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THERMALLY CONTROLLED ELECTRIC SWITCH

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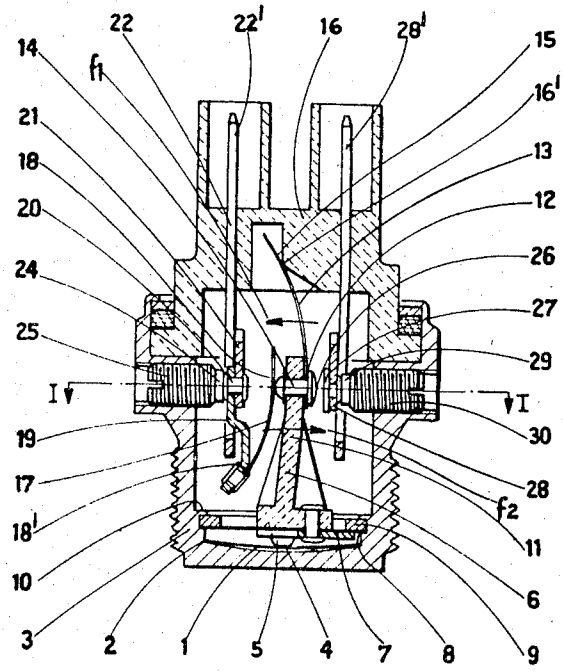


Fig. 1.

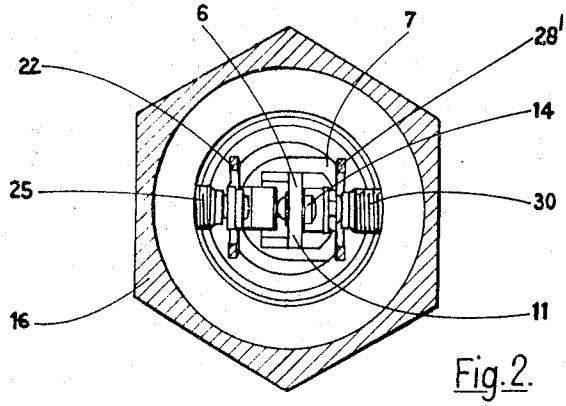


Fig. 2.

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THERMALLY CONTROLLED ELECTRIC SWITCH

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7 Claims

ABSTRACT OF THE DISCLOSURE

A thermally controlled electric switch allowing to predetermine temperature limits for the opening and closing of an electric circuit, comprising a metal housing and a movable contact under the action of a bimetallic plate and of a pair of springs, said springs controlling the movement of said movable contact.

Background of the invention

This invention relates to a thermally controlled electric switch of the type described in my Patent No. 3,221,126 for automatically opening and closing an electric circuit at predetermined temperature limits of the medium in which the thermal element of the thermally controlled electric switch is immersed, said limits being adjustable from the outside of the housing.

The electric switch according to my Patent No. 3,221,126 comprises a movable contact subjected to the opposing action of spring means and of a bimetallic curved disc-shaped plate located on the bottom of the metal housing and reversing its curvature in accordance with predetermined temperature limits of the medium in which the thermal element of the switch is immersed; this electric switch is of the character wherein the movable contact is carried by an arm of a bent lever, said arm being arranged substantially along the housing axis, whereas the other arm of the lever extends parallel to the bimetallic plate, and is restrained at one end to a stationary point, about which it can pivot under the action of said plate and said spring means, imparting to the movable contact a movement larger than the plate excursion, so as to bring it to a closing or an opening position, respectively.

I have actually found that the spring (designated at **17** in FIG. 2 of my Patent No. 3,221,126) regulating the pressure on the bimetallic plate for calibrating the electric contact closing temperature, even when choice material is used therefor, would suffer at temperature changes and after a long period of operating cycles from an alteration in its resiliency and pressure capability on the bimetallic plate, whereby also the calibration rates may be changed.

Summary of the invention

It is the principal object of the improved thermally controlled electric switch according to the present invention to remove or to minimize the above calibration changes.

It is another object of the present invention to simplify the construction and the calibration operation, thus ensuing an economical advantage.

In view of the above the improved electric switch of the present invention is essentially characterized in that said spring means consist of a pair of springs, acting in opposite directions on the movable contact, at least one of said springs being associated with opposing force calibrating means operable from the outside of the housing.

According to this arrangement the calibrated pressure on the bimetallic plate center is given by the differential pressure between the two flat springs, one of which exerting a substantially constant pressure on the bimetallic plate, greater than the pressure being required for letting the bimetallic plate release at the predetermined temperature, while the other spring exerts an opposite pressure and is adjustable from the outside so as to obtain the required resulting pressure on the bimetallic plate; thus, the usual work aging will so affect at the same time the two springs that substantially an equal resiliency reduction occurs on both springs, and the resulting pressure on the bimetallic plate is substantially invaried in time.

Brief description of the drawings

The invention will be better illustrated by the following description when considered in conjunction with the accompanying drawings, in which:

FIG. 1 is an axial sectional view of the device;

FIG. 2 is a sectional view of the device taken along line II—II of FIG. 1.

