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Beeman et al.

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[54] **TOTALIZER CIRCUIT FOR COIN OPERATED TELEPHONES**

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[73] Assignee: **GTE Automatic Electric Laboratories Incorporated**, Northlake, Ill.

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[52] **U.S. Cl.** ..... **179/6.3 R**

[51] **Int. Cl.** **H04m 17/02**

[58] **Field of Search** ..... 179/6.3, 6.4, 6.5; 194/1 N, 17, 16

[56] **References Cited**

UNITED STATES PATENTS

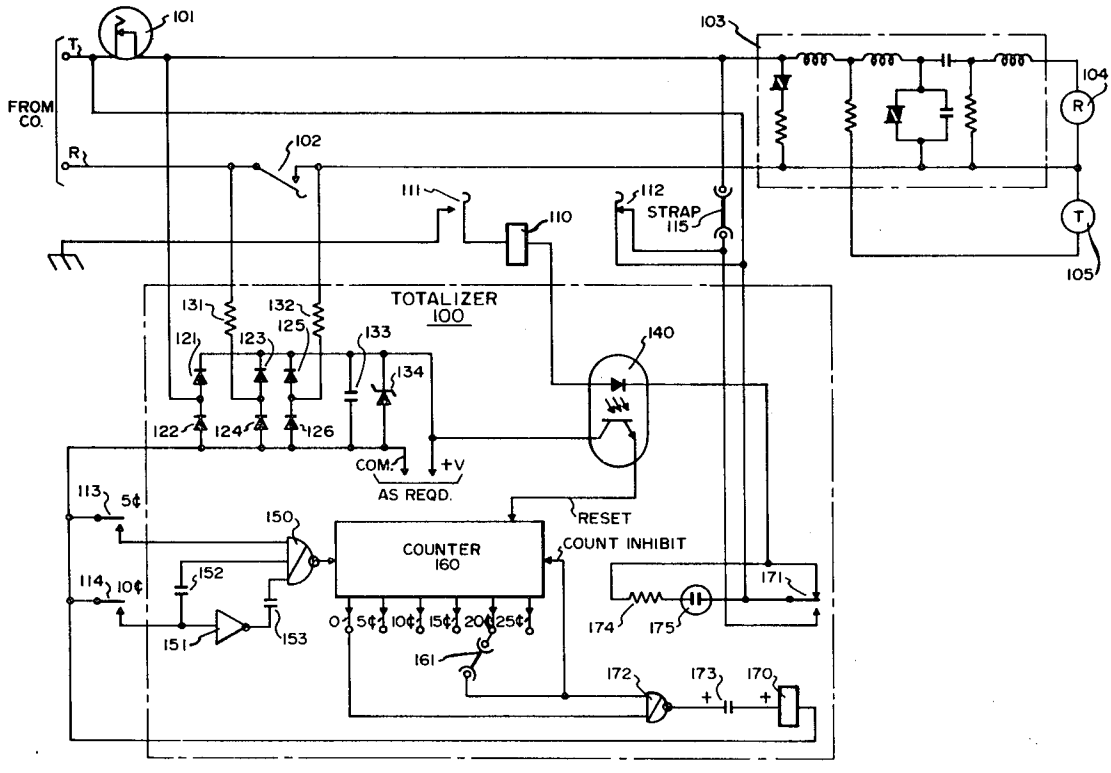
3,279,480	10/1966	Jarvis	194/1 N
3,307,671	3/1967	Shirley	194/1 N
3,668,290	6/1972	Robertson, Jr.	179/6.3 R
3,703,229	11/1972	Bowring	194/1 N
3,760,101	9/1973	Burns	179/6.3 R
3,806,651	4/1974	Battrick	179/6.5
3,814,907	6/1974	Edington et al.	179/6.3 R

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[57] **ABSTRACT**

An electronic totalizer circuit which permits a coin telephone to be programmed for any desired initial deposit rate, and with minor modification to be used on telephones that provide prepay, semi-postpay and emergency calling modes of operation. The circuit is intended as a conversion unit for coin operated telephones lacking totalizing capabilities.

