

June 27, 1944.

W. Y. LANG ET AL

2,352,271

TELETYPEWRITER PAY STATION CIRCUIT

Filed Dec. 6, 1940

3 Sheets-Sheet 1

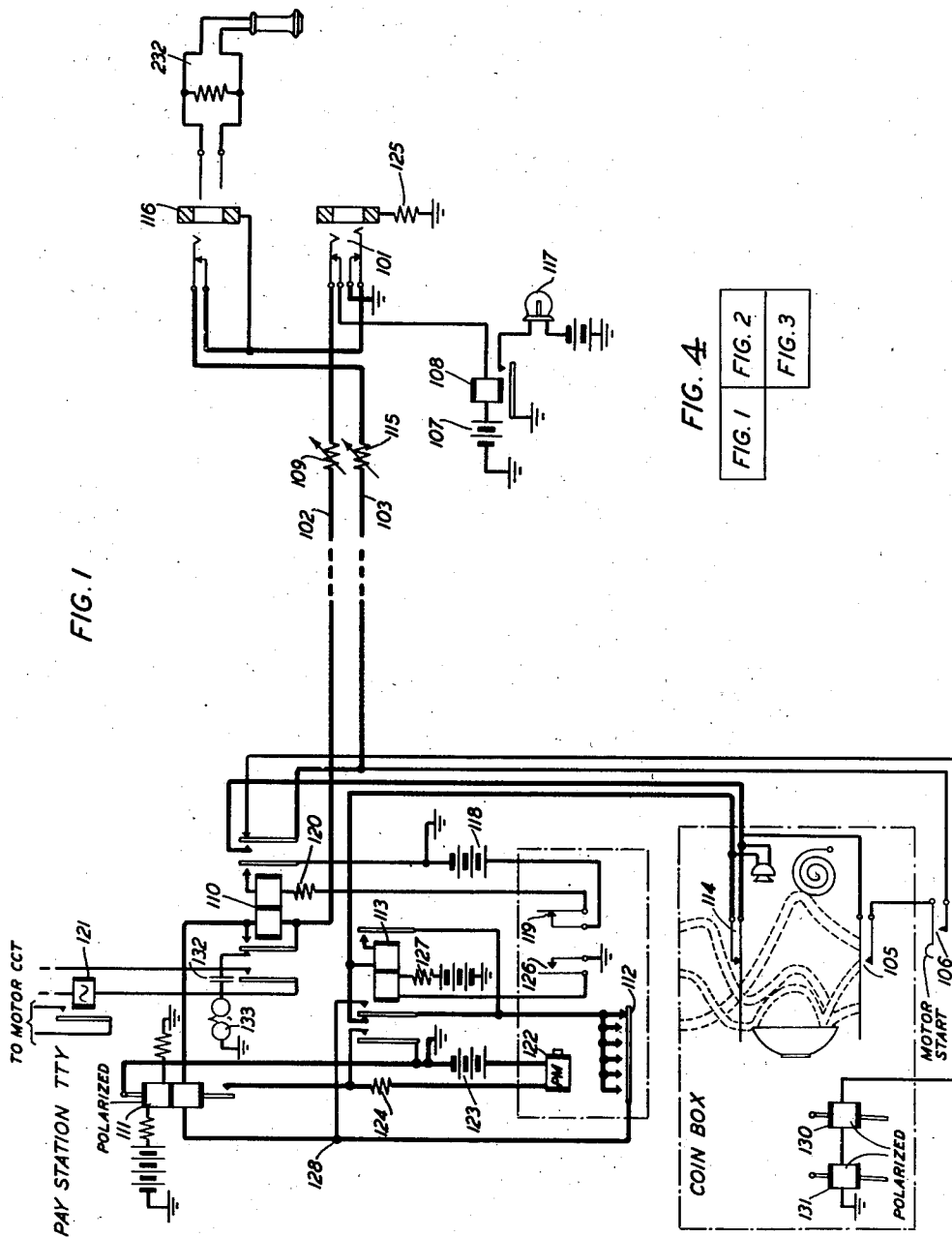


FIG. 1

FIG. 1	FIG. 2	FIG. 3
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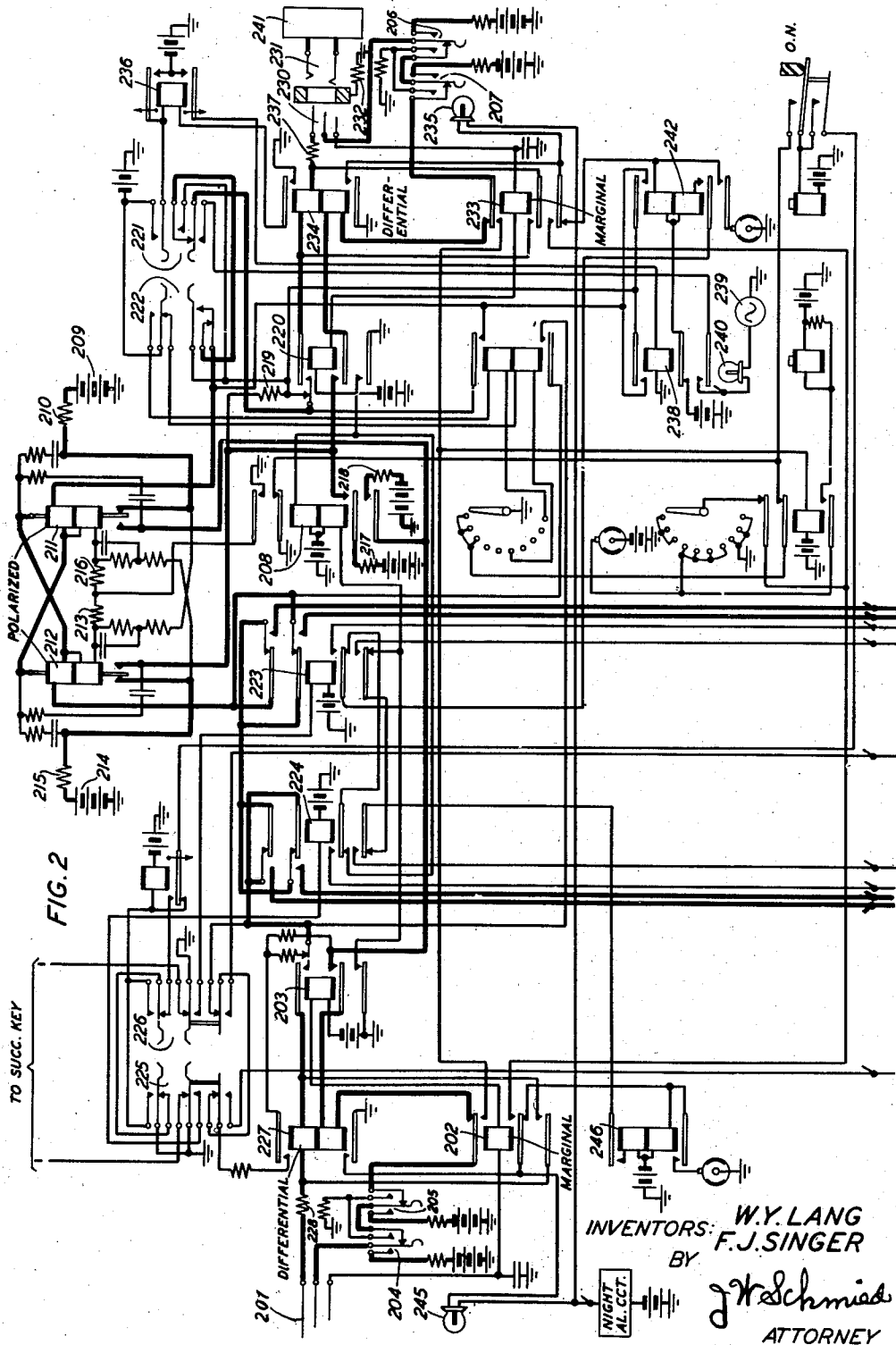
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3 Sheets-Sheet 2



