

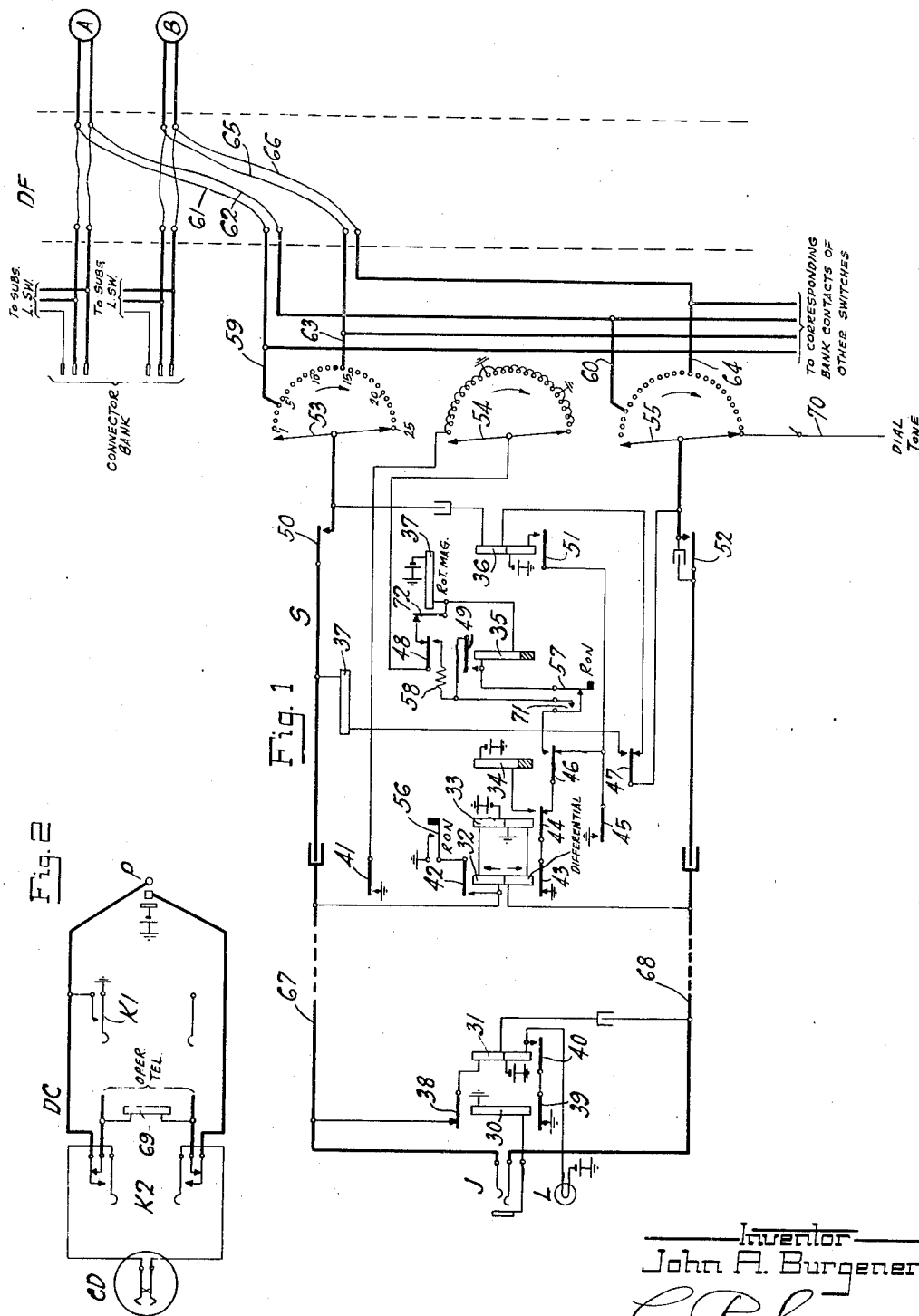
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to automatic telephone systems in general, but is more particularly concerned with automatic telephone systems provided with secretarial service.

5 The main object of the present invention is to provide secretarial service for business men, professional men, and the like, who are habitually or occasionally away from their offices. In many instances it may be impossible for telephone
10 subscribers of this class to have their telephone calls answered when they are away. Some subscribers, no doubt, have secretaries to answer their telephones, but others, who are called away from their offices occasionally, may find
15 that it is either impracticable or too expensive to employ a secretary. As a result, a great many telephone calls are lost.

