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DIFFERENTIAL ADJUSTMENT

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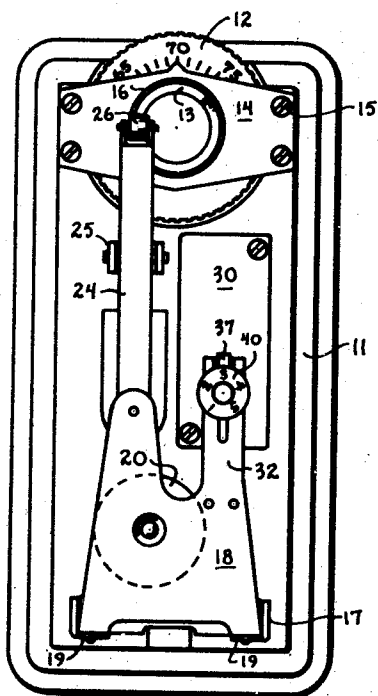


Fig. 1

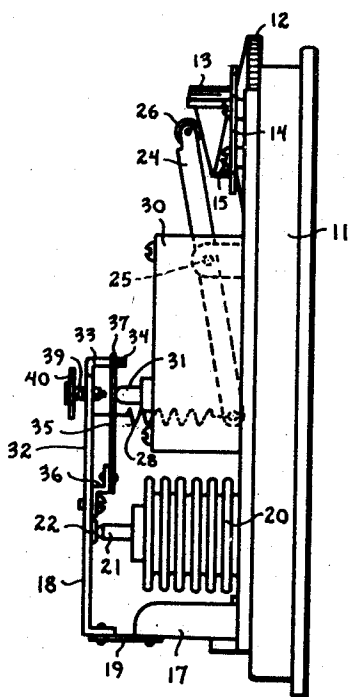


Fig. 2

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DIFFERENTIAL ADJUSTMENT

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12 Claims. (Cl. 200—83)

The present invention relates broadly to differential adjustments and is directed more particularly to a novel way of obtaining an adjustable differential for operating mechanisms of the self return type in which a greater force is required to actuate them than to maintain them in actuated position.

In prior art devices of the above type it has been necessary to adjust certain parts of the operating mechanism itself in order to adjust the differential of operation. This is often complicated and inconvenient, especially where the operating mechanism is completely enclosed in a protective casing, such, for example, as in the case of the unitary snap action switch disclosed in the copending application of Albert E. Baak, Serial No. 307,991, filed December 7, 1939.

It is therefore one of the primary objects of my invention to provide a differential adjustment for devices of the above type, which is independent of the operating mechanism and which is readily accessible and easily made.

Another object of my invention is to provide a differential adjustment which is applicable universally to all devices of the above type and in which no changes in the operating mechanisms are required when the application is made.

These and other objects are readily apparent as the following specification is read in the light of the accompanying drawing, in which

Figure 1 is a front elevation of an automatic switching arrangement embodying my invention, and

Figure 2 is a side elevation of the device shown in Figure 1.

Referring now to the drawing the reference numeral 11 indicates an insulating base upon which the adjusting dial 12 is rotatably mounted. The base of the dial is provided with a helical cam 13 and a friction element 14 is mounted at its ends to the base by means of screws 15 and the hole 16 in the friction element receives the cam 13 so that the element bears against the face of the dial 12 and offers a certain amount of resistance to its movement so that the dial will remain in its adjusted positions.

Base 11 also carries a bracket 17 upon which the lever 18 is mounted by two hinge elements 19. A bellows 20 is mounted on the base 11 and the bellows is provided with a pin 21 which engages in a seat 22 in the lever 18. The adjusting lever 24 is pivotally mounted on the bracket 25 which is in turn carried by the base. At one end of the lever 24 is a roller 26 which engages the surface of the helical cam 13. The other end

of the lever 24 is connected to one end of a spring 28, the other end of which is connected to the lever 18.

It will thus be seen that the spring 28 opposes rotation of the lever 18 due to the expansion of the bellows 20 and also holds the roller 26 in engagement with the surface of the cam 13. Rotation of the adjusting dial 12 will cause a rotation of cam 13 and a corresponding adjustment of the tension of the spring 28 whereby the bellows will be opposed by a force which is dependent upon the position of the adjusting dial 12. This dial may therefore be calibrated in degrees to indicate the temperature at which the lever 18 is rotated by the bellows 20.

It is desired that the lever 18 be used to operate a control mechanism of the self return type in which a greater force is required to actuate the mechanism than to maintain it in its actuated position. Although this invention is applicable to any mechanism of this type, for the convenience of illustration, a snap action switch such as the one discussed in the copending application of Albert E. Baak, Serial No. 307,991 filed December 7, 1939, has been shown at 30. The snap action mechanism is completely enclosed in a casing through which an operating pin 31 extends. In order to actuate this switch a predetermined force must be exerted on the pin 31 and after the switch has been actuated this force must be decreased to a predetermined lower value in order to permit the switch to return to its original position.

