

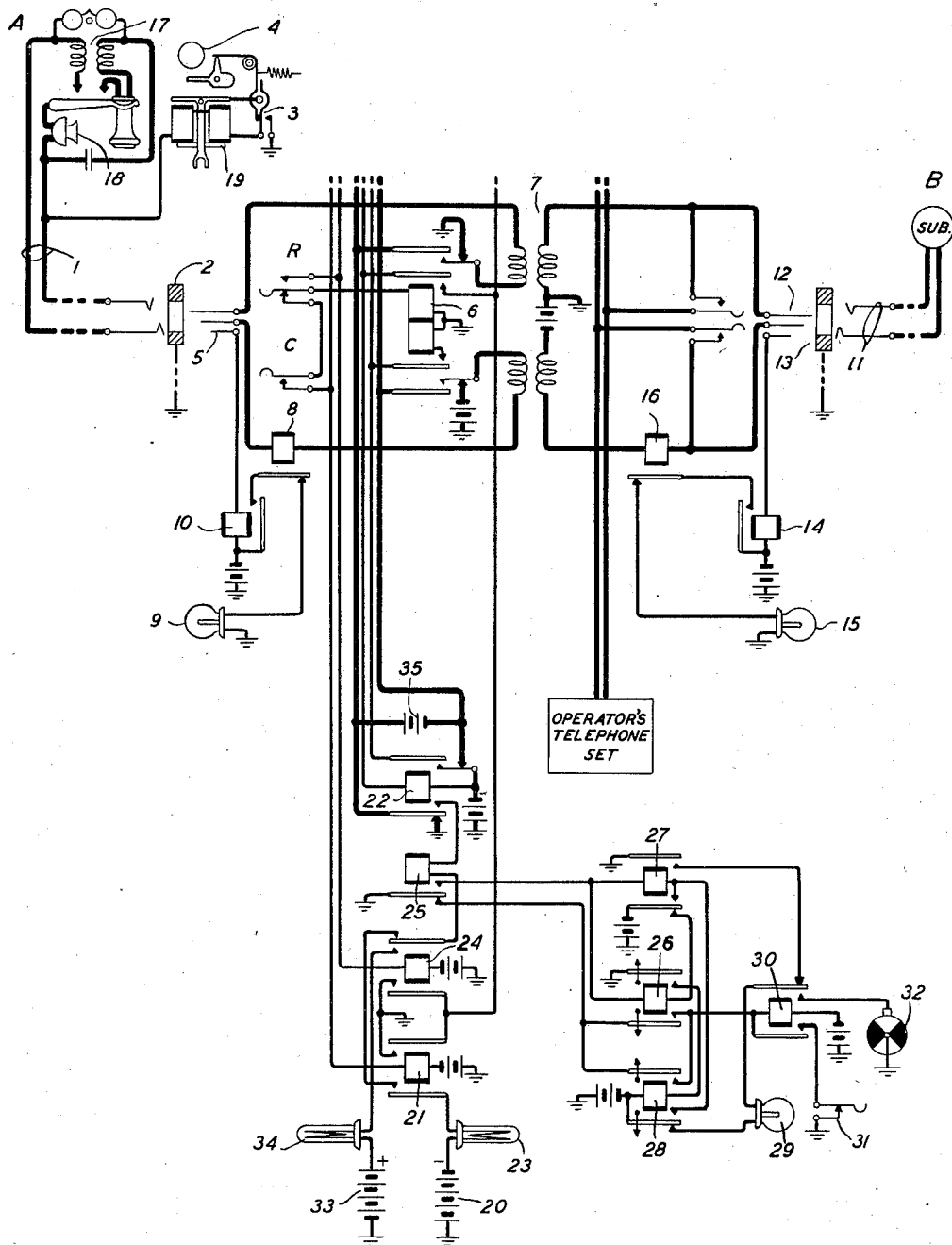
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PREPAYMENT TELEPHONE SYSTEM

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PREPAYMENT TELEPHONE SYSTEM

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This invention relates to prepayment or coin box telephone systems in which the deposit of a coin in a suitable receiving mechanism at a calling subscriber's station is required before a connection is established between the calling and a called line.