9 Claims, 2 Drawing Figures



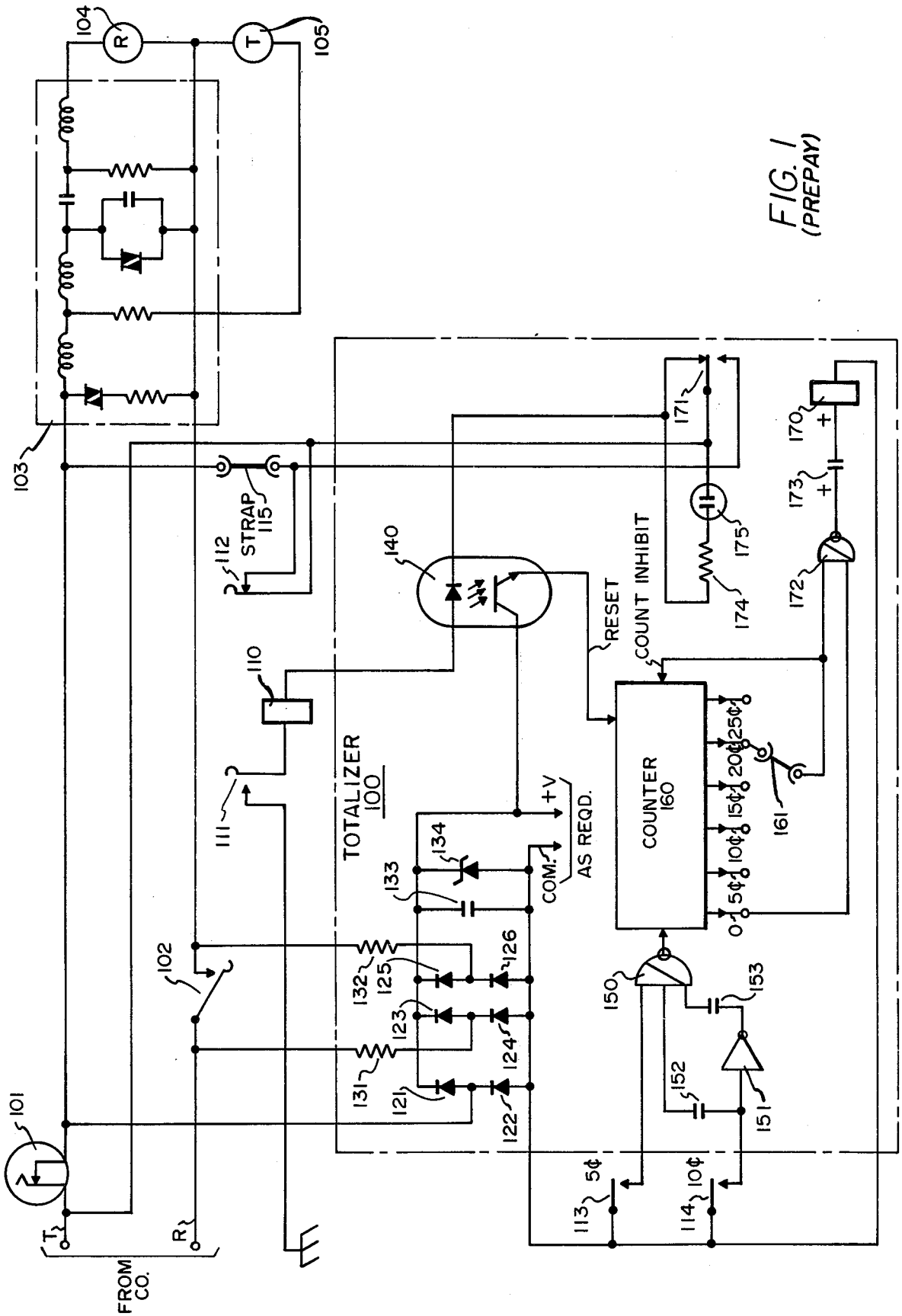

104
R
T
105
103
STRAP
115
112
140
RESET
COUNT INHIBIT
171
170
173
175
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172
110
111
TOTALIZER
100
+V
AS REQD.
COM.
134
133
COUNTER
160
25¢
20¢
15¢
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5¢
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123
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131
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151
101
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CO.
113
5¢
114
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FIG. 1
(PREPAY)

