

July 15, 1941.

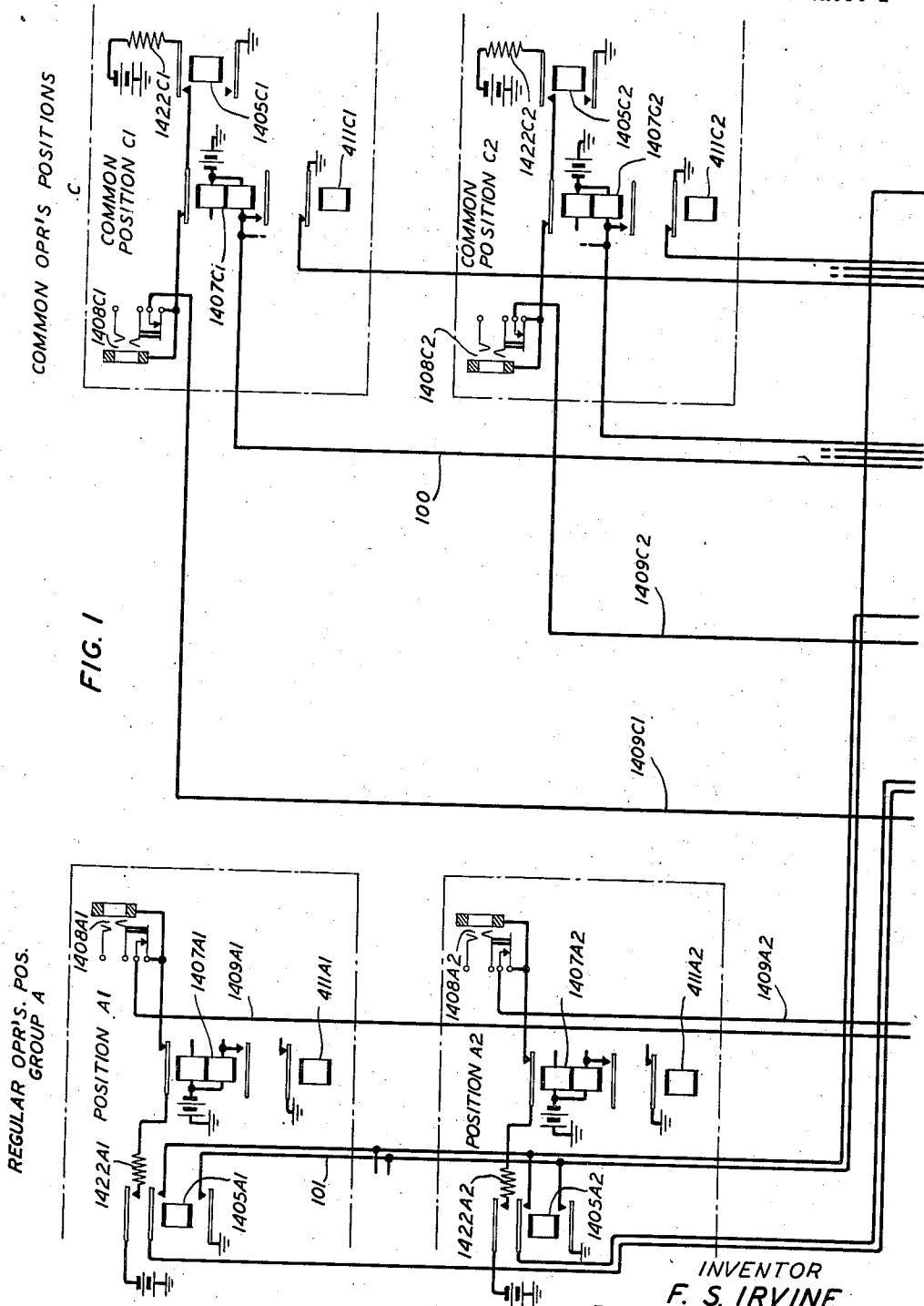
F. S. IRVINE

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OPERATOR'S POSITION CIRCUIT

Filed April 3, 1940

2 Sheets-Sheet 1



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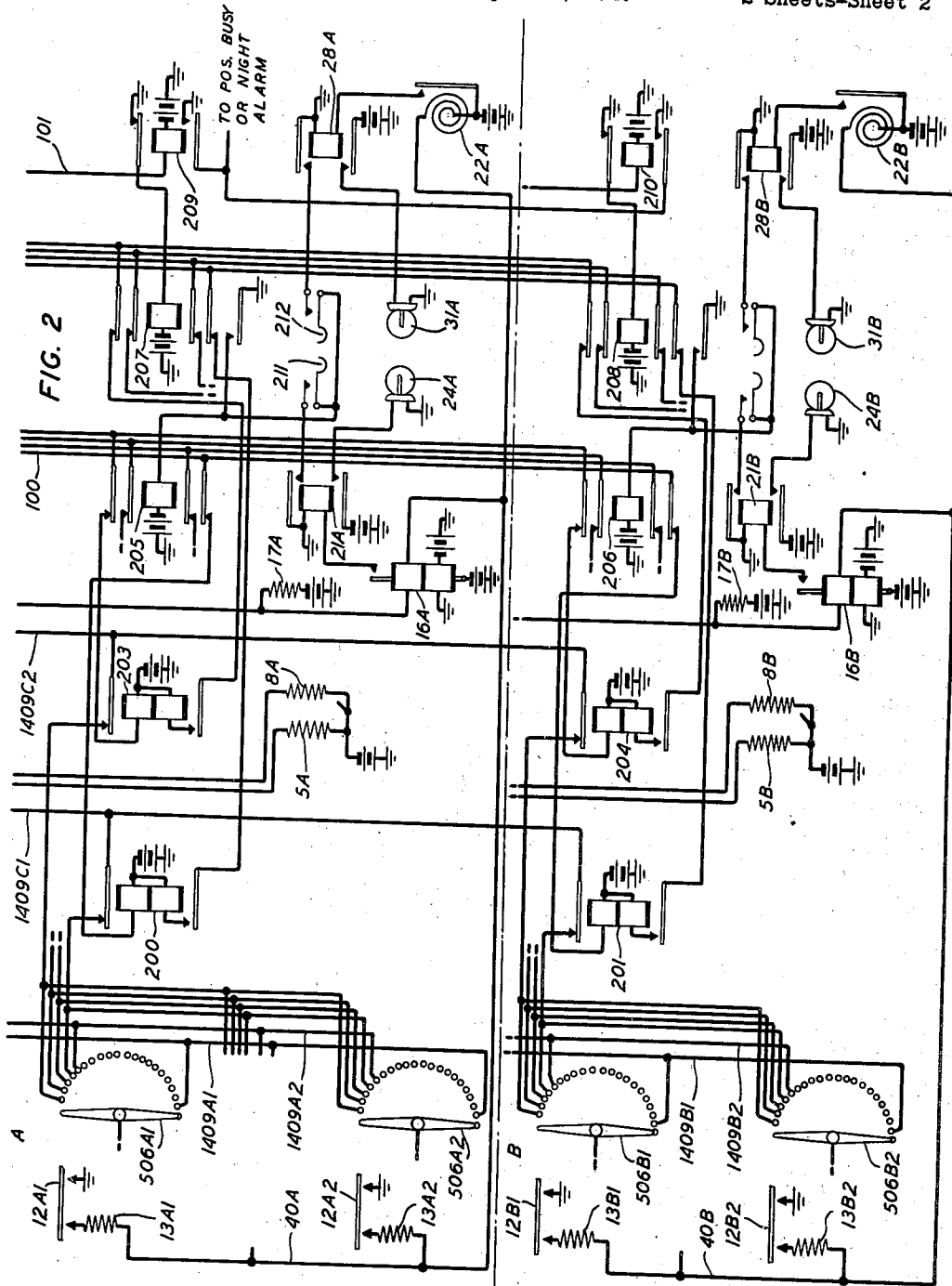
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OPERATOR'S POSITION CIRCUIT

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9 Claims. (Cl. 179-27)

This invention relates to telephone systems and has for its object to increase the efficiency of such systems.

