A shock-resistant structure for a portable watch includes a watch casing in which a watch movement is mounted by means of a pair of opposed support elements which engage the watch movement and a pair of shock-absorbing rings made of a resilient material which are disposed between each of the support elements and the watch casing. The various elements are secured in place in the watch casing by a retaining member which is removably attached to the watch casing.

19 Claims, 4 Drawing Figures
This invention relates to shock-resistant structures and more particularly to a shock-resistant structure for a portable watch or the like.

Heretofore, shock-resistant mountings used in portable watches have not always been satisfactory in that the desired resistance against shock was not always obtained. Such watches would be susceptible to damage or to impairment of the precision initially built into the watch. In these known prior art shock-resistant structures, sufficient space was not provided for the elastic deformation of the shock-absorbing member, thereby reducing the overall effectiveness of its shock-absorbing properties. Also, in these known arrangements, sufficient overall stability and stability of the watch movement was not achieved. In addition, known structures were complicated and difficult to assemble and, because of the structural arrangement, it was not always possible to provide for magnetic resistance in the watch.

Accordingly, to the present invention, the aforesaid and other difficulties and disadvantages of prior art devices are overcome by the provision of a shock-resistant structure which utilizes a pair of support elements engaging a watch movement and a shock-absorbing means having a resilient construction disposed between each element and the watch casing whereby the watch movement is supported in the casing means by the resilient shock-absorbing means.

Accordingly, an object of the present invention is to provide a shock-resistant structure for a portable watch or the like which is capable of absorbing large shock loads when applied in any direction and which at the same time is relatively easy to assemble and disassemble.

Another object is to provide a shock-resistant structure for a portable watch wherein ample space is provided for the elastic deformation of a shock-absorbing member and wherein good stability of the watch movement in the watch case is obtained.

A further object is to provide a shock-resistant structure which can be used with various different types of watch movements and which is readily adaptable to be constructed to provide magnetic resistance.

A further object is to provide a shock-resistant structure which can be used with mechanical or electronic watches or with other types of portable instruments.

The aforementioned and other objects and advantages of the invention will be apparent as it is better understood from the following description relating to the preferred embodiments thereof.

SUMMARY OF THE INVENTION

A shock-resistant structure for a portable watch of the like includes a watch casing in which a watch movement is mounted by means of a pair of support elements which engage the watch movement and a pair of shock-absorbing rings made of a resilient material which are disposed between each of the support elements and the watch casing. The various elements are secured in place in the watch casing by a retaining member which is removably attached to the watch casing. The shock-absorbing rings, the two support elements, and the watch movement are disposed between opposed surfaces on the retaining member and on the watch casing, whereby the retaining member applies a compressive force on the resilient shock-absorbing rings to thereby retain the various elements in place in the watch casing and thereby effect a resilient mounting for the watch movement in the watch casing.

BRIEF DESCRIPTION OF THE DRAWINGS:

Other features and advantages of the invention will be understood from the following description of examples of the invention, appended claims, and drawings in which:

FIG. 1 is a partial cross-sectional view of a shock-resistant watch according to one embodiment of the invention.

FIG. 2 is a plane view, on a smaller scale, showing the bayonet type connection between the retaining ring and the case body as utilized in the watch of FIG. 1.

FIG. 3 is a partial cross-sectional view of a shock-resistant watch according to an alternate embodiment of the invention.

FIG. 4 is a partial cross-sectional view of a shock-resistant watch according to another alternate embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, FIG. 1 shows a portion of a shock-resistant watch case according to one embodiment of the invention as comprising a case body 10 which is generally dish-shaped having a side wall 12 and a back wall 14.

The inside of the case body 10 is provided with a receiving surface or ledge 16 which receives a ring 18 which may be circular in cross section. The ring 18 is made of a material capable of absorbing shock, for example, a resilient material such as rubber, plastic or the like. A circular frame 20 having an outer flange 22 rests on the ring 18 as shown in FIG. 1.

The surfaces of the ledge 16 and of the frame 20 may be circular, in part, to conform to the circular cross-sectional shape of the ring 18 and thereby maximize the area of contact between the abutting surfaces. The frame 20 may be made of metal or plastic.

