April 4, 1944. L. M. BLESSING 2,345,959

TELEPHONE SYSTEM

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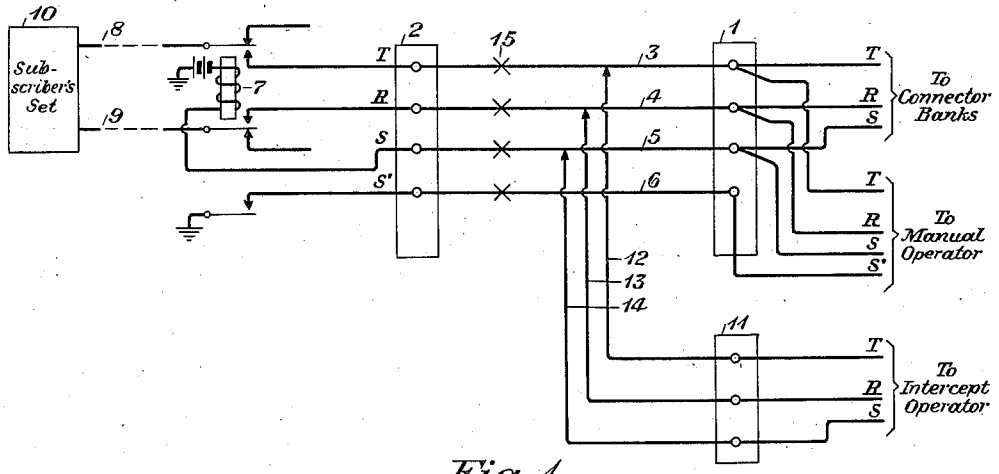


Fig. 1

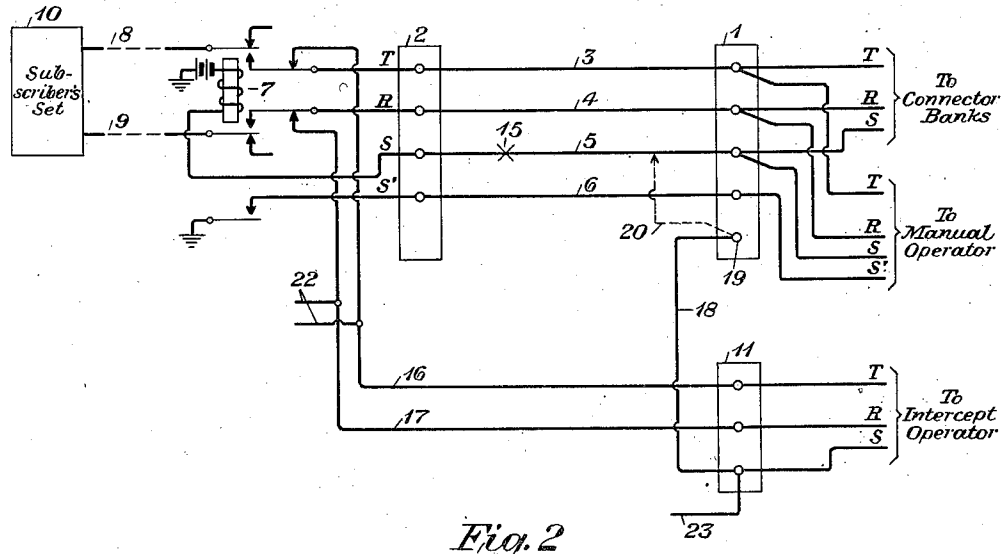


Fig. 2

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TELEPHONE SYSTEM

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2 Claims. (Cl. 179—91)

This invention relates to transmission systems, such for example as telephone systems, and more particularly to improvements in the switchboard apparatus used in such systems.

