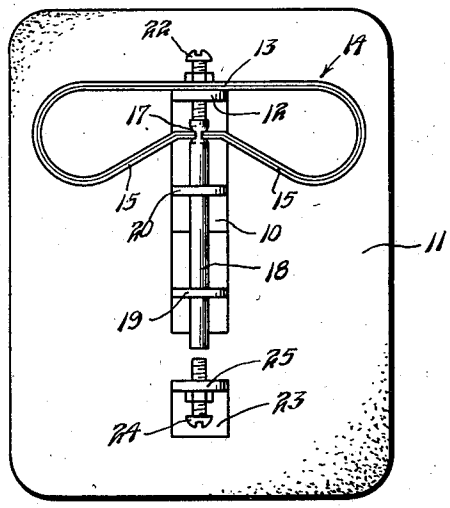
Jan. 18, 1944. H. D. MATTHEWS 2,339,501

SNAP ACTION ELEMENT

Filed Aug. 3, 1942



INVENTOR.
Howard D. Matthews
BY
George H. Fisher
Attorney

Patented Jan. 18, 1944 2,339,501

UNITED STATES PATENT OFFICE

2,339,501

SNAP ACTION ELEMENT

Howard D. Matthews, Detroit, Mich., assignor to Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., a corporation of Delaware

Application August 3, 1942, Serial No. 453,354

8 Claims. (Cl. 297—15)

This invention relates broadly to thermostatic snap action elements and is more particularly directed to a snap action element of the bimetallic thermostatic strip type.

In a great many of the prior art thermostatic snap action devices, resort is made to various types of toggle elements and spring elements for producing the snap action, and in a great many instances such toggle and spring elements add needlessly to the complication of the mechanism and also add greatly to the expense of manufacture. It is therefore the main object of the present invention to design a thermostatic snap action device which does not depend for its snap action on the operation of an external spring or toggle mechanism.

Another object of the invention is to form a bimetallic strip in such manner that the end portions thereof are bent backward upon themselves with the two extreme ends normally overlapping each other, and then to provide some means for preventing the overlapping of the two ends so that stresses are set up in the bimetallic strip.

These and other objects will readily become apparent as the following specification is read in the light of the accompanying drawing, the single figure of which illustrates one embodiment of my invention.

Referring now to the drawing, a supporting bracket 10 may be suitably fixed to an insulating panel 11, the upper portion of the bracket 10 having a forwardly extending portion 12, which suitably carries an intermediate portion 13 of the bimetallic thermostatic strip generally indicated at 14. The two end portions 15 are looped around and bent back upon themselves in such a manner that if unrestrained they would overlap each other. Instead of being unrestrained, however, they are separated and the two extreme ends are seated in oppositely disposed notches 17 in the operating member 18 which slides vertically through openings in the two forwardly extending portions 19 and 20 carried by the bracket 10. Adjustable screw 22 passes through an opening in the intermediate portion 13 of the bimetallic strip 14 and is screw threaded into the forward extension 12 to form an adjustable stop for the operating member 18.

A second bracket 23 is suitably fixed to insulating panel 11 and carries a second adjustable screw 24 which is screw threaded in a forwardly extending portion 25 on the bracket 23 to form a second adjustable stop for the operating member 18. The limits of movement of operating member 18 are thus determined by the adjustment of the two screws 22 and 24.

With the parts, in the position shown in the drawing, the two end portions 15 of the strip 14 will tend to move the operating member 18 in an upwardly direction against the adjustable screw 22 due to the fact that these end portions 15 are biased towards each other by reason of the inherent resilience of the strip and by being further forcibly separated by the operating member 18. Assuming that the active element of the bimetal is on the inside, then an increase in temperature will build up a force in the bimetal tending to cause the ends 15 to deflect downwardly. At first this force will be opposed by the aforementioned stress in the bimetal tending to hold the element 18 against the screw 22, but after a sufficient change in temperature the force in the bimetal which is due to the increase in temperature will overcome the force due to the stress in the bimetal and cause the ends 15 to start to move the operating member 18 downwardly. As soon as the member 18 starts to move downwardly the angle at which the ends 15 apply their force to the operating member 18, will be decreased and this angle, as well as the spring rate of the bimetal, is so chosen that as soon as the operating member 18 starts to move the spring rate of the bimetal will be over-compensated so that the operating member 18 will actually snap downwardly into engagement with the adjustable screw 24. Upon a subsequent decrease in temperature, the opposite operation will take place so that as the operating member 18 is raised by the bimetal the angle at which the ends 15 exert their force upon the operating member 18 is increased to again overcompensate the spring rate of the bimetal and cause the operating member 18 to snap into engagement with the adjustable screw 22.