Next in the order of arrangement of parts is a dial ring 24. The upper portion of the dial ring 24 has an annular ridge or ledge which receives a circular dial 26. The dial ring 24 has an outer surface which is circular in cross-section and which receives a second ring 28 which is circular in cross section. The second ring 28 as is the case of the first ring 18 is made of a material capable of absorbing shock, for example a resilient material such as rubber, plastic or the like. The dial ring 24 has a shoulder 30 which cooperates with an upper surface of the frame 20 to define an annular space in which a flange of a watch movement 36 is accommodated. Thus the watch movement 36 is mounted between the frame 20 and the dial ring 24. A retaining ring 38 having a partial circular cross-sectional surface which engages the shock-absorbing ring 28 is detachably secured to the case body 10 by a bayonet-type connection. To this end, the retaining ring 38 has a pair of lugs 40, 42 extending radially outwardly from the peripheral surface thereof. These lugs 40, 42 fit into a groove 44 provided on the inner surface of the case body 10, access to the groove 44 being provided by a pair of opposed notches or cut outs 46, 48 in the lip—
like portion 50 of the watch casing 10 which forms the upper portion of the groove 44. FIG. 2 shows the position of the retaining ring 38, wherein the lugs 40, 42 on the latter are aligned with the respective notches 46, 48 in the lip-like portion 50 of the watch case 10. It will be apparent, therefore, that as the retaining ring 38 is rotated from the position shown in FIG. 2, the lugs 40, 42 will pass into the groove 44 to thereby secure the retaining ring 38, in position on the watch case 10. The retaining ring 38 may, or course, be removed from the watch casing 10 by rotating the retaining ring 38 again to a position where the lugs 40, 42 are aligned with the respective notches 46, 48. To facilitate rotation of the retaining ring 38, notches or cut outs 52 may be provided on the inner and upper portion thereof for receiving radial projecting lugs of a suitable tool (not shown) whereby manual rotation of the tool will rotate the retaining ring 38. The retaining ring 38 may be made of metal or plastic.

The watch case 10 is provided with a shoulder 54 which receives a glass or crystal cover 56 through which the dial 26 and the hands (not shown) of the watch may be viewed. A tension ring 58 having an annular flange 60 is disposed in an annular cut out in the glass cover 56 and facilitates securement of the glass cover 56 to the case body 10.

From the above description, it will be seen that the various parts are placed in the watch case 10 through the open front opening. The various elements are assembled in the watch casing 10 in the order described, that is, in the order of assembly, the shock-absorbing ring 18, the frame 20, watch movement 36, the dial ring 24, and the shock-absorbing ring 28. With the above parts in position, the retaining ring 38 is then installed in the manner previously described wherein the lugs 40, 42 are aligned with the respective notches 46, 48 in the watch case 10 and the retaining ring 38 then rotated as the lugs 40, 42 engage the walls of the groove 44. A suitable tool may be employed to engage the notches 52 on the retaining ring 38 to facilitate installation of the latter. In this regard, the various parts are dimensioned so that the shock-absorbing rings 18, 28 have to be compressed slightly in order for the lugs 40, 42 to align with the groove 44 in the watch casing. However, the slight compression may be readily obtained by the use of the previously mentioned installation tool wherein the latter is merely pressed inwardly and then rotated to effect installation of the retaining ring 38. Once the retaining ring 38 is installed, it will be urged or biased against the lip-like portion 50 of the watch case 10 by the resiliency of the shock-absorbing rings 18, 28, thereby fixing the retaining ring 38 in place. Also the shock-absorbing ring 18, frame 20 watch movement 36, dial ring 24 shock-absorbing ring 28 and retaining ring 38, will all be urged or biased together at their respective contacting surfaces by the aforementioned resiliency of the shock-absorbing rings 18, 28. After the retaining ring 38 is installed the tension ring 58 and glass cover 56 are assembled in the usual manner to complete the assembly of the watch.

From the description it will be seen that the watch movement 36 is insulated or separated from the watch case 10 by the two shock-absorbing rings 18, 28. By selecting the proper shock-absorbing properties of the two rings 18, 28 e.g. the extent of resiliency of the rubber or plastic material or the spring constant of the spring employed, shocks applied to the watch from all directions will be absorbed by the shock-absorbing ring 18, 28.

In the watch construction described above, the frame 20 and dial ring 24 may be made of malleable iron having high magnetic permeability in cases where magnetic resistance is required. The shock absorbing rings 18, 28 may be fixed to the abutting surface on the frame 20 and dial ring 24 by suitable adhesive. Also the cross-sectional configuration of the shock-absorbing rings 18, 28 may take on various configurations in addition to the circular configuration shown in the drawings. As may be desired or deemed suitable, the dial 26 and dial ring 24 may be made as one piece.

