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INDICATING AND RECORDING SYSTEM

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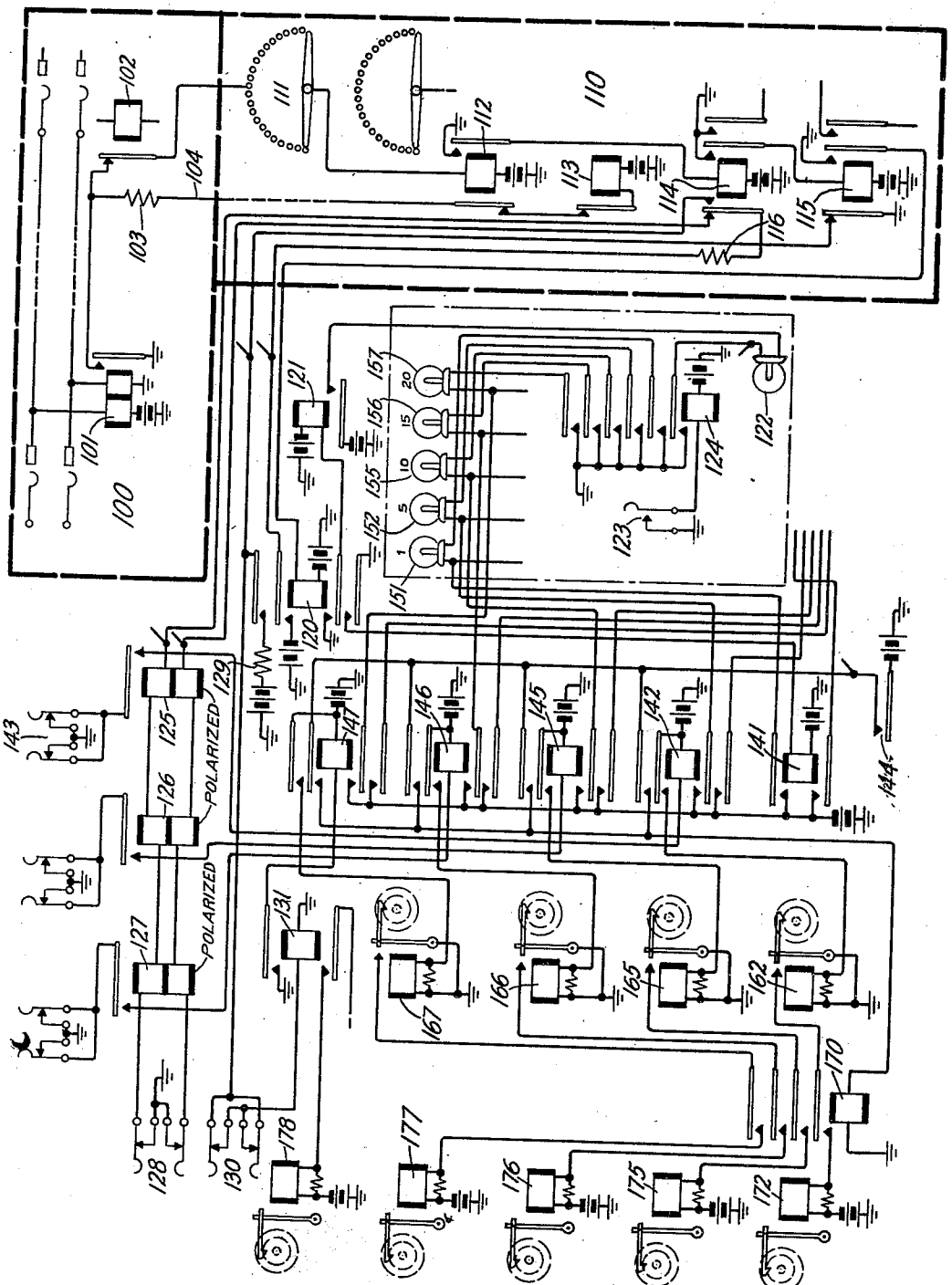

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INDICATING AND RECORDING SYSTEM

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The purpose of this invention will be more clearly understood from a consideration of the detailed description which follows in connection with the drawing which shows the recording and indicating equipment in detail and portions of other circuits with which it is adapted to be used.

The embodiment of the invention shown in the drawing is one adapted for use in connection with the call distributing system disclosed in the patent of W. W. Carpenter et al., No. 1,816,634, granted July 28, 1931. In that patent calls incoming to a centralized information office are stored by associating a storing circuit with the trunk over which the call is incoming. These storing circuits are selected in a predetermined order and if an operator is idle the associated trunk is connected with an operator's position. When the trunk has been so connected the storing circuit is released to store another call. The call remains stored until all preceding calls have been attended to and an operator becomes idle. The number of stored calls, therefore, gives an indication of the adequacy of the service. The storing circuit has, therefore, been selected as the unit by which the recording and indicating equipment shall be controlled.

