Jan. 12, 1926. 1,569,803

B. E. GETCHELL

RELAY

Filed July 10, 1922 2 Sheets-Sheet 1

Fig. 1.

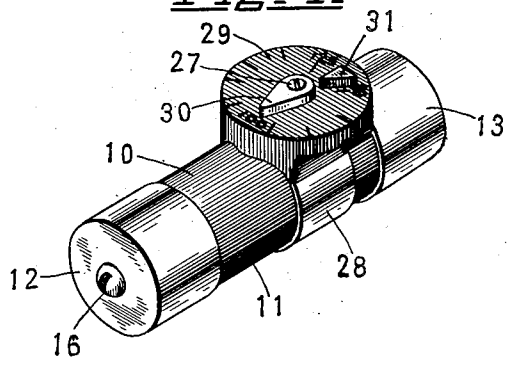

Fig. 3.

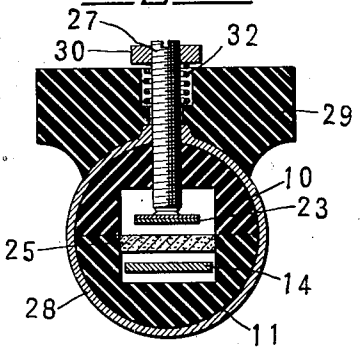

Fig. 4.

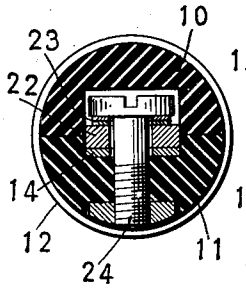

Fig. 2.

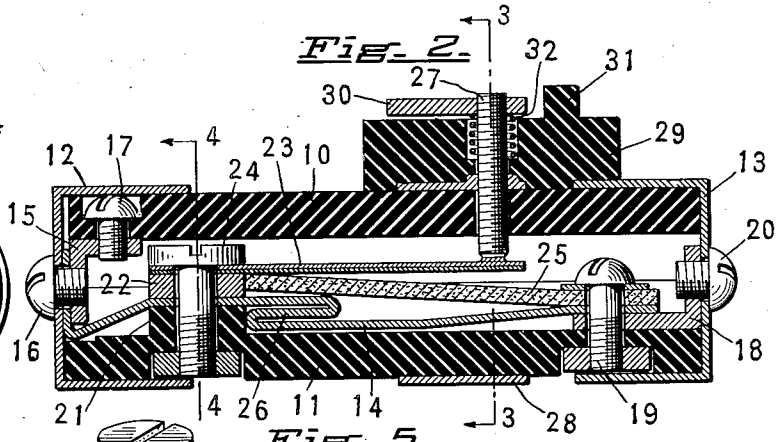

Fig. 5.

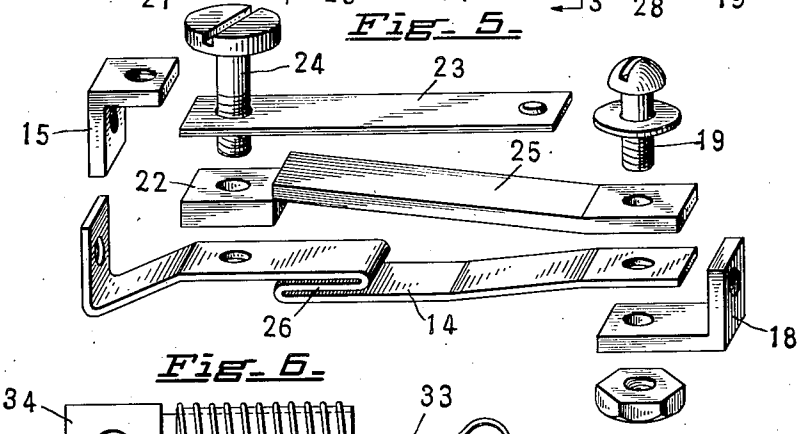

Fig. 6.

