Jan. 1, 1935. H. J. BRANDENBURGER 1,986,553

ELECTRICALLY OPERATED WORK CYCLE TIMER

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Fig-1-

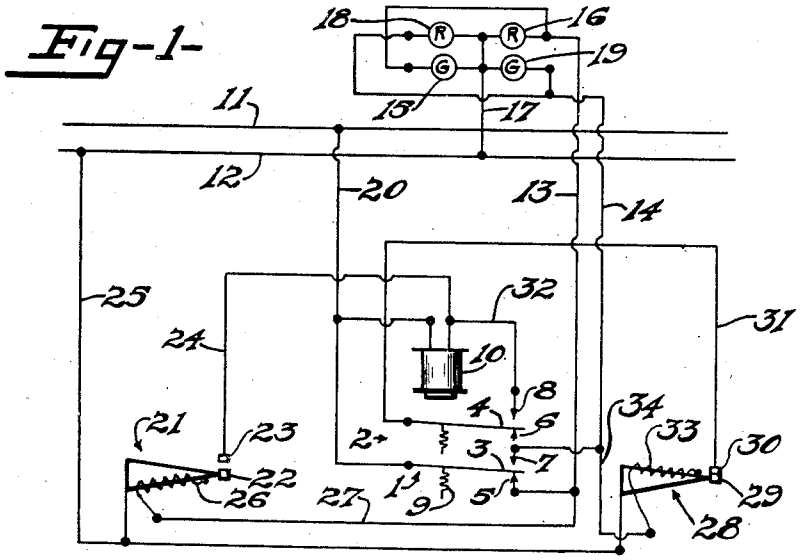
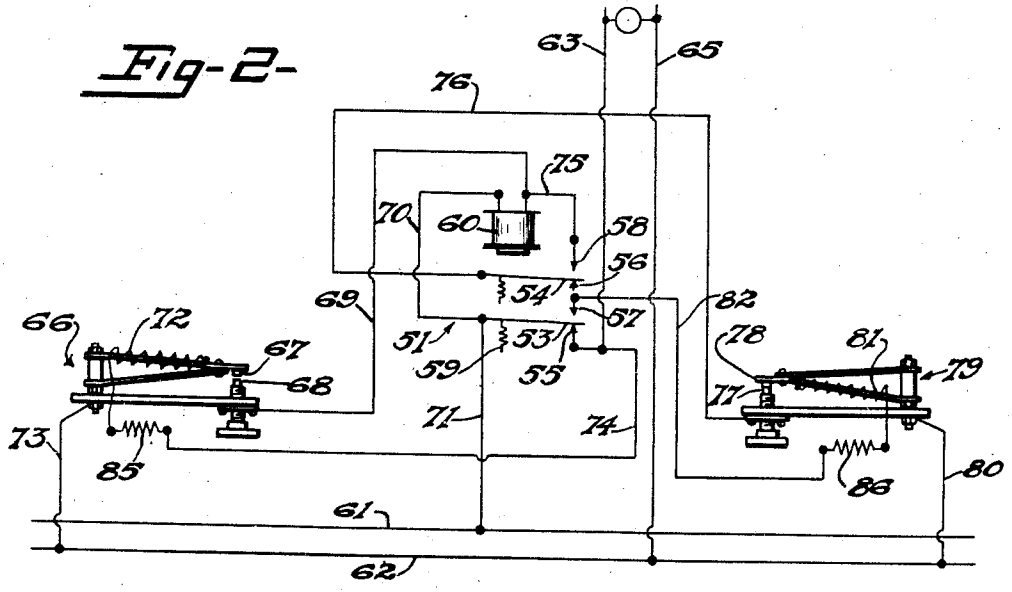


Fig-2-



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ELECTRICALLY OPERATED WORK CYCLE TIMER

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2 Claims. (Cl. 175—320)

This invention relates to work cycle timers and has for its object a timer in which the closing and opening of the work circuit or circuits to be timed, is controlled by the throwing of a relay or double throw switch and the throwing of the switch timed by electrically operated means as heating elements controlled by the switch itself so that the timer includes no cams, drums, or any mechanism aside from the double throw switches and thermal switches or their equivalents.

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 is a diagrammatic view of this timer showing the same as timing the operation of signals.