Referring now more specifically to the drawing the upper rectangle shows schematically the trunk circuit 100, while the lower right rectangle shows portions of a storing circuit 110. The lower left rectangle shows a relay and a plurality of lamps located at an operator's position. When a call is extended to the trunk circuit 100, relay 101 is operated and initiates the extension of the call to an idle operator's position. Relay 101 connects ground over its front contact and the back contact of relay 102 to the corresponding terminals in all storing circuits. It also connects ground through resistance 103 to an allotter which in turn establishes a circuit for operating magnet 113 of a storing circuit switch. This intervening apparatus has been indicated by the broken portion of conductor 104. The operation of magnet 113 causes brush 111 to pass over its contacts until it reaches the contact marked by relay 101. A circuit is then closed from ground on that contact to the winding of relay 112 which operates and opens the circuit of magnet 113 bringing the switch to rest in engagement with the calling trunk. Relay 112 also closes an obvious circuit for relay 114 which in turn operates relay 115. Relays 114 and 115 indicate to the starting equipment (not shown) that a call has been stored and to prepare circuits for controlling the connection of the trunk with the operator's position.

Relay 115 closes a circuit from ground over its inner right contact through the winding of relay 120 to battery. Relay 120 operates relay 121 which lights a lamp such as lamp 122 at each operator's position where key 123 is closed to operate relay 124 and supply ground to the lamp circuits. Key 123 is shown merely as a convenient way of operating relay 124 which would ordinarily be controlled by a contact on the operator's telephone jack or other convenient means, since, when the position is vacant, the lamps have no utility. Relay 120 also supplies battery over its inner upper contact to resistance 116 and the left armature of relay 114. This battery also extends in multiple to the similar resistances and armatures of all of the storing circuits.

In the storing circuit shown, since relay 114 is assumed to have been operated, a circuit extends from battery as above traced over the front contact of relay 114, through the lower windings of relays 125, 126 and 127 to ground through key 128. Assuming that this is the only storing circuit busy, circuits are also closed over the left back contact of the other relays 114 through the upper windings of relays 125, 126 and 127 to ground through key 128. Relay 120 also closes a circuit from battery through resistance 129 over its outer upper contact, over the contact of key 130 to the winding of relay 131 and ground. A branch of this circuit extends in multiple to the back contacts of relays similar to relay 115 in all of the storing circuits. In the circuit shown, relay 115 being operated, this circuit is open, but in the remaining storing circuits, this

circuit extends to ground thus shunting the winding of relay 131 and preventing its operation. Relay 120 also closes a circuit from ground over its lower contact through the winding of relay 141 to battery. Relay 141 closes a circuit from battery through its upper front contact to lamp 151 and to other similar lamps at other positions.

When the trunk circuit 100 has been associated with an operator's position, relay 102 is operated opening the circuit of relay 112 and in turn the circuits of relays 114 and 115, resulting in the release of relays 120, 121 and 141 and the darkening of lamps 122 and 151. The allotting equipment indicated by the dotted section of conductor 104 prevents the reoperation of magnet 113 until storing circuit 110 is again allotted for use. If storing circuit 110 was the only one in use at the time, the battery supply for relays 127, 126 and 125 is disconnected when the storing circuit becomes idle, thus preventing unnecessary current flow and heating of the relays when no storing circuits are busy.

Relays 125, 126 and 127 are polarized, the upper winding tending to prevent the closure of the relay contact and the lower winding tending to cause its closure. As set forth above, the circuits through the two windings of these relays extend in multiple to contacts of relays such as relay 114 in all storing circuits. As soon as one storing circuit becomes busy battery is supplied to the armature of all relays 114 and circuits are closed through the two windings of relays 125 to 127 as previously described. Since in the system illustrated there are twenty storing circuits, when one storing circuit is busy the circuit of the lower winding of these relays extends to battery through one resistance 116, while the circuit through the upper winding extends to battery through nineteen such resistances in parallel. That is, the resistance in the circuit through the upper windings is approximately one nineteenth that in the lower windings. As additional storing circuits become busy the lower winding circuit includes more parallel resistances and the upper winding circuit includes fewer so that the resistance of the lower winding circuit decreases while that of the upper winding circuit increases. Relay 125 is wound so that when five storing circuits or one-fourth of the total number are busy, the lower winding becomes effective to close the relay contact. Relay 126 is wound so that when one-half of the storing circuits or ten are busy it will close its contact while relay 127 closes its contact when three quarters of the storing circuits or 15 are busy. If the number increases beyond the marginal number, the increased current merely holds the relays operated in each case. When all of the storing circuits are busy, all of the relays 115 will be operated and the shunt around the winding of relay 131 opened at the back contacts of relays 115.

