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Clement et al.

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[54] **DEVICE FOR REGULATING THE CURRENT STRENGTH FOR A THERMAL RELAY**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **337/84**, 335/176, 337/57, 337/75, 337/101

[51] **Int. Cl.** **H01h 61/02**

[58] **Field of Search** 337/57, 70, 75, 78, 82, 337/84, 85, 99, 101, 150; 335/154, 176

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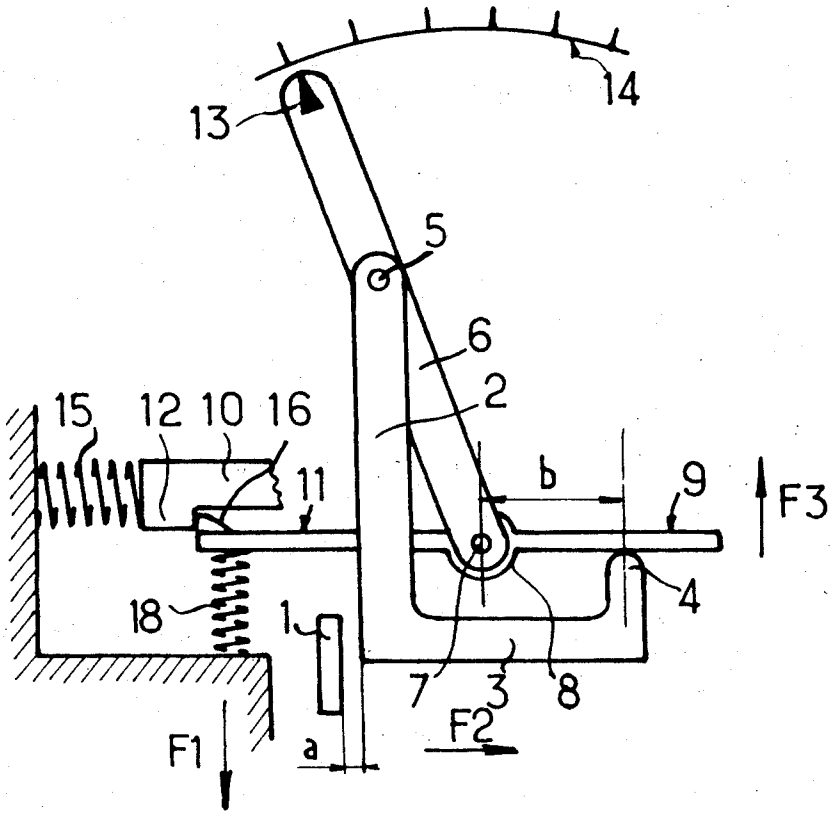
[57] **ABSTRACT**

Device for simultaneously regulating the current strength and the sensitivity of a thermal relay.

A variable-ratio transmission is established between the heat-sensitive component and the triggering component by means of a transmission lever whose point of application is mobile; applicable to thermal relays associated with contactors.