To overcome this undesirable situation, the present invention provides an inexpensive but
20 highly efficient arrangement whereby an operator in the telephone exchange can intercept and answer calls to stations that are temporarily unattended. This service can be contracted for by a subscriber, either for a regular
25 term (months or year), or on a temporary basis to be charged either by the day or by the number of calls handled during the period the service is given. Telephone companies can install this type of service without making any changes
30 in the regular exchange equipment. Various features relating to the operation of the system will not be specifically mentioned at this time, but will be described in the specification and pointed out in the appended claims.

35 The accompanying drawing comprising Fig. 1 and Fig. 2 shows by means of the usual circuit diagrams a sufficient amount of equipment in a system embodying the invention to permit the same to be readily described and understood.

40 Fig. 1 shows a secretarial switch S that is accessible over the jack J and trunk conductors 67 and 68 to the exchange operator. The exchange distributing frame DF, and a portion of the regular exchange line equipment of sub-
45 scribers A and B is also shown.

Fig. 2 shows a portion of the operator's dialling cord.

Referring now to the drawing, in Fig. 1 is shown a switch S having two line wipers and one
50 control wiper, which is of the well-known single-level rotary type. This switch is only one of a group of similar switches. All corresponding line contacts of this group of switches are multipled together and are wired to one side of the
55 exchange distributing frame DF. Each switch,

such as S, is controlled by an operator by means of her dialling cord DC, part of which is shown in Fig. 2, over jack J and conductors 67 and 68. It should be noted, however, that the op-
60 erator's position need not be in the same exchange with the secretarial switch S. The trunk conductors 67 and 68 may be the conductors of a regular inter-office exchange trunk.

Subscribers at substations A and B are regular automatic telephone subscribers and are ac-
65 cessible to other subscribers over the regular switch train. Since the regular switches in the exchange form no part of the present invention, only the connector bank terminals, over which calling subscribers in the exchange complete
70 connections to the substations shown, and the conductors extending to the subscribers' individual line switches, are shown.

The invention having been described in general, will now be described in connection with
75 a detailed description of its operation. For this purpose it will be assumed that the subscriber at substation A has previously subscribed for secretary service. Therefore, his line has been connected at the distributing frame DF, by
80 means of jumpers 61 and 62, to the banks of the secretarial switches, such as switch S. It will also be assumed that the subscriber at substation A contemplates temporarily leaving the vicinity of his telephone and desires to have
85 the operator in the exchange answer all his calls during his absence.

The subscriber at substation A removes his receiver and operates his calling device in accordance with the telephone number of the
90 operator in the exchange handling secretary service. The automatic switches in the exchange (not shown) respond to the impulses transmitted by the calling subscriber and complete the connection to the operator in the ex-
95 change. The subscriber at substation A gives the operator his name and telephone number and any other information the operator may need to intelligently answer his calls. A doctor, for example, may want the operator to inform
100 calling subscribers that they may reach him either by calling his home or the hospital. In case the doctor intends to leave his office to make several calls he will then have the operator inform calling subscribers of the time he in-
105 tends to return.

The operator then inserts the plug P, of her dialling cord DC, into a jack, such as jack J. It will be assumed that when the operator plugs into jack J that the secretarial switch S is in
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its normal position, as shown on the drawing. Responsive to the plugging in of the dialling cord an obvious circuit is completed over the sleeve for operating cut-off relay 30. Upon operating, relay 30 disconnects the line relay 31 from across the line at armature 38 and its resting contact. In addition, a circuit is closed for operating line relay 38 of the secretarial switch S over the following circuit: battery, upper winding of line relay 33, upper winding of the differential relay 32, conductor 67, tip of the plug and jack, normally closed contacts of the key K2, impedance 69, normally closed contacts of the key K2, ring side of the plug and jack, conductor 68, lower winding of differential relay 32, lower winding of line relay 33, to ground. Upon operating, line relay 33 closes a circuit from ground, armature 43 and its resting contact, armature 44 and its front contact, winding of the slow-to-release relay 34, to battery. Relay 34 operates over this circuit and at armature 46 and its front contact prepares a circuit for the rotary magnet 37 and the slow-to-release series relay 35. The operator, upon plugging in, also receives a dial tone signal over the following circuit: dial-tone machine (not shown), dial-tone conductor 70, contact 25 associated with wiper 55 of the switch S, lower line conductor of the switch S, conductor 68, ring side of the plug and jack, normally closed contacts of the key K2, the operator's telephone (not shown), normally closed contacts of key K2, tip of plug and jack, conductor 67, upper windings of relays 32 and 33, to battery. This signal indicates to the operator that the switch is in its normal position and will respond to the impulses transmitted by the operator.

