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COMBINED TELEPHONE AND TELEGRAPH SYSTEM

Filed Dec. 30, 1932

2 Sheets-Sheet 1

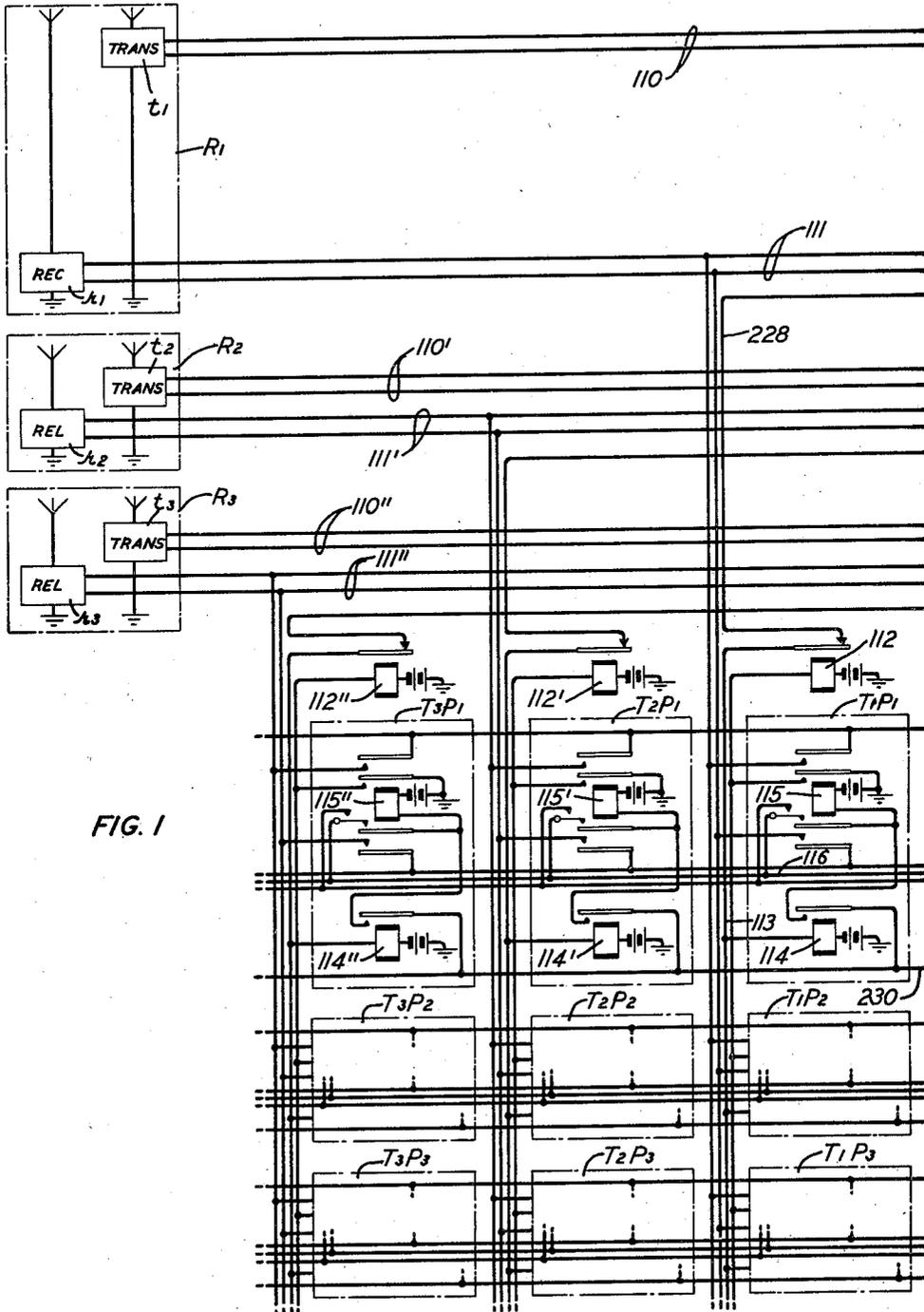


FIG. 1

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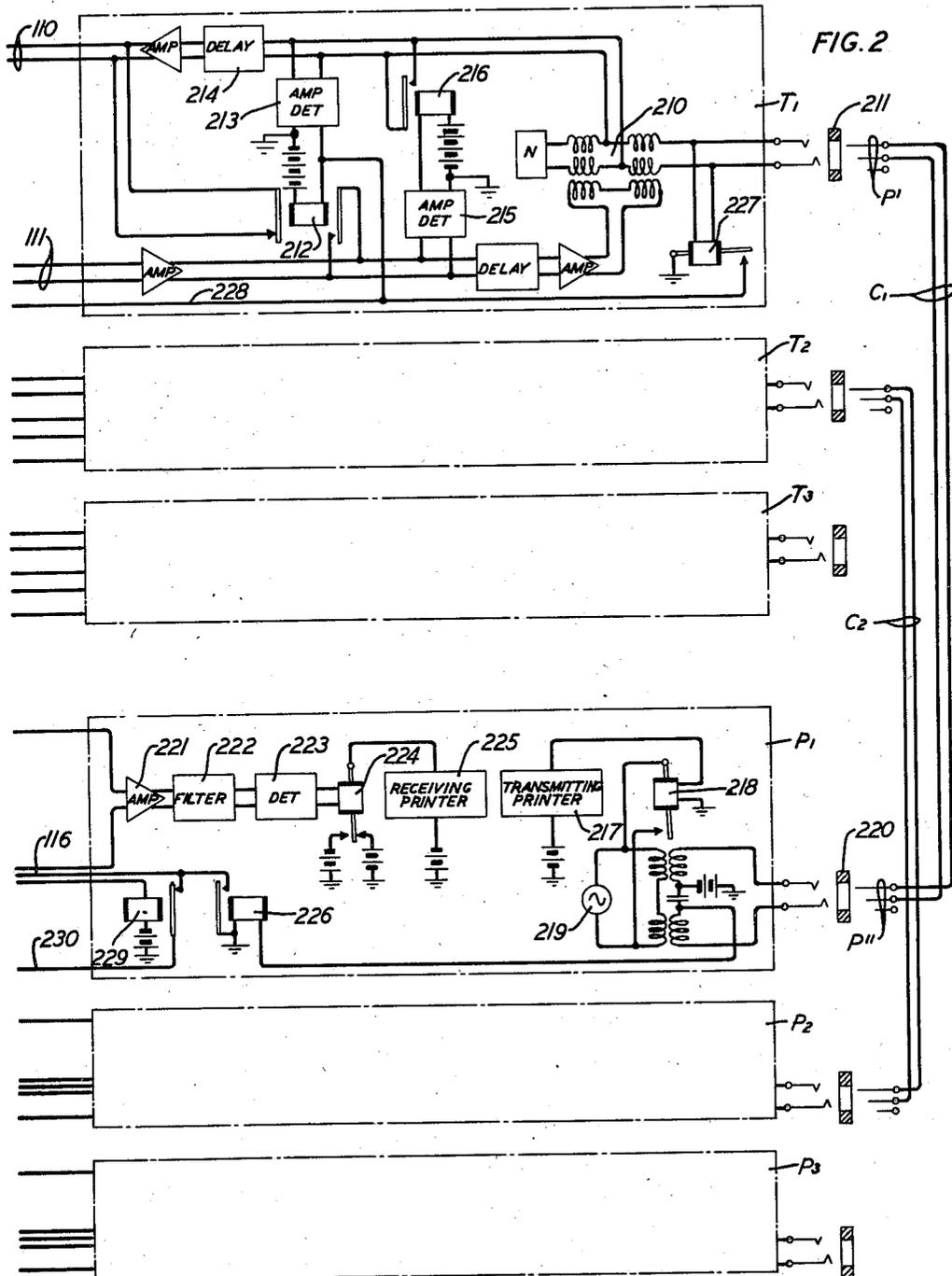
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2 Sheets-Sheet 2



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COMBINED TELEPHONE AND TELEGRAPH SYSTEM

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1 Claim. (Cl. 179-3)

This invention relates to the combined telephone and telegraph systems and particularly to arrangements for switching telegraph apparatus into association with a telephone circuit when it is not being used for telephone transmission.

