United States Patent [19]

Cohen et al.

[11] **3,839,691**

[45] **Oct. 1, 1974**

[54] **SETTING AND TRIGGERING DEVICE FOR THERMAL RELAY**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **337/132,** 337/66, 337/72

[51] **Int. Cl.** **H01h 61/00**

[58] **Field of Search** 337/52, 49, 59, 62, 64, 337/65, 66, 67, 75, 72, 77, 73

[56] **References Cited**

UNITED STATES PATENTS

1,492,967	5/1924	Donle	337/72 X
2,053,934	9/1936	Atwood	337/49
2,952,757	9/1960	Ellenberger	337/66
3,217,125	11/1965	Brackett	337/64
3,413,583	11/1968	Clark et al.	337/66 X
3,495,203	2/1970	Neubauer	337/66 X
3,675,177	7/1972	Ellenberger	337/66

FOREIGN PATENTS OR APPLICATIONS

19,325	8/1956	Germany	337/66
708,972	8/1941	Germany	337/66
1,463,369	12/1968	Germany	337/66

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Attorney, Agent, or Firm—William Anthony Drucker

[57] **ABSTRACT**

A thermal relay designed to control the power supply circuit of a contactor, said thermal relay comprising movable contacts cooperating with stationary contacts, a triggering slide released by thermoelements for displacing the movable contacts to open the circuit in case of excessive current flow and a hand control, controlling the slide and the movable contacts for opening or closing the circuit. The slide cannot be reset in proper position for closing the circuits unless the thermoelements are cold.

2 Claims, 4 Drawing Figures

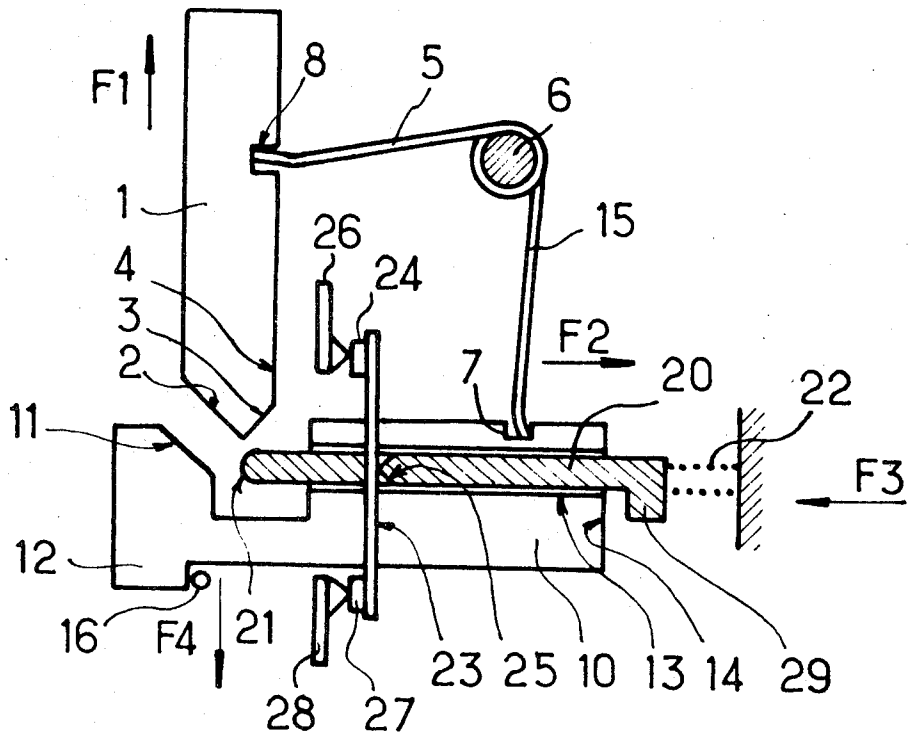
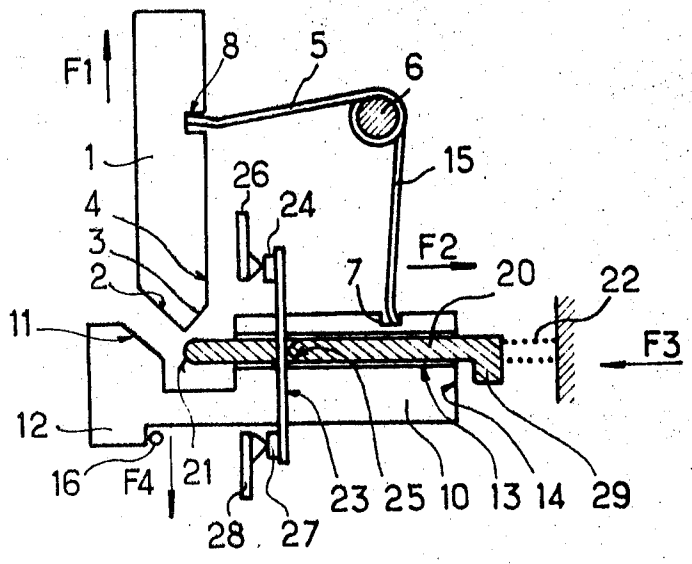


