

Jan. 12, 1932.

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1,840,376

TELEPHONE SYSTEM

Filed April 30, 1930

3 Sheets-Sheet 1

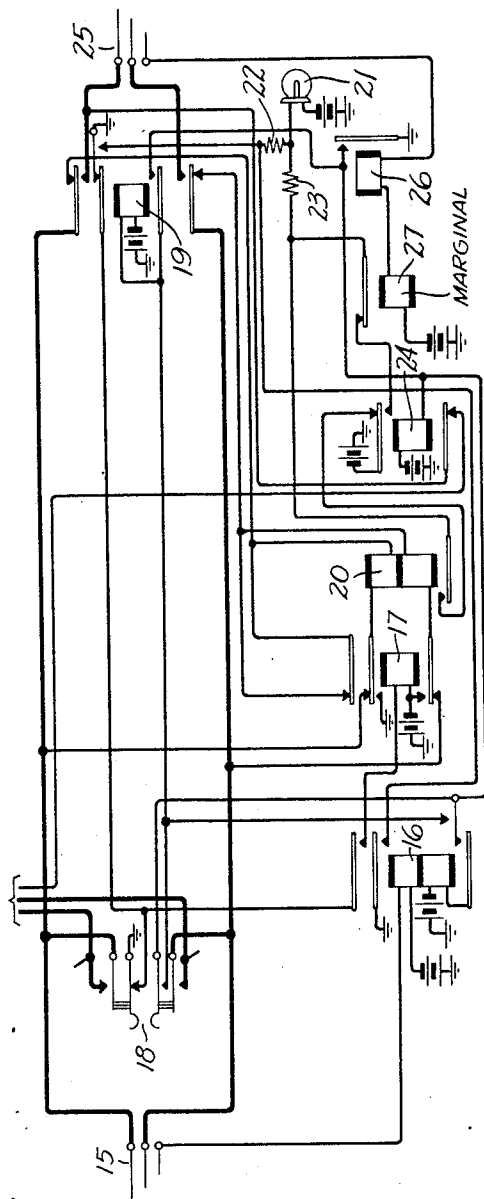


Fig. 1

