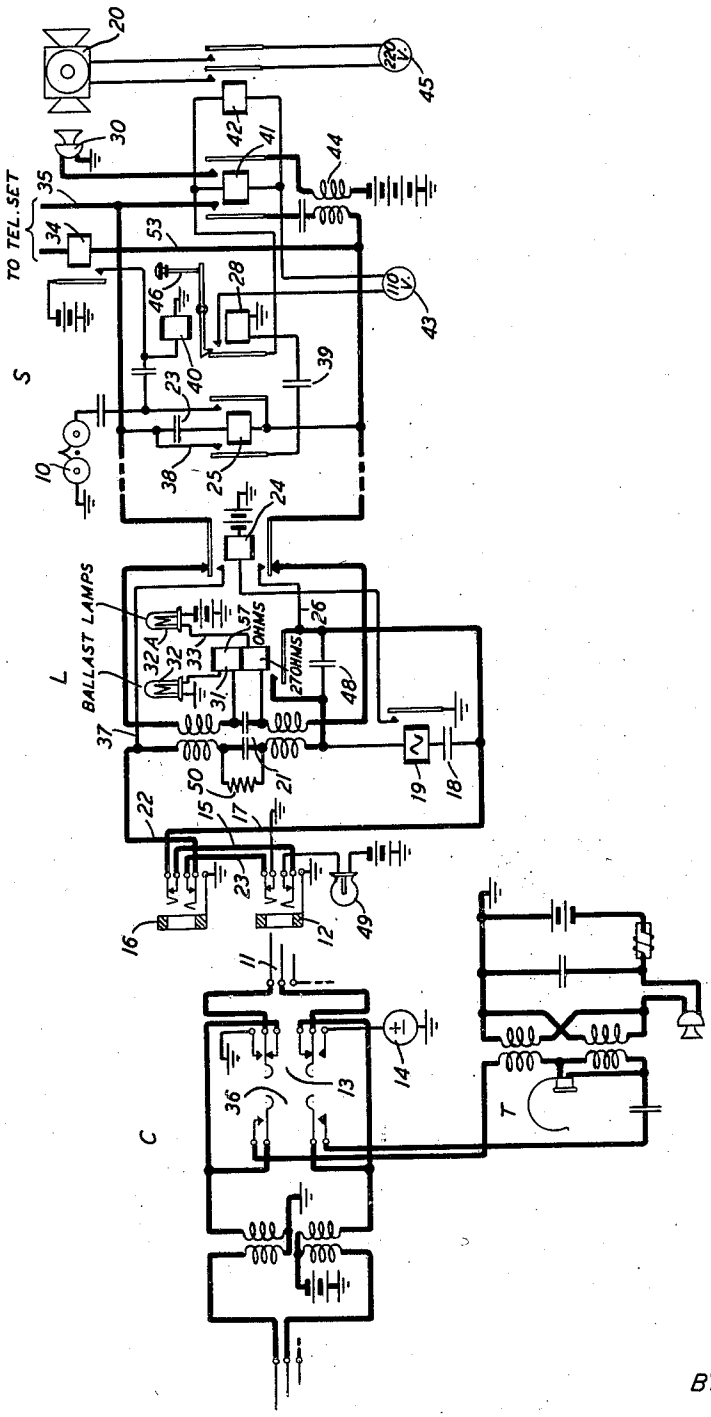
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COMBINED TELEPHONE AND FIRE DISPATCH SYSTEM

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COMBINED TELEPHONE AND FIRE DISPATCH SYSTEM

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This invention relates to systems of remote control and particularly to combined telephone and fire alarm signaling systems.

It is the object of this invention to provide an improved system of remote control in which a telephone line circuit, normally adapted for the transmission of speech current between a central office and a subscriber's station, is utilized as the medium over which signaling devices located at a point remote from the central office may be controlled by a central office operator.

