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H. HOVLAND

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COIN DETECTION SYSTEM

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2 Sheets-Sheet 1

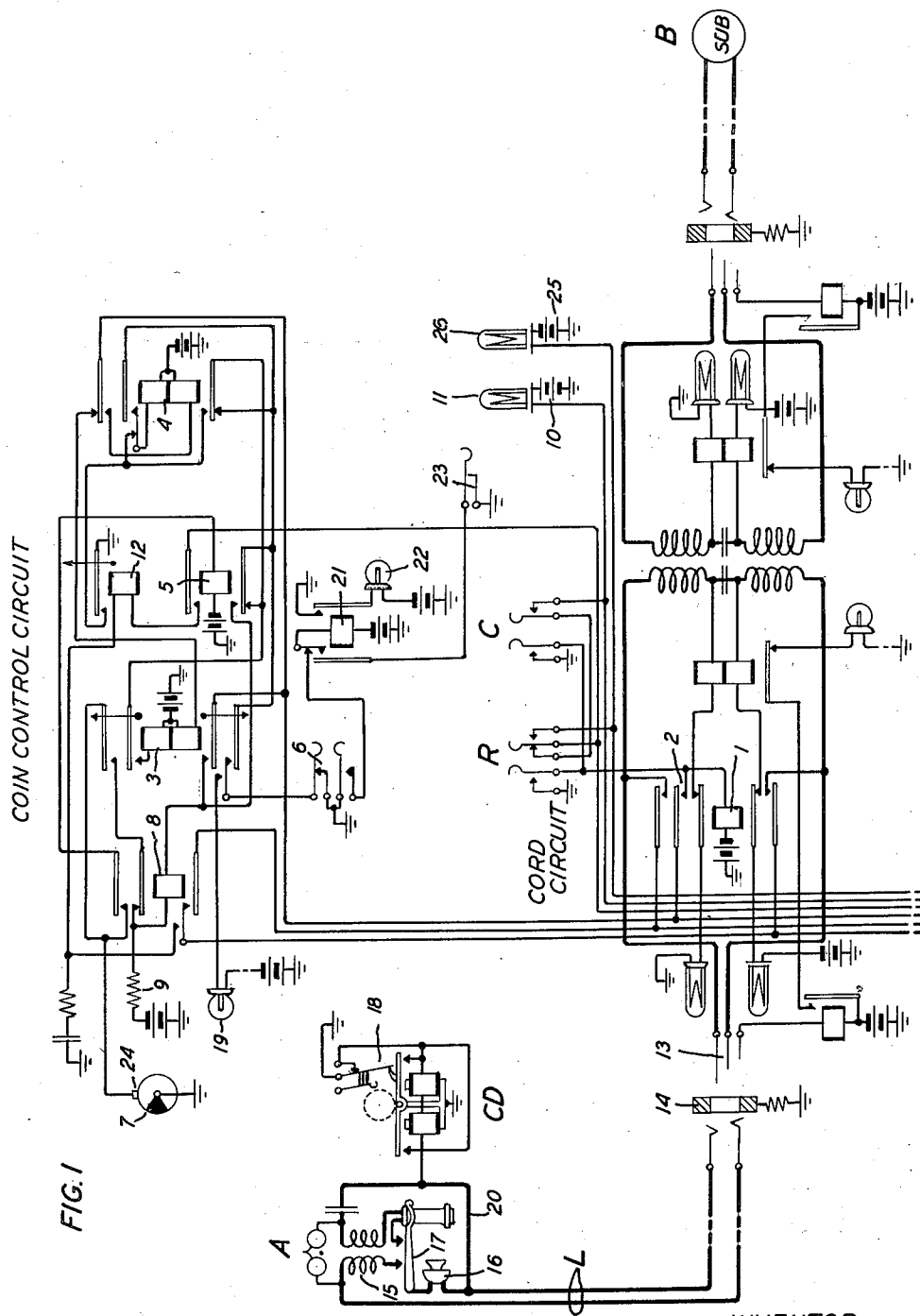


FIG. 1

INVENTOR
H. HOVLAND
BY *H. Kingman*
ATTORNEY

Nov. 19, 1935.