The operator operates her key K2 to close the normally opened contacts and to open the normally closed contacts thereby connecting the calling device CD across the line. The circuit of the line relay 33 is not interrupted by the operation of the key K2 because of the make-before-break combination of the springs. Therefore, the loop circuit for the line relay is closed through the calling device before the loop circuit including the operator's telephone is opened.

The subscriber's line has been jumpered by means of jumper wires 61 and 62 to conductors 59 and 60. These conductors are wired to predetermined contacts of the bank of the switch S. Therefore, the operator dials a predetermined number to advance the wipers 53—55, inclusive, to the bank contacts of the switch to which the conductors 59 and 60 are connected. In this case the operator manipulates her calling device CD to transmit the digit 4. The calling device CD interrupts the circuit of the line relay 33 four times. The slow-to-release relay 34 remains energized during the momentary interruptions of its energizing circuit at armature 34 and its front contact, due to the copper slug around its core. The first time line relay 33 falls back the following circuit is closed: ground, armature 43 and its resting contact, armature 44 and its resting contact, armature 46 and its front contact, normally closed contacts 57 of the rotary off-normal springs RON, winding of the slow-to-release series relay 35, winding of rotary magnet 37, to battery. Relay 35 and the rotary magnet 37 both energize over this circuit. When line relay 33 energizes after the first interruption, the rotary magnet falls back, thereby advancing the wipers 53—55, inclusive,

into engagement with the first set of back contacts. Contacts 56 and 71 of the rotary off-normal springs RON are closed and contact 57 of the rotary off-normal springs RON is opened as soon as the wipers of the switch are advanced from their normal resting position. At armature 49 and its front contact, relay 35 prepares a new impulsing circuit for the rotary magnet 37. Each time the line relay 33 falls back, after the first interruption, a circuit is closed from ground, armature 43 and its resting contact, armature 44 and its resting contact, armature 46 and its front contact, contacts 71 of the rotary off-normal springs RON (closed on the first rotary step of the switch), armature 49 and its front contact, winding of the slow-to-release series relay 35, winding of rotary magnet 37, to battery. The rotary magnet 37 is energized every time this circuit is closed and falls back when the circuit is opened. In response to the dialling of the digit 4 the wipers 53—55, inclusive, are advanced into engagement with the fourth set of bank contacts. The line relay 33 remains in its energized position after the dialling of the digit 4, thereby opening the circuit for the slow-to-release series relay 35 which subsequently falls back.

The secretarial switch S has now been positioned to the bank contacts to which the subscriber's line has been cross-connected at the distributing frame DF. The operator now removes the plug P, of the dialling cord DC, from the jack J and can immediately use the same for setting other switches, similar to switch S, to temporarily connect up other subscribers for secretarial service. Responsive to the removal of the plug P, the cut-off relay 30 falls back and prepares the circuit for the line relay 31. In the switch the circuit for line relay 33 is opened. Line relay 33 falls back, and opens the circuit for the slow-to-release relay 34 which also deenergizes. The secretarial switch S is now in the position to signal the operator each time the bell at substation A is rung.

Operator answers a call during the time that the subscriber at substation A is absent

When a subscriber in the automatic telephone exchange has operated the various switches in accordance with the telephone number of the subscriber at substation A, a connector engages his line and transmits ringing current over the line. The transmission of ringing current over the line rings the bell at substation A and also operates the ring-down relay 36, of the secretarial switch, over the following circuit: the ringing source in the connector (not shown) over one side of the subscriber's line, jumper 61, conductor 59, wiper 53 and its associated fourth bank contact, condenser and upper winding of ring-down relay 36, armature 47 and its resting contact, wiper 55 and its associated fourth bank contact, conductor 60, jumper 62, back over the other side of the line to the connector. The ring-down relay responds over this circuit and closes a locking circuit for itself over its lower winding, from battery, lower winding of ring-down relay 36, armature 51 and its front contact, armature 46 and its resting contact, armature 44 and its resting contact, armature 43 and its resting contact, to ground. At armatures 50 and 52 and their respective front contacts, relay 36 extends the ringing circuit over conductors 67 and 68, armature 38 and its resting contact, to the upper winding of line relay 33.

