

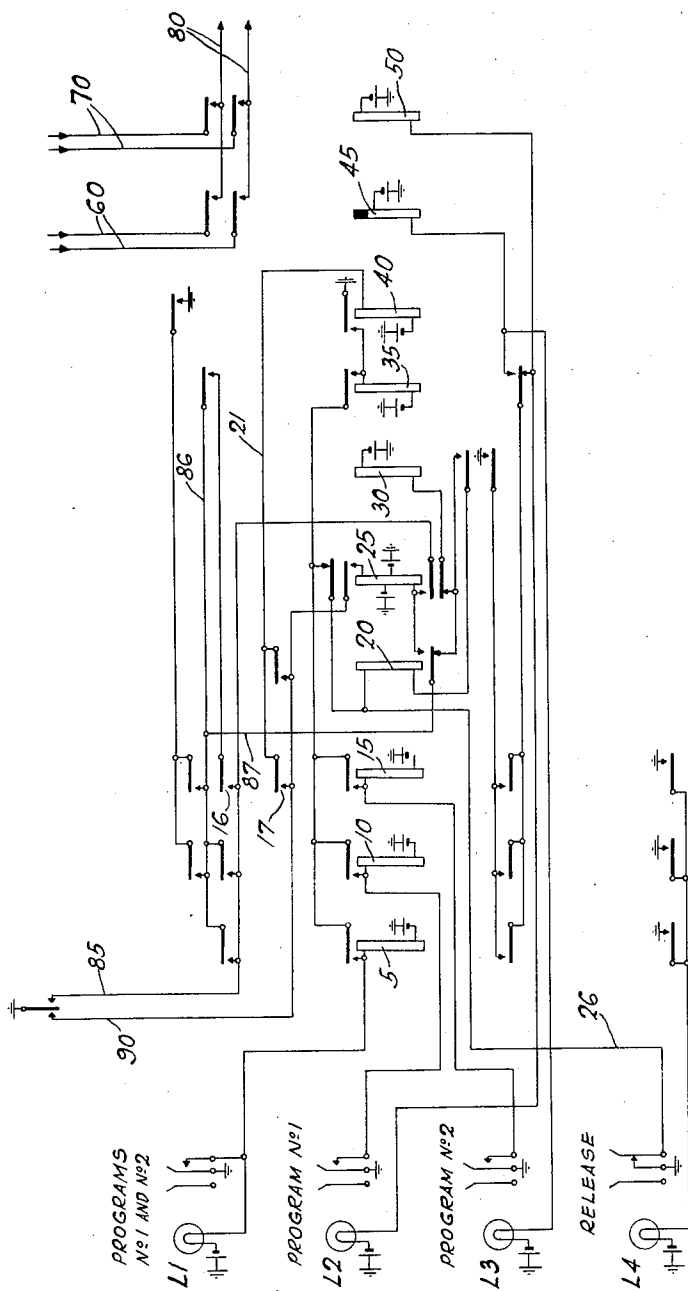
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ELECTRICAL CONTROL SYSTEM

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ELECTRICAL CONTROL SYSTEM

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The present invention relates in general to electrical control systems, but is particularly concerned with the provision of circuits and apparatus employed in the control of the connection of the output circuits of previously recorded matter, to be reproduced, with the input circuit of a radio broadcasting station, or of an amplifying system.

More specifically, the object of the invention is to provide a control arrangement whereby the output conductors of any one of a number of previously recorded programs or messages may be selectively connected with the input conductors of a broadcasting system by the simple operation of a key, and whereby, alternatively, another key may be operated to bring about the connection of the output circuits, of a number of previously recorded messages with the input circuit of a broadcasting equipment, in sequence.

