

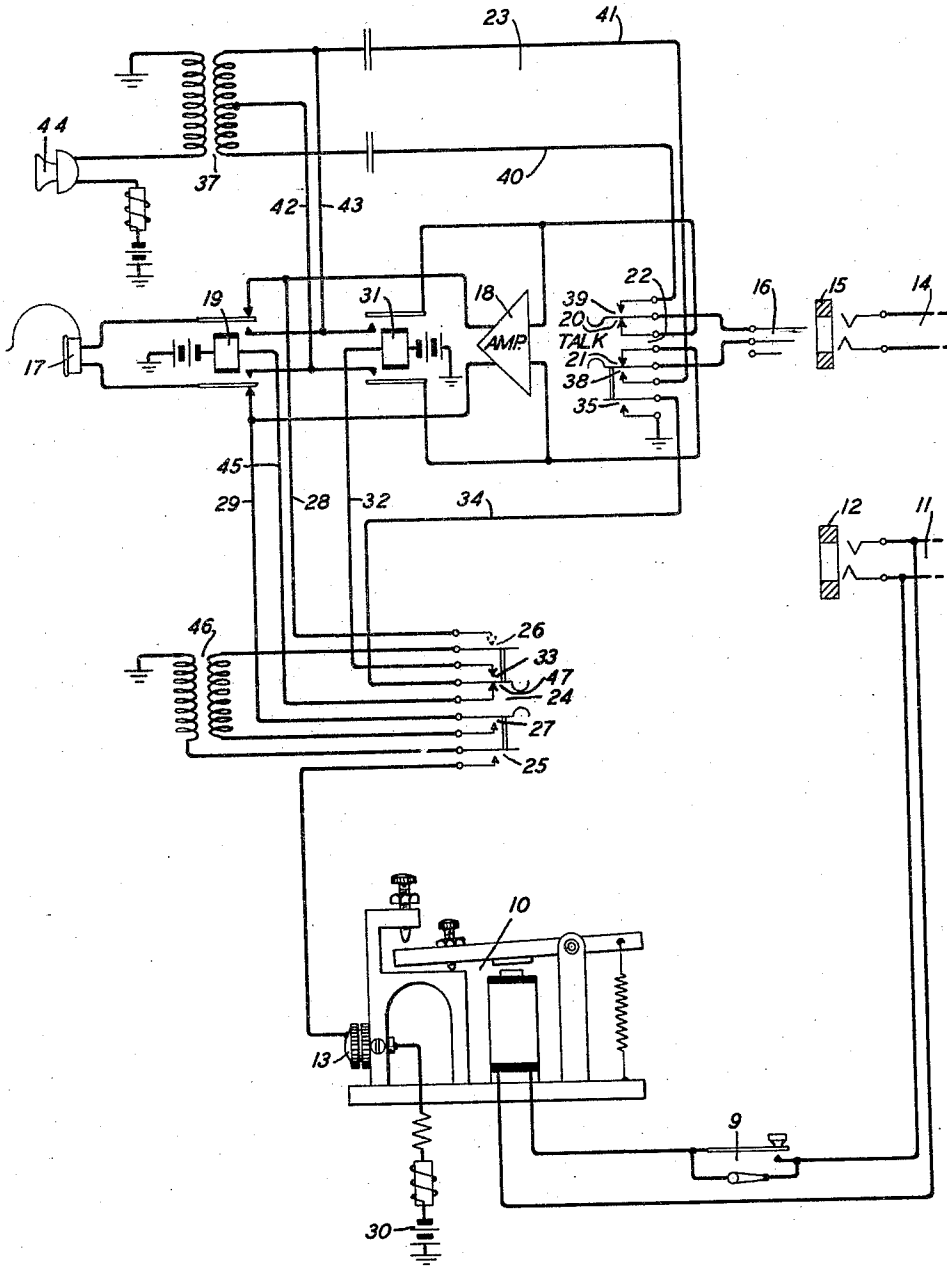
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates in general to telephone systems and particularly to testing equipment located at telephone test and control boards for the purpose of testing and monitoring long line connections.

In communicating between the test boards of widely separated offices, it is common practice to transmit telegraphic code signals over order-wires interconnecting the offices. These order-wires terminate at the offices in telegraph sounders which are actuated in accordance with the signals being transmitted to convey messages to the test man. As there are numerous such sounders located at the test board, invariably operating at the same time, it is difficult for a test operator to distinguish the signals incoming on the sounder located at his position from those incoming on sounders at adjacent positions. To overcome this difficulty and thereby minimize the probability of error in translating code messages, a carbon button transmitter is located in close proximity with the sounder and inductively associated with the test operator's receiver. In this manner, the code signals are carried directly to the ear of the operator, by way of the electrical connection between the carbon button transmitter and his receiver, permitting him to concentrate on the message being recorded on his sounder without interference from neighboring sounders.