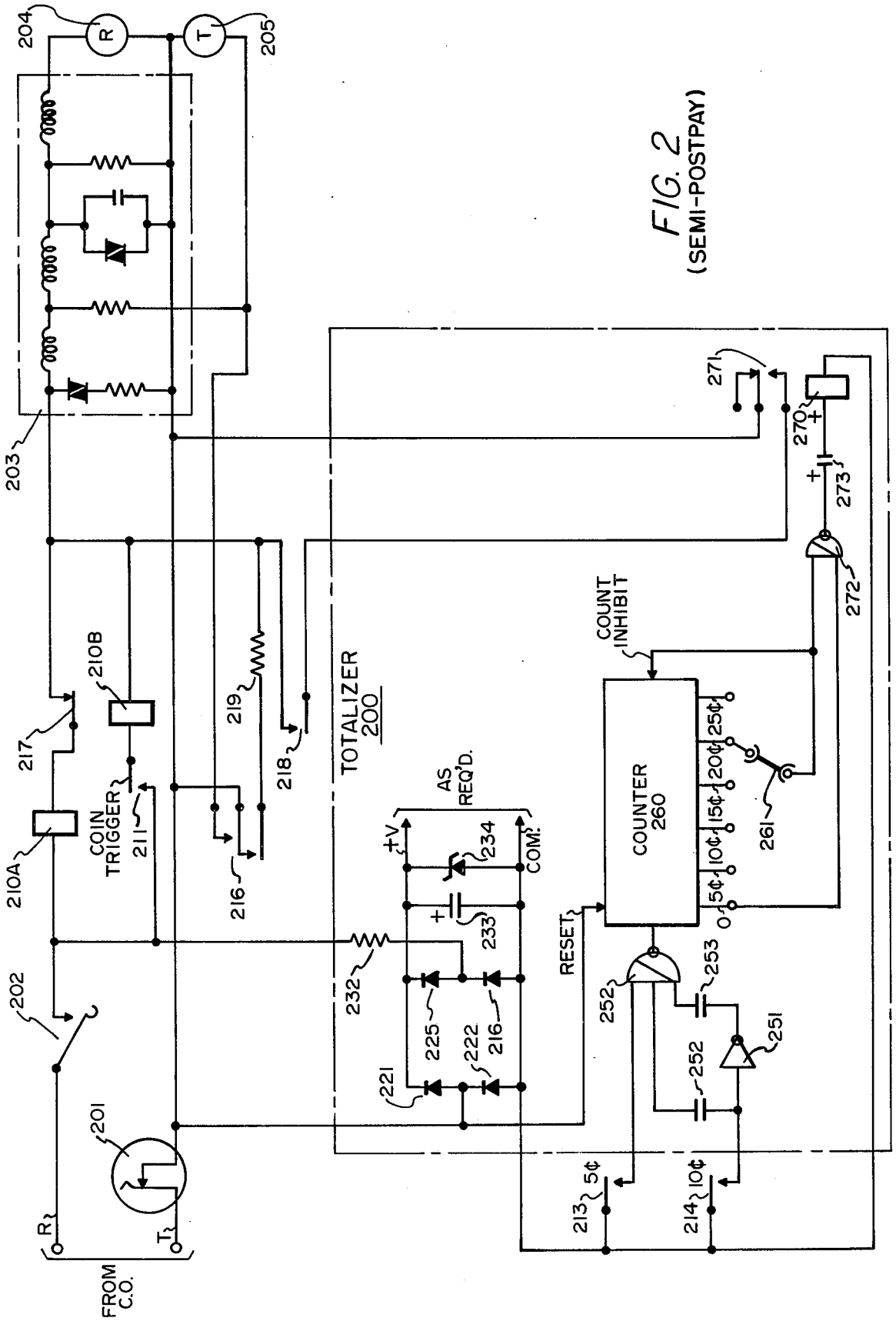


FIG. 2
(SEMI-POSTPAY)

TOTALIZER CIRCUIT FOR COIN OPERATED TELEPHONES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a coin telephone circuit and more particularly to a variable initial deposit rate totalizing circuit useful in prepay, semi-postpay and emergency calling modes of operation in coin operated telephones.

