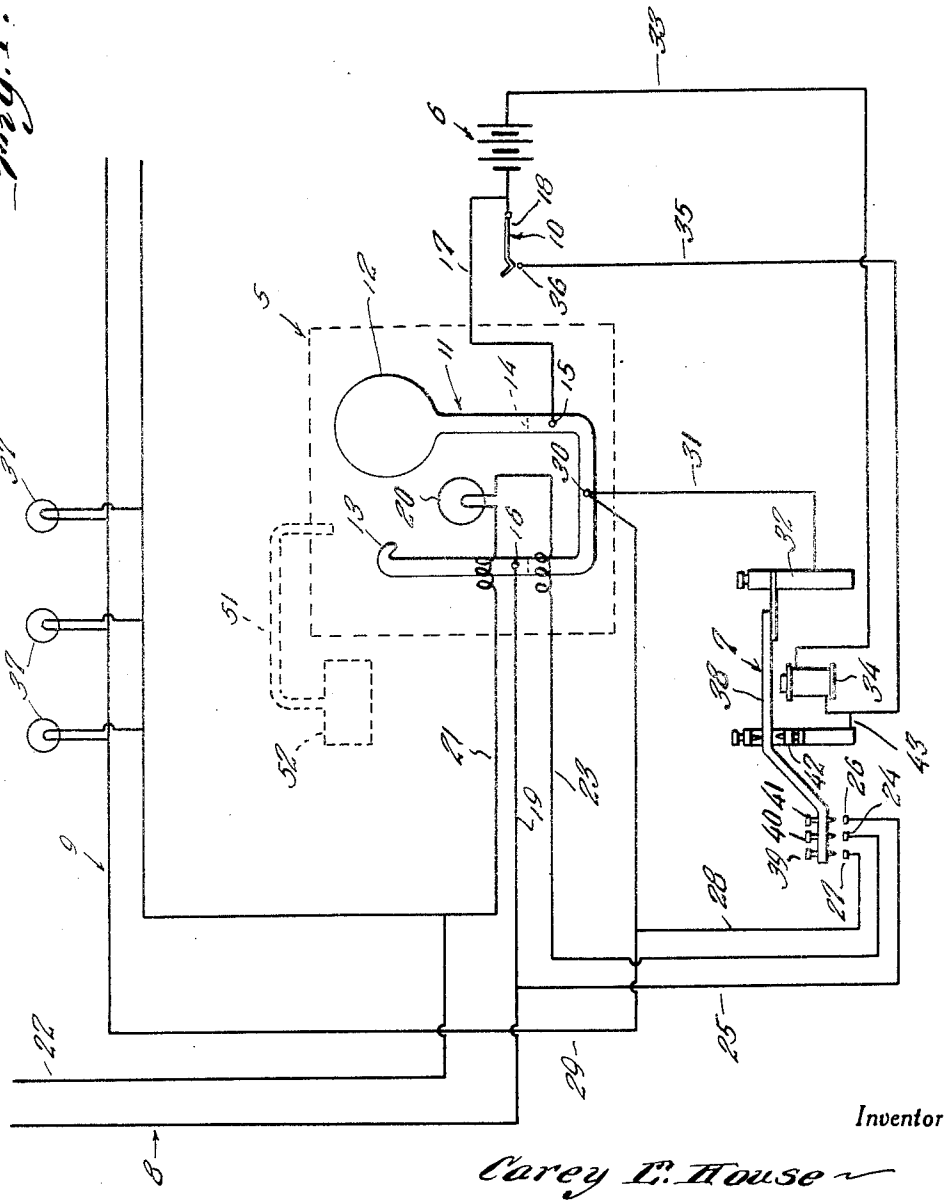
May 15, 1934. C. E. HOUSE 1,958,822

TIME CONTROL CIRCUIT BREAKER

Filed Feb. 14, 1933 2 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

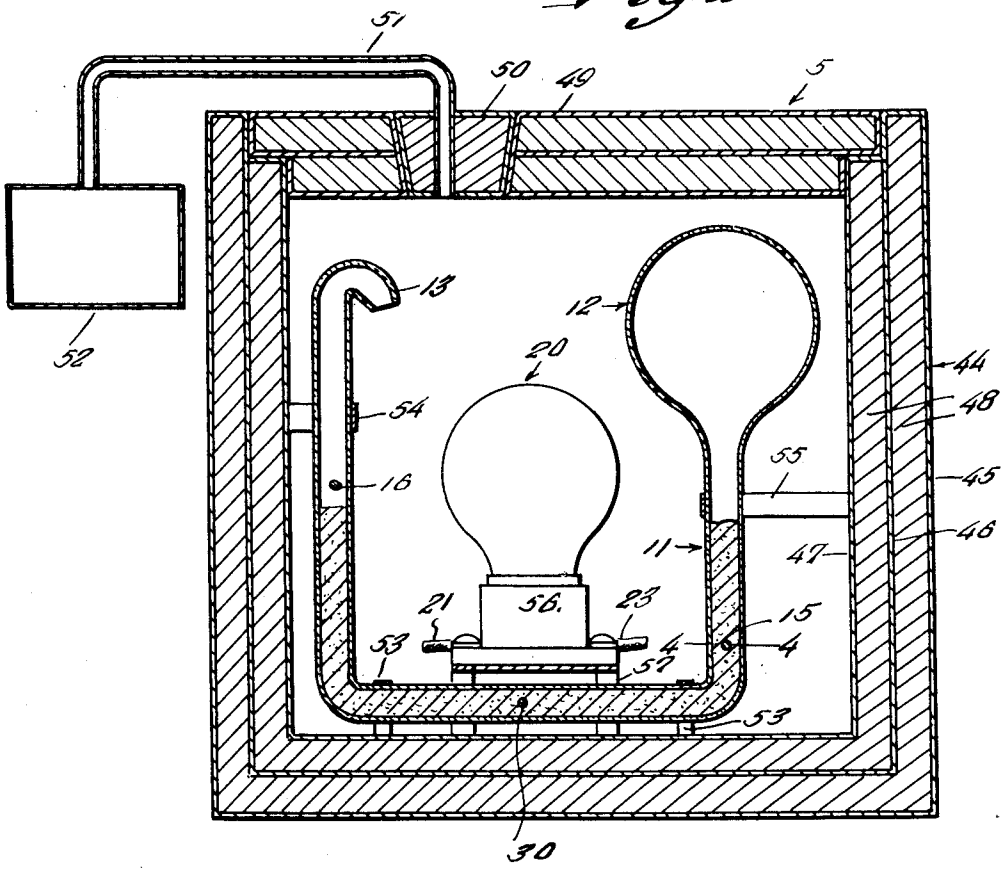
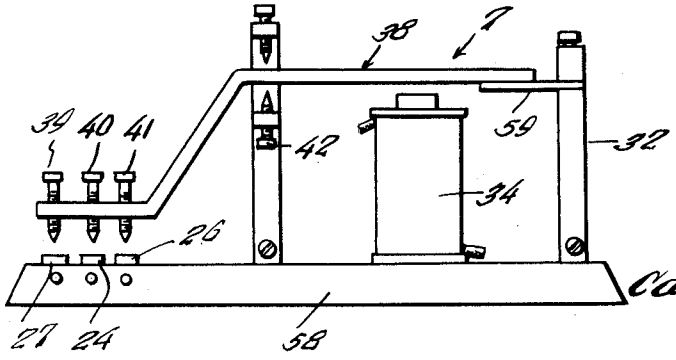


Fig. 3.



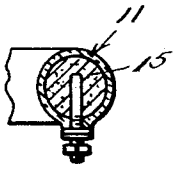


Fig. 4.

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1,958,822

UNITED STATES PATENT OFFICE

1,958,822

TIME CONTROL CIRCUIT BREAKER

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Application February 14, 1933, Serial No. 656,725

2 Claims. (Cl. 175—375)

My invention relates generally to means for conditioning the operation of circuit breaking means, so that it will operate and break a circuit after a predetermined elapsed time, from the actuation or incidence of means for actuating or placing the same in a condition of operation, and particularly to thermo-electric means in the form of a delayed-action electrical intermediary between an energizing means for a circuit or circuits and means to break the circuit or circuits, wherein the expansiveness or movement of materials when heated, is utilized initially to form and complete a circuit, and the contractibility thereof upon the withdrawal of heat therefrom is utilized to make and break the circuits, the time required for the contraction, upon cooling as the heating medium is withdrawn, determining the elapsed time between the initial closing of the circuit or circuits and the final breaking of the circuit or circuits, by the circuit breaking means.

