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2,819,366

THERMOSTATIC SWITCH

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FIG. 1

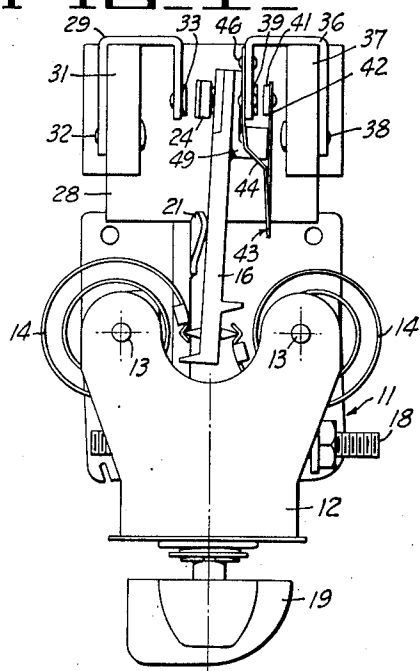


FIG. 2

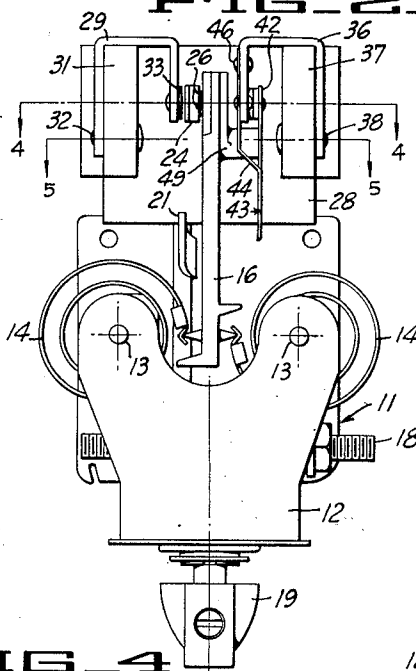


FIG. 3

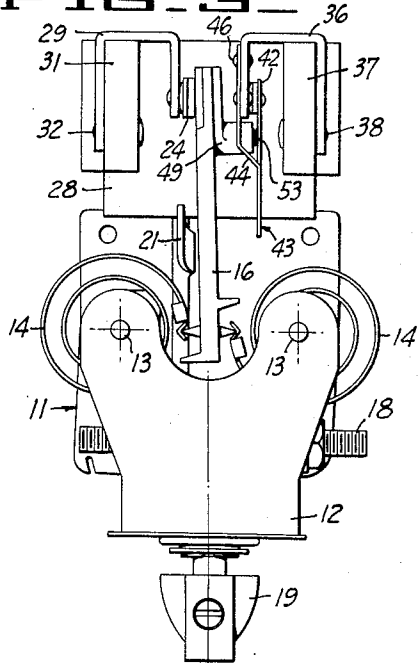


FIG. 4

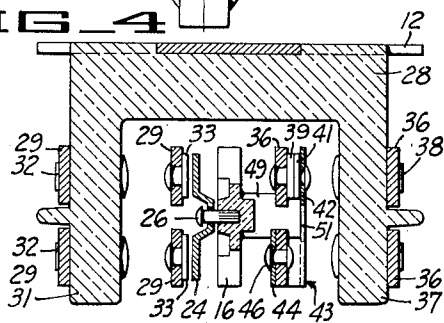
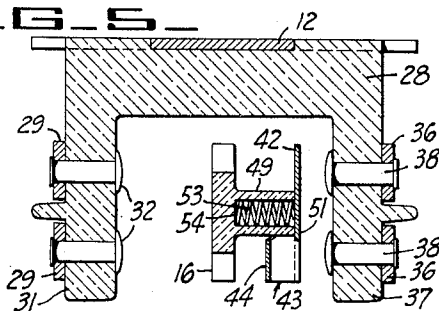


FIG. 5



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2,819,366

## THERMOSTATIC SWITCH

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4 Claims. (Cl. 200—138)

This invention relates generally to thermostatic switches and more particularly to thermostatic switches of the type utilized for controlling line voltage circuits.

In many heating applications it is desirable to control the heating equipment by a thermostatic switch connected directly in the power lines. The thermostats adapted for such service require heavier construction and heavier electrical contacts which increases the mass which must be moved when the switch is opened and closed. In addition, in such switches contact pressure must remain positive up until the moment the switch is opened to prevent excessive arcing. Such thermostatic switches have been provided with a snap action to make possible a quick make and break in order to prolong the life of the contacts and to prevent radio interference. However, it has been found that in utilizing a snap action the movable contacts have a tendency to vibrate and bounce off of the stationary contacts when the switch is moved into a closed position. This causes excessive arcing which shortens the life of the contacts. In addition, it has been found that such snap action switches are relatively insensitive and act erratically.