31 at the operator's position. The line relay responds over this circuit and completes a locking circuit for itself over the following circuit: from battery, lower winding of relay 31, armature 40 and its front contact, armature 39 and its resting contact to ground. By this same action the line relay 31 completes a circuit for lighting the lamp L to notify the operator that substation A is being signalled.

10 The operator upon noting the lighted lamp L inserts the plug P into the jack J, completing an obvious circuit for operating the cut-off relay 30. Relay 30 opens the circuit for the upper winding of line relay 31 at armature 38 and its resting contact, and at armature 39 and its front contact, opens the locking circuit for relay 31 and the circuit for the lamp L. The impedance 69 in the operator's cord circuit DC is bridged across the line conductors 67 and 68, thereby completing the previously traced operating circuit for line relay 33 of switch S. Upon operating, a line relay 33 completes a holding circuit for ring-down relay 36 at armature 45 and its front contact, and at the same time it opens the initial holding circuit for relay 36 at armature 44 and its resting contact. Line relay 33 also completes a circuit for the slow-to-release relay 34 at armature 44 and its front contact. At armature 47 and its front contact, relay 34 connects the impedance 37 across the line conductor, thereby operating the ring-cut-off relay in the connector (not shown) to disconnect the ringing current and to complete the talking connection between the subscriber desiring to establish a connection with substation A and the operator in the exchange. The operator answers the call by giving the name or telephone number of the wanted subscriber. Depending on circumstances, she informs the calling subscriber that the subscriber at substation A is absent and that she will take the message for him, or gives any other appropriate information.

After the calling subscriber hangs up, the operator removes the plug P, of the dialling cord DC, from the jack J. This opens the circuit to the cut-off relay 30 which falls back and prepares the circuit for the line relay 31 at armature 38 and its resting contact. Line relay 33, of the switch S, also falls back and at armature 45 and its front contact opens the locking circuit for the lower winding of the ring-up relay 36. Relay 34 which is slow to release, after its circuit is opened at armature 44 and its front contact, holds up long enough to prevent the ground at armature 43 and its resting contact from completing a circuit for the lower winding of relay 36 at armature 46 and its resting contact. Ring-up relay 36 upon falling back, opens the circuit over the upper and lower line conductors at armatures 50 and 52 and their respective front contacts, and at armature 51 and its front contact it opens its locking circuit.

The switch is now in position to signal the operator when substation A is signalled again by a calling subscriber. Therefore, each time a subscriber in the exchange desires to establish a connection with the subscriber at substation A, when he is absent, the operator is signalled in the manner previously described. The operator responds by plugging in and makes notations of any information that the calling subscriber may desire to have the operator convey to the subscriber at substation A when he returns.

When the subscriber at substation A returns

he calls the operator at the exchange, over the regular exchange switches, to inform the operator that he wants his line disconnected from the secretarial service. The operator gives the subscriber the numbers of the subscribers that have called him during his absence and also any message or information she has received from the parties calling.

Releasing the secretarial switch after the subscriber has returned

To disconnect the substation A from secretarial service, the operator must restore the wipers 53—55, inclusive, to their normal or home position. To accomplish this the operator inserts the plug P, of the dialling cord DC, into the jack J. This causes relays 30, 33, and 34 to operate as has been previously described. The operator now operates the key K1 to ground both sides of the trunk line, one path including the tip of the plug P, and the other path including the normally closed contacts of the key K2, impedance 69, and the ring side of the plug. The ground on the lower line conductor 68 places a short circuit around the lower windings of relays 32 and 33. The ground on the upper line conductor 67 completes an operating circuit for the upper winding of differential relay 32 in series with the upper winding of relay 33. Line relay 33 remains energized and differential relay 32 operates. At armature 42 and its front contact, relay 32 completes a locking circuit for itself, from ground, contacts 56 of the rotary off-normal springs RON (closed as long as the wipers of the switch are off-normal), armature 42 and its front contact, upper winding of relays 32 and 33 in series, to battery. The slow-to-release relay 34 falls back shortly after the energization of relay 32. After the operator has unbalanced the line, by the operation of the key K1, she may remove the plug P from the jack J. As soon as the differential relay 32 has been locked up in series with the line relay 33, the switch is automatically restored to normal in the manner to be explained. Removal of the plug from the jack J causes the cut-off relay 30 to fall back and prepares a circuit for the line relay 31 as before.