4 Claims, 4 Drawing Figures



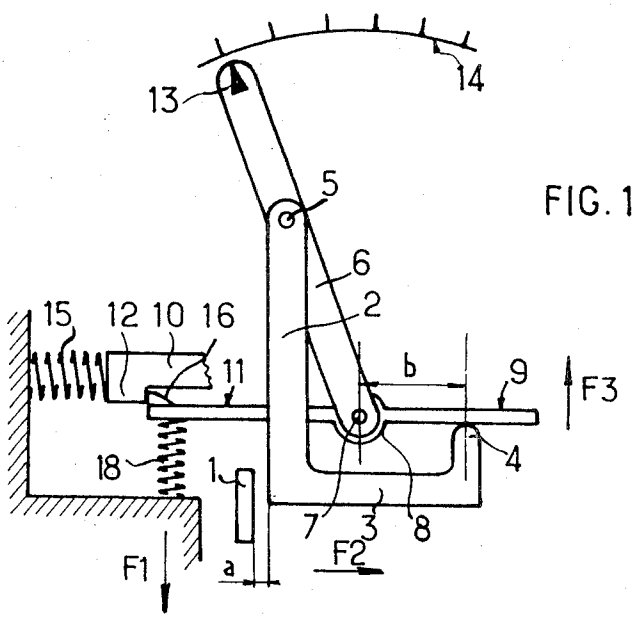


FIG. 1

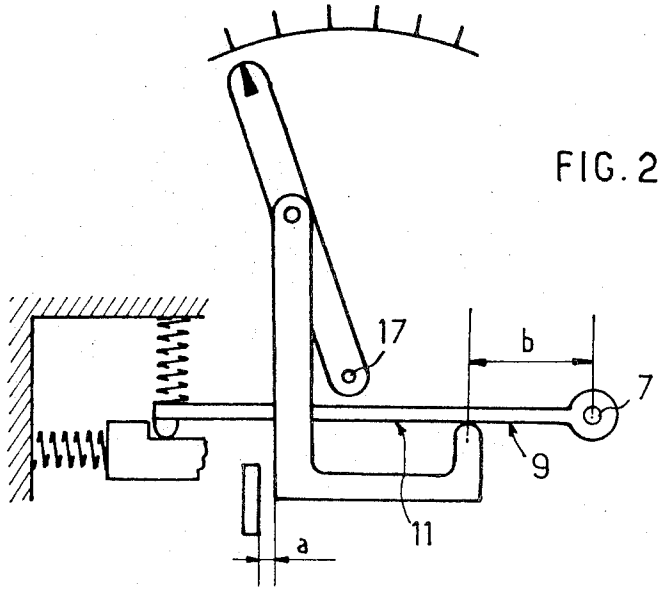


FIG. 2

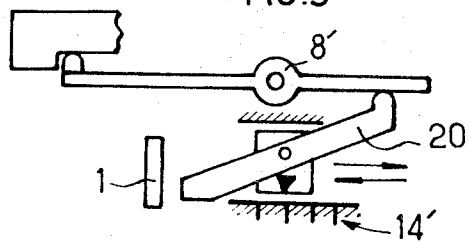


FIG. 3

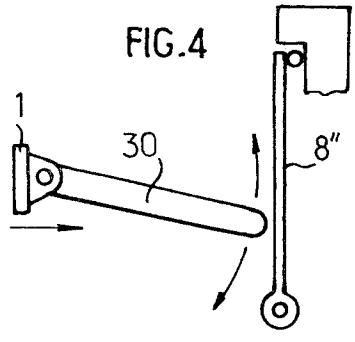


FIG. 4

DEVICE FOR REGULATING THE CURRENT STRENGTH FOR A THERMAL RELAY

The invention relates to a device for regulating the current strength for thermal relays comprising a mechanism for transmitting the movement coming from the thermoelements to the lock triggering the contacts, a regulating device making it possible to adjust the gap which separates said thermoelements from the transmission mechanism, and a two-metal compensator capable of modifying the triggering stroke as a function of the ambient temperature.

Such devices are particularly applicable to thermal relays designed to be associated with contactors in order to ensure the safe working of instruments which consume electric power from the circuit in which they are connected. A thermal relay capable of being fitted with the present device is, e.g., shown in the patent application made by the Applicant and bearing the title "Setting and Triggering device for Thermal Relay" and filed on the same day.

Already known are triggering devices conforming to the instruments mentioned above wherein the movement of a component connected to the thermoelements is in the same direction as that which is imparted to the triggering lock or to the mobile part which carries it.

The result is that altering the distance which separates these two components in no way alters the sensitivity of the instrument, so that the increase in current which is necessary to cause unlocking is the same irrespective of the current strength selected to cause the opening of the contacts.

The fact that it is impossible to adapt the sensitivity to the current strength which causes triggering may cause working defects such as untimely cut-offs, or conversely premature fatigue in the user instruments when the value of the current consumed is close to that selected for triggering.

The invention consequently proposes to provide a triggering device wherein the sensitivity is modified at the same time as the value of the triggering current strength selected.

Moreover, it provides means of making this sensitivity evolve in the same direction as, or the opposite direction to, the increase in current strength, so that according to the characteristics proper to the user instruments, it will be possible to construct triggering devices capable of meeting their needs in the best possible way.

In accordance with the invention, this result is achieved by the fact that the two-metal compensator takes the form of a triggering lever whose first arm is equipped with the lock and whose second arm is subjected to the action of a transmission mechanism whose position is altered by a regulating device which simultaneously separates the transmission mechanism from the thermoelements and moves the point of application of the movement of the transmission mechanism on the second arm.

In accordance with an advantageous embodiment of the invention, the triggering lever has two branches positioned on either side of its pivot axis and the transmission mechanism is a pivotal mobile part which moves away from or approaches the thermoelements when it is moved parallel to the lever.

A better understanding of the invention will be obtained from the following description, which is accompanied by the following figures:

FIG. 1 shows an embodiment wherein the sensitivity decreases with the triggering current strength ;

FIG. 2 shows a similar embodiment, but where the sensitivity increases with the triggering current strength ;

FIGS. 3 and 4 show two variants.

The device covered by the invention can be likened to a variable-ratio transmission positioned between a mobile component **1**, whose movements are linked to those of thermoelements (not shown), and a triggering slide **10** which will open safety contacts under the influence of a spring **15** when the lock **16** which holds it via the lip **12** moves in the direction F_1.

Referring to FIG. **1**, we see that the transmission device consists notably of a triggering lever **8** which has two arms **9** and **11** positioned on either side of an axis of rotation **7**. The lock **16** is carried by the end of the arm **11**. This lever consists in reality of a two-metal blade which can assume a certain camber as a function of the ambient temperature and consequently acts as a compensator.