Relay 125 in operating, closes a circuit for relay 142 from ground at key 143. Relay 142 closes a circuit for lamp 152 and similar lamps at the various operators' positions. It also closes an obvious circuit for meter 162 to indicate the number of times that five storing circuits have become busy. In addition it closes a circuit from battery through the clock controlled contact 144 over the uppermost contact of relay 142 to the winding of relay 170 and ground. Relay 170 operates once every six seconds under the control of contact 144 as long as relay 142 remains operated. With relay 170 and meter 162 operated, a circuit is closed from battery through the winding of meter 172 and the contact of relay 170 to ground through the contact of meter 162. The readings of meters 162 and 172 serve to indicate the average length of time that five storing circuits remain busy. For example, assume that between readings of the meters, the meter 162 has operated ten times and meter 172 has operated fifty times. Since meter 172 operates once every six seconds during the time that meter 162 is operated, the fifty operations of meter 172 indicate an elapsed time of 300 seconds, and since during that 300 seconds meter 162 is operated ten times the average length of time that each operation continued will be 30 seconds. It is, of course, to be understood that such an indication would not usually mean that the same five storing circuits remained busy throughout the entire time but that as many as five were busy at the same time, the individual storing circuits making up the group varying as the apparatus functions.

Similarly the operation of relay 126 causes relay 145 to in turn operate meter 165 and light the lamp 155 to indicate and record the number of times that ten storing circuits were busy. Meter 175 like meter 172 serves in the calculation of the average duration of such a busy condition. Relay 127 in like manner operates relay 146 to control meters 166, and 176 and lamp 156. Relay 131 operates relay 147 which in turn operates meters 167 and 177 and lights lamp 157. In addition relay 131 prepares a circuit for meter 178 which records the number of calls received while all of the storing circuits are busy.

It is apparent from the above description that the present recording and indicating arrangement provides a close check on the functioning of the distributing equipment and permits more efficient management of the office routines. In addition the display of the lamps before the individual operators shows them when congestion occurs

and encourages them to increased effort. The numerous keys permit the use of only such parts of the equipment as seems desirable. While the recording and indicating equipment has been shown associated with a call distributing arrangement, it is obvious that it is applicable to any sort of electrical circuit where the operation of a relay may indicate a particular condition of that equipment.

What is claimed is:

1. In a signaling system, a plurality of circuits, means for marking said circuits as busy or idle, indicating means, and means to operate said indicating means when a predetermined random number less than all of said circuits are busy whether the remaining circuits are busy or idle.

2. In a signaling system, a plurality of circuits, means for marking said circuits as busy or idle, a meter and means to operate said meter when a predetermined random number less than all of said circuits are busy whether the remaining circuits are busy or idle.

3. In a signaling system, a plurality of circuits, means for marking said circuits as busy or idle, a meter, a timing device and means to operate said meter under the control of said timing device when a predetermined number less than all of said circuits becomes busy whether the remaining circuits are busy or idle.

4. In a telephone system, a plurality of first circuits, means for associating said first circuits with other circuits, and means to indicate when a predetermined random number less than all of said first circuits are associated with said other circuits whether or not the remaining first circuits are associated with said other circuits.

5. In a telephone system, a plurality of first circuits, means for associating said first circuits with other circuits, a signal, and means to display said signal when a predetermined random number less than all of said first circuits are associated with said other circuits whether or not the remaining first circuits are associated with said other circuits.

6. In a telephone system, a plurality of first circuits, means for associating said first circuits with other circuits, a meter, and means to operate said meter each time that a predetermined random number less than all of said first circuits become associated with said other circuits whether or not the remaining first circuits are associated with said other circuits.

7. In a telephone system, a plurality of first circuits, means for associating said first circuits with other circuits, a meter, a timing device, and means to repeatedly operate said meter under the control of said timing device whenever a predetermined random number less than all of said first circuits become associated with said other circuits whether or not the remaining first circuits are associated with said other circuits.

8. In a telephone system, a plurality of first circuits, means for associating said first circuits with other circuits, and means to indicate the average length of time that a predetermined random number less than all of said first circuits remain associated with said other circuits, comprising a meter, a second meter, a timing device, means to operate said first meter each time that said predetermined number of first circuits becomes associated with said other circuits, and means to repeatedly operate said second meter under the control of said timing device as long as said predetermined number of first circuits are associated with said other circuits.