Restoration of the switch to normal is completed in the following manner. When the differential relay 32 is energized and locked up in series with the line relay through contacts 56 of the rotary off-normal springs RON a circuit is completed, from ground, armature 41 and its front contact, multiplied contacts associated with the wiper 54, wiper 54, armature 48 and its resting contact, self-interrupting contacts 72 of the rotary magnet, winding of the rotary magnet 37, to battery. The rotary magnet interrupts its own circuit at armature 72 and its resting contact, causing the magnet to fall back. When the rotary magnet falls back the wipers 53—55, inclusive, are advanced to the next set of bank contacts. The rotary magnet, upon falling back, also closes armature 72 and its resting contact. This completes the energizing circuit again for the rotary magnet 37 by way of the grounded bank contacts associated with wiper 54. This self-interrupting operation continues until the wipers 53—55, inclusive, are rotated to the twenty-fifth bank contact. Since the twenty-fifth bank contact associated with the wiper 54 is not grounded, the circuit for the rotary magnet 37 is opened, therefore, the switch is brought to rest in its normal or home position.

In addition, when the twenty-fifth bank contact is reached by the wiper, the rotary off-normal contacts RON are restored to their normal position as shown on the drawing. When contact 56 of the rotary off-normal springs RON is opened, the locking circuit for relays 32 and 33 is opened. The relays accordingly fall back. At armature 41 and its front contact, relay 32 removes the ground from the bank contact associated with the wiper 54 and at armature 43 and its resting contact it prepares a circuit for the operation of relay 34. The switch is now restored to normal. The switch can now be used to connect up any other subscriber desiring secretary service.

Subscriber at substation B desires secretary service

It will be assumed that the subscriber at substation B has called the operator handling secretary service to inform her that he would like to subscribe for secretary service. The operator informs the exchange attendant, who cross connects the line of substation B to an idle contact set in the secretary switch S. This jumpering is done at the exchange distributing frame DF and it will suffice to say that the attendant may connect the subscriber for secretary service by merely adding the jumper wires 65 and 66. The attendant informs the operator that the code number for operating the secretarial switch S to connect up the subscriber at substation B is 04. The operator writes this information on a card or some sort of an index so that when the subscriber at substation B desires to leave his premises and informs the operator of such intentions, the operator will find the code number on the subscriber's card. The operator is thus informed of the code number required to set the secretarial switch to the subscriber's line.

It will now be assumed that the subscriber at substation B has called the operator over the regular exchange switch train to inform her that he is about to leave his premises and wants his incoming calls answered. The operator plugs in the jack J as before, causing the operation of the line relay 33 and the series relay 34. In addition the cut-off relay 30 is operated over the sleeve of the plug as before.

If the subscriber at substation A is still connected up for secretarial service and the switch shown on the drawing is the one being used, the operator, upon plugging in at the jack J will not receive the dial tone signal, inasmuch as the wipers of the switch will be in an off-normal position. This informs the operator of the busy condition of the secretarial switch S. The operator then removes plug P from the jack J and inserts the same into a jack having access to a similar switch. Since all the line bank contacts of the switches are multipled together and then wired to the distributing frame, the operator may select any one of the secretarial switches, such as switch S, over a jack such as J.

It will be assumed, however, that the switch S is in its normal position when the operator plugs in, therefore, she receives the dial tone signal. This informs her that she may position the secretarial switch to the subscriber's line. The operator operates key K2 to connect up the calling device CD and to remove her telephone from across the line. The first digit dialled, in this case, is the digit 0, which in-

terrupts the circuit for the line relay 33 ten times. The rotary magnet 37 follows the impulses and the wipers 53—55, inclusive, are advanced to the tenth set of bank contacts in the manner previously described. The wiper 54 encounters ground on its associated tenth bank contact. The ground encountered by wiper 54, is extended by way of armature 48 and its front contact, resistance 58, armature 49 and its front contact, winding of the slow-to-release series relay 35, winding of the rotary magnet 37, to battery. It might be well to mention that the slow-to-release series relay does not fall back immediately after the last impulse is transmitted, but remains energized for a short period thereafter. Therefore, as soon as the wiper 54 is advanced from the ninth to the tenth bank contact, responsive to the tenth impulse transmitted, ground is immediately extended over the wiper 54 to maintain the series relay 35 energized. The rotary magnet 37 does not operate over this circuit due to the fact that the resistance 58 is now in the circuit. The resistance 58 is of such value that the slow-to-release series relay 35 will remain energized but the current flow through the rotary magnet 37 is insufficient to cause it to energize.

