

DEVICE FOR THE LEAKPROOF FASTENING OF A WATCH GLASS TO
A WATCH CASE

The present invention relates to a device for
5 the leakproof fastening of a watch glass to a watch
case, comprising an annular seal of cylindrical general
shape, made of a compressible material and having an
inner annular projection at the upper end of this
annular seal, an annular groove made on that edge of
10 the watch glass into which this annular projection is
engaged, an outer lateral surface made on the upper
part of the housing in order to receive the lower part
of the inner face of said annular seal, the base of
which comes into abutment against a bearing surface,
15 and a bezel fitted around said seal, at the same time
compressing the latter radially.

Devices are already known for the leakproof
fastening of a glass consisting of hard material, such
as toughened glass or sapphire, in which the glass
20 consisting of hard material is fastened in a ring
produced from a material which is soft in relation to
the watch glass and also in relation to the metal of
the case to which it is to be fastened. This ring
usually consists of organic glass, such as Plexiglass.

25 A fastening device of this type is described in
CH 519 193, in which the watch glass is accommodated in
a ring consisting of organic glass, the entire assembly
subsequently being introduced by mounting into a
receptacle of a bezel housing, the deformations
30 resulting from the mounting operation being absorbed by
the ring consisting of organic glass which also ensures
the leakproofing of the fastening. A false bezel may be
fastened to the bezel housing in order to conceal the
fastening ring of the watch glass. In a variant, the
35 fastening ring is accommodated in an annular groove
made in the edge of the watch glass, so as not to
project from the periphery of the latter and thus not
be visible.

Such a fastening device is necessary for the

annular seal surrounding the watch glass to be subjected to stress before this assembly is fastened in an orifice of the housing. The removal of this assembly presents serious problems, since the prestressed seal
5 is entirely embedded in the housing and the glass of sapphire or toughened-glass type cannot be deformed.

CH 583 438 proposed a solution which does not have the abovementioned disadvantages and in which the annular seal made of relatively soft glass, which
10 surrounds the watch glass, is engaged around a lateral surface made on the upper end of the housing, around the raised portion, and is compressed radially against this lateral surface by the bezel mounted around this seal. In a preferred embodiment, not described in this
15 patent, the bezel extends over the entire height of the annular seal, so that the upper part of this seal is compressed between the bezel and the watch glass and so that the lower part of this seal is compressed between this bezel and the lateral surface of the housing on
20 which it is engaged.

Although this fastening method has proved successful for many years, particularly with regards leakproofing, it became clear that its design was capable of being improved even further in many
25 respects.

Thus, in the abovementioned fastening system, only the frictional force makes it possible to ensure that the annular seal is fastened to the lateral surface of the housing, so that the seal must have
30 sufficient rigidity, giving rise to pronounced stresses on the other parts, particularly giving rise to a torque tending to deform the raised portion and the bezel.

The same surface of the bezel serves for
35 clamping the seal around the watch glass and around the lateral surface of the housing. In view of the many manufacturing tolerances in the various elements involved in this fastening, the force necessary for removing the bezel may vary in a ratio of 1 to 4. In

view of the differences in the frictional forces occurring as a result of these tolerance variations, the position of the bezel after mounting may change slightly from one piece to another, thus having effects
5 on the compression of the annular seal.

During the mounting of the bezel, the seal undergoes deformations in the region of the watch glass which are greater than those determined by leakproofing. If this seal is clamped firmly, there is
10 a risk that it will form a bead which is interposed between the housing and the bezel and prevents the latter from being laid against the housing. It is also possible, in the event of a sharp compression of the annular seal, that the latter is deformed into the
15 space provided between the watch glass and the housing.

As a consequence of the design of the assembly operation, in which, in the assembled position, the bezel is held solely by friction around a piece consisting of compressible material, the bezel remains
20 subject to a force tending to cause it to rise.

Finally, the injection points can be located only in a visible zone or in a contact zone and are therefore annoying in both cases.

The object of the present invention is partly
25 to overcome the abovementioned disadvantages.

To achieve this, the subject of this invention is a device for the leakproof fastening of a watch glass to a watch case according to Claim 1.

One of the essential advantages of the present
30 invention is due to the fact that the base of the annular seal is retained on the housing by anchoring and no longer by friction. Consequently, the extreme values of the force necessary for removing the bezel come within a somewhat limited range, in spite of the
35 disparity of the clamping values inherent in the manufacturing tolerances of the various elements.