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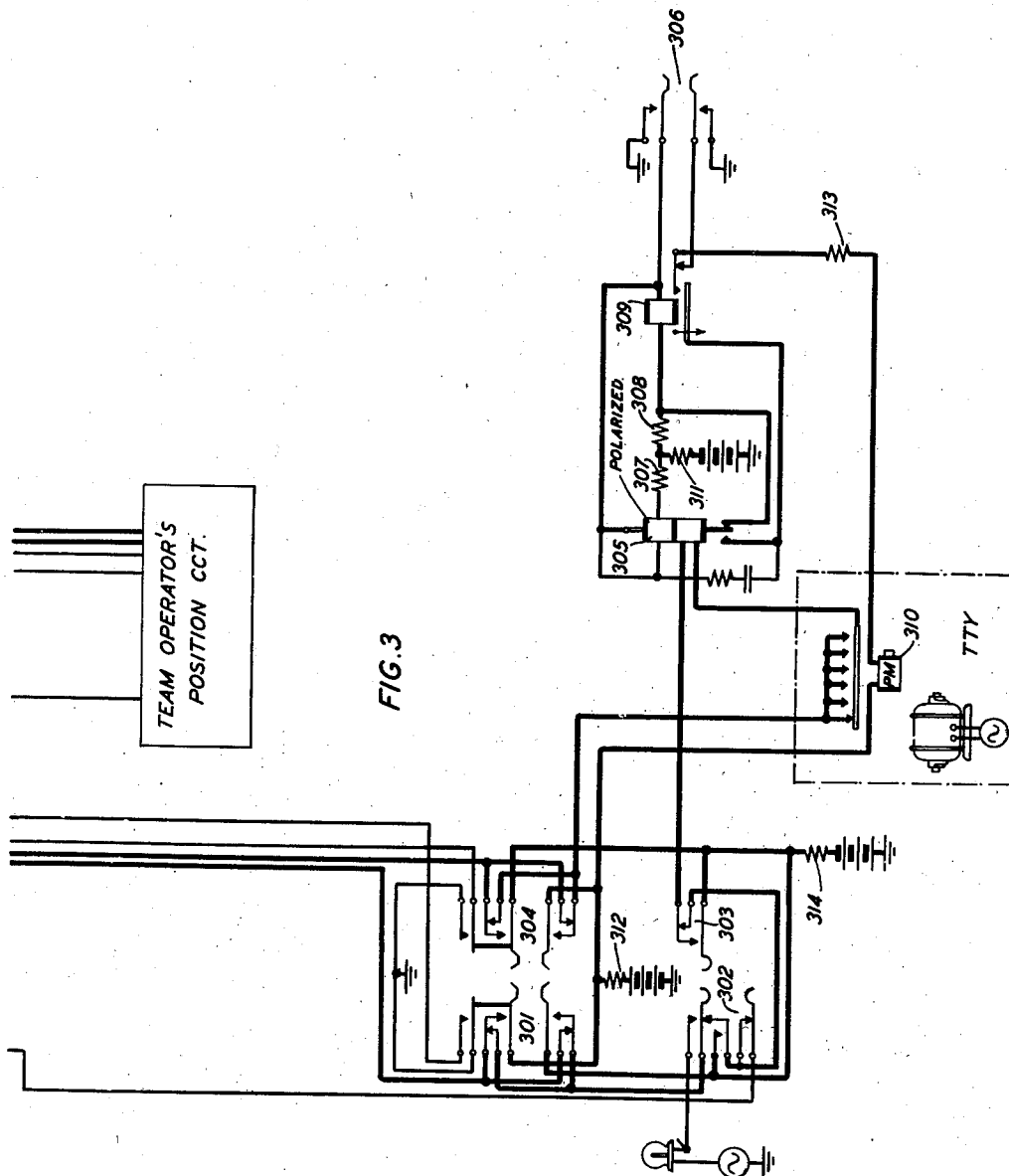
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TELETYPEWRITER PAY STATION CIRCUIT

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3 Sheets-Sheet 3



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2,352,271

TELETYPEWRITER PAY STATION CIRCUIT

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Application December 6, 1940, Serial No. 368,838

39 Claims. (Cl. 178—2)

This invention relates to teletypewriter switching systems. More specifically this invention is a pay station teletypewriter switching circuit. In accordance with this invention teletypewriter facilities are made available to the public in response to the deposit of a coin or coins in a coin box connected to a teletypewriter station circuit.