This object is attained in accordance with a feature of the invention by the provision of a novel circuit arrangement which provides for the selective control of a plurality of signaling devices over a telephone line circuit normally adapted for the transmission of speech currents.

Another feature of the invention resides in the use of a double jack-ended line circuit which permits the use of an operator's regular ringing equipment in effecting the selective actuation of a plurality of signaling devices.

A further feature of the invention places a remotely located audible signaling device under the complete control of an operator at a central office in such a manner that the signaling device may be connected to and disconnected from a local power source by the transmission of signaling current over the line circuit.

A still further feature of the invention provides means under the control of an operator for simultaneously completing a signaling circuit at a remote point and connecting to the telephone circuit a monitoring microphone in such a manner that the operator may be apprised of the proper functioning of the signal actuated upon the completion of the signaling circuit.

Another feature of the invention resides in the provision of means for preventing the false operation of the remotely located signaling devices on extraneous voltages, such as may result from lightning discharges or from nearby power lines, which voltages may be impressed on the line circuit.

These and other features of the invention will be readily understood from the following detailed description made with reference to the accompanying drawing which discloses the telephone line circuit L of this invention and an operator's cord circuit C and associated equipment, by virtue of which signaling equipment located at a substation S and at a point remote from the substation may be controlled.

The line circuit L terminates at the central office in a pair of jacks, one of which is utilized by the operator in establishing a telephone connection with the substation S which is provided with the regular type ringer 10 and the usual telephone set, not shown, but indicated by the legend "To tel. set," and the other of which is utilized by the operator in transmitting a fire signal to the station S or to some remote point at which the fire siren 20 is located. The station S may be located at a fire headquarters or fire house and the siren 20 may constitute part of the station equipment or may be located at some central point in a locality in which the fire headquarters or fire house is situated. A monitoring microphone 30 located in close proximity to the siren 20 is furnished for a purpose which will be indicated hereinafter.

The invention will be best understood from the following detailed description of the operation of the system disclosed in the drawing.

Assuming that an operator at a central office desires to establish a telephone connection with the substation S, she inserts the calling plug 11 of a cord circuit, such as C, into the jack 12 associated with the line circuit L which is individual to the station S and actuates a ringing key 13. A circuit is thereupon established which may be traced from the grounded ringing current source 14, lower alternate contacts of key 13, ring contacts of plug 11 and jack 12, conductor 15, normal ring contacts of jack 16, ring conductor 17 of line L, condenser 18, winding of relay 19, left-hand section of repeating coil 21, tip conductor 22 of line L, normal tip contacts of jack 16, conductor 23, tip contacts of jack 12 and plug 11 to ground by way of the upper alternate contacts of key 13.

Relay 19 operates in this circuit and at its armature and armature contact establishes an obvious energizing circuit for relay 24 which operates, causing the substation end of the line circuit L to be disconnected from the right-hand section of repeating coil 21 and connected directly to the jack terminals.

Relay 25 now operates in a circuit extending from ringing current source 14, lower alternate contacts of ringing key 13, ring contacts of plug 11 and jack 12, conductor 15, normal ring contacts of jack 16, ring conductor 17 of line circuit L, conductor 26, front contact and lower armature of relay 24, winding of relay 25, condenser 27, upper armature and front contact of relay 24, conductor 37, tip conductor 22 of line circuit L, tip contacts of jack 16, conductor 23, tip contacts of jack 12 and plug 11 to ground at the upper alternate contact of key 13. Relay 25, in

operating, connects the ringer 10 and the winding of relay 40 to the ring conductor of line circuit L by way of its right-hand armature and front contact and at its left-hand armature and front contact connects relay 28 to the tip side of the line. Relay 40 operates at this time but performs no useful function. It will be noted that the tip side of the line L is grounded at the upper alternate contact of key 13 so that relay 28 is effectively shunted and therefore does not operate at this time. The ringer 10 and relay 40, as before stated, however, being connected to the ring side of the line, operate on current from the source 14.

