

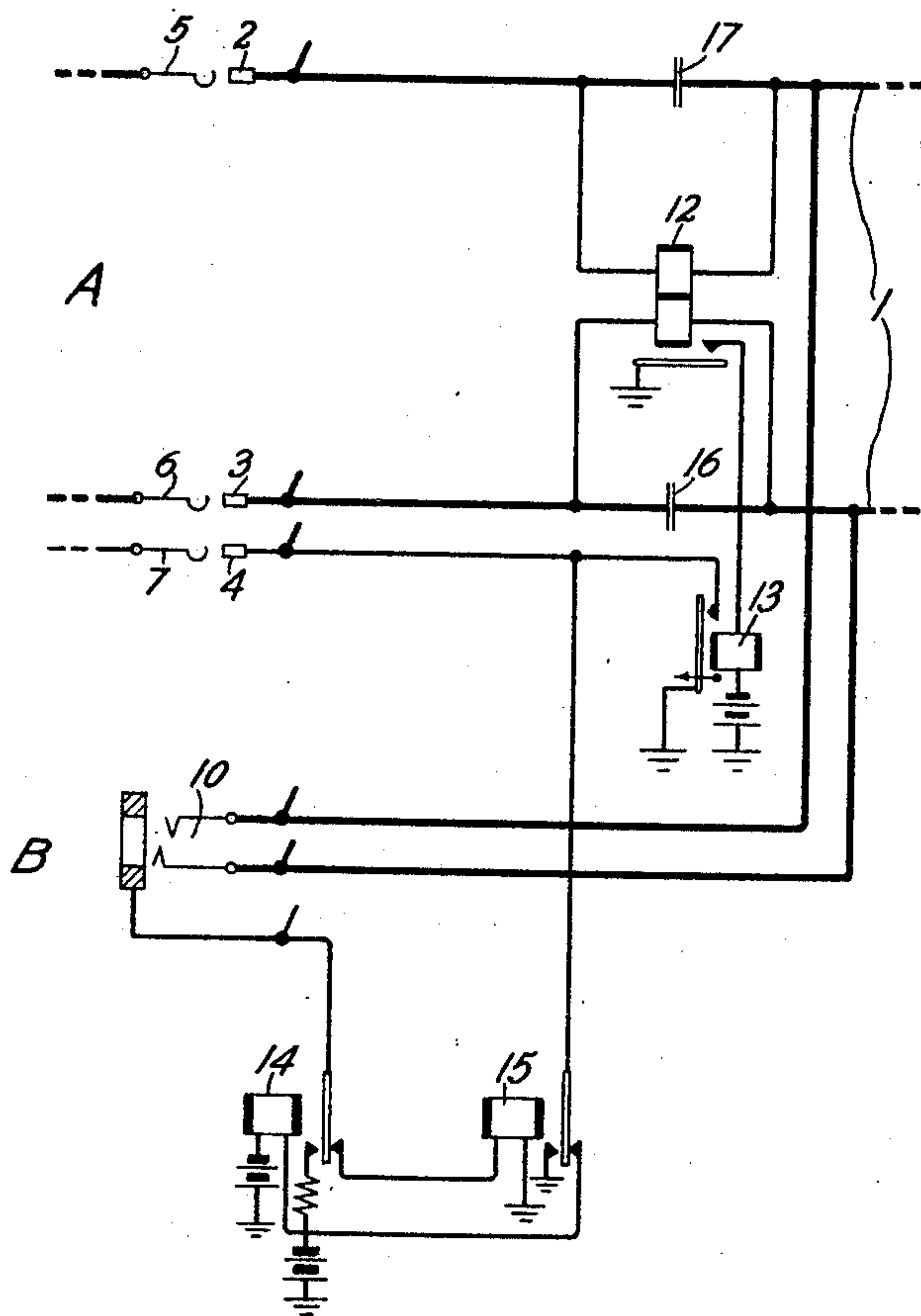
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to telephone systems and particularly to trunking systems.

The object of the invention is to simplify and improve trunking arrangements of the kind in which signals are transmitted from one trunk to another connected at a switching center.