It is an important object of my invention to provide delayed action circuit breaking means of the character described above wherein expansible fluid material is heated by electrical heating means energizable simultaneously with the initial closing of the circuit or circuits to be controlled, the expansible medium being arranged to expand to a degree in which it operates to break the energization of the electrical heating means and upon its cooling and contracting as a consequence of the withdrawal of the heat act so as to break the circuit or circuits to be controlled, the interval of elapsed time between the said initial energization and the last-mentioned circuit breaking function, determining the period of delayed action.

It is also an important object of my invention to provide delayed circuit breaking means of the character described above in which there is only one moving part.

It is also an important object of my invention to provide in a device of the character described above means for controlling the building up of heat in the heat controlled element of the device, and provide means for controllably dissipating heat thereform, whereby to predetermine the time required for contraction thereof to the point at which the circuit or circuits to be controlled are broken.

Other objects and advantages of my invention will be apparent from a reading of the following description in connection with the drawings, wherein for purposes of illustration I have shown a preferred embodiment of my invention.

In the drawings:—

Figure 1 is a general diagrammatic view of the embodiment.

Figure 2 is a longitudinal vertical sectional view through the thermo-electric unit.

Figure 3 is a side elevational view of the relay unit.

Figure 4 is a horizontal sectional view taken through Figure 2 approximately on the line 4—4.

Many adaptations and uses of the device of the invention will be apparent to those familiar with the pertinent art, but it is the desire to call attention to the usefulness of the device of the invention in households for a enabling a householder to "turn off" the lights in any part of the house upon retiring without immediately extinguishing the lights, so that he has time to get into bed before the lights actually "go off".

Another interesting application of the invention is the arrangement thereof in connection with the operation of garage lights, whereby a person is enabled to have the use of the lights therein for a sufficiently long time after having "turned off" the lights to enable him to lock the garage doors and reach another point separated therefrom before the lights actually "go off". Another application of the device of the invention is in connection with stores and other business places, wherein the lights may be "turned off" at closing time without being extinguished until some later time, perhaps hours later, and without further attention or operation by employes. Such instances and others of like character might be enumerated indefinitely, but the above is believed sufficient to disclose the general character of the invention.

Referring in detail to the drawings, wherein like numerals refer to like parts throughout the same, the numeral 5 refers generally to the thermo-electric unit, the numeral 6 to the thermo-electric unit energizing means, the numeral 7 to the relay unit, the numeral 8 to the power line conductors in which the thermo-electric unit 5 and the relay unit 7 are interpolated for control of the light circuit 9 or any other similar circuit or circuits to be controlled. The numeral 10 refers generally to the main switch, the closing of which conditions the operation of the thermo-electric unit 5 and the relay unit 7 for controlling the light or other circuit 9 and its energization by the power line 8.

Referring particularly to diagrammatic Figure 1, it will be seen that the U-shaped mercury tube 11 is equipped on one horn with the expanded portion or globe 12. The other horn rises to an appropriate height and its open end is turned

over as indicated at 13. A quantity of mercury 14 is disposed in the tube 11. Normally the mercury rises in the bulb equipped leg of the tube to a point above a contact 15, and is at a level in the left hand leg of the tube below the contact 16. The contact 15 is connected by a conductor 17 to the arm 18 of the switch 10 and to one side of the source of electrical energy such as the battery 6. The contact 16 has connected thereto one of the power lines 8, which is designated 19.