H. HOVLAND

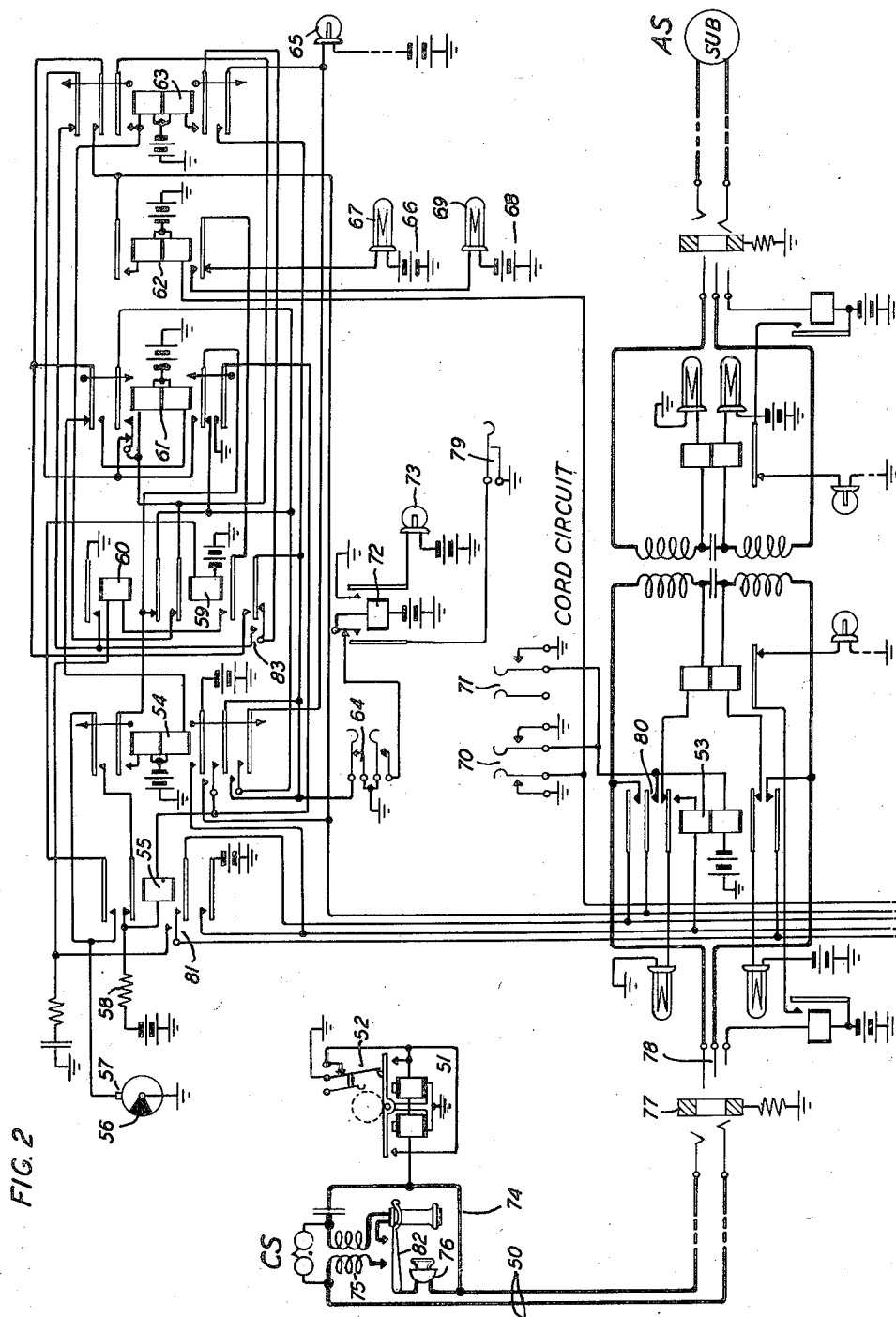
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COIN DETECTION SYSTEM

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2 Sheets-Sheet 2

COIN CONTROL CIRCUIT



INVENTOR
H. HOVLAND
BY *H. J. Krigman*
ATTORNEY

UNITED STATES PATENT OFFICE

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COIN DETECTION SYSTEM

Henry Hovland, Williston Park, N. Y., assignor to
Bell Telephone Laboratories, Incorporated, New
York, N. Y., a corporation of New York

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8 Claims. (Cl. 179—6.3)

This invention relates to telephone systems in which prepayment or registration of a coin is necessary to obtain a connection with another subscriber, and in some cases with the operator.

