

5 Shock absorbing device for a mobile rotating on a staff

The object of the invention is a shock absorbing device for a mobile rotating on a staff.

10 Conventional shock absorbing devices used in horology usually have five parts: a jewel hole, the bow, the jewel, the endstone and a spring, with the spring resting against the endstone. As the five components mentioned above are gathered together in the jewel hole, the spring is small and has a relatively small amplitude in operation. The shock absorbing
15 device thus formed is therefore of limited effectiveness. Moreover, the assembly of the parts mentioned above, above and below the mobile, consists of a relatively complex device that must be completely dismantled when a part is to be changed.

20 The purpose of this invention is to remedy these disadvantages.

The shock absorbing device for a mobile rotating on a staff according to the invention is characterised in that it comprises at least one spring component made up of a series of blades linking the circumference of the component with a
25 central jewel hole arranged to hold the staff of the mobile.

The blades may be radial and arranged facing the centre of the device.

30 The blades may also be sloped in such a way as to form an acute angle of between 0 and 15° with the diameter of the device.

The blades may also have a curved configuration. In this case, they will take the form of an arc of a circle linking the circumference of the spring component with the central jewel hole.

In a preferred embodiment, the blades engage with a groove made in the circumference of the jewel hole, with play between the blades and the groove.

5 A jewel designed to hold the staff of the mobile is pressed into the jewel hole.

The device usually comprises two spring components surrounding the mobile, which may be a balance wheel and hairspring combination, in which case the jewel hole is made in one piece with the stud support of the balance wheel.

10 The spring component may have a free sector without any spring blades.

A further object of the invention is a production method for the device, characterised in that it consists of conventional machining, wire cutting (wire EDM), electroforming
15 (spark EDM), swage cutting, micromoulding techniques achieved by exposing UV-sensitive resin, galvanic deposition in micromoulds or galvanic coating on a substrate, the device being made of metal or plastic, or both.

20 The drawing shows, as an example, an embodiment of the shock absorbing device according to the invention.

In the drawing:

- 25 - figure 1 is a perspective view of a spring component used in a shock absorbing device,
- figure 2 is a cross-section of the component in figure 1,
- figure 3 is a cross-section through the centre of the spring component in figure 1,
- 30 - figure 4 is a perspective view showing the assembly process of the spring component in figure 1,
- figure 5 is a cross-section of a detail
A in figure 4,
- figure 6 is a perspective view of a balance wheel and
35 hairspring combination mounted inside a suspension

shock absorbing device, the upper part of the device being truncated in order to show the balance wheel adjustment system,

- 5 - figure 7 is a top view of a variant of the device in figure 6, and
- figure 8 is a cross-section of the device in figure 6, showing the potential uses offered by the aforementioned device.

10 The spring component 1 shown in figures 1 to 5 comprises a jewel 2 pressed into a jewel hole 3, itself held by a series of blades 4 extending radially towards the centre, from an annular area 5 of the component 1, which is in the shape of a disc.

15 In the embodiment shown in the drawing, the blades extend radially towards the centre of the component. However, according to a variant not shown, the blades 4 may be curved or sloped in such a way as to form an acute angle that can be between 0 and 15° relative to the diameter of the component.

20 Moreover, as shown in figure 2, the blades 4 become thinner two thirds along their length towards the centre.

 The spring blades 4 will perform the shock absorbing function. As shown in figure 3, the jewel 2, which will guide the mobiles of the mechanisms fitted with the spring components

25 1, is frictionally pressed into the jewel hole 3.

 The vertical play of the mobile can be adjusted by pressing the jewel 2 to a greater or lesser extent into the jewel hole 3. The jewel hole 3 has a groove 6 in its outer circumference that is designed to hold the blades 4.

