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TORSIONAL SNAP ACTION DEVICE

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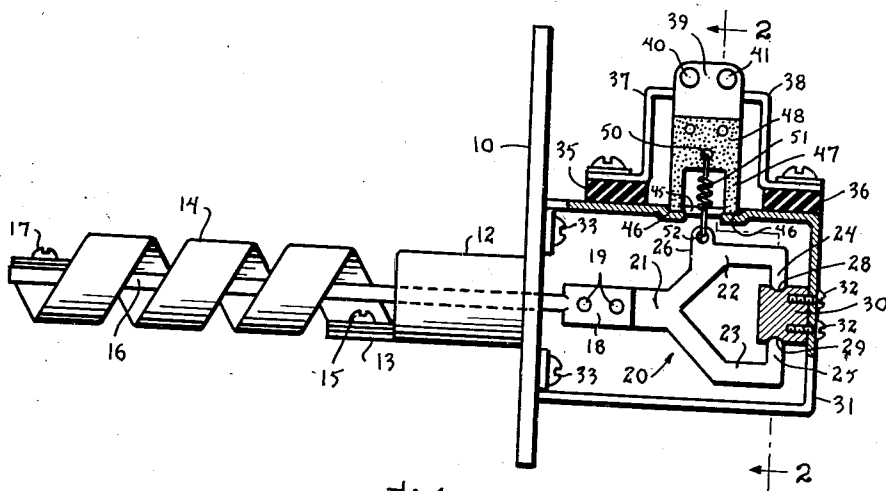


Fig.1

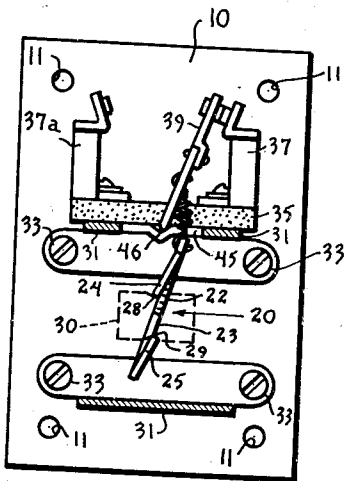


Fig. 2

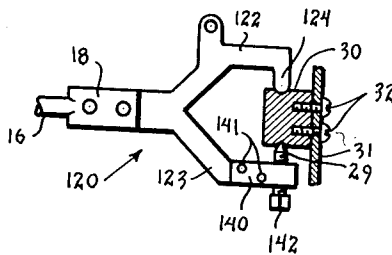


Fig. 3

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TORSIONAL SNAP ACTION DEVICE

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The present invention relates to a snap action device and more particularly to a device which snaps from one position to another due to torsional stress.

5 An object of my invention is to provide a snap action device of simple structure comprising few parts, but being accurate and positive in operation.

10 Another, more specific object, is to provide a snap action device which requires no external springs, bails, or stops to prevent overtravel thereof.

15 Another object is to provide an electrical switching mechanism, employing a novel double snap action to inhibit vanishing contact pressure, and which will be compact and simple in structure.

20 A further object is to provide a snap action mechanism which operates between a plurality of positions of equilibrium that are determined solely by stresses set up in the snapping member.

Other objects will become apparent by reference to the accompanying specification, the claims, and the drawing, in which

25 Figure 1 is an elevational view of a form of my invention with certain parts in section,

30 Figure 2 is a sectional view taken on the line 2—2 of Figure 1 with certain parts in elevation and another part represented by broken lines to more clearly illustrate the principle of the device, and

Figure 3 is a fragmentary view of a modification.

35 In Figures 1 and 2, a base plate 10 is provided which is adapted to be secured to an air duct, bonnet of a furnace, or the like, by means of screws which can be placed through holes 11. The base plate 10 is also provided with an hollow drawn support 12, the end of which is provided with an ear 13 to which a bimetal helix 14 is secured by a screw 15. The free end of the bimetal 14 is secured to a rod 16 by a screw 17. The opposite end of the rod 16 has an enlarged portion 18 to which a snapping element 20 is secured by rivets 19 or other conventional means.