5 This is customarily accomplished by the deposit of a coin (usually a nickel) in a box, having one or more coin slots, at the calling station, the box being provided with a polarized electromagnet having an armature adapted to be tilted in either
10 of two directions depending upon the direction of the current passed through its coil. A coin deposited in such a box is arrested therein in such a manner as to close a connection to ground from one side of the line through the coils of
15 the electromagnet which in some systems operates the line relay at the central office and lights the line lamp.

The coin thus arrested within the box may be diverted either into a return chute, if the call cannot be completed, or into a collect chute leading to a coin drawer, if the connection is established, by the proper tilting of the before-mentioned armature which is controlled by the exchange operator by the application to the line,
20 by means of one or the other of two keys, of direct current of the proper polarity.

The time of collecting the coin may vary in different localities. In some cases, such as at public pay stations, the collection is made at or just before the start of conversation and in other cases, due to local conditions, when the conversation is concluded. In all cases, however, the coin is returned to the subscriber at once if the desired connection cannot be established.

25 At the operator's position, a coin pilot lamp is provided which is caused to light when either of the two coin keys is operated, provided a ground exists at the calling station, and remains lighted as long as the key is held depressed. If
30 the coin box mechanism functions normally, the operation of the coin box electromagnet will dispose of the coin and when the magnet armature returns to normal, upon the release of the coin control key, the ground will be removed from the
35 line and a second operation of the key would be ineffective to operate the magnet or light the coin pilot lamp. If, however, for any reason a ground on the line exists after the coin control key has been operated and released, which might
40 be caused by failure of the mechanism to properly dispose of the coin or to an artificial ground applied through accident or intent, the operator would be unaware of this condition unless she made a test by the simple expedient of operating
45 the coin control key a second time, whereupon

the coin pilot lamp would light as an indication that the first operation of the key had not cleared the line. If successive operations of the key caused the synchronous lighting of the coin
5 pilot lamp, the line would be considered out of order and should receive attention at once. Tests of this character are occasionally made by the operating force at some exchanges, but in busy "coin box" operator's positions, they can only be made at infrequent intervals due to the
10 extra time and labor involved. Hence, a coin box may be in trouble and ineffective to collect the proper toll for considerable periods of time before the trouble is recognized and corrected.
15 Possessing a knowledge of the foregoing characteristics of present day prepayment systems, unscrupulous users of this kind of telephone service sometimes seek to avoid payment of the initial charge by artificially grounding the line independent of the coin box by which method, under
20 present conditions, they are enabled to obtain a local connection without proper payment. Such fraudulent methods may consist in the application of a permanent ground to the proper line wire or in applying ground to the line until
25 a certain stage of the call is reached after which the ground is removed.

An object of the invention is to detect such fraudulent practices without necessitating any special act on the part of the operator other
30 than observing the pilot lamp.

A feature whereby the foregoing object is attained resides in means which, after responding to an initial operation of either the collect or refund key, will display a pilot signal before the
35 operator and hold it displayed unless a ground was present on the line which was removed by the application of coin control current thereby retiring the signal which would be the condition and functional operation attending the normal
40 and legitimate use of the coin box.

In other words, means is provided for automatically retiring the displayed pilot signal only when ground is present on the line when the coin disposal current is applied and said ground disappears immediately following such current
45 application. Under all other conditions, the signal will persist until manually retired.

The invention will be understood from the following description and read in connection with
50 the accompanying drawings,

Fig. 1 of which represents a calling subscriber's line equipped with a coin device of the well-known type, as shown in United States Patent to O. F. Forsberg 1,043,219, or 1,076,285 to 55

W. F. Hosford, and a cord circuit arranged in accordance with the present invention, which requires for its proper functioning that the operator hold the coin disposal key operated long enough to permit at least two impulses of the coin disposal current to be applied to the line; and

Fig. 2 represents an arrangement similar in operation to Fig. 1 with this difference that the coin disposal key need be operated only momentarily whereupon the coin test apparatus is locked in an operated condition and is released only when a coin ground exists at the calling station, which is removed by application of the disposal current to the line, or when a release key is manually operated.

A description of the operation of the circuit of Fig. 1 will first be given.

Let it be assumed that a subscriber's station A, desirous of obtaining a connection with another subscriber, B, for example, has gained the attention of the operator either by inserting a coin of the proper denomination in the device CD in addition to removing the receiver from the switch-hook, or without the initial deposit of such a coin, has given the number of the desired subscriber to the operator, and has been connected as desired.