2. Description of the Prior Art

Most of the coin telephones now in operation throughout the country are descendants of a design first introduced in 1912 by the originator of public telephones, The Gray Telephone Paystation Company. During its evolution the coin telephone has seen incorporation of such features as dial operation, anti-side tone transmission circuits, one piece hand set, conversion from 5 to 10 service, self compensating transmission networks, printed wiring transmission networks, single coil prepay coin relays and touch calling operation.

Among the more recent modifications of coin telephone design have been the inclusion of totalizer mechanisms which operate in response to the deposit of coins to store coin deposit information during operation. Most embodiments of this device to date have been electromechanical in nature and are typified by that disclosed in U.S. Pat. No. 3,435,146 issued to E. R. Andregg and K. F. Voyles. Due to the size of the electro-mechanical totalizer mechanism it is not readily adaptable for inclusion in coin telephones not particularly equipped for totalizers.

Accordingly is the object of the present invention to provide a coin telephone adapter circuit that incorporates electronic circuitry with the attendant advantages of reduced size and economy for a programmable totalizer, that is readily adapted for inclusion in existing coin telephones.

SUMMARY OF THE INVENTION

The present invention is an electronic totalizer designed for addition to existing non-totalizer equipped coin telephones. The totalizer provides the following functions: The totalizer prevents the completion of all calls until the required amount of money up to a predetermined base rate has been deposited, except when the unit is modified to provide calls for the emergency calling feature. By means of strapping options any base rate may be selected as desired in **5** increments. The present totalizer controls the existing coin operated telephone circuitry and may be used with coin telephones equipped with conventional rotary dials or touch calling units. Power for operating the totalizer is so low that it can be derived from the telephone line with no penalty of loop length and no adjustments are required. As indicated previously various modifications of the circuitry of the present invention permit operation of the associated coin telephone in prepay, semi-postpay and emergency calling modes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic circuit diagram of an electronic totalizer, adapted for inclusion in a coin operated telephone intended for operation in the prepay mode.

FIG. **2** is a schematic circuit diagram of an electronic totalizer adapter for inclusion in a coin telephone intended for operation in the semi-postpay mode.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Prepay Operation

Referring first to FIG. **1** a totalizer in accordance with the present invention is shown in a coin telephone equipped for Prepay Operation. In addition to the totalizer, those portions of the coin telephone that are required for operation of the totalizer circuitry are shown. Other portions not required have been eliminated from the drawing of FIG. **1** to simplify the understanding of the present invention.

Shown as a portion of the coin telephone circuit are terminals T and R connected to a telephone line extending to a telephone central office, dial **101** containing dial inpulsing springs, transmission network **103,** receiver **104** and a transmitter **105.** In addition the coin telephone circuitry includes a switch hook **102** shown in its non-operated or "on-hook" position, coin relay **110** and its associated coin trigger springs **111** and **112.** Coin trigger springs **111** and **112** are shown in their normal position, prior to the deposit of any coins in the telephone. In addition the coin telephone circuit includes coin operated switches **113** and **114** which operate in response to the deposit of nickels and dimes respectively. It should also be noted that these two springs are also shown in their normal or pre-coin deposit position.

The totalizer **100** consists of a power supply portion including diodes **121** through **126** inclusive, resistors **131, 132** capacitor **133** and a zener diode **134.** Also included in the totalizer **100** are a decimal decoder counter **160,** which may be a standard integrated circuit counter used to count and store information relative to the quantity and value of deposited coins. The counter circuitry may take several forms that are well known and as such, the details thereof do not form a portion of the present invention.

