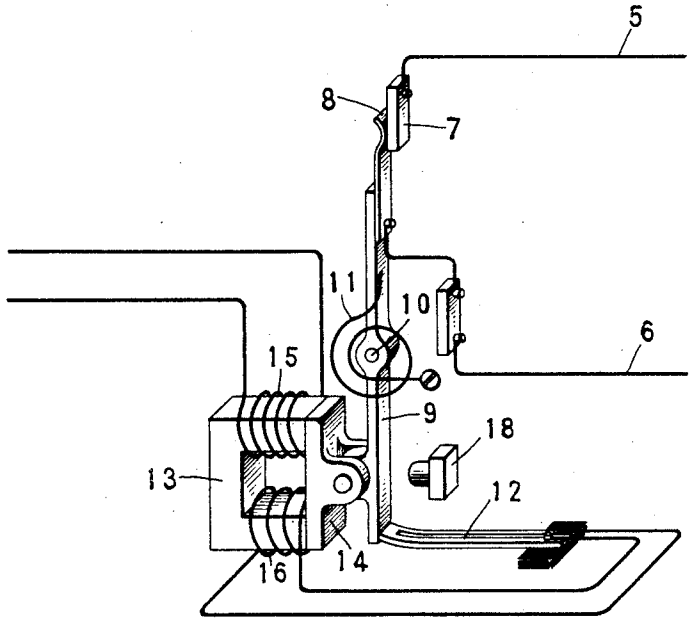
July 30, 1929. B. E. GETCHELL 1,722,741

TIME DELAY UNDER VOLTAGE RELEASE

Filed July 3, 1926

Fig. 1.



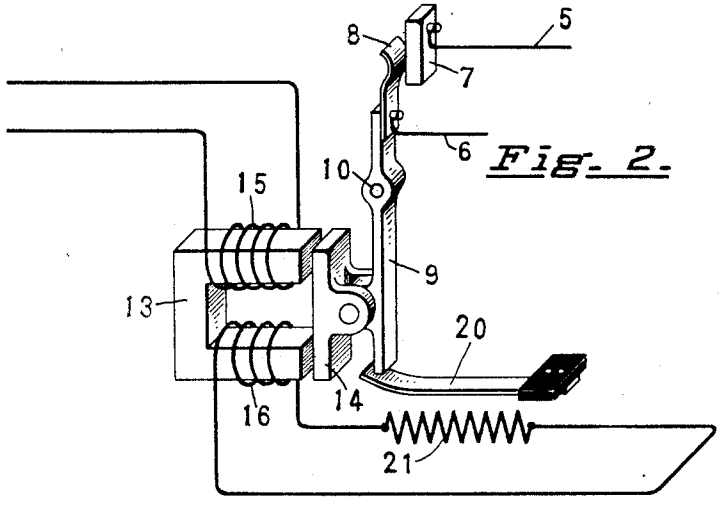


Fig. 2.

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TIME DELAY UNDER-VOLTAGE RELEASE.

Application filed July 3, 1926. Serial No. 120,309.

The object of the invention is to provide a means for preventing the instantaneous tripping or opening of a switch in the event of an under voltage period in the circuit or, in other words, to compel a pre-determined interval of time between the releasing of the switch by the usual under voltage coils and the opening movement of the switch. In many instances the under voltage period is very brief but in former constructions of this class the switch would fly open, no matter how brief the under voltage period might be and thus cause interruptions in the service and, further, require the services of someone familiar with the electric system to again close the switch.

Obviously these temporary interruptions are vexatious as well as costly and the aim of this invention is to provide a switch that will open on under voltage conditions in a manner that meets all the requirements of safety but which will have a time lag or a predetermined delay which will prevent the opening of the switch until the under-voltage period has exceeded a predetermined interval of time.

The invention may be adapted to any form of switch having a movable contact carrier. The invention broadly consists in interposing a thermostatic latch in the path of the movable switch member in such a manner that the latch will move into the opening path of the member on ordinary circuit conditions and will remain in that position as long as the voltage of the circuit remains normal and for a predetermined period afterward, but, as soon as the voltage drops below a predetermined value, the latch in cooling will move slowly in the opposite direction out of the path of the movable member and thus release the switch. This thermostatic latch is governed by the voltage of the circuit. This is accomplished by a secondary winding in inductive relation to the under-voltage release magnet. This secondary winding is connected in such a manner that the current induced therein will heat the thermostatic latch either by directly passing this current through the thermostatic latch or indirectly by passing the current through a heater coil adjacent thereto.

Obviously the current supplied by this secondary coil is dependent on and proportional to the voltage of the main circuit. The operation is governed by the voltage of the main circuit and there are no relay circuits in which electrical contacts are used.

Ordinarily the switch would be provided with either an opening spring or an equivalent therefor. The bi-metallic thermostatic metal of which the latch is made, is now produced commercially in such standard and uniform thicknesses and grades that it is comparatively a simple matter to construct switches of this class which will operate at an approximately exact predetermined point.