Thus it will be seen that I have designed a thermostatic snap action mechanism utilizing a bimetallic thermostatic strip in which the snap action is due to the stresses set up within the bimetal itself but which is not of the "over center" type of snap action of the bimetal and which does not need any extraneous element such as toggle members or springs to produce the snap action. It will also be noted that the entire snap action mechanism is formed of active bimetal thus decreasing the operating differential of the device.

The specific embodiment has been disclosed for the purposes of illustration only and I intend to be limited only by the scope of the appended claims.

I claim as my invention:

1. A device of the character described comprising in combination, a bimetallic thermostatic strip having an intermediate portion and two end portions, said end portions being bent back upon themselves and located opposite each other, said end portions further being biased toward each other by reason of the inherent resilience of the strip, and movable means located between said ends and forcing them apart thereby setting up stresses in said strip, said two ends deflecting in the same direction with a snap action upon changes in temperature.

2. A device of the character described comprising in combination, a bimetallic thermostatic strip having an intermediate portion and two end portions, said end portions being bent back upon themselves in such manner that they would normally overlap each other by reason of the inherent resilience of the strip, said ends being prevented from overlapping whereby stresses are set up in said strip, said two ends deflecting in the same direction upon changes in temperature, and being so directed that upon movement of said two ends in one direction they move with a snap action through a predetermined range.

3. A device of the character described comprising in combination, a bimetallic thermostatic strip having an intermediate portion and two end portions, said end portions being bent back upon themselves and toward said intermediate portion, said end portions further being biased toward each other by reason of the inherent resilience of the strip, and movable means located between said ends and forcing them apart thereby setting up stresses in said strip, said ends acting on said movable means at such an angle as to tend to force said movable means towards said intermediate portion, a change in temperature causing said ends to deflect away from said intermediate portion, the resultant reduction in said angle causing such movement to occur with a snap action.

4. A device of the character described comprising in combination, a bimetallic thermostatic strip having an intermediate portion and two end portions, said end portions being bent back upon themselves in such manner that they would normally overlap and extend toward said intermediate portion, said ends being prevented from overlapping whereby stresses are set up in said strip causing said ends to oppose each other at such an angle that they are forced toward said intermediate portion, a change in temperature causing said ends to deflect away from said intermediate portion, the resultant reduction in said angle causing the spring rate of the bimetallic strip to be overcompensated thereby causing such movement to occur with a snap action.

5. A device of the character described comprising in combination, a bimetallic thermostatic strip having an intermediate portion and two end portions, said end portions being bent back upon themselves and toward said intermediate portion, and movable means located between said ends and forcing them apart thereby setting up stresses in said strip, said ends acting on said movable means at such an angle as to tend to force said movable means towards said intermediate portion, a change in temperature causing said ends to deflect away from said intermediate portion, the resultant reduction in said angle causing the spring rate of the bimetallic strip to be overcompensated thereby causing such movement to occur with a snap action, and adjustable means for limiting the amount of movement of said movable means.

6. A device of the character described comprising in combination, a bimetallic thermostatic strip having an intermediate portion and two end portions, said end portions being bent back upon themselves in such manner that they would normally overlap and extend toward said intermediate portion, said ends being prevented from overlapping whereby stresses are set up in said strip causing said ends to oppose each other at such an angle that they are forced toward said intermediate portion, a change in temperature causing said ends to deflect away from said intermediate portion, the resultant reduction in said angle causing the spring rate of the bimetallic strip to be overcompensated thereby causing such movement to occur with a snap action, and means for individually adjusting the amount of travel of said ends in each direction.

7. A device of the character described comprising in combination, a bimetallic thermostatic strip having an intermediate portion and two end portions, said end portions being bent back upon themselves and being biased towards each other because of the inherent resilience of the strip and being located opposite each other, and movable means located between said ends and forcing them apart thereby setting up stresses in said strip, said two ends deflecting in the same direction with a snap action upon changes in temperature, and means for guiding said movable means for straight line movement.

8. A device of the character described comprising in combination, a bimetallic thermostatic strip having an intermediate portion and two end portions, said end portions being bent back upon themselves and toward said intermediate portion, and movable means located between said ends and forcing them apart thereby setting up stresses in said strip, said ends acting on said movable means at such an angle as to tend to force said movable means towards said intermediate portion, a sufficient change in temperature to start said ends to deflect away from said intermediate portion, the resultant reduction in said angle causing the spring rate of the bimetallic strip to be overcompensated thereby causing such movement to be completed with a snap action, and means for guiding said movable means for straight line movement.

HOWARD D. MATTHEWS.