Included in the totalizer and connected between the coin operated switches **113** and **114** is logic circuitry consisting of gate **150,** inverter **151** and capacitors **152** and **153** which provide an input from the coin operated switches **113** and **114** to the decoder **160.** The output of the decoder **160** is connected by strap **161** to gate **172,** whose output is coupled through capacitor **173** to a bistable rate relay **170** having associated contacts **171,** Also included in the totalizer **100** is an optical isolator device **140** which provides a reset function for the counter.

For a further understanding of the present invention a description of the placement of a telephone call in a coin telephone of the prepay type in accordance with the present invention will be described.

Initially the subscriber will remove his hand set not shown, containing transmitter **105** and receiver **104** from hook switch **102** causing it to complete a circuit for terminal T through dial **101,** the transmission network **103,** transmitter **105** and receiver **104,** through the hook switch contacts **102,** to terminal R. The loop is now closed to the central office preparing it for response to signals from the coin telephone.

At this time the subscriber wishing to place a call must deposit the proper amount of money in the coin slot of the coin operated telephone. It should be noted

that in the present embodiment as shown, that the counter output 20 lead is strapped by means of strap **161** to the input of NOR gate **172.** This strapping indicates that the initial or base rate for operation of the present coin operated telephone is 20 . Other base rates may be established by connection strap **161** to one of the other terminals such as the 5 , 10 etc. outputs of counter **160.**

Assuming now that the customer deposits first a nickel, coin operated switch **113** will operate momentarily, connecting ground to one of the inputs of NOR gate **150.** This causes an output pulse from NOR gate **150** which is extended to counter **160** which normally has an output on the lead extending from the zero terminal lead. An output signal will now be present on the 5 output lead. Because it has no output connection, no signal will be extended to NOR gate **172.** With the output signal being removed from the zero output lead, this will cause gate **172** to produce in a direction to cause operation of rate relay **170,** which will be coupled to the relay by means of capacitor **173.** Capacitor **173** will charge and current flow to the relay **170** will cease. Relay **170** being bistable will remain operated. At this time the operation of rate relay **170** will cause operation of its associated contacts **171** placing a short directly across the dial inpulse springs of dial **101** and opening the operating path for coin relay **110.**

When the initial coin deposit was made coin trigger springs **111** and **112** also operated. Coin trigger spring **111** prepared an operating path to ground for coin relay **110,** while coin trigger springs **112** opened to remove a previously existing short circuit across the dial **101.** This latter short circuit path includes strap **115.** If the coin operated telephone of the present invention is normally of the prepay type, but equipped for emergency calling, strap **115** would not be present and the short circuit provided by that strap and the path through the coin trigger springs **112** would not be present. Permitting direct dialing of emergency numbers without depositing of coins.

Recalling that a 20 ¢ total deposit is required before dialing can commence, the subscriber will now deposit a second nickle reoperating coin operated switch **113,** and cause the advance of counter of **160** to produce an output on the 10 ¢ output lead. It should also be noted that coin springs **111** and **112** will stay operated after the initial coin deposit and therefore no further action takes place involving their circuitry at this time. At this time the subscriber deposits a dime operating coin operated switch **114.** The resulting ground pulse through the circuitry of inverter **151** and associated capacitors **152** and **153** will cause NOR gate **150** to produce two output pulses to counter **160** causing it to advance its output from the 10 ¢ to 15 ¢ output terminal and from the 15 ¢ output terminal to the 20 ¢ output terminal. Because strap **161** is connected between the 20 ¢ output terminal and the input of gate **172,** NOR gate **172** will produce a zero output, causing rate relay **170** to restore due to current produced by the charge stored in capacitor **175** flowing through relay **170** in a direction to cause it to restore. Afer the change of capacitor **175** has dissipated relay **170** will remain restored since it is a bistable relay. At the same time an output from counter **160** was extended to gate **172** the same output was also extended over a count inhibit lead back into the decimal counter **160** preventing it from operating further in response to deposit of any additional coins.