The operator now dials the second digit of the code number which is in this case, the digit 4. Each time the circuit of the line relay 33 is interrupted, a circuit is completed from ground, armature 43 and its resting contact, armature 44 and its resting contact, armature 46 and its front contact, contacts 71 of the rotary off-normal springs RON (closed on the first rotary step of the switch), armature 49 and its front contact, winding of the series relay 35, winding of rotary magnet 37, to battery. It will be noted that this circuit short circuits the resistance 58. The rotary magnet responds to the impulses over this circuit, therefore, the wipers of the switch are advanced to the fourteenth bank contact set, to which set the line of substation B has been cross connected for secretary service.

It should be noted that the wiper 54 upon advancing from its tenth bank contact, no longer encounters the ground on its associated bank contact, therefore, when the wipers come to rest responsive to the dialling of the digit 4, the series relay 35 releases. As soon as the series relay 35 falls back the circuit for the rotary magnet is opened. If the operator inadvertently dials another digit the rotary magnet cannot respond to these impulses due to the fact that the rotary off-normal springs RON have been operated to open the circuit through contact 57 and inasmuch as the series relay 35 has fallen back the alternative circuit for the rotary magnet, including the contacts 49 of the series relay 35, is also opened.

The operator removes her cord circuit as before, causing the release of relays 30, 33, and 34.

The ring-down relay 36 is now connected across the subscriber's line and will respond each time ringing current is transmitted over the line to signal the subscriber at substation B. When this occurs the relay 36 operates and locks over its lower winding as has been previously described, and at its upper and lower armatures 50 and 52 and their respective front contacts, completes a circuit for the line relay 31 at the operator's position. The line relay operates and locks over its lower winding and by the same action lights the lamp L to signal the operator.

The operation of the circuit responsive to the

plugging in by the operator has been previously described, therefore, it will suffice to say that the operator plugs in to answer all incoming calls to the substation B. When the subscriber at substation B returns to his premises and notifies the operator at the exchange, the operator plugs in again and by operating her key K1 unbalances the line, to automatically restore the switch to normal.

If a subscriber, who has previously subscribed for secretary service, has his line jumpered to one of bank contact sets numbered 21 to 24, inclusive, it is necessary for the operator to dial three digits in order to set the secretarial switch to the contacts of the subscriber's line when he desires to have the operator at the exchange answer his calls. It will be assumed that a subscriber, having his line jumpered to contact set 22 of the switch S, desires to leave his premises and has informed the operator that he wants his calls answered during his absence. The operator plugs in as before to seize a secretarial switch, such as the switch S, and receives the dial tone signal. The operator then throws her key in to connect up the calling device CD as before. The code number for setting the wipers of the switch into engagement with the subscriber's line is 002. Responsive to the dialling of the digit 0 the wipers of the switch are advanced ten steps to the tenth set of bank contacts. In this position ground is encountered by the wiper 54 to hold the series relay 35 engaged in a circuit including the resistance 58 and the winding of the rotary magnet 37. The series relay remains energized over this circuit and does not fall back after the first series of impulses. The second digit dialled which is the digit 0, short-circuits the resistance 58 as before and the rotary magnet 37 is operated in series with relay 35. The wipers of the switch are advanced ten more steps to the twentieth set of bank contacts. In this position the wiper 54 again encounters ground which completes the previously traced circuit for holding the series relay 35 energized, but which does not operate the rotary magnet 37. The final digit dialled is the digit 2. The series relay 35 and the rotary magnet 37 are operated in series over a circuit that short-circuits the resistance 58. The magnet following the impulses causes the wipers of the switch to advance two more steps to engage the bank contacts to which the line conductors of the subscriber desiring the service have been cross-connected. The operator releases as before, causing all the relays of the switch to restore to normal. The secretarial switch S is now in a position to respond to all calls to the subscriber's line as has been previously described in detail. The switch is restored to normal, after the subscriber returns to his premises, when the operator plugs in and operates her key K1 to unbalance the line. This causes the differential relay 32 to operate and close the self interrupting stepping circuit for the rotary magnet 37 which advances the wipers of the switch to their normal or home position.

