Sept. 11, 1934. H. J. BRANDENBURGER 1,973,603

CYCLE TIMER FOR CONTROLLING WORK CIRCUITS

Filed Jan. 14, 1932

Fig-1-

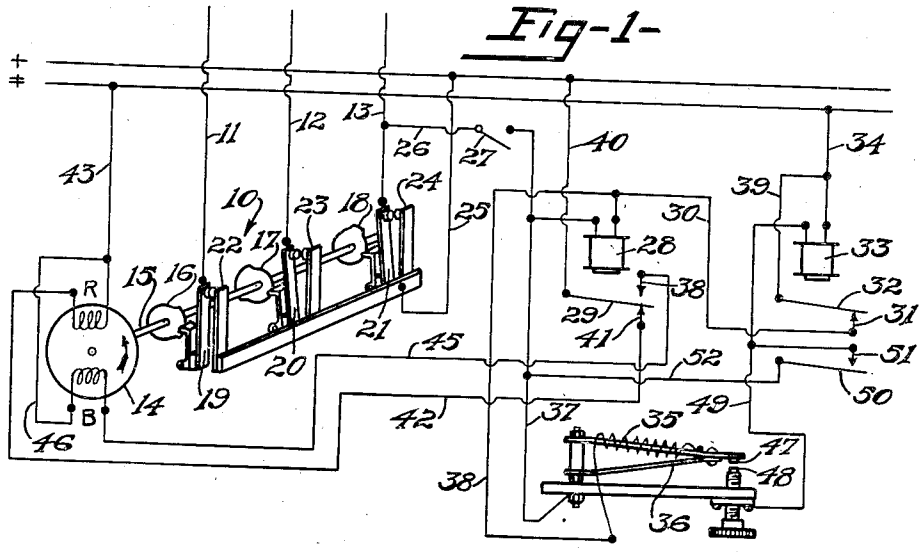
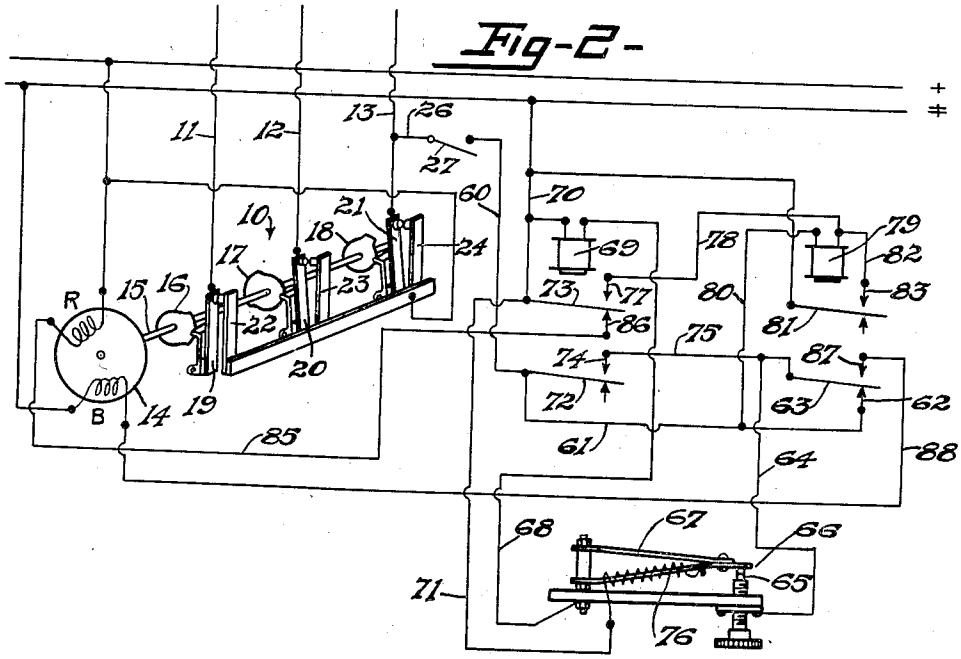


Fig-2-



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CYCLE TIMER FOR CONTROLLING WORK CIRCUITS

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5 Claims. (Cl. 177—337)

This invention relates in general to work cycle timers. More particularly, the invention relates to means for varying a period or periods of the work cycle timer, as set forth in my co-pending application, Ser. No. 515,722.

