

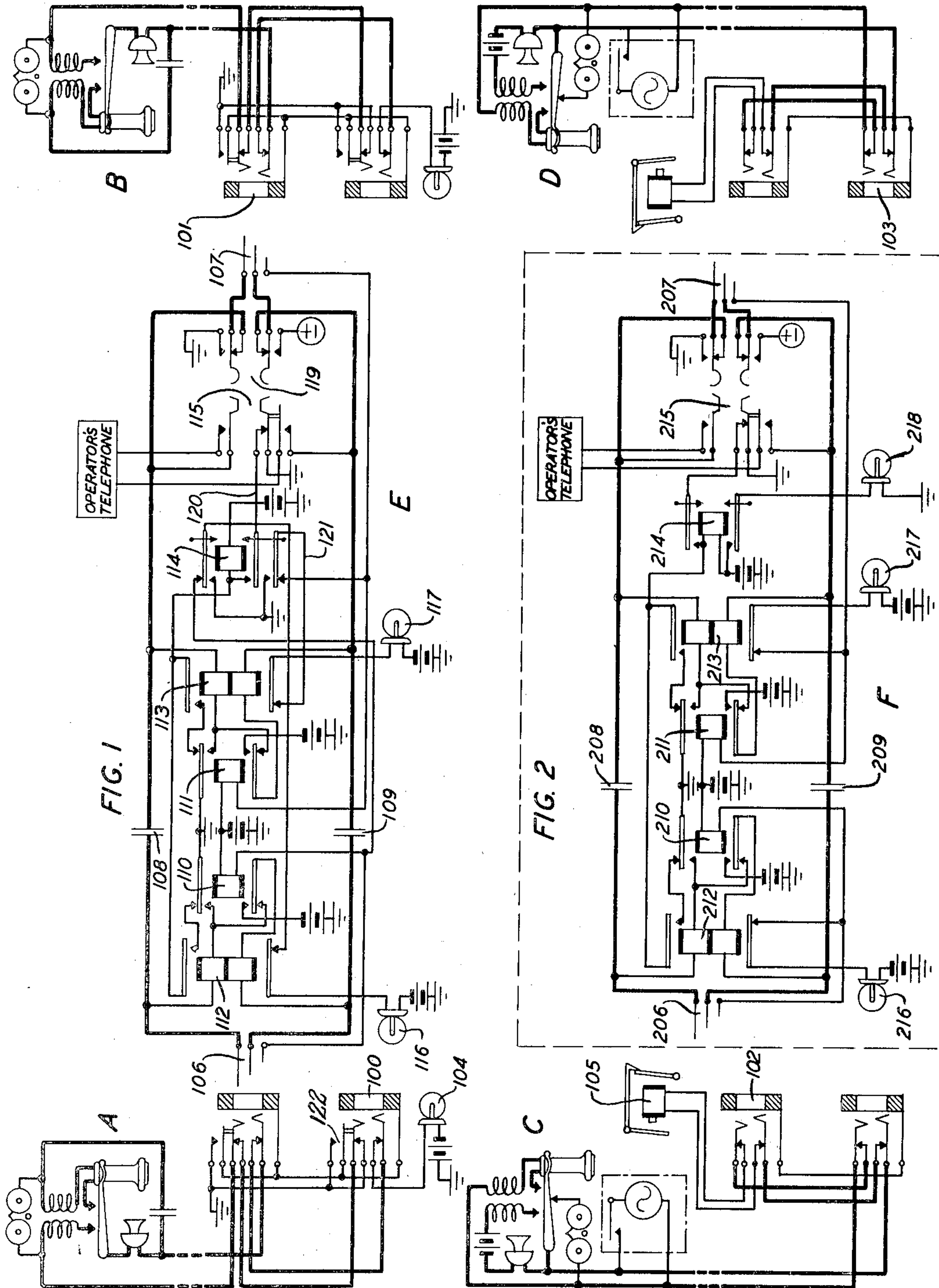
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to telephone systems and more particularly to universal cord circuits for interconnecting telephone lines of like or unlike character.