A feature of great importance, is that the thermostatic latch is operated by a secondary circuit which is arranged in inductive relation to the main circuit but which has no other connection with the main circuit or switch terminals. This secondary circuit is connected, directly or indirectly, with the thermostatic latch and remains operative just as long as the circuit of the U. V. R. coils is closed and up to normal voltage.

Fig. 1 is a diagrammatic view of one form of apparatus embodying my invention, showing the main circuit controlling switch in the running or closed circuit position.

Fig. 2 shows diagrammatically a somewhat modified arrangement in the open circuit position.

The main line, having branches or conductors 5 and 6, is provided with any suitable form of switch including a stationary contact 7 and a movable contact 8. The movable contact may consist of a lever or arm 9 pivoted at 10. This arm is provided with any suitable means tending to move it to the open circuit position of the switch. Such means may be provided by gravity or by means of a spring device 11 of any suitable type.

The latch member 12 is preferably bimetallic so that a change in temperature will cause the free end of it to bend. This member is anchored at one end and the free end is located near the arm 9 so that normally when the parts are in the running position, the switch arm 9 is held in the position shown in Fig. 1 by the latch member.

The under voltage release-magnet is provided with a frame or core 13 which is stationary and has an armature 14 which is connected to the switch arm 9. The core of the magnet is preferably U shaped and is provided with two coils or windings 15 and 16, which constitute, in effect, a transformer.

The primary winding 15 is energized by current from the line conductors 5—6 and acts primarily as the winding of the under voltage release magnet. The secondary coil 16 furnishes the necessary current for heating the thermostatic latch 12 when the apparatus is in the normal running position. The arm 9 is also preferably provided with some suitable form of stop device, as, for instance, stop 18 to limit the opening movement of the switch. The switch member 9 may be provided with means for direct manual operation or it may be operated from a distance electromagnetically.

When the voltage in the primary coil 15 is decreased below a predetermined minimum, the under voltage magnet will release its pull on the armature 14 but the switch will still be held in the closed position by the thermostatic latch 12. If the reduced voltage in the primary coil continues below the normal for a length of time predetermined by the design of the apparatus, the thermostatic latch will cool off sufficiently to bend from the position shown in Fig. 1 to a position corresponding to that of the latch 20 in Fig. 2, whereupon the spring 11 will separate the switch contact 8 from the contact 7 and open the main line. By reason of this thermostatic latch, a temporary drop in voltage will have no effect on the switch and thus there will be no interruptions in the circuit due to such temporary condition.

In the form shown in Fig. 2, instead of heating the thermostatic latch by passing current directly through it, we have shown a latch 20 adapted to be heated by an adjacent resistance heating element 21 so that no current need pass through the latch 20.

It will be seen from these two Figures, Nos. 1 and 2, that the device operates automatically under predetermined conditions and that the switch cannot be relatched while the voltage condition remains below a predetermined minimum, since the latch member 12 or 20 will not stay in position to hold the switch arm 9 unless the coil 16 is receiving sufficient energy from the coil 15 to heat and bend the thermostatic latch into latching position.

I claim:—

1. The combination of a primary coil in the circuit to be protected, a secondary coil in inductive relation thereto, a movable switch member having an armature and a bi-metallic thermostatic latch member heated by current flowing thru the secondary coil for coacting with said armature to hold the switch member in closed circuit position under normal conditions and for releasing the switch member when the voltage falls below a predetermined value and a spring for moving the switch member to open circuit position when released by the latch member, said coils being adapted to attract the armature and close the circuit thru the switch member regardless of the condition of the latch member.

2. An under voltage release device including a movable switch member, a magnet coil for normally holding said switch member in the closed circuit position, a latch for preventing said switch member from opening the circuit when said magnet coil temporarily releases said switch member, and means including a permanently closed circuit in inductive relation with said magnet coil for controlling said latch.

3. An under voltage release device including a switch member, an electro-magnet for normally holding said switch member in closed circuit position while voltage is normal, a thermostatic latch, a secondary coil on said electromagnet thermally controlling said latch, said latch operating to hold the switch member in closed circuit position for a predetermined period after failure of voltage.

4. An under voltage release device including a movable switch member, an electro-magnet for holding said switch member in closed circuit position while the voltage remains normal, a thermostatic latch co-operating with said switch member to prevent the immediate opening of said switch member on failure of voltage and a secondary coil on said magnet to control said latch so as to prevent the opening movement of said switch member until after a predetermined period of time.

5. An electric switch comprising a movable switch member, a spring tending to move the switch member to open circuit position, an electro-magnet having primary and secondary coils in inductive relation, an armature connected to the switch member and adapted to be attracted to the magnet when the latter is energized to close the circuit thru the switch, a thermostatic spring latch held out of the path of movement of the switch member at normal atmospheric temperature, and a circuit connected with said secondary coil for heating said thermostatic latch and moving it to latching engagement with the switch member under normal running conditions, said magnet being adapted to close the switch regardless of the temperature of the latch.

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