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(54) LEVER POSITIONING DEVICE

(71) We, KABUSHIKI KAISHA SEIKOSHA, a Japanese Company of 5, 2-chome, Kyobashi, Chuo-ku, Tokyo, Japan do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to lever positioning devices. Such devices may be used in, for example, alarm stop mechanisms or switches.

According to the present invention there is provided a lever positioning device comprising: a lever slideably supported on fixed structure and biased for movement in a given direction, the lever having two opposed pawls which are disposed in different planes; a first control cam provided with alternatively disposed relatively deep recesses and relatively shallow recesses; and a second cam provided with a plurality of teeth positions corresponding to the recesses of the first cam, the first and second cams being rotatably supported between the two pawls so that the first cam is engageable by one of said pawls and the second cam is engageable with the other of said pawls, the engagement between said one pawl and one of the relatively shallow recesses in the first cam determining one relative position of the lever, and engagement between said one pawl and one of the relatively deep recesses in the first cam determining a second relative position of the lever.

Preferably the teeth of the second cam are angularly displaced relative to the recesses of the first cam in the direction of rotation of the cam.

In the preferred embodiment the second cam has relatively large teeth with positions corresponding to the relatively deep recesses of the first cam and relatively small teeth for positions corresponding to the relatively shallow recesses of the first cam.

The said lever may carry a push button by means of which it is slideably moved.

The device may include a spring for biasing the lever in said given direction.

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

Figure 1 is an elevational view of a lever positioning device according to the present invention;

Figure 2 is a cross-section of the device of Figure 1 taken on the line II—II;

Figure 3 is an enlarged view of part of the device of Figure 1; and

Figures 4 to 6 illustrate the operation of the device of Figure 1.

Throughout the description the terms 'upper', 'lower', etc., refer to the directions as seen in the drawings.

Referring to Figures 1 and 2 there is illustrated a lever positioning device according to the present invention. A base plate 1 is provided with four guides 2 which slideably support an operating lever 3. The lever 3 is maintained spaced apart from the base plate 1 by a pre-determined distance by means of projections 4. The base plate 1 carries a shaft 5 on which a position control cam 6 and an integral supplementary cam 7 are rotatably supported. The lever 3 is provided with a lower pawl 8 arranged to engage the control cam 6 and an upper pawl 9 arranged to engage the supplementary cam 7, the pawls 8, 9 being opposed to each other. The pawl 8 is formed at an end of a raised portion 10 of the lever 3, so that the pawl 8 to the pawl 9 are located in different planes. Therefore, the pawl 8 is engageable only with the control cam 6 and the other pawl 9 is engageable only with the supplementary cam 7. The pawls 8, 9 are provided with respective ramp portions 8a, 9a which extend in the rotational direction of the cams 6, 7 so that engagement at a top dead centre position cannot occur.

As shown in Figure 3, the control cam 6 is

provided with four relatively deep recesses 6a angularly spaced apart by 90° and four relatively shallow recesses 6b also angularly spaced apart by 90°. The supplementary cam 7 is provided with four relatively large teeth 7a in positions which substantially correspond to the recesses 6a and four relatively small teeth 7b in positions which substantially correspond to the recesses 6b. The teeth 7a, 7b are angularly displaced in a counter clockwise direction by an angle θ from respective recesses 6a, 6b in order to avoid engagement at a top dead centre position between the pawl 9 and the teeth 7a, 7b. In the illustrated embodiment, the angle θ is 6° although it may be any desired angle. A coil spring 13 is connected between the hook 11 and a pin 12. The hook 11 is formed from a lower end portion of the lever 3 and extends at right angles to the plane of the latter. The pin 12 projects from the base plate 1 through a guide slot 3a in the lever 3. Thus the lever 3 is urged upwardly by the spring 13 so that normally, the pawl 8 abuts against one of the recesses 6a, 6b of the control cam 6.

A push-button 14 is provided at a top end portion of the lever 3.

In the state shown in Figure 1, the pawl 8 abuts against one of the recesses 6a due to the action of the spring 13 and the lever 3 is retained in an upper position out of engagement with the teeth 7a. When the button 14 is depressed, the lever 3 moves downwardly against the action of the spring 13. This causes the pawl 9 to act against the right side of one of the teeth 7a to rotate the supplementary cam 7 and the control cam 6 in the counterclockwise direction until the lever 3 is prevented from moving further by virtue of engagement between the pawl 9 and the concave recess between the tooth 7a and the adjacent tooth 7b (Figure 4).

In the state shown in Figure 4, the pawl 8 is adjacent one of the recesses 6b of the control cam 6. Upon release of the push-button 14, the lever 3 moves upwardly under the action of the spring 13, and is retained in a lower position with the pawl 8 abutting one of the recesses 6b of the control cam 6 as shown in Figure 5. During this operation the control cam 6 and the supplementary cam 7 rotate to a small extent in the counterclockwise direction, and the pawl 9 is adjacent to, but out of engagement with, one of the teeth 7b which is displaced leftwards slightly.

Upon depression of the button 14 again, the lever 3 moves downwardly so that the pawl 9 pushes on the right side of one of the teeth 7b of the supplementary cam 7. The supplementary cam 7 and the control cam 6

are rotated further in the counterclockwise direction as shown in Figure 6. In this state, the pawl 8 faces one of the recesses 6a of the position control cam 6. When the button 14 is released, the lever 3 is restored to its upper position by the spring 13. The pawl 8 rotates the position control cam 6 in the counterclockwise direction until it abuts the bottom of one of the recesses 6a as shown in Figure 1. Thus the lever 3 is once more retained in its upper position as shown in Figure 1.