5 An object of the invention is to interconnect lines of like or of unlike character and to provide supervision for said connections.

A feature of the present invention, whereby the foregoing object is attained, resides in a universal
10 cord circuit having supervisory relays individual to each end thereof, said relays controlling individual lamp signals on common battery connections and serving as ring-off relays on magneto connections to lock up an auxiliary relay which
15 controls a magneto disconnect signal.

In one embodiment of my invention, the common battery supervisory lamps are used for common battery supervision on common battery connections and for magneto disconnect and recall
20 signals on magneto connections. In another embodiment separate signal devices are used for common battery supervision and for magneto signaling.

The invention will be understood from the following description together with the accompanying figures of the drawing in which the two embodiments of my invention are illustrated.

Figure 1 shows the embodiment in which the common battery supervisory lamps are used interchangeably for common battery supervision
30 and for magneto signaling.

Fig. 2 shows the embodiment in which a separate signal lamp is used for the magneto signaling.

Circuit description

In Fig. 1, A and B are subscribers' common battery lines and C and D are subscribers' magneto lines. E is an operator's universal cord circuit located at an operator's position at a switch-
40 board at which are also located line jacks 100 and 101 of common battery lines A and B, respectively, and line jacks 102 and 103 of magneto lines C and D, respectively. Associated with jack 100 is common battery line lamp 104 and with jack
45 102 is magneto drop signal 105.

An operator's telephone circuit is associated with cord circuit E which is adapted to be connected thereto. Universal cord circuit E consists of answering and calling cords comprising tip and ring talking conductors and sleeve conductors and terminating in connecting plugs 106 and
50 107 respectively. Condensers 108 and 109 connect the tip and ring talking conductors of the answering and calling cords, respectively.

55 Answering and calling sleeve relays 110 and

111 are associated with their respective ends of the cord and operate responsive to the connection of the sleeve to a grounded conductor. This occurs when their respective plugs are inserted into the jacks of common battery lines but not
60 on connections to magneto lines.

Answering and calling supervisory relays 112 and 113 are provided with two windings and are normally bridged directly across the tip and ring conductors of their respective ends of the cord.
65 In response to the operation of its associated sleeve relay, however, battery and ground are connected through a supervisory relay to the ring and tip conductors, respectively.

Auxiliary relay 114 can be energized over either
70 of two circuits, the first extending through a front contact of the answering supervisory relay and back contact of the answering sleeve relay and the second extending through these respective contacts of the calling supervisory and sleeve
75 relays. Relay 114 will be operated, therefore, only in response to the operation of one of the supervisory relays. An advantage of this arrangement resides in the delay given to the operation of relay 114 by the addition of the operating time of a supervisory relay. This decreases the possibility of fortuitous operation of relay 114 due to momentary impulses coming over the line or to the discharge of condensers
80 108 and 109. To further prevent accidental operation of relay 114 it may be designed with slow-to-operate characteristics.

Upon operating, relay 114 will lock up under control of the cord circuit talk key 115.

Answering and calling supervisory lamps 116
90 and 117 are controlled by their respective supervisory relays. They also are arranged to be controlled by auxiliary relay 114 when their associated plug terminals are connected to magneto line jacks and there is consequently no ground on the
95 sleeve.

Fig. 2 shows the second embodiment of my invention in which a separate lamp is provided for magneto signaling. Universal cord circuit F is
100 here understood to be associated with line circuits A, B, C and D and with the operator's telephone circuit in the same manner as cord circuit E.

In cord circuit F a magneto signal lamp 218 will be lighted in response to the operation of
105 auxiliary relay 214. Common battery supervisory lamps 216 and 217 are controlled by their associated supervisory relays, only. Otherwise, corresponding elements of this cord are similar to those of cord circuit E.