With the restoration of relay **170** a path will be completed from terminal T through break contacts **171** and through the light emitting diode that forms a portion of optical isolator **140** to coin relay **110.** Because coin trigger springs **111** were previously operated a path is now complete from coin relay **110** to ground. Completion of this path prepares coin relay **110** for operation and extends ground over terminal T to the central office to advise the central office equipment that a proper amount of coinage has been deposited in the coin operated telephone. When rate relay **170** restored the short was also removed from across the inpulse springs of dial **101** by the opening of the make contact **171.**

When the connection is established through contacts **171** from terminal T, to the light emitting diode of optical isolator **140,** current from the telephone central office will cause the light emitting diode to operate, turning on the associated photo transistor also included in optical isolator **140.** This operation will complete a path from battery to the reset lead of counter **160,** causing it to reset to zero.

At this time the subscriber may now operate his dial to effect control of the central office switching equipment to complete a connection to a selected subscriber.

After the subscriber has reached his party and completed his call, he replaces the hand set including transmitter **105** and receiver **104** on hook switch **102** opening the connections to the telephone central office. Coin battery will now be returned from the central office over the lead connected to terminal T through break contact **171,** and the optical isolator **140** to coin relay **110** causing it to operate at this time to collect the previously deposited coins. It should be noted that prior to the application of coin battery to the telephone line from the telephone central office, insufficient current was available for operation of coin relay **110,** although sufficient current was available for operation of the light emitting diode that was included in optical isolator **140.** Operation of the coin relay **110** restores coin trigger springs **111** and **112** to their normal position. At this time the coin operated telephone is fully restored to normal and is ready for placement of additional calls over its facility.

If after the subscriber has deposited one or more coins in the coin telephone, he decides not to complete the call, and the total of the coins deposited is not equal to the established base rate, the following sequence of events take place. To abandon the call the subscriber will place his hand set including transmitter **105** and receiver **104** in its normal position on hook switch **102** causing it to restore. The restoration of hook switch **102** opens the loop connection to the telephone central office, causing the central office telephone equipment to return coin battery over the lead connected to terminal T. This coin battery is conducted from terminal T through neon diode **175** and resistor **174** to the optical isolator **140** and particularly to the light emitting diode that forms a portion thereof, and from there to coin relay **110** and through coin trigger springs **111** to ground. Application of coin battery over this path causes operation of the photo transistor that is included in the optical isolator **140** which will cause application of potential to counter **160,** causing it to reset back to zero. The operation of counter **160** to its reset position causes an output on the zero terminal lead which through gate **172** and capacitor **173** will cause rate

relay **170** to restore. The restoration of relay **170** completes a direct connection at break contacts **171** from the conductor connected to the T lead to the optical isolator **140.** With the restoration of rate relay **170** and the restoration of it· associated contacts **171,** resistor **174** and neon diode **175** are no longer in the circuit, and sufficient current is available to cause coin relay **110** to operate. With the operation of coin relay **110** the previously deposited coins will be refunded and the present coin telephone returns to its normal arrival condition.

It should be noted that the totalizer circuit **100** derives its power directly from the telephone line connected to the telephone central office. A self contained power supply consisting of diodes **121** through **126,** resistors **131** and **132** capacitor **133** and zener diode **134** provide a source of power for the circuitry of the totalizer.

To provide this power a connection from terminal T connected to the telephone central office through dial **101** is made to the junction between diodes **121** and **122** the return path is made from the terminal R connected to the telephone central office through resistor **131** to the junction of diodes **123** and **124.** The four diodes **121** through **124** inclusive function as a full-wave rectifier whose output is utilized as required. The above outlined circuitry is employed power the totalizer circuit when the present coin operated telephone is in its normal or "on-hook" position.

When the telephone is in the operated or "off-hook" position the power is drawn from the telephone central office in similar matter except that a return path is also provided through resistor **132** which is connected between the junction of diodes **125** and **126,** through operated switch hook **102** to the lead connected to terminal R. This additional path provides a higher source of available energy when the telephone hand set has been removed from the hook switch. It should be noted that in the present circuitry, a requirement exists that power be available from the telephone central office at all times in order to provide operating power for the totalizer **100.** If totalizer **100** were not prepowered, it would be possible to operate the coin trigger springs and thus complete a call to the telephone central office with deposit of but a single coin of any denomination.