In response to the actuated signal 10, the receiver at the station S is removed from its switchhook, effectively bridging the telephone set across the line L in the well-known manner. Relay 31 now operates in a circuit extending from grounded battery, filament of lamp 32A, conductor 33, lower winding of relay 31, lower right-hand winding of repeating coil 21, back contact and lower armature of relay 24, conductor 53, winding of relay 34, through the closed subscriber's line loop, conductor 35, upper armature and back contact of relay 24, upper right-hand winding of repeating coil 21 to ground through the upper winding of relay 31 and filament of lamp 32A. Relays 31 and 34 operate in this circuit, the latter performing no useful function at this time. Relay 31, however, short-circuits the condenser 48 and completes the ring side of the line. An indication of the response of the subscriber is given to the operator by a supervisory lamp (not shown) in the cord circuit C which is lighted by the operation of a cord supervisory relay (not shown). The cord supervisory relay operates as a consequence of the closed supervisory loop through resistance 50 and the armature contacts of relay 31.

If the operator desires to communicate with the subscriber, she actuates talk key 36 which connects her telephone set across the cord circuit C. At the termination of conversation, the operator withdraws plug 11 from jack 12 and the subscriber at station S replaces the receiver on its switchhook whereupon the operated relays release and the circuit restores to normal.

Should the central office operator wish to broadcast a fire signal, she proceeds in the manner hereinbefore described in signaling a subscriber at station S except that the alarm jack 16 is utilized in place of the jack 12.

The actuation of ringing key 13, as in the previous case, causes relay 19 to operate and close an obvious circuit to relay 24. Relay 24, operated, excludes the repeating coil 21 from a ringing circuit and connects relay 25 directly to the jack terminals of the line L. Relay 25 operates and at its right-hand armature and front contact connects the ringer 10 to the ring side of line L and at its left-hand armature and front contact connects the mechanically locking relay 28 to the tip side of line L.

It will be noted that when the jack 16 is employed in the seizure of line L, the subsequent actuation of key 13 causes ground potential at the upper alternate contacts of key 13 to be extended to the junction point of the circuits including the ringer 10 and relay 40 by way of the tip contact of plug 16, ring contact of jack 12, ring conductor of line L, conductor 26, lower alternate contact and armature of relay 24 and the right-hand armature and front contact of relay 25. Since the ringer 10 and relay 40 have one terminal thereof permanently connected to ground, these devices are effectively shunted and do not operate. Signaling current from the source 14, however, causes relay 28 to operate in a circuit extending from source 14, lower alternate contacts of key 13, ring contacts of plug 11, tip spring of jack 16, conductor 22, conductor 37, front contact and upper armature of relay 24, conductor 38, front contact and left-hand armature of relay 25, condenser 39, winding of relay 28 to ground. Relay 28, in operating, locks its armature under the control of the latching armature of relay 40 and therefore remains operated after the central office operator has restored her key 13.

Relay 28, in operating, connects relays 41 and 42 to the local power source 43, the former closing the primary winding of repeating coil 44 to the monitoring microphone 30 and the secondary winding of repeating coil 44 to the line conductors of line L and the latter connecting the fire siren 20 to the local power source 45. The siren signal 20 is accordingly sounded to broadcast the existence of a fire.

The siren 20 and microphone 30 are placed in close proximity so that sound emanating from the siren is picked up by the microphone and transmitted back over the line L by way of the repeating coil 44. By actuating key 36, the operator may listen to the actuated siren in order to determine whether or not it is functioning properly.

A subscriber at station S may respond to the actuated signal 20 by removing the receiver from its switchhook whereupon relays 34 and 31 operate as hereinbefore described. Relay 34, in operating, closes an obvious energizing circuit for relay 40 which unlatches the armature of relay 28 and permits it to restore to normal, it being understood that it only requires a momentary actuation of ringing key 13 to effect the operation of relay 28. The release of the armature of relay 28 opens the energizing circuit for relays 41 and 42 whereupon the monitoring microphone 30 is disconnected and the signal 20 silenced.

