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3,237,183

WATCHMAN TOUR MONITORING SYSTEM

Filed Dec. 16, 1963

2 Sheets-Sheet 1

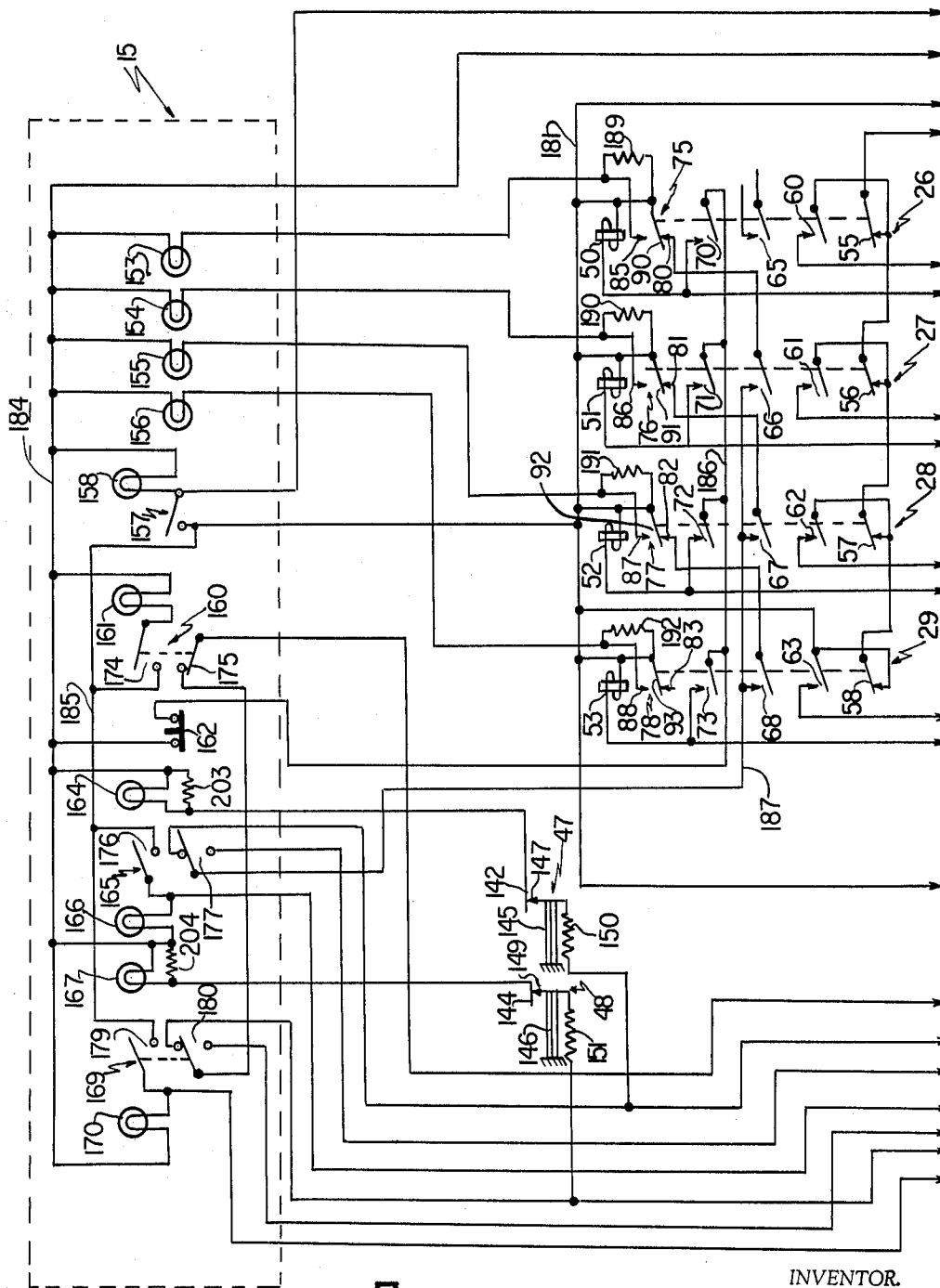


Fig. 1a

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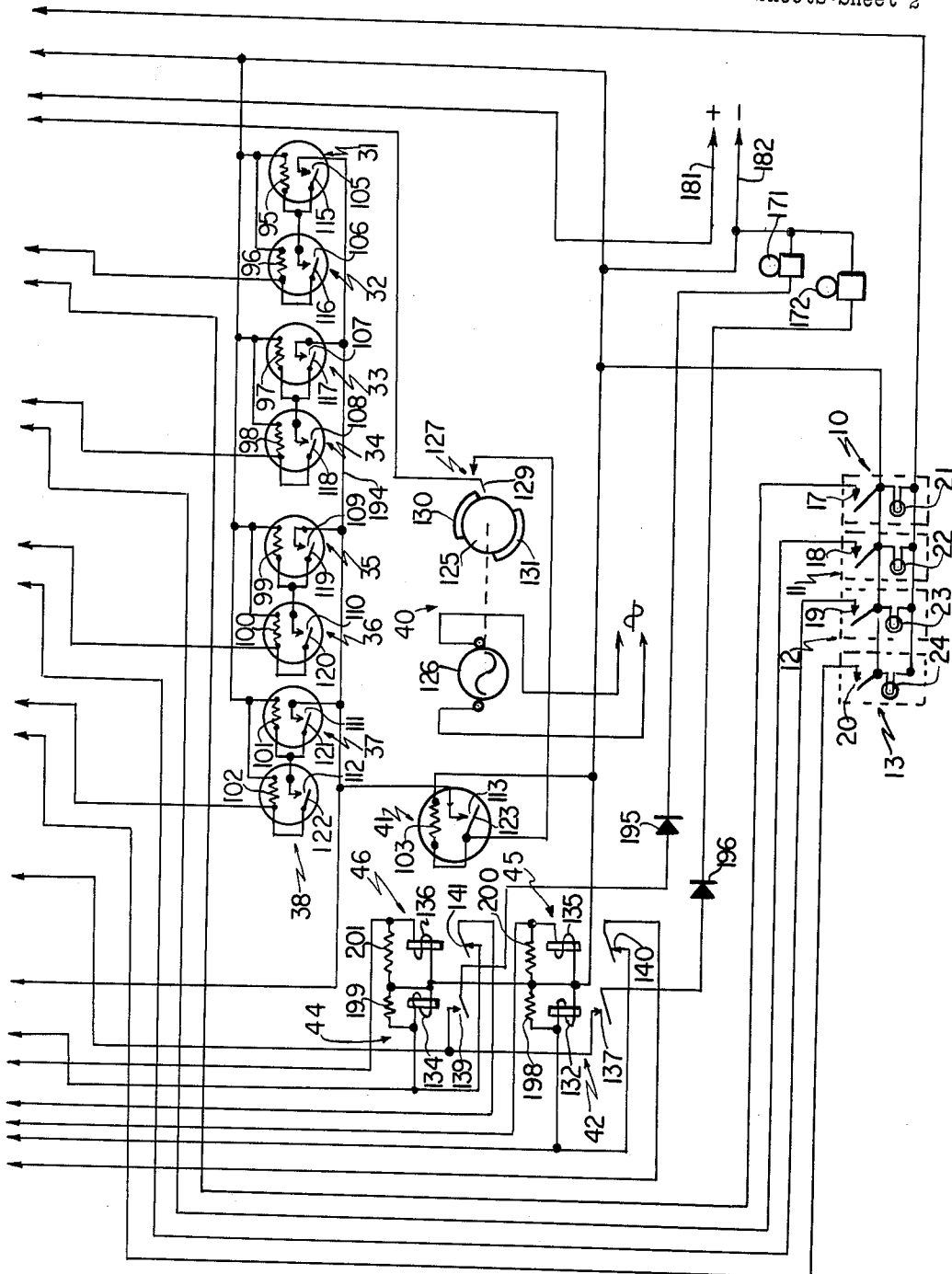


Fig. 1b

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WATCHMAN TOUR MONITORING SYSTEM
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5 Claims. (Cl. 340—306)

This invention relates to systems for monitoring watchmen during the execution of a predetermined tour, and, more particularly, to such a system which automatically gives an alarm if the watchman's movements deviate from a predetermined schedule.

In the past, electrical systems have been used to monitor the movements of a watchman as he made a predetermined tour of the watched premises. In such systems, signal transmitting station boxes are positioned at predetermined locations along the route of the tour to be operated in sequence by the watchman. Each of these station boxes sends a coded signal to a central location where the signal is recorded, for example, on a paper tape. From this record, it can be determined when, and in what order, each station box was operated.