An object of the invention is to utilize a four-wire radio telephone system for transmitting telegraph signals when the system is not being used for telephonic transmission.

Another object is to utilize a plurality of relay groups at a central office for automatically connecting to a radio telephone circuit the receiving unit of a telegraph set immediately after its associated sending unit has been connected to the circuit at a toll switchboard.

Heretofore in systems of the type herein described the selection by an operator, at a switchboard, of a telegraph transmitter of a printer set for operation over the transmitting side of a telephone channel, automatically connects the associated telegraph receiver of the set to the receiving side of the same channel by means of a rotary selector switch comprising three contact banks as disclosed in U. S. Patent 1,828,823, granted to E. R. Taylor on October 27, 1931.

According to the present invention, the selection of a telegraph receiver corresponding to a selected telegraph transmitter is accomplished by means of a group of relays. There are provided for each printer set in the system as many groups of relays as there are telephone channels.

Four-wire telephone systems are usually provided with voice-operated arrangements for suppressing echoes and preventing singing over the four-wire circuit. In a well known arrangement of this type, voice-operated relays are provided whereby when transmission takes place from the two-wire terminal out over the transmitting side of the four-wire circuit, the normally disabled transmitting channel will be cut through for transmission and the receiving circuit will at the same time be disabled. Similarly, when telephone transmission is being received over the receiving side of the circuit, voice-operated relays will disable the transmitting side as well as the voice-operated equipment associated therewith to prevent any interference with reception.

When such a circuit is to be used for full duplex telegraph transmission, if the telegraph transmitter is to be applied to the two-wire terminal it is necessary to actuate the voice-operated relay which cuts through the transmitting side of the circuit. This may be done automatically upon the connection of the telegraph transmitter to the

circuit but necessarily results in disabling the receiving side of the circuit at the same time. Therefore, the telegraph receiver must be associated with the receiving side of the four-wire circuit beyond the point at which it is disabled in order that telegraph signals may be freely received.

When several four-wire circuits are provided and one or more telegraph sets are available, the present invention provides an arrangement whereby, when the transmitting apparatus of a telegraph set is connected to the two-wire terminal of a particular four-wire circuit, its corresponding telegraph receiving apparatus is automatically switched into connection with the receiving side of the four-wire circuit.

The invention will now be more fully understood from the following description when read in connection with the accompanying drawings of which:

Fig. 1 illustrates the connections of three telephone channels to three radio channels respectively, and nine groups of relays whereby the receiving unit of three telegraph printers may be automatically connected as desired, but one at a time, to any one of the three telephone channels; and

Fig. 2 shows in schematic layout the equipment provided for a telephone channel and equipment provided for a printer set. Two additional telephone channels and two additional printer sets are shown in diagrammatic form.

Referring to the drawings, the terminal arrangement of a four-wire system comprising a transmitting line 110 and a receiving line 111 is illustrated in detail. In practice, the transmitting line may be associated with the radio transmitter of a trans-Atlantic telephone circuit and the receiving line with the corresponding radio receiver of such a system. Such a system is illustrated in the drawing as the preferred embodiment of the invention.

The ends of the transmitting and the receiving lines are connected through a hybrid coil 210 to a two-wire terminal ending in a jack 211 through which connections may be established by means of a cord circuit to various telegraph circuits. In order to prevent singing over the four-wire part of the system, the transmitting line 110 is normally disabled by a contact at the left armature of a voice-operated relay 212. This relay may be operated by current from an amplifier-detector arrangement 213 associated with the transmitting line 110 so when voice currents flow over said line the normal short circuit con-

trolled by the relay 212 will be opened to cut the line through for transmission. At the same time a contact at the right armature of the relay 212 is closed to disable the receiving line 111. A delay circuit 214 may be provided between the amplifier-detector arrangement 213 and the point at which the short circuit is applied to the line 110 in order to enable the relay 212 to operate before the voice currents arrive at the short circuit.