In this manner, repeated depression and releases of the button 14 causes the lever 3 to be selectively retained in the upper and lower positions.

WHAT WE CLAIM IS:—

1. A lever positioning device comprising: a lever slideably supported on fixed structure and biased for movement in a given direction, the lever having two opposed pawls which are disposed in different planes; a first control cam provided with alternatively disposed relatively deep recesses and relatively shallow recesses; and a second cam provided with a plurality of teeth positions corresponding to the recesses of the first cam, the first and second cams being rotatably supported between the two pawls so that the first cam is engageable by one of said pawls and the second cam is engageable with the other of said pawls, the engagement between said one pawl and one of the relatively shallow recesses in the first cam determining one relative position of the lever, and engagement between said one pawl and one of the relatively deep recesses in the first cam determining a second relative position of the lever.

2. A device as claimed in claim 1 in which the teeth of the second cam are angularly displaced relative to the recesses of the first cam in the direction of rotation of the cam.

3. A device as claimed in claim 1 or 2 in which the second cam has relatively large teeth with positions corresponding to the relatively deep recesses of the first cam and relatively small teeth for positions corresponding to the relatively shallow recesses of the first cam.

4. A device as claimed in any preceding claim in which said lever carries a push button by means of which it is slideably moved.

5. A device as claimed in any preceding claim including a spring for biasing the lever in said given direction.

6. A lever positioning device substantially as herein described with reference to and as shown in the accompanying drawings.



provided with four relatively deep recesses 6a angularly spaced apart by 90° and four relatively shallow recesses 6b also angularly spaced apart by 90°. The supplementary cam 7 is provided with four relatively large teeth 7a in positions which substantially correspond to the recesses 6a and four relatively small teeth 7b in positions which substantially correspond to the recesses 6b. The teeth 7a, 7b are angularly displaced in a counter clockwise direction by an angle θ from respective recesses 6a, 6b in order to avoid engagement at a top dead centre position between the pawl 9 and the teeth 7a, 7b. In the illustrated embodiment, the angle θ is 6° although it may be any desired angle. A coil spring 13 is connected between the hook 11 and a pin 12. The hook 11 is formed from a lower end portion of the lever 3 and extends at right angles to the plane of the latter. The pin 12 projects from the base plate 1 through a guide slot 3a in the lever 3. Thus the lever 3 is urged upwardly by the spring 13 so that normally, the pawl 8 abuts against one of the recesses 6a, 6b of the control cam 6.

A push-button 14 is provided at a top end portion of the lever 3.

In the state shown in Figure 1, the pawl 8 abuts against one of the recesses 6a due to the action of the spring 13 and the lever 3 is retained in an upper position out of engagement with the teeth 7a. When the button 14 is depressed, the lever 3 moves downwardly against the action of the spring 13. This causes the pawl 9 to act against the right side of one of the teeth 7a to rotate the supplementary cam 7 and the control cam 6 in the counterclockwise direction until the lever 3 is prevented from moving further by virtue of engagement between the pawl 9 and the concave recess between the tooth 7a and the adjacent tooth 7b (Figure 4).

In the state shown in Figure 4, the pawl 8 is adjacent one of the recesses 6b of the control cam 6. Upon release of the push-button 14, the lever 3 moves upwardly under the action of the spring 13, and is retained in a lower position with the pawl 8 abutting one of the recesses 6b of the control cam 6 as shown in Figure 5. During this operation the control cam 6 and the supplementary cam 7 rotate to a small extent in the counterclockwise direction, and the pawl 9 is adjacent to, but out of engagement with, one of the teeth 7b which is displaced leftwards slightly.

Upon depression of the button 14 again, the lever 3 moves downwardly so that the pawl 9 pushes on the right side of one of the teeth 7b of the supplementary cam 7. The supplementary cam 7 and the control cam 6

are rotated further in the counterclockwise direction as shown in Figure 6. In this state, the pawl 8 faces one of the recesses 6a of the position control cam 6. When the button 14 is released, the lever 3 is restored to its upper position by the spring 13. The pawl 8 rotates the position control cam 6 in the counterclockwise direction until it abuts the bottom of one of the recesses 6a as shown in Figure 1. Thus the lever 3 is once more retained in its upper position as shown in Figure 1.

In this manner, repeated depression and releases of the button 14 causes the lever 3 to be selectively retained in the upper and lower positions.

WHAT WE CLAIM IS:—

1. A lever positioning device comprising: a lever slideably supported on fixed structure and biased for movement in a given direction, the lever having two opposed pawls which are disposed in different planes; a first control cam provided with alternatively disposed relatively deep recesses and relatively shallow recesses; and a second cam provided with a plurality of teeth positions corresponding to the recesses of the first cam, the first and second cams being rotatably supported between the two pawls so that the first cam is engageable by one of said pawls and the second cam is engageable with the other of said pawls, the engagement between said one pawl and one of the relatively shallow recesses in the first cam determining one relative position of the lever, and engagement between said one pawl and one of the relatively deep recesses in the first cam determining a second relative position of the lever.

2. A device as claimed in claim 1 in which the teeth of the second cam are angularly displaced relative to the recesses of the first cam in the direction of rotation of the cam.

3. A device as claimed in claim 1 or 2 in which the second cam has relatively large teeth with positions corresponding to the relatively deep recesses of the first cam and relatively small teeth for positions corresponding to the relatively shallow recesses of the first cam.

4. A device as claimed in any preceding claim in which said lever carries a push button by means of which it is slideably moved.

5. A device as claimed in any preceding claim including a spring for biasing the lever in said given direction.

6. A lever positioning device substantially as herein described with reference to and as shown in the accompanying drawings.

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