The invention is disclosed in a single sheet of drawing diagrammatically illustrating the preferred embodiment of the invention. The invention, as illustrated, shows four key sets. When the key designated "Programs No. 1 and No. 2" is operated, various ones of the relays function to first connect up the conductors 70 with the input conductors 80 of a broadcasting equipment, not shown, and remain so connected until the program No. 1 has been completed. The leads 70 are then disconnected from the conductors 80 and the leads 60 become connected with the conductors 80 and the program No. 2 is then transmitted. The proper timing of the connecting and disconnecting of the leads 70 and 60 with the input conductors 80 of the broadcasting equipment is taken care of by impulses transmitted over conductors 85 and 90.

If either the program No. 1 or program No. 2 is to be transmitted independently, this may be accomplished by operation of the appropriately identified key. The key designated "Release" is simply provided for the purpose of releasing the equipment and discontinuing an incomplete program should occasion require.

In order to describe the invention in detail it will first be assumed that the operator desires to cut in both the programs No. 1 and No. 2. He, therefore, momentarily depresses non-locking push key designated "Programs No. 1 and No. 2", thereby bringing about the energization of relay 5. This relay, upon operating, at its inner-upper contacts completes a locking circuit for itself including the upper contacts of relay 25, the holding conductor 26, and the grounded con-

tacts of the release key. The relay 5 also; at its lowermost contacts completes the circuit of signal lamp L4, which lights up to show that the transmission of a program has been initiated; at its inner-lower contacts prepares a point in a circuit for relay 50, which will be traced later; and at its uppermost contacts connects the impulse conductor 85 with the start-stop conductor 86.

The impulsing equipment, not shown, is associated with conductors 85 and 90 alternately. An impulse is first transmitted over conductor 85 and is made use of to initiate the transmission of program No. 1. At the termination of program No. 1 an impulse is transmitted over conductor 90 and is utilized to bring about the disconnection of the conductors 70 over which program No. 1 is coming and by initiating the transmission of program No. 2 by connecting conductors 60 to the input conductors 80 of the broadcasting equipment. Following the completion of program No. 2 arrangements are provided whereby the transmission of the next impulse over conductor 85 brings about the disconnection of the conductors 60, over which program No. 2 is coming, from the input circuit of the broadcasting equipment. The relay circuits are so arranged that impulses transmitted over conductors 85 and 90 also function to bring about the release of the various previously operated and locked-up relays following the transmission of the program or programs selected in accordance with the key operated. The impulses over these conductors may be transmitted manually or automatically in any well-known manner at the start and close of the programs.

It has been assumed that the operator has operated the appropriate key for transmitting programs No. 1 and No. 2, with the resultant operation of relay 5, and the consequent connection of the start-stop conductor 86 to the conductor 85. Therefore, the next impulse transmitted over this conductor is extended by way of the upper-outer contacts of relay 5, the start-stop conductor 86, conductor 87, through the break contacts of relay 20, the lower break contacts of relay 25, and through the winding of relay 30 to negative battery. This latter relay, upon operating, at its inner contacts prepares an operating circuit for the relay 20 and a holding circuit for itself, and at its outer contacts completes a circuit for the lamp L2 and the relay 50 in multiple, by way of the inner-lower contacts of relay 5 and the break contacts of relay 35. The relay 50, upon operating, connects conductors 70, ex-

tending from the equipment transmitting program No. 1, into connection with conductors 80 constituting the input circuit of the broadcasting equipment. Program No. 1 is, accordingly, broadcast.

At the termination of the impulse over conductors 85, relay 20 becomes energized in series with relay 30, over a circuit including the lower break contacts of relay 25, the inner-lower make contacts of relay 30, the winding of relay 20, holding conductor 26 and to the grounded side of battery supplied through the contacts of the key designated "Release". The relay 20, upon operating, at its lower contacts opens the initial operating circuit for relay 25, and at its upper contacts connects the impulse conductor 90 to the relay 40.