The purpose of any watchman monitoring system is to provide a way of detecting any interruption in the tour, which might indicate that foul play had befallen the watchman, and any failure by the watchman to visit each of the stations throughout the tour route.

In order for the previously mentioned prior system to be effective, it is necessary that an operator be present at the central station to constantly check the sequence of the stations reporting and to keep track of the time elapsed between reports. Since a watchman normally reports at short intervals, the operator watching such a system is forced to stay at his station, or at least not be absent for more than a few minutes at a time. The watchman's tours are conducted for days, weeks, and months without any trouble or deviation from the schedule except in rare instances. During this time, the operator has accomplished nothing and has suffered from frustration, and boredom for lack of an incident.

Accordingly, an object of the present invention is to provide an improved watchman's tour monitoring system.

Another object is to provide such a system which automatically gives an alarm if the watchman fails to operate the station boxes according to a predetermined schedule.

Another object is to provide such a system which automatically gives an alarm if the watchman is overdue in operating a station box.

Another object is to provide such a system which automatically gives an alarm if the watchman operates the station boxes in the wrong sequence.

Another object is to provide such a system which releases the operator to perform other duties in addition to monitoring the system.

A further object is to provide such a system which is relatively simple and economical in construction and is foolproof in operation.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. 1a and FIG. 1b of the drawings are portions of a circuit diagram which, when arranged with FIG. 1a over FIG. 1b so that those conductors extending to the edges of

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the sheets are in alignment, provide a complete circuit diagram of a watchman tour monitoring system in accordance with the present invention.

Referring to the drawing in detail, the system in accordance with the present invention generally comprises a plurality of station boxes 10 to 13, monitoring circuitry, and an alarm and control panel 15. Only four such boxes and elements related to these boxes are shown for the sake of simplicity, but any desired number may be used.

The station boxes 10 to 13 respectively include a switch 17 to 20 and a lamp 21 to 24. The switches 17 to 20 are preferably built into a lock type unit so that they can be closed only by employing a key.

The monitoring circuitry includes a plurality of relays 26 to 29, a plurality of time delay devices 31 to 38, a cam switching assembly 40, a time delay device 41 connected to the switching assembly, two alarm bell relays 42 and 44, two alarm bell cut-off relays 45 and 46, and two flasher units 47 and 48.

The relays 26 to 29 respectively include a coil 50 to 53, four sets of single throw contacts, 55 to 58, 60 to 63, 65 to 68, and 70 to 73, and a set of double throw contacts 75 to 78. The double throw contacts 75 to 78 respectively include a first stationary contact, 80 to 83, a second stationary contact 85 to 88, and a movable contact 90 to 93.

The time delay devices 31 to 38 and 41 respectively include a heater element 95 to 103, and a heat responsive switch 105 to 113 each having a bi-metallic switch arm 115 to 123.

The cam switching assembly 40 includes a cam disc 125, a clock motor 126 for driving the cam disc through one revolution each hour, and a switch 127 provided with a cam follower 129. The cam disc 125 is provided with two switch closing cam portions 130 and 131.

The relays 42, 44, 45, and 46 respectively include a coil 132, 134, 135, and 136, and a pair of switch contacts 137, 139, 140, and 141 respectively.

The two flasher units 47 and 48 respectively include a stationary switch contact 142 and 144; a bi-metallic strip 145 and 146 supported at one end; a movable contact 147 and 149 on the free end of the strip; and a heater 150 and 151 for heating the strip when the contacts are closed.

The alarm and control panel 15 includes a plurality of tour monitoring lamps 153, 154, 155, 156, a guard call switch 157 and lamp 158, a tour disconnect switch 160 and lamp 161, a reset switch 162, an out-of-sequence alarm lamp 164, an out-of-sequence bell cut-off switch 165 and lamp 166, a watchman overdue alarm lamp 167, and a watchman overdue bell cut-off switch 169 and lamp 170. An out-of-sequence alarm bell 171 and a watchman overdue alarm bell 172 are provided at convenient locations to alert the responsible personnel. The bells 171 and 172 are constructed to produce sounds of different pitch or character so that they may easily be distinguished one from another. The tour disconnect switch 160 includes a pair of normally open contacts 174 and a pair of normally closed contacts 175, the out-of-sequence bell cut-off switch 165 includes a pair of normally open contacts 176 and a set of double throw contacts 177, and the watchman overdue bell cut-off switch 169 includes a pair of normally open contacts 179 and a set of double throw contacts 180.