With relay 212 operated, transmission may take place from the two-wire terminal over the transmitting line 110 but current can not be transmitted from the receiving line 111 to the two-wire terminal. In order that transmission may take place in the opposite direction, an amplifier-detector 215 is associated with the receiving line 111 and controls the relay 216 which, when actuated, closes a short circuit across the transmitting line 110, this short circuit at the same time disabling the amplifier-detector 213 and preventing any interference with reception over the line 111. It will thus be seen that transmission may take place in only one direction at a time.

The telephone system above described may be used for telegraph transmission when it is not being employed for telephony and preferably the telegraph signals would be transmitted and received as audible tones modulated or controlled in accordance with the telegraph message. When a telegraph transmitter is connected to the two-wire terminals of jack 211, it is obviously necessary to actuate the relay 212 to remove the short circuit from the transmitting line 110. This results in disabling the receiving line 111 at the same time by means of the right-hand armature and contact of relay 212. Consequently, it has been the practice heretofore to permanently connect the receiving telegraph apparatus with the receiving line 111 at a point beyond the short circuit controlled by the relay 212.

Where a number of such telephone circuits are provided and one or more sets of telegraph equipment are available, an arrangement, such as above described, becomes impracticable as flexibility in the connection of the telegraph equipment to the idle telephone line is impossible.

To avoid this difficulty, the present invention provides an arrangement whereby, when a telegraph transmitter is connected to the two-wire terminal at jack 211, the corresponding telegraph receiver will be automatically associated with the receiving line 111.

In the drawings, three telephone channels T₁, T₂ and T₃ are shown arranged to be accessible to three printing telegraph circuits P₁, P₂ and P₃. Any one of the telegraph circuits may be connected by means of cord circuits C₁ and C₂ to any one of the telephone channels when the channel selected is not being used for telephonic transmission. The three telephone channels are shown respectively connected to three radio channels R₁, R₂ and R₃ each of which is equipped with a retransmitter *t* and a repeating receiver *r*. For the purpose of illustration, it is assumed that the telephone channel T₁ is not being used for telephonic transmission at the time it is desired to connect printer circuit P₁ to it by means of cord circuit C₁. The telegraph transmitting and receiving equipment of the printer circuits P₁, P₂ and P₃ are identical. The equipment shown for printer circuit P₁ comprises a transmitter 217 which is arranged to send direct current pulses through the winding of a transmitting relay 218

to control the transmission of a tone of frequency *f* from a generator 219 to the transmitting jack 220. The receiving equipment of printer circuit P₁ comprises a tone amplifier 221, a receiving filter 222 for selecting the receiving telegraph *f* and a detector 223 in whose output circuit is included a receiving relay 224. The receiving relay 224 sends direct current pulses to the receiving unit, or printer 225.

The telegraph transmitter may be associated with the two-wire terminal of the telephone circuit by inserting the plugs *p*' and *p*'' of the cord circuit C₁ in the jack 211 of the two-wire terminal of the telephone circuit and in the jack 220 of the telegraph transmitter, respectively. When this connection is established the operating circuit of relay 226 associated with the telegraph transmitter of printer circuit P₁, and that of relay 227 associated with the two-wire telephone terminal will be completed from battery, over the tip spring of jack 220, tip of plug *p*'', tip conductor of the cord C₁, tip of the plug *p*' and tip spring of jack 211, through the winding of relay 227, over the ring spring of jack 211 and ring of plug *p*', ring conductor of cord C₁, ring of plug *p*'', ring spring of jack 220, through the winding of relay 226, to ground. Relays 227 and 226 operate. The operation of relay 227 connects ground to the winding of the voice-operated relay 212 which operates to disable the receiving line 111 and at the same time removes the normal short circuit from the transmitting line 110. The system is now in condition to transmit telegraph signals from the printer circuit P₁ over the cord circuit C₁ and thence over transmitting line 110.