Further as may be desired or deemed suitable, both the dial ring 24 and frame 20 may be made of a material having shock-absorbing properties and may be made of the same material as the shock absorbing rings 18, 28. The dial ring 24 and shock-absorbing ring 28 may be made from an integral piece of material. Also the frame 20 and shock-absorbing ring 18 may be made from one integral piece of material. In addition, the shock-absorbing ring 28 and the retaining ring 38 may be made from one piece of material having shock-absorbing properties, whereby the resiliency of the material will facilitate fixing of the retaining ring 38 in place on the watch case 10.

FIG. 3 shows an alternate embodiment which is similar to the embodiment of FIG. 1 except that instead of a bayonet-type connection between the retaining ring and case body a threaded connection is employed. Thus in FIG. 3, the case body 10a has an internal thread which threadedly engages an external thread on the retaining ring 38a. To facilitate rotation of the retaining ring 38a notches or cut outs 52a may be provided on the inner upper portion thereof for receiving radial projecting lugs of a suitable tool (not shown) whereby manual rotation of the tool will rotate the retaining ring 38a. Other than the use of a thread connection rather than a bayonet-type connection, the retaining structural features of the embodiment in FIG. 3 are the same as in the embodiment of FIG. 1. Accordingly, except for the threaded connection 13, the same reference numerals followed by the suffix "a" have been used in FIG. 3 to indicate the same parts as used in the FIG. 1 embodiment, thereby avoiding unnecessary repetition in describing the same part in the two embodiments. The various parts in the FIG. 3 embodiment are assembled as previously described above in connection with the FIG. 1 embodiment except of course, that the retaining ring 38a is threaded into position on the watch case 10a so that the shock-absorbing rings 28a, 18a are compressed slightly whereby the shock-absorbing ring 18a, frame 20a, watch movement 36a, dial ring 24a, shock-absorbing ring 28a and retaining ring 38a will be urged or biased together at their respective contacting surfaces by the resiliency of the shock-absorbing rings 18a, 28a.

FIG. 4 shows a further alternate embodiment as comprising a case body 62 on which a case back 64 is threadedly received by threads 66. The case back 64 has an annular lip 68 which engages and applies a compression force on a packing ring 70 disposed between the case body 62 and the lip 68. The inside of the case body 62 includes two shock-absorbing rings, 18b, 28b, a frame 72, watch movement 74, and a dial ring 76 similar to that previously described. Thus the shock-absorbing ring 18b rests on a receiving surface 78 on
the case back 64 and the frame 72 which may be made of metal or plastic rests on the shock-absorbing ring 18b. The dial ring 76 which may be made of metal or plastic has an annular surface 80 which is circular in cross-section and which is in contact with the shock-absorbing ring 28b. The inside of the case body 62 is also provided with a surface 82 which is circular in cross section and which also contacts the shock-absorbing ring 28b. The dial ring 76 has a shoulder which cooperates with an upper section of the frame 72 to define an annular space in which a flange of the watch movement 74 is accommodated whereby the watch movement 74 is mounted between the frame 72 and the dial ring 76.

A dial 84 is suitably mounted on the dial ring 76 and a protective ring 86 which may be made of rubber or plastic is secured to the dial ring 76 by an adhesive.

The case body 10 is provided with a shoulder which receives a glass or crystal cover 88. A tension ring 90 having an annular flange is disposed in an annular cut out in the glass cover 88 to facilitate securement of the glass cover 88 to the case body 10.

In assembling the watch, the dial ring 76 with the protective ring 86 and dial 84 affixed thereto is assembled onto the watch movement 74 and the shock-absorbing ring 28b is engaged with the surface 80 on the dial ring 76. Thus the dial 84, protective ring 86, dial ring 76, the watch movement 74 and the shock-absorbing ring 28b are assembled into a sub-assembly unit outside of the case body 62. With the glass side of the watch facing downwardly, the aforementioned sub-assembly is placed in the case body 62 such that the shock-absorbing ring 28b engages the surface 82 on the case body 62. Subsequently, the frame 72 and shock-absorbing ring 18b are installed and then the case back 64 is threaded into position at 66 to compress the two shock-absorbing rings 18b, 28b, thereby resiliently mounting the watch movement 74 in the case body 62.

