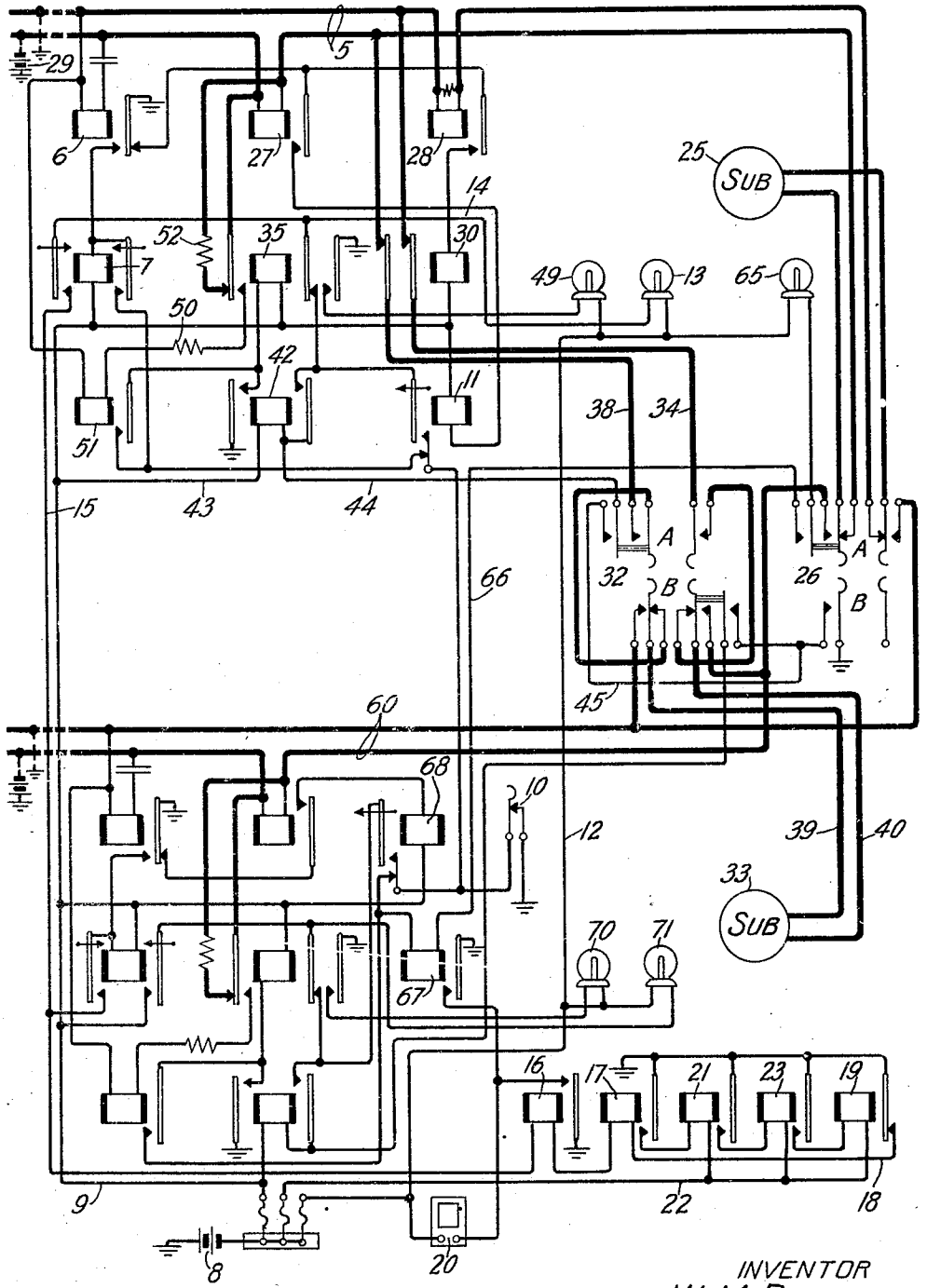
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to telephone systems and more particularly to such systems equipped for secretarial service.

It is common practice in large business establishments to employ telephone service of such a type that communications of minor importance, directed to their officers, may be intercepted and handled by secretaries without inconveniencing the officers. In order to provide such facilities, secretarial service systems have been employed, wherein calls intended for an officer or principal are initially handled by a secretary who either consummates the call herself, or transfers it to the principal, if circumstances warrant it. Usually, such systems also provide a direct line for the principal on which calls of a strictly private nature may be answered by him, and which, during his absence, may be attended to by the secretary.

Heretofore, this latter type of service did not insure strict privacy on calls incoming on the principal's line, but permitted the secretary to have access to the principal's line during the course of conversation and to "listen in" if she were so disposed.

It is the object of this invention to insure, in secretarial service systems, absolute privacy to the principal on calls incoming on his own line.

This object is attained in accordance with a feature of the invention, by the provision of an auxiliary tip relay in the principal's line, which operates upon the removal of the receiver at the principal's station to prevent the secretary from operatively associating her sub-set with the principal's line.