The system is supplied with direct current electrical power from a positive line 181 and a negative line 182. The negative line 182 is connected to a first side of each of the switches 17-20 and to a conductor 184 in the panel 15. The positive line 181 is connected to a first side of each of the relay coils 50-53, to a first side of the alarm relay contacts 139 and 137, and to a conductor 185 in the panel 15. The second side of the switches 17-20 are respectively connected to the second side of the relay coils 50-53 thus connecting each of the switches 17-20 in series

with one of the relay coils 50-53 across the power lines 181 and 182.

With reference to the relays 26-29, the movable contacts 90 to 93 are each connected to the positive line 181, and the lamps 153 to 156 are connected between the negative conductor 184 and the contacts 85 to 88 respectively, so that operation of each of the relays 26 to 29 brightly illuminates the associated lamp 153 to 156. A resistor 189 to 192 is connected between the contacts 85 to 88 and the contacts 90 to 93 respectively to at all times provide a low level of current flow through the lamps to dimly illuminate them and thus indicate that the bulbs are operative. The contacts 70 to 73 are connected between the second or positive side of the switches 17 to 20 respectively and a conductor 186 which is connected through the reset switch 162 to the negative conductor 184. The contacts 70 to 73 thus provide current paths parallel to those through the switches 17 to 20 and latch the relays 26 to 29 in the energized condition after the switches 17 to 20 have reopened. The contacts 66, 67, 68 are connected between the contacts 80, 81, 82 respectively and a conductor 187. The conductor 187 is connected through the normally closed contacts of the bell cut-off switch contact set 177 and then both through the flasher 47 to the alarm lamp 164 and the conductor 184, and through the relay coil 134 to the negative conductor 182.

The contacts 55 to 58 are connected in series with the cam operated switch 127 and the heater 103 of the timer 41 between the positive conductor 181 and the negative conductor 182. The contacts 60 to 63 are respectively connected in series with the timer heaters 96, 98, 100, 102 between the negative line 182 and the positive sides of the contacts 55 to 58 respectively. The timer switches 106, 108, 110, 112 are connected in series with the timer heaters 95, 97, 99, 101 respectively across the heaters 96, 98, 100, 102 respectively. The timer switches 105, 107, 109, 111 are respectively connected between the negative side of the switches 106, 108, 110, 112 and a conductor 194. The conductor 194 is connected through the normally closed tour disconnect switch contacts 175, and the normally closed cut-off switch contacts 180, and is further connected both through the flasher unit 48 and the alarm lamp 167 to the negative conductor 184, and through the relay coil 132 to the negative line 182.

The normally open contacts 139 of relay 44 are connected in series with a diode 195 and the bell 171 between the positive conductor 181 and the negative conductor 182. Likewise, the normally open contacts 137 of the relay 42 are connected in series with a diode 196 and the bell 172 between the conductors 181 and 182.

The coil 136 of the relay 46 is connected in series with the normally open contacts of the contact set 177 between the conductors 182 and 187, and the normally closed contacts 141 of relay 46 are connected in series with the lamp 66 and the normally closed contacts of the contact set 177 between the conductors 184 and 187.

The coil 135 of the relay 45 is connected in series with the normally open contacts of the contact set 180 between the conductor 182 and the conductor 194 (via the switch contacts 175), and the normally closed contacts 140 are connected in series with the lamp 170, the normally closed contacts of the contact set 180, and the contacts 175, between the conductors 184 and 194. A 200 ohm resistor 198 to 201 respectively is connected in parallel with each of the relay coils 132, 134, 135, 136, and 250 ohm resistors 203 and 204 are respectively connected in parallel with the lamps 164 and 167 to insure sufficient current flow to heat the flasher heaters 150 and 151 so that the flashers will operate.

The guard call switch 157 is connected in series with the lamp 158 between the conductors 184 and 185, and also is connected in series with the parallel connected lamps 21 to 24 between the conductors 181 and 182.

The tour disconnect lamp 161 and switch contacts 174 are connected in series between the conductors 184 and

185, the lamp 166 and the contacts 176 are connected in series between the conductors 184 and 185, and the lamp 170 and the contacts 179 are likewise connected.