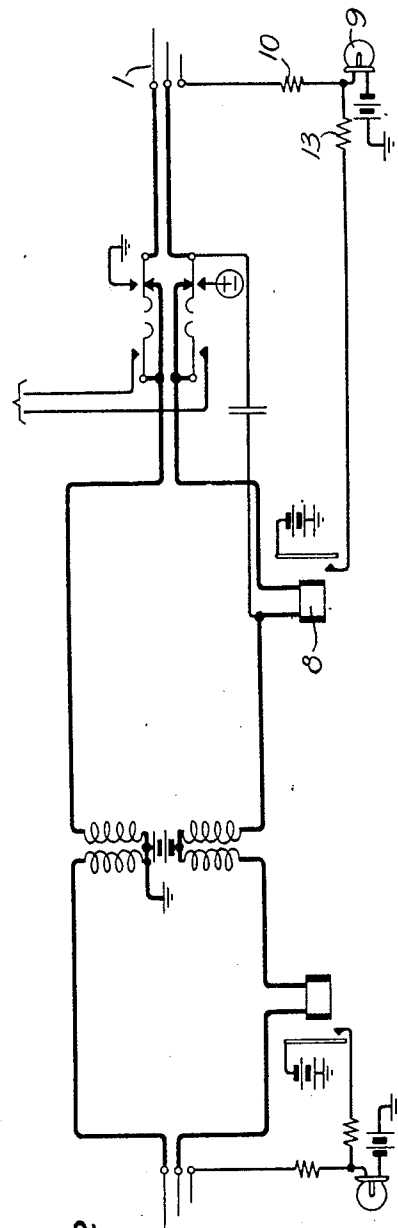


Fig. 2

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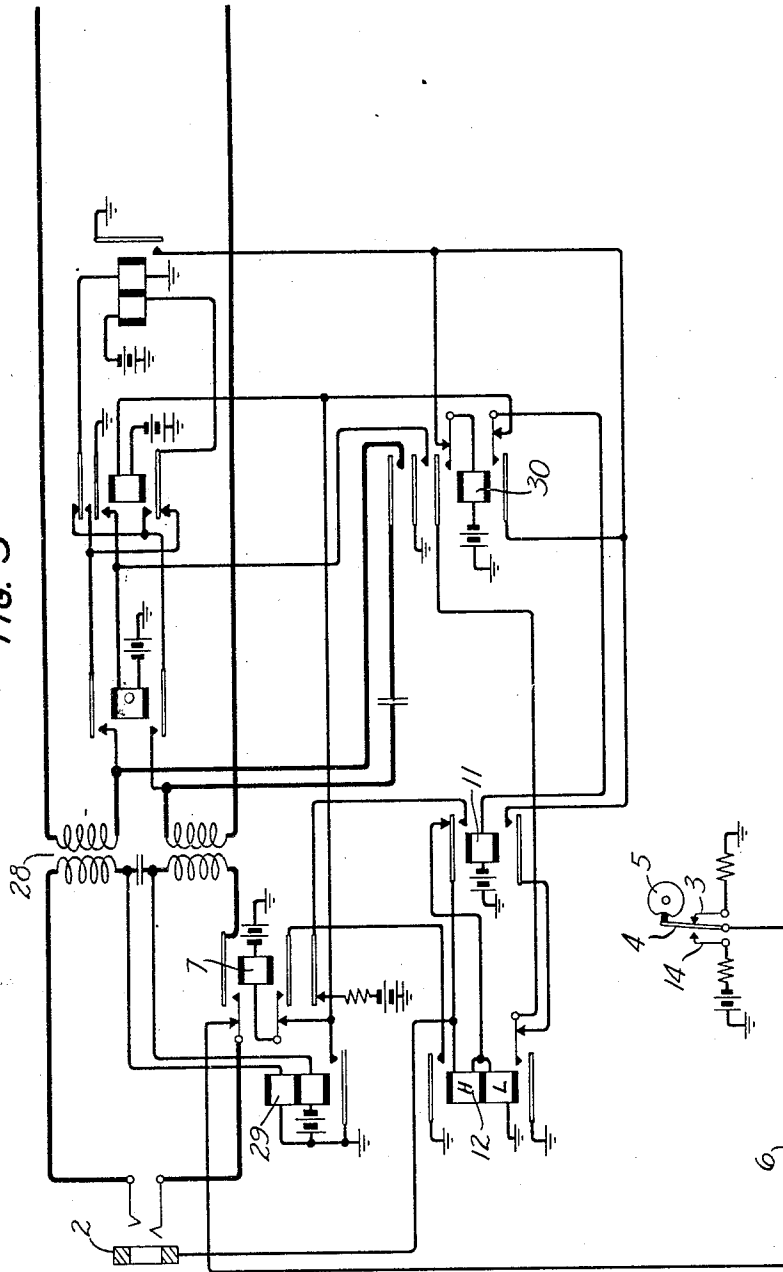
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FIG. 3