If the system is one that requires the initial deposit of a coin by the calling subscriber, no further act on the subscriber's part is necessary unless the charge for the desired connection is greater than the coin deposited, in which case the operator will return the deposited coin in the manner hereinafter described and request the deposit of the proper amount of the charge. If, however, the system is one in which the subscriber may call the operator without depositing a coin but requires such a deposit before a conversational connection can be established with the called subscriber, the calling subscriber must, after giving the number of the called subscriber to the operator, deposit a coin, usually a nickel, in the coin device before the connection can be completed.

Since this invention has only to do with disposal of the coin at the calling subscriber's station once it has been deposited, it will be assumed that the coin has been deposited and that the desired connection to the called subscriber has been established.

The operator, after making the connection and observing that the called subscriber has answered, which is usually indicated by the darkening of the "called supervisory" lamp of the cord circuit in use, is instructed to collect the coin, i. e., to press the coin collect key, which in normal operation will cause the coin held in suspense at the calling station to be dropped into the coin receptacle or drawer provided for the purpose.

When the operator presses the collect key C, relay 1 in the cord circuit operates in an obvious circuit. The operation of relay 1 disconnects, at its innermost contacts, the normal talking battery from the answering or calling subscriber's end of the cord circuit and closes at its contact 2 a circuit to operate relay 3 in the common or position coin control circuit. This circuit is traced from ground through the left-hand contacts of key C, contacts 2 of relay 1, uppermost back contact of relay 4 to battery through the lower winding of relay 3. Relay 3 locks in a circuit traced from battery through its upper winding and upper inner contacts through the lower

back contacts of both relays 4 and 5, through the lowermost contacts of relay 3 to ground through the upper back contacts of key 6.

Relay 3, operated, lights lamp 19 by connecting ground from the upper contacts of key 6 through the lower outer contacts of relay 8 to lamp 19 and causes at least two pulses of coin collect current to be transmitted over the line in the following manner: If the metallic segment of interrupter 7 is not in contact with brush 24, relay 8 is operated immediately. The circuit for this function is traced from ground through the left-hand contacts of key C, contacts 2 of relay 1, lower inner front contacts of relay 3, the winding of relay 8 to battery through resistance 9. Had the metallic segment of interrupter 7 been in contact with brush 24, relay 8 would not have operated until the segment broke contact with the brush since relay 8 would have had ground connected to both its winding terminals. One of these ground paths has already been described and the other is traced from ground through the segment of interrupter 7, brush 24, the upper outer contacts of relay 3, upper inner back contacts of relay 8 to the winding of relay 8. The use of this "pick-up" arrangement assures the transmission of a complete collect pulse.

The operation of relay 3 causes the operation of relay 5 when the metallic segment of interrupter 7 makes contact with brush 24. This circuit is traced from ground through the metallic segment of interrupter 7, brush 24, the upper outer front contacts of relay 8 to battery through the winding of relay 5. Relay 5, operated connects positive coin battery to the tip and ring conductors of line L to collect the coin in the usual manner. This circuit is traced from positive battery 10 through current limiting lamp 11, the right hand contacts of coin collect key C, the right-hand back contacts of coin return key R, upper contacts of relay 5, the winding of relay 12 to the lower contacts of relay 8. From the lower contacts of relay 8 the circuit is traced through two parallel paths, one from the middle lower contact of relay 8 through the lower, outer contacts of relay 1, the ring springs of plug 13 and jack 14, the ring conductor of line L, the primary winding of induction coil 15, switch-hook contacts 17, transmitter 16 to ground through the windings of coin device CD and coin contacts 18, the other path from the lowermost contact of relay 8, uppermost contacts of relay 1, the tip springs of plug 13 and jack 14, the tip conductor of line L, conductor 20 to ground through the windings of coin device CD and coin contacts 18.

Under normal operation, both the coin device CD and relay 12 operate in this circuit. The coin device drops the coin in the coin drawer but ground is maintained connected until the circuit is opened and the coin magnet armature returns to its normal position. The operation of relay 12 causes the operation of relay 4 by connecting ground to its upper winding through its upper inner back contacts. Relay 4 locks through both its windings, the path through its upper winding being traced through its upper inner front contacts and the lowermost contacts of relay 3 to ground through the upper contacts of key 6 and through its lower winding and upper outer front contacts, contacts 2 of relay 1 to ground through the left-hand contacts of collect key C. The locking circuit of relay 3 is transferred on the lower contacts of relay 4 from ground through the contacts of key 6 to ground through the

contacts of relay 12 and relay 3 being of the slow-to-release type does not release during the momentary open circuit while the lower armature of relay 4 is passing from its back to its front contacts.