If it is unnecessary for the subscriber at station S to communicate with the central office operator upon hearing the signal 20, the signal may be silenced by actuating a mechanical release button 46 at station S which performs the same function as does relay 40 just described.

If, for any reason, as on a daily test call, an operator after having caused the operation of the signal 20, deems it advisable to silence the signal, she may do so by withdrawing the plug 11 from jack 12, inserting it into jack 16 and actuating the ringing key 13. Signaling current from the source 14 thereupon causes the operation of relay 25 and the consequent functioning of ringer 10 and relay 40 as pointed out in a previous description. Relay 40 operates to release the armature of relay 28 whereupon relays 41 and 42 release, causing the disconnection of the monitoring microphone 30 from the line circuit L and the signal 20 from its local power supply 45. Should a subscriber at station S respond to the ringer signal at this time, the operator will inform him that the ringer was actuated in connection with the silencing of the signal 20.

A subscriber at station S may also initiate a call to the central office by removing the receiver from its switchhook which causes relays 34 and 31 to operate. Relay 34 performs no useful function at this time but relay 31 short-circuits condenser 48 and establishes a circuit for lamp 49

which may be traced from grounded battery, filament of lamp 49, normal ring contacts of jacks 12 and 16, conductor 17, armature and front contact of relay 31, lower left-hand winding of repeating coil 21, resistance 50, upper left-hand winding of repeating coil 21, conductor 22 to ground by way of the normal tip contacts of jacks 16 and 12. Lamp 49 is thus lighted on a call originating at station S, being extinguished when the operator inserts plug 11 into jack 12 in answering the incoming call. Lamp 32, being a ballast lamp, does not light though included in the energizing circuit for relay 31.

To avoid the false operation of relays 28 and 40 and the consequent false operation of the signals 20 and 30 due to electric surges to which the line circuit L may be subject, relay 25 is provided so as to operate only when there is a difference of potential across the tip and ring conductors of the line circuit. This desired difference of potential is set up, of course, when the central office operator rings on the line as hereinbefore described.

Any undesirable difference of potential from lightning discharges or inductively built-up voltages from nearby power lines is prevented by balancing the circuit at the central office end of the line. These extraneous voltages are impressed by static or inductive effects on both the tip and ring sides of the line simultaneously, so that, if each side of the line has the same impedance to ground, the voltages built up on each conductor will be the same both as to potential and phase. Under this condition, there will be, of course, no potential difference across the tip and ring of the line and relay 25 will not operate. With relay 25 in an unoperated condition, the operating circuits of relays 28 and 40, as well as ringer 10, are open and false operation of the fire alarm broadcast signal or telephone signal is prevented.

In the present invention this balancing is accomplished by employing the balanced two-winding relay 31 and the two ballast lamps 32 and 32A to ground. Lamp 32A is connected to ground through battery and lamp 32 to direct ground. The impedance of the circuit including upper winding of relay 31 and filament of lamp 32 to ground must, of course, equal the impedance of the circuit including the lower winding of relay 31, filament of lamp 32A and battery to ground.

Though the present invention has been described in connection with a combined telephone and fire alarm system, it is to be understood that the features of remote control embodied in this system are applicable to other phases of telephone operation such, for example, as the control of metering devices and the like over telephone line circuits.

What is claimed is:

1. In a telephone system, a central office, a plurality of signaling devices located at a remote point, a control relay for one of said signaling devices, a line circuit interconnecting said central office and said remote point, a source of signaling current at said central office, means at said central office for establishing a signaling circuit including both of the line conductors of said circuit and for transmitting current from said source thereover, and means included in said signaling circuit and responsive to current from said source for connecting one of said signaling devices to one of said line conductors and said control relay to the other of said line conductors whereupon said signaling device responds to current from said source by way of one of said line conductors and said control relay is effectively shunted.