The lever **6** which is the regulating component of the device comprises a pivot which, in the example of embodiment, is merged with the axis **7** on which the lever **8** is mounted.

This pivot could, however, be positioned elsewhere without the working being otherwise modified.

The free end of the regulating component **6** is equipped with a pointer **13** which is positioned opposite a scale **14**, while at a point situated between this end and the pivot axis there is a second pivot **5** on which a transmission lever **2, 3, 4** is hung.

The latter is made up of three portions, one **2** of which extends to opposite the mobile component **1**. This mobile component is as stated above, connected to the thermoelements whose deformation depends on the strength of the current which heats them. The connection in question, which is not covered by the patent, may consist of a differential detector suitable to react to a phase imbalance. The device is, however, still valid if the mobile component **1** is itself the end of a thermoelement and it will hereinafter be designated by this term.

A second portion **3** of the lever **2** carries at the end a thrust finger **4** which is in contact with the arm **9** of the compensation thermoelement **8**. The purchase of the finger **4** is situated at a distance *b* from the axis of ratation **7**.

The working of the instrument is as follows : When the temperature of the thermoelements **1** is high enough, their deformation causes a reduction of the distance *a* which separates them from the portion **2** of the transmission lever **2, 3, 4** in the direction F_2. A further increase in temperature will cause the thermoelements to bear against the portion **2** of the transmission lever which will be swung by the finger **4** against the triggering lever and cause it to pivot in the direction F_3 until such time as the lock **16** releases the slide **10.**

It is clear that the transmission ratio between the movements of the thermoelements and those of the lock will in particular be a function of the distance *b*.

If a higher triggering current strength is selected, the regulating lever **6** is subjected to rotation which will position its pointer opposite another point on the scale and cause a movement of the transmission lever in the direction F_2. The distance *a* will therefore have increased, and the point of application of the finger **4** will

also have been moved so that the length *b* of the lever will have become longer.

The result is that the movement towards F_3 of the finger **4** will have to be greater to cause the unlocking of the slide **10** and consequently the sensitivity will have been modified at the same time as the triggering current strength.

When the increase in sensitivity is required as a function of the increase in the regulating current strength, the arrangement shown in FIG. **2** will be adopted, wherein the increase of the distance *a* is reflected by a decrease in the length of the lever arm *b*. In this figure, the regulating lever has been pivoted on a pivot **17** different from the one around which the triggering lever is pivoted. It is clear that this measure could also be adopted in the example of embodiment in FIG. **1**.

The examples of embodiment described above are non-limiting examples of the invention which consists of making a transmission component simultaneously effect a variation of the distance from a thermoelement and a modification of the point of application on a lever.

In this way, it would be possible to position between thermoelements and a triggering lever **8'**, a mobile push-rod arranged in a slanting position whose lateral adjustment **14'** would simultaneously modify the distance separating one of its ends from the thermoelements, while the other end would come opposite a variable point belonging to the regulating lever, see FIG. **3**.

In this case, however, the scale would not be practicable, as it would have to move with the push-rod.

Another simplified form of embodiment of the invention would consist of putting on the mobile part **1** connected with the movement of the thermoelements, a lever **30** whose general direction would be fairly slanting in relation to the direction of movement of the mobile part and whose end would, by a rotation corresponding to the current strength adjustment, come opposite a variable point on an intermediate lever **8''** moving in the same direction, see FIG. **4**.

We claim:

1. Device for regulating the current strength for a thermal relay comprising a mechanism transmitting the movement coming from the deformation of the thermoelements to the contact-triggering lock, a regulating device making it possible to adjust the gap which separates said thermoelements from the transmission mechanism, and a two-metal compensator capable of modifying the triggering stroke as a function of ambient temperature, characterized in that the two-metal compensator takes the form of a lever **8** whose first arm **11** is fitted with a lock **16** and whose second arm **9** is subjected to the action of a transmission mechanism **2, 3** whose position is modified by a regulating device **6** which simultaneously separates the transmission mechanism **2, 3** from the thermoelements **1** and moves the point of application **4** of the movement of the transmission mechanism on the second arm **9**.

2. Device in accordance with claim **1**, characterized in that the lever **8** has two branches **11, 9** positioned on either side of its pivot axis **7** and that the transmission mechanism **2, 3, 4** is a pivotal mobile part which moves away from or approaches the thermoelements **1** when it is moved parallel to said lever **8**.

3. Device in accordance with claim **1** or **2**, characterized in that the transmission mechanism is pivoted on a nipple **5** on a lever **6** constituting the regulating device and pivoted on the same axis **7** as the two-metal compensator **8**.

4. Device in accordance with claim **1**, characterized in that the transmission mechanism consists of an orientable lever which can be moved in translation and acts as a push-rod **20–30** respectively between the thermoelements **1** and a variable point on a triggering lever **8'—8''** respectively.

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