A differential adjusting mechanism has been provided on the lever 18 for actuating the switch 30. The end of the arm 32 of the lever 18 is bent at right angles to the rest of the lever and a hole 33 is formed therein to form a first stop 34. A portion of the end of leg 32 has been broken away in Figure 2 in order to more clearly show the hole and stop. A leaf spring 35 is connected at one end to a bracket 36 carried by the lever 18 and the other end 37 extends through the hole 33 and is biased against the stop 34. A screw 39 is adjustably positioned in the lever 18 to form a second stop for the spring 35. The screw 39 may be furnished with a dial 40 to indicate its adjustment relative to the lever 18.

The spring 35 is originally tensioned against the stop 34 to have a force which is sufficient to hold the switch 30 in actuated position but which is insufficient to actuate the switch. Therefore when the switch 30 is in its normal position and the bellows 20 is expanded the spring 35 will engage the stop 34 as shown in Figure 2 of the

drawing. On a decrease in temperature the bellows 20 will contract and the spring 28 will move the lever 18 toward the switch 30. As it does so the spring 35 will engage the pin 31 but as it does not exert a sufficient force to actuate the switch 30 it will be flexed until it engages the stop 39. Further movement of the lever 18 toward the switch will now actuate the switch. On an expansion of the bellows 20 due to a temperature increase the lever 18 will move away from the switch 30 but as the spring 35 exerts a sufficient force to hold the switch in its actuated position the spring will leave the stop 39 and eventually engage the stop 34 as the lever moves away from the switch. On further movement of the lever 18 away from the switch the stop 34 will pick up the end 37 of the spring 35 and permit the switch 30 to move to its original position.

It will therefore be seen that it is the position of the stop 34 which determines the temperature at which the switch moves from its actuated to its original position and it is the position of the stop 39 which determines the temperature at which the switch is moved to its actuated position. The temperature at which the switch is moved to its original position can therefore be indicated directly on the scale carried by the adjusting dial 12 whereas the difference between this temperature and the temperature at which the switch is moved to its actuated position may be indicated on the dial 40 carried by the adjustable stop 39.

It is therefore clear that the differential adjustment disclosed in the present application is one which may be applied universally to any operating mechanism which requires a first force to actuate it and a second smaller force to maintain it in actuated position and that the adjustment may be applied to such mechanisms without changing the mechanism in any way. Furthermore the adjustment is one which is simple in construction and easy to manipulate.

As various changes and modifications of this invention may occur to those who are skilled in the art I wish it to be understood that I intend to be limited only by the scope of the appended claims and not by the specific embodiment disclosed.

I claim as my invention:

1. In a device of the character described, an operating mechanism of the self return type in which a predetermined force is required to actuate it in one direction and a predetermined smaller force will prevent it from returning to its original position, a control device shifted between two positions of operation by said mechanism, an actuating member for said mechanism, means applying an initial force to said member sufficient to hold said mechanism in actuated position but incapable of exerting a sufficient force to actuate it, and means for supplying an additional force independently of said last mentioned means to actuate said mechanism and then removing said additional force and some of said initial force to permit said mechanism to return to its original position.

2. In a device of the character described, an operating mechanism of the self return type in which a predetermined force is required to actuate it in one direction and a predetermined smaller force will prevent it from returning to its original position, a control device shifted between two positions of operation by said mechanism, an actuating member for said mechanism, spring means exerting a force on said actuating

member sufficient to hold said mechanism in actuated position but incapable of exerting a sufficient force to actuate it, and means for supplying an additional force independently of said spring means to said actuating member for actuating said mechanism and for acting on said spring means to remove some of the force which it exerts on said actuating member in order to permit said mechanism to return to its original position.

3. In a device of the character described, an operating mechanism of the self return type in which a predetermined force is required to actuate it in one direction and a predetermined smaller force will prevent it from returning to its original position, a control device shifted between two positions of operation by said mechanism, an actuating member for said mechanism, spring means exerting a force on said actuating member sufficient to hold said mechanism in actuated position but incapable of exerting a sufficient force to actuate it, a condition responsive device, a control member movable thereby for supplying an additional force to said actuating member independently of said spring means for actuating said mechanism at one condition value and for acting on said spring means at a second condition value to remove some of the force which it exerts on said actuating member in order to permit said mechanism to return to its original position, and means for varying the difference between said condition values.

4. In a device of the character described, an operating mechanism of the self return type in which a predetermined force is required to actuate it in one direction and a predetermined smaller force will prevent it from returning to its original position, a control device shifted between two positions of operation by said mechanism, an actuating member for said mechanism, a control member, first and second stops on said control member, spring means carried by said control member, said spring means being biased against said first stop, and a condition responsive device for moving said control member in a direction to cause said spring means to engage said actuating member, said spring means having insufficient force to actuate said mechanism whereby it is flexed into engagement with said second stop so as to actuate said mechanism on continued movement of said control member, said spring means having sufficient force to maintain said mechanism in actuated position whereby said mechanism does not return to its original position until the spring means engages said first stop on a reverse movement of said control member.