An object of this invention is the improvement of teletypewriter switching systems.

A more specific object of this invention is the provision of teletypewriter circuits whereby teletypewriter service may be made available for general use by the public upon the performance by the user of a certain prerequisite condition, such as the depositing of a coin, etc.

A feature of this invention is a coin collection device connected to a teletypewriter station circuit.

A further feature of this invention is an arrangement wherein the use of the teletypewriter station facilities for communication may be prevented until a coin is deposited.

A further feature of this invention is an arrangement wherein after communication between a calling and a called party has proceeded, it may be suspended under control of the central station operator until an additional coin is deposited.

These and other features will become apparent from the following description when read with reference to the associated drawings in which:

Fig. 1 is the teletypewriter pay station circuit and station line circuit of this invention;

Fig. 2 is a well-known teletypewriter cord circuit modified to cooperate with the pay station circuit and station line circuit of this invention; and

Fig. 3 is a well-known operator's position circuit which cooperates with the cord circuit of Fig. 2.

The operation of the circuits in so far as is necessary to an understanding of the invention herein will now be described.

The drawings are to be arranged as shown in Fig. 4. That is to say, Fig. 2 is to be positioned at the right of Fig. 1 and Fig. 3 below Fig. 2. The conductors extending to the bottom margin of Fig. 2 connect to conductors extending to the top margin of Fig. 3 in corresponding positions.

The wiring and apparatus shown at the left-hand side of Fig. 1 is the teletypewriter pay station circuit. It will be located in some public place to which any one wishing to make use of pay station teletypewriter equipment has access. The pay station equipment is connected to jack 101 which is located in a switchboard at a tele-

typewriter switching office by means of loop conductors 102 and 103. The cord circuit per Fig. 2 is one of a plurality of cords at a particular operator's position in the switchboard. The cord circuit is used to interconnect calling and called parties either directly, as in the case of local calls which may be completed in a single switchboard, or through a second switchboard or a number of switchboards in tandem. Fig. 3 is the operator's position circuit. One such circuit is furnished per operator's position. It may be connected to any of the cord circuits which the operator may be using at any time by the manipulation of a key individual to each of the cords. This connects teletypewriter sending and receiving equipment to a particular cord for communication incident to establishing and supervising the connection.

GENERAL DESCRIPTION OF PAY STATION CIRCUIT

The pay station circuit as shown in Fig. 1 is a loop circuit having its ends terminated in battery and ground at the central station. When the loop is not in use, it is open at the right-hand outer contacts of relay 110. The bottom loop conductor, conductor 103, is grounded through the right-hand outer armature and back contact of relay 110 and the windings of coin collect and return magnets 130 and 131. The winding of a polar receiving relay, which controls the teletypewriter receiving magnet, and the teletypewriter transmitting contacts are connected in series with the top loop conductor which is open.

As will become apparent from the detailed description below, the loop may be closed at the pay station by performing two operations, namely (1) inserting a coin in a coin box which closes one set of make contacts 105 in the coin box, and (2) manually closing the contacts of motor start key 106, which key is located external to the coin box in any convenient position. These two sets of contacts are arranged in series to close a shunt around the open right-hand outer contacts of relay 110 where the loop is open. This energizes the left-hand winding of relay 110 which closes the loop.

The coin box which is used in the pay station circuit may be any one of a large variety of multicoins boxes such as that disclosed in the patents to O. F. Forsberg 1,043,219, November 5, 1912, A. F. Bennett 1,863,322, June 14, 1932, and the application of O. A. Shann et al. Serial No. 271,630, filed May 4, 1939, having electrical connections simplified in accordance with the coin box circuit shown in Fig. 1.

As is explained in the disclosures of the above-mentioned patents and application, in the operation of multicoin boxes, the coins in dropping through their respective chutes strike bells or metal coils which generate characteristic tones which are picked up by a transmitter. A particular coin slot may be arranged so that it strikes a bell once to indicate say the deposit of a five cent coin. The ten cent slot may be arranged so that the ten cent coin strikes the same bell twice in passing. The twenty-five cent coin will strike a metal coil, or cathedral gong as it is known, to generate a different tone.

The transmitter is arranged in such position with respect to the bell or gong that it can pick up the tone. This results in the generation of a corresponding tone in the receiver at the central station.

The pay station circuit herein is so arranged that the transmitter is normally shunted by contacts 114 so that its resistance is not normally included in the loop circuit. As any coin passes down through its respective slot it opens contacts 114 which opens the normally closed shunt around the well-known transmitter. While the contacts are open and the transmitter is connected in series in the loop, it picks up the tone which is generated by the striking of the bell or gong. Then contacts 114 are slowly restored to reclose the shunt.

In the case of the first coin which is dropped into the slot, in order to permit the loop to be closed when motor start key 106 is actuated, although contacts 114 are opened to remove the shunt from around the coin tone transmitter as the coin passes contacts 114, since the loop is not yet closed and the operator's coin signal receiver is not yet connected to the coin signal jack the operator does not check the coin's denomination.

Since it is necessary to deposit a coin in order to close contacts 105, which contacts must be closed in series with motor start key contacts 106 before the loop can be closed and preliminary to lighting line signal lamp 117, the central station operator knows that a coin has been deposited.

A coin, after being deposited and closing contacts 105, is held in suspension for collection or return under control of coin collect and coin return keys in the cord circuit at the central station which connect either positive or negative battery to the ring of the loop to actuate either the coin collect or the coin return polarized magnet in the coin box to direct the suspended coin to the coin storage compartment or to the coin return hopper, respectively.

Outward call

The manner in which the circuits function on an outward call, that is on a call which originates at the pay station will first be described.