It has been found that in certain localities exchanges, particularly the larger private branch exchanges, are subject to heavy in and out station movement. In other words, subscribers at such an exchange might be transferred frequently to other localities and until their sets were assigned to others, incoming calls for these subscribers would be routed to an intercept operator so that the incoming callers could be informed that the particular called subscriber was no longer available at his previous station. In order to transfer an incoming call to an intercept operator it has been the practice for the plant maintenance force to disconnect all of the cross connections between two terminal strips associated with a particular line and to connect these cross connections to a terminal strip associated with the intercept operator. When the line is reassigned to another subscriber all of these cross connections would have to be restored to their original condition. When the in and out station movement in the exchange is heavy, this procedure frequently adds up to a sizeable effort. It is the primary object of this invention to provide a simpler and easier arrangement for effecting the transfer of an incoming call to an intercept operator and its subsequent reassignment to a new subscriber than the arrangements heretofore used. It is one of the features of the invention that only one rather than all of the cross connections between two terminal strips will have to be disconnected and then connected to the terminal strip associated with the intercept operator. Other objects and features of the invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing in the Figures 1 and 2 of which the invention is illustrated. Fig. 1 illustrates arrangements utilized in the prior art. Fig. 2 illustrates the arrangements of the invention. Similar reference characters have been utilized to denote like parts in both figures.

In Fig. 1 are shown arrangements which have been utilized in the past to transfer an incoming call from a subscriber's line to an intercept operator. A terminal strip 1 is shown having tip, ring and sleeve conductors extending to the banks of a connector of a step-by-step machine switching arrangement. The terminal strip 1 might also have tip, ring and sleeve conductors and an additional conductor S' extending to a manual operator's position. A second terminal strip 2 is provided. Cross connections 3, 4, 5 and 6 connect the contacts of terminal strip 1 with corresponding contacts on terminal strip 2. Extending from terminal strip 2 are tip and ring conductors terminating in the make contacts of a cut-off relay 7. A sleeve conductor extends from terminal strip 2 to the winding of the cut-off relay 7. Another conductor S' extends from the terminal strip 2 to the contact and lower armature of the cut-off relay 7. When a call comes in for the subscriber's set 10, ground will be applied to either of the sleeve conductors shown associated with terminal strip 1, and thence will be applied over cross connection 5 and the sleeve conductor associated with terminal strip 2, through the winding of cut-off relay 7, to battery and ground. This will operate the cut-off relay and connect the subscriber's set 10 by means of conductors 8 and 9 to the tip and ring conductors connected to terminal strip 2, and thence over cross connections 3 and 4 to the tip and ring conductors connected to terminal strip 1. The lower armature of the cut-off relay 7 will apply ground to conductor S' and thence over cross connection 6 to conductor S' connected to terminal strip 1 for the purpose of giving a busy signal. If the subscriber having subscriber's set 10 should move away from the vicinity of the private branch exchange, it would be desirable to have incoming calls over this subscriber's set transferred to an intercept operator until the subscriber's set 10 is assigned to another subscriber. To accomplish this it has been the practice for the maintenance force to open all of the cross connections 3, 4, 5 and 6 between terminal strips 1 and 2 at points such as indicated at 15. Conductors 12, 13 and 14 which lead to the tip, ring and sleeve contacts of a terminal strip 11 associated with an intercept operator would then be connected across cross connections 3, 4 and 5 as shown. Accordingly incoming calls would thus be transferred directly to the intercept operator. Obviously when the subscriber's set 10 was assigned to another subscriber, the cross connections 3, 4, 5 and 6 would all have to be closed again and the conductors 12, 13 and 14 removed therefrom. As heretofore pointed out, when the in and out station movement is heavy, as is apt to be the case in a large private branch exchange, this would entail considerable work for the maintenance force.