2. In a telephone system, a central office, a line circuit interconnecting said central office and a remote point, a pair of signal current responsive devices located at said remote point, means at said central office for grounding one of the conductors of said line circuit and applying a different signaling potential to the other of said line conductors, and means effective upon the operation of said first means for grounding the conductors of said line circuit each by way of a different one of said pair of signal current responsive devices.

3. In a telephone system, a central office, a line circuit interconnecting said central office and a remote point, a pair of grounded signal current responsive devices located at said remote point, means at said central office for grounding one of said conductors of said line circuit and applying a different signaling potential to the other of said line conductors and means effective upon and as a consequence of the operation of said first means for effectively connecting a different one of said signal current responsive devices to each of said line conductors.

4. In a telephone system, a central office, a line circuit connecting said central office with a remote point, a grounded source of signaling current at said central office, a pair of grounded signaling current responsive devices located at said remote point, an electro-magnet connected across said line circuit, means at said central office for grounding one of the conductors of said line circuit through said signaling current source and applying a direct ground to the other conductor of said line circuit to cause said electromagnet to operate, and switching means controlled by said electro-magnet for connecting said signaling devices to separate conductors of said line circuit whereupon one of said signaling devices operates in parallel with said electromagnet and the other of said signaling devices is effectively shunted.

5. In a telephone system, a central office, a line circuit connecting said central office with a remote point and terminating at said central office in a pair of jacks, a source of signaling current, means for transmitting current from said source over said line circuit by way of either of said jacks, a pair of signal current responsive devices at said remote point and means included in said line circuit and effective upon the transmission of signaling current over said line circuit by way of one of said jacks for causing the first of said responsive devices to operate on current from said source and to short-circuit the second of said responsive devices, said means also effective upon the transmission of signaling current over said line circuit by way of the other of said jacks for causing the second of said responsive devices to operate on current from said source and to shunt the first of said responsive devices.

6. In a telephone system, a central office, a line circuit connecting said central office with a remote point, a signaling device at said remote point, a source of signaling current, means for transmitting current from said source over said line circuit in two different manners, means responsive to current transmitted over said line circuit in one manner for causing said signaling device to operate and lock independent of the transmitted current and means responsive to current transmitted from said source over said line circuit in a different manner for disabling said signaling device.

7. In a telephone system, a central office, a subscriber's station, a line circuit interconnecting said central office and said subscriber's station, a signal at said subscriber's station, a signal located at a point remote from said subscriber's station, means at said central office for selectively operating said signals, and means controlled by the receiver switchhook contacts at said subscriber's station and immediately responsive to their actuation for arresting the operation of said remotely located signal.

8. In a telephone system, a central office, a line circuit connecting said central office with a remote point and terminating at said central office in a pair of jacks, a connecting circuit adapted to be associated with said line circuit by way of either of said jacks, a source of signaling current, a key for connecting said source of current to said connecting circuit, a pair of signal current responsive devices at said remote point and means included in said line circuit and effective upon the actuation of said key and the association of said connecting circuit with said line circuit by way of one of said jacks for causing the first of said responsive devices to operate on signaling current from said source, and said means also effective upon the actuation of said key and the association of said connecting circuit with said line circuit by way of the other of said jacks for causing the second of said responsive devices to operate on signaling current from said source.

9. In a telephone system, a central office, a line circuit connecting said central office with a remote point, an audible signal device at the remote point, a microphone at the remote point located in close proximity with said signal device, a source of signaling current at said central office, and means responsive to the transmission of current from said source over said line circuit for causing the operation of said signal device and the connection of said microphone in inductive relation to said line circuit.

10. In a telephone system, a central office, a subscriber's station, a line circuit interconnecting said central office and said subscriber's station, an audible signal device located at a point remote from said station, a microphone located in close proximity with said signal device, a source of power for said signal device, a source of signaling current at said central office, and means responsive to the transmission of current from said source of signaling current for connecting said signal device to its source of power and said microphone in inductive relation to said line circuit.

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