To originate a call, a coin is inserted in slot 104 of the coin box, momentarily opening contacts 114, which contacts reclose slowly, and closing contacts 105. Then motor start key 106 is actuated manually momentarily. This closes a circuit which extends from battery 107 at the central office, through the winding of relay 108, break contact and tip jack 101, pad resistance 109, loop conductor 102, left-hand winding of relay 110, bottom winding of polar relay 111, teletypewriter sending contacts 112, left-hand armature and break contact of relay 113, break contacts 114, make contacts 105, make contacts 106, conductor 103, pad resistance 115, break

contact and tip of coin signal jack 116, ring and break contact of jack 101 to ground. Relay 108, at the central office, operates lighting lamp 117 as a signal that the pay station is calling. Relay 110 at the station operates and then locks over a circuit from the positive pole of battery 118, through contacts 119, which contacts are normally closed, resistance 120, right-hand winding of relay 110, right-hand inner make contact and armature of relay 110 to the negative terminal of battery 118 which is grounded. The operation of relay 110 closes a circuit from one side of a source of commercial power supply, preferably alternating current, through the winding of an alternating current relay 121, the left-hand outer armature and front contact of relay 110 to the opposite side of the power source, operating relay 121. The operation of relay 121 closes the power supply circuit for the teletypewriter motor (not shown). The operation of relay 110 shunts its operating winding through the left-hand inner armature and front contact of relay 110.

Polar relay 111 at the pay station is biased by an obvious circuit through its top winding which maintains the armature of relay 111 in its left-hand position, as shown, while the loop traced above is open. When the loop is closed, the effect of current in the bottom winding of relay 111 preponderates over the effect of the biasing current and the armature of relay 111 is actuated to its right-hand position to engage its marking contact. When the armature of relay 111 is in engagement with its right-hand contact, the teletypewriter receiving magnet 122 is energized over a circuit from the positive terminal of battery 123, through the winding of receiving magnet 122, resistance 124, right-hand or marking contact and armature of relay 111 to the negative terminal of battery 123.

Central station operator response to line signal

In response to the lighting of lamp 117 in the switchboard at the central station the operator at the particular position where the lamp 117 and its associated jack 101 are located, inserts plug 201 into jack 101. This separates the tip and ring of jack 101 from their associated break contacts. Relay 108 is released, extinguishing lamp 117. The tip ring and sleeve of the station jack are extended through the tip ring and sleeve of the cord.

Description of cord circuit

Except for the modifications necessary to condition the cord circuit per Fig. 2 to cooperate with a pay station circuit, the cord circuit per Fig. 2 is well known in the art. It is arranged on one side for answering incoming calls on subscriber or toll lines. Both the answering and calling cords are arranged to provide an automatic flashing recall on both toll and subscriber lines. Both cords are arranged to provide a steady disconnect signal. Both cords are arranged to send a recall signal over a connected toll line. The calling cord is arranged to send a disconnect signal over a connected toll line. The calling cord is arranged to ring on a subscriber line or toll line. Ringing on a subscriber line or a toll line to which the answering cord is connected may be accomplished in the operator's position circuit. The cord circuit is equipped with a single line repeater for repetition of telegraph signals. A teletypewriter key is provided to connect the cord to either a home or team operator's position circuit.

Since the operation of the cord is well known, it will be described only so far as is necessary to an understanding of the manner in which it cooperates with the pay station circuit of Fig. 1 to provide pay station service.

In order to cooperate with the pay station circuit, the well-known cord circuit per Fig. 2 has been modified so as to include coin collect and coin return keys in each side of the cord. These keys are indicated as 204, 205, 206 and 207.

The sleeve circuit may be traced from ground in Fig. 1 through resistance 125, sleeve of jack 101, sleeve of plug 201, winding of marginal relay 202, winding of relay 203 to battery. The magnitude of resistance 125 is high to prevent the operation of marginal relay 202, which operates only on connection to a toll line, in which the corresponding sleeve resistance is low. Relay 203 operates. The operation of relay 203 operates relay 208 over a circuit from ground through the bottom armature and front contact of relay 203, through the bottom winding of relay 208 to battery.

The operation of relay 208 energizes the cord repeater relays. A circuit may be traced from positive battery 209, through resistance 210, armature and right-hand or marking contact of polar relay 211, bottom winding of polar relay 212, resistance 213, top outer armature and front contact of relay 208 to ground. A circuit may also be traced from positive battery 214, through resistance 215, left-hand or marking contact and armature of polar relay 212, the bottom or biasing winding of polar relay 211, resistance 216 and the top outer armature and front contact of relay 208 to ground.

A circuit may be traced from negative battery through resistance 217, bottom inner armature and front contact of relay 208 to the right-hand or spacing contact of polar relay 212. A circuit may be traced from negative battery through resistance 218, bottom outer front contact and armature of relay 208, to the left-hand or spacing contact of polar relay 211.

A circuit may be traced from negative battery through resistance 217, bottom inner armature and front contact of relay 208, resistance 219, top break contacts of the make-before-break contact combination of relay 220, bottom armature and break contact of key 221, bottom break contacts of the make-before-break combination of key 222, top winding of polar relay 211, armature and left-hand or marking contact of relay 212 and resistance 215 to positive battery.

The transmission circuit through the answering cord may be traced from positive battery 209, through resistance 210, right-hand or marking contact and armature of polar relay 211, top winding of polar relay 212, top outer armature and back contact and top inner back contact and armature of relay 223 in parallel, top outer armature and back contact and top inner back contact and armature of relay 224 in parallel, top front contact and armature of relay 203, top winding of differential relay 227 and resistance 228 to the tip of plug 201.

The tip of plug 201 engages with the tip of jack 101 which has been disconnected from the path through relay winding 108 to battery 107. The circuit around the subscriber's loop has been traced and shown to extend to the ring of jack 101 which was disconnected from ground upon the insertion of plug 201 in jack 101. The ring circuit extends through the ring of plug 201, armature and break contact of key 204, armature

and break contact of key 205, top armature and back contact of relay 202, bottom winding of differential relay 227, bottom inner armature and front contact of relay 203, bottom outer armature and front contact of relay 208, and resistance 218 to negative battery.

It may be observed that the loop remains closed after plug 201 is inserted in jack 101. Positive battery 107 connected to the tip of the subscriber's loop through jack 101 is replaced by positive battery connected to the marking contact of relay 211. Ground connected to the ring of the subscriber's loop through jack 101, is placed by negative battery connected to resistance 218. The polarity of the current through the loop remains the same as before the insertion of plug 201.