The numeral 20 refers to a suitable heat means for the bulb 12, which may be a resistance filament of some adequate form such as a filament bulb. One side of the heater bulb 20 is connected to one side of the circuit to be controlled by conductor 21 which constitutes one of the lines of the light circuit 9. Connected to the conductor 21 is the remaining one of the power lines 8, designated 22. The remaining side of the heater bulb 20 is connected by a conductor 23 to one of the contacts 24 of the relay unit. A conductor 25 connects the power line conductor 19 with another of the relay contacts 26, while the third relay contact 27 is connected by a conductor 28 to the remaining line of the light circuit 9, which is designated 29. The conductor 29 is connected to a contact 30 in the side portion of the mercury tube 11, the tube contact 30 being connected by a conductor 31 to the relay armature post 32.

The battery 6 has the remaining side thereof connected by a conductor 33 to one side of the relay electro-magnet 34, and the remaining side of the electro-magnet 34 is connected by means of a conductor 35 to the switch point 36 of the main switch 10.

A plurality of lamps 37 or other electrically operable apparatus is connected across the lamp circuit lines 21, 29.

Operation of the above described arrangements is effected as follows:—

The arm 18 of the control switch 10 is closed into contact with the switch point 36, to set the thermo-electric unit 5 for operation through functioning of the relay unit 7. Upon the closing of the switch 10 the battery 6 will energize the electro-magnet 34 of the relay unit and cause the armature 38 thereof to be drawn downwardly so as to bring the contact elements 39, 40, and 41 thereof into contact with the relay contacts 27, 24, 26. At the same time the armature 38 electrically engages the contact 42 which is connected by a conductor 43 to the conductor 35. This position of the armature 38 closes a circuit through the battery 6 through the tube contacts 15, 30, through the mercury 14 therein, through the armature or post 32, through the armature 38 to the contact 42 and through electro-magnets 34 and back through the line 33 to the battery 6. This circuit maintains the relay armature in the down position so that a circuit through the armature contact 41, conductor 25 to power line 19, and return through power line 22 to one side of the heater bulb 20, and through one side of the light circuit 9 is maintained so as to energize the filament in the heater bulb, and through the armature point 40 and the conductor 23, and a circuit through from the power line 22 to the light circuit 9 through the conductor 21 and through the armature contact 39 to the tube contact 30 and to the other side of the light circuit 9 designated 29.

The completion of these circuits causes the heater bulb 20 to be energized and heat the heat absorbing bulb 12 of the tube 11, so that the mercury or the like 14 therein will be moved by the expansion of the gases or other expansible fluid in the bulb 12 thereabove, so that the level of the mercury in the bulb equipped arm of the tube will be depressed and the level in the plain arm of the tube elevated. It should be stated that the lights 37 or the like are immediately energized upon closing of the switch 10.

When sufficient heat has been applied to the bulb 12 to cause the fluid therein to push the level of the mercury below the contact 15, the circuit from the battery through the relay unit will be automatically broken both at the tube contact 15 and at the relay contact 42. This deenergizes the relay magnet 34 and permits the armature 38 to swing back into initial position, and this breaks the circuits controlled by the armature contacts 39, 40, 41, namely, the lights circuit 9 and the heater bulb circuit 20. When this heater bulb 20 has its circuit broken, it no longer furnishes heat to the tube 12. A casing to be described surrounds the tube 11 and the heater bulb 20 and maintains the heat at a predetermined temperature for a predetermined length of time. As the temperature drops and the expansive fluid in the bulb 12 contracts, the mercury is permitted to resume gradually its initial position, so that eventually the mercury will drop below the contact 16 in the plain arm of the tube 11 and break the only remaining circuit through the contact 16 to the power line 19 and through the contact 30 to the light circuit conductor 29 and through the contact 30 to the relay conductor 31, back to the relay which is then in open position, whereby the light circuit 9 is broken and the lights 37 extinguished.

Details of the thermo-electric unit 5 and of the relay unit 3 are disclosed in Figures 2, 3 and 4 of the drawings, to which attention is now drawn.

