

"PENDULUM DEVICE"

This invention relates to a pendulum device, e.g. for use in a clock or the like.

A pendulum device is disclosed in Japanese Utility Model Publication No. 19280/1983 in which a horizontal guide groove is formed in a pendulum support portion disposed in a frame which holds a clock movement. A cover portion is provided above the guide groove. A pair of V-shaped projections are formed on an upper surface of a support body which can slide in the guide groove and are detachable therefrom. A rotational centre body which is disposed at the top end of a pendulum rod may be placed on the V-shaped projections through V-shaped grooves which are provided at opposite ends of the rotational centre body. Then the support body is inserted into the guide groove so that the pendulum rod is mounted.

However, in the above described pendulum device a large number of parts are needed and the manufacturing cost is therefore considerable. Furthermore, mounting of the pendulum rod is a very complicated task.

According to the present invention, there is provided a pendulum device comprising a pendulum rod having a rod support portion adjacent its upper end; a support body having a rod mounting portion on which the rod support portion

is adapted to be mounted for swinging movement thereon; one of said portions being provided with a pair of V-shaped projections which are spaced apart along the axis of the said swinging movement and which have a space therebetween, and the other of said portions having a pair of V-shaped grooves which are spaced apart along the axis of the said swinging movement and which are respectively engageable with the V-shaped projections; the said other portion having a restrictor part which is adapted to fit loosely in the space between the V-shaped projections so as to restrict horizontal movement of the rod support portion, the restrictor part being provided with a guide groove which communicates with the V-shaped grooves, the guide groove being such that, when the pendulum rod is disposed in an inclined position beyond the limit of its normal angle of swing, the V-shaped projections may be passed relatively through the guide groove.

Either the pendulum rod or the support body may have a resilient arm for engaging the other member so that the pendulum rod may be held in the said inclined position.

The pendulum rod and support body may be respectively provided with mutually engageable parts for restricting upward movement of the pendulum rod with respect to the support body.

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

Figure 1 is a view from the back, partly in cross-section, of a pendulum device according to the present invention;

5 Figure 2 is a cross-sectional view of a support portion of the pendulum device;

Figure 3 is a view, partly in cross-section, of a pendulum rod of the pendulum device;

Figure 4 is a cross-sectional view taken along the line IV-IV of Figure 3;

10 Figure 5 is an enlarged view illustrating the positions of the parts when the pendulum rod is attached;

Figure 6 is a view from the back, partly in cross-section illustrating the positions of the parts when a resilient arm on the pendulum rod is in contact with a stationary member; and

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Figure 7 is a view from the back, partly in cross-section, illustrating a method of attaching the pendulum rod.

Figure 1 shows the back of a pendulum device according to the present invention. A timepiece movement case 2, which serves as a support body of a pendulum rod 1, comprises an upper case 3 and a lower case 4. In the movement case 2, there is provided a timepiece mechanism housing portion 5 in which a timepiece mechanism (not shown) is housed. A battery housing chamber 6 is provided in a side

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portion of the timepiece mechanism housing portion 5.

A driving circuit housing portion 7 for housing a driving circuit (not shown), which effects swinging of the pendulum rod 1, is provided in a lower portion of the movement case 2. The central portion of the driving circuit housing portion 7 is provided with an exciting coil housing portion 7a for housing an exciting coil (not shown). A fastening pin 3a is provided for securing the pendulum rod 1 in such a manner that it cannot be swung when being transported.

A support portion 8 or rod mounting portion for supporting the pendulum rod 1 so that it can swing from side to side is provided at the top end of the timepiece movement case 2. As shown in Figure 2, the support portion 8 is integrally formed with the lower case 4, and has a portion 8a which projects over the upper case 3 by being mounted on a U-shaped grooved portion 3b formed in the upper portion of the upper case 3. V-shaped projections 9, 10 are provided on the upper surface of the support portion 8 so that the projections 9, 10 are spaced from each other along the axis of swinging movement by a space d.

As shown in Figure 1, a stationary member 11 is provided in the side portion of the battery housing chamber 6. The stationary member 11 is integrally formed with the case 2, projects over the case 2, and is so positioned that the pendulum rod 1 can come into contact with it.

As shown in Figure 1 and in Figures 3 to 7, a frame 12, having an opening 12a therein, is formed integrally with the top end of the pendulum rod 1. A swinging centre body 13, or rod support portion, which extends horizontally within the opening 12a, is provided at the upper end portion of the frame 12. V-shaped groove portions 14, 15 which are spaced apart along the axis of swinging movement and which are respectively adapted to engage the projections 9, 10 are provided at the opposite ends of the swinging centre body 13. A restrictor part or restricting portion 16, which is adapted to fit loosely in the space d between the projections 9, 10, is also provided for the swinging centre body 13. The restricting portion 16 is provided with a guide groove 17 which communicates with the V-shaped groove portions 14, 15 and which allows the projections 9, 10 to pass relatively through the guide groove 17 when the pendulum rod 1 is swung in the direction shown by an arrow in Figures 1, 6 and 7 to an extent that exceeds a normal swinging angle A.