When the metallic segment of interrupter 7 breaks contact with brush 24, relay 5 releases and opens the coin collect circuit through the winding of relay 12 to the coin device. Coin device CD releases, disconnecting ground from the line and relay 12 releases, transferring the holding ground for relay 3 from the contacts of relay 12 to the lower back contact of relay 5.

After an interval, the metallic segment of interrupter 7 again makes contact with brush 24 and relay 5 again operates and connects coin battery to line L as before. This time, however, no ground is present at substation A and relay 12 does not operate. With relays 5 and 4 operated and relay 12 non-operated, the locking circuit of relay 3 is opened and relay 3 releases, extinguishing lamp 19 and releasing relay 8. The release of relay 8 opens the operating circuit of relay 5 releasing it. Relay 4 remains operated, however, in the circuit through its lower winding and upper inner front contacts to ground through the contacts of collect key C, previously described, until the operator noting the darkened lamp releases key C which opens the circuit to relay 4 releasing it and returning the coin control circuit to normal.

The operation of the circuit for the return of the coin is the same as that for collecting the coin described above except that coin return key R is operated instead of key C. The operation of key R through its left-hand contacts operates relays 1 and 3 as before but in this case negative battery 25 through current limiting lamp 26 and the right-hand front contacts of key R is connected to the line through the contacts of relays 5, 8, and 1 and the winding of relay 12 and this battery causes coin device CD to return the coin in the usual manner. Relay 12 being a neutral relay functions on either polarity of battery.

If for any reason the ground is not present at substation A when the coin collect or coin return key is operated, or if the ground is present but is not removed by the application of coin collect or coin return current to the line, lamp 19 remains lighted indicating that the substation apparatus has not functioned properly or has been tampered with. To illustrate this condition, let it be assumed that a ground is connected with fraudulent intent, or otherwise, to conductor 20. The operation of the circuit is the same as described above until the second pulse of coin collect battery is transmitted over the line. In this case, relay 12 operates on the second pulse since the ground is not removed by the operation of the coin device. The operation of relay 12 provides a holding path for relay 3 during the time relay 5 is operated, thus causing relay 3 to remain operated. This circuit is traced from ground through the contacts of relay 12, through the lower front contacts of relay 4 to battery through the upper inner contacts and upper winding of relay 3. Lamp 19 remains lighted as an indication of trouble and the coin control circuit transmits pulses of coin collect current over the line until the operator releases the collect key C. In order to release the coin control circuit and extinguish lamp 19, it is necessary to operate key 6 which operation will be described later.

Had no ground been present on the line when coin collect key C was operated, relay 12 would

not have operated on the first pulse and consequently relay 4 would have remained in a released condition. With relay 4 released, relay 3 remains operated under control of key 6. The circuit for holding relay 3 operated is traced from ground through the upper back contacts of key 6, lowermost front contacts of relay 3, lower back contacts of relay 4 to battery through the upper inner contacts and upper winding of relay 3. With relay 3 operated, lamp 19 remains lighted as in the case of a ground on line L.

In order to release the coin control circuit when the coin device has not functioned normally, it is necessary to operate release key 6. The operation of this key opens the locking circuits of relays 3 and 4 releasing them and extinguishing lamp 19. The operation of key 6 also causes the operation of relay 21 through the left-hand back contacts of the latter. Relay 21 locks through its left-hand front contacts from ground through the contacts of key 23 and lights lamp 22 through the right-hand contacts of relay 21 as an indication of failure. After the trouble has been recorded or cleared, key 23 is operated which releases relay 21 and extinguishes lamp 22.

Referring now to Fig. 2, a circuit is shown which accomplishes the same result as Fig. 1, except that only a momentary operation of the coin collect or coin return keys is required. As in the case of Fig. 1, it is assumed that a connection has been established between subscriber CS and another subscriber in the exchange AS, and that it is desired to either collect or return the coin by applying positive or negative coin battery to the line.