The thermo-electric unit 5 comprises a closed casing 44 which may comprise double walls formed by an outside casing 45 a partition 46 and an inner casing 47 arranged in progressively outwardly spaced relation and providing spaces therebetween which are filled with suitable insulating material 48, so that the heat loss from the heater bulb 20 and the expansible medium containing bulb 12 is negligible and determinable. The box 44 is provided with a removable cover 49 constructed similarly to the walls and provided with a removable stopper 50 having a tube 51 fastened therein and communicating with the interior of the casing 44. The tube 51 leads to a heat dissipator which operates to controllably dissipate heat by conduction and convection. The casing 44 and the heat dissipator 52 are vacuum tight, and a vacuum is produced within the casing 44 and the dissipator 52 for decreasing the convection and conduction of heat developed by the heater bulb 20 and for suitably retarding the contraction of the expansible fluid medium in the tube, particularly in the bulb portion 12 thereof. The outer and inner casings 45, 47 and the partition 46 preferably of reflecting material so as to prevent dissipation of heat from the interior of the casing 44 by radiation. The size and arrangement of the heat dissipator 52 and its tube 51 will be predetermined so as to condition a predetermined rate of dissipation of heat from the interior of the thermo-electric unit.

Within the casing 47 suitable floor brackets 53 and wall brackets 54, 55 support the tube 11

in speed relationship to the floor and sides of the inner casing 47. The heater bulb 20 is mounted in a suitable socket base 56 mounted on floor brackets 57 in such a way that it is in proper heating relationship to the expansible medium containing bulb 12. By the means described, any suitable period of delay for the return of the mercury 14 to the initial position may be arranged for, and rendered free of outside influence, so as to be accurate and constant, and render the operation of the thermo-electric unit reliably accurate.

The relay unit may comprise a suitable base 58 mounted on any suitable location outside of the or distantly separated from the thermo-electric unit 5. Mounted at one end will be the armature post 32 carrying the armature 38 which is maintained upwardly sprung by spring mounting 59. Longitudinally separated from the post 32 is the contact post carrying the contact 42, and between the two posts are located the electro-magnets 34. The positions and relationships of the armature contact members 39, 40, and 41 with the base contacts 27, 24, 26 is believed to be obvious.

Though I have shown and described herein a preferred embodiment of my invention, it is to be definitely understood that I do not desire to limit the application of the invention thereto, and any change or changes may be made in materials, and in the structure and arrangement of the parts, within the spirit of the invention and the scope of the subjoined claims.

What is claimed is:—

1. The combination with a circuit to be controlled and a source of electrical current, of a U-shaped closed tubing having mercury therein, an electrical contact in each leg of the tubing, an electrical contact in the bight portion thereof, an eletrical resistance adjacent said tubing, a relay having a pivotally mounted armature, a magnet for actuating said armature, said armature having three spaced electrical contacts thereon, a corresponding number of stationary electrical contacts, a make and break switch, a battery, one terminal of the battery being connected to one terminal of the make and break switch, and to one of the contacts in one of the legs of the tubing, the other terminal of the battery being connected to one conductor of the magnet, the other terminal of the magnet being connected to the other electrical contact of the make and break switch, a single stationary electrical contact associated with said armature, and being connected to one magnet conductor, an electrical conductor connecting the armature to the electrical contact in the bight portion of the tubing, one of the conductors of the source of electrical supply being connected to one conductor of the work circuit and to one terminal of the resistance, the other terminal of the resistance being connected to one of the three stationary electrical contacts, the other conductor of the source of electrical supply being connected to the remaining electrical contacts in the tubing and to one of the remaining stationary electrical contacts, the other electrical conductor of the work circuit being connected to the electrical contacts in the bight portion of the tubing and to the remaining stationary electrical contact.

2. In combination with a work circuit, and a source of electrical supply, a U-shaped tubing having mercury therein and an integral bulb on one end thereof, electrical contacts in each leg and in the bight portion thereof the mercury normally contacting the contact in the bight portion and one leg of the tube, a relay having an armature and a magnet, a make and break switch, a second source of electrical supply, an electrical circuit including said second source of electrical supply, said relay, and said magnet whereby upon actuation of said make and break switch, the relay is actuated, electrical contacts on said armature, stationary electrical contacts associated therewith, an electrical circuit including said last named electrical contacts, a resistance, said work circuit and said source of electrical supply for energizing the working circuit and the resistance upon actuation of the relay, and an electrical circuit including said armature, a stationary electrical contact cooperating with the armature said second source of electrical supply and one of the contacts in the tubing for energizing said magnet upon the opening of the make and break switch.

CAREY ETNIER HOUSE.