Operation

The operation of the circuits shown in Fig. 1 is as follows:

5 Upon originating a call from common battery station A the subscriber removes the receiver from the switchhook thereby closing a circuit for battery over the line and through the contacts of the multiple jacks to light line lamp 104.

10 The operator, upon seeing lamp 104 lighted, inserts plug 106 into jack 100 and operates talk key 115 to connect her telephone set to the cord. Lamp 104 is extinguished by the opening of ring contacts of the jack and ground is connected to the sleeve by the closing of its sleeve contacts. A
15 circuit is thereby closed to operate answering sleeve relay 110 from battery, through the winding of relay 110, sleeve conductor of the answering cord, sleeve of plug 106, sleeve of jack 100 to ground through contacts 122 of said jack. Re-
20 lay 110 operates connecting battery and ground to the cord through the windings of relay 112. A circuit is also closed to light lamp 116 from bat-
25 tery, through lamp 116, lower back contacts of relay 112, upper back contacts of relay 114, over the sleeve conductor to ground. Since the re-
30 ceiver is off the switchhook at the subscriber's station, a circuit is closed to supply current to the subscriber's transmitter over the line loop and hence to operate answering supervisory re-
35 lay 112. Relay 112, in operating, opens the energizing circuit for lamp 116 by opening its lower back contact but it does not close a circuit for the operation of relay 114 at its upper contact since the circuit is now open at the upper back
40 contact of relay 110.

Upon ascertaining the number of station de-
sired by the calling subscriber, and which we will
here assume to be station B, the operator per-
forms the usual busy test by touching the tip of
45 her calling plug 107 to the sleeve of jack 101 connected to the called line. Finding the line
idle the operator inserts plug 107 into jack 101. Calling sleeve relay 111 operates and calling su-
50 pervisory lamp 117 lights over circuits similar to those described for the answering end of the
cord. Calling supervisory relay 113 does not op-
erate at this time, however, since the line circuit
is open at subscriber's station B where the re-
ceiver is still on the switchhook.

55 The operator releases talk key 115, thereby disconnecting her telephone set from the cord, and momentarily operates ringing key 119 applying
ringing current to the called line.

When the called subscriber answers a circuit
is closed for the operation of calling supervisory
60 relay 113 over the line loop. Relay 113 operates and extinguishes lamp 117. The circuits are now
in condition for conversation between common
battery stations A and B with transmitter bat-
tery being supplied through the windings of
answering and calling supervisory relays 112 and
113 to stations A and B, respectively.

65 Upon the subscriber at either station hanging up his receiver on completion of the conversa-
tion, the associated supervisory relay releases
and lights its supervisory lamp as a disconnect
signal to the operator. When the operator re-
moves the plugs from the jacks in response to
these signals the circuits return to normal.

70 In case magneto station D was the called station instead of common battery station B, the opera-
tor will have inserted plug 107 into jack 103 after
performing the usual busy test on the sleeve of
that jack. Since no ground is found on the sleeve
75 of jack 103, relay 111 will not operate and lamp

117 will remain dark. Relay 113 will remain
bridged directly across the tip and ring con-
ductors of the calling cord.

When the subscriber at station D answers, cur-
rent is supplied to his transmitter from the local
80 battery at his station.

Upon termination of the conversation, sub-
scriber A hangs up and lamp 116 is lighted as
previously described. Subscriber D, after hang-
85 ing up, operates the magneto generator at his
station for a short interval thereby sending an
alternating current over the line. Relay 113
operates during the interval in response to this
current closing a circuit for the energization of
90 relay 114 as follows: From battery, through relay
114, upper front contacts of relay 113, upper back
contacts of relay 111 to ground. Relay 114 op-
erates and establishes a holding circuit for itself
from battery, through its own winding, its lower
95 front contact, conductor 120, normally closed
contact of talk key 115 to ground.