It is not only necessary that a test operator be able to transmit and receive telegraph code signals at his position at the test board but he must also carry on verbal conversation over telephone lines upon which he may be called upon to monitor and do this while transmitting and receiving code signals over his order-wire.

Heretofore, it has been found that this twofold requirement has resulted in the transmission, over the voice circuit to which the test operator is connected, of clicks emanating from his order-wire sounder which causes undue disturbance to the parties at distant points on the voice circuit.

It is the object of this invention, therefore, to permit an operator to monitor over a voice circuit with which a telegraphic carbon but-

ton transmitter is electrically associated without interference to the voice circuit from the telegraph signals.

This object is attained in accordance with a feature of the invention by the provision of relay means responsive to the actuation of a key, which connects the sounder transmitter to the operator's receiver circuit, for interposing a vacuum tube amplifier, having a unidirectional transmission characteristic, between the voice circuit over which an operator may be conversing and the operator's receiver, thereby preventing the sounder clicks applied to the receiver from passing out over the voice circuit.

The invention will be readily understood from the following detailed description made with reference to the accompanying drawing which discloses a test and control operator's telephone circuit embodying the features of this invention.

Generally indicated by the numeral 10 is shown in enlarged form, a telegraph sounder bridged across the line conductors of an order-wire or telegraph channel 11 which terminates at the test board in the jack 12. Mechanically secured to the anvil of the sounder is a carbon button transmitter 13 by virtue of which the clicks set up by the operation of the sounder may be electrically transmitted to the operator's receiver as will appear from a later description. A telegraph key 9 is shown connected in series with the sounder 10 to indicate that the order-wire 11 is employed for two-way telegraph traffic as is the usual practice.

A toll line multiple 14 is shown terminating at the test operator's position in a jack 15.

With the plug 16 inserted in jack 15, it will be noted that the test operator is in a position to monitor on the toll line to which jack 15 is multiplied. Under this condition, the operator's receiver 17 is bridged across the output side of the monitoring amplifier 18 by way of the armatures and back contacts of relay 19, and the input side of the amplifier 18 is connected to the toll line multiple by way of normal contacts 20 and 21 of talk key 22 and the tip and ring terminals of plug 16 and jack 14. This condition pre-

vailing, the operator may not converse over the voice circuit 23 to the toll line but may merely listen in for monitoring purposes.

If, while monitoring on the toll line, it becomes necessary for the test operator to listen to and translate telegraphic code signals incoming over the order-wire 11 and received by the sounder 10, the operator would actuate sounder key 24. The actuation of this key connects, by way of alternate contacts 25, the carbon button transmitter 13 to the primary winding of induction coil 26 and connects the secondary winding of the induction coil 26 across the operator's receiver 17 by way of alternate contacts 26 and 27 of key 24, conductors 28 and 29 and the back contacts and armatures of relay 19. The clicks of the sounder 10 are acoustically transmitted to the carbon button transmitter 13 which is connected to a battery supply 30. These clicks are then relayed to the operator's receiver 17 through the medium of the induction coil 26. In this manner the operator can distinctly and without confusion caused by neighboring sounders, hear in his receiver the code signals incoming over the order-wire 11 and at the same time carry on his monitoring duties as well.

It will be noted that the carbon button transmitter circuit is connected to the output side of monitoring amplifier 18 so that the clicks emanating from sounder 10 are not sent out over the plug-end of the operator's circuit to cause disturbance to the parties in conversation on the toll line of which jack 15 is a multiple and upon which the test operator is monitoring, it being understood that transmission is possible in one direction only through amplifier 18 and that in the direction indicated by the apex of the figure schematically representing an amplifier having a unidirectional transmission characteristic.

Should it become necessary for the test operator to talk on the toll connection by way of multiple jack 15 or over any other circuit with which plug 16 may be associated and at the same time receive code signals incoming over the order-wire 11, he would actuate talk key 22 in conjunction with sounder key 24.

With both keys 22 and 24 operated, a circuit is established extending from grounded battery, winding of relay 31, conductor 32, alternate contacts 33 of key 24, conductor 34 to ground by way of the alternate contacts 35 of key 22. Relay 31 operates in this circuit and at its armatures and front contacts connects the upper half of the right-hand winding of the induction coil 37 across the input side of the amplifier 18, the alternate contacts 38 and 39 of key 22 connecting the secondary windings of coil 37 across the tip and ring terminals of plug 16 and jack 14. Under this condition, the circuit for incoming voice currents extends from the tip and

ring of jack 14, tip and ring of plug 16, alternate contacts 39 and 38 of talk key 22, conductors 40 and 41, lower right-hand winding of induction coil 37, conductors 42 and 43, front contacts and armatures of relay 31, through the amplifier 18, back contacts and armatures of relay 19 through the operator's receiver 17. The outgoing voice currents set up by the operator in talking into his transmitter 44 pass through the induction coil 37, conductors 40 and 41, alternate contacts 39 and 38 of key 22 to the tip and ring terminals of plug 16 and jack 15 and out over the established connection.

