

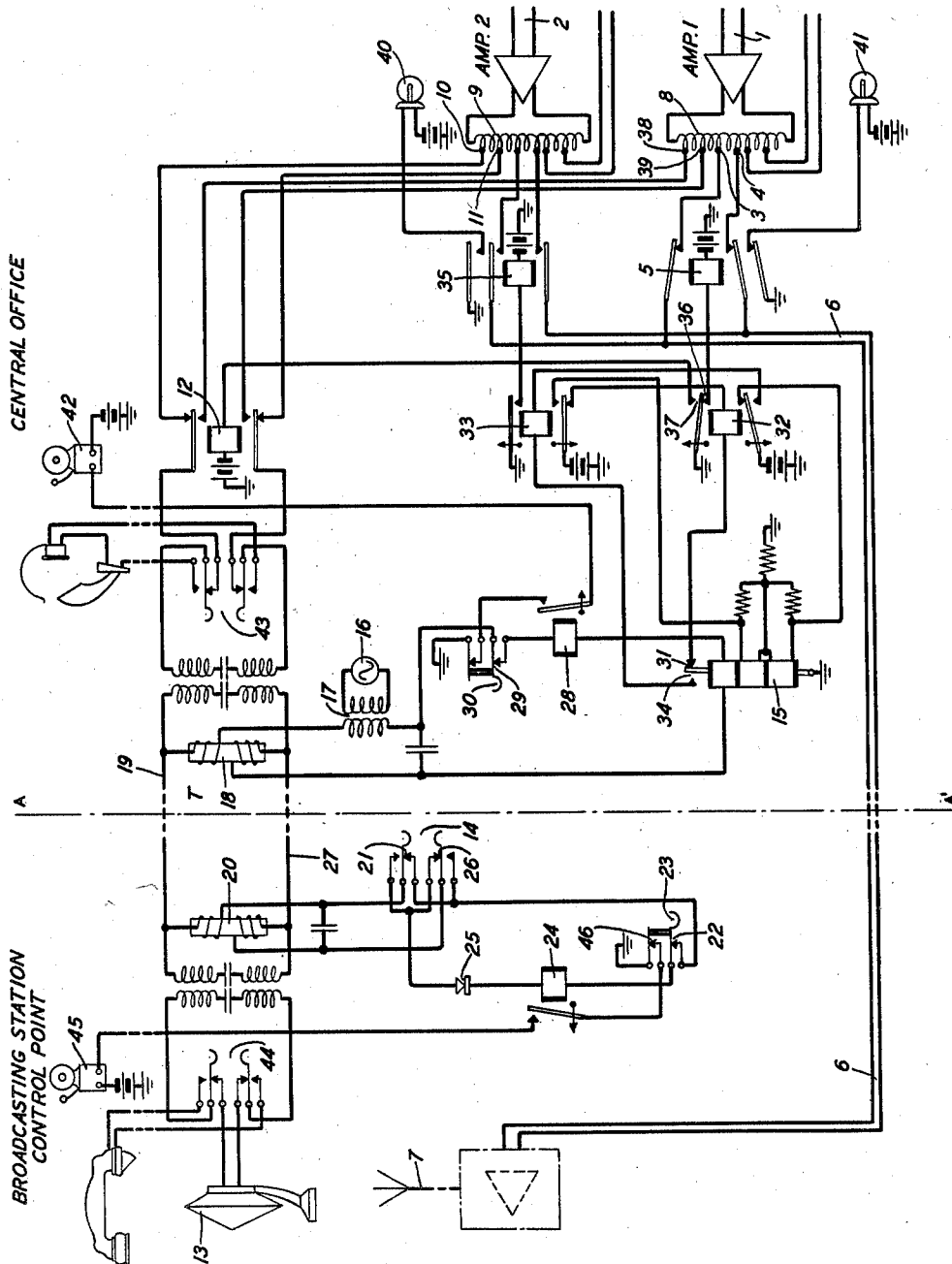
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P. B. MURPHY

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BROADCAST SWITCHING SYSTEM

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INVENTOR
P. B. MURPHY
BY *A. B. Krigman*
ATTORNEY

UNITED STATES PATENT OFFICE

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BROADCAST SWITCHING SYSTEM

Paul B. Murphy, South Nyack, N. Y., assignor to
Bell Telephone Laboratories, Incorporated, New
York, N. Y., a corporation of New York

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3 Claims. (Cl. 179—1)

This invention relates to broadcasting systems and more particularly to electric signaling and switching systems therefor.

An object of the invention is to enable an attendant at a broadcast station to connect the transmitter thereat to either of two different program sources located at a distant switching point, to monitor on the other source, to signal and talk with an attendant at the switching point, and to enable the switching point attendant to signal and talk with the station attendant.

