

UNITED STATES PATENT OFFICE

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COMBINED TELEPHONE AND TELEGRAPH SYSTEM

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

10 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
15 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 re-
20 ceived 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.

25 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 obviously necessary to actuate the voice-operated relays which cut through the transmitting side of the circuit.
30 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
35 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.

40 Where 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 con-
45 nected 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.

50 The invention will now be more fully un-

derstood from the following description when read in connection with the accompanying drawing, the figure of which illustrates in schematic form the preferred embodiment of the invention.

55 Referring to the drawing, the terminal arrangement of a four-wire system comprising a transmitting line TL and a receiving line RL is illustrated. In practice the transmitting line may be associated with the radio
60 transmitter of a transatlantic telephone circuit, and the receiving line with the corresponding radio receiver of such a system. The ends of said lines are connected through a hybrid coil 10 to a two-wire terminal end-
65 ing in a jack J through which connections may be established to various telephone circuits. In order to prevent singing over the four-wire part of the system the transmit-
70 ting line TL is normally disabled by a contact of a voice-operated relay TVR. This relay may be operated by currents from an amplifier-detector arrangement TV asso-
75 ciated with the transmitting line TL so when voice currents flow over said line the normal short-circuit controlled by the relay TVR will be opened to cut the line through for transmission. At the same time another
80 contact of the relay TVR is closed to disable the receiving line RL. A delay circuit TDN may be provided between the amplifier-detector arrangement TV and the point at which the short-circuit is applied to the
85 line TL in order to enable the relay TVR to operate before the voice currents arrive at the short-circuit.

With the relay TVR operated, transmis-
90 sion may take place from the two-wire terminal over the transmitting line TL but currents cannot be transmitted from the receiving line RL to the two-wire terminal. In order that transmission may take place in the opposite direction, an amplifier-detec-
95 tor RV is associated with the receiving line RL and controls the relay RVR which, when actuated, closes a short-circuit across the transmitting line TL, this short-circuit at the same time disabling the amplifier-de-
100 tector TV and preventing any interference with reception over the line RL. 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 terminal of the jack J, it is obviously necessary to actuate the relay TVR to remove the short-circuit from the transmitting line TL. This results in disabling the receiving line RL at the same time by means of the inner contact of the relay TVR. Consequently, it has been the practice heretofore to permanently connect the receiving telegraph apparatus with the receiving line RL at a point beyond the short circuit controlled by the relay TVR.

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 lines 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 J, the corresponding telegraph receiver will be automatically associated with the receiving line RL.

In the drawing the telegraph transmitting equipment is shown as comprising a transmitting printer TP which sends direct current pulses through a transmitting relay TR to control the transmission of a tone of frequency f from a generator G to the transmitting jack J'. The corresponding receiving equipment comprises a tone amplifier RA, a receiving filter RF for selecting the receiving telegraph tone f' , and a detector RD in whose output is included a receiving relay TR. The receiving relay PR sends direct current pulses through the receiving printer RP.

The telegraph transmitter may be associated with the two-wire terminal of the telephone circuit by inserting the plugs P and P' of a cord circuit C in the jack J of the two-wire terminal of the telephone circuit and in the jack J' of the telegraph transmitter, respectively. When this connection is established the circuit of relay F associated with the telegraph transmitter, and of relay TG associated with the two-way telephone terminal will be completed from battery over the tip contact of the jack J', tip contact of the plug P', tip conductor of the cord C, tip contacts of the plug P and jack J, through the winding of the relay TG, over the ring contacts of the jack J and plug P, ring conductor of the cord C, ring contacts

of the plugs P' and jack J' and thence through the winding of relay F to ground.

When the relay F is energized it closes the circuit of the relay Z which removes ground from the test contact corresponding to the connected telegraph apparatus at each of the selective switches that are associated with the several telephone circuits. The energization of the relay TG connects ground to the voice-operated relay TVR and causes said relay to disable the receiving line RL and at the same time remove the normal short-circuit from the transmitting line TL. The system is now in condition to transmit telegraph signals from the printer TP over the cord circuit C and thence over the transmitting line TL.

The operation of the relay TG also completes the circuit of relay P which in turn completes a circuit from battery over the contact of said relay, normal inner right hand contact of relay X, through the stepping magnet SM of the selective switch associated with the telephone line, through the interrupting contact of said magnet, and thence over wiper a to ground over the test contact of the selector bank. The completion of this circuit causes the stepping magnet SM to automatically advance the wipers step by step until the wiper a encounters the contact from which ground was removed by the operation of the relay Z. During this operation the right-hand winding of relay X has been short-circuited by the ground connected to the wiper a , but as soon as the wiper encounters an open circuit this short-circuit is removed and the right-hand winding of relay X is energized in series with the stepping magnet SM as soon as the latter releases its armature. The relay X upon being energized, at its inner right-hand contact opens the circuit of the stepping magnet SM and locks up over its left-hand winding and the contact of the relay P. Relay X at its outer right-hand contact completes the circuit of relay Y which in turn connects ground to the test wiper a to prevent any other switches associated with other telephone circuits from selecting the telegraph receiving equipment which is now associated with the receiving line RL over the wipers b and c of the selecting switch and over the left-hand front contacts of the relay X. Telegraph transmission may now take place over the circuit in both directions simultaneously.