The invention will be readily understood from the following detailed description made with reference to the accompanying drawing which discloses a principal's line and a secretary's line terminating in a set of keys at a secretary's position, by virtue of which a secretary may answer calls on either line.

On a call incoming on the principal's line 5 the operation is as follows: Ringing current from equipment at a central office (not shown), operates ringing relay 6, which opens its back contact and closes its front contact effecting a circuit for relay 7 which may be traced from grounded battery 8, through the common bus-bar and fuse block, conductor 9, winding of relay 7, front contact and armature of relay 6 to ground.

In attracting its right-hand armature relay 7 locks to ground on key 10 by way of the normal make-before-break contacts of relay 11. At its left-hand armature and front contact, relay 7 establishes a circuit from grounded battery 8, common bus-bar and fuse block, conductor 12, filament of line and busy lamp 13, conductor 14, left-hand armature and front contact of relay 7, conductor 15, windings of relays 16 and 17 in series, conductor 18, back contact and inner armature of relay 19, to ground. Lamp signal 13 is lighted in this circuit and relays 16 and 17 operate. Relay 17 in attracting its armature establishes an obvious circuit for buzzer 20 which thereupon operates.

Relay 17 in operating establishes a circuit for relay 21 extending from grounded battery 8, common bus-bar and fuse block, conductor 22, winding of relay 21, front contact and armature of relay 17 to ground.

Relay 21, at its armature and front contact establishes an operating circuit for relay 23, connecting it in parallel with its own winding in the circuit just traced. Relay 23 in like manner connects the winding of relay 19 in parallel with its own winding. Relay 19 thereupon operates and its back contact and armature opens the circuit hereinbefore traced, in which relays 16 and 17 operated in series and line lamp 13 was lighted. Lamp 13 is thereupon extinguished and relays 16 and 17 restored to normal. Relay 16 opens the circuit for buzzer 20 which is thereupon silenced. Relay 17 upon restoring opens the circuit for relay 21 which in turn causes the release of relay 23. Relay 23, in like manner causes relay 19 to restore its armature to normal. Now the flashing circuit which comprises relays 17, 21, 23 and 19 is in its normal condition.

However, with relay 7 still operated, relays 16 and 17 again operate in series and lamp 13 is lighted in the same circuit hereinbefore traced. Buzzer 20 reactuates in response to the operation of relay 16. In response to

the operation of relay 17, relays 21, 23 and 19 again operate in the same manner as just described. Relay 19 again opens the circuit for relays 16 and 17 and lamp 13. This cycle of operation and release of the flashing circuit is repeated as long as relay 7 remains operated. This results in a flickering of lamp 13 and a tapping of buzzer 20 to indicate an incoming call.

The secretary noticing the flickering of lamp 13 realizes that a call is awaiting attention on the principal's line 5. In the absence of the principal the secretary may answer the call in a manner hereinafter to be described.

Assuming that the principal is available, he proceeds to answer the call in the usual manner by removing the receiver from the switch-hook at his sub-set 25. This action closes his line loop through the normally made contacts of key 26 which is located at the secretary's position. Relays 27 and 28 thereupon operate on current from the central office battery indicated at 29.

With relay 6 restored at the cessation of ringing, relays 30 and 11 now operate in parallel in a circuit extending from grounded battery, common bus-bar and fuse block, conductor 9, thence in parallel through winding of relay 11 and front contact and armature of relay 27, and winding of relay 30, and front contact and armature of relay 28 to ground by way of the back contact and armature of relay 6. In attracting its armature, relay 30 disassociates conductors 38 and 34 which are connected to contacts of the secretary's key 32, from the principal's line 5. By this arrangement it is impossible for the secretary to connect her sub-set 33 to the principal's line by the actuation of key 32, thereby insuring absolute privacy to the principal on calls incoming on his own line.

Relay 11, operating as previously described, opens the locking circuit for relay 7 which thereupon releases and opens the flashing circuit whereupon lamp 13 ceases to flicker and burns steadily owing to the transfer of contacts effected by the operation of relay 11. The circuit in which lamp 13 is now lighted may be traced from grounded battery, common bus-bar and fuse block, conductor 12, filament of line lamp 13, conductor 14, inner right-hand armature and back contact of relay 35, armature and front contact of relay 11, to ground at the normal contacts of key 10. The steady glow of lamp 13 serves as a busy signal at this time.

At the termination of conversation the principal hangs up the receiver thereupon opening the line loop and causing the release of relays 27 and 28 which, in turn, cause relays 30 and 11 to restore. The release of these relays restores the circuit to normal condition and the principal's line is ready for the next call.

It is believed unnecessary to describe the progress of an incoming call on the secretary's line as it is obvious that the secretary's line equipment is the same as that of the principal's line with the exception of that required for the cut-off feature hereinbefore described, and which is individual to the principal's line. The flashing circuit is common to both lines.

