May 3, 1938. C. E. O. KRIEGSTEDT 2,116,436

THERMOSTATIC CONTROL DEVICE

Filed Dec. 18, 1936

Fig. 1.

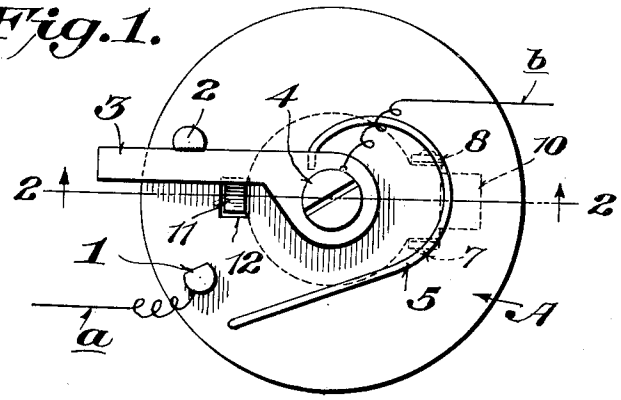


Fig. 2.

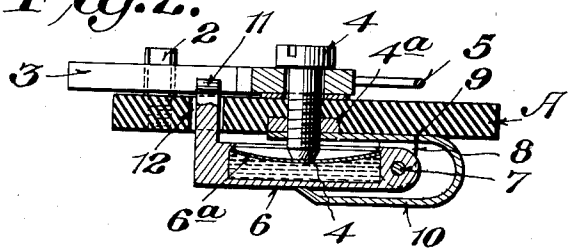


Fig. 3.

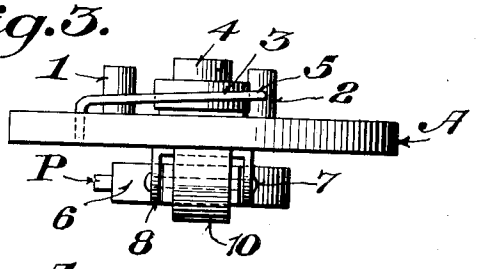
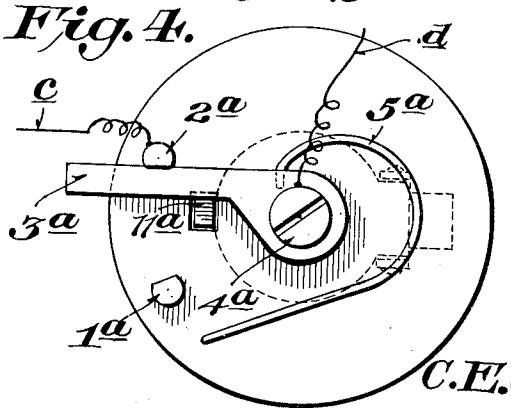


Fig. 4.



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UNITED STATES PATENT OFFICE

2,116,346

THERMOSTATIC CONTROL DEVICE

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Application December 18, 1936, Serial No. 116,616

4 Claims. (Cl. 297—3)

This invention relates to thermostatic control devices for electric switches and analogous uses.

A primary object of the invention is to provide a device that will reliably function to automatically close an open circuit upon the existence of a predetermined condition, or on the other hand break or interrupt a closed electric circuit to protect a service current line and electrical equipment in circuit therewith.

A further object of the invention is to provide a simple and compact device that may be economically manufactured and assembled and which contains relatively few parts thereby rendering the same of maximum serviceability.

With the above and other objects in view which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

A preferred and practical embodiment of the invention is shown in the accompanying drawing, in which:—

Figure 1 is a top plan view of the device embodying the present improvements.

Figure 2 is a transverse sectional view taken on the line 2—2 of Fig. 1.

Figure 3 is a side elevation of the construction shown in Figs. 1 and 2.

Figure 4 is a plan view of the device illustrating another application of the invention.

Similar reference characters designate corresponding parts throughout the several figures of the drawing.

The present invention includes in its organization a body of insulating material designated generally as A and preferably of flat disk-like formation. One face of the body is provided with stationary posts 1 and 2, the latter in all uses of the invention constituting an impact member. In the first application of the invention, the pin 2 serves as an electrical contact as will later appear for engaging with a swinging circuit-closing arm 3. This arm is preferably of metal and is pivoted to the body A by the screw or equivalent fastening 4 mounted in a nut 4a. Also, as will be observed from Fig. 1 the said arm 3 is normally biased toward the impact member 1 by a spring 5 which has one end engaging the arm at one side of its pivot while the opposite end is suitably anchored in the base.

At the side of the body opposite the arm 3 there is provided a thermally responsive element 6 which is hingedly mounted by the pin 7 in the depending ears 8 of a bracket 9. This bracket is preferably stamped to include a spring portion 10 whose free end engages the outer face of the thermal responsive element 6 to urge the same toward the disk. At a point substantially diametrically opposite from the hinge connection of the thermal element with the base, said thermal element is provided with a detent lug 11. This lug operates in an opening 12 in the base which is so located as to be traversed by the arm 3 in its movement.

The thermal responsive element 6 is preferably in the form of a casing, one wall of which is provided with an expansible diaphragm 6a, thereby providing a container for a thermally responsive fluid, such for example, as oil or the like which will expand upon the application of heat. The diaphragm 6a of the casing is formed on the side of the thermal responsive element which lies next to the body A.