The effect of the current through the bottom or biasing windings of polar relays 211 and 212 in the paths traced above is to tend to actuate the armatures of these relays to engage with their respective spacing contacts. This effect is opposed in each instance by the effect of the current in the top or line windings of these relays in the paths traced above, which latter effect preponderates and the armatures are actuated to engage with their marking contacts with which each is shown in engagement in Fig. 2. The effects of the current in the top and bottom windings of differential relay 227 neutralize each other so the armatures remain unoperated as shown in Fig. 2.

Operator's position circuit connected to cord

The operator will connect her position circuit to the cord in order to communicate with the calling party. This may be done before the cord is connected to the calling line or after such connection. To perform this operation the operator actuates key 225. This connects ground through the middle armature and front contact of key 225, and the winding of relay 224 to battery, operating relay 224. The operation of relay 224 connects the transmission loop in the operator's position circuit in series with the cord circuit transmission loop heretofore traced. The position circuit loop is cut in at the two top make-before-break contact combinations of relay 224. The operator's loop may be traced from the top outer make contacts of the make-before-break contact combination of relay 224, through the top break contacts of the make-before-break contact combination of key 301 in parallel with the bottom break contacts of the bottom make-before-break contact combination of key 301, top armature and break contact of key 302, break contacts of the make-before-break contact combination of key 303, bottom winding of the operator's polar receiving relay 305, sending contacts of the operator's transmitter, top and bottom break contacts of the make-before-break contact combinations of key 304 in parallel to the top inner make contacts of the make-before-break contact combination of relay 224.

The bottom winding of relay 305 is thus inserted in series in the transmission loop which now extends through all of the circuits, namely, the pay station line and station circuit, the cord circuit and the operator's position circuit. The armature of relay 305 is shown in engagement with its right-hand or spacing contact. The effect of the current in the bottom winding, when the circuits are interconnected and current flows for the marking condition, is to operate the armature of relay 305 to engage with

its left-hand or marking contact. Key 306 is operated. This establishes a path for energizing the top or biasing winding of relay 305, which path may be traced from battery through resistances 311 and 307, top winding of relay 305 and the top armature and make contact of key 306 to ground. The effect of current in this path returns the armature of relay 305 to its right-hand or spacing contact when the loop is opened either at the transmitting contacts in the station circuit or at the transmitting contacts in the operator's position circuit as well as when the armature of relay 211 is actuated to engage with its left-hand or spacing contact, in response to a spacing signal received from the circuit to which the calling end of the cord is connected. Under this latter condition both ends of the loop which extend through the bottom winding of relay 305 are connected to negative battery and the loop current drops to zero.

With key 306 operated, when relay 305 is in its left-hand or marking contact, the winding of relay 309 is energized from ground through the top make contact and armature of relay 306, winding of relay 309, resistances 308 and 311 to battery. When the armature of relay 305 is engaged with its right-hand or spacing contact, the winding of relay 309 is shunted by the path through the armature and right-hand or spacing contact of relay 305 but relay 309 remains operated during the reception of ordinary communication signals, as relay 309 is a slow-release relay. Its function is to prevent the teletypewriter from spinning during long idle intervals. In order to do this it is necessary to maintain the receiving magnet 310 energized during such intervals. During the reception of ordinary marking and spacing signals, the receiving magnet 310 is energized for marking and deenergized for spacing signals. The circuit by means of which magnet 310 is energized during marking may be traced from battery through resistance 312, winding of receiving magnet 310, resistance 313, make contacts of the make-before-break contact combination of relay 309, which is operated, left-hand or marking contact and armature of relay 305 and through the top armature and make contact of key 306 to ground. When the armature of relay 305 is actuated to engage with its right-hand or spacing contact, this path is broken and magnet 310 is deenergized. Relay 309 does not release on ordinary spacing signals. For long spacing signals relay 309 releases, closing an energizing path for magnet 310 through its break contacts to ground on the bottom armature and make contact of key 306.

Calling party and operator communicate

The calling party operates the teletypewriter at the pay station to transmit the number of the called party. This is recorded on the teletypewriter receiver in the operator's position circuit as magnet 310 follows the signals.

Operator extends the call

The next step in the proceedings is the extension of the circuits toward the called party. If the call is a local call, it may be completed in the same switchboard as the one in which the calling pay station line is terminated. If the call is to a station in a distant city it will be extended to a switchboard in the distant city for completion by means of a long distance circuit extending to the switchboard in the distant city.

The operator will connect her position circuit

to the calling end of the cord by operating key 301. This connects her transmitter and the bottom winding of the receiving relay 305 in series with the cord repeater. This circuit may be traced from battery in Fig. 3 through resistance 314, bottom armature and make contact of key 301, top armature and break contact of key 302, break contacts of key 303, bottom winding of receiving relay 305, transmitting contacts, break contacts of key 304 to the top inner make contacts of relay 224 from whence the circuit has been traced to positive battery 209.

Positive battery is connected to the tip conductor of the station loop simultaneously to hold the loop closed. The circuit for this may be traced from positive battery in Fig. 3 through resistance 312, the middle armature and front contact of key 301 to the top outer make contacts of the make-before-break contact combination of relay 224. From this point the circuit extends over the tip around the station loop and back on the ring to negative battery connected to resistance 218 in Fig. 2.

The operator inserts the plug of the calling cord 230 into the jack 231 connected to the called line or to a trunk extending to the proper distant city.

If the connection is made directly to a subscriber's line, ground through a relatively high resistance 232, approximately 600 ohms, is connected, in the sleeve of the called line, to the circuit which extends through the windings of marginal relay 233 and relay 220. Relay 220 operates. Relay 233 remains unoperated as it is arranged to respond only when connected to a trunk circuit having a lower sleeve resistance.

The operation of relay 220 connects the tip of the calling cord to the cord circuit repeater. This circuit may be traced from the tip of plug 230 through resistance 237, top winding of differential relay 234, top armature and front contact of relay 220 to a circuit which has been traced from this point to positive battery 214.

It will be assumed that the cord circuit per Fig. 2 is connected to a regular subscriber's line indicated by a rectangular box 241. This regular subscriber's line is not arranged for pay station service.

In a well-known line circuit of such type, while the line is idle, the line conductor which connects to the tip of the cord is connected to ground through a condenser and ringer. The other line conductor, which connects to the ring, is connected directly to ground.