The pendulum rod 1 is provided with a magnet holding portion 18 for holding a permanent magnet (not shown) at a position opposite to the exciting coil housing portion 7a. A pair of securing hooks 19 are provided above the magnet holding portion 18 for securing the pendulum rod 1 to a securing pin 3a so as to prevent movement of the pendulum rod 1 when being transported. A resilient arm 20 is provided at the side of the

magnet holding portion 18. The resilient arm 20 is formed integrally with the pendulum rod 1, and its size and shape are such that, as shown in Figure 6, it can engage the stationary member 11 when the pendulum rod 1 swings to an extent that exceeds a normal swinging angle. Reference numeral 21 represents a connecting portion for connecting a pendulum (not shown) to the pendulum rod 1.

When the pendulum rod 1 is attached to the case 2, as shown in Figure 7, the resilient arm 20 is first positioned outside the stationary member 11. With the resilient arm 20 kept in this position, the pendulum rod 1 is moved so as to cause the V-shaped projections 9, 10, which are provided on a top surface of the support portion 8, to pass relatively through the guide groove 17 formed in the restricting portion 16 of the swinging centre body 13 which is disposed at the upper end of the pendulum rod 1. The projections 9, 10 pass along the guide groove 17 from the rearside of the case 2 toward the front surface thereof. By positioning the pendulum rod 1 within a normal swinging angle A with the resilient arm 20 deformed elastically, the V-shaped groove portions 14, 15, which are respectively provided at opposite ends of the swinging centre body 13, are, as shown in Figure 6, engaged with the corresponding V-shaped projections 9, 10 disposed on the upper surface of the support portion 8. As a result, the

restricting portion 16 is disposed loosely in the space d between the projections 9,10, whereby the pendulum rod 1 is supported so that it can swing from side to side even though the longitudinal position of the swinging centre body 13 is restricted.

If the pendulum rod 1 swings beyond the normal swinging angle, the resilient arm 20, as shown in Figure 6, engages elastically with the stationary member 11.

Consequently, the pendulum rod 1 is always positioned within the normal swinging angle A without any separation of the pendulum rod 1 from the support portion 8 beyond the restricting portion 16. Furthermore, when an upward force is applied, the lower surface of the projecting portion 8a is brought into contact with the inner edge of the frame 12. Consequently, the projecting portion 8a and the frame 12 serve as a restricting means, whereby upward detachment of the pendulum rod 1 is restricted. Thus, the pendulum rod 1 is supported by the support portion 8 so that it cannot be detached and can swing from side to side within the normal swinging angle A. When the pendulum device is transported, the securing hooks 19 may be fastened to the securing pin 3a so as to secure the pendulum rod 1 to the timepiece movement case 2 so that it cannot be separated therefrom, allowing transportation to be carried out with

safety.

In the embodiment shown in the drawings, although the structure described is one in which the V-shaped projections 9, 10 are described as provided on the support portion 8, and the V-shaped grooves 14, 15 and the restricting portion 16 are described as provided on the swinging centre body 13, the V-shaped projections 9, 10 may alternatively be provided on the swinging centre body 13, and the V-shaped grooves 14, 15 and the restricting portion 16 may also be provided on the support portion 8. Furthermore, although restricting means, for restricting the pendulum rod 1 from being detached upwardly have been shown as being formed by the projecting portion 8a which projects rearwardly over the case 2 and a frame 12 formed in the upper end portion of the pendulum rod 1, the restricting means may alternatively be formed by a cover or the like, which is disposed opposite to the upper surface of the swinging centre body 13, and the cover or the like may be provided at the top end of the support portion 8. Furthermore, although the resilient arm 20 is shown as being provided on the pendulum rod 1, it may alternatively be provided on a stationary member such as the timepiece movement case 2 or a timepiece movement fixing plate (not shown).

The embodiment shown in the drawings enables the number of parts to be decreased, whereby manufacturing costs can

be reduced. Furthermore, the attachment of the pendulum rod can be very easily carried out and the separation of the pendulum rod can be prevented.



C L A I M S

1. A pendulum device comprising a pendulum rod having a rod support portion adjacent its upper end; a support body having a rod mounting portion on which the rod support portion is adapted to be mounted for swinging movement thereon; one of said portions being provided with a pair of V-shaped projections which are spaced apart along the axis of the said swinging movement and which have a space therebetween, and the other of said portions having a pair of V-shaped grooves which are spaced apart along the axis of the said swinging movement and which are respectively engageable with the V-shaped projections; the said other portion having a restrictor part which is adapted to fit loosely in the space between the V-shaped projections so as to restrict horizontal movement of the rod support portion, the restrictor part being provided with a guide groove which communicates with the V-shaped grooves, the guide groove being such that, when the pendulum rod is disposed in an inclined position beyond the limit of its normal angle of swing, the V-shaped projections may be passed relatively through the guide groove.

2. A pendulum device as claimed in claim 1 in which either the pendulum rod or the support body has a resilient arm for engaging the other member so that the pendulum rod may be held in the said inclined position.



3. A pendulum device as claimed in any preceding claim in which the pendulum rod and support body are respectively provided with mutually engageable parts for restricting upward movement of the pendulum rod with respect to the support body.
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4. A pendulum device substantially as hereinbefore described with reference to and as shown in the accompanying drawings.
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