Operation of relay 114 does not affect the
lighted condition of answering supervisory lamp
116 since with the answering cord connected to a
common battery line, ground is connected to the
100 sleeve conductor and hence to both back and
front upper contacts of relay 114. At its lower
outer front contact, however, relay 114 connects
ground to conductor 121 which is in the energizing
circuit for calling supervisory lamp 117. When
105 relay 113 releases upon the called subscriber
discontinuing the operation of his magneto
generator the circuit is completed for the
lighting of lamp 117 as a signal to the operator.

The operator operates her talk key 115 and
110 challenges on the line, whereupon, receiving no
reply she disconnects. The operation of the
talk key opens the holding circuit for relay 114
which causes it to release extinguishing lamp
117. Since lamp 117 can only be extinguished by
115 the operation of the talk key the operator is
forced to challenge on all disconnections involv-
ing a magneto station. This insures attention
from the operator in case the magneto subscriber
had signaled for a recall.

120 When a subscriber at station C initiates a call
he operates his magneto generator which sends
current over the line to operate magneto drop
signal 105. The operator, noticing the signal,
inserts plug 106 into jack 102 and restores the
125 drop. Relays 110 and 112 remain unoperated and
lamp 116 is not lighted. On a call to station B
or D, the operation of the calling cord relays
and lamp will be the same as previously described
for these respective stations. Answering cord
130 supervisory relay 112 will operate in response to
the operation of the magneto at station C for a
disconnect or recall signal. This will energize
relay 114 and lamp 116 will be lighted on release
of relay 112.

135 If magneto stations C and D are connected,
however, a disconnect or recall signal sent by
either subscriber from his magneto generator will
operate relay 114 and cause both calling and
answering supervisory lamps 116 and 117 to light
140 since both are in this case under control of relay
114. The rest of the operation is the same as
previously described.

The operation of cord circuit F in connection
with the same line circuits and operator's tele-
145 phone circuit is the same as that of cord circuit
E with the following exception: When either ter-
minal of cord F is connected to a magneto line
the supervisory lamp associated with that termi-
150 nal remains dark throughout the connection.

The associated supervisory relay will operate on a magneto disconnect or recall signal energizing auxiliary relay 214 in the same manner as described for cord E. Relay 214, in operating, lights auxiliary lamp 218 to signal the operator.

With the auxiliary lamp of cord F lighted the operator is informed immediately that she must challenge on the line to determine whether a recall is desired. With the arrangement shown in cord E she would be unable to distinguish between common battery disconnect signals which do not require a challenge and magneto signals which require one without observing the type of line to which the cord is connected.

While the present invention is disclosed as embodied in certain specific arrangements, applicant does not wish to be limited by such disclosure, but desires to cover broadly all arrangements which come within the spirit and scope of the appended claims.

What is claimed is:

1. In a telephone system comprising lines of two different characters, a universal cord circuit for interconnecting any two of said lines, answering and calling connecting terminals for said cord circuit, a supervisory signal individual to each end of the cord, a supervisory relay individual to each end of the cord, a locking relay, signal means controlled thereby, and switching means adapted to connect each supervisory relay to control its respective supervisory signal when their associated connecting terminal is connected to a line of the first character and to connect said relay to control the initial energizing circuit for said locking relay when its associated terminal is connected to a line of the second character.

2. In a telephone system comprising magneto and common battery telephone lines, a universal cord circuit for interconnecting any two of said lines, answering and calling connecting terminals for said cord circuit, a supervisory signal individual to each end of the cord, a supervisory relay individual to each end of the cord, a locking relay, signal means controlled thereby, and switching means adapted to connect each supervisory relay to control its respective supervisory signal when their associated connecting terminal is connected to a common battery line and to connect said relay to control the initial energizing circuit for said locking relay when its associated terminal is connected to a magneto line.

3. In a telephone system comprising lines of two different characters, a universal cord circuit for interconnecting any two of said lines, answering and calling connecting terminals for said cord circuit, a supervisory signal individual to each end of the cord, a supervisory relay individual to each end of the cord, a locking relay, and switching means adapted to connect each supervisory relay to control its respective supervisory signal when their associated connecting terminal is connected to a line of the first character and to connect said relay to control the initial energizing circuit for said locking relay when its associated terminal is connected to a line of the second character, said locking relay controlling said respective supervisory signal.