As previously explained, upon the completion of the transmission of program No. 1, an impulse will be transmitted over conductor 90, and this is utilized as a program transfer pulse. The transmission of a pulse over conductor 90, owing to the operated condition of relay 20, extends by way of the upper contacts of this relay, and by way of conductor 21, through the winding of relay 40 to negative battery. The relay 40 accordingly momentarily operates, at its inner contacts completes an operating circuit for relay 35, and at its outer contacts closes a point in a circuit not used at this time. The relay 35, upon operating, at its inner-upper contacts completes a locking circuit for itself by way of the upper-break contacts of relay 25 and the locking conductor 26, at its upper-outer contacts closes a point in a circuit which is open at another point at this time, and at its lowermost contacts interrupts the circuit of lamp L2 and of the relay 50 and substitutes therefor the lamp L3 and the relay 45. The lamp L2 accordingly becomes extinguished, and serves to inform the operator that program No. 1 has been concluded, while the relay 50 becomes deenergized to disconnect the conductors 70 from the conductors 80. The relay 45 functions to connect the conductors 60, extending from the equipment of program No. 2, into connection with the conductors 80 extending to the input circuit of the broadcasting equipment, while the lamp L3 lights up to indicate that program No. 2 is now being transmitted.

At the completion of the transmission of program No. 2 an impulse is again transmitted over the conductor 85. Owing to the operated condition of relay 20, this impulse passes by way of the upper-outer make contacts of relay 5, the start-stop conductor 86, the lower-make contacts of relay 20, and through the lower winding of relay 25 to negative battery. This latter relay accordingly operates, at its upper-outer contacts disconnects the holding conductor 26 from the common locking circuit of relays 5, 20, 30, and 35, respectively, thereby permitting these relays to restore. Relays 5 and 30, upon restoring, each opens the circuit of relay 45. This relay, therefore, also restores and brings about the disconnection of conductors 60 from conductors 80; the restoration of this relay also causes lamp L3 to become dark to notify the operator that the transmission of program No. 2 has been completed. The relay 25 also, at its inner-lower contacts, locks itself up to the impulse conductor 85, thus insuring that positive battery will be removed from the hold conductor for a sufficient length of time to insure the proper release of the various relays. The relay 25, at its lower break contacts, also opens the circuit of relay 30 for the purpose of preventing its reenergization over a circuit in-

cluding the break contacts closed upon the deenergization of relay 20.

At the completion of the impulse transmitted over conductor 85, the relay 25 will become deenergized and the system is then again in its normal position.

It will now be assumed that the operator desires to cut in program No. 1 only, and that he accordingly momentarily operates the key designated "Program No. 1". When this key is operated the associated relay 10 becomes energized. This relay, upon operating, at its inner-upper contacts completes a locking circuit for itself including the upper-break contacts of relay 25 and the previously identified holding conductor 26, at its inner-lower contacts prepares a point in an operating circuit for the lamp L3 and for the relay 50, respectively, at its lowermost contacts it also completes a circuit for the signal lamp L4, at its middle-upper contacts prepares an operating circuit for the relay 30 by connecting conductor 85 to this relay in the same way as did relay 5, and at its uppermost contacts prepares an operating circuit for relay 25.

When the next impulse is transmitted over conductor 85, it passes by way of the middle-upper make contacts of relay 10, start conductor 86, through the break contacts of relay 20, the lower-break contacts of relay 25, and through the winding of relay 30 to negative battery. This relay accordingly operates, and at its lowermost contacts completes the circuit of lamp L2 and of relay 50, by way of the inner-lower contacts of relay 10 and the previously traced circuit including the lower contacts of relay 35. The lamp L2, therefore, lights up to indicate to the operator that program No. 1 is cut in, while the relay 50 operates to actually connect the conductors 70, over which program No. 1 is transmitted, with the conductors 80. The relay 20 operates, as before, upon the termination of the impulse over conductor 85, to prepare operating circuits for relays 25 and 40.

Upon the conclusion of program No. 1 an impulse is accordingly transmitted over conductor 90, through the upper contacts of relay 20, conductor 21 and the winding of relay 40 to negative battery. It will be noted that this impulse is now used as a "stop" impulse instead of as a "transfer" impulse. The relay 40, upon operating, at its uppermost contacts now completes a circuit for the relay 25 by way of the upper-outer contacts of relay 10, the start-stop conductor 86, the lower make contacts of relay 20, and the lower winding of relay 25 to negative battery.