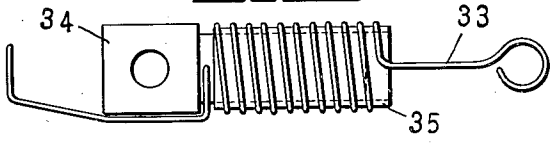

Fig. 7.

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Jan. 12, 1926. 1,569,803

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RELAY

Filed July 10, 1922 2 Sheets-Sheet 2

Fig. 8.

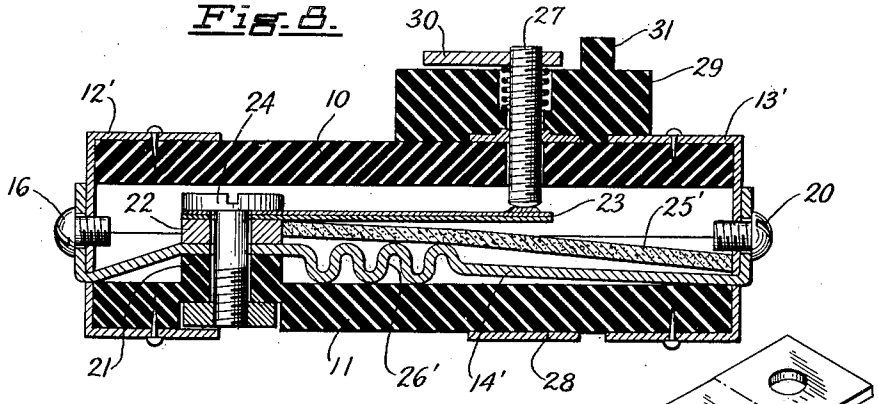


Fig. 9.

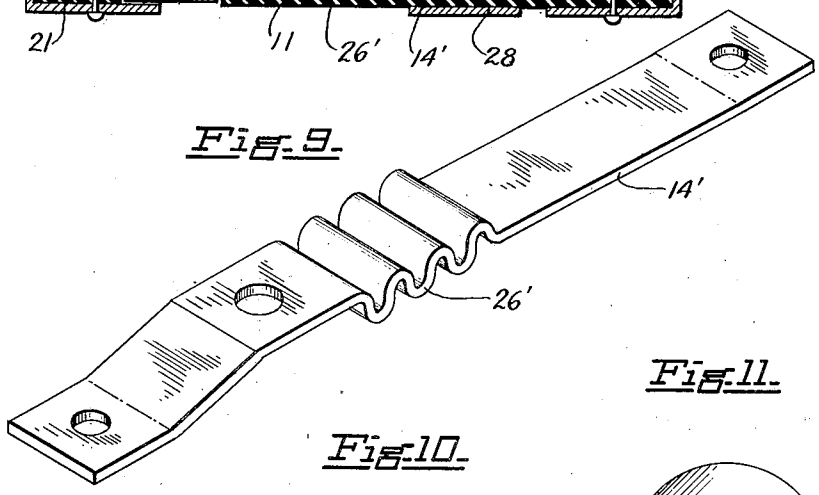
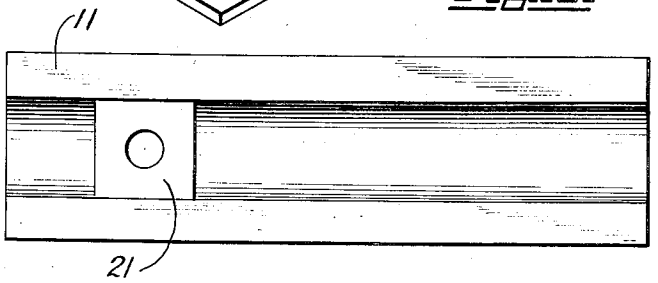


Fig. 11.

Fig. 10.