From ground on the ring of the regular subscriber's line (not shown) the circuit extends through the ring of jack 231, armature and break contact of key 206, armature and break contact of key 207, top armature and break contact of relay 233, bottom winding of differential relay 234, bottom inner armature and front contact of relay 220, bottom inner make contact and armature of relay 208 and resistance 217 to negative battery. Relay 234 operates. This lights the calling cord supervisory lamp 235 over a circuit from ground through the armature and front contact of relay 234, filament of lamp 235 to battery through the night alarm circuit. It also operates relay 242 in parallel with the lamp through the top winding of relay 242 to battery through the bottom inner armature and back contact of relay 238. The operation of relay 242 closes a circuit from negative battery through resistance 217, bottom inner armature and front contact of relay 208, resistance 219, top arma-

ture and front contact of relay 242 to the calling side of the repeater to hold it closed. The operation of relay 234 also prepares a circuit for the operation of relay 236 from ground through its upper front contact and armature, through the winding of relay 236 to the top armature to key 221.

Operator rings called party

The operator now rings the called party by operating key 211. The operation of key 221 operates relay 236, opens the tip lead and connects the calling side of the repeater to negative battery through resistance 217, through the make contacts of the make-before-break combination of key 221.

The operation of relay 236 locks the relay over a path from battery, through the front contact and top armature of relay 236, winding of relay 236, and through the top armature and front contact of relay 234 to ground. The operation of relay 236 closes a circuit from battery through the bottom front contact and armature of relay 236 and the winding of relay 238, to ground, operating relay 238. The operation of relay 238 releases relay 242 and transfers the holding path for the calling side of the cord repeater from the contacts of relay 242 to corresponding contacts on relay 238. The operation of relay 238 applies ringing to the tip of the cord and its connected station loop conductor over a circuit from a grounded source of alternating current 239, through the filament of lamp 240, bottom front contact and armature of relay 238 and the bottom front contact and armature of key 221 to the tip of the cord over a circuit heretofore traced. This current passes over the tip conductor of the station loop and through a condenser and ringer to ground operating the ringer. In response to this the called party will operate his station loop and power switch which disconnects the ringer, closes the loop and connects power to his station teletypewriter so that the station equipment is conditioned to communicate with the calling party. The response of the called party by connecting the tip and ring loop conductors together will cause current to pass through both the upper and lower windings of differentially wound relay 234. This will release the armature and extinguish the calling supervisory lamp 235. It will also release relay 236 which was locked to ground on the top front contact of relay 236. This in turn will release relay 238 to disconnect the ringing current. The transmitting contacts and the winding of the receiving magnet at the called station are connected in series in the station loop and the station is ready for communication.

Operator communicates with calling party regarding tariff

After the operator has rung the called party, while waiting for the called party to respond, she will disconnect her position circuit from the calling side of the cord and connect it to the answering side of the cord. She then requests the calling party to deposit coins in the necessary amount, depending on the tariff, and plugs her receiving device into coin signal jack 116 so that she may check the denomination and number of the coins as they are deposited in a well-known manner.

In order to connect her position circuit to the answering end of the cord, the operator releases key 301 and actuates key 304. This will connect

negative battery to the repeater in the cord circuit to maintain it in the closed or marking condition. The circuit may be traced from negative battery in Fig. 3 through resistance 314, middle armature and front contact of key 304 to the top inner make contacts of the make-before-break combination of relay 224, where it connects to a path, which has heretofore been traced in detail, to positive battery 209 connected to the marking contact of polar relay 211. The operation of key 304 also connects positive battery in the operator's position circuit through the operator's receiving relay and transmitting contacts to the tip of the cord circuit. This circuit may be traced from positive battery through resistance 312, the bottom armature and front contact of key 304, the sending contacts of the operator's teletypewriter, bottom winding of relay 305, front contact and armature of key 303, upper break contact and armature of key 302, upper break contact and armature of key 301, to the make contacts of the top outer make-before-break combination of relay 224 in Fig. 2, from which point the circuit has heretofore been traced over the tip, around the station loop and back on the ring to its termination in negative battery connected to resistance 218.

The operator types the amount of the tariff for the particular call, which is recorded on the station teletype receiver. She then listens by means of her audible receiver 232 which is connected to jack 116. Each coin which is deposited causes a characteristic tone to be transmitted over the circuit and through resistance 232 which actuates the receiver. Thus the operator may identify the number and denomination of the deposited coins which pass contacts 105 at the station.

Calling and called parties communicate

After the operator has checked to insure that the proper amount has been deposited, she withdraws her audible receiving device 232 from jack 116. She also restores her splitting key 304, by means of which her position circuit was connected to the calling subscriber, to normal. The operator also restores key 225 to normal to disconnect her position circuit from the cord. The calling and called parties then communicate.

If the operator has occasion to answer a call on another line, she actuates a key corresponding to key 225 in another cord which connects her position circuit to the other cord and proceeds as described above.

Operator intervenes on overtime call

If the calling and called parties communicate for longer than the interval permitted for the amount deposited, the operator will again reconnect her position circuit to the calling party's loop by actuating key 225 in the original cord and key 304 in the position circuit. The operator will type "Time up. Deposit ——— for additional ——— minutes." The operator will then send out a particular upper case signal, such as an upper case S. In response to the reception of the corresponding train of signal elements by the teletypewriter receiving magnet 122, the teletypewriter receiving mechanism instead of making a selection which prints a letter, makes a selection which operates a mechanism which performs a function in a well-known manner. The function which is performed is the closing of contacts 126. This closes a circuit from battery through resistance 127, left-hand winding of relay

113 and contacts 126 to ground, operating relay 113.

The operation of relay 113 at its left-hand outer armature and front contact closes a shunt around the armature and marking contact of relay 111 to maintain the station receiving magnet 122 energized so that it no longer may follow relay 111. This prevents the reception of further signals. At the left-hand inner transfer contacts of relay 113, the loop path through the sending contacts is shunted by a path which extends from point 128 through the left-hand inner front contact and armature of relay 113 and then in series through the right-hand armature, front contact and locking winding of relay 113. Relay 113 is arranged so that its right-hand armature and associated front contact close before the left-hand inner armature breaks from its back contact to prevent the opening of the loop.