30 The positioning of the spring blades 4 is described in reference to figure 4. The jewel hole 3 must simply be brought against the blades 4 and pressure exerted on the aforementioned blades 4 until they move over the jewel hole 3 to rest in the groove 6. Once the blades are in position in the groove 6, the

35 spring blades 4 return to their original position, and the

component 1 returns to its flat configuration. Figure 5 shows the cross-section of detail A, on an enlarged scale, of the jewel hole 3 containing the blades 4 after they have returned to their flat idle position, and shows that vertical play 7 is provided between the groove 6 and the aforementioned blades. Similarly, lesser lateral play 8 is provided between the aforementioned blades 4 and the bottom of the groove 6. The plays 7 and 8 will allow the component 1 to operate freely and in optimum conditions.

10 The component 1 can be produced by various currently known methods, such as conventional machining, wire cutting (wire EDM), electroforming (spark EDM), swage cutting, micromoulding techniques achieved by exposing UV-sensitive resin, galvanic deposition in micromoulds or galvanic coating
15 on a substrate without a micromould.

The block of components may be made from plastic or metal materials, or both, or by galvanic injection or deposition in micromoulds.

Figure 6 shows a shock absorbing device for a balance wheel and hairspring combination 9 mounted between two spring components 1 and 1' in figures 1 to 5. If the balance wheel and hairspring combination 9 is mounted as shown in figure 6, the stud support 10 allowing for the adjustment of the balance wheel 9 is an integral part of the jewel hole 3, and
25 adjustments can be made using the slot 11 made in the upper part of the jewel hole 3.

As a variant, and to allow for the fine adjustment of the device, a sector of the component 1 or 1' may be left free as shown in figure 7. The stud support 10 will then be more
30 accessible, thus facilitating adjustment.

In operation, the device in figure 6 can absorb shocks with much greater amplitude than shock absorbing devices of the prior art. The components of the balance wheel are therefore better protected. Moreover, the balance wheel and hairspring
35 combination can be interchangeable inside the device, without

having to dismantle the device. As shown in figure 8, a tool can be used to lift the spring blades 4 in the direction of the arrow 12, and the balance wheel and hairspring combination 9 can be removed once its spring has been released, in order to
5 position another balance wheel in the device without dismantling the assembly.

Although the shock absorbing device has been developed for horology, its use is not however limited to this field, and the device described may be used in numerous technical fields,
10 such as mechanics, micromechanics, the space industry, etc.

CLAIMS:

1. A shock absorbing device for a mobile rotating on a staff, comprising:
at least one spring component; and
a central jewel hole arranged to hold the staff of the mobile.
2. A device according to claim 1, wherein the at least one spring component comprises a series of blades linking a circumference of the component with the jewel hole.
3. A device according to claim 2, wherein the blades are radial and are arranged towards the centre of the device.
4. A device according to claim 2 or 3, wherein the blades are sloped to form an acute angle of between about 0 and 15° with the diameter of the device.
5. A device according to claim 2, 3 or 4, wherein the blades have a curved configuration.
6. A device according to any one of the claims 2 to 5, wherein the blades engage with a groove in the circumference of the jewel hole.
7. A device according to claim 6, wherein the engagement has free play between the blades and the groove.

8. A device according to any one of the preceding claims, further comprising a jewel pressed into the jewel hole.
9. A device according to claim 8, wherein the jewel is arranged to hold the staff of the mobile.
10. A device according to any one of the preceding claims, wherein the at least one spring component comprises two spring components surrounding a mobile.
11. A device according to any one of the preceding claims, wherein the mobile is a balance wheel and hairspring combination.
12. A device according to any one of the preceding claims, wherein the jewel hole is integral with a stud support.
13. A device according to any one of the preceding claims, wherein a or the spring component comprises a sector without spring blades.
14. A device according to any one of the preceding claims, wherein the jewel hole comprises a blind hole concentric with its axis of rotation.
15. A method of producing a device as defined in any one of the preceding claims, the method is selected from the group comprising: conventional machining, wire cutting, electroforming, swage cutting, micromoulding using ultra-violet sensitive resin, galvanic

deposition in micromoulds, and galvanic coating on a substrate.

16. A method according to claim 15, wherein the method comprises wire cutting comprising wire electro-discharge machining.
17. A method according to claim 15, wherein the method comprises electroforming comprising spark electro-discharge machining.
18. A method according to claim 15, 16 or 17, wherein the device comprises metal and/or plastic materials.