4. In a telephone system comprising magneto and common battery telephone lines, a universal cord circuit for interconnecting any two of said lines, answering and calling connecting terminals for said cord circuit, a supervisory signal individual to each end of the cord, a supervisory

relay individual to each end of the cord, a locking relay, and switching means adapted to connect each supervisory relay to control its respective supervisory signal when their associated connecting terminal is connected to a common battery line and to connect said relay to control the initial energizing circuit for said locking relay when its associated terminal is connected to a magneto line, said locking relay controlling said respective supervisory signal.

5. In a telephone system comprising lines of two different characters, a universal cord circuit for interconnecting any two of said lines, answering and calling connecting terminals for said cord circuit, a supervisory signal individual to each end of the cord, a supervisory relay individual to each end of the cord, a locking relay, a third signal controlled thereby, and switching means adapted to connect each supervisory relay to control its respective supervisory signal when their associated connecting terminal is connected to a line of the first character and to connect said relay to control the initial energizing circuit for said locking relay when its associated terminal is connected to a line of the second character.

6. In a telephone system comprising a magneto and common battery telephone lines, a universal cord circuit for interconnecting any two of said lines, answering and calling connecting terminals for said cord circuit, a supervisory signal individual to each end of the cord, a supervisory relay individual to each end of the cord, a locking relay, a third signal controlled thereby, and switching means adapted to connect each supervisory relay to control its respective supervisory signal when their associated connecting terminal is connected to a common battery line and to connect said relay to control the initial energizing circuit for said locking relay when its associated terminal is connected to a magneto line.

7. In a telephone system, a universal cord circuit adapted to interconnect lines of like or of unlike character, answering and calling connecting terminals for said cord circuit, answering and calling supervisory relays associated with said terminals, respectively, answering and calling supervisory signals controlled by said relays, a locking relay, signal means controlled thereby, and means to delay operation of the locking relay comprising an energizing circuit for said relay including contacts of one of said supervisory relays whereby said locking relay operates only after the operation of said supervisory relay.

8. In a telephone system, a universal cord circuit for interconnecting magneto and common battery lines, answering and calling connecting terminals for said cord circuit, answering and calling supervisory relays individual to said terminals, answering and calling supervisory signals controlled by said relays, a magneto signal, an electromagnet controlling said signal, and circuit means to operate said electromagnet only in response to the operation of one of said supervisory relays.

9. In a telephone system, a universal cord circuit for interconnecting lines of like or of unlike character, answering and calling connecting terminals for said cord circuit, tip and ring talking conductors connecting said terminals, answering and calling supervisory signals, answering and calling supervisory relays normally bridged across the tip and ring conductors at their respective terminals, an electromagnet normally energized in response to the operation of

- either of said supervisory relays, signal means controlled thereby, a switching relay associated with each terminal responsive to the connection of said terminal to a line of a first character
- 5 to open the initial energizing circuit for said electromagnet and to connect talking battery to the cord talking conductors through the windings of its associated supervisory relay, the energizing circuit for each supervisory signal being
- 10 completed through contacts of its associated supervisory relay only in response to the connection of the associated terminal to a line of the first character.
- 15 10. In a telephone system, a universal cord circuit for interconnecting magneto and common battery telephone lines, answering and calling
- connecting terminals for said cord circuit, a supervisory lamp individual to each end of the cord, a supervisory relay individual to each end of the cord, each of said relay controlling its associated lamp only when the associated terminal is connected to a common battery line, a switching relay associated with each said terminal, said relay being energized responsive to the connection of the terminal to a common battery line, an auxiliary locking relay, a signal controlled thereby, an initial energizing circuit for said relay including a front contact of one of said supervisory relays and a back contact of its associated switching relay.
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