When the right-hand winding of relay 113 is connected in series with the loop, relay 113 locks up, as the loop is continuous and positive battery is connected to one end and negative battery is connected to the other end at the central station. Contact 126 reopens automatically in a well-known manner, after relay 113 locks, as the teletypewriter receiving mechanism completes the cycle of operations in response to the upper case signal by which the contacts were closed. The shunting of the station teletypewriter sending contacts prevents any further transmission from the pay station until additional coins are deposited.

The operator reconnects her audible receiver 232 to the coin signal jack 116 and checks the deposit of the additional coin or coins by noting the number and pitch of the tones received as the coins are deposited.

After the correct amount has been deposited the operator opens the line momentarily, which permits relay 113 to release. This removes the shunts from around the contacts of the station circuit receiving relay 111 as well as that around the station transmitting contacts 112 and the calling and called parties may thereupon resume communication.

Recall

Either station attendant may recall the operator. The attendant at the called station which does not include pay station equipment actuates a power switch to open the called station loop. This opens the tip and grounds the ring. The attendant then recloses the loop. In the case of the calling pay station, the attendant at the station transmits an upper case H as described above which opens the tip of the loop and grounds the ring. Then the attendant at the pay station immediately reoperates motor start key 106 to close the shunt around the open loop contacts of relay 110. It should be remembered that contacts 105 are maintained closed by the suspended coin or coins. Relay 110 reoperates, reclosing the loop.

In response to opening the loop momentarily, the differential relay in the corresponding end of the cord circuit, such as relay 227 will operate as described above for the disconnect operation. Simultaneously relay 246 will operate over a circuit from ground through the bottom armature and front contact of relay 227, the bottom inner armature and back contact of marginal relay 202, which is released, through the bottom winding of relay 246 to battery. Relay 246 operates and locks over a circuit from battery through the top winding, top front contact and armature of relay 246, bottom outer armature and back contact of

relay 224, which relay is released, bottom outer armature and back contact of relay 223, which is also released, to ground through the bottom armature and front contact of relay 203, which is operated over the sleeve circuit of the cord, which is still connected to jack 101.

When differential relay 227 releases, on the reestablishing of the station loop circuit, the lamp circuit which has been controlled from the steady ground at relay 227 is flashed from interrupted ground through the bottom armature and front contact of relay 246 and the bottom inner back contact and armature of relay 202.

The supervisory lamp associated with the calling end of the cord is flashed over a corresponding circuit associated with the calling end of the cord in a similar manner on a recall from the called party.

Disconnect

Upon completion of the call the calling subscriber transmits a disconnect signal to light the supervisory lamp in the answering end of the cord. This is performed in the following manner.

The calling subscriber operates the teletypewriter transmitter to send an upper case H signal. This signal will operate receiving relay 111 at the calling subscriber's own station. The train of signals corresponding to the upper case H will cause the teletypewriter receiving mechanism controlled by receiving magnet 122 to make a selection which results in the actuation of a functional lever in a well-known manner. The functional lever in turn will open contacts 119. This in turn will deenergize the right-hand or locking winding of relay 110. Relay 110 releases. This will reopen the station loop at the right-hand outer contacts of relay 110. When the loop is opened, as the right-hand outer armature of relay 110 engages its back contact, the ring of the loop is grounded through the windings of the coin collect and coin return relays. This energizes the bottom winding of differential relay 227 which lights the supervisory lamp in the answering end of the cord. The circuit for this may be traced from ground, through the bottom armature and front contact of relay 227, filament of the supervisory lamp 245 to battery through the night alarm circuit.

The supervisory lamp 235 associated with the calling end of the cord will be lighted when the called party disconnects in a similar manner by a corresponding circuit associated with the calling end of the cord.

After the calling party has disconnected, the operator at the central station may collect or return the deposited coins which have been held in suspension during the proceedings described above, by operating either key 204 or key 205. Key 204 supplies positive battery over the ring through the windings of polarized coin collect and coin return relays 130 and 131. Key 205 supplies negative battery to the same circuit. The windings of the relays are so poled that one responds to positive battery and is unaffected by negative battery while the other responds to negative battery and is unaffected by positive battery. By actuating the proper key the operator at the central station may operate either relay to collect or return the coins as required.

Operator disconnects cord

After the operator has collected or returned the coins, she disconnects the cord circuit from the jacks with which it is connected. This ex-

tinguishes the supervisory lamps and returns the circuits to their normal unoperated condition.

Inward call

The circuit per Fig. 1 may serve as the called station circuit. In such cases the operator at the central station will connect the plug 230 associated with the calling end of her cord into a jack such as 101 and operate the ringing key in the calling cord in the same manner as described above. The ringing current will pass over the tip of the station loop through the left-hand inner armature and back contact of relay 110 through condenser 132 and ringer 133 which are connected in series across the pay station top loop conductor operating the ringer. In response to this the called party will deposit a coin in the coin box at the called station to close contacts 105 so that the called pay station may be closed in the manner described above by thereafter momentarily operating motor start key 106 to operate relay 110 which closes the called station loop.

At the conclusion of the call, when relay 110 in the called party's loop has been released, the operator will return the coin to the called party in the same manner as described above by operating the coin return key associated with the calling end of the cord.

What is claimed is:

1. In a teletypewriter switching system, a teletypewriter station circuit, a first means therein responsive to the depositing of a coin in a coin collection device in said circuit for signaling a central station and a second means therein, independent of said first means, for generating direct current telegraph signals.

2. In a teletypewriter switching system, a central teletypewriter switching station, a local teletypewriter station, a teletypewriter transmitter and receiver at each of said stations, means in said system for establishing a continuous direct current telegraph path connecting said teletypewriters, a calling signal independent of said teletypewriters for attracting an operator's attention to said path at said central station, a coin collection device connected to said path at said local station and means at said local station responsive to the insertion of a coin in said device for operating said signal.

3. In a teletypewriter switching system, a central teletypewriter station, a local teletypewriter station, a telegraph path arranged for the transmission of direct current telegraph signals connecting said stations, teletypewriter means at each of said stations for communicating over said path, a coin collection device connected to said path at said local station and means at said central station for discriminating between the denomination of coins inserted in said device.