Figure 2 is a diagrammatic view of a similar timer operating flashing signals, the light and dark periods of which are accurately timed.

I have here illustrated my invention in its simplest form, in Figure 1 as adapted to time the display of traffic signals on intersecting streets and in Figure 2 to time flashing signals.

This timer comprises generally a double throw switch or relay having a movable member normally arranged in one of its two positions and movable into its normal position by any suitable means, as a spring, an electro-magnet for throwing the movable switch member into its second position, starting and stick circuits for the magnet connected respectively in the feed circuit through the movable switch member when respectively in its first and its second positions, the starting circuit being normally open and the stick circuit normally closed (disregarding the position of the movable switch member) and electrically operated timed means for timing the closing of the starting circuit to a predetermined interval and to time the opening of the stick circuit to a predetermined interval, the timing means for the starting circuit having a circuit connected in the feed circuit through the movable switch member when the latter is in its first position and the timing means of the stick circuit being connected in the feed circuit through the movable switch member when in its second position. Thus, initially when the movable switch member is in its first position, a time interval intervenes before the circuit is closed through the electro-magnet to throw the switch member to its second position and also a predetermined timed interval occurs before the stick circuit is broken by the timing means to permit the double throw switch to return to its starting position and the cycle to repeat.

The work circuits are connectable in the feed circuit through the double throw switch when in its first and second positions, one or some of them being connected in a closed circuit when the switch member is in its first position and others when in its second position.

1 designates the double throw switch, 2 the movable switch member thereof having terminals 3, 4. 5 and 6 designate one row of contacts with which the terminals 3 and 4 are engaged when the member 2 is in its first or starting position. 7 and 8 designate an opposite row of contacts with which the terminals 3, 4 are engaged when the member 2 is in its second position. The double throw switch here shown is a two-pole switch for the reason that the invention which lies in the timing means, is illustrated as in its simplest form.

The double throw switch or relay may be of any suitable form, size and construction, and as the construction thereof is well known as they are standard articles of manufacture, further description is thought to be unnecessary. Usually the member or arm 2 is a pivoted arm and it is moved in one direction to hold the terminals 3, 4 engaged with the contacts 5, 6 by a spring 9.

10 designates the electro-magnet arranged in juxtaposition to the switch member 2 to throw said switch member when the electro-magnet is energized. 11 and 12 designate the wires of a feed circuit, and 13 and 14, are wires or legs of the work circuits connectable in the feed circuit through the double throw switch when the switch member 2 is in one or the other of its two positions, the wire 13 being shown as feeding a go or green signal 15 on one street and a red signal 16 on an intersecting street, the circuit being completed through return wire 17. The wire 14 is shown as feeding red signal 18 on the first street and the green signal 19 on the intersecting street, this circuit being completed through return wire 17. The wire 13 is connected in the feed circuit through the contact 5 of the double throw switch and the terminal 3 when the switch member 2 is in its first position. The wire 14 is connected in the feed circuit through the contact 7 and the terminal 3 when the movable switch member is in its second position.

The movable switch member is connected to

the wire 11 of the feed circuit through conductor 20.

The starting circuit for the magnet 10 has a normally open switch 21 therein having a terminal 22 normally spaced from a contact 23 which is connected by a wire 24 to one end of the coil of the magnet 10, the other end of the coil being connected to the wire 20. The frame of the switch 21 is connected to a return wire 25. The electrically operated timing means is preferably a heating element arranged in juxtaposition to the switch 21 to heat and warp it when the heating coils are energized, to cause the terminal 22 to engage the contact 23 and thus close the starting circuit through the electro-magnet 10. The time required for the heating element to warp the switch 21 sufficiently to engage the terminal 22 with the contact 23 is the time period that the work circuit 13 is closed and the work circuit 14 opened. 26 designates the heating coil electrically connected at one end to the frame of the switch 21 and at its other end to a wire 27 connected to the contact 5.

The stick circuit for the electro-magnet includes a switch, as a thermal switch 28 having a terminal 29 normally engaged with the contact 30 connected to one end of the coil of the magnet 10 through the double throw switch when in its second position, as through wire 31, terminal 4 of the switch member 2, contact 8 and wire 32. The other end of the coil 10 of the magnet, as before stated, is connected to the wire 20. The switch 28 is also preferably a thermal switch and the timed opening thereof is effected by means of a heating coil 33 connected at one end to the frame of the switch 28 and at its other end in the feed circuit through the switch arm 2 when in its second position as through wire 34, contact 7 and terminal 3 of the switch member when in its second position.