Description of the preferred embodiment

The bimetallic plate **1** rests on bottom **2** of housing **3**. Tip **5** presses on center **4** of said plate **1** and is secured to an insulating material bent lever **6** which is anchored to a resilient plate **7** pivotable at **8** and retained in position through a ring **9** by a fullering **10**, the whole substantially as described in my Patent No. 3,221,126.

The lower end **12** of the flat spring **13** is secured on the vertical arm **11** of said bent lever **6** by means of a rivet **14**.

The other end **15** of the flat spring **13** presses, with a predetermined pressure, on the corner **16'** of the closing cap **16** made of insulating material. Pressure of the flat spring **13** is transmitted in the direction of arrow *f*1 (as readily seen from FIG. 1) to bent lever **6**, pivoted at **8**, and from the latter to the bimetallic plate.

Such pressure is constant, non adjustable and greater than the pressure required for letting the bimetallic plate release at the desired temperature.

The upper end **18** of a second flat spring **17** urges against said rivet **14**, the other end **18'** of this second flat spring being secured to bracket **19**, which in turn is anchored by the rivet **20** to the resilient plate **21**, integral with plate **22**, the upper end **22'** of which acts as an electric plug.

Plate **22** is incorporated by casting-injection or other process in the insulating cap **17**.

Rivet **20** presses on the insulating cylinder **24** carried by the adjusting screw **25**. By conveniently screwing said screw **25**, a pressure is exerted on rivet **20** and hence on resilient plate **21** and bracket **19** so that the pressure of spring **17** on rivet **14** is increased in the direction of arrow *f*2. This pressure opposes that of spring **13** and, as a result, reduces the pressure of tip **5** on the bimetallic plate. It is apparent that pressure of spring **17** can then be calibrated until release of bimetallic plate is obtained at the desired temperature.

On release, head **26** of rivet **14** will contact with a sufficient pressure a small disc **27** carried by a resilient plate **28** integral with the plate **28'**, which latter acts as a second electric plug. As plate **22'**, plate **28'** is incorporated in cap **17**.

In turn, the small disc **27** is in contact with the insulating small disc **29** carried by a second adjusting screw **30**. When temperature lowers, and attains a given rate, said bimetallic plate will return to its initial position. Provision is made for the aforementioned screw **30** allowing to adjust the pressure on head **26** in order that the bimetallic plate is returned to said initial position or released at a

predetermined temperature rate, which is higher than that at which said bimetallic plate would release when not being subjected to any pressure.

Since small disc **27**, rivet **14**, spring **17** and bracket **19** are of good electrically conductive material, it is apparent that when head **26** contacts small disc **27** the circuit between plates **22'** and **28'** is closed, whereas it is broken when said elements **26** and **27** are separated from each other.

From the foregoing it is apparent that screw **25** provides calibration for bimetallic plate release when temperature increases, to close the circuit, whereas screw **30** provides calibration when temperature lowers, to open said circuit.

I claim:

1. A thermally controlled electric switch having a metal housing, a movable contact subjected to the opposing action of spring means and of a curved disc-shaped bimetallic plate located on the bottom of said housing and reversing its curvature in accordance with predetermined temperature limits of the medium in which the thermal element of the switch is immersed, the switch being of the character wherein the movable contact is carried by an arm of a bent lever, said arm being arranged substantially along the housing axis, whereas the other arm of said lever extends parallel to the bimetallic plate and is restrained at one end to a stationary point, about which it can pivot under the action of said plate and said spring means, imparting to the movable contact a movement larger than the plate excursion, so as to bring it to a closing or an opening position respectively, said spring means consisting of a pair of springs, acting in opposite directions on the movable contact, at least one of said springs being associated with opposing force calibrating means, operable from the outside of the housing.

2. A thermally controlled electric switch as claimed in claim **1**, wherein said springs are flat springs.

3. A thermally controlled electric switch as claimed in claim **2**, wherein a first flat spring is secured at one end to the end of said bent lever carrying said movable contact, and merely bears at the other end against a fixed internal abutment of the housing body.

4. A thermally controlled electric switch as claimed in claim **3**, wherein a second flat spring is secured at one end to the free end of an elastic bracket and merely bears at the other end against said movable contact carried by said bent lever, in turn said free end of the elastic bracket bearing on an adjustable stop means.

5. A thermally controlled electric switch as claimed in claim **4**, wherein the plug terminals for the external electric circuit consist of the ends of flat rods fast with the housing body and inwardly extending thereto to resiliently bear on independently adjustable stop members.

6. A thermally controlled electric switch as claimed in claim **5**, wherein one of the inner ends of said flat rods is the support for said elastic bracket, the location of which being adjusted through the respective stop member.

7. A thermally controlled electric switch as claimed in claim **6**, wherein the inner end of the other flat rod carries a fixed contact cooperating with said movable contact.

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U.S. Cl. X.R.

337—373, 389, 392