

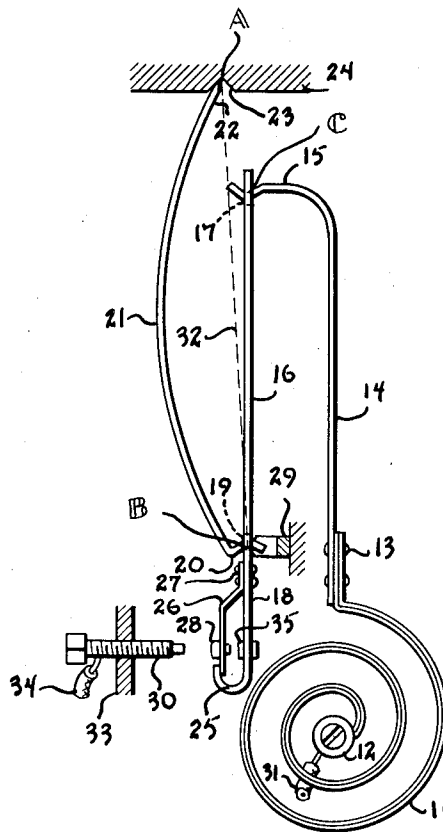
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SWITCH

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SWITCH

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5 Claims. (Cl. 200—67)

This invention relates generally to the art of switches and more particularly to a switch of the snap action type which employs a resilient operating member.

5 It is an object of this invention to provide a snap action switch which has a minimum number of parts and yet is efficient in operation.

Another object is to provide a switch which will produce a type of snap action which is similar to that produced by a permanent magnet and yet which does not use a magnet but is entirely mechanical in its operation, and therefore is much cheaper to manufacture.

15 These and other objects will become apparent as the following specification is read with reference to the accompanying drawing, in which the single figure is a more or less diagrammatic representation of my snap action switch.

The present switch is operated by means of a bimetallic coil thermostat 11 which has a fixed end 12 and which carries at its free end by means of rivets 13, a resilient operating arm 14 having an end which is bent over as shown at 15. A contact arm 16 is shown as having a hole 17 at one end thereof through which is inserted the end 15 of the operating arm. The other end 18 of the contact arm is provided with a second hole 19 through which is inserted one end 20 of a bowed compression spring 21, the other end 22 of which bears against a notch 23 in a stationary support 24 to form a knife edge bearing. The end 18 of contact arm 16 is bent over as shown at 25 to restrain the movement of a leaf spring 26 riveted to the end 18 as shown at 27. Carried by spring 26 is a movable contact 28 which is adapted to engage stationary contact 30 which is adjustably mounted in the stationary support 33. An electrical conductor 31 is connected to the bimetallic spiral 11 at 12 and conductor 34 is connected to the stationary contact 30 for the purpose of connecting the switch into a suitable control circuit.

In order to assist in explaining the action of this switch, reference numeral A will be used to designate the point of contact of spring 21 with the stationary support 24, B will designate the contact point between spring 21 and contact arm 16, and C will designate the contact point between contact arm 16 and resilient arm 14.

Assuming the parts are in the position shown in the single figure of the drawing it will be seen that the compression spring 21 is exerting a downward pull on the contact arm 16 at B which in turn exerts a downward pull on the intumed end 15 of the resilient arm 14 at C. The effect of this force is to tend to swing the point C toward the

left due to the angle between the arm 16 and an imaginary line connecting point C and point 13 at which arm 14 is supported. This movement will be resisted by the thermostatic element 11 which will cause a slight bend in the arm 14. It will be noted that there is a component of force exerted by spring 21 on arm 16 holding the point B thereof against the stop 29. This force is due to the angle between the arm 16 and an imaginary line 32 connecting the points A and B, or in other words, the angle ABC. The line 32 is the line of force of the spring 21. The stop 29 engages arm 16 at the point B and hence this engagement has no effect at the point C.

As the temperature to which the bimetal coil 11 responds decreases arm 14 will be permitted to swing to the left until point C is on the line AB, at which time the pressure between contact arm 16 and stop 29 will be zero. It might be pointed out that as point C is moved back and forth the effect of the force exerted by spring 21 on arm 16 is to try to make point B follow point C in such a manner as to keep the points A, B, and C in the same straight line. Therefore, on a further drop in temperature, arm 14 will be permitted to move point C to the left of the line AB and spring 21 will move point B away from stop 29 to align the points A, B, and C again. It will be seen that as point B moves to the left the angle between the contact arm 16 and arm 14 increases which will cause arm 14 to bend further to move point C further to the left and spring 21 will continue to move point B to the left to try to keep the points A, B, and C in a straight line. In order to do this the point B must move much farther than the point C and the bending force exerted by arm 16 on the arm 14 is increased so rapidly due to the increase in the angle between arm 16 and arm 14, after B has once left stop 29 that the result is a snap action which causes contacts 28 and 30 to engage and which causes arm 16 to swing point C well to the left of the line AB.