To collect the coin at the subscriber's station, the operator depresses key 71, which causes the operation of relay 53 by connecting ground to its lower winding terminal. With relay 53 operated, ground through the contacts of key 71 is connected through contacts 80 of relay 53, the upper middle back contacts of relay 63, the upper outer back contacts of relay 61 to battery through the lower winding of relay 54. Relay 54 operates in this circuit and locks over a circuit traced from battery through its upper winding and upper inner contacts through the upper outer back contacts of relay 59 and the lower inner back contacts of relay 61 in parallel to ground through the lower outer front contacts of relay 54 and the upper back contacts of key 64. Relay 54 operated: Lights lamp 65 by connecting ground through the upper back contact of key 64 and the lowermost front contacts of relay 54 to battery through the filament of lamp 65; holds relay 53 operated in a circuit traced from ground through the upper contacts of key 64, lower middle front contacts of relay 54, contacts 80 and lower winding of relay 53 to battery; and starts the coin control circuit in operation to send at least two pulses of coin battery over the line in the following manner:

Relay 55 operates immediately after relay 54 closes its contacts provided the metallic segment of interrupter 56 is not in contact with brush 57. Relay 55 is provided as a "pick-up" device to prevent sending out a short pulse should relay 54 operate during the time that the metallic segment of interrupter 56 is connected to brush 57. Should this occur, ground is connected to both winding terminals of relay 55 to prevent its operation. Thus ground through the upper back contacts of key 64 through the lower middle front contacts of relay 54 is connected to the right-hand winding terminal of relay 55 while ground

through the metallic segment of interrupter 56, brush 57, the upper outer front contact of relay 54 and the upper inner back contact of relay 55 is connected to the left-hand winding terminal of relay 55. When the metallic segment of interrupter 56 breaks contact with brush 57, or if it was not in contact with brush 57 at the time relay 54 operated, relay 55 operates in a path traced from ground through the upper back contacts of key 64, lower middle front contacts of relay 54, the winding of relay 55 to battery through resistance 58.

Relay 55, operated, connects interrupter 56 to interrupter relay 59 and relay 59 operates each time the metallic segment of the interrupter makes contact with the brush as long as relay 55 remains operated. This circuit is traced from ground through the metallic segment of interrupter 56, brush 57, the upper outer contacts of relay 55 to battery through the winding of relay 59. When interrupter relay 59 operates under control of interrupter 56 a pulse of positive coin collect battery is transmitted over line 50 to operate coin device 51. This circuit is traced from positive battery 66 through current limiting lamp 67, lower back contacts of relay 62, lower inner front contacts of relay 59, the winding of relay 60 to the lower inner front contacts of relay 55. From the lower inner front contacts of relay 55, the circuit divides so that the coin battery is transmitted over both line wires of line 50. The circuit over the tip line wire is traced from the lower inner armature of relay 55, uppermost front contacts of relay 53, the tip springs of plug 78 and jack 77, tip line wire of line 50, conductor 74, to ground through the windings of coin device 51 and coin contacts 52. The circuit over the ring wire is traced from contact 81 of relay 55, lower outer contacts of relay 53, the ring springs of plug 78 and jack 77, the ring conductor of line 50, the winding of induction coil 75, switch-hook contacts 82, transmitter 76, conductor 74, to ground through the windings of coin device 51 and coin contacts 52. Coin device 51 and relay 60 both operate in this circuit. The coin device disposes of the coin but ground is maintained connected to the device until the circuit is opened and the coin magnet armature returns to normal. The operation of relay 60 causes the operation of relay 61 in a circuit traced from ground through the contacts of relay 60, the uppermost back contacts of relay 63, to battery through the upper inner back contacts and upper winding of relay 61. Relay 61 is of the slow operate type to prevent its false operation when the lower outer contacts of relay 59 are connected together while the latter relay is operating and releasing. Relay 61 locks through both its windings. The locking circuit for its upper winding is traced from ground through the upper back contacts of key 64, lower outer front contacts of relay 54, to battery through the upper inner front contacts and upper winding of relay 61. The locking circuit for the lower winding of relay 61 is traced from ground through the upper back contacts of key 64, lower middle front contacts of relay 54, upper middle back contacts of relay 63, to battery through the upper outer front contacts and lower winding of relay 61. With relays 59 and 61 both operated, the locking path for relay 54, described previously, is opened but ground through the contacts of relay 60, through the uppermost back contacts of relay 63 and the lower inner front contacts of relay 61 holds relay 54 locked until

relay 59 releases and closes the locking path first described.