The operation of the form shown in Figure 1 is as follows: Assuming that the feed circuits 11 and 12 are closed in any suitable manner, as by a switch, the current flows as follows: from feed wire 11, wire 20, terminal 3 of the switch member 2, contact 5, then through the work circuit 13 through the signals 15, 16 or other electro-responsive devices, thence through the return wire 17 to the feed wire 12. At the same time, the current is passing through wire 27 through the heating coil 26 of the normally open switch 21 in the starting circuit, and after it heats the coil 26 sufficiently to engage the terminal 22 with the contact 23, a circuit is established through the coils of the magnet 10 as follows: from feed wire 11, wire 20, magnet 10, wire 24, contact 23, terminal 22 thence through the frame of the switch 21 to return wire 25. Immediately upon the closing of the starting circuit, the switch member 2 is thrown to its second position, wherein the terminals 3, 4 are engaged with the contacts 7, 8 and thus the circuit through the wire 13 and the heating coils 26 of the normally open starting circuit switch 21 is broken and the work circuit 14 closed. At the same time a stick circuit for the magnet 10 is established from feed wire 11, wire 20, magnet 10, wire 32, contact 8 and terminal 4 through wire 31, thence through frame of the switch 28 to the return wire 25. Also, at the same time, the circuit is closed to the timing coil or heating element 33 from feed wire 11, wire 20, terminal 3 of the switch member 2, contact 7, wire 34 through the heating coil 33 thence through the frame of the switch 28 to the return wire 25. As the heating coil heats, it warps the switch 28 separating the terminal 29 and contact 30, thus breaking the stick circuit so that the magnet 10 is de-energized and the spring 9 free to react and return the switch memb 2 to its starting position and the cycle to repeat as long as the feed circuit is closed. Although the work circuits are here shown as connected directly to signals, the work circuits leading from the opposite rows of contacts of the double throw switch may control other electrical devices, which in turn control elements as signals.

The feature of this invention is the timing for the closing of the various periods of the work cycle by timing the closing of the starting circuit for the master relay and likewise timing the opening of the stick circuit for the master relay, the timing means being controlled by the position of the movable member of the relay or double throw switch.

In other words, the movable switch member, when in one of its two positions, cuts in one timer and cuts out the other, and when in the other of its two positions, cuts out the first timer and cuts in the second, and the operation of the switch member, or the energization of its magnet, is controlled by the timing means, one timer cutting in the magnet, and the other cutting it out.

One of the other numerous uses for which this timer is applicable is shown in Figure 2 wherein it is shown as controlling and timing the flashing of lamps or signals with a predetermined accurate time extent for the flashes and the time intervening between the flashes. In Figure 2, 51 designates the double throw switch having terminals 53 and 54, the terminal 53 being movable between opposing contacts 55 and 57 and the terminal 54 being movable between the contacts 56 and 58, the contact 56 being a dead one, as is the contact 6 in Figure 1.

59 designates the spring for returning the double throw switch to its normal position wherein its terminals 53, 54 are engaged with the contacts 55 and 56.

60 designates the electro-magnet for throwing the switch 51 against the action of its returning spring 59. 61 and 62 designate the feed wires. 63 designates a work circuit in which one or more flashing lamps 64 are connected. 65 is the return wire. 66 is the normally open thermal switch in the starting circuit for the magnet 60, this switch having a terminal 67 normally spaced apart from the contact 68 which is connected by a wire 69 to one end of the coil of the magnet 60, the other end of the coil being connected to wires 70 and 71 to the feed line 61.