The invention will be understood from the following description when read in connection with the accompanying drawing which shows at the left of the vertical broken line AA' a control point at a broadcasting station, herein referred to as a station, and at the right of the line AA' equipment at a telephone central office at which point various lines, over which broadcast programs are transmitted, are switched to establish what are referred to as broadcast networks.

Connecting the central office and the control point of the station, shown at the left of the drawing, are a so-called broadcast loop over which the station receives a program to be broadcast from its transmitter, and a trunk line which serves the following three-fold purpose: (1) as a switching control channel whereby an attendant at the station is able to control switches at the central office to transfer its program loop from one program source to another; (2) to serve as a monitoring channel between the central office and station whereby when the station is receiving a program over its program loop, which program is incoming to the central office over one of two program lines, an attendant at the station can monitor (i. e., listen) on a program incoming to the central office over another program line, and (3) to serve as an intercommunicating telephone channel between the central office and station including both signaling and voice transmission.

Program switching control and monitoring

Referring to the drawing it will first be assumed that a program is incoming over line 1 to the central office where it is amplified by means AMP—1 the output of which amplifier includes a tapped coil 8. Assuming that relay 5, to be referred to later, is operated, points 3 and 4 of the coil 8 are connected over front contacts of the relay 5 to a program loop 6 which extends to the broadcast station shown at the left of the vertical line AA'. Under normal conditions this program loop 6 will be connected, by means of switching

and amplifying equipment (not shown) to transmitting equipment including antenna 7.

It will be noted from the drawing that line 2 also terminates in an amplifier AMP—2 the output of which includes a tapped coil 9. Under the same assumed conditions points 10 and 11 of the coil 9 are connected over the back contacts of relay 12 to the trunk T which terminates at the broadcast station in a loud-speaker 13. It will therefore be obvious that during the period that the program loop 6 is connected to the output of AMP—1 the monitoring loud-speaker 13 at the station is connected to monitoring taps 10 and 11 in the output coil of AMP—2.

It will now be further assumed that when the program on line 1, now being transmitted from the antenna 7, is finished, the next program to be transmitted from the station will be one transmitted over line 2 to the central office and, therefore, it will be necessary to switch the program loop 6 from the output of AMP—1 to the output of AMP—2. Further, when the station is receiving a program from AMP—2 it is desired that the monitoring loud-speaker 13 be transferred from the output coil 9 to the output coil 8 in order that the station attendant can monitor on the program being transmitted over line 1.

The operation of the circuits whereby this transfer is effected will now be described.

At the conclusion of the program being transmitted from the station, and the conclusion of the program on line 2, the control attendant at the station operates transfer key 14 thereby reversing the direction of current flow through the upper winding of polar relay 15 at the central office as follows: 16 is a source of alternating current in series with the primary winding of a transformer 17, the secondary winding of which is in series with a circuit which can be traced from the upper terminal of the secondary winding, through the upper winding of impedance coil 18, tip conductor 19 of the trunk T, upper winding of impedance coil 20 at the broadcast station, contact 21 of key 14, contacts 22 of signaling key 23, winding of relay 24, unilateral conducting device 25, which in practice may be a rectifier of the copper oxide type, contacts 26 of key 14, lower winding of impedance 20, ring conductor 27 of the trunk T, lower winding of impedance 18, upper winding of polar relay 15, winding of relay 28, and contacts 29 of signaling key 30 to the lower terminals of the secondary winding of transformer 17.

Due to the unidirectional characteristics of

rectifier 15 only the alternating half waves in one direction pass through the polar relay 15, which we will assume tend to close contacts 31 thereby energizing relay 32 in an obvious circuit to battery at the lower back contact of relay 33. Relay 33 in its operated position connects the program loop 6 to the output coil 8 of AMP-1 as previously described.

When the station attendant operates transfer key 14 the rectifier 25 is reversed with respect to the circuit previously traced, thereby causing rectified current to flow in the opposite direction through the upper winding of polar relay 15, thus causing the armature thereof to open contacts 31 and close contacts 34 thereby opening the circuit of relay 32 which relay releases slowly. Closure of contacts 34 of relay 15 prepares a circuit to operate relay 33 but until relay 32 releases and closes its lower back contacts this circuit is not complete and therefore relay 33 cannot operate. When relay 32 is completely released, however, it closes its lower back contact thereby completing the foregoing circuit for relay 33 which relay then operates and closes a circuit for operating relay 35. Relay 32 in releasing also opens contact 36, thereby releasing relay 5 to disconnect program loop 6 from amplifier AMP-1, and closes its contact 37 thereby operating relay 12. The operation of relay 12 disconnects the trunk T from the monitoring taps 10 and 11 of the output coil 9 of AMP-2 and connects the trunk over its front contacts to the monitoring taps 38 and 39 of the output coil 8 of AMP-1.