When manual and dial telephone exchanges are interconnected it is customary to employ operators at the dial exchanges to receive instructions from the manual exchanges and to control the dial equipment in accordance therewith. In one such system link circuits interconnect the incoming trunks, the operators' positions and the register senders. The incoming trunks are arranged in two groups and the link circuits and positions are similarly grouped. A few operators' positions are provided which serve both sets of link circuits. Since the link circuits test the operators' positions in succession, the common positions are tested twice as often as the different group positions and it has been found that the operators at the common positions are sometimes excessively busy.

In accordance with the present invention, means is provided for rendering common positions available at a later stage in the handling of a call than that at which the group operators become available. Means is also provided when calls are waiting to render the common positions available at the same stage as the group operators.

The features of the invention will become more apparent from a consideration of the following description taken in connection with the drawings in which:

Fig. 1 shows two group operators' positions and two common operators' positions; and

Fig. 2 shows two links of each group and two calls waiting signal circuits.

These drawings are based on the disclosures of Patent 1,855,616, granted to W. E. Stevens, April 26, 1932, and on Patent 2,060,585, granted on November 10, 1936 to C. G. Miller. Where possible, the same reference characters will be employed as are used in these patents. Where the same piece of equipment appears more than once, suffixes such as A1, B1, etc. will be employed. Reference is hereby made to the above-mentioned patents for complete descriptions of the operations involved.

In the drawings, group operators' positions A1 and A2 of group A are shown at the left of Fig. 1 and common operators' positions C1 and C2 are shown at the right of Fig. 1.

In Fig. 2 four link circuits, two from each group are represented by the brush of the position finder over which the link tests for an idle position. In addition, one sequence switch cam, namely,

that over which the calls waiting signal circuit is controlled, is shown for each link.

Referring to the first group position A1, when an operator occupies the position, the connection of her headset thereto operates relay 1405A1. Relay 1405A1 connects battery through resistance 1422A1, over the upper back contact of relay 1407A1 and the normal contacts of jack 1408A1 to conductor 1409A1 which is multiplied to one contact of each of the banks to which brushes 506A1 and 506A2 as well as the remaining test brushes of the A group of links have access. Similarly, when position A2 is occupied an idle battery will be connected over conductor 1409A2 to contacts of the banks to which brushes 506A1, 506A2, etc. have access. The test brushes 506B1, 506B2, etc. of link group B have access in common to a B group of operators' positions.

The common operators' positions, when occupied and idle, connected battery to conductors 1409C1, 1409C2, etc. and these conductors are multiplied to bank terminals to which the test brushes of both groups of links have access.

As described in the above-identified Stevens patent, when a link is seized it hunts for an idle operator's position and establishes a connection therewith, over which the position is marked busy and a talking connection is established over which the operator receives the wanted number. When the operator starts to operate her key-set to record the number, relay 1407A1 operates, opening the connection of battery to conductor 1409A1 and permitting the link to advance.

In the circuit disclosed in the Stevens patent each operator has a key-set which includes a row of keys for each digit of a telephone designation and the recorded number is transmitted to the associated sender by means of a series of code pulses. When a key has been operated in each row of the key-set, the locking circuit of relay 1407A1 is opened and that relay releases to restore the connection of battery to conductor 1409A1 so that the operator's position may be selected and the operator may receive another wanted number while the code pulses are being transmitted. When the pulsing circuit is ready to send out the last digit relay 411A1 is operated.

The functioning of a common operator's position, for example, position C1, is very similar to that of the group operator. However, each common position is provided with two relays 200 and 201, one for each group of links, and conductor 1409C1, which is marked by battery when position C1 is idle, is connected over the back contact of relay 200 to bank contacts to which brushes

506A1, 506A2, etc. of the group A links have access and over the back contact of relay 201 to the bank contacts to which brushes 506B1, 506B2, etc. of the group B links have access. Relays 203 and 204 connect conductor 1409C2 to the links of groups A and B, respectively.