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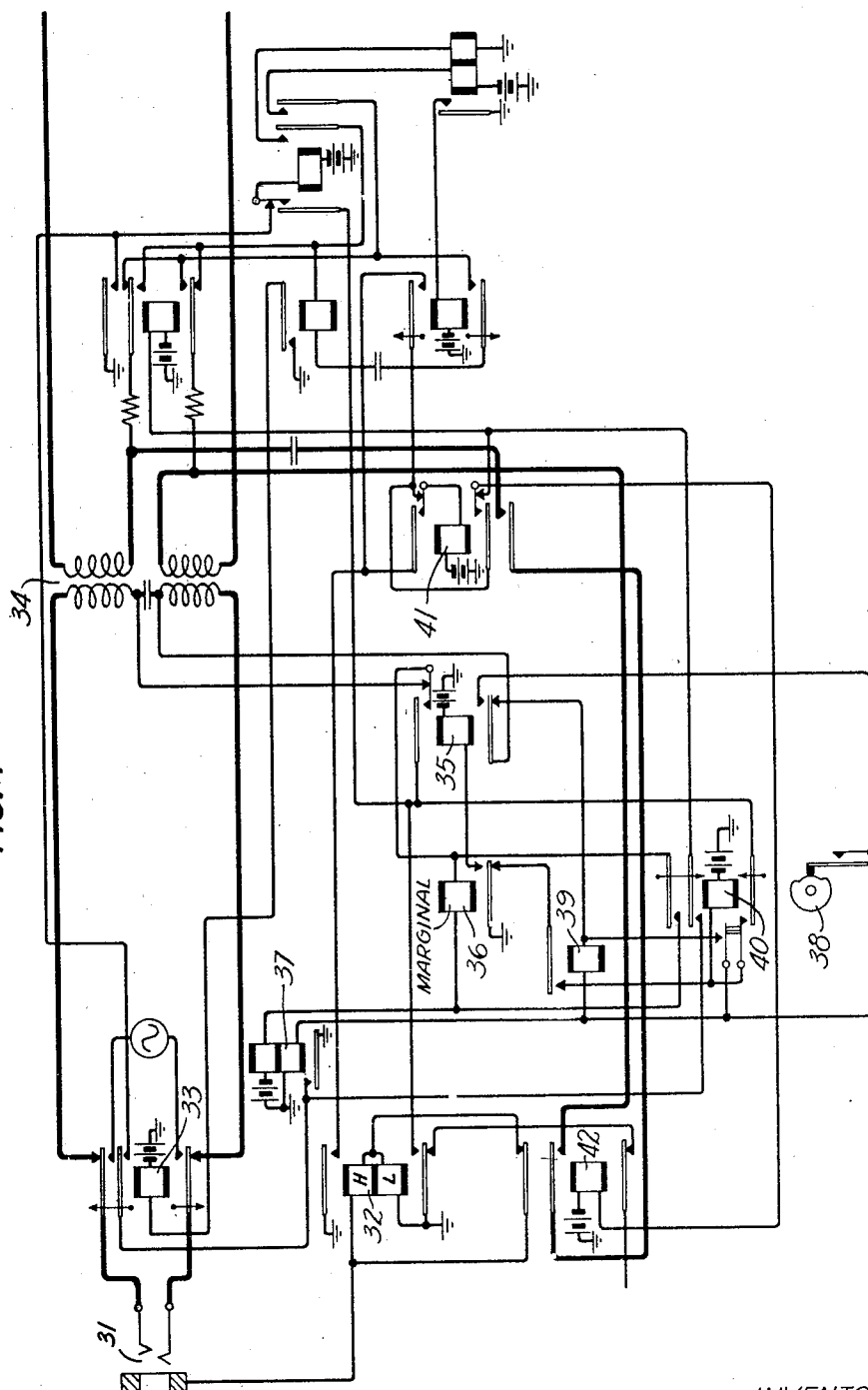
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FIG. 4



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TELEPHONE SYSTEM

Application filed April 30, 1930. Serial No. 448,495.

This invention relates to telephone systems and particularly to trunk circuits and their cooperating link circuits.

A feature of the invention is means in a trunk circuit responsive to the connection thereto of a link circuit of a nature not adapted for cooperation therewith for displaying a signal giving notice of such wrong connection. Due to the complexity of modern telephone systems where one operator has to handle traffic over several varieties of lines she must have several varieties of cord circuits suitable for cooperation therewith. The present invention, therefore, provides a signal to notify the operator that she has used a cord circuit unsuited for connection to the line with which she has made connection.

Due to the rapid growth of toll service and the desire of the telephone operating companies to handle this service with the same speed as local service it is becoming expedient to place toll trunks before A operators. Then, since the toll trunk requires much higher transmission cord circuits than does the ordinary local line, such A operators' positions are equipped with toll cords in addition to the usual "A" cords. To prevent the establishment of a connection from a local line over an "A" cord to a toll trunk a preemptory signal in the form of a flashing lamp in the cord circuit is given to attract the operator's attention to her error.

The drawings consist of four sheets of circuit diagrams illustrating the present invention. Fig. 1 shows a cord circuit specially adapted for use with toll switching trunks; Fig. 2 shows an ordinary A operator's cord circuit; and Figs. 3 and 4 show two forms of toll switching trunk with which the cord circuit of Fig. 1 is adapted to cooperate.

The toll switching trunks of Figs. 3 and 4 are circuits that terminate at a position where the operator handles ordinary traffic between subscribers and traffic originating at a subscriber's station and directed from there to a toll point. Since it is intended that such latter connections shall be handled over high quality transmission circuits the present invention provides means to notify the operator

when she has by mistake used the wrong cord for establishing such a connection.