The invention has for its object, the employment of means for stopping, or varying, the operation of the timer during any period or periods, and the employment of a thermal switch for re-establishing the operation of the timer after the same has been stopped for a predetermined length of time.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawing in which like characters designate corresponding parts in all the views.

Figure 1 represents a schematic view of a work cycle timer together with the apparatus for varying the operation of the timer.

Figure 2 is a schematic representation of a modified form of the structure shown in Figure 1.

It is well known to those skilled in the art that a thermal switch can itself only make and break a comparatively small amount of current through its movable contacts due to the relatively arcing caused by the exceedingly slow movement of the movable contacts. Also, these thermal switches have a tendency to make and break through a series of contacts rather than by a quick make and break contact.

This arcing and fluttering at the contacts produces excessive wear, and causes the contacts to burn and pit and eventually weld or stick together. Also, the repetition of the contacts is detrimental to the operation of certain apparatus.

An important object of my invention is to convert the microscopic make or break, to one of appreciable length and at the same time convert the slow movement of the thermal contacts to a quick make and break.

Another object, is provision for instantaneously removing the heating coil of the thermal switch from the circuit upon the first contact, or separation, of the movable contacts of the thermal switch.

Referring to Figure 1 of the drawing, 10 designates in general a work cycle timer controlling the work circuits 11, 12 and 13. These work circuits may be employed to operate any apparatus which it is desired to operate through a work cycle, as for example traffic signalling lights. The timer consists of a suitable operating means as an induction disk motor 14 which revolves the shaft 15 with its cams 16, 17, 18, which in turn operate movable contacts 19, 20, 21 respectively through a predetermined work cycle. The contacts 19, 20, 21 engage, when actuated by their respective cams, suitable complemental contacts 22, 23, 24 which are stationary and which are supplied in common with current from the feed circuit through wire 25. As here shown the motor is actuated by the running coil R.

It is often desired to vary the operation of the timer during one or more periods of its cycle, while one or more of the work circuits are energized, for example, it is often desired to vary one or more periods in the cycle of a traffic signal timer, such as the lengthening of the green light on one of the intersecting streets during certain periods of the day. I have arbitrarily selected circuit 13 as one which is desired to be varied from the usual operation by the timer. The variation, in this instance, consists in stopping the timer for a predetermined time during the period when the contacts 21, 24 are engaged and the work circuit 13 energized. It will be obvious to those skilled in the art, as the description proceeds, that this variation might consist in simply slowing the timer down during such period or running it faster during such period. Connected to the work circuit which is desired to be varied, in this instant the work circuit 13, is a branch circuit which obviously is energized at the same instant the work circuit is energized. I designate this branch circuit a control circuit inasmuch as it controls the means for varying the period of the cycle timer. In this circuit is connected switch 27 which may be either manually operated or operated at predetermined intervals by any suitable means, such as a time clock or the like. This circuit includes a coil of a relay 28 which provides a shifting means for its armature 29. This circuit is also connected by wire 30 to the normally closed contacts 31, 32 of relay 33, wires 34 and 39 completing the circuit to the common return of the feed circuit. The heating coil 35 of a thermal switch 36 is also connected in this control circuit through the wire 37, the body of the thermal switch 36, heating coil 35, wire 38, wire 30, contacts 31, 32, wires 39, 34. The running coil R of the motor 14 is connected in a circuit, which I designate as an operating circuit through the wire 40, normally closed contacts 29, 41, wire 42, running coil R, wire 43 to the common return of the feed circuit.

From the above, it will be apparent that when the cam 18 moves the contact 21 into engagement with the contact 24 and the switch 27 is in "on" position a hot circuit is provided through the relay 28 and the heating coil 35. Accordingly, the relay 28 shifts the armature 29 into "up" position or from contact 41 to contact 38, thus breaking the circuit through the running coil R and stopping the timer. In cases where the cycle timer may have some appreciable coasting effect, the motor 14 may be instantly stopped by providing a braking coil B which is connected into a hot circuit through the contacts 29, 38, wires 45, 46 and 43.