FIG. 1


F1
8
5
6
1
15
26
24
4
3
2
F2
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20
22
11
F3
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F4
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25
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28
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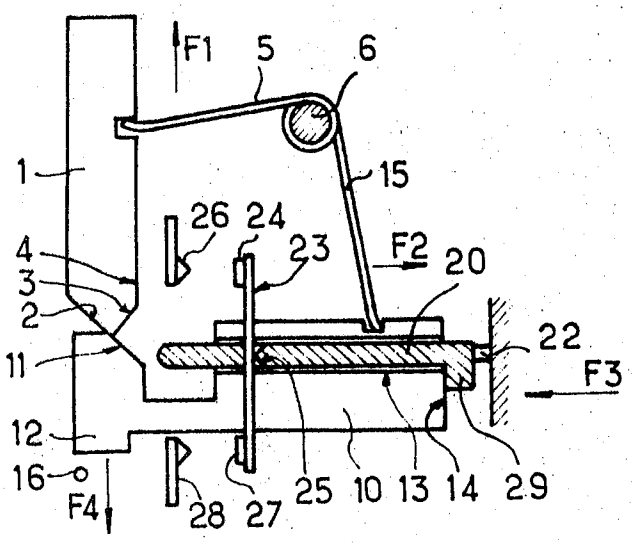
FIG. 2


F1
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F4
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FIG. 3

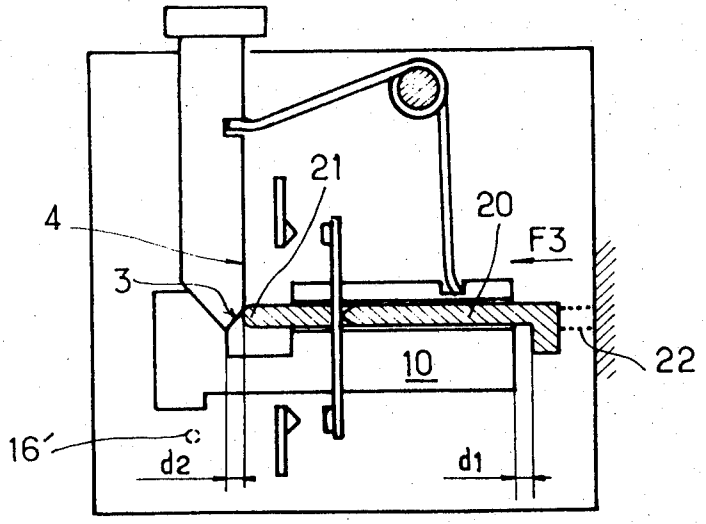
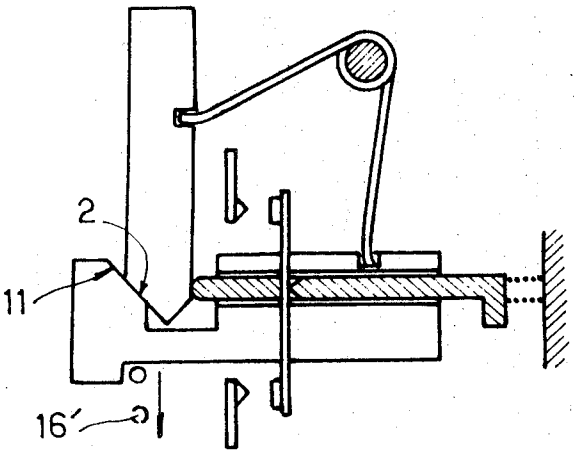


FIG. 4



SETTING AND TRIGGERING DEVICE FOR THERMAL RELAY

The invention relates to a thermal relay designed to cut off the feed to a contactor, comprising a set of mobile contacts which may be made to open either by the intervention of a triggering device released when thermoelements are traversed by too strong a current or by means of a manual control, which moreover serves to re-set the triggering device.