Should the principal be busy or absent when a call, such as has been described in detail, arrives on his line, the secretary noticing the continued flickering of the line lamp, may answer the call by actuating transfer key 32 to position A so as to operate the upper set of spring contacts. This operation connects the conductors 38 and 34 leading from the principal's line, to conductors 39 and 40, respectively, leading to the secretary's sub-set. The secretary is then in position to converse with the party on the principal's line. The removal of the receiver at the secretary's position results in the same operations as hereinbefore described in connection with the answer of a call by the principal.

In the event that a call comes in on the secretary's line while the secretary is answering the call on the principal's line, she would hold the connection on the principal's line and proceed to answer the call on her own line. This condition is taken care of in the following manner:

The secretary will have actuated key 32 to position A in order to connect her instrument with the principal's line. Relay 27 now operates from central office battery, relay 28 remaining deenergized due to the fact that the principal's receiver is on the switch-hook and the line loop accordingly open. Relay 27 causes relay 11 to operate in the same manner as described previously, which opens the flashing circuit and closes the busy lamp circuit giving a steady signal to indicate a busy line.

The secretary then operates key 26 to position B whereupon relay 42 operates in a circuit extending from grounded battery, common bus-bar and fuse block, conductor 9, conductor 43, winding of relay 42, conductor 44, left-hand alternate contact of key 32 (operated to A position), conductor 45, to ground on the alternate contacts of key 26 (operated to B position). Relay 42 locks to ground on the contacts of key 10, by way of its own right-hand armature and front contact and the armature and front contact of relay 11. At its left-hand armature and front contact relay 42 connects ground to the winding of relay 35 which operates from battery 8 by way of conductor 9.

At its inner right-hand armature relay 35 opens the busy signal circuit to lamp 13 causing this lamp to be extinguished. At its outer right-hand armature relay 35 connects ground to the circuit of "hold" lamp signal

49, which circuit is completed to battery 8 by way of conductor 12. At its left-hand armature, it bridges the tip and ring conductors of the principal's line 5 with the winding of relay 51 in series with resistance element 50. This connection serves as a holding bridge preventing the release of the connection on the principal's line while the secretary answers a call on her own line. The left-hand armature of relay 35 also opens the shunt circuit, including resistance element 52, around relay 27, thereby giving this relay greater operating power while the holding circuit is across the line.

Relay 51 now operates from central office battery indicated at 29, and prepares a locking circuit for relay 35. The purpose of this will appear presently.

The secretary then restores key 32 and operates it to position B. This operation causes the release of relay 27 which releases relay 11, the latter in turn releasing relay 42. Relay 42 removes ground from the winding of relay 35 which however does not restore owing to the locking circuit referred to in the preceding paragraph, which is now completed to ground at key 10 by way of the normal make-before-break contacts of relay 11.

The connection on the principal's line is now held by the holding bridge effected by the operation of relay 35, and the secretary's sub-set 33 is connected to her own line 60 by virtue of the actuation of key 32 to position B.

When the call on the secretary's line is terminated the secretary actuates key 32 from position B to position A, again connecting her instrument with the principal's line. Relay 27 again operates from central office battery by way of the closed loop through the secretary's instrument. Relay 27 causes relay 11 to function which in turn opens the locking circuit for relay 35. The release of relay 35 causes relay 51 to restore, hence the entire path of the holding circuit is opened. Relay 35 also opens the circuit for "hold" lamp 49 and restores the original circuit for the busy lamp signal 13.

The secretary in like manner may hold a connection on her own line while attending a call on the principal's line. It is believed that a detailed description of this operation is unnecessary as the description just completed is substantially applicable in every detail.

A call incoming on the secretary's line 60 and intended for the principal may be transferred to the principal's station 25 by the actuation of key 26 to position A. This operation connects the line conductors of the secretary's line 60 to the principal's sub-set and at the same time causes the transfer lamp 65 to be lighted in a circuit extending from grounded battery 8, common bus-bar and fuse block, conductor 12, filament of lamp 65, outermost left-hand alternate contact of key 26 in position A, conductor 66, winding of relay 67, normal make-before-break contacts of relay 68 to ground on the contacts of key 10.

The "hold" lamp 70 and the line and busy lamp 71 associated with the secretary's line are lighted in the same manner and for the same purpose as lamps 49 and 31, respectively.

The key 10 is usually actuated when the business day is completed and neither the secretary nor principal is available to answer incoming calls. The actuation of this key prevents the lighting of lamps 13 and 17 and the operation of buzzer 20 on incoming calls when the equipment is unattended. This prevents any unnecessary drain on the local battery 8.

What is claimed is:

In a telephone system, a line, a signal associated with said line adapted to be actuated intermittently in response to a call incoming on said line, a station on said line, a second station, a key for connecting said second station with said line and means responsive to the seizure of said line at said first station in answer to the incoming call for altering the characteristic of said signal and rendering said key ineffective to connect said second station with said line.

In testimony whereof, I have signed my name to this specification this 19 day of February, 1929.

WILFRED M. ROSEKRANS.