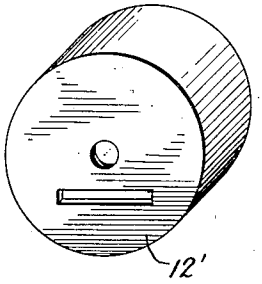
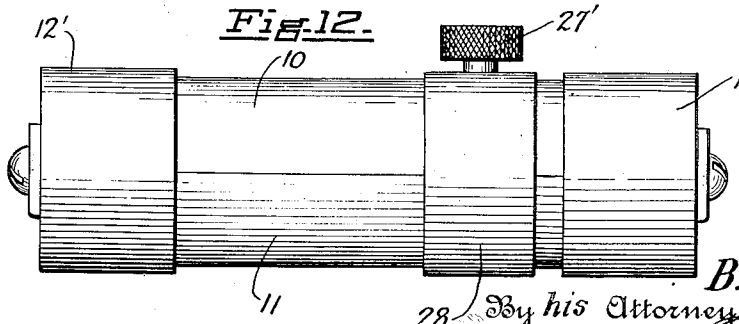


Fig. 12.



Inventor

B.E. Getchell,

By his Attorney

Patented Jan. 12, 1926. 1,569,803

UNITED STATES PATENT OFFICE.

BENJAMIN E. GETCHELL, OF PLAINVILLE, CONNECTICUT, ASSIGNOR TO THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, OF PLAINVILLE, CONNECTICUT, A CORPORATION OF CONNECTICUT.

RELAY.

Application filed July 10, 1922. Serial No. 573,965.

To all whom it may concern:

Be it known that I, BENJAMIN E. GETCHELL, a citizen of the United States of America, residing at Plainville, Hartford County, Connecticut, have invented a new and useful Relay, of which the following is a specification.

My invention relates particularly to an overload relay or automatic circuit breaker intended for use with motor starting switches. A motor will stand a certain amount of overload for a limited period of time, and when that limit has been reached it is necessary to open the circuit to avoid injury to the motor from excessive heat. I have therefore sought to design a device which may be economically manufactured according to standard specifications and which will automatically open a circuit in case an overload persists for a given period of time, which period is within the safe limits of the apparatus.

Another object is to facilitate the adjustment of such a device so that the percentage of permissible overload may be varied.

Another object of the invention is to provide means in a standardized device for varying the time factor of the relay.

Another object is to construct a device of the character described in such a way that the parts may be readily assembled or separated for the purpose of manufacture and repair.

In its preferred form, the invention contemplates the use of a heater element in the main circuit and a thermostatic element and adjustable contact in an auxiliary circuit. These elements are electrically connected through the medium of a heat transmitting member, the size and material of which determines the time required for the heating of the thermostatic element. By adjusting the contact the delayed action of the thermostatic cutout may be controlled.

Figure 1 is a perspective view of one form of device embodying the improvements of my invention.

Fig. 2 is a longitudinal sectional view of the same on an enlarged scale.

Fig. 3 is a transverse sectional view on the plane of the line 3—3 of Fig. 2.

Fig. 4 is a transverse sectional view on the plane of the line 4—4 of Fig. 2.

Fig. 5 is a perspective view of the interior parts separated.

Figs. 6 and 7 are detail views of a modified form of heater element.

Fig. 8 is a sectional view of the preferred form of device.

Fig. 9 is a perspective view of the heater element of Fig. 8.

Fig. 10 is a plan view of the lower half of the casing.

Fig. 11 is a perspective view of an end cap.

Fig. 12 is a side view of a relay with an adjustable knob.