Such thermal relays are in particular used to protect polyphase instruments fed by a contactor, in case of overloading or unbalanced phases.

In this type of thermal relay, it is important to make it impossible for the contacts to close and the triggering mechanism to be re-set so long as the thermal conditions of the thermoelements, which translate the thermal state of the instrument consuming current, have not returned to a normal value, failing which manual pressure on the re-set button would aggravate the conditions which have led to the cut-off.

Already known are thermal relays of the type mentioned above, for example in U.S. Pat. No. 3,193,647 of Beaudoin et al., wherein the fixed contacts can be moved when the strength of the current consumed by an instrument exceeds a pre-selected value. One of the disadvantages of this type of instrument is that the fixed contacts have to be connected by means of braided wires to the connecting terminals to allow them to move. Another disadvantage is due to the fact that the mobile equipment which will cause the fixed contacts to move is permanently on load when the contacts are closed, which reduces the instrument's sensitivity.

The invention consequently proposed to provide a triggering and resetting system wherein the mobile contacts can only resume their closed position against absolutely fixed contacts when the triggering device has returned to a stable position corresponding to a satisfactory thermal condition.

In accordance with the invention, this result is achieved by the fact that operation of the manual setting component produces, on the one hand, the cooperation of a first part connected thereto to cause the mobile contacts to move away, and on the other hand, the cooperation of a second part connected thereto to move a triggering slide to a position where it can be retained by a lock connected to the thermoelements, while the release of the manual setting component ensures that the contacts are kept in an open position for a travel exceeding that which is necessary for said slide to connect with the lock and also exceeding that which is necessary for said slide, in case of non-locking, to cause a further withdrawal of the contacts.

In accordance with an advantageous embodiment of the invention, the mobile contacts are positioned on a contact-holder one heel of which can be moved by a bearing surface of the slide towards a first resilient component which tends to apply it to the fixed contacts and one end of which cooperates with a first inclined plane, constituting the first part, and situated at the end of the setting component, while a second inclined plane of the latter, constituting the second part, cooperates with the slide to allow the movement of the bearing surface towards the heel when the manual setting component is released, under the influence of a second resilient part **15** whose strength exceeds that of the first resilient part.

A better understanding of the invention will be obtained from the description which represents a non-limiting example of embodiment of the invention, and the figures which provide the following illustrations:

FIG. **1** shows the thermal relay in its working position;

FIG. **2** shows the same instrument in its "at rest" position;

FIGS. **3** and **4** show two successive stages of the setting procedure.

In FIG. **1**, the thermal relay is in the working position, i.e., the setting component **1** is at rest, the mobile contacts **24, 27** carried by a bridge **23** are applied to the fixed contacts **26, 28** by a resilient part represented by the spring **22** and the triggering device represented by the slide **10** is hooked by its lip **12** on to the lock **16** whose position corresponds to thermoelements in a cold state.

The setting component **1** is normally recalled in the direction of the arrow F_1 by a spring **5** whose end hooks into the housing **8** while the slide is subjected to the action of a spring **15** which tends to move it in the direction of the arrow F_2.

In the embodiment illustrated in the figures, the springs **5** and **15** are in fact the ends of the same torsional spring mounted on a cylindrical support **6.**

The figure shows that the contact bridge **23** is placed in a housing **25** formed in a contact-holder **20** with a rounded end **21** and a heel **29.** This contact-holder is subjected to the action of the spring **22** to effect a movement in direction F_3 when the heel **29** or the end **21** are not in contact with an obstacle.

The movement in question is guided by a groove **13** made in the triggering slide **10** and can take place freely so long as the heel **29** is not applied against the bearing surface **14** of the slide.

As the latter is mobile in the direction of the arrow F_2, it can therefore carry the contact-holder **20** along with it under the effect of the spring **15** which exerts, through the housing **7,** a thrust exceeding that which is developed by the spring **22.**

The slide also has a surface **11** which is inclined in relation to the direction of movement F_3 and consequently, also inclined in relation to the direction F_1 which is perpendicular to F_3.

The setting component **1** is positioned in such a way that a first part belonging thereto, represented by the inclined plane **3** and the bearing surface **4,** can cooperate with the end **21** of the contact-holder when the device is actuated in the direction of the arrow F_4, while a second part represented by the inclined plane **2** can cooperate with the inclined surface **11** belonging to the slide **10,** in the same movement.