A coin deposited in such a receiving mechanism or box is arrested therein in such a manner as to close a connection between one side of the line and ground through the coils of an electromagnet, which ground in some cases causes the lighting of a line lamp at the central office as a calling signal.

In other cases the circuits are arranged in such a manner that the calling subscriber can signal the operator without depositing a coin whereupon the operator connects the answering end of her cord circuit to the line, asks for the number of the desired line and makes the wanted connection with the other end of the cord circuit. However, the cord circuit employed in this case is usually arranged in such a manner that when it is connected to the called line, apparatus in the cord prevents conversation between the lines until the calling line is grounded by the deposit of a coin, or otherwise, whereupon the prevention means is disabled and a conversational path is completed between the lines.

In both of the cases above described, the deposited coin is disposed of by the operator in a well-known manner by the depression, for a proper time interval, of either a collect or refund key which connects a relatively high potential current to the line.

A so-called coin pilot lamp is also provided at the central office and connected in series with the coin potential source and line which is lighted whenever one or the other of the two keys is operated, provided the cord is connected to a line on which a ground exists.

When the coin potential is applied to the line the electromagnet in the coin box at the subscriber's station is energized, if a coin is present, which causes the coin to fall into the coin drawer or into a return receptacle where it can be recovered by the subscriber.

Operation of the electromagnet, however, closes a holding circuit for itself to ground whereby it remains operated, and the line grounded, until the disposal key is released whereupon the electromagnet releases and the ground is removed. It will, therefore, be noted that the pilot lamp at the central office will light if a ground is present on the line when a disposal key is operated and will remain lighted until the key is released.

If the original ground on the line was caused by the deposit of a coin in the proper manner and the coin was disposed of in response to the first application of coin potential, a second application of coin potential will not encounter ground and the pilot lamp will remain dark.

The foregoing operating characteristics of such systems as described, suggests a method for determining whether the ground is one legitimately placed on the line by deposit of a coin or one fraudulently connected by the subscriber, as, if the first depression of a disposal key lights the pilot lamp and a second depression does not light it, it is probable that the original ground was caused by a coin which was disposed of by the first application of coin potential thereby leaving the line free of ground thereafter whereas, if the pilot lamp relights in response to a second depression of the disposal key, it is evident that either the coin disposal mechanism at the subscriber's station is out of order or the subscriber has fraudulently attempted to secure a connection without depositing a coin by the obvious expedient of artificially grounding the line independent of the coin mechanism.

In view of the foregoing it has been the practice in some cases to instruct the operator, when collecting coins, to hold the disposal key depressed a sufficient length of time to permit the pilot lamp to light and be observed and following this, to depress the key a second time and hold it depressed long enough to permit the lamp to again light and be observed in case ground is still present on the line.

It frequently happens, however, that operators neglect to press the coin disposal key more than once and for such a short interval that the coin potential applied to the line fails to actuate the coin electromagnet and dispose of the coin. It also follows that such a short application of current to the line may fail to display the pilot signal.

An object of the present invention is therefore to insure that the operator holds the coin disposal key depressed long enough to dispose of the coin.

A feature of the invention whereby this object is attained resides in means for causing the pilot lamp to flash if a ground exists on the line and the coin disposal key is not held depressed a predetermined length of time.

Another feature resides in means for steadily lighting the pilot lamp after the coin disposal key has been depressed a predetermined length

of time if ground is present on the line during that entire interval.

The invention will be understood from the following description when read in connection with the accompanying drawing.