Another great advantage is due to the fact that the annular seal is no longer radially compressed uniformly over its entire height, but that two separate

compression zones are formed, one in the region of the watch glass and the other in the region of the fitting surface, adjacent to the upper edge of the housing. Thus, during the mounting of the bezel, its base does
5 not compress the upper part of the seal, thus avoiding the risk of formation of a bead which comes into place between the bezel and the housing.

That part of the annular seal which is located between the lower face of the watch glass and the upper
10 edge of the housing is not compressed, or compressed very little, radially, thus avoiding the risk of being deformed into the free space separating the watch glass from the housing. The radial compressions induced in the two clamping zones are not necessarily the same,
15 but may be adapted to requirements independently in each zone. Since the hold of the assembled elements is not attributable solely to the frictional forces, it is then possible to use a seal consisting of a less rigid material, thus making it possible to reduce the
20 stresses exerted on the other elements and, in particular, on the raised portion.

Contrary to the seal of the fastening device of the prior art, in the present invention, when the seal is injected, the injection points of the seal may be
25 arranged, particularly with regard to opaque seals, in that portion of its outer face which is located between the bulge of the base of the seal and the part of smallest diameter of the inner face of the bezel. After mounting, this portion is, in fact, concealed by the
30 bezel and also forms a non-functional zone of the seal, since said portion is not in contact with any surface of the bezel.

It can be seen that, by preserving the same general principle for the leakproof fastening of the
35 watch glass as that known from the prior art, the present invention makes it possible to afford substantial improvements which are appreciable, in particular, during the assembly operations and also in terms of maintenance, since demounting is thereby made

easier by a narrower dispersion of the values of the forces for removing the bezel, without any impairment in leakproofing efficiency, on the contrary.

The invention will be understood more clearly
5 from a reading of the following description relating to an embodiment and a variant of the device for the leakproof fastening of a watch glass, which is the subject of this invention, and with the aid of the accompanying drawings in which:

10 Figures 1 to 4 are partial views in diametral section, illustrating four steps in the fastening of a watch glass according to this embodiment,

Figure 5 is a view in diametral section, similar to that of Figure 4, of a variant.

15 In the embodiment illustrated in Figures 1 to 4, there can be seen a watch glass 1, an annular seal 2 of cylindrical general shape, the upper part of a housing 3 and a bezel 4 mounted around the outer face of the annular seal 2. This watch glass, which
20 preferably consists of a hard material, such as toughened glass and, more advantageously, sapphire glass, is machined from a sheet. The edge of the watch glass 1 is delimited by two portions of different diameters, one of large diameter 1a and the other of
25 smaller diameter 1b, adjacent to the lower face of the watch glass 1. An annular groove 1c separates these two portions 1a and 1b.

The annular seal 2 has an inner annular projection 2a adjacent to its upper edge. This
30 projection 2a penetrates into the annular groove 1c of the watch glass 1, whilst the portion of small diameter 1b penetrates slightly into the inner face of the annular seal 2. To make understanding easier, in all the figures the deformed portions of the annular seal 2
35 have been illustrated in their non-deformed state by broken lines.

The lower part of this annular seal 2 is engaged around a lateral interlocking surface 3a made at the upper end of the housing 3 and located

substantially at the same level as the raised portion 3b. The base of this lateral interlocking surface 3a has an annular groove 3c.

5 A swollen heal 2b projects symmetrically on either side of the inner and outer lateral faces at the base of the annular seal 2. That part of this swollen heal 2b which projects on the inside of the annular seal 2 engages into the annular groove 3c of the lateral interlocking face 3a.

10 The inner lateral face of the bezel 4 comprises two cylindrical portions, a lower portion 4b of larger diameter and an upper portion 4a of smaller diameter. The diameter of the lower portion 4b of larger diameter of the inner lateral face of the bezel is greater than
15 the diameter of the outer lateral face of the annular seal 2, but smaller than the outside diameter of its swollen heal 2b, whereas the diameter of the upper portion 4a is smaller than the diameter of the outer lateral face of the annular seal 2.

20 Thus, during the mounting of the bezel 4, the lower portion 4b of the bezel engages freely around the annular seal, since the diameter of this lower portion is larger than that of the annular seal 2. Only when this lower portion 4b comes level with the swollen
25 heal 2b does it compress the latter in the annular groove 3c of the lateral face 3a of the housing 3, thus fastening this seal 2 to the latter.

Simultaneously with the compression of the swollen heal 2b by the lower portion 4b of the bezel 4,
30 its upper portion 4a, having a smaller diameter than the seal 2, compresses the upper part of the latter, that is to say essentially that part which is located in the region of the watch glass 1, at the same time pressing the inner annular projection 2a of the seal 2
35 into the annular groove 1c of the watch glass 1 and also causing that part of small diameter 1b of the watch glass 1, said part being located below the inner annular projection 2a, to penetrate slightly into the seal 2.