In operation, the clock motor 126 is energized and rotates the cam disc 125 one revolution each hour. Each half hour one of the cam portions 130 or 131 closes the switch 127 to start a tour and holds the switch closed for about 15 minutes.

When the switch 127 closes, current flows from the line 181 to the line 182 through the relay contacts 58, 57, 56, 55 and through the heater coil 103 of the timer 41. The current flow through the coil 103 heats the bimetallic strip 123 of the contacts 113 causing it to slowly bend so as to close the contacts after a predetermined time delay. The watchman is scheduled to arrive at the first station box 10 before the contacts close, and when he arrives he momentarily close the switch 17 to operate the relay 26.

When the relay 26 is operated, the contacts 75 are operated to light the lamp 153 to indicate that the station box 10 has been operated, the contacts 70 hold the coil 50 in energized condition, the contacts 55 break the circuit to the timer 41, and the contacts 60 provide a closed circuit between the conductors 181 and 182 through the contacts 58, 57, 56 and the heater coil 96 of the timer 32. After a predetermined period of time the contacts 106 of the timer 32 close in response to the heat of the coil 96 and the heater coil 95 of the timer 31 is connected in parallel with the coil 96 to provide a further time delay.

Before the contacts 105 of the timer 31 close, the watchman should have arrived at the second station and should have operated the switch 18 to actuate the relay 27. If however, the watchman did not operate the switch 18 within the proper period, the contacts 105 close and current would flow from the line 181 through the relay contacts 58, 57, and 56, the relay contacts 60 (which are then closed), the timer contacts 106 and 105, the conductor 194, the normally closed contacts of switches 175 and 180, and then the current divides, one portion flowing through the flasher 48 and the alarm lamp 167 to the conductor 184, another portion flowing through the relay coil 132 to the conductor 182, and a third portion flowing through the normally closed contacts 140 of relay 45 and through the alarm cutoff lamp 170 to the negative conductor 184. The current flow through the flasher 48 passes through the heater 151 which quickly heats the bimetallic strip 146 sufficiently to move contact 149 away from contact 144 and break the circuit. The current flow to the lamp is interrupted and the strip 146 cools and moves contact 149 back to re-establish current flow. This operation is repeated rapidly causing the lamp 167 to flash on and off. The current flow through the relay coil 132 closes the contacts 137 allowing current to flow from the conductor 181 through the diode 196 and the bell 172 to the conductor 182. In the alarm condition, both the lamps 167 and 170 are illuminated and the bell 172 rings.

The cutoff switch 169 is operated to silence the alarm bell 172. The switch contacts 180 are thus operated to break the existing current paths to the lamps 167 and 170 and to the relay coil 132, and instead to connect the relay coil 135 to the conductor 194 to open the relay contacts 140. At the same time, the switch contacts 179 close to provide a current path through the lamp 170. Thus only the lamp 170 is lit after the switch 169 is operated.

If the switch 169 should be accidentally operated when there is no signal (i.e. conductor 194 is not connected to positive line 181) then the relay coil 135 will not be energized, the contacts 140 will remain closed, and current will flow from positive line 185 through contacts 179, the contacts 140, and then both through the relay coil 132 to negative conductor 182 and through the flasher 48 and the lamp 167 to the negative conductor 184. Thus the alarm bell 172 and the alarm lamp 167 are energized to indicate a trouble condition exists.

If during his tour the watchman bypasses one of the station boxes, for example the station box 12, and operates the switch at the next station box, for example switch 20 at station box 13, the out-of-sequence alarms are energized as follows. Under this condition the relay 28 is unenergized and the contacts 82 and 92 connect the positive line 181 to the contacts 68 of the relay 29. When the relay 29 is energized by the operation of switch 20, the contacts 68 close and current flows (from the line 181) through the contacts 68, the conductor 187, the normally closed contacts of the contact set 177 and then through the flasher 47 and the lamp 164 to the negative line 184, through the relay coil 134 to the negative conductor 182, and through the contacts 141 and the lamp 166 to the negative conductor 184. Thus the lamp 164 is made to flash on and off and the relay 44 operates to close the contacts 139 and sound the bell 171.