If magnetic resistance is desired, the dial ring 76 and frame 72 may be made of malleable iron having high magnetic permeability. The shock-absorbing rings 28b, 18b may be fixed to the respecting abutting surface on the dial ring 76 and the frame 72 by adhesive or the like. Also the cross-sectional configuration of the shock-absorbing rings 18b, 28b may take on various configurations in addition to the circular configuration shown in the drawings. As may be desired or deemed suitable, the dial 84 and dial ring 76 may be made as one piece.

Also, both the dial ring 76 and frame 72 may be made of a material having shock-absorbing properties and may be made of the same material as the shock-absorbing rings 18b, 28b. The dial ring 76 and shock-absorbing ring 28b may be made from one integral piece of material. Also the frame 72 and shock-absorbing ring 18b may be made from one integral piece of material.

The shock-resistant watch case structure of the present invention may be used with both mechanical and electronic watches. From the above description, it will be seen that the assembly of the watch is relatively simple and easy, the watch movement is mounted in a stable condition, and it is possible to provide for magnetic resistance. Further, the principles of the present invention, in addition to being utilized with portable watches, may also be used as a shock-resistant arrangement for other portable instruments.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the forms hereinbefore described being merely preferred embodiments thereof.

What is claimed is:

1. A shock-resistant structure for a portable watch or the like comprising a casing means, a watch movement disposed in said casing means, a pair of support elements engaging said watch movement, and shock-absorbing means disposed between each of said elements and said casing means such that the watch movement is supported in said casing means by said support elements and said shock-absorbing means.

2. A shock-resistant structure according to claim 1 wherein said pair of elements comprise a frame and a dial ring, said watch movement having a section disposed in contacting engagement with opposed portions of said frame and dial ring.

3. A shock-resistant structure according to claim 2 wherein said shock-absorbing means comprises a pair of resilient rings one of which is located between said frame and said casing means and the other of which is located between said dial ring and said casing means.

4. A shock-resistant structure according to claim 3 wherein said casing means comprises a case body and a retaining member removably attached to said case body, said pair of resilient rings, frame, and dial ring being disposed between opposed surfaces on said retaining member and said casing means, said retaining member applying a compressive force to said pair of resilient rings.

5. A shock-resistant structure according to claim 4 wherein said casing means comprises a bowl shaped casing body having an integral side-wall and bottom wall, said retaining member being detachably engaged with the inside of said side-wall, and urged said resilient rings, frame and dial ring towards said back wall.

6. A shock-resistant structure according to claim 4 wherein said casing means and said retaining member have means providing a cooperative threaded connection therebetween.

7. A shock-resistant structure according to claim 4 wherein said casing means and said retaining member have means providing a bayonet-type connection therebetween.

8. A shock-resistant structure according to claim 7 wherein said means providing a bayonet connection comprises radial lugs on said retaining member and a groove having notches in said casing means, said notches providing access for said lugs to said groove.

9. A shock-resistant structure according to claim 4 wherein said casing means comprises a casing body having a casing back removably connected thereto, said casing back constituting said retaining member which applies a compressive force to said pair of resilient rings.

10. A shock-resistant structure according to claim 3 wherein portions of said frame and dial ring which engage said resilient rings and portions of the casing means which engage said resilient rings have cross-sectional configuration corresponding to the cross-
sectional configuration of the portions of the resilient rings which are engaged thereby.

11. A shock-resistant structure according to claim 3 further comprising a dial mounted on said dial ring.

12. A shock-resistant structure according to claim 1 comprising a glass cover mounted on said casing means.

13. A shock-resistant structure according to claim 1 wherein said shock-absorbing means are made of rubber.

14. A shock-resistant structure according to claim 1 wherein said shock-absorbing means are made of plastic.

15. A shock-resistant structure according to claim 4 whereby one of said resilient rings and said retaining member are made integral.

16. A shock-resistant structure according to claim 3 wherein said frame and dial ring are made of malleable iron to provide magnetic resistance.

17. A shock-resistant structure according to claim 3 wherein said resilient rings are affixed to the respective frame and dial ring by adhesive.

18. A shock-resistant structure according to claim 3 wherein one of said resilient rings and said dial ring are made integral.

19. A shock-resistant structure according to claim 3 wherein one of said resilient rings and said frame are made integral.

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