In the above description it should be noted that reference has been made to deposit of nickels and dimes to achieve the base rate required for operation of the present coin telephone. If a subscriber were to drop a quarter in the coin slot of the coin telephone, coin trigger springs **111** and **112** would operate, however counter **160** would not operate and accordingly the telephone would be in condition for placement of a call. This reflects the fact that a quarter is equal to or exceeds the established base rate requirement.

SEMI-POSTPAY OPERATION

Referring now to FIG. **2** a totalizer in accordance with the present invention is shown in a coin operated telephone equipped for semi-postpay operation. The circuitry of the totalizer is similar to that of the previously described unit with three digit numbers beginning with 2 generally identifying circuit elements like those in FIG. **1** which begin with the digit **1.** The telephone circuitry is also essentially similar except that a different form of coin relay is incorporated in the semi-postpay form of coin operated telephone. The circuitry of the totalizer **200** for a semi-postpay coin operate telephone, distinguishes from that of the totalizer **100** shown in FIG. **1** by its omission of two diodes **123** and **124** and associated resistor **131,** optical isolator **140** and the resistor-neon lamp combination **174** and **175** respectively. The remaining circuitry being identical to that shown in FIG. **1.**

In the coin telephone circuitry it should be noted that the coin relay is a two coil unit consisting of coin relay coils **210A** and **210B** each with separate associated spring contacts. Associated with coil **210A** is double make spring contacts **216** while associated with coil **210B** are break contacts **217** and make contacts **218.** A single coin trigger **211,** is also employed in this embodiment. It should be further noted that coin relay **210** is polarized with coil A operating its associated contacts in response to reverse battery before coins are deposited and releasing after the first coin has been deposited. Coil **210B** operates its associated contacts **217** and **218** after the first coin has been deposited and when reverse battery is present. The coin trigger **211** resets in response to normal battery conditions.

A subscriber wishing to make a call removes the hand set from the hook switch **202** which completes the loop to the telephone central office through terminal T, dial **201,** transmission network **203** coin relay springs **217** and coin relay coil **210A,** and then through the hook switch **202** to terminal R connected to the telephone central office. At this time dial tone is returned to the subscriber and the dial can be operated to establish the desired connection through the telephone central office.

When the connection is established to the dialed number, if the dial selection is to an operator or to an emergency number, reverse battery will not be returned and conversation may ensue in the usual manner. If however this is not a special service call of any sort on the connection being established, reverse battery will be returned from the telephone central office causing coin relay coil **210A** to operate. This operation at contacts **216** places a direct short across transmitter **205** and a low impedance shunt through resistor **219** across the transmission network to prevent the subscriber utilizing the receiver **204** as a transmitter. If the called subscriber answers, the calling subscriber utilizing the present coin telephone will hear the answering subscriber via the receiver **204.** On determining that he has reached the desired party, the coin telephone user will deposit coins having a predetermined total value equalling the established base rate in use for the present coin telephone.

Deposit of coins totalling or exceeding in monetary value the predetermined value established, will remove the low impedance shunt from transmission network **203** and the direct short across transmitter **205,** so that conversation may ensue.

The details of operation of the totalizer circuit **200** can best be understood by the following description: initially assume that the calling subscriber has deposited a single nickel. In response to the deposit of the initial nickel, coin operated switch **213** will operate and through NOR gate **250** advance counter **260** from its zero output to the 5 ¢ terminal output position. Since no signal is available from that terminal and the output on the zero terminal is removed, the resulting output from NOR gate **272** through capacitor **273** will cause rate relay **270** to operate. Operations of rate relay **270**

at contacts **271** prepares a shunt path directly across the transmission network.