45 The snapping element 20 is provided with a shank portion 21 which is bifurcated to form two arms 22 and 23. The two arms 22 and 23 are returned to form fingers 24 and 25, respectively. The arm 22 is also provided with an ear 26, the purpose of which will be hereinafter more fully set forth.

50 The fingers 24 and 25 are adapted to engage recesses 28 and 29 in a block 30. The block 30 is of a size sufficient to spread the arms 22

and 23 and thus place a tensional stress in the arms 22 and 23 and the shank portion 21 of the member 20. The purpose of setting up this stress in the aforesaid members will be more fully described in the operation of the device. The block 30 is secured to a U-shaped bracket 31 by screws 32. The bracket 31 is in turn secured to the base plate 10 by screws 33.

Conventionally secured on the top of the bracket 31 are two insulating electrical terminal 10 blocks 35 and 36. Secured to the terminal blocks 35 and 36 are the contact brackets 37 and 38, respectively, and a similar second set of contacts, only one of which 37a is shown. A contact bridge 15 member 39 formed of conducting material carries 15 movable contacts 40 and 41 which cooperate with the stationary contacts on the brackets 37 and 38 as well as the contacts on the similar brackets.

The upper part of the bracket 31 is provided with an hole 45 and a pair of recesses 46 into 20 which the legs 47 of the carrying member 48 for the bridge 39 are adapted to seat. The member 47 is provided with an hole 50 into which one end of the spring 51 is hooked. The opposite end of the spring 51 is hooked through the hole 52 in 25 the ear 26 upon the snapping member 20. Therefore it is seen that the snapping member 20 is operatively connected to the electrical contact mechanism in a manner to provide an overcenter snap action to the contact bridge 39 in making and breaking the electrical circuit, as is clearly shown in Figure 2.

Referring now to Figure 3, a snapping member 120 is shown secured to the enlarged portion 18 of the rod 16. The snapping member 120 is 35 provided with arms 122 and 123. The upper arm is provided with a finger 124 similar to the finger 24 of Figures 1 and 2. The lower arm 123 is provided with a block 140 secured to the arm 123 by means of rivets 141. The block 140 carries a set screw 142 which is adapted to cooperate with the lower recess 29 of the block 30. Therefore it is seen that means are provided to adjust the amount of tensional or spreading stress placed in the snapping member 120. 45

Operation

Referring to Figure 2, the snapping member 20 is shown in the position assumed when snapped in a clockwise direction. The device has two 50 positions of equilibrium, a counter-clockwise position and a clockwise position. These positions of equilibrium are assumed when the tensional stress in the snapping member 20 is equalized by the torsional stress set up in the arms 22 and 23 as 55

they are warped in planes oblique to the plane common to the member 20 due to the rotation of the fingers 24 and 25 about their respective recesses 28 and 29 in the block 30. Because the fingers 24 and 25 rotate about independent pivot points the tendency of the arms 22 and 23 is to approach each other as they are rotated away from the vertical dead center position. Inasmuch as the initial stress placed in the snapping member 20 is reduced as the member is rotated and the torsional stress placed in the arms 22 and 23 is increased because of that rotation, a position of equilibrium of stresses will be reached at a point predetermined by the initial spreading stress placed in the member 20.

The positions of balance of the member 20 in which the device will stop after being snapped over a dead center mid position will be determined by the amount of initial spreading tension placed in the snapping member 20. In that form of my invention shown in Figures 1 and 2 this tension may be predetermined by means of different sized blocks 30. In Figure 3 the set screw 142 is adapted to adjust the initial tension in the snapping element 120.