When it is again desired to use the telephone circuit for telephone transmission the plugs P and P' are withdrawn, thereby releasing relays TG and F. Relay F releases relay Z which again connects ground to the test contact of the selector switch. Relay TG in turn releases the relay TVR to restore the telephone circuit to normal. Relay P is released at the same time, thereby causing the armatures of relays X and Y to fall back

and restore the circuit to normal. The deenergization of relay X disconnects the receiving line RL from the telegraph receiving equipment at the left-hand contacts of said relay although said telegraph receiving equipment will remain connected to the wipers *b* and *c* of the selector switch unless the telegraph transmitter is connected to some other telephone circuit, in which case the selector of such other circuit will select the telegraph receiver. By leaving the telegraph receiver thus connected to the wipers *b* and *c* of the selector switch, the telegraph receiver will be at once connected to the receiving line RL over the contacts of the relay X, should the transmitter be again connected to the two-wire terminal, and this takes place without any hunting upon the part of the selector switch.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated without departing from the spirit of the invention as defined in the following claims.

What is claimed is:

1. In a transmission system, a four-wire telephone circuit comprising a transmitting line and a receiving line connected to a two-wire terminal, a telegraph apparatus comprising a telegraph transmitter and a telegraph receiver, means to connect the telegraph transmitter to the two-wire terminal of the telephone circuit at the will of the operator, and means automatically responding to such connection to connect the telegraph receiver to the receiving side of the four-wire circuit.

2. In a transmission system, a plurality of four-wire telephone circuits each comprising a transmitting line and a receiving line connected to a two-wire terminal, telegraph apparatus comprising a telegraph transmitter and a telegraph receiver, means to connect the telegraph transmitter to the two-wire terminal of any one of said telephone circuits, and means associated with the receiving line of each telephone circuit to automatically select the telegraph receiver in response to the connection of the telegraph transmitter to the two-wire terminal of the telephone circuit.

3. In a transmission system, a plurality of four-wire telephone circuits each comprising a transmitting line and a receiving line connected to a two-wire terminal, telegraph apparatus comprising a telegraph transmitter and a telegraph receiver, means to connect the telegraph transmitter to the two-wire terminal of any one of said telephone circuits, and a step-by-step switch associated with the receiving line of each four-wire telegraph circuit to select the telegraph receiver in response to the connection of the telegraph transmitter to the two-wire terminal of said telephone circuit.

4. In a transmission system, a four-wire

circuit comprising a transmitting line and a receiving line connected to a two-wire terminal, means normally disabling said transmitting line, voice-operated apparatus associated with said transmitting line and operating in response to transmission over the two-wire terminal to remove the disabling means from the transmitting line and to disable the receiving line, a telegraph apparatus comprising a telegraph transmitter and a telegraph receiver, means to connect the telegraph transmitter to the two-wire terminal of the telephone circuit, means responsive to such connection to cause the voice-operated apparatus associated with the transmitting line to cut through the transmitting line for transmission and disable the receiving line, and means responsive to the connection of the telegraph transmitter to the two-wire terminal to automatically connect the telegraph receiver to the receiving line of the telephone circuit beyond the point at which it is disabled.

5. In a transmission system, a plurality of four-wire telephone circuits each comprising a transmitting line and a receiving line connected to a two-wire terminal, the transmitting line of each four-wire circuit being normally disabled, voice-operated apparatus associated with each transmitting line and responsive to transmission from the two-wire terminal to remove the disabling means from each transmitting line and disable the corresponding receiving line, a telegraph apparatus comprising a telegraph transmitter and a telegraph receiver, means to connect the telegraph transmitter to the two-wire terminal of any four-wire circuit, means responsive to such connection to operate the voice-operated apparatus associated with the corresponding transmitting line to remove the disabling means therefrom and to disable the corresponding receiving line, and means associated with the receiving line of each four-wire circuit for automatically selecting the telegraph receiver and connecting it to the receiving line at a point beyond which it is disabled, said selecting means acting in response to the connection of the telegraph transmitter to the corresponding two-wire terminal.

6. In a transmission system, a plurality of four-wire telephone circuits each comprising a transmitting line and a receiving line connected to a two-wire terminal, the transmitting line of each four-wire circuit being normally disabled, voice-operated apparatus associated with each transmitting line and responsive to transmission from the two-wire terminal to remove the disabling means from each transmitting line and disable the corresponding receiving line, a telegraph apparatus comprising a telegraph transmitter and a telegraph receiver, means to connect the telegraph transmitter to the two-wire terminal of

any four-wire circuit, means responsive to such connection to operate the voice-operated apparatus associated with the corresponding transmitting line to remove the disabling
5 means therefrom and to disable the corresponding receiving line, and a step-by-step selector associated with the receiving line of each four-wire circuit and operating in response to the connection of the telegraph
10 transmitter to the two-wire terminal of any telephone circuit to select the telegraph receiver and connect it to the corresponding receiving line beyond the point at which it is disabled.

15 7. In a transmission system, a plurality of four-wire telephone circuits each comprising a transmitting line and a receiving line connected to a two-wire terminal, a plurality of telegraph sets each comprising a telegraph
20 transmitter and a telegraph receiver, means to connect the telegraph transmitter of a set to the two-wire terminal of any one of said telephone circuits, and means associated with the receiving line of each telephone circuit
25 to automatically select the corresponding telegraph receiver of a set in response to the connection of the telegraph transmitter thereof to the two-wire terminal of the telephone circuit.

30 In testimony whereof I have signed my name to this specification this 17th day of March, 1930.

EDMUND R. TAYLOR.

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