At the left of the drawing is represented a calling subscriber's line 1 with associated line jack 2 which terminates in a coin-box station A of the usual prepayment type. At the right is indicated a called subscriber's line 11 with associated line jack 12 and substation B. To connect the calling and called stations an operator's cord circuit, arranged according to this invention is shown. It is provided with the usual coin collect and coin return keys C and R for the proper disposal of coins deposited at the calling station and is similar to other cord circuits installed at the same position which are not shown. In addition to the cord circuit other apparatus is shown, which is common to the position and is arranged according to this invention to cooperate with the cord circuit shown on the drawing, and with the other cord circuits (not shown) through nine vertical multiple leads, to effect the disposal of coins at the calling station and to give certain indications to the operator of the deposit or non-deposit of a coin by the calling subscriber. This will be fully described hereinafter.

A detailed description of the operation of the invention will now be given.

Let it be assumed that the subscriber at station A desires to establish a connection with the station of subscriber B. To call the operator at the central station, a coin must first be deposited at station A, if the line circuit (not shown) associated with the answering jack 2 is arranged according to the so-called "nickel first" plan. With this arrangement the central office line relay (not shown) operates through a circuit from ground, coin contacts 3, which were operated when coin 4 was deposited, through winding of coin magnet 19, over tip conductor of line 1 and through the winding of the line relay (not shown) to battery at the central office. If the aforesaid line circuit is arranged according to the so-called "nickel last" plan it is not necessary for the calling subscriber to first deposit a coin to obtain the attention of the operator. With this arrangement removing the receiver from the switchhook at station A operates the line relay over both line conductors in the well-known manner.

In response to the line signal, not shown, the operator inserts plug 5 into answering jack 2. Central office ground and battery are now connected through the upper and lower normally closed contacts, respectively, of relay 6 and the left-hand windings of repeating coil 7 to the line 1 through the tip and ring conductors of plug 5 and jack 2. Supervisory relay 8 operates over the subscriber's loop and disconnects lamp 9 to prevent its lighting when sleeve relay 10 operates over an obvious sleeve circuit through plug 5 and jack 2. On being informed that a connection with the line 11 of station B is required, the operator inserts calling plug 12 into jack 13, causing the operation of sleeve relay 14 over an obvious sleeve circuit to ground. Relay 14 in operating, lights calling supervisory lamp 15 through a circuit from ground through lamp 15, normally closed back contacts of supervisory relay 16, and operated contacts of relay 14 to battery. The operator now rings on the line, actuating the usual ringing key, which, with its

associated source of ringing current is not shown. When station B answers supervisory relay 16 operates from battery through the right-hand windings of repeating coil 7, through tip and ring contacts of plug 12 and jack 13, over line 11 and through the circuit of station B. Relay 16 in operating opens the circuit of lamp 15, extinguishing it. Supervisory lamps 9 and 15, both being dark, is an indication to the operator that the conversational connection between the subscribers of stations A and B is now established. If the line circuit, as before stated is of the so-called "nickel first" arrangement, the coin 4 was necessarily deposited prior to the answer of the operator; if the circuit, however is of the "nickel last" type, then the coin 5 should be deposited by the calling subscriber at some time prior to or immediately after the answer of the called subscriber of station B.

It is now in order to describe the invention in reference to the functioning of the coin disposal apparatus. The invention provides in connection with the disposal of a coin the following features: (a) an indication to the operator that the coin disposal key has been held actuated sufficiently long to assure the proper functioning of the coin magnet at the calling station; (b) means for determining the existence of a ground at the calling station, due to the deposit of a coin or otherwise, the absence of which would indicate that the calling subscriber has failed to deposit a coin; (c) means for determining whether the ground, at the calling station, if any, is due to the deposit of a coin, or is due to a ground connected fraudulently or otherwise.