Heretofore, in systems of this kind the signals usually had to be repeated at the switching center as the signals originating through one trunk were not of the character suitable for reception over the other trunk. For example, the original signal may be produced by increasing the direct current on one trunk, while the desired signal at the receiving station may be a reversal of current on the other trunk. Suitable means was therefore provided at the switching center for reception of signals of one character and for the production and transmission of signals of the other character. This necessitated a physical separation of the two trunks at the switching center as far as direct current transmission therethrough was concerned, while a repeating coil arrangement was provided for the transmission of talking current from one trunk to another.

In these types of systems the arrangement is usually such that the trunks incoming to the switching center terminate in automatic switches which may be actuated to select outgoing trunks terminating in the banks thereof. These outgoing trunks are also manually accessible through branches terminating in jacks at operators' positions at the switching center. Circuit arrangements are usually provided in these outgoing trunks whereby when a trunk is taken for use by a selector the manual branch thereof is made busy and a holding condition is established for the selector under control of the engaged trunk.

This invention is an improvement in trunking systems of this general type in that they are arranged for direct transmission of supervisory signals produced by the reversal of current on the trunk. Hence, no signal translating means need be provided in these trunks connected through for direct current transmission at the switching center, nor is a talking current repeating coil required, but the

trunks may be arranged with condensers bridging the direct current connections for this purpose.

A feature of this invention is a system in which relay means is provided in the direct current connections of an outgoing trunk of this kind, whereby a busy condition at the jack and a holding condition for a selector is established when a trunk is taken for use by said selector and whereby these conditions are maintained undisturbed during subsequent signaling over the trunk by the reversal of current therein.

This invention has been illustrated in the accompanying drawing which shows the outgoing end of a trunk at a through-switching point.

Referring to the drawing, trunk 1 terminates at its outgoing end in terminals 2, 3 and 4 of an automatic switch at A of which the brushes 5, 6 and 7 only have been shown. This switch may be of any well known type used in automatic telephone systems arranged for hunting for idle lines and in which the ground connection on the sleeve indicates a busy condition and serves after a connection has been established, as a holding ground for the switch. This trunk also terminates with tip, ring, and sleeve conductors at a jack 10 which may be located in a manual switchboard at B. Through this switchboard at B, connections may be established manually by means of the usual cord circuits employed in such offices. A battery connection on the sleeve of the jack indicates a busy condition when tested by an operator in the usual manner. The tip, ring, and sleeve conductors at the switch and jack may be multiplied to other switches and jacks.

Referring now to the operation of trunk 1, after a connection has been established from the switch A through brushes 5, 6 and 7 with the terminals 2, 3 and 4 respectively and over trunk 1 to a distant office the arrangement may be such that a circuit from battery and ground is established through the tip and ring conductors of the trunk to cause the operation of relay 12. This relay has two windings one included in the tip conductor and the other in the ring conductor.

The windings are serially wound so that regardless of which direction the current is passing through the tip and ring conductors relay 12 will always become operated as soon as the connection is closed. Relay 12 in operating closes an obvious circuit for the operation of relay 13, and this relay in operating closes a connection to ground for the sleeve conductor to terminal 4. The ground connection to the sleeve terminal 4 may be employed as a holding ground for the switch at A and as a busy ground to other switches. The connection to ground established by relay 13 also closes an obvious circuit for the operation of relay 14. Relay 14 in operating establishes a connection to battery for the sleeve of jack 10 which may serve as a busy indication on this and the multiple jacks as is well known in the art.

The purpose of this arrangement is to permit the establishing of a direct current path through the trunk and allow supervision over it by the reversals of the originally applied current. As the windings of relay 12 are serially wound reversals of current over the trunk will not cause the release of relay 12. In case, however, that relay 12 should, during the reversal, disturb the circuit for relay 13 due to a momentary partial release, relay 13 has been made slow-to-release. Hence, supervision by current reversals over the tip and ring conductors of the trunk will not disturb the holding ground for the switch at A nor the busy condition of the trunk in regard to connections attempted over other switches or over jack 10 and the multiple jacks.

A connection over the trunk from the switchboard at B may be established by merely inserting a plug of an ordinary cord into the jack 10 and thus apply battery in the usual manner to the sleeve to cause the operation of relay 15. This relay in operating opens the connection for relay 14 and connects ground to a conductor connected directly to the sleeve terminal 4 so as to make the trunk busy and thus prevent it from being seized by the switch at A or the other switches. Condensers 16 and 17 bridge the direct current paths through the windings of the relay 12 to establish a talking current path independent of the windings of relay 12.