Deposit of the initial nickel will also operate coin trigger springs **211** resulting in operation of coin relay coil **210B** and its associated contacts **217** and **218.** When contacts **218** close the shunt path across the transmission network previously outlined affectively disables both receiver **204** and transmitter **205.** At contacts **217** the operating path for coin relay coil **210A** is opened causing contacts **216** to restore, preparing the transmission circuitry of the telephone for operation at such time as coins totaling in value the predetermined base rate have been deposited.

Deposit of additional coins whose monetary value is equal or greater than the 20 ¢ base figure, causes the counter **260** to advance and through gate **272** to cause rate relay **270** to restore. Restoration of rate relay **270** at contacts **271** removes the direct short across the transmission network. At this point conversation may ensue.

On completion of the call the subscriber will return the hand set to hook switch **202** opening the loop to the telephone central office.

When initial connection is made to the telephone central office, potential present at termainl T from telephone central office is conducted by way of the reset lead to the decimal counter **260.** This potential is effective to automatically reset the counter **260** to its zero state, which will cause application at terminal zero of an output to gate **272** which through coupling capacitor **273** cause rate relay **270** to restore.

While preferred embodiments of the present invention only, have been shown, it will be obvious that numerous modifications may be made without deparing from the spirit and scope of the invention, which shall be limited only be the claims appended hereto.

What is claimed is:

1. A coin operated telephone instrument adapted for connection to a telephone central office by means of a telephone line, including a transmitter, a receiver, a calling device, a coin detecting mechanism normally inhibiting conversation between said instrument and a selected subscriber station of the type requiring deposit of at least one coin in said telephone instrument equivalent in total value to a predetermined value, said coin detecting mechanism operated in response to deposit of a first coin of any value to condition said instrument for conversation with said selected subscriber station, and a totalizer, said totalizer comprising: counting means electrically advanced once in response to deposit of each coin of a first value and electrically advanced twice in response to deposit of each coin of a second value, said counting means initially operated to generate a first output in response to a first advance and further operated to generate a second output in response to a predetermined number of additional advances; switching means connected to said counting means initially operated in response to said counting means first output to further inhibit conversation between said instrument and said selected telephone subscriber station, and further operated in response to said counting means second output to permit conversation between said instrument and said selected telephone subscriber station.

2. A coin operated telephone instrument as claimed in claim **1** wherein: said counting means further operation inhibits further advance of said counting means.

3. A coin operated telephone instrument as claimed in claim **1** wherein: said counting means comprise a decimal counter and logic circuitry, said logic circuitry operated in response to deposit of a coin of a first value to generate a single output pulse to advance said counter once, and in response to deposit of a coin of a second value to advance said counter twice.

4. A coin operated telephone instrument as claimed in claim **1** wherein: said switching means comprise a relay.

5. A coin operated telephone instrument as claimed in caim **1** wherein: said coin detecting mechanism is operated in response to deposit of a first coin of any value to prepare an operating circuit for said instrument, said switching means initial operation opening said operating circuit, and said switching means further operation completing said prepared operating circuit.

6. A coin operated telephone instrument as claimed in claim **5** wherein: there is further included reset means included in said operating circuit, operated in response to said operating circuit completion, to reset said counting means.

7. A coin operated telephone instrument as claimed in claim **1** wherein: said coin detecting mechanism initially completes a first shunt circuit around said calling device, and in response to deposit of a first coin of any value opens said first shunt circuit; said switching means initial operation completing a second shunt circuit around said calling device and said switching means further operation removing said second shunt from said calling device.

8. A coin operated telephone instrument as claimed in claim **1** wherein: said coin detecting mechanism is initially operated in response to connection of said instrument to a selected subscriber station of the type requiring deposit of at least one coin in said telephone instrument equivalent in total value to a predetermined value, to complete a first shunt circuit around said transmitter; said switching means initial operation preparing a second shunt circuit around said transmitter and around said receiver; said coin detecting mechanism further operated in response to deposit of a first coin of any value, to complete said second shunt circuit; and said switching means further operation removing said second shunt circuit.

9. A coin operated telephone instrument as claimed in claim **8** wherein: there is further included reset means comprising a circuit connection between said counting means and said telephone line, said reset means operated in response to connection of said instrument to said central office, to reset said counting means.

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