Assuming the parts in the position shown and the bimetallic helix 14 being subjected to a change in temperature and rotating the rod 16: the snapping member 20 will be rotated in a counter-clockwise direction. When the member 20 is thus rotated, it will be seen that the torsional stress in the arms 22 and 23 will decrease because they will be returned to the common plane of the member 20. The spreading stress in the member 20 will be increasing because the fingers rotating around their respective bearing points will be spreading the arms 22 and 23. The member 20 will be rotated to a substantially vertical position past dead center at which time the torsional stress caused by convergence of the arms 22 and 23 will create a couple which will rotate the member 20 in cooperation with the bimetallic helix 14. Therefore, it is seen that the device after passing a dead center mid position will reach a point when the stress within the snapping member 20 will cooperate with the stress in the bimetallic member 14, at which time the device will snap into a position of counter-clockwise equilibrium.

When the snapping element 20 is snapped past center position the connecting spring 51 which is hooked to the contact carrying member 47 will be moved past the dead center position in alignment with the recesses 46. Therefore after the snapping member 20 has snapped into an extreme position the contact carrying member will snap from one set of stationary contacts to the other. Because the contact carrying member does not move away from the contacts until the snapping member 20 has snapped past the dead center position vanishing contact pressure is inhibited between the closed contacts.

While I have shown my device in connection with a temperature responsive element it will be understood that this snap acting mechanism could be used with humidity responsive devices, pressure responsive devices, or as a manual over-center switch. It is also fully anticipated that similar devices could be constructed wherein the snapping member is placed under a compressional stress, rather than tensional stress as utilized, without departing from the spirit of the present invention. Many modifications and forms of my invention will occur to those skilled in the art, therefore it should be clearly understood that I am not to be limited in my inven-

tion only to those forms shown and described but by the scope of the appended claims.

I claim as my invention:

1. A snap action switching mechanism comprising in combination, a member providing a pair of opposed bearing surfaces, a resilient member provided with a pair of fingers, said fingers being in engagement with said bearing surfaces so as to place stress in said resilient member, means for causing relative rotation between said bearing surfaces and said resilient member whereby said mechanism snaps from one position to another, and switching means operated by one of said members.

2. A snap action control mechanism, in combination, a member providing a pair of opposed surfaces, a resilient member provided with a pair of fingers having forcible and rotative engagement with said surfaces, said forcible engagement setting up a stress in said resilient member, means for providing relative rotative movement between said surfaces and said fingers whereby the stress in said resilient member is varied and a snap action is produced, and control means operated by one of said members.

3. A snap action mechanism comprising, a resilient member provided with a pair of spaced fingers, a pair of opposed spaced bearings cooperating with said spaced fingers to set up a stress in said resilient member, means to rotate said resilient member to cause rotation of said fingers about the respective bearing of each to vary the stress in said resilient member whereby said member snaps from one position to another.

4. A snap action control mechanism comprising, a bifurcated member of resilient material provided with a pair of spaced fingers, a pair of opposed spaced bearings which cooperate with said fingers to place stress in said resilient member, means to rotate said resilient member to cause rotation of said fingers about the respective bearing of each to vary the stress in said resilient member whereby said member snaps from one position to another, and control means operated by said member.

5. A snap action switching mechanism comprising, a resilient member provided with a pair of spaced fingers, a pair of opposed spaced bearings cooperating with said spaced fingers to set up a stress in said resilient member, means to rotate said resilient member to cause rotation of said fingers about the respective bearing of each to vary the stress in said resilient member whereby said member snaps from one position to another, a rotative member provided with electrical contacts, bearing means about which said contact member rotates, fixed electrical contacts in cooperable relation with said first contacts, and connecting means between said rotative member and said resilient member whereby said contacts move into and out of engagement with a snap action subsequent to the snap action of said resilient member.

6. A snap action switching mechanism comprising, a bifurcated member of resilient material provided with a pair of spaced fingers, a pair of opposed spaced bearings which cooperate with said fingers to place stress in said resilient member, means to rotate said resilient member to cause rotation of said fingers about the respective bearing of each to vary the stress in said resilient member whereby said member snaps from one position to another, a rotative member provided with electrical contacts, bearing means about which said contact member rotates, fixed

electrical contacts in cooperable relation with said first contacts, and connecting means between said rotative member and said resilient member whereby said contacts move into and out of engagement with a snap action subsequent to the snap action of said resilient member.

