CHRONOGRAPH CONTROL DEVICE

The present invention concerns a chronograph control device. More specifically, it concerns a device of this type for a chronograph that has at least two push-buttons.

The invention applies in particular to "two time" chronographs, which have two push-buttons, in this case a first push-button, which starts and stops a chronograph mechanism and a second push-button, which resets a counter and controls a display member, such as a hand.

Designers wish to ensure that the feeling of resistance felt when a first push-button is activated remains constant compared to the resistance felt when a second push-button is activated and, in a preferred identical mode, while keeping the functions of the two push-buttons independent. This is not always the case for known chronographs, particularly when one of the push-buttons is activated more often than the other. For many applications, equal resistance for both push-buttons is also desired, i.e. one wishes the user to feel the same resistance both when he activates the start/stop push-button and when he activates the reset push-button. Moreover, it is sought to make the functions of the two push-buttons completely independent of each other.

A chronograph control device according to the preamble of claim 1 is known, in particular, from GB Patent No. 698 763. This document discloses a chronograph mechanism including two push-buttons, each cooperating with a pivotably mounted lever. The first lever cooperates with the second so as to make the second lever pivot when the first lever is driven in rotation. A spring abuts on a stud secured to the second lever, so as to stop the lever against the second push-button. When the second lever is pivoted

via the action of the push-button, it is subjected to the return force of the spring, whereas the first lever is subjected to this return force indirectly, via the second lever. One drawback of this mechanism is the interdependence of the two push-buttons.

It is thus an object of the invention to overcome this drawback and to provide users with a chronograph control device that meets the requirements explained above.

The invention therefore concerns a chronograph control device according to claim 1. This device includes a first, pivotably mounted lever, which is activated by a first push-button, and whose movement is limited in the direction of the first push-button by a first stop member, and a second, pivotably mounted lever, which is activated by a second push-button, and whose movement is limited in the direction of the second push-button by a second stop member. A spring is fixedly mounted on the second lever.

According to the invention, the first lever is associated with an arm that cooperates with the spring such that, when one or other of the two levers is activated by one of the push-buttons, the arm and the spring move in relation to each other in such a way that the arm is still subjected to the return force of the spring. The return force of said spring and the geometry of the mechanism, namely the length of the lever arms involved, thus determine the resistance that the user feels when he activates one of the push-buttons. If the return force of the spring decreases over time, the resistance felt when one of the two push-buttons is activated will decrease such that the ratio of these two resistances to each other always remains constant. The force felt when the push-button is activated also depends, of course, upon the friction between the elements. Since the friction is low compared to the return force of the spring, it will be ignored hereafter.

The arm can be provided with a beak and may cooperate with the spring via the beak. It is also possible to provide the arm with a pin or peg, so that the arm cooperates with the spring via the pin or peg. This variant enables an arm and a spring, which are not in the same plane, to cooperate

with each other, which is particularly advantageous when the two levers are not in the same plane.

According to a first embodiment, the arm is integral with the first lever, and said first lever pivots in an opposite direction of rotation to the second lever. This embodiment has the advantage of being simple, which facilitates assembly of the device and thus assembly of the chronograph.

It is clear that numerous variants of this first embodiment could be envisaged, all of these variants falling within the field of protection of claim 1. The arm and the spring could, in theory, cooperate with each other via any type of intermediate part. The spring could, of course, take the form of any type of elastic element. It could be a jumper spring, but it is also possible to use an elastic element attached to the second lever, in particular an extended portion, connected to the lever by an elastic section.

For a device of this type, wherein the arm is integral with the first lever, which pivots in the opposite direction of rotation to the second lever, it is particularly advantageous to select the geometry of the device such that the distance between the pivoting axis of the first lever and the direction of the force exerted on the push-button, when the latter is activated, is equal to the distance between the pivoting axis of the second lever and the direction of the force exerted on the second push-button, when the latter is activated. In such case, the resistance felt when the first push-button is activated is equal to the resistance felt when the second push-button is activated. This resistance depends only on the return force of the spring and the aforecited distances, and friction, which will be ignored as stated above. Given that, when either one of the two push-buttons is activated, the beak and the spring move in relation to each other such that the beak is always subjected to the return force of the spring, the ratio of resistance felt depends only upon the ratio of the lever arms involved, and thus on the ratio between, on the one hand, the distance between the pivoting axis of the first lever and the direction of force exerted on the first push-button, and, on the other

hand, the distance between the pivoting axis of the second lever and the direction of force exerted on the second push-button.