The cutoff switch 165 is operated to silence the alarm bell 171. The switch contacts 177 of the switch 165 are thus moved to break the existing current paths from the conductor 187 to the lamp 164, the relay coil 134, and the lamp 166, and to establish a current flow from the conductor 187 through the relay coil 136 to open the relay contacts 141. At the same time, the contacts 176 of the switch 165 are closed to connect the lamp 166 across the conductors 184 and 185 to maintain the lamp 166 illuminated.

As with switch 169, if the switch 165 is operated when there is no alarm signal to energize the relay 46, current will flow from conductor 185 through the switch contacts 176, the relay contacts 141, to the relay coil 134 and through the flasher 47 to the lamp 164 to give audible and visual indication that something is wrong.

If at any time it is wished to have the guard report back to the control station the switch 157 is closed to connect each of the lamps 21 to 24 between the conductors 185 and 182 and thus provide an indication at each station box that the watchman should report back. Also, the lamp 158 is illuminated to indicate that the switch 157 is closed.

When the tour has been completed, all of the relays will be latched in the energized position (if all of the station boxes were operated). The system is then reset by pressing the switch 162 which cuts off power to the latching contacts 70 to 73 and the relays become de-energized.

When it is desired to turn off the system, for example during the normal working hours when the building is fully occupied, the tour disconnect switch 160 is operated. The contacts 175 of the switch 160 disconnect the alarm transmitting conductor 194 from the alarm circuit while the contacts 174 thereof light the lamp 161 to indicate that the switch has been thrown. During this period the motor 126 may continue to run so that the tour will start on time when the system is turned on again.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. In a system for monitoring the movements of a watchman throughout a tour of a plurality of check stations to be visited in a predetermined sequence within a predetermined time interval, the combination of a plurality of switches each at one of the stations, a plurality of relays each connected to be operated by the operation of one of said switches, first and second contact sets on each of said relays, said first contact set of each relay being interconnected with said second set of the next relay in the sequence, an indicating circuit connected to said inter-

connected contact sets for giving an indication if any relay is operated before the previous relay in the sequence is operated, a second indicating circuit, a plurality of time delay switching devices each connected to one of said relays to close said second indicating circuit a predetermined time interval after each relay is operated, and means for inerting said time delay switching devices when the next relay in the sequence is operated before said interval has expired.

2. A system according to claim 1 including means for holding each operated relay in the operated condition, and a plurality of indicating means each under the control of one of said relays for indicating which switches have been operated.

3. In a system for monitoring the movements of a watchman throughout a tour of a plurality of check stations to be visited in a predetermined sequence, the combination of a plurality of switches each at one of the stations, a plurality of relays each connected to be operated by the operation of one of said switches, means for holding each operated relay in the operated condition, a first normally closed contact set and a second normally open contact set on each of said relays, said first contact set of each relay being connected in series with said second contact set of the next relay in the sequence, an indicating circuit connected across said series connected contact sets to give an indication if any relay is operated to close said second set thereof before the previous relay in the sequence is operated to open said first set thereof.

4. In a system for monitoring the movements of a watchman throughout a tour of a plurality of check stations to be visited in a predetermined sequence within a predetermined time interval, the combination of a plurality of switches each at one of the stations, a plurality of relays each connected to be operated by the operation of one of said switches, means for holding each operated relay in the operated condition, a set of contacts on each of said relays, an indicating circuit, a plurality of time delay switching devices each connected to said set of contacts of one of said relays and to said indicating circuit for closing said indicating circuit a predetermined time interval after each relay is operated and means for inerting said time delay switching devices when the next relay in the sequence is operated before said interval has expired.

5. In a system for monitoring the movements of a watchman throughout a tour of a plurality of check stations to be visited in a predetermined sequence within a predetermined time interval, the combination of a plurality of switches each at one of the stations, a plurality of relays each connected to be operated by the operation of one of said switches, means for holding each operated relay in the operated condition, a set of normally open contacts and a set of normally closed contacts on each of said relays, a time delay switching device associated with each of said relays and having a control circuit and an output circuit, an indicating circuit connected to said output circuits of said switching devices, said normally open contacts of each relay being connected in series with said control circuit of said associated switching device and with normally closed contacts of the next relay in the sequence across a source of power, whereby when one of said relays is operated said normally open contacts thereof close and current flows through the control circuit of the associated time delay switching device and when the next relay in the sequence is operated said normally closed contacts thereof are operated to interrupt the current flow through the control circuit of the time delay switching device.

No references cited.

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