In Fig. 2 are shown the arrangements of the invention. An incoming call for the subscriber

causes ground to be applied to either of the sleeve conductors associated with the terminal strip 1 and causes the cut-off relay 7 to operate and connect conductors 8 and 9 to the tip and ring conductors and cross connections 3 and 4 so that the call will go direct to the subscriber's set 10. To transfer an incoming call to the intercept operator, conductors 16 and 17 are provided and are connected to the tip and ring conductors extending from terminal strip 2 by means of additional contacts on the cut-off relay 7. The conductors 16 and 17 will be connected to these tip and ring conductors when the cut-off relay 7 is unoperated, but will be disconnected therefrom when the cut-off relay 7 is operated. Conductors 16 and 17 terminate in the tip and ring contacts of a terminal strip 11, which is connected to an intercept operator. An additional contact 19 is provided on terminal strip 1. This contact is connected by conductor 18 to the sleeve contact of terminal strip 11. To transfer an incoming call to the intercept operator all that the maintenance force will have to do will be to open the cross connection 5 at a point such as 15 and connect the cross connection 5 as indicated by the dotted line 20 to contact 19 of terminal strip 1. All of the other cross connections will not have to be disturbed. As cross connection 5 has been opened as at 15, ground applied to the sleeve conductors connected to terminal strip 1 will not operate the cut-off relay 7. Accordingly an incoming call will be transmitted over the tip and ring conductors associated with terminal strip 1, over cross connections 3 and 4, over the tip and ring conductors connected to terminal strips 1 and 2, and thence over conductors 16 and 17 to the tip and ring contacts of terminal strip 11 connected to the intercept operator. Ground connected to either of the sleeve circuits connected to terminal strip 1 will be applied from cross connection 5 to conductor 18, and thence to the sleeve contact of terminal strip 11. It will be seen that the arrangements of the invention provide that only one of the cross connections, namely cross connection 5, will have to be opened and only one connection from the cross connections, such as cross connection 5 to contact 19, will be necessary. Accordingly the arrangements of the invention provide a simpler and easier method for transferring an incoming call to an intercept operator than the arrangements heretofore referred to, and will save considerable time on the part of the maintenance force. It is obvious that the switchboard would have other terminal strips corresponding to terminal strips 1 and 2, and other subscribers' lines with their individual cut-off relays. Accordingly additional conductors, such as 22, might be bridged across conductors 16 and 17. Each pair of additional conductors, such as 22, would terminate at additional contacts provided on other of the cut-off relays, and additional conductors, such as 23, would be provided on the terminal strip 11 to lead to other terminal strips, such as 1. In this way the arrangements of the invention would provide means for transferring a plurality of incoming calls to an intercept operator.

While the invention has been disclosed as embodied in certain specific forms which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. In a telephone switchboard a first terminal strip, tip, ring and sleeve conductors terminating at said terminal strip, a second terminal strip, tip, ring and sleeve cross connections between said first and second terminal strips, a subscriber's line, a cut-off relay for said line, tip and ring conductors connected to said second terminal strip and terminating at the make contacts of said cut-off relay, a third terminal strip, a pair of conductors connected across said last mentioned tip and ring conductors when said cut-off relay is unoperated, said pair of conductors being connected to the tip and ring contacts of said third terminal strip, means for connecting said sleeve cross connection when opened to the sleeve contact of said third terminal strip, and tip, ring and sleeve conductors leading from said third terminal strip to an intercept operator's position.

2. In a telephone switchboard a first set of terminal strips, tip, ring and sleeve conductors terminating at each of said terminal strips, a second set of terminal strips, tip, ring and sleeve connections between each of the terminal strips of said first and second sets, a plurality of subscribers' lines, cut-off relays for each of said lines, tip and ring conductors connected to each of the terminal strips of said second set and terminating at the make contacts of said cut-off relays, a terminal strip connected to an intercept operator's position, pairs of conductors connected across said last mentioned tip and ring conductors when said cut-off relays are unoperated, said pairs of conductors being connected to the tip and ring contacts of said last mentioned terminal strip, and means for connecting said sleeve cross connections when opened to the sleeve contact of said last mentioned terminal strip.

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