According to a second embodiment, the arm is pivotably mounted and articulated on the end of the first lever. The first lever pivots in the same direction of rotation as the second lever, and the arm pivots in the opposite direction of rotation to the two levers. Preferably, the arm is articulated on the second lever and pivots about the same axis as said second lever.

If one wishes the resistance felt by the user when one of the push-buttons is activated to be the same for both push-buttons, the geometry of the mechanism could be sized accordingly. One could, for example, alter the ratio of moments necessary for activating a push-button and thus alter the ratio of resistance felt, by changing the length of the lever arms involved.

According to a particularly advantageous embodiment, the first and/or the second stop member is formed by the corresponding push-button.

The invention will become clearer upon reading the following description of two preferred embodiments, given by way of non-limiting example, and referring to the annexed drawings, in which:

- Figure 1 shows a view of a chronograph control device, seen from the gear train side, according to a first embodiment of the invention, and

- Figure 2 shows a view of a chronograph control device, seen from the gear train side, according to a second embodiment of the invention.

As illustrated in Figure 1, the chronograph control device according to the first embodiment of the invention includes a first lever 20, pivotably mounted on a first pivot 25, activated by a first push-button 10, and a second lever 22, pivotably mounted on the same pivot 25, and activated by a second push-button 12. The movement of the two levers 20, 22 is limited in the direction of their respective push-buttons 10, 12, by a stop member

that is not shown in Figure 1. To prevent the two push-buttons 10, 12 being activated simultaneously, the two levers 20, 22 are secured to each other via a pin 28, which can move in a longitudinal hole. The first lever 20 takes the form of reset lever and can control the motion, for example, of a conventional hammer stem-bolt, in order to release a hammer held by a spring. The second lever 22 starts and stops a chronograph counter. As the invention only concerns the control device, the actual chronograph mechanism will not be described in detail. However, according to the invention, the device can, in theory, be used with any type of timepiece mechanism, in particular a chronograph mechanism comprising column wheel or cam systems.

As can be seen in Figure 1, a jumper spring 30 is mounted on the second lever 22 by means of two studs. Said spring 30 is generally V-shaped with one arm immobile relative to the second lever 22 and a second arm located on the side of first lever 20. Further, in the end part of the arm on the side of the first lever, said spring 30 includes a notch or slot 32, which cooperates with a beak 24 attached to first lever 20. This beak 24 is held in said notch 32 by the return force of spring 30. When the first lever 20 is pivoted via the action of the first push-button 10 on pivot 25, in the direction of arrow A, the beak 24 attached to first lever 20 has to overcome the notch force holding it in notch 32 of spring 30. Once this force has been overcome, the user will feel the resistance decrease and will know that the desired reset has occurred. If the user continues to activate push-button 10, beak 24 is no longer in notch 32, but is sliding along the inclined plane 34 that forms the end of spring 30, while first lever 20 still resists the return force of spring 30. This inclined plane 34 ensures the return of lever 20, 22, when the user releases the push-button 10, 12.

The resistance that will be felt by a user who presses on first push-button 10 in order to reset the chronograph counter mechanism, is thus proportional to the notch force that has to be overcome in order for beak 24 to leave notch 32 of said spring 30.

When the second lever 22 is pivoted via the action of second push-button 12 on the same pivot 25 in the direction of arrow B, it also resists the same notch force, determined by the geometry of spring 30 and by the return force thereof. However, in this case, the force is exerted by the movement of spring 30 and not by that of beak 24. As the resulting force is the same as when the first lever 20 pivots, the sensation of resistance when the first and second push-buttons 10, 12 are respectively activated depends only on the actual lever arm ratio in each case, as explained in more detail below.

The resistance that will be felt when the first push-button 10 is activated is inversely proportional to the distance d_1 between the pivoting axis 25 of first lever 20 and the direction F_1 of the force exerted on first push-button 10 when the latter is activated. Likewise, the resistance that will be felt when the second push-button 12 is activated is inversely proportional to the distance d_2 between the pivoting axis 25 of the second lever 22 and the direction F_2 of the force exerted on the second push-button 12 when the latter is activated. If one wishes the resistance to be the same for both push-buttons 10 and 12, the device illustrated in Figure 1 must be sized such that distances d_1 and d_2 are equal. One could, of course, choose a desired ratio between distances d_1 and d_2, which is greater than or less than 1.