To collect the coin 4 at station A the operator now actuates the coin collect key C. Prior to the functioning of the coin disposal circuit there is a flow of current from central office battery through the lower back contacts of relay 6, lower left-hand windings of repeating coil 7, supervisory relay 8, ring conductors of plug 5 and jack 2, then over the ring conductor of line 1, left-hand winding of induction coil 17, left-hand switchhook contacts, transmitter 18, winding of coin magnet 19, to ground through contacts 3. The voltage of the central office battery, however, is insufficient to cause the functioning of the coin magnet 19. The actuation of key C closes a circuit for operating relay 21 which may be traced from battery through the winding of relay 21, operated contacts of key C, back contacts of key R, and upper winding of relay 6 to ground. Relay 6 also operates in this circuit and operates relay 22 from battery through the winding of relay 22, upper inner make contacts of relay 6 to ground on the operated upper make contacts of relay 21. Relay 6 locks through its lower winding and lower inner make contacts to battery on the upper front contacts of relay 22. Relay 21 operated closes a circuit for operating coin magnet 19, which is traced from negative high voltage coin battery 20, ballast resistance lamp 23, lower contacts of relay 21, upper back contacts of relay 24, winding of relay 25, lower operated front contacts of relay 22, uppermost operated front contacts of relay 6, upper left-hand winding of repeating coil 7, tip conductors of plug 5 and jack 2, over tip conductor of line 1 and to ground through winding of coin magnet 19 and associated contacts 3, which were operated by the deposit of coin 4. Coin magnet 19 therefore functions to cause the collection of coin 4 in a well-known manner.

To effect the collection of the coin without causing annoying acoustic disturbances at stations A and B an arrangement is provided, similar to that disclosed in a copending application of Anderson et al., filed Aug. 8, 1935, Serial No. 35,226. With this arrangement the operation of relay 6 transfers with its continuity contacts the left-hand windings of repeating coil 7 from their normal connection with central office ground and battery to a non-grounded battery 35, of approximately equal voltage, which is normally connected in multiple with the central office battery through back contacts on relay 22. Since relay 22 operates in response to the operation of, and after relay 6, it follows that the central office battery is not disconnected from its multiple relation with the non-grounded battery 35, until after battery 35 has been connected with the left-hand windings of repeating coil 7, thereby avoiding the possibility of momentarily disconnecting battery or ground from the talking circuit, before the battery 35 is connected at both terminals. This latter result would follow if one of the break contacts of relay 6 should open before the make contacts of relay 6 should close. This arrangement therefore avoids the possibility of causing a click in the receivers of stations A and B. Since relay 6 is locked under control of relay 22 as hereinbefore described, relay 6 cannot release until relay 22 releases, thereby assuring clickless operation on the release as well as the operation of relay 6.

Continuing now the description of the coin control apparatus, relay 25 operates in series with coin magnet 19 in the circuit before traced and operates relay 26 from ground on its front contacts through the winding of relay 26 to battery on the lower back contacts of relay 27. Relay 26 in closing its upper contacts operates relay 28, which in turn operates relay 27. This latter operating circuit may be traced from battery through the lower front contacts of relay 28, winding of relay 27 to ground on the front contacts of relay 25. When relay 27 operates, the operating circuit for relay 26, before traced is opened. Relay 26 releases slowly and opens the operating circuit of relay 28, which also releases slowly. Relay 27 remains locked through its lower front contacts under control of relay 25, and closes a circuit for lighting lamp 29 steadily, when relay 28 releases, which is traced from battery through the lower back contacts of relay 28, lamp 29, upper back contacts of relay 30, to ground on the upper operated contacts of relay 27.

The steady illumination of lamp 29 is an indication that the key C has been held actuated the necessary length of time to assume the functioning of the coin magnet 19, per condition (a) aforesaid. The steady lighting of lamp 29 is due to the fact that the coin control circuit through the winding of relay 25 has been closed sufficiently long to permit relays 25, 26 and 28 to operate and relays 26 and 28, which are slow releasing, to release. These relays are designed to measure sufficient time to assure the functioning of coin magnet 19. Too short an operation of coin control key C would cause either a failure to light lamp 29 at all or a flashing of lamp 29 due to the operation of relay 30 from battery through its winding, and the upper contacts of relay 28 alone, or also through the lower contacts of relay 26, to ground on the back contacts of relay 25, which it is assumed has released before relays 26 and 28 have released. Relay 30 in operating locks to ground on contacts of key 31. To discontinue

the flashing of lamp 29 the operator now releases relay 30 by operating key 31.