Relay 227, in operating, connects ground to a circuit traceable over conductor 228, contact and armature of relay 112, conductor 113, through the winding of relay 114, to grounded battery. Relay 114 operates and completes the circuit traceable from ground, armature and contact of relay 226, contact and armature of relay 229, conductor 230, armature and contact of relay 114, through the winding of relay 115, to grounded battery. Relay 115 operates and closes at its inner lower armature and contact, a locking circuit for itself traceable over conductor 116, contact and armature of relay 226 to ground. Also relay 115, in operating, connects at its inner upper armature and contact an operating circuit for relay 112 which opens the operating circuit for relay 114. Relay 114 releases. Relay 115, in operating, closes at its outer upper and outer lower armature and contacts a communication circuit extending from the receiving line 111 to the receiving equipment of printer circuit P₁. Relay 115, in operating, closes in parallel with its locking circuit, a path extending over its innermost lower contact a circuit extending through the winding of relay 229, to grounded battery. Relay 229 operates and removes ground from the contact of relays 114, 114', 114'' associated with printer circuit P₁ in order to prevent ground from being connected by a relay corresponding to relay 227 of telephone channel T₁, in one of the other telephone channels for operating relays 115' or 115'' whereby a second telephone channel will be connected to the printer circuit P₁. In a similar manner, relay 112 operates to open the operating circuit for relay 114 and the corresponding relay for each of the other printer circuits P₂ and P₃ thereby preventing circuits P₂ and P₃ from being connected to the receiving line 111.

Relay 115 is held operated under control of relay 226 as long as the cord circuit C₁ intercon-

nects jacks 211 and 220. When the cord circuit C_1 is removed from the jacks, relay 115 releases to restore the circuit to its normal condition. It will be noted, therefore, that a relay, such as relay 112, is provided for each of the telephone channels and that each of these relays is common to all the printer circuits.

When it is again desired to use the telephone circuit for telephonic transmission the plugs p' and p'' are withdrawn thereby releasing relays 226 and 227. The release of relay 226 releases relay 115 which in turn causes the release of relay 112. The operating circuit for relay 114 closes at the armature and contact of relay 112 but this circuit is now opened because of the release of relay 227. The release of relay 227 causes the release of relay 212 whereby the telephone channel T_1 is restored to normal. The release of relay 115 disconnects the receiving unit of printer circuit P_1 from the receiving line 111.

Printer circuit P_1 may be connected in a similar manner to either of telephone channels T_2 or T_3 by interconnecting jack 220 by means of a cord circuit with a jack, corresponding to jack 211, of the desired channel. Should telephone channel T_2 be selected for connection to printer circuit P_1 , then relay group T_2P_1 would be employed for connecting the receiving unit of printer circuit P_1 to the receiving line 111' of telephone channel T_2 . Should telephone channel T_3 be selected then relay group T_3P_1 would be employed for connecting the receiving unit of printer circuit P_1 to the receiving line 111'' of telephone channel T_3 .

Should it be desired to use printer circuit P_2

for connection to any one of the telephone channels T_1, T_2, T_3 a cord circuit would be inserted in the jack associated with printer circuit P_2 and in the jack associated with the desired telephone channel. A connection thus established would cause to be engaged the relay group of groups T_3P_2, T_2P_2 and T_1P_2 , depending on which telephone channel was selected to connect the receiving unit of printer circuit P_2 to the receiving line of the selected telephone channel.

In like manner printer circuit P_3 may be connected to the receiving line of one of the telephone channels, but in this case a relay group of groups T_3P_3, T_2P_3 and T_1P_3 will be engaged to complete the connection.

What is claimed is:

In a transmission system, a plurality of four-wire telephone circuits each comprising a transmitting line and a receiving line, a two-wire terminal for each of said telephone circuits, a plurality of telegraph sets each comprising a telegraph transmitter and a telegraph receiver, a link circuit for connecting any one of said telegraph transmitters to the two-wire terminal of any one of said telephone circuits, and a plurality of relay groups corresponding in number to the numerical product of said plurality of telephone circuits multiplied by said plurality of telegraph sets, each of said groups comprising two relays only which when operated in response to a connection established by said link circuit, complete a connection for communication purposes between one of said telephone circuits and one of said telegraph sets.

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