Figure 2 shows a chronograph control device according to a second embodiment. In this second embodiment, those elements that are identical to those described with reference to Figure 1 will be designated by the same reference numerals. As in the first embodiment, the device includes a first lever 20, pivotably mounted on a first pivot 25, activated by a first push-button 10, and a second lever 22, pivotably mounted on a second pivot 21 and activated by a second push-button 12. The movement of the two levers 20, 22 is limited in the direction of their respective push-buttons 10, 12, by a stop member that is not shown. Unlike the first embodiment, the second embodiment includes a beak 24, which cooperates with notch 32 of

spring 30. This beak 24 is no longer integral with first lever 20, but integral with an arm 26 articulated on first lever 20 at a place designated by the reference 27 in Figure 2. This arm 26 is pivotably mounted on the same pivot 21 as the second lever 22, but it could also be pivotably mounted on a third pivot. In any case, the first lever 20 and second lever 22 pivot in the same direction B, whereas arm 26 pivots in the opposite direction A. Nonetheless, as in the embodiment illustrated in Figure 1, the sensation of resistance when the first and second push-buttons 10, 12 are respectively activated, depends only upon the actual lever arm ratio in both cases and thus only on the geometry of the device. As in the first embodiment described above, the resistance that will be felt when one of the two push-buttons 10, 12 is activated, is inversely proportional to the distance d_1, d_2 between the pivoting axis of the associated lever 20, 22 and the direction F_1, F_{12} of the force exerted on the push-button 10, 12 concerned when said push-button is activated. In order to size the device shown in Figure 2 so that the resistance is the same for both push-buttons 10, 12, account must be taken not only of distances d_1 and d_2, but also of the distance between hinge 27 of arm 26 and the pivot 28 on which arm 26 and the second lever 22 are pivoting, and the position of said pivot 26 relative to spring 30 and beak 24.

CLAIMS

1. Chronograph control device including:

- a first, pivotably mounted lever (20), which is activated by a first push-button (10), and whose movement in the direction of the first push-button is limited (10) by a first stop member,

- a second, pivotably mounted lever (22), which is activated by a second push-button (12), and whose movement in the direction of the second push-button (12) is limited by a second stop member,

- a spring (30) mounted on the second lever (22), characterized in that the first lever (20) is associated with an arm (26) that cooperates with the spring (30) such that, when one or other of the two levers (20, 22) is activated by one of the push-buttons (10, 12), the arm (26) and the spring (30) move relative to each other in such a way that the arm (26) is subjected to the return force of the spring (30).

2. Chronograph control device according to claim 1, characterized in that the arm (26) is provided with a beak (24) that cooperates with the spring (30).

3. Chronograph control device according to claim 1, characterized in that the arm (26) is provided with a pin or peg that cooperates with the spring (30).

4. Chronograph control device according to any of the preceding claims, characterized in that the arm is attached to the first lever (20) and in that said first lever (20) pivots in an opposite direction of rotation (A) to that (B) of the second lever (22).

5. Chronograph control device according to claim 4, characterized in that the distance (d_1) between the pivoting axis (25) of the first lever (20) and the direction (F_1) of the force exerted on the first push-button (10) when said push-button is activated, is equal to the distance (d_2) between the pivoting axis (25) of the second lever (22) and the direction (F_2) of the force

exerted on the second push-button (12), when said push-button is activated.

6. Chronograph control device according to claim 1, characterized in that the arm (26) is pivotably mounted and articulated on the end of the first lever (20), said first lever (20) pivoting in the same direction of rotation (B) as the second lever and the arm (26) pivoting in the opposite direction of rotation (A) to the two levers (20, 22).

7. Chronograph control lever according to any of the preceding claims, characterized in that the arm (26) is articulated on the second lever (22) and pivots about the same axis (21) as said second lever (22).

8. Chronograph control device according to any of the preceding claims, characterized in that the first and/or second stop member is formed by the corresponding push-button (10, 12).

9. Chronograph control device according to any of the preceding claims, characterized in that the spring (30) is a jumper spring.