When common position C1 is seized and relay 1407C1 operates, the operating ground for relay 1407C1 is extended over conductor 100, lower back contact of relay 205, to the upper winding of relay 200 and battery and over the lower back contact of relay 206 to the upper winding of relay 201 and battery. Relay 200 operates and locks in a circuit from battery through its lower winding and front contact, outer lower back contact of relay 207, to ground at the back contact of relay 411C1. In a similar manner relay 201 operates and locks over the outer lower back contact of relay 208 to ground at the back contact of relay 411C1. Relays 200 and 201 disconnect conductor 1409C1 from the bank contacts of the link groups A and B respectively. The release of relay 1407C1 at the end of the keying operation reconnects battery to conductor 1409C1 but with relays 200 and 201 operated, the position is not marked idle to the group switches until relay 411C1 operates, when the number has been transmitted to the sender. This delay in marking the common position available is effective, when group positions are available, to equalize the seizure of the group and common positions.

However, when one or the other group of positions is vacated, this delay is removed so that the common operators may serve that group. When a position, for example position A1, is occupied operating relay 1405A1, ground is connected to conductor 101, operating relay 209. As long as one operator's position of the group is occupied, relay 209 will be held operated, but when all of the positions are vacated relay 209 releases, operating relay 207. Relay 207 in turn operates relay 205 and these relays open the operating and locking circuits of relays 200 and 203 so that the common positions become available at the same stage as the group positions. However, as regards group B, relays 201 and 204 still function and the common positions are held busy to this group until the later time.

The group B positions control a relay 210 which in turn controls relays 208 and 206 to remove the delay at the common positions when all B positions are vacated.

There may be times when, although group positions are available, the calling rate is high enough to overload one group or the other. For the purposes of indicating such a condition an arrangement known as a calls waiting signal circuit has been provided and this circuit is disclosed in the above-identified Miller patent. Two such circuits have been indicated at the right of Fig. 2. While each link is hunting for a position, ground is connected over cam 12A1 for example, through resistance 13A1 over conductor 40A through the upper winding of polarized relay 16A to battery through resistance 17A. Each of the group positions closes a circuit which may be traced by way of example from battery through resistance 5A and inner upper contact of relay 1405A1, in parallel with resistance 17A and battery. As pointed out in the Miller patent, the resistances are selected to cause relay 16A to operate at a predetermined relative congestion of incoming calls, at which point relay 21A operates, lighting lamp 24A. Voltmeter relay 22A closes its contact at a voltage which represents a dif-

ferent relative congestion, operating relay 28A and lighting lamp 31A. Keys 211 and 212 are provided to cancel the delay for the common positions at either desired point of congestion. With key 211 operated, the operation of relay 21A operates relay 205 to prevent the operation of relays 200 and 203, while with key 212 operated, relay 205 is operated under the control of relay 28A. It may be noted, that when the delay is removed by the calls waiting signal circuit, the operating circuits of relays 200 and 203 are opened immediately, but the locking circuits remain closed, so that if a call has locked in the delay, it will be completed on that call but not on subsequent calls.

A similar calls waiting signal circuit is provided for the group B links and positions.

What is claimed is:

1. In a telephone system, link circuits divided into groups, operators' positions individual to said groups, operators' positions common to said groups, means to associate one of said link circuits with one of said positions, means to mark said positions available when occupied and idle, means responsive to the association of said link circuit with an available position to remove said marking, means to restore said marking at a particular stage of the operation of said position equipment, and means individual to said common positions to delay the effect of said restoring means until a later stage of the operation of said common position equipment.

