17 of the flange 13 and the projection 15b is supported on the upper part 20 of the case body so that the sealing ring is compressed between the radially outer surface 17 of the flange 13 and the radially inner surface 16 of the case body without significant deformation. In this timepiece case assembly, the sealing ring 15 abuts the radially inner surface 16 of the case body and the radially outer surface 17 of the flange 13 so that the sealing ring forms a watertight seal with these surfaces and the watch is made waterproof because the sealing ring 15 is compressed. Because of the force exerted by the compression of the sealing ring the glass-carrying ring is rigidly fixed to the case body.

The above construction of timepiece case assembly may be further improved by inclining the radially outer surface 17 of the flange 13 and the radially inner surface 16 of the case body to the central axis of the case body

or by providing a groove in each surface to receive a part of the sealing ring such as is envisaged by the arrangements shown in Figures 6 and 7.

5 In the timepiece case assembly shown in Figure 8 the sealing ring 15 is supported by the projection 15b on the upper part 20 of the case body and abuts the radially inner surface of the case body so that the radially
10 outer surface 17 of the flange 13 is pushed radially inwardly. The sealing ring is able to exert this force on the flange 13 because it is made of resilient material such as plastics material or soft metal which materials are
15 harder than rubber so that the sealing ring may exert a force on the glass-carrying ring without itself being significantly deformed. Moreover, as the sealing ring is harder than the conventional rubber packing element, the
20 sealing ring is not deformed when the watch is subjected to a high pressure therefore the watch will remain waterproof for a long time. The sealing ring 15 acts both for ensuring that the watch is waterproof and for rigidly fixing
25 the glass-carrying ring to the case body. Accordingly, the timepiece case assembly shown in Figure 8 is simpler and less expensive to manufacture and there is no need to provide the conventional bezel. Furthermore,
30 the watch may be made thinner.

Figure 9 shows a further embodiment of a watch case assembly according to the present invention wherein a glass-carrying ring 24
35 is disposed radially outwardly of a part 24a of the case body. A radially outer surface 21 is provided on the part 24a of the case body and between said surface and a radially inner surface 27 of a depending, annular resilient flange 23 of the glass-carrying ring 24
40 there is disposed a resilient sealing ring 25. The sealing ring 25 is L-shaped in cross-section and has a part which extends between the part 24a of the case body and the glass-carrying ring 24. When the
45 timepiece case assembly shown in Figure 9 is assembled, the sealing ring 25 is compressed between the radially inner surface 27 of the flange 23 and the radially outer surface 21 of the part 24a of the case body. Thus, the watch is made water-
50 proof and the glass-carrying ring is rigidly attached to the case body. Therefore, this timepiece case assembly achieves the same advantages as the timepiece case assembly illustrated in Figure 8. Moreover, with the
55 timepiece case assembly shown in Figure 9

the sealing ring is not visible from the front of the watch so the appearance of the whole watch is enhanced.

WHAT WE CLAIM IS:—

1. A timepiece case assembly comprising a glass-carrying ring having a depending, annular resilient flange, a case body, and a resilient sealing ring disposed therebetween and in engagement with a surface of the flange and a surface of the case body, the sealing ring being substantially I-shaped or L-shaped in cross-section. 60
2. An assembly as claimed in claim 1 in which the sealing ring is substantially L-shaped in cross-section, a part of said sealing ring being disposed between the base of said glass-carrying ring and the case body. 65
3. An assembly as claimed in claim 1 in which the sealing ring is substantially L-shaped in cross-section and has a projection engaging with a part of said case body. 70
4. An assembly as claimed in claim 3 in which the said surface of the case body is disposed radially outwardly of said surface to the flange. 75
5. An assembly as claimed in claim 3 in which the said surface of the case body is disposed radially inwardly of said surface of the flange. 80
6. An assembly as claimed in any of claims 2 to 5 in which a groove is formed in said surface of the flange and a groove is formed in said surface of the case body, parts of said sealing ring being engaged in said grooves respectively. 85
7. An assembly as claimed in any preceding claim in which said surface of the flange and the said surface of the case body are inclined to the central axis of the case body. 90
8. An assembly as claimed in any preceding claim in which said sealing ring is made of plastics material or soft metal. 95
9. A timepiece case assembly substantially as herein described with reference to and as shown in the accompanying drawings. 100
10. A waterproof watch having a timepiece case assembly as claimed in any preceding claim.

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or by providing a groove in each surface to receive a part of the sealing ring such as is envisaged by the arrangements shown in Figures 6 and 7.

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the sealing ring is not visible from the front of the watch so the appearance of the whole watch is enhanced.

WHAT WE CLAIM IS:—

1. A timepiece case assembly comprising a glass-carrying ring having a depending, annular resilient flange, a case body, and a resilient sealing ring disposed therebetween and in engagement with a surface of the flange and a surface of the case body, the sealing ring being substantially I-shaped or L-shaped in cross-section.

2. An assembly as claimed in claim 1 in which the sealing ring is substantially L-shaped in cross-section, a part of said sealing ring being disposed between the base of said glass-carrying ring and the case body.

3. An assembly as claimed in claim 1 in which the sealing ring is substantially L-shaped in cross-section and has a projection engaging with a part of said case body.

4. An assembly as claimed in claim 3 in which the said surface of the case body is disposed radially outwardly of said surface to the flange.

5. An assembly as claimed in claim 3 in which the said surface of the case body is disposed radially inwardly of said surface of the flange.

6. An assembly as claimed in any of claims 2 to 5 in which a groove is formed in said surface of the flange and a groove is formed in said surface of the case body, parts of said sealing ring being engaged in said grooves respectively.

7. An assembly as claimed in any preceding claim in which said surface of the flange and the said surface of the case body are inclined to the central axis of the case body.

8. An assembly as claimed in any preceding claim in which said sealing ring is made of plastics material or soft metal.

9. A timepiece case assembly substantially as herein described with reference to and as shown in the accompanying drawings.

10. A waterproof watch having a timepiece case assembly as claimed in any preceding claim.

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