It should be understood that while the invention has been illustrated as adapted to but a single arrangement of connecting switches and jacks and where supervisory signals are transmitted over the trunk, it may be equally well applied to systems where dialing signals are transmitted over the trunk and other systems without departing from the spirit thereof, and that the invention should be limited only by the scope of the appended claims.

What is claimed is:

1. In a telephone system, a switch, an operator's position, a trunk, and means respon-

sive to the passage of current over said trunk for establishing and maintaining a busy condition at the operator's position and a holding circuit for the switch regardless of subsequent changes of current over said trunk.

2. In a telephone system, a switch, an operator's position, a trunk, means responsive to the passage of current in either direction over said trunk for establishing and maintaining a busy condition at the operator's position and a holding circuit for the switch regardless of subsequent reversals of current over said trunk.

3. In a telephone system, a selector switch, an operator's position, a trunk terminating at one end in said switch and at said position, and means in said trunk responsive on the seizure of the trunk by said switch and the transmission of current thereover for establishing a busy condition for said trunk at the operator's position and for establishing a holding circuit for the switch, said means being maintained actuated regardless of the direction of the current transmitted over said trunk at the time of the seizure thereof and of subsequent reversals in the direction of said current.

4. In a telephone system, a selector switch, an operator's position, a trunk terminating at one end in said switch and at said operator's position, a relay having its windings connected in the conductors of said trunk and responsive to direct current transmitted over the trunk when seized by said switch, and means responsive to the operation of said relay for establishing a busy condition at the operator's position and a holding condition for said switch, said means being maintained actuated regardless of the subsequent reversal in the direction of said current.

5. In a telephone system, a selector switch, an operator's position, a trunk terminating at one end in said switch and at said operator's position, a relay having its windings connected in the conductors of said trunk and responsive to direct current transmitted over the trunk when seized by said switch, another relay responsive to the operation of said first-mentioned relay for establishing a busy condition at the operator's position and a holding condition for the switch, said second-mentioned relay having slow-to-release characteristics to maintain it operated regardless of momentary release of said first-mentioned relay during subsequent reversals in the direction of said current.

6. In a telephone system, a selector switch, an operator's position, a trunk terminating at one end in said switch and at said operator's position, a relay having its windings connected in the conductors of said trunk and responsive to direct current transmitted over the trunk when seized by said switch, another relay, a circuit for said second relay controllable to operate said second

relay in response to the operation of said first relay, and means controllable by the operation of said second relay to establish a busy condition at the operator's position and a holding condition for said switch, said
5 second relay having slow-to-release characteristics to maintain it operated regardless of momentary disturbances in said circuit.

10 In witness whereof, I hereunto subscribe my name this 27th day of March, 1929.

FRANKLIN A. KORN.

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DISCLAIMER

1,752,438.—*Franklin A. Korn*, Elizabeth, N. J. TELEPHONE SYSTEM. Patent dated April 1, 1930. Disclaimer filed September 18, 1931, by the assignee, *Bell Telephone Laboratories, Incorporated*.

Hereby enters this disclaimer to the said claims of said Letters Patent, which are in the following words to wit:

"1. In a telephone system, a switch, an operator's position, a trunk, and means responsive to the passage of current over said trunk for establishing and maintaining a busy condition at the operator's position and a holding circuit for the switch regardless of subsequent changes of current over said trunk.

"2. In a telephone system, a switch, an operator's position, a trunk, means responsive to the passage of current in either direction over said trunk for establishing and maintaining a busy condition at the operator's position and a holding circuit for the switch regardless of subsequent reversals of current over said trunk.

"3. In a telephone system, a selector switch, an operator's position, a trunk terminating at one end in said switch and at said position, and means in said trunk responsive on the seizure of the trunk by said switch and the transmission of current thereover for establishing a busy condition for said trunk at the operator's position and for establishing a holding circuit for the switch, said means being maintained actuated regardless of the direction of the current transmitted over said trunk at the time of the seizure thereof and of subsequent reversals in the direction of said current."

[*Official Gazette* October 6, 1931.]