9. In a signaling system, a plurality of first circuits, means for associating said first circuits with other circuits, and means to indicate when a plurality of different predetermined proportional numbers of said circuits are associated with said other circuits.

10. In a signaling system, a plurality of circuits, means for associating said circuits with other circuits, a plurality of lamp signals, and means to display a different one of said lamp signals when each of a plurality of different predetermined proportional numbers of said circuits are associated with said other circuits.

11. In a signaling system, a plurality of circuits, means for associating said circuits with other circuits, a plurality of meters, and means to operate a different one of said meters whenever each of a plurality of different predetermined proportional numbers of said circuits are associated with said other circuits.

12. In a signaling system, a plurality of circuits, means for associating said circuits with other circuits, and means to indicate the average length of time that each of a plurality of different proportional numbers of said circuits are busy, comprising a plurality of meters, a second plurality of meters, a timing device, means to operate one of said first plurality of meters each time that a corresponding proportional number of said circuits are associated with said other circuits, and means to repeatedly operate a corresponding one of said second plurality of meters under the control of said timing device as long as said proportional number of said circuits remain associated with said other circuits.

13. In a signaling system, a plurality of responsive devices, means for associating said devices with other equipment, and means to indicate when a predetermined random number of said devices are associ-

ated with other equipment, said indicating means comprising a polarized relay having two windings, a circuit through each winding of said relay, each circuit extending in multiple to all of said devices, and means in each device for completing one or the other of said circuits according as said device is or is not associated with other equipment.

14. In a signaling system, a plurality of responsive devices, means for associating said devices with other equipment, and means to indicate when a predetermined random number of said devices are associated with other equipment, said indicating means comprising a polarized relay having two windings, a circuit through each winding of said relay, each circuit extending in multiple to all of said devices, means in each device for completing one or the other of said circuits according as said device is or is not associated with other equipment, a lamp, and means controlled by said polarized relay whenever a predetermined number of said devices are associated with other equipment to light said lamp.

15. In a signaling system, a plurality of responsive devices, means for associating said devices with other equipment, and means to record when a predetermined random number of said devices are associated with other equipment, said recording means comprising a polarized relay having two windings, a circuit through each winding of said relay, each circuit extending in multiple to all of said devices, means in each device for completing one or the other of said circuits according as said device is or is not associated with other equipment, a meter, and means controlled by said polarized relay whenever a predetermined number of said devices are associated with other equipment to operate said meter.

16. In a signaling system, a plurality of responsive devices, means for associating said devices with other equipment, means to indicate when each of a plurality of predetermined proportional numbers of said devices are associated with other equipment, said indicating means comprising a plurality of polarized relays, each having two windings, a circuit extending in series through one winding of each of said relays, a second circuit extending in series through the other winding of each of said relays, each of said circuits extending in multiple to all of said devices, means in said devices for completing either the first or the second of said circuits according as the device is or is not associated with other equipment, the windings of said relays being so proportioned that each relay operates when a different predetermined number of said first circuits have been completed.

17. In a signaling system, a plurality of responsive devices, means for associating said devices with other equipment, means to indicate when a plurality of predetermined proportional numbers of said devices are associated with other equipment, said indicating means comprising a plurality of polarized relays, each having two windings, a circuit extending in series through one winding of each of said relays, a second circuit extending in series through the other winding of each of said relays, each of said circuits extending in multiple to all of said devices, means in said devices for completing either the first or the second of said circuits according as the device is or is not associated with other equipment, the windings of said relays being so proportioned that each relay operates when a different predetermined number of said first circuits have been completed, a plurality of lamp signals, and means controlled by said relays to display the corresponding one of said lamp signals.

18. In a signaling system, a plurality of responsive devices, means for associating said devices with other equipment, means to indicate when a plurality of predetermined proportional numbers of said devices are associated with other equipment, said indicating means comprising a plurality of polarized relays, each having two windings, a circuit extending in series through one winding of each of said relays, a second circuit extending in series through the other winding of each of said relays, each of said circuits extending in multiple to all of said devices, means in said devices for completing either the first or the second of said circuits according as the device is or is not associated with other equipment, the windings of said relays being so proportioned that each relay operates when a different predetermined number of said first circuits have been completed, a plurality of meters, and means controlled by each of said relays to operate a corresponding meter to record the number of times the corresponding number of devices become associated with other equipment.

In witness whereof, we hereunto subscribe our names this 1st day of October, 1929.

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