When relay 59 releases under control of interrupter 56, the coin collect current is removed from the line, releasing relay 60, and coin device 51 which disconnects the ground from the line. With relay 61 operated and relay 59 released, a circuit is closed for the operation of relay 63. This circuit is traced from ground through the upper back contacts of key 64, lower outer front contacts of relay 54, upper inner front contacts of relay 61, upper inner back contacts of relay 59 to battery through the upper winding of relay 63. Relay 63 locks in a circuit traced from ground through the upper back contacts of key 64, lower outer front contacts of relay 54, upper inner front contacts of relay 61, to battery through the upper inner front contacts and upper winding of relay 63.

When interrupter 56 again operates relay 59 coin collect battery is again applied to both conductors of the line over paths already traced. In this case, however, ground is not present at coin contacts 52, and relay 60 does not operate. With relays 59 and 61 both operated and relay 60 released, the locking path for relay 54 is opened and relay 54 releases. The release of relay 54 releases all of the relays in the circuit and extinguishes lamp 65.

The operation of the circuit for the return of the coin is the same as that described above for the collection of the coin except that key 70 is depressed instead of key 71 and relay 62 is operated and locked which connects negative battery 68 to the line instead of positive battery when relay 59 operates. The circuit for the operation of relay 62 is traced from ground through the left-hand contacts of key 70, to battery through the lower winding of relay 62. Relay 62, operated, locks in a circuit traced from ground through the upper contacts of key 64, lower middle contacts of relay 54 to battery through the upper contacts and upper winding of relay 62. With relay 62 operated, the coin current path is traced from negative coin battery 68, through current limiting lamp 69, lower front contacts of relay 62 to the lower inner front contacts of relay 59. The circuit from this point is the same as previously traced for the coin collect function. Relay 62 is released upon the release of relay 54 as previously described.

Had no ground been present on the line or if a ground was present but was not removed by the operation of the coin device, the circuit is arranged to remain locked in and lamp 65 to remain lighted until the line number is recorded and release key 64 is operated.

To illustrate this feature, let it be assumed that a ground is connected with fraudulent intent or otherwise to conductor 74. When coin collect key 71 is depressed the operation of the coin control circuit will be the same as that described above until the second pulse of the coin current is transmitted over the line. In this case relay 60 operates on the second pulse as well as the first since ground is not removed by the operation of the coin device. Relay 54 releases, releasing relays 59, 60, 61, and 62 as before but relay 54 being somewhat slow in releasing allows the operation of relay 60 to hold relay 63, which is also slow to release, operated until the locking path of relay 63 is taken up by relay 59. The circuit for holding relay 63 operated from the contacts of relay 60 is traced from ground through the contacts of relay 60, contacts 83 of

relay 59 to battery through the lower inner contacts and lower winding of relay 63. After relay 59 releases, this locking circuit is modified so that ground through the upper contacts of key 64, through the lowermost back contacts of relay 59 holds relay 63 operated through its lower inner front contacts and lower winding.

By this method of operation, the desirable feature of applying but two pulses of coin current to the line is obtained and the subsequent removal of the ground does not satisfy the circuit as it does in the case of the circuit shown in Fig. 1. Relay 63 remains locked operated and holds lamp 65 lighted until the operator, noting the lighted lamp, records the line number and operates release key 64. The operation of this key opens the locking circuit of relay 63 releasing it and extinguishing lamp 65. The operation of key 64 also causes the operation of relay 72 in a circuit traced from ground through the lower contacts of key 64 to battery through the left-hand back contacts and winding of relay 72. Relay 72, operated, locks through its left-hand front contacts to ground through the contacts of key 79 and lights lamp 73 at a supervisory position. The supervisor may release relay 72 and extinguish lamp 73 by operating key 79.

If no ground had been present on the line when key 70 or 71 was operated, relay 60 would not have operated on the first pulse and relay 61 would have remained in a released condition. With relay 61 released, relay 54 is held operated over paths already described and the circuit continues to transmit pulses of coin battery over the line and lamp 65 remains lighted until the operator noting the lighted lamp releases the circuit by operating release key 64 as previously described.

What is claimed is:

1. In a prepayment coin system, a subscriber's station, a central office, a line therebetween, a coin device at the station connected to the line and adapted to receive a coin and hold it in suspense thereby applying a ground condition to the line through said device, said device being further adapted to be actuated by current of a predetermined voltage received over the line and flowing to said coin ground to dispose of the coin thereby removing the said ground condition, a pilot signal at the central office, a grounded source of intermittent current impulses at the central office of such predetermined voltage as to actuate said coin device, operator-controlled means adapted to initiate the connection of said intermittent current source to the line and to display said pilot signal, and other means automatically responsive thereafter to retire said displayed signal and disconnect said source from the line when a predetermined current flows through the line upon the application of one impulse and no current flows upon the next succeeding application, thereby indicating that the coin device has functioned in a normal manner.