In the form shown in Figs. 1 to 4 the body of the device is formed of two parts 10 and 11 which are grooved longitudinally so as to form a container, and these parts are preferably of insulating material and held together by the metallic end members or caps 12 and 13. The heater element such as 14 (and 14′ Figs. 8 and 9) is formed of resistance metal, the size and resistance of which is selected to afford the proper heating effect at the load the unit is intended to carry. One end of the heater strip may be bent up so as to fit between an angular support 15 and the end of the cap to which it is detachably secured by the screw 16. The screw 17 may serve to secure the support to the body or casing. The other end of the heater strip may be secured to an angular support 18 by means of a screw or bolt 19 which also secures the angular support to the casing. The screw 20 may serve to connect the end cap 13 to the support and thus to the casing. The heater strip extends longitudinally of the casing and one part of it rests on the boss 21. The ends of the heater strip 14′ may be passed through slots in the end caps 12′ and 13′ and secured by the screws 16 and 20 as shown in Fig. 8. The caps may be held to the casing by tacks or pins. The heat conducting and transmitting member 22 may be formed for instance of copper in contact with the heater strip above the boss 21. The thermostatic element 23 is formed for instance of a bimetallic combination commonly used for thermostatic elements. One end of this thermostatic strip is secured to the copper spacer 22 by means of a screw or bolt 24. An asbestos insulat-

ing strip 25 or 25′ is preferably interposed between part of the heater strip and part of the thermostatic strip so that the heating effect will be concentrated at the stationary end of the thermostatic element. To further concentrate the heating effect I prefer to crimp fold or double the heater strip upon itself as at 26 or 26′ adjacent the heat transmitter 22. This also prevents the expansion and contraction of the heater element from acting mechanically against the screw 24 which might otherwise be displaced and vary the position of the thermostatic strip 23.

The adjustable contact screws 27 (and 27′ Fig. 12) pass through a ring or collar 28 which surrounds the casing between the end caps 12 and 13 and serves as an external electrical terminal. The insulating disc or turret 29 is preferably provided with a graduated dial, and the end of the adjustable contact screw 27 is provided with an indicating pointer 30. The turret is provided with a stop 31 to limit the swinging movement of the pointer. A spring 32 preferably surrounds the screw 27 beneath the pointer 30 and may be housed in the outer face of the turret 29. This spring holds the turret or dial down against the casing or body of the unit and also puts a tension on the adjusting screw. 27 through the medium of the pointer 30 so as to provide frictional resistance to prevent the pointer and screw from changing their position by vibration.

I have found that the heater element 14 may be made of strip material for relays having a capacity of 5 amperes and greater. Below this size I have found it more convenient to form the heater element as shown in Figs. 6 and 7. In this case the resistance wire 33 is connected to a strip 34. Part of the wire is wound around an insulating strip 35 on the end of the strip 34, and the opposite ends of the wire are shaped so that they may be connected to the supports 15 and 18 in the same way that the ends of the heater strip 14 are secured. The strip 34 is adapted to be mounted on the boss 21 and to be engaged by the copper transmitting member 22.

With a device constructed as herein described it is possible to adjust the elements so as to permit a 600% overload for a few seconds, a 400% overload for thirty seconds, and a 200% overload for nearly two minutes, and 125% overload for six or eight minutes. By substituting a different size of copper block 22, or by making the block of other material the fundamental time lag of the device may be designed to suit the particular conditions for which the relay is to be used. The heat generated in the heater element 14 is proportional to the current flowing. The direct heat from the principal part of the heater element is shielded from the movable part of the thermostatic element by the asbestos strip 25. The bending of the thermostatic strip is therefore substantially proportional to the current flowing through the heater strip and conducted through the spacer block 22. The exact point to which the contact between the movable end of the strip 23 and the screw 27 will be broken may be varied by adjusting the screw 27. The scale of the dial may be marked with divisions indicating from 80% to 125% of the load. In initial adjustment of the device the contact screw is adjusted for the rated capacity of the relay. The pointer is then turned on the screw and set at 100 and then soldered in place on the screw. If the pointer is now moved from 100 toward 80 on the dial the screw will be backed out or unscrewed slightly thus lessening the amount of heat or current necessary to separate the end of the thermostatic strip from the end of the screw. If the pointer is moved toward 125 on the scale it will then be necessary to increase the heat or current in order to open the circuit.

The device is so constructed that it may be mounted in clips like an ordinary cartridge type fuse.