The relay 25 now operates, as before, to disconnect the hold conductor 26 from the previously operated and locked-up relays, thereby permitting them to restore to normal. It will be noted that the relay 25 in this case has been locked up to the impulse conductor 90 by way of its inner-upper contacts, and its upper winding to insure that the relay 25 will be held up for at least the length of time required to release the various previously operated relays. The relay 45 has been made slow to operate in order to prevent it from momentarily pulling up, before relay 30 restores, when the impulse being transmitted over conductor 90 is being utilized as a "stop" impulse.

It will now be assumed that the operator desires to cut in program No. 2 only and, therefore, he momentarily depresses the key designated "Program No. 2".

Upon the operation of this key the associated

relay 15 becomes energized. This relay, upon operating, at its inner-upper contacts completes a locking circuit for itself, and at its lowermost contacts completes the circuit of signal lamp L4, at its inner-lower contacts closes a point in the operating circuit of the lamp L3 and of the relay 45, and at its contacts 17 connects the impulse conductor 90 to the conductor 21 extending to the relay 40. The relay 15 also, at its uppermost contacts prepares a point in the operating circuit of relay 30, and at its contacts 16 prepares an operating circuit for relay 25.

Since the relay 20 is not energized at this time the relay 15 has been utilized to extend the impulse from conductor 90 to the relay 40. Therefore, when the next impulse is received over conductor 90, the relay 40 becomes momentarily energized, and is followed by relay 35.

This latter relay, upon operating, at its inner-upper contacts becomes locked up over the previously traced locking circuit, at its upper-outer contacts connects the start-stop conductor 86 via contacts 16 of relay 15 to the impulse conductor 85 to prepare an operating circuit for relay 25, and at its lowermost make contacts completes the circuit of relay 30. This circuit extends from positive potential applied through the upper-outer contacts of relay 40, through the upper-outer contacts of relay 15, the start conductor 86, conductor 87, the break contacts of relay 20, the lower break contacts of relay 25, and the winding of relay 30 to negative battery. The relay 30, upon operating, at its inner contacts prepares the formerly traced series operating circuit for relay 20 and holding circuit for itself, and at its lowermost contacts completes the circuit of relay 45. This latter relay upon operating, connects conductors 60, extending from the equipment transmitting program No. 2, with the input conductors 80 of the broadcasting equipment. Since relay 40 is only momentarily operated it follows that the operation of relay 20 immediately follows the operation of relay 30.

Following the conclusion of program No. 2 an impulse is again transmitted over the conductor 85. This impulse passes by way of contacts 16, the upper-outer contacts of relay 35, over the start-stop conductor 86, conductor 87, the lower-make contacts of relay 20, and through the lower winding of relay 25 to negative battery. As in the first description covering the transmission of programs No. 1 and No. 2, the relay 25, at its inner-lower contacts, completes a locking circuit for itself including the impulse conductor 85 to insure that the relay 25 will remain energized for a sufficient period of time to enable the formerly energized and locked up relays to restore to their normal position.

If during the course of the transmission of a program it is desired to stop the same, this may be accomplished by operating the key designated "Release", which removes positive potential from the hold conductor 26 and accordingly permits any locked-up relays to restore to normal.

In illustrating and describing the invention, in order to keep the disclosure as simple as possible, provisions have only been shown for connecting one or the other of two programs or, alternatively, both programs in sequence to the input circuit of the broadcasting equipment. It will be obvious, however, to those skilled in the art, that provisions may readily be made for quite as readily connecting up one or a combination of a greater number of programs.