We will therefore first describe the results of connecting the cord circuit of Fig. 2 to the trunk circuit of Fig. 3. When plug 1 is inserted in jack 2 a circuit is established from ground, contacts 3 and 4 of interrupter 5, conductor 6, normal contacts of the upper armature of relay 7, ring of jack 2, ring of plug 1, supervisory relay 8 to battery. In the meantime a circuit is established from battery, supervisory lamp 9, resistance 10, sleeve of plug 1, sleeve of jack 2, normal contacts of the upper armature of relay 11, lower low resistance winding of relay 12 to ground. Supervisory lamp 9 will be energized in this circuit but during the energization of supervisory relay 8 will be shunted through resistance 13 so that it will not glow. However, as interrupter 5 functions the contact 4 will be periodically moved away from contact 3 and into connection with contact 14, which leading to a battery connection will cause the deenergization of supervisory relay 8 and consequently will cause supervisory lamp 9 to flash. The operator noting the flashing of lamp 9 will take down the connection established through the cord circuit of Fig. 2 and substitute the cord circuit of Fig. 1.

The insertion of plug 15 into the jack of the calling subscribers line will cause the energization of relay 16 through the usual ground connection found on the sleeve of the subscriber's line jack. Relay 17 will be energized through the front contact and upper outer armature of relay 16 by ground either at the inner normal contact of the operator's listening key 18 or the inner upper armature and back contact of relay 19. Relay 17 connects ground and battery to the windings of relay 20 and talking battery is thus connected through the back contacts of relay 19 to the calling subscribers line. An energizing circuit for signal lamp 21 is established through resistance 22 and the front contact and inner upper armature of relay 16 to ground but the signal lamp 21 is prevented from glowing at this time due to a shunt circuit established through resistance 23, armature and contact

of relay 20, back contact and upper armature of relay 24 to battery.

It will be assumed that at this point plug 25 is inserted in jack 2. A circuit will then be established through the lower low resistance winding of relay 12 in series with relay 26 and marginal relay 27. All three relays will become energized. Relay 26 will extend a ground connection through the contacts of the lower armature of relay 16 to energize relay 19 and this latter relay will lock through its inner lower armature and front contact to this same ground. Relay 24 becomes energized to transfer the control of signal 21 to relay 27. Since relay 27 is at this instant energized lamp 21 will glow.

If it is assumed that the operator's key 18 is now operated then relay 17 will be released and the windings of relay 20 will be bridged across the tip and ring of plug 25. This results in the establishment of a circuit from contact 4 of interrupter 5, conductor 6, normal contacts of the upper armature of relay 7, ring of jack 2, ring of plug 25, front contact and outer lower armature of relay 19, back contact and lower armature of relay 17, lower winding of relay 20, back contact and upper outer armature of relay 17, upper winding of relay 20, upper inner armature and back contact of relay 17, upper outer armature and front contact of relay 19, tip of plug 25, tip of jack 2, upper left hand winding of repeating coil 28, upper winding of relay 29 to ground. When interrupter 5 moves to the point where contacts 4 and 14 come together then relay 29 will become energized.

Upon the energization of relay 29 a circuit is closed for the energization of relay 7 and this relay locks to the front contact and upper armature of relay 12. The energization of relay 7 substitutes the lower winding of relay 29 for the connection through interrupter 5 so that talking battery is supplied to the calling subscriber through the windings of relay 29.

The energization of relay 29 also closes a circuit through the normal contacts of the lower armature of relay 30 to the winding of relay 11. Relay 11 opens the short circuit about the upper high resistance winding of relay 12 and this causes the deenergization of marginal relay 27 and the consequent shunting of signal lamp 21.

Since further operations of the trunk circuit of Fig. 3 and the cord circuit of Fig. 1 have nothing to do with the present invention, they will not be described.