Although I have referred to the construction as particularly adapted for use with motor starting switches, it should be understood that I do not consider the invention in its broader aspect to be limited in use with any particular combination.

I claim:

1. An electric relay comprising an insulating housing, a heater element mounted therein, a thermostatic element, a time lag element thermally and electrically connecting said thermostatic element with said heater element, an adjustable contact screw co-acting with said thermostatic element, and end caps to which the terminals of the heater element are secured.

2. In an electric relay, an insulating housing, a heater element mounted therein, a thermostatic element, a time lag element interposed between said heater element and said thermostatic element, external connections to said heater element and a contact for said thermostatic element.

3. In an electric relay, an insulating housing, a heater element mounted therein, a thermostatic element detachably connected to said heater element at one end, a non-conducting shield detachably mounted between all of the remaining parts of said heater element, and said thermostatic element, and a contact normally engaging the movable end of said thermostatic element.

4. In an electric relay, an insulating housing, a thermostatic strip therein, a heater element having a crimped portion for con-

centrating the heat of said element on one end of said thermostatic strip and an adjustable contact for the other end of said thermostatic strip.

5. In an electric relay, a housing, a heater element, a thermostatic element connected thereto in said housing, an encircling band, an adjustable contact screw therein co-acting with said thermostatic element and extending outside of said housing, a detachable turret surrounding a part of said screw, a pointer secured to said screw, and a spring interposed between said pointer and said turret.

6. An insulating housing, end caps therefor, a heater strip having its ends connected to said end caps, a thermostatic strip, means for connecting one end of said thermostatic strip to said heater strip and securing both of said strips to said housing, a contact for the other end of said thermostatic strip, said heater strip being constructed to concentrate its heat adjacent the connected portions of said strips, and a thermal insulating member interposed between the movable end of said thermostatic strip and said heater strip.

7. In an electric relay, an insulating housing having a groove, a heater element mounted therein, a thermostatic element electrically connected to said heater element at one end, a non-conducting shield closing the space between said heater element and the movable end of said thermostatic element, and a contact normally engaging the movable end of said thermostatic element.

8. In an electric relay, an insulating housing formed in two parts, a heater strip mounted within said housing, a thermostatic strip mounted within said housing, means for securing said strips to one of said parts, an adjustable contact screw co-acting with said thermostatic strip, and means for securing said parts together including a band forming a connection for said screw and constituting an external electric terminal.

9. An electric relay comprising an insulating housing, a heater element mounted therein, a thermostatic element, means for thermally and electrically connecting said elements including a removable spacer, an adjustable contact screw co-acting with said thermostatic element, and an external indicating pointer for said screw.

10. In an electric relay, an insulating housing, a heater element mounted therein, a thermostatic element, a removable time lag element interposed between said heater element and said thermostatic element, and external connections to said heater element and said thermostatic element.

11. In an electric relay, a housing, a heater element, a thermostatic element connected thereto in said housing, an adjustable contact screw co-acting with said thermostatic element and extending outside of said housing, a turret surrounding a part of said screw, a pointer secured to said screw, and a spring interposed between said pointer and said turret.

12. In an electric relay, an insulating housing, a heater element mounted therein, a thermostatic element, a time lag element interposed between said thermostatic element and said heater element, and a screw for securing all of said elements to said housing.

13. In an electric relay, an insulating housing having an interior boss, a heater strip supported on said boss, a thermostatic strip, a time lag element interposed between said thermostatic strip and said heater strip, and a screw passing through said strips and securing them to said boss.

14. In an electric relay, an insulating housing, a heater strip mounted therein and having a crimped portion, a thermostatic strip thermally and electrically connected adjacent said crimped portion, and an insulating shield between the crimped portion of said heater strip and a part of said thermostatic strip.

15. In an electric relay, an insulating housing formed in two parts, a heater strip and a thermostatic strip connected to one of said parts, a contact screw connected to the other part, end caps, and an intermediate band holding said parts together.

BENJAMIN E. GETCHELL.