5. In a device of the character described, an operating mechanism of the self return type in which a predetermined force is required to actuate it in one direction and a predetermined smaller force will prevent it from returning to its original position, a control device shifted between two positions of operation by said mechanism, an actuating member for said mechanism, a control member, first and second stops on said control member, spring means carried by said control member, said spring means being biased against said first stop, and a condition responsive device for moving said control member in a direction to cause said spring means to engage said actuating member, said spring means having insufficient force to actuate said mechanism whereby it is flexed into engagement with said second stop so as to actuate said mechanism on continued movement of said control member, said spring means

having sufficient force to maintain said mechanism is actuated position whereby said mechanism does not return to its original position until the spring means engages said first stop on a reverse movement of said control member, one of said stops being adjustable to vary the differential of operation of said switch.

6. In a device of the character described, an operating mechanism of the self return type in which a predetermined force is required to actuate it in one direction and a predetermined smaller force will prevent it from returning to its original position, a control device shifted between two positions of operation by said mechanism, an actuating member for said mechanism, a control member, said control member having an offset portion in the form of a stop, a leaf spring fixed at one end to said control member, the free end of said spring being biased against said stop, a second stop adjustably carried by said control member, and a condition responsive device for moving said leaf spring in a direction to engage said actuating member, said leaf spring having insufficient strength to actuate said mechanism whereby it is flexed until it engages said second stop resulting in actuation of said mechanism upon continued movement of said control member, said spring having sufficient strength to maintain said mechanism in actuated position whereby said mechanism cannot return to its original position until after said leaf spring is picked up by said first stop on a reverse movement of said control member.

7. In a device of the character described, a snap action switch of the self return type, an actuating member for said switch, spring means exerting an initial force on said actuating member sufficient to hold said switch in actuated position but incapable of exerting a sufficient force to actuate it, and a condition responsive device for supplying additional force independently of said spring means to actuate said switch and for removing said additional force and some of said initial force to permit said switch to return to its original position.

8. In a device of the character described, a snap action switch of the self return type, a casing enclosing said switch, an actuating pin extending through said casing, a lever, a pair of stops carried by said lever, a leaf spring carried by said lever and biased against said first stop, and a condition responsive device for rotating said lever to cause said spring to engage said pin, said spring having insufficient force to actuate said switch whereby it is flexed into engagement with said second stop so that said switch is actuated on further rotation of said lever, said spring exerting sufficient force to maintain said switch in actuated position whereby said switch cannot return to its original position on a reverse rotation of said lever until after said spring has been picked up by said second stop.

9. In a device of the character described, a snap action switch of the self return type, a casing enclosing said switch, an actuating pin extending through said casing, a lever, a pair of stops carried by said lever, a leaf spring carried by said lever and biased against said first stop

and a condition responsive device for rotating said lever to cause said spring to engage said pin, said spring having insufficient force to actuate said switch whereby it is flexed into engagement with said second stop so that said switch is actuated on further rotation of said lever, said spring exerting sufficient force to maintain said switch in actuated position whereby said switch cannot return to its original position on a reverse rotation of said lever until after said spring has been picked up by said second stop, one of said stops being adjustable to vary the difference in the condition values at which said switch is actuated in each direction.

10. In a device of the character described, an operating mechanism of the self return type in which a predetermined force is required to actuate it in one direction and a predetermined smaller force will prevent it from returning to its original position, a control device shifted between two positions of operation by said mechanism, spring means for holding said mechanism in actuated position but incapable of developing a force great enough to actuate it, a condition responsive device, and connections between said condition responsive device and said mechanism, said connections including means for actuating said mechanism at one value of said condition and removing the effect of said spring means at another value of said condition, said actuating means actuating said mechanism independently of any spring force of said spring means.

11. In a device of the character described, an operating mechanism of the self return type in which a predetermined force is required to actuate it in one direction and a predetermined smaller force will prevent it from returning to its original position, a control device shifted between two positions of operation by said mechanism, a condition responsive device, and connections between said condition responsive device and mechanism for operating said mechanism at one value of said condition and permitting it to return at a second value of said condition, said connections including a spring for retaining said mechanism in actuated position and stop means for removing the effect of said spring.

12. In a device of the character described, an operating mechanism of the self return type in which a predetermined force is required to actuate it in one direction and a predetermined smaller force will prevent it from returning to its original position, a control device shifted between two positions of operation by said mechanism, a condition responsive device operatively connected to said mechanism, and means for determining the differential of operation including a spring which is capable of maintaining said mechanism in actuated position but is incapable of developing a force great enough to actuate it, and means for removing the effect of said spring at a value of said condition, said last mentioned means actuating said mechanism independently of any spring force of said spring at a different value of said condition.

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