Operation of relay 35, in response to operation of relay 33, connects the program loop 6 to the output coil 9 of AMP-2 whereupon the succeeding program received over line 2 is transmitted over program loop 6 to the station, and the program incoming over line 1 is transmitted over the trunk T and heard at the station on monitoring loud-speaker 13.

Operation of relay 35 also closes a circuit to light pilot lamp 40 as an indication to an attendant at the central office that AMP-2 is connected over program loop 6 to the station, it being noted that pilot lamp 41 associated with AMP-1 is extinguished by the release of relay 5.

The middle and lower windings of relay 15 are for the purpose of preventing this relay from being falsely operated to effect a program transfer, due to an interruption of its operating circuit, which will occur when signaling between the station and the central office, to be later described, it being noted that when relay 15 is in the position shown, i. e., with its armature closing contacts 31 and thereby holding relay 32 operated, the lower front contact of this relay maintains a circuit from battery through the lower winding of relay 15 to ground which winding is so connected that the direction of current flow therethrough tends to hold its contacts 31 closed, and a full strength reversal of the current flowing in the upper or line winding is necessary to cause the contacts 31 to open, and contacts 34 to close. When this occurs due to operation of key 14, relay 32 eventually releases and when relay 33 operates due to the closure of contacts 34 this relay 33 closes at its lower front contact a similar biasing circuit including the middle winding of relay 15 to hold contacts 34 closed until another full strength line current reversal occurs.

Intercommunicating between station and central office

In addition to the foregoing described switching and monitoring function of the trunk T this trunk also serves as a communication channel between the control attendant at the station and the central office. The manner in which an attendant at either terminus of the trunk signals and converses with an attendant at the other terminus, will now be described.

Let it be assumed that the station attendant desires to communicate with the attendant at the central office. To signal the central office the station attendant operates signal key 23 thereby opening the previously traced circuit which includes relay 28 at the central office which relay thereupon releases. Relay 28 in releasing closes, at its back contact, an obvious circuit to operate the signal bell 42. When the central office attendant hears the signal he will operate his talk key 43 thereby connecting his telephone set with the trunk and disconnecting the monitoring circuit normally closed in the unoperated position of the key. If the attendant at the station has also operated his talk key 44 the two attendants can converse with each other.

Relay 24 at the station end of the circuit also releases when key 23 is operated but bell 45 is not operated due to the fact that contacts 46 in key 23 are opened thereby disconnecting operating ground for the bell.

The circuit operates in a similar manner in case the central office attendant desires to call the station attendant and operate the key 30, thereby actuating bell 45.

In case of trouble on trunk T, which results in an open circuit thereof, relays 24 and 28 will release causing the actuation of bells 45 and 42 respectively, thereby calling attention to the trouble.

What is claimed is:

1. In a broadcasting system, in combination, a switching point, two lines terminating thereat over which broadcast programs are transmitted, a broadcast station, a line between said switching point and said station, switching means at said switching point for connecting said station line to either of said program lines, a trunk line between said station and switching point, said trunk line serially including a source of alternating current, a unidirectional current conducting device, and a polar relay adapted to operate in either of two directions depending on the direction of the current flowing therethrough, a switch at the station end of said trunk line for reversing the connection of said unidirectional device with respect to the trunk to cause a current reversal thereover, and a consequent reverse operation of said polar relay, said polar relay being so connected and arranged as to control said switching means for connecting the station line to one or the other of said program lines, a monitoring receiver at the station connected to said trunk line, and means responsive to the connection of said station lines to either one of said program lines for connecting the other program line to said trunk line.

2. In an electrical signaling system, in combination, a line serially including a source of alternating current, a unidirectional current conducting device and a relay, said relay being adapted to operate in either of two directions depending on the direction of current flowing therethrough, switching means for reversing the

connection of said device with respect to the line to cause a current reversal thereover and the reverse operation of said relay, a second relay in series with the line adapted to be normally operated regardless of the current direction there-
through, signal means controlled by said second relay, means for interrupting the line current to release said second relay to control said signal means, and means maintaining the first relay in either operated position during said current interruption.

3. In an electrical signaling and switching system, in combination, a line serially including a

source of alternating current, a rectifier and a polarized relay adapted to close either one of two switching circuits depending on the direction of current flowing therethrough, means for reversing said rectifier with respect to the line to reverse the direction of current thereover, a second relay in series with the line adapted to be operated on line current in either direction, signal means controlled by said second relay, means for opening said line to release said second relay, and means for holding said polarized relay in either operated position while said line is open.

PAUL B. MURPHY.