What is claimed is:

1. In an electrical control system; a plurality of pairs of conductors, comprising the output circuits of the reproducing equipment associated with previously recorded records, arranged for connection with the input circuit of a broadcasting equipment; a set of keys; means controlled by the actuation of a key of said set for selectively preparing the system for the connection of one or a combination of said first pairs of conductors with the input circuit depending on the key actuated, a pair of impulse conductors over which impulses are transmitted at the start and close of each program, means then automatically operated in response to the receipt of an impulse over one of said impulse conductors to connect a selected one of the plurality of pairs of conductors to the input circuit; and means automatically effective in response to the receipt of another impulse over the other impulse conductor to bring about the disconnection of such pair of conductors at the conclusion of the transmission of a program over such pair, to fully restore the control system to normal in case the selection made constituted but one program, and to alternatively bring about such disconnection and the connection of a second of said plurality of pairs with said input circuit in case the selection initially made constituted more than one record.

2. In an electrical control system, a plurality of pairs of incoming conductors, means for selecting any or all pairs of said conductors for connection with an outgoing circuit, a system of relays for connecting and subsequently disconnecting the selected pair or pairs from the outgoing conductors, means including a pair of conductors over which impulses are transmitted alternately at the start and close of the programs, and circuit arrangements utilizing a pulse transmitted over either one of said conductors to control the operation of said relays to connect a selected pair of incoming conductors with the outgoing conductors and utilizing a pulse transmitted over the remaining one of said conductors to control the operation of said relays to disconnect the incoming conductors therefrom, the respective conductors employed to control the respective connecting and disconnecting operations being dependent on the selection made.

3. In an electrical control system; a plurality of pairs of conductors, extending from the output circuits of the reproducing equipment associated with previously recorded records, arranged for connection with the input circuit of a broadcasting equipment; a pair of impulse conductors, over which impulses are transmitted, manually operated means for selecting either pair of the plurality of conductors connection with the input circuit, means controlled by an impulse transmitted over one of said impulse conductors to connect the input circuit with the selected pair of the plurality of conductors and controlled by an impulse transmitted over the other impulse conductor to disconnect the selected pair of conductors from the input circuit in case a certain one of said pairs of conductors is selected by said manual means, the function of the impulses transmitted over the conductors of said pair being reversed in case a different one of said pairs of conductors is selected by said manual means.

4. In a program transmitting system, a first and a second program trunk, an impulse conductor associated with each trunk, an input circuit, a program selecting key corresponding to