The thermal switch 36 provides a variable timing means for controlling this variation established in the cycle timer. As the heating coils 35 are now connected into a hot circuit the contact 47 of the thermal switch will be moved toward and into engagement with the adjustable contact 48. The time within which the contacts 47, 48 engage depends upon the adjustment of the contact 48. The engagement of contacts 47, 48 complete a hot circuit through the wire 49, relay 33, wire 34. It is to be remembered that the body of the thermal switch 36 to which the contact 47 is electrically connected is already supplied with current from the positive line through the control circuit. Relay 33 now shifts its armature 32 out of engagement with the contact 31, thus breaking the control circuit through the relay 28 and through the heating coil 35. In this form of my invention, the breaking of the control circuit instantly upon engagement of the contacts 47, 48 of the thermal switch is of great importance.

The relay 33 is provided with an additional armature 50 which when the relay 33 is energized is shifted into contact with the contact 51; this shifting resulting in a hot stick circuit from the control circuit 26, wire 52, armature 50, contact 51, wire 49, relay 33, wire 34 to the other side of the feed circuit. It will be obvious that this is accomplished instantly upon the slightest contact of the contacts 47, 48 and regardless of any fluttering or repetition of engagement between these contacts, the result cannot be transferred to the relay 28, inasmuch as the circuit through the relay is broken and also the circuit through the thermal switch is broken.

Accordingly, once the relay 33 becomes energized, it is maintained in such condition through the stick circuit and remains in this condition until the timer 10 operates through the remainder of the period and opens the contacts 21, 24. It will be observed that immediately after the relay 33 is energized the relay 28 is de-energized and the armature 29 again shifted into engagement with the contact 41 which opens the braking circuit, if one is employed, restoring a hot circuit through the running coil R. The motor 14 then operates the timer through the period which has been varied and through the succeeding periods of the cycle.

Referring to Figure 2 of the drawing, the control circuit consists of wire 26, switch 27, wire 60, wire 61, stationary contact 62, armature 63, wire 64, contacts 65, 66, thermal switch 67, wire 68, relay 69, wire 70, to the other side of the circuit. The heating coil 76 of the thermal switch 67 is also connected in this circuit through the wires 71, 70.

In this embodiment of my invention, the thermal switch is so arranged that the contacts 65, 66 are normally engaged.

When the relay 69 is energized, the armatures 72, 73 are attracted in their "up" position. A circuit is now established through wire 60, armature 72, contact 74, wire 75, wire 64, contacts 65, 66, the heating coil 76 of the thermal switch, wires 71, 70 to the other side of the circuit. It will be noted that at this instant the heating coil 76 of the thermal switch is supplied with current through the previously described circuit and through the latter circuit. Also, the relay 69 is likewise supplied with current through the same two circuits in that the relay and the heating coil of the thermal switch are connected in parallel. Simultaneously, upon the relay 69 becoming energized, a circuit is established through armature 73, contact 77, wire 78, relay 79, wire 80, wires 61, 60, to the positive side of the line, through the work circuit 13 of the timer. The armatures 63, 81 of relay 79 are now attracted in their "up" position, and a stick circuit for the relay 79 is established through wire 82, contact 83, armature 81, wire 84, wire 70, to the negative side of the line. The operation described is completed substantially instantaneously and it is to be noted that the circuit from the positive side of the line, through the running coil R, wire 85, is broken through the armature 74, contact 86. Also, the braking coil B has become energized through wire 60, armature 72, contact 74, wire 75, armature 63, contact 87, wire 88, braking coil B, to the negative side of the line. The motor 14 and the timer 10 are thereupon stopped with the work circuit 13 being energized.

The contact 65 of the thermal switch is adjustable so that the time required for the thermal switch to separate the contacts 65, 66 may be adjusted. After this time elapses the contacts 65, 66 separate and the circuit to the relay 69 is open permitting the armatures 72, 73 to resume their down position in which the circuit through the braking coil B is interrupted through the contact 74, armature 72, and the circuit to the running coil R is again re-established through the contact 86, armature 73.

It is to be noted that inasmuch as the circuit for the heating coil 76 for the thermal switch is connected through the contacts 65, 66 and contacts 72, 74, this circuit becomes instantly broken upon the opening of the circuit through the relay 69 by the separation of the contacts 65, 66.

It is to be further noted that inasmuch as the stick circuit for the relay 79 is completed through the contact 21, this relay will be restored to normal position upon the timer completing the period that has been varied or lengthened as above.