Lamp 29, either flashing or steadily illuminated indicates per condition (b) aforesaid that a ground exists at station A due to a coin deposited, to a fraudulent connection or otherwise.

Condition (c) concerning the determination of the genuine or fraudulent character of the ground at station A will now be discussed. If the ground has been legitimately applied by the deposit of the coin 4 and the key C has been held operated sufficiently long to assure the collection of the coin 4, as evidenced by the steady burning of lamp 29, coin contacts 3 are opened when the coin control circuit is opened following the release of relays 6, 21 and 22 when key C is restored to normal. Consequently, a second application of coin current will fail to operate relay 25, and lamp 29 will not be relighted. However, if the ground at station A is fraudulently, or irregularly connected, opening the coin collect circuit cannot cause the removal of said ground and lamp 29 will light a second time.

The invention has been described in connection with the collection of a coin at station A. It will now be discussed with reference to the return of a coin.

To return a coin the return key R is actuated, which closes a circuit for operating relays 6 and 24 from battery through the winding of relay 24, operated contacts of key R and upper winding of relay 6 to ground. Relay 24 in operating connects positive high potential coin return battery 33 through ballast resistance lamp 34 and its upper operated front contacts to the winding of relay 25, and connects ground at its lower contacts to the upper inner make contacts of relay 6. The other apparatus now functions as hereinbefore described in connection with the collection of a coin. Lamp 29 lighted steadily assures the operator that key R was actuated sufficiently long to return the coin, and lighted intermittently indicates that the time of closure was too short. If lamp 29 flashes relay 30 should be released by operating key 31, thereby extinguishing lamp 29. Key R should then be actuated again for a longer period to insure that lamp 29 will be extinguished when key R is released.

What is claimed is:

1. In a prepayment coin system for telephone lines in which a deposited coin at a subscriber's station grounds the line thereat and is disposed of by means of current of a predetermined potential connected to the line at the central office, thereby removing the ground from the line, operator controlled switching means at the central office for connecting said disposal potential to the line, a pilot lamp, and means for causing said lamp to flash intermittently responsive to a ground condition on the line when said disposal potential is connected thereto and the subsequent disconnection of said potential from the line before the expiration of a predetermined time interval.

2. In a prepayment coin system for telephone lines in which a deposited coin at a subscriber's station grounds the line thereat and is disposed of by means of current of a predetermined potential connected to the line at the central office for a predetermined interval of time thereby removing the ground from the line, operator controlled switching means at the central office for connecting said disposal potential to the line, a pilot lamp, a normally open circuit for said lamp in-

cluding a source of current therefor, and means for closing said circuit at the end of said predetermined time interval if said disposal potential encounters ground on the line during the entire interval.

5 3. In a prepayment coin system for telephone lines in which a deposited coin at a subscriber's station grounds the line thereat and is disposed of by means of current of a predetermined potential connected to the line at the central office
10 thereby removing the ground from the line, operator controlled switching means at the central office for connecting said disposal potential to the line, a pilot lamp, a normally open circuit for said
15 lamp including a source of current therefor, and means for periodically closing and opening said circuit responsive to a ground condition on the line when said disposal potential is connected thereto and the subsequent disconnection of said
20 potential from the line before the expiration of a predetermined time interval.

4. In a prepayment coin system for telephone lines in which a coin deposited in a receiving

mechanism at a subscriber's station grounds the line thereat and wherein the coin is disposed of by application to the line of a predetermined current potential for a predetermined interval of time and the ground is removed upon disconnection of said potential, a source of coin disposal potential, a coin disposal key for connecting said potential to the line, a pilot lamp, a normally open circuit for said lamp including a source of current, an interrupter means adapted to be included in said lamp circuit, a timing means, and a relay in series with said source of disposal potential adapted to operate when said disposal source is connected to a grounded line to initiate operation of said timing means, said timing means being adapted to close said lamp circuit and include the interrupter means therein if said key is released before the expiration of said predetermined interval of time and to close said circuit independent of said interrupter means if the key is maintained operated for the predetermined interval of time.

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