Let it now be assumed that plug 1 of the cord circuit of Fig. 2 is inserted in jack 31 of the trunk circuit of Fig. 4. There is then established a circuit from battery, supervisory lamp 9, resistance 10, sleeve of plug 1, sleeve of jack 31, and low resistance winding of relay 32 to ground. Relay 32 becomes

operated in this circuit and supervisory lamp 9 glows. At the same time a circuit is established from ground, tip of plug 1, tip of jack 31, upper outer armature and back contact of relay 33, upper left hand winding of repeating coil 34, normal contacts of the upper armature of relay 35, winding of marginal relay 36, upper winding of relay 37 to battery. Relay 36 becomes operated in this circuit and causes the energization of relay 35, whereupon relay 36 locks in a circuit from ground on the lower armature and front contact of relay 32, upper armature and front contact of relay 35, winding of relay 36, upper winding of relay 37 to battery. A circuit is now established from battery, supervisory relay 8, ring of plug 1, ring of jack 31, lower armature and back contact of relay 33, lower left hand winding of repeating coil 34, lower armature and front contact of relay 35, contacts of interrupter 38, lower winding of relay 37 to ground. Each time the contacts of interrupter 38 are closed, supervisory relay 8 attracts its armature and shunts supervisory lamp 9 so that this signal flashes in unison with the operation of interrupter 38. This notifies the operator that she has used the wrong cord in the trunk of Fig. 4.

The operator will now substitute the cord of Fig. 1 for the cord of Fig. 2. When plug 25 is inserted in jack 31, a circuit including relays 27, 26 and 32 in series is established. Through the operation of relay 26, relay 19 becomes operated as hereinbefore described and the windings of relay 20 are bridged across the tip and ring of the trunk as before. A circuit may now be traced from battery, upper winding of relay 37, winding of marginal relay 36, normal contacts of the upper armature of relay 35, upper winding of repeating coil 34, back contact and upper outer armature of relay 33, tip of jack 31, thence through the windings of relay 20, ring of jack 31, lower armature and back contact of relay 33, lower left hand winding of repeating coil 34, lower armature and back contact of relay 35, winding of relay 39, lower winding of relay 37 to ground. Due to the resistance of relay 39 in this circuit, relay 36 does not operate, but relay 39 attracts its armature. Thereupon a circuit is established from ground, armature and back contact of relay 36, armature and front contact of relay 39, winding of relay 40 to battery and ground. Relay 40 locks in a circuit from ground, the lower armature and front contact of relay 32, the lower armature and front contact of relay 40, winding of relay 40 to battery. Through its upper outer armature, relay 40 short circuits the winding of marginal relay 36 and through the auxiliary contacts controlled by its lower armature, relay 40 short circuits the winding of relay 39. Battery and ground for talking

purposes is now supplied from the windings of relay 37 over the tip and ring of the trunk circuit and thence through the cord circuit of the calling subscriber.

The operation of relay 37 extends a connection from ground, armature and front contact of relay 37, front contact and inner upper armature of relay 40, normal contacts of the inner lower armature of relay 41, winding of relay 42 to battery. Relay 42 opens the circuit around the upper high resistance winding of relay 32 to cause the de-energization of marginal relay 27 in the cord circuit to control the supervisory signal 21.

Since further operations of the trunk circuit of Fig. 4 and the cord circuit of Fig. 1 have nothing to do with the present invention, they will not be described.

What is claimed is:

1. In a telephone system, link circuits of different character, a trunk circuit adapted to cooperate with certain of said link circuits, a signal device in each of said link circuits, and means responsive to a connection between said trunk circuit and other than said certain of said link circuits for operating the signal of said connected link circuit.

2. In a telephone system, an operator's position, cord circuits of different characteristics thereat, a trunk circuit appearing thereat adapted to cooperate with certain of said cord circuits, and means in said trunk circuit responsive to a connection between said trunk circuit and other than said certain of said cord circuits for signaling the operator at said position.

3. In a telephone system, link circuits of different character, a trunk circuit adapted to cooperate with certain of said link circuits, a signal device in each of said link circuits, and means responsive to a connection between said trunk circuit and other than said certain of said link circuits for intermittently operating the signal of said connected link circuit.

4. In a telephone system, link circuits of different character, a trunk circuit adapted to cooperate with certain of said link circuits, a supervisory signal in each of said link circuits, an interrupter in said trunk circuit for intermittently operating the supervisory signal of a connected link circuit, and means responsive to a connection between other than said certain of said link circuits for rendering said interrupter effective.

In witness whereof, I hereunto subscribe my name this 28th day of April, 1930.

WILEY WHITNEY.