By the novel arrangement in both Figures 1 and 2, the control or starting circuit which energizes the relays 28, 69, is connected through contacts of the relays 33, 79, and the relays 33, 79 are always energized and the contacts through the control or starting circuits opened before the contacts of the relays 28, 69 are released or restored to their normal position. Accordingly, when the circuits through the relays 28, 69, are de-energized, it is impossible for a circuit to be re-established through them, for example, as a result of the repetition or re-establishing of the contacts 47, 48 or 65, 66, respectively inasmuch as the control or starting circuit has been previously broken by the energizing of the relays 33, 79.

What I claim is:

1. A work cycle timer for controlling work circuits, means for operating the timer through its cycle, and means for varying the normal operation of the timer during a period of its cycle including a first and second switch, said switches being normally held in one position and shiftable into second position, means for shifting each of said switches, an operating circuit for energizing the timer operating means, said circuit connected through the contacts of the first switch when in its normal position, a thermal switch, a control circuit energized by the timer during a period of its cycle, said circuit being connected through the contacts of the second switch when in its normal position and including the shifting means for the first switch and the heating coil of the thermal switch, the shifting means for the second switch being connected in said control circuit through the movable contacts of the thermal switch and through the contacts of said second switch when in shifted position, the thermal switch being operable to cause shifting of the second switch a predetermined length of time after the energizing of the control circuit.

2. A cycle timer for controlling work circuits, means for operating the timer through its cycle, and means for varying the regular operation of the timer during a period of its cycle including first and second shiftable switches, means for shifting each of said switches, an operating circuit connected through the contacts of the first switch for energizing the timer operating means, and a control circuit energized periodically by the timer, said control circuit being connected through the shifting means of the first switch and the contacts of the second switch when in normal position, a thermal switch connected in said control circuit and being operable to successively energize the shifting means of the second switch and de-energize the shifting means of the first switch a predetermined length of time after the control circuit is energized, and a stick circuit for holding the second switch in shifted position until the control circuit is de-energized by the timer at the end of said period.

3. In a cycle timer for controlling work circuits, means for operating the timer through its work cycle, brake means for stopping said timer and means for varying a period of the cycle of the timer including a first and a second switch, said switches being normally held in one position and shiftable into a second position, and means for shifting each of said switches, the operating means for the timer being connected in circuit through the contacts of the first switch when in its normal position and the brake means being connected in circuit when the said switch is in its shifted position, a thermal switch, a control circuit energized by the timer during a period of its cycle, the shifting means for the first switch and the heating coil of the thermal switch being connected in said control circuit through the contacts of the second switch when in its normal position, the shifting means for the second switch being connected in said control circuit through the movable contacts of the thermal switch when said second switch is in normal position and through the contacts of said second switch when in shifted position, said control circuit being de-energized by the timer at the end of said period.

4. A cycle timer for controlling work circuits, means for operating the timer through its cycle, and means for varying the operation of the timer during a period of its cycle including first and second shiftable switches, and a thermal switch, a control circuit periodically energized by the timer, and connected through the contacts of the second switch when in normal position, the shifting means of the first switch and the heating coil of the thermal switch being connected in said control circuit, the shifting means of the second switch being connected in said control circuit through the movable contacts of the thermal switch, a circuit for energizing the timer varying means connected through the contacts of the first switch when in shifted position, and a stick circuit for holding the second switch in shifted position until the control circuit is de-energized by the timer, the thermal switch being operable to cause shifting the second switch a predetermined time after the first switch has been shifted.

5. A cycle timer for controlling work circuits, means for operating the timer through its cycle, and means for varying the normal operation of the timer during a period of its cycle including a switch normally held in one position and shiftable into a second position, an operating circuit for energizing the timer operating means connected through the contacts of said switch when the same is in normal position, a second shiftable switch, a control circuit energized by the timer during a period of its cycle and connected through the contacts of the second switch when the same is in normal position, means connected in the control circuit for shifting said first switch when said control circuit is energized by the timer, a thermal switch having its heating coil connected in said control circuit, means for shifting said second switch including one of said other switches, the thermal switch being operable in conjunction with said second switch a predetermined time after the control circuit is energized by the timer to deenergize the shifting means of the first switch, said control circuit being deenergized by the timer at the end of said period.

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