In general, it is an object of the present invention to provide an improved thermostatic switch of the above character which is characterized by its reliability and long life.

Another object of the invention is to provide a thermostatic switch of the above character which has greater sensitivity.

A further object of the invention is to provide a switch of the above character in which the movable contacts do not vibrate or bounce off of the stationary contacts when the switch is moved to a closed position.

A still further object of the invention is to provide a switch of the above character in which arcing of the contacts is reduced when the switch is moved to a closed position.

Additional objects and features of the invention will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawing.

Referring to the drawing:

Figure 1 is a front elevational view of a thermostatic switch embodying the present invention showing both sets of contacts in an open position.

Figure 2 is a front elevational view similar to that shown in Figure 1 showing one set of contacts in an open position and one set of contacts in a closed position.

Figure 3 is a front elevational view similar to Figures 1 and 2 but showing both sets of contacts in a closed position.

Figure 4 is a cross sectional view taken along the line 4—4 of Figure 2.

Figure 5 is a cross sectional view taken along the line 5—5 of Figure 2.

In general, the present invention consists of a thermostatic switch in which the movable contact is positively

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loaded in one direction by spring means to prevent vibration and rebound and to prevent the movable contact from hanging up on dead center.

As shown in the drawing, my improved thermostatic switch consists generally of a mounting 11 which carries electrical contacts and operating parts. In the structure illustrated, the mounting consists of a metal mounting member 12 carrying a pair of spaced posts 13. As described in my Patent No. 2,713,100 a pair of spirally wound bimetallic strips 14 have one of their ends attached to the posts 13 and have the other of their ends engaging and carrying a contact arm 16. Temperature changes cause the bimetallic strips 14 to swing the free end of contact arm 16 between two positions.

In order to afford adjustment for the switch so that the bimetallic elements 14 will operate the contact arm 16 at different temperatures, adjustment means 18 operable by the knob 19 is provided and is identical to that disclosed in my Patent No. 2,713,100. As also described in my Patent No. 2,713,100 the contact arm 16 is adapted to be engaged and operated by a lever 21 which is manually controlled by the knob 19 for a purpose hereinafter described.

A movable contact member 24 is loosely mounted on one side of the free end of contact arm 16 by suitable means such as rivet pins 26. The rivet pins 26 serve to prevent rotation of the contact member 24 relative to the arm 16, but permit limited pivotal or swinging movement between the contact member and the arm 16 about an axis at right angles to the axes of the rivet pins 26.

A U-shaped mounting block 28 of suitable insulating material is mounted on the mounting member 12. A pair of substantially U-shaped metal bars 29 are spaced apart and are fixed to the leg 31 of the mounting block 28 by rivets 32. A pair of stationary contacts 33 are mounted on the free ends of the bars 29 and are adapted to be engaged by the contact member 24 as shown in Figure 4.

A pair of substantially U-shaped bars 36 are also fixed to the leg 37 of the mounting block 28 by suitable means such as rivets 38. A stationary contact 39 is mounted on the lowermost bar 36 and is adapted to be engaged by a movable contact 41 mounted on one leg 42 of a spring-like member 43. The spring-like member 43 is provided with another leg 44 which is offset slightly from leg 42 and is secured to the uppermost bar 36 by suitable means such as rivets 46.

Suitable means is provided for operating the movable contact 41 from the contact arm 16 and can consist of a projection 49 which is mounted on the free end of the contact arm 16 on the side opposite the side on which the contact member 24 is mounted. The projection 49 is adapted to engage a portion 51 on the leg 42 so that upon movement of the contact arm 16 to the right, as viewed in Figure 1, the leg 42 will also be moved to the right to open contacts 41 and 39 for a purpose hereinafter described.

Suitable means is also provided for biasing or positively loading the contact arm 16 in one direction to prevent vibration or rebound upon movement of contact member 24 into engagement with stationary contacts 33 and to prevent the contact member from hanging up in dead center. Such means can consist of a small coil spring 53 housed within a recess 54 in the projection 49. As can be seen from Figure 5, one end of the spring engages the bottom of the recess 54 and the other end of the spring engages the portion 51 on the leg 42 to continuously urge the contact arm 16 in a direction away from the leg 42.