Since the pivot 4 for the arm 3 is in the form of a screw fastening, it not only serves to pivotally mount the arm 3 on the base but also projects through the base so that the lower end 4b of the screw constitutes an adjustable abutment for engaging the diaphragm of the thermal responsive element 6. By turning the screw 4 it will be apparent that the thermal responsive element may be moved toward or from the face of the body on which it is mounted. Consequently, since the thermal responsive element carries the detent lug 11 which operates in the opening 12, it will be apparent that the upper end of the lug 11 will project a greater or less distance above the face of the body to which the arm 3 is pivoted according to the setting or position of the end 4a of the screw. If the upper end of the lug 11 projects its maximum distance beyond the face of the body on which the arm 3 is mounted it will be apparent that a greater degree of heat will be required to expand the thermal responsive element and thereby require a greater length of time to withdraw the lug 11 from holding engagement with the arm 3. On the other hand if the pivot 4 is adjusted so that the thermal responsive element is pushed away from the face of the body to which it is hinged, the upper end of the lug 11 will have less projection in the opening 12 and therefore when heat is applied to the thermal responsive element 6 the lug will be required to travel a relatively short distance and thus move quickly out of the path of the arm 3.

Figures 1 and 2 of the drawing illustrate the relative position of parts when the same are set to hold the arm 3 away from the stationary impact member 1. When the thermal responsive

element becomes heated the fluid expands and consequently the bulged flexible diaphragm will push the casing away from the body of the disk against the tension of the spring 10, and, in so moving will draw the lug 11 into the opening 12 to a point beneath the arm 3 thereby releasing the same to the influence of the spring 5. The arm 3 will then snap toward the stationary impact member 1.

The foregoing is an explanation of the operation of the device when it is used to automatically close a normally open circuit, and when the impact member 1 is connected to a line wire terminal *a* and the contact arm 3 is connected to a line wire terminal *b*.

When the device is to be used as an automatic line protector, that is, to automatically open the circuit in a normally closed line upon the occurrence of an overload, the arrangement shown in Fig. 4 will be used. In this case the construction will be the same as that shown in Figs. 1 and 2 but the stop pin 2^a will serve as an electrical terminal for the line wire *c* while the arm 3^a will be connected to the service line through the wire *d*. Under normal conditions, assuming that the arm 3^a is held in the position shown in Fig. 4 by the lug 11^a current will pass from line *c* through terminal 2^a hence through the arm 3^a and back into the service line through the wire *d*. However, assuming that a short or other unusual condition occurs in the line *c*—*d* the surge of current will cause the arm 3^a to heat up and this heat is quickly conducted through the shank of the pivot pin 4^a to the thermal fluid medium in the thermal responsive element 6^a, thus causing the same to expand and consequently to move the lug 11^a out of holding relation to the arm 3^a. The arm will be therefore thrust by the spring 5^a toward the pin 1^a which in this case merely serves as a stop for limiting the movement of the arm when pressed by the spring 5^a. Thus, the circuit in the line *c*—*d* will be broken and cannot be restored until manually reset. This resetting will require the depression of the lug 11^a to permit the arm 3^a to be swung back to normal position, and then the release of the lug 11^a will cause it to occupy a latching position with respect to the arm. It will of course be understood that the thermal responsive element will have had an opportunity to cool and thus contract so that the device may be manually reset.

From the foregoing it will be apparent that the present device may be used to close a normally open circuit, or, on the other hand to open a normally closed circuit by the simple expedient of making a contact out of either one of the stationary members 1 or 2.

The thermal responsive element can be simply and economically made and may be readily filled with fluid through the plug P or its equivalent in one side thereof (Fig. 3).

I claim:—

1. A thermostatic control device including an insulating body, a stationary impact receiving member on the body, an arm on one side of the body normally spring biased to the impact receiving member, a thermal responsive element hinged to the other side of the body and spring biased thereto, a pivot for mounting said arm on the body and adjustable therein to provide an adjustable abutment for the thermal responsive element, and a detent carried by the thermal responsive element for holding and releasing said arm relative to the impact receiving member.

2. A thermostatic control device including an insulating body, a stationary impact receiving member thereon, a spring biased arm movably supported on one side of the body, and a thermal responsive element hinged to the other side of the body, a detent controlled by said thermal responsive element for holding and releasing said arm relative to the impact receiving member, a spring for urging said thermal responsive element toward the body, and a pivot for holding the arm to the body, said pivot piercing the body and having one end thereof positioned for engagement by the thermal responsive element whereby adjustment of the pivot may control the movement of the thermal responsive element and the detent controlled thereby.

3. A thermostatic control device including a disc-like body having a stationary impact receiving member thereon, an arm oscillatable in a plane parallel to one face of the body and normally spring biased toward the impact member, a thermal responsive element hinged to the other side of the body for movement at substantially right angles thereto, a spring for normally urging the thermal responsive element toward the body, a detent carried by the thermal responsive element and adapted to be moved into and out of the path of said arm, and means for holding said arm to the body and also regulating the degree of travel of the detent relative to the arm through the thermal responsive element.

4. A thermostatic control device including a disc-like insulating body having a stationary impact receiving member thereon and also provided with an opening, an arm pivoted on one side of the body and normally spring biased toward the impact receiving member, a thermal responsive element hinged to the other side of the body at a point eccentric to the axis of the disc, a spring for normally urging said responsive element toward the body, a lug carried by the thermal responsive element and operating in said opening in the body to project into and out of the path of movement of said arm, and means for regulating the degree of projection of said detent lug into the path of movement of said arm.

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