7. A snap action mechanism comprising a resilient member, said member being bifurcated to form a pair of spaced arms normally in the same plane, means to stress said arms in opposite directions transverse to said bifurcation, and means to cause relative rotation between said stressing means and said resilient member about an axis substantially longitudinally of said bifurcation.

8. A snap action mechanism comprising, a resilient member, said member being bifurcated to form a pair of spaced arms normally in the same plane, means stressing said arms in opposite directions transverse to said bifurcation, which stress tends to warp said arms into substantially parallel planes that are oblique to the common plane, and means to cause relative rotation between said stressing means and said resilient member about an axis substantially longitudinally of said bifurcation.

9. A snap action mechanism comprising, a resilient member, said member being bifurcated to form a pair of spaced arms normally in the same plane, means placing a stress in said arms, which stress tends to move said member in either direction from a dead center position, said arms when moved by said stress cooperating with said stressing means to create a counteracting stress in said resilient member, said first mentioned stress decreasing and said second mentioned stress increasing as said member is moved from a dead center position, and means to cause relative rotation between said stressing means and said resilient member about an axis substantially longitudinally of said bifurcation.

10. A snap action mechanism comprising, a resilient member, said member being bifurcated to form a pair of spaced arms normally in the same plane, means stressing said arms in opposite directions thereby tending to move them to one of two positions of stability of resiliency of said member, and means to cause relative rotation between said stressing means of said resilient member about an axis substantially longitudinally said bifurcation.

11. A snap action mechanism comprising, a resilient member, said member being bifurcated to form a pair of spaced arms normally in the same plane, means stressing said arms in opposite directions transverse to said bifurcation, which stress tends to move said member from dead center position to one of two positions, said arms and said stressing means cooperating with said member to create a counteracting stress in said member when said arms and member are moved, said first mentioned stress increasing and said second mentioned stress decreasing as said member is moved from dead center position, and

means to cause relative rotation between said stressing means and said resilient member about an axis substantially longitudinally said bifurcation.

12. A snap action mechanism comprising, a resilient member, said member being bifurcated to form a pair of spaced arms normally in the same plane, stressing means to stress said arms in opposite directions transverse to said bifurcation, mean to cause relative rotation between said stressing means and said resilient member about an axis substantially longitudinally of said bifurcation, control means operated by one of said arms, and means to adjust the stress in said arms to change the control point of said control means.

13. A snap action mechanism comprising, a resilient member, said member being bifurcated to form a pair of spaced arms normally in the same plane, stressing means to stress said arms in opposite directions thereby tending to move them to one of two positions of stability of resiliency of said member, means to cause relative rotation between said stressing means and said resilient member about an axis substantially longitudinally said bifurcation, control means operated by one of said arms, and means to adjust the stress in said arms to change the control point of said control means.

14. A snap action mechanism comprising, in combination, a member of resilient material provided with a pair of arms, a block provided with bearing recesses on opposite faces, said arms being in engagement with said recesses so as to place stress in said resilient member, means to rotate said member about an axis substantially longitudinally said arms, said rotation tending to vary the stress in said member to cause the mechanism to snap from one position to another, and means to manually adjust the stress in said arms.

15. A snap action mechanism comprising, a pair of members normally in a common plane, said members being biased for movement toward each other, means resisting said bias thereby causing said members to twist and to lie in substantially parallel different planes, and means for producing relative rotation between said bias resisting means and said members.

16. A snap action mechanism comprising, a pair of members biased toward each other, means resisting relative movement of said members toward each other for causing said members to twist, and means to rotate said members in the same angular direction about said resisting means to thereby produce a snap action.

17. A snap action mechanism comprising, a pair of members biased toward each other, means resisting relative movement of said members toward each other for causing said members to twist, and means for producing relative rotation between said first means and said members causing said members to rotate in the same angular direction to thereby produce a snap action.

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