What is claimed is:

1. In a telephone system arranged for secretarial service, a switch having access to a subscriber's line, means for setting said switch to select said line, an operator's position, and means in said switch responsive to a call incoming to said line for completing a connection to signal the operator at said position.

2. In a telephone system arranged for secre-

tarial service, a secretarial switch having access to a subscriber's line, an operator's position, means at said position for advancing the wipers of said switch to engage said line when the subscriber thereon desires to have all his calls answered by the operator at said position, a relay in the switch operated responsive to a call incoming to said line, and contacts controlled by said relay for completing a connection from said line to the operator's position.

3. In a telephone system arranged for secretarial service, a secretarial switch having access to a subscriber's line, an operator's position, means at said position for advancing the wipers of said switch to engage said line when the subscriber thereon desires to have all his calls answered by the operator at said position, and means in said switch responsive each time said line is signalled for completing a connection to signal the operator at said position.

4. In a telephone system arranged for secretarial service, a secretarial switch having access to a subscriber's line, an operator's position, means at said position for advancing the wipers of said switch to engage said line when the subscriber thereon desires to have all his calls answered by the operator at said position, means in said switch responsive each time said line is signalled for completing a connection to signal the operator at said position, and means for completing a talking connection with the calling subscriber when the operator answers said call.

5. In a telephone system arranged for secretarial service, a secretarial switch having access to a subscriber's line, an operator's position, means at said position for operating the switch to connect with said line, and means responsive to a call incoming to said line for signalling the operator by way of the said switch in operated position.

6. In a telephone system, an automatic switch, a motor magnet for operating said switch to engage successive contacts, a relay operated when said switch is released and maintained energized until said switch restores to normal, and means comprising a wiper and the said contacts successively engaged thereby and contacts on said relay for operating said switch to restore to normal.

7. In a telephone system arranged for secretarial service, a switch, a subscriber's line, a distributing frame for cross-connecting said line to bank contacts of said switch when the subscriber on said line subscribes for secretary service, an operator's position, means at said position for controlling said switch to select said line, said switch arranged to remain connected to the selected line when the operator disconnects and all relays in said switch are released, and means responsive to an incoming call to said subscriber's line for signalling the operator.

8. In a five relay switch, a magnet for advancing the wipers of the switch, a trunk line terminating in said switch, means at the distant end of said trunk line for operating certain of said relays to advance the wipers of said switch to select a subscriber's line, said switch arranged to maintain the wipers connected with the selected line after all the relays in said switch have been released, means at the distant end of the trunk for operating a release relay in said switch to restore the wipers of said switch to normal, and means responsive to the

operation of said release relay for closing a self-interrupting circuit for said magnet to advance the wipers to normal and for maintaining said release relay energized until the wipers are restored to normal.

9. In an automatic switch, a single magnet, a relay, a first series of impulses for operating said relay and said magnet in series to set the switch, said relay arranged to remain in its energized position during said impulse series and to release when said impulse series is terminated, and contacts on said relay for preventing the operation of said relay and said magnet responsive to a second series of impulses, and means responsive only to a predetermined number of impulses in said first series of impulses for maintaining said relay energized during the interval between the first and second series of impulses.

10. In an automatic switch, wipers, a line relay, a release relay, a series relay, a stepping magnet, an operating circuit for said series relay and said magnet including contacts of each of said relays, and a holding circuit for said series relay including contacts of the series relay and one of the switch wipers.

11. In an automatic switch, a series relay and a stepping magnet, an impulse circuit closed with the switch in normal position for operating the relay and the magnet, contacts con-

trolled by the relay for maintaining the impulse circuit closed after the magnet advances the switch from normal position, and means for energizing the relay independent of said impulse circuit responsive to the switch being advanced to a particular off-normal position.

12. In an automatic switch terminating a line, an impulse relay and a releasing relay connected to the line, means for operating and releasing the impulse relay over the line to set the switch, means for operating both relays over the line to initiate the release of the switch, and means for maintaining both relays operated independent of the line during the releasing operation of the switch.

13. In a telephone system, a subscriber's line, a trunk, a switch terminating one end of the trunk, a signal associated with the other end of the trunk, means controlled over the trunk for operating the switch to connect with said line, means for extending a subsequent connection to the line independent of said switch, and means responsive to said last connection for operating said signal.

14. A telephone system as claimed in claim 13 in which the extension of the subsequent connection to the line operates both the signal associated with the trunk and a signal associated with the line.

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