The position in which the various components are, shows that the triggering of the setting component **1** towards F_4 will cause the slide to recoil slightly in the direction F_3 and the contact-holder to make a larger recoil movement in the direction F_2, separating the fixed and mobile contacts as shown in FIG. **4.**

The setting component, which subsequently, when the electroelements are cold, only acts as a switch, will be used in this way when it is wished to de-excite the contactor whose coil feed circuit is in series with the contacts **26, 24, 27, 28.**

When the strength of the current consumed by an instrument fed by means of the contactor is going to become too high, the thermoelements will change shape

to move the lock **16** in the direction F_4 and consequently move the slide **10** in the direction F_2 under the action of the spring **15,** bringing about the opening of the contacts due to the thrust of **14** on the heel **29** and the placing of the various components in the "at rest" position shown in FIG. **2.**

Besides the triggering function which has just been accomplished, the thermal relay also has to ensure that the closing of the contacts can only occur when the thermal conditions of the thermoelements, which translate the thermal condition of the consuming instrument, have resumed their normal state. Any operation of the setting component must therefore have no effect on the contacts so long as the slide **10** cannot be retained, held by the lock **16.**

FIGS. **3** and **4** show successive stages of a procedure for re-setting the contacts.

When, from the "at rest" position shown in FIG. **2,** the setting component is moved in the direction F_4, the situation shown in FIG. **3** will first of all arise, which corresponds to a movement of the slide **10** in the direction F_3, and decompression of the spring **22** due to a slight movement of the contact-holder **20** in the same direction.

Further movement of this part is now prevented by the cooperation of the inclined plane **3** then the surface **4** with its end **21**; the result is that the contacts cannot close during the setting procedure and the gap d_1 will continue to increase. However, the movement of the slide is insufficient for the lip **12** to arrive opposite the lock **16.**

In FIG. **4,** the movement of the slide has become sufficient for the lock **16** to be able to grip the lip **12** when the thermoelements are cool. If, however, the lock has remained in the position corresponding to hot thermoelements indicated by **16'**, the contacts, which can only close when the setting component is released in direction F_1, will be prevented from closing since the movement d_2 necessary for such closing is greater than the distance d_1 which separates the heel **29** from the slide and this distance continues to decrease as and when the setting component **1** moves towards the top of the figure.

In other words, the upward travel of the button which is to allow the contact-holder to move to the closed position, is greater than that which is necessary for the slide to apply a further recoil to the contact-holder in the direction F_2; this travel also exceeds that which is necessary for the slide to remain hooked on the lock, failing which the contacts could not close.

The example of embodiment shown in the figure is in no way limitative, as the contact-holder and the slide could be arranged so as to be guided separately. The nature of their movements could also be modified and become circular. Similarly, the parts of the setting component cooperating with the slide and with the contact-holder can be associated with intermediary components to change the direction of movement.

We claim:

1. A thermal relay comprising:

a. a movable contact holder (**20**) including a stud (**29**) and a thrust surface (**21**), and provided with mobile contacts (**24,27**), which cooperate with fixed contacts (**26,28**) when the contact holder is subjected to the action of a first resilient element (**22**);

b. a lock (**16**) connected to a thermosensitive element carrying electric current;

c. a slide (**10**) having a hook (**12**) and a bearing (**14**), which is operable in either a first position in which the hook (**12**) is applied, through the force of a second resilient element (**15**) against the lock (**16**) and in which the bearing (**14**) is located a distance from the stud (**29**); or in a second position in which the hook is no longer applied against the lock owing to deformation of the thermosensitive elements and in which the bearing (**14**) forces the stud (**29**) of the contact holder (**20**) against said first resilient element (**22**), said slide also having a ramp (**11**) inclined in relation to the direction of movement of the slide; and

d. a manual operating device (**1**) including a first ramp (**2**) which when actuated cooperates with the ramp (**11**) to move the slide into a first position and a second ramp (**3**) which cooperates with the thrust surface (**21**) to move the contact holder and separate the fixed and mobile contacts (**26, 28** and **24, 27**).

2. In a thermal relay according to claim **1,** the improvement in which: the first and second ramps of the manual operating device (**1**) include surfaces (**3,4**) inclined in opposite directions located between the ramp (**11**) and the thrust surface (**21**) to cause oppositely directed movements of the slide (**10**) in relation to the contact holder (**20**), the latter being guided in a groove (**13**) of the slide (**10**).

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