It will be seen that as arm 16 is snapped to the left causing contacts 28 and 30 to engage that spring 26 will be deflected until the stop 35 on end 18 of arm 16 strikes contact 28. The pressure between the contacts 28 and 30 will be determined at this point by the angle between the line 32 and contact arm 16.

Assuming now that the temperature begins to rise, bimetal coil 11 will begin to unwind until it builds up enough force in arm 14 to swing point C to the right in opposition to the force exerted by contact arm 16. As point C moves to a position on the line AB the contact pressure between

stop 35 and contact 28 will be zero but contacts 28 and 30 will still be held closed by spring 26. Upon further movement of point C to the right the spring 21 will move point B to the right to keep it aligned with points A and C which will reduce the angle between arms 16 and 14. The reduction of this angle reduces the moment arm through which the arm 16 exerts its bending force on the arm 14. Thus the bending force is reduced and arm 14 will straighten out slightly which will in turn move point C farther to the right. Point B will follow and cause a further reduction in the bend in arm 14 which moves C still farther to the right. This action occurs rapidly once point B has started moving and the result is a snap action.

The snap action is accomplished because of the resilience of the arm 14. As the switch snaps to the left from the position shown in the drawing a force is stored in arm 14 by bending it more than it is bent in the drawing. This bending is caused by the increase in the angle between arms 16 and 14. As the switch is moved to the right the angle between arms 16 and 14 is reduced which reduces the bending force and the force stored up in arm 14 is released to produce the snap action.

It will therefore be seen that I have devised a snap action switch which is extremely simple and reliable in operation and which employs a minimum number of parts. This switch has the added advantage that it will be cheap to manufacture.

As certain modifications and changes may occur to those who are skilled in the art it is to be understood that I am not limited by the specific embodiment disclosed, but the limits of this invention are to be determined by the scope of the appended claims.

I claim as my invention:

1. A snap action mechanism comprising in combination, a compression member, a control member, a relatively fixed support, one portion of said compression member engaging said fixed support and another being operatively connected to said control member at a first point, a resilient actuating member connected to a second point on said control member, said second point lying in an area extending between the relatively fixed support and said first point, said actuating member being supported at one side of said control member so that said control member exerts a bending force on said actuating member tending to move said second point across a line connecting the two portions of said compression member, and means for causing said actuating member to move said second point across said line whereby the compression member moves said control member in a direction to increase said bending force resulting in a further movement of said second point independently of said last mentioned means whereby a snap action is produced.

2. A snap action mechanism comprising in combination, a compression member, a control member, a relatively fixed support, one portion of said compression member engaging said fixed support and another being operatively connected to said control member at a first point, a resilient actuating member connected to a second point on said control member, said second point lying in an area extending between the relatively fixed support and said first point, said actuating member being supported at one side of said control member and lying generally along side thereof so

that said control member exerts a bending force on said actuating member tending to move said second point across a line connecting the two portions of said compression member, and means for causing said actuating member to move said second point across said line whereby said compression member moves said control member in a direction to increase the angle between said control member and actuating member and thereby increase the bending force, thus producing a snap action.

3. Snap action mechanism comprising in combination, a compression spring reacting at one end against a fixed support, a floating control arm, said compression spring reacting at its other end on said control arm near one end thereof, and a resilient actuating member mounted at one side of and connected to the other end of said control arm at a point lying in an area extending between said fixed support and the said other end of the compression spring, whereby said control arm exerts a bending force on said resilient actuating arm tending to move the said other end of the control arm between the ends of said compression spring.

4. A snap action mechanism comprising in combination, a compression member, a control member, a relatively fixed support, one portion of said compression member engaging said fixed support and another being operatively connected to said control member at a first point, a resilient actuating member connected to a second point on said control member, said second point lying in an area extending between said relatively fixed support and said first point, said actuating member and said point being at one side of a line connecting said two portions of said compression member so that said control member exerts a bending force on said actuating member tending to move it across said line, a first stop, said compression member holding said first point on said control member against said first stop as long as said second point is on said one side of said line, a second stop, and means for causing said actuating member to move said second point across said line whereby said compression member moves said control member in a direction to increase said bending force and hence moves said first point into engagement with said second stop with a snap action.

5. A snap action mechanism comprising in combination, a control member, a relatively fixed support, an elongated spring member reacting at a first point against said support and exerting a substantially longitudinal force on said control member at a second point, a resilient actuating member connected to said control member at a third point in such a manner that said control member exerts a bending force on said actuating member, said third point lying in an area extending between said first and second points whereby the force exerted by said spring member on said control member tends to keep the three points in alignment, and means for causing said actuating member to move said third point laterally with respect to said control member and across a line connecting said first and second points whereby the leverage between said control member and actuating member is changed resulting in said resilient actuating member being bent in the direction of its movement whereby said control member moves with a snap action.

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