Operation of my thermostatic switch can now be described as follows: Let it be assumed that the thermostatic switch is in the position shown in Figure 1. As shown, contacts 39 and 41 have been locked in an open

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position by the lever 21 which has moved the free end of the contact arm 16 to the right as viewed in Figure 1. The projection 49 on the contact arm has moved the leg 42 to the right and has opened contacts 39 and 41.

When the contact arm 16 is held in the position shown in Figure 1 by the lever 21, the contact arm is unresponsive to the bimetallic elements 14 because the lever 21 serves to lock the contact arm in the extreme right position. In this position the switch is in a position which is termed the "off" position, that is, both sets of contacts are open.

When it is desired to move the thermostatic switch from the "off" position, the knob 19 is rotated in a clockwise direction, as viewed in Figures 1 and 2. Assuming that the thermostatic switch is connected to a heater, the knob 19 is rotated to a position determined by the temperature which it is desired for the switch to operate to turn off the heater, as, for example, 70° F.

Upon rotation of the knob 19 from the "off" position shown in Figure 1, the lever 21 is moved to the left as viewed in Figure 2, and the contact arm 16 is freed. As soon as the contact arm 16 is freed by the lever 21, the free end of the contact arm 16 is moved to the left, as viewed in Figure 2, by the spring-like member 43, and the contacts 39 and 41 are closed.

Assuming that the temperature is above 70° F., the contact member 24 is not moved into engagement with stationary contacts 33 by the bimetallic elements 14. The spring 53 continuously urges the free end of the contact arm 16 away from the spring-like member 43, but its force is insufficient to cause an appreciable movement of the contact arm 16 independently of the bimetallic elements 14.

Now let it be assumed that the temperature drops below 70° to cause operation of the contact arm 16, and movement of the contact member 24 into engagement with the stationary contacts 33, as shown in Figure 3. It has been found that the snap action of the contact arm 16 in closing contacts 24 and 33 causes vibration and rebound of the contact arm 16 and the contact member 24 which causes excessive arcing and damage to the contacts. The impact in closing the contacts actually causes a slight rebound of the contacts and vibration in the contact arm 16 and contacts which hampers or inhibits a proper closure between the contact member 24 and the contacts 33.

The use of the spring 53 greatly reduces or eliminates this rebound or vibration and therefore reduces the arcing during closing of contacts 24 and 33 and therefore greatly increases the life of the contacts. The spring 53 acts as a snubber and is positioned so that it is adjacent the free end of the contact arm 16 and adjacent contact member 24 to be most effective. The coil spring 53 serves to positively load or bias the contact arm 16 in one direction toward a position in which contacts 24 and 33 are closed.

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Thus, the force required to move the contact member 24 into engagement with the contacts 33 is less than required to open the contacts 24 and 33.

Since the coil spring 53 is compressed more in a closed position of the movable contacts than in an open position, there is a differential in forces which improves the sensitivity of the thermostatic switch and the reliability of the thermostatic switch because it prevents the contact arm 16 from hanging up on dead center.

It is apparent from the foregoing that I have provided an improved thermostatic switch having greater sensitivity and reliability and in which contact life is greatly increased.

I claim:

1. In a switch, a stationary contact, a movable contact, a contact arm, said movable contact being mounted on one end of said contact arm, means engaging the other end of said arm for moving the arm and the movable contact between open and closed positions relative to said stationary contact, and means engaging said arm for continuously urging said arm and movable contact towards one of said positions.

2. A switch as in claim 1 wherein said last named means includes a spring.

3. In a thermostatic switch, a contact arm, a movable contact mounted on one end of said contact arm, a stationary contact, temperature responsive means engaging the other end of said arm for moving said contact arm and said movable contact between open and closed positions relative to said stationary contact, and spring means engaging said arm for continuously urging said arm and said movable contact to a closed position, said spring means being mounted on the side of said arm opposite the side on which said movable contact is mounted and adjacent the movable contact.

4. In a thermostatic switch, a contact arm, a movable contact loosely mounted on one side of said arm adjacent one end thereof, a pair of stationary contacts, temperature responsive means engaging the other end of said arm for moving said arm and said movable contact between open and closed positions relative to said stationary contact, and spring means mounted on the side of said arm opposite said movable contact and serving to continuously urge said arm and movable contact to a closed position, said spring means being mounted in a region generally opposite the movable contact.

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