2. In a telephone system, link circuits divided into groups, operators' positions individual to said groups, operators' positions common to said groups, means to associate one of said link circuits with one of said positions, means to mark said positions available when occupied and idle, means responsive to the association of said link circuit with an available position to remove said marking, means to restore said marking at a particular stage of the operation of said position equipment, means individual to said common positions to delay the effect of said restoring means until a later stage of the operation of said common position equipment, and means under the control of said group positions to cancel said delay.

3. In a telephone system, link circuits divided into groups, operators' positions individual to said groups, operators' positions common to said groups, means to associate one of said link circuits with one of said positions, means to mark said positions available when occupied and idle, means responsive to the association of said link circuit with an available position to remove said marking, means to restore said marking at a particular stage of the operation of said position equipment, means individual to said common positions to delay the effect of said restoring means until a later stage of the operation of said common position equipment, and means under the control of one of said groups of positions to cancel said delay with regard to said group.

4. In a telephone system, link circuits divided into groups, operators' positions individual to said groups, operators' positions common to said groups, means to associate one of said link circuits with one of said positions, means to mark said positions available by connecting a predetermined potential to a conductor to which said link circuits have access, means in said position to remove said potential from said conductor during the operation of said position equipment,

means to reconnect said potential to said conductor at a particular stage of the operation of said position equipment and means individual to said common positions to disconnect said conductor from said link circuits until a later stage in the operation of said position equipment.

5. In a telephone system, link circuits divided into groups, operators' positions individual to said groups, operators' positions common to said groups, means to associate one of said link circuits with one of said positions, means to mark said positions available by connecting a predetermined potential to a conductor to which said link circuits have access, means in said position to remove said potential from said conductor during the operation of said position equipment, means to reconnect said potential to said conductor at a particular stage of the operation of said position equipment, and means individual to said common positions to delay the connection of said conductor to said link circuits until a later stage in the operation of said position equipment, and means under the control of said group positions to cancel said delay.

6. In a telephone system, link circuits divided into groups, operators' positions individual to said groups, operators' positions common to said groups, means to associate one of said link circuits with one of said positions, means to mark said positions available by connecting a predetermined potential to a conductor to which said link circuits have access, means in said position to remove said potential from said conductor during the operation of said position equipment, means to reconnect said potential to said conductor at a particular stage of the operation of said position equipment, means at each common position individual to each subgroup of links to disconnect said conductor from said link circuits until a later stage in the operation of said position equipment, and means under the control of one of said groups of positions to prevent the operation of the disconnecting means individual to that group to render said common positions available at said particular stage.

7. In a telephone system, link circuits divided into groups, operators' positions individual to said groups, operators' positions common to said groups, means to associate one of said link circuits with one of said positions, means to mark said positions available by connecting a predetermined

potential to a conductor to which said link circuits have access, means in said position to remove said potential from said conductor during the operation of said position equipment, means to reconnect said potential to said conductor at a particular stage of the operation of the position equipment, means at each common position individual to each group of links to disconnect said conductor from said link circuits until a later stage in the operation of said position equipment, and means under the control of either of said groups of positions to prevent the operation of the disconnecting means individual to that group to render said common positions available at said particular stage.

8. In a telephone system, link circuits divided into groups, operators' positions individual to said groups, operators' positions common to said groups, means to associate one of said link circuits with one of said positions, means to mark said positions available when occupied and idle, means responsive to the association of said link circuit with an available position to remove said marking, means to restore said marking at a particular stage of the operation of said position equipment, means individual to said common positions to delay the effect of said restoring means until a later stage of the operation of said common position equipment and means effective if all of the positions of one of said groups are vacated to render said common positions available to said group at said particular stage.

9. In a telephone system, link circuits divided into groups, operators' positions individual to said groups, operators' positions common to said groups, means to associate one of said link circuits with one of said positions, means to mark said positions available when occupied and idle, means responsive to the association of said link circuit with an available position to remove said marking, means to restore said marking at a particular stage of the operation of said position equipment, means individual to said common positions to delay the effect of said restoring means until a later stage of the operation of said common position equipment and means effective if a particular relative busy condition exists in one of said groups of positions to render said common positions available to said group at said particular stage.

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