72 designates the heating element or coil arranged in juxtaposition to the switch 66, the coil being electrically connected at one end to the frame of the switch which is connected to return wire 73, and the other end of the heating coil being electrically connected through a wire 74 to the contact 55 of the double throw switch. Thus, initially the current passes from the feed wire 61 through wire 71 to terminal 53, thence through contact 55 thence through work circuit 63 and lamp or lamps therein to the return wire 65. Also, the current passes from the contact 55 through wire 74 and through the heating coil 72 and the frame of the switch 66 to return wire 73. The coils 72 heat and cause the switch 66 to warp. When the switch warps sufficiently to engage the terminal 67 with contact 68, a starting circuit for the magnet is established from wire 61 through wire 71, wire 70, through the coils of the magnet 60, thence through wire 69, contact 68 and terminal 67 and through the frame of the

switch 66 to the return wire 73. When the magnet 60 is thus energized it throws the double throw switch to carry the terminal 53 into engagement with the contact 57 and the terminal 54 into engagement with the contact 58, thus breaking the work circuit and also the circuit through the heating coil 72 and establishing a stick circuit to hold the magnet energized for a timed period and hence timing the interval that the lights are extinguished. The stick circuit is as follows: from wire 61, through wire 71, wire 70, coils of magnet 60, wire 75, contact 58, terminal 54, wire 76, to the contact 77 and terminal 78 of the normally closed switch 79 in the stick circuit and thence through return wire 80. At the same time, a circuit is established through the heating coils 81 of the switch 79 from wire 61 through wire 71, terminal 53 of the double throw switch, contact 57, wire 82 through the heating coils 81, one end of which is connected to the frame of the switch 79 and the other end to the wire 82. When the coils are heated sufficiently to separate the terminal 78 from the contact 77, the stick circuit is broken and the double throw switch returns to its starting position under the action of the spring 59 and the cycle repeats.

Suitable resistances 85 and 86 are connected in the starting and stick circuits in order to cut down the current carried by the heating coils.

The timing of the closing of the normally open switch 21 or 66 in the starting circuit may be adjusted or varied by separating more or less the contact 23 or 68 from the terminal 22 or 67; and the timing of the opening of the switch 28 or 79 in the stick circuit varied or adjusted by varying the mechanical pressure between the terminal 29 and contact 30 or between the contact 77 and terminal 78. As seen in Figure 2 the contact 23 or 68 in each case is a screw which can be turned in one direction or the other to vary the gap between it and the terminal 22 or 67 of the switch 21 or 66. Also, the contact 30 or 77 is a similar screw which can be tightened or loosened to press more or less against the terminal 29 or 78, it being understood that the switches are of resilient material, capable of being tensioned.

Although I have illustrated my invention as in its simplest form, it may be embodied in more or less complex form in connection with other instruments or to control other relays but in any case, the essential feature is the timing of the closing of the starting circuit and the timing of the opening of the stick circuit by electrically operated means controlled by or connected in a feed circuit through the relay or double throw switch.

What I claim is:

1. The combination with a feed circuit and work circuits to be timed; of a cycle timer for connecting the work circuits to the feed circuit including a double throw switch having a movable member normally arranged in one of its two positions, means for returning the movable member to its first position, an electromagnet for throwing the movable member into its second position, the work circuits being connectable to the feed circuit through the movable switch member when in one or the other of its positions, a starting circuit for the magnet, a stick circuit connected in the feed circuit through the double throw switch member when in its second position, a single, normally open switch in the starting circuit, a single, normally closed switch in the stick circuit, electrically operated timing means arranged to close the starting circuit switch and having a circuit connected to the feed circuit through the switch member, when in its first position and electrically operated means for opening the switch in the stick circuit and having a circuit connected to the feed circuit through the double throw switch member, when in its second position.

2. The combination with a feed circuit and work circuits to be timed; of a cycle timer for connecting the work circuits in the feed circuit including a double throw switch having a movable member normally arranged in one of its two positions, means for returning the movable member to its first position, an electromagnet for throwing the movable member into its second position, the work circuits being connectable to the feed circuit through the movable switch member when in one or the other of its positions, a starting circuit for the magnet, a stick circuit connected to the feed circuit through the double throw switch member when in its second position, a single, normally open switch in the starting circuit, a single, normally closed switch in the stick circuit, electrically operated timing means arranged to close the starting circuit switch and having a circuit connected to the feed circuit through the switch member, when in its first position and electrically operated means for opening the switch in the stick circuit, and having a circuit connected to the feed circuit, through the double throw switch member when in its second position, the switches in the starting circuit and the stick circuit being thermal switches and the electrically operated means therefor being heating coils arranged in juxtaposition to the switches respectively to heat and warp the same when the circuits thereof are closed, to close the starting circuit and open the stick circuit.

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