In this manner the operator may carry on a telephone conversation and at the same time receive in his receiver 17 code signals set up by the sounder 10 and its associated carbon button transmitter 13 without the signals being transmitted over the established voice circuit, since the carbon button transmitter circuit is connected across the receiver 17 and also across the output side of the amplifier 18.

Should the operator desire to carry on a telephone conversation at a time when there is no necessity for the sounder key to be actuated, he would operate the talk key 22 only. Under this condition relay 19 operates in a circuit extending from grounded battery, winding of relay 19, conductor 45, normal contacts 46 of key 24, conductor 34 to ground on the alternate contacts 35 of key 22. Relay 19 operates in this circuit and connects the receiver 17 across the conductors 40 and 41 by way of the lower right-hand winding of induction coil 37, conductors 40 and 41 being associated respectively with the tip and ring terminals of plug 16 by way of alternate contacts 39 and 38 of key 22.

With only key 22 operated, it will be noted that the amplifier 18 is disconnected from the operator's equipment both at the contacts 20 and 21 of key 22 and at the back contacts of relay 19.

From the foregoing description, it is evident that applicant has devised a circuit arrangement whereby telegraphic code signals incoming over one line and voice signals incoming over another distinct line may be simultaneously picked up by an operator's receiver and in such a manner that the voice channel is rendered opaque to the telegraphic signals thereby preventing the code signals from interfering with the conversation being carried on over the voice channel.

What is claimed is:

1. In combination, a telephone line, a telegraph channel, means associated with said telegraph channel for the reception of code signals incoming over said channel, an operator's telephone receiver, and means for associating said receiver with said telephone line and said means for the simultaneous reception of voice signals and code signals in-

coming over said telephone line and said telegraph channel respectively.

2. In combination, a telephone line, a telegraph channel, means associated with said telegraph channel for the reception of code signals incoming over said channel, an operator's telephone receiver, means for associating said receiver with said telephone line and said means for the simultaneous reception of voice signals and code signals incoming over said telephone line and said telegraph channel respectively, and means for rendering said telephone line immune to disturbance from the code signals incoming over said telegraph channel.

3. In combination, a telephone line, an operator's telephone, a link circuit connecting said line and said operator's telephone, a unidirectional current conducting device, a current source of audible frequency, and switching means for interposing said device in said link circuit and for connecting said audible frequency source to said link circuit between said device and said operator's telephone.

4. In combination, a telephone line, an operator's telephone, a link circuit connecting said line and said operator's telephone, a unidirectional current conducting device connected in said link circuit, a current source of audible frequency, and switching means for connecting said audible frequency source to said link circuit between said operator's telephone and said device.

5. In combination, a telephone line, an operator's telephone, a link circuit connecting said line and said operator's telephone, a unidirectional current conducting amplifier connected in said link circuit, said telephone line being connected across the input side of said amplifier, a current source of audible frequency, and switching means for connecting said audible frequency source to said link circuit between said operator's telephone and the output side of said amplifier.

6. In combination, a telephone line, an operator's telephone, a link circuit connecting said line and said operator's telephone, a unidirectional current conducting device, a telegraph sounder, a transmitter acoustically coupled with said telegraph sounder, and switching means for connecting said transmitter to said link circuit between said operator's telephone and said device whereby the signals emanating from said sounder may be heard in said operator's telephone and are prevented from being transmitted over said telephone line.

7. In combination, a telephone line, an operator's telephone, a link circuit connecting said line and said operator's telephone, a unidirectional current conducting device, a telegraph sounder, a transmitter acoustically coupled with said telegraph sounder, and switching means for interposing said device

in said link circuit and for connecting said transmitter to said link circuit between said device and said operator's telephone.

8. In combination, a telephone line, an operator's telephone, a link circuit connecting said line and said operator's telephone, a unidirectional current conducting amplifier in said link circuit, said telephone line being connected across the input side of said amplifier, a telegraph sounder, a transmitter acoustically coupled with said telegraph sounder, and means for connecting said transmitter to said link circuit between said operator's telephone and the output side of said amplifier.

In witness whereof I hereunto subscribe my name this 26th day of February, 1932.
TOLA A. MARSHALL.