- said first and second program trunks, means operated responsive to the momentary actuation of said key for preparing said program trunks for connection with said input circuit, means for
- 5 transmitting impulses over said impulse conductors, means responsive to the receipt of the first impulse over the first impulse conductor for completing the prepared connection of the first program trunk to the input circuit, means responsive to the receipt of an impulse over the
- 10 second impulse conductor for disconnecting the first program trunk from the input circuit and for completing the prepared connection of the second program trunk to the input circuit, and
- 15 means responsive to the receipt of the second impulse over the first impulse conductor for disconnecting said input circuit from said second program trunk and for releasing said preparing means.
- 20 5. In a program transmitting system, a first and a second program trunk, an impulse conductor associated with each trunk, an input circuit, program selecting keys corresponding to said program trunks, means operated responsive
- 25 to the momentary actuation of each of said keys for selectively preparing said program trunks for connection with said input circuit, means for transmitting impulses over said impulse conductors, means responsive to the receipt of the
- 30 first impulse over the first impulse conductor for connecting the first program trunk to the input circuit in case the preparing means corresponding to the first program trunk is operated, means responsive to the receipt of an impulse over the
- 35 second impulse conductor for disconnecting the first program trunk from the input circuit and for connecting the second program trunk to the input circuit in case the preparing means corresponding to the second program trunk is operated,
- 40 and means responsive to the receipt of the second impulse over the first impulse conductor for disconnecting said input circuit from said program trunks and for releasing said preparing means.
- 45 6. In a program transmitting system, a first and a second program trunk, a first and second impulse conductor over which impulses are transmitted at the start and close of each program, an input circuit, means responsive to the receipt
- 50 of the first impulse over the first impulse conductor for connecting the first program trunk to the input circuit, means responsive to the receipt of an impulse over the second impulse conductor for disconnecting the first program trunk
- 55 from the input circuit and for connecting the second program trunk to the input circuit, and means responsive to the receipt of the second impulse over the first impulse conductor for stopping further connection of said program trunks
- 60 with said input circuit.
7. In a program transmitting system, a program trunk and a first and second impulse conductor therefor, means for transmitting impulses over said conductors at the start and close of the
- 65 program, an input circuit, means responsive to the receipt of an impulse over the first impulse conductor for connecting the program trunk to the input circuit, and means responsive to the receipt of an impulse over the second impulse
- 70 conductor for disconnecting the program trunk from the input circuit and for preventing the reconnection of said trunk with said circuit in case another impulse is transmitted over said first impulse conductor.
- 75 8. In a program transmitting system, a first and a second program trunk, a first and a second impulse conductor over which impulses are transmitted at the start and close of each program, an input circuit, means for utilizing the first impulse received over the first impulse conductor as a start impulse to connect the first program trunk to the input circuit and for utilizing the first impulse received over the second impulse conductor as a stop impulse to disconnect the first program trunk from the input circuit in case only the first program trunk is to be used, means for utilizing the first impulse received over the second impulse conductor as a start impulse to connect the second program trunk to the input circuit and for utilizing the impulse thereafter received over the first impulse conductor as a stop impulse to disconnect the second program trunk from the input circuit in case only the second program trunk is to be used.
9. In a program transmitting system, a first and a second program trunk, a first and a second impulse conductor over which impulses are transmitted at the start and close of each program, an input circuit, means for utilizing the first impulse received over the first impulse conductor as a start impulse to connect the first program trunk to the input circuit and for utilizing the first impulse received over the second impulse conductor as a stop impulse to disconnect the first program trunk from the input circuit in case only the first program trunk is to be used, and means for utilizing the first impulse received over the first impulse conductor as a start impulse to connect the first program trunk to the input circuit, for utilizing the impulse received over the second impulse conductor as a transfer impulse to disconnect the first program trunk from the input circuit and to connect the second program trunk to the input circuit, and to utilize the second impulse received over the first impulse conductor as a stop impulse to disconnect the second program trunk from the input circuit in case the first and second program trunks are to be successively used.
10. In a program transmitting system, a first and a second program trunk, a first and a second impulse conductor over which impulses are transmitted at the start and close of each program, an input circuit, means for utilizing the first impulse received over the second impulse conductor as a start impulse to connect the second program trunk to the input circuit and for utilizing the impulse thereafter received over the first impulse conductor as a stop impulse to disconnect the second program trunk from the input circuit in case only the second program trunk is to be used, and means for utilizing the first impulse received over the first impulse conductor as a start impulse to connect the first program trunk to the input circuit, for utilizing the impulse received over the second impulse conductor as a transfer impulse to disconnect the first program trunk from the input circuit and to connect the second program trunk to the input circuit, and to utilize the second impulse received over the first impulse conductor as a stop impulse to disconnect the second program trunk from the input circuit in case the first and second program trunks are to be successively used.
11. In a program transmitting system, a first and a second program trunk, a first and a second impulse conductor over which impulses are transmitted at the start and close of each program, an input circuit, means for utilizing the first impulse received over the first impulse conductor as a

start impulse to connect the first program trunk to the input circuit and for utilizing the first impulse received over the second impulse conductor as a stop impulse to disconnect the first program trunk from the input circuit in case only the first program trunk is to be used, means for utilizing the first impulse received over the second impulse conductor as a start impulse to connect the second program trunk to the input circuit and for utilizing the impulse thereafter received over the first impulse conductor as a stop impulse to disconnect the second program trunk from the input circuit in case only the second program trunk is to be used, and means for utilizing the first impulse received over the first impulse conductor as a start impulse to connect the first program trunk to the input circuit, for utilizing the impulse received over the second impulse conductor as a transfer impulse to disconnect the first program trunk from the input circuit and to connect the second program trunk to the input circuit, and to utilize the second impulse received over the first impulse conductor as a stop impulse to disconnect the second program trunk from the input circuit in case the first and second program trunks are to be successively used.

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