It can be seen that, with this device, the fastening of the seal 2 is assured at its two ends, on the one hand, by the penetration of the inner annular projection 2a into the annular groove 1c of the watch glass 1 and, on the other hand, by penetration of a portion of the swollen heal 2b of this seal 2 into the annular groove 3c of the housing. In both cases, this engagement of the seal into the annular grooves 1c and 3c is accompanied by the centripetal radial pressure exerted on the annular seal 2 by the bezel 4. This seal is therefore no longer held on the housing simply by friction, but by hooking. This fastening method thus makes it possible to use a softer material than in the abovementioned prior art. Whereas the seal has hitherto been produced from 6.6 polyamide, the modulus of elasticity of which is between 2100 and 3000 MPa, in the present invention it may consist of polyamide, in particular PBT or POM, the modulus of elasticity of which is between 1000 and 3000 MPa.

The variant illustrated in Figure 5 differs from the embodiment described above only in the shape of the annular seal 2' and, more specifically, in the shape of the swollen heal 2'b. Contrary to the swollen heal 2b, the latter projects only on the outer lateral face of the annular seal 2', leaving the inner lateral face of this cylindrical annular seal 2' downward from the base of the inner annular projection 2'a engaged into the annular groove 1c of the watch glass 1. The hooking of the annular seal 2' in the annular groove 3c of the housing 3 occurs as a result of the deformation of the base of this annular seal 2', said deformation being induced when the lower part of the bezel 4b engages onto that part of the swollen heal projecting on the outer lateral face of the seal and imparts centripetal radial compression to said part.

This variant has the advantage of making it easier to remove the annular seal 2' from the mold during its injection, while at the same time preserving the system of anchoring this seal on the housing. This

variant also allows the mounting and demounting of the annular seal 2' to be made easier.

As can be seen, the changes made to the fastening device of the prior art give rise to
5 virtually no complication either as regards the operations of machinery or injecting the various elements or as regards the mounting operations, so that the great advantages which have been seen are obtained, without entailing any disadvantage and without the need
10 for an additional operation either in the manufacturing program or in the mounting operations.

Advantageously, the injection points of the seal 2 or 2' will be located opposite that part 4b of the bezel 4 which has the largest inside diameter and
15 on the outer face of the annular seal 2 or 2', said outer face being located between the heel 2b or 2'b and the top of the part 4b of the bezel 4. Thus, these injection points are not visible and are not located in a contact zone of the annular seal 2 or 2'.



CLAIMS

1. Device for the leakproof fastening of a watch glass to a watch case, comprising an annular seal (2,2') of a cylindrical general shape, consisting of a compressible material having an inner annular projection (2a, 2'a) at the upper end of this annular seal (2, 2'), an annular groove (1c) made on that edge of the watch glass (1) into which this annular projection (2a, 2'a) is engaged, an outer lateral surface (3a) made on the upper part of the housing (3) in order to receive the lower part of the inner face of said annular seal (2, 2'), the base of which comes into abutment against a bearing surface of the housing (3), and a bezel (4) fitted around said seal (2, 2'), at the same time compressing the latter radially, characterized in that the base of said annular seal (2, 2') has an annular bulge (2b, 2'b) projecting at least from its outer lateral face, and in that the inner lateral surface of the bezel (4) fitted around this seal (2, 2') comprises two concentric cylindrical surfaces (4a, 4b) of different cross sections, the cylindrical surface (4b) of larger cross section being that which is adjacent to the base of the bezel (4), these cross sections being slightly smaller than the cross sections of the outer lateral face of said annular seal (2, 2') and of said annular bulge (2b, 2'b) in the non-compressed state, the base of said outer lateral surface (3a) of the upper part of the housing (3) having an annular groove (3c) in order to receive a portion of said annular seal (2, 2'), said portion being deformed as a result of the fitting of the bezel (4), thus ensuring the axial blocking of this annular seal (2, 2').
2. Device according to Claim 1, characterized in that said annular bulge (2b) projects on either side of the inner and outer cylindrical faces of said annular seal (2).

3. Device according to one of the preceding claims, characterized in that the injection points of said annular seal (2, 2') are located on its outer cylindrical face between said annular bulge (2b, 2'b) and the part where the inside diameter of the bezel (4) becomes smaller.
- 5 4. Device according to one of the preceding claims, characterized in that said annular seal (2, 2') consists of a polymedic material, the modulus of
- 10 elasticity of which is between 1000 and 3000 Mpa.