2. In a prepayment coin system, a subscriber's station, a central office, a line therebetween, a coin device at the station connected to the line and adapted to receive a coin and hold it in suspense thereby applying a ground condition to the line through said device, said device being further adapted to be actuated by current of a predetermined voltage received over the line and flowing to said coin ground to dispose of the coin thereby removing the said ground condition, a pilot signal at the central office, a grounded source of intermittent current impulses at the central

office of such predetermined voltage as to actuate said coin device, operator-controlled means adapted to initiate the connection of said intermittent current source to the line and to display said pilot signal, and other means automatically responsive thereafter to maintain said signal displayed as long as successive current impulses encounter the same line condition either grounded or ungrounded.

3. In a prepayment coin system for telephone exchanges in which grounding the line at a subscriber's station by means of a deposited coin is necessary to obtain a connection with another line at the central office and in which the coin is collected or returned to the subscriber by means of current of a predetermined voltage transmitted over the line under control of the operator, automatic means initiated by the operator for periodically transmitting current impulses over the line to dispose of the deposited coin thereby removing said ground, and means including a signal adapted to be displayed upon initiation of said automatic means and maintained displayed as long as the current impulses transmitted to the line encounter the same line condition, either ground or absence of ground.

4. In a prepayment coin system for telephone exchanges in which grounding the line at a subscriber's station by means of a deposited coin is necessary to obtain a connection with another line at the central office and in which the coin is collected or returned to the subscriber by means of current of a predetermined voltage transmitted over the line under control of the operator, automatic means initiated by the operator for periodically transmitting current impulses over the line to dispose of the deposited coin thereby removing said ground, and means including a signal adapted to be displayed upon initiation of said automatic means and retired if the first current impulse transmitted encounters a ground on the line and no ground is encountered upon the transmission of the second impulse.

5. In a prepayment coin system for telephone exchanges in which grounding the line at a subscriber's station by means of a deposited coin is necessary to obtain a connection with another line at the central office and in which the coin is collected or returned to the subscriber by means of current of a predetermined voltage transmitted over the line under control of the operator, automatic means initiated by the operator for periodically transmitting current impulses over the line to dispose of the deposited coin thereby removing said ground, and means including a signal adapted to be displayed which is locked in and remains displayed until manually released by the operator if the first impulse transmitted to the line does not encounter a ground condition thereon.

6. In a prepayment coin system for telephone exchanges in which grounding the line at a subscriber's station by means of a deposited coin is necessary to obtain a connection with another line at the central office and in which the coin is collected or returned to the subscriber by means of current of a predetermined voltage transmitted over the line under control of the operator, automatic means initiated by the operator for periodically transmitting current impulses over the line to dispose of the deposited coin thereby removing said ground, means including a signal which is displayed responsive to the initiation of said automatic means, and means for retiring the displayed signal only when ground is present on the line at the time the first impulse of current is transmitted,

which ground disappears immediately following such current impulse and before the second impulse is transmitted.

7. In a prepayment coin system for telephone exchanges in which grounding the line at a subscriber's station by means of a deposited coin is necessary to obtain a connection with another line at the central office and in which the coin is collected or returned to the subscriber by means of current of a predetermined voltage transmitted over the line under control of the operator, automatically transmitting current impulses over the line to dispose of the deposited coin thereby removing said ground, means including a signal which is displayed responsive to initiation of said automatic means, and means for retiring the displayed signal only when ground is present on the line when one impulse of current is transmitted and is

not present when the next succeeding impulse is transmitted.

8. In a prepayment coin system for telephone exchanges in which grounding the line at a subscriber's station by means of a deposited coin is necessary to obtain a connection with another line at the central office and in which the coin is disposed of by means of current of a predetermined voltage transmitted over the line under control of the operator, automatic means initiated by the operator for periodically transmitting current impulses over the line to dispose of the deposited coin thereby removing said ground, means including a signal which is displayed responsive to initiation of said automatic means, and means for retiring the displayed signal only when one impulse of current encounters ground on the line and the next succeeding impulse encounters no ground.

HENRY HOVLAND. 20