4. In a teletypewriter switching system, a central teletypewriter station, a local teletypewriter station, a direct current telegraph path connecting said stations, teletypewriter means at each of said stations for communicating over said path, a coin collection device connected to said path at said local station and means at said central station for indicating the number of coins which are inserted in said device.

5. In a teletypewriter switching system, a central teletypewriter station, a local teletypewriter station, a direct current telegraph path connecting said stations, teletypewriter means at each of said stations for communicating over said path, a coin collection device connected to said path at said local station and means connected to said

path responsive to the insertion of a coin in said device for operating a line calling signal at said central station independent of said teletypewriter at said central station.

6. In a telegraph system, a local teletypewriter station, a central teletypewriter station, a telegraph path connecting said stations, telegraph transmitting and receiving means connected to said path for communicating over said path by means of direct current and no current signal impulses and means at said central station for preventing further communication over said path after communication over said path has been established until additional coins have been deposited in a collection device at said local station.

7. In a telegraph system in combination, a first and a second local telegraph station, a central telegraph station, telegraph means for establishing a continuous electrical telegraph path between teletypewriters connected to said path at each of said local stations, said path extending through said central station and a coin collection device connected to said path at said first local station responsive to control means at said central station for regulating communication between said local stations.

8. In a teletypewriter switching system, a pay station teletypewriter circuit at a first local station, a teletypewriter cord circuit at a central teletypewriter switching station, a teletypewriter station circuit at a second local station, an operable telegraph path interconnecting said circuits, teletypewriter connected to said path at each of said stations and means in said circuits for controlling communication over said circuits responsive to the prepayment of established charges for individual calls.

9. In a teletypewriter switching system, a local teletypewriter station, a teletypewriter thereat connected to a central teletypewriter switching station by means of a continuous electrical telegraph path arranged for the transmission of direct current telegraph signals, means at said central station for checking the deposit of coins in a coin collection device at said local station and means, including a teletypewriter cord circuit, for extending said path toward a called teletypewriter station.

10. In a teletypewriter switching system, in combination, a pay station telegraph circuit, a first means in said circuit for generating direct current telegraph signals and a second means in said circuit for generating individual signals to characterize coins of different denominations.

11. In a teletypewriter switching system, in combination, a pay station teletypewriter circuit including a teletypewriter transmitter, a teletypewriter receiver and a coin box, means dependent upon the depositing of a coin in said box for conditioning said circuit for communication and means responsive to the operation of said receiver for preventing further communication from said transmitter until an additional coin is deposited.

12. In a teletypewriter switching system, in combination, a prepayment teletypewriter station circuit at a local teletypewriter station connected to a teletypewriter line circuit at a central teletypewriter switching station, means for transmitting impulses of direct current between said stations as telegraph signals and means for transmitting an alternating current between said stations to denote the depositing of a coin.

13. A system in accordance with claim 12 including in combination a signal connected to said

line circuit at said central station for indicating that said local station is calling.

14. A system in accordance with claim 12 including in combination a teletypewriter cord circuit for responding to a call from said local station.

15. A system in accordance with claim 12 including, in combination, a teletypewriter cord circuit and an operator's teletypewriter position circuit comprising a teletypewriter transmitter and receiver for communicating between said local station and said central station.

16. A system in accordance with claim 12 including, in combination, means at said central station for checking the denomination of coins and the number of coins deposited in a coin collection device at said local station.

17. A system in accordance with claim 12 including, in combination, control means at said central station for controlling the return of coins deposited in a coin box at said local station.

18. A system in accordance with claim 12 including, in combination, coin collection control means for controlling the collection of coins deposited in a coin box at said local station.

19. A system in accordance with claim 12 including, in combination, communication control means for suspending communication to or from said local station, after communication has been established, until additional coins have been deposited in a coin box at said local station.

20. In a teletypewriter switching system, in combination, a prepayment local teletypewriter station circuit connected to a central teletypewriter switching station, means, including a teletypewriter, at said central station for extending a telegraph path, arranged for the transmission of direct current telegraph signals, from said local station toward a second telegraph station and means in said extension means responsive to control means at said local station for recalling an operator's attention to said path.

21. In a teletypewriter switching system, a subscriber's teletypewriter station circuit, a teletypewriter therein, means in said circuit for transmitting and receiving telegraph signals and means in said circuit for preventing the operation of said teletypewriter until after a coin has been deposited in a coin collection device connected directly to said teletypewriter in said circuit.

22. In a teletypewriter switching system, in combination, a subscriber's teletypewriter station circuit including a coin collection device, a direct current telegraph loop circuit connecting transmitting contacts on a teletypewriter in said station circuit directly to a central teletypewriter switching station and a flexible link at said central station for extending said circuits to a distant station.

23. In a teletypewriter switching system, a first and a second teletypewriter station circuit, a teletypewriter machine in each of said circuits, a continuous direct current telegraph path arranged for two-way teletypewriter communication interconnecting said machines, a coin collection device connected in said station circuit at one of said stations and means connected to said path for controlling communication over said path in response to the depositing of a coin in said device.

24. In a teletypewriter switching system, a local teletypewriter station, a central teletypewriter switching station, a teletypewriter machine at each of said stations, a continuous direct current telegraph path interconnecting said machines, a coin collection device connected to said

path at said local station, means in said path responsive to the depositing of a coin in said device for controlling communication over said path, and means at said central station, independent of said teletypewriter thereat, for identifying coins deposited in said device.

25. In a teletypewriter switching system, a local teletypewriter station, a central teletypewriter switching station, a teletypewriter transmitter at said local station, a coin collection device at said local station, means responsive to the actuation of said device for establishing a continuous electrical telegraph path interconnecting said transmitter and said central station a line calling signal at said central station responsive to the establishment of said path, a teletypewriter transmitting and receiving machine at said central station and a cord circuit at said central station for connecting said machine to said path.

26. In a teletypewriter switching system, a local teletypewriter station, a central teletypewriter switching station, a teletypewriter transmitting and receiving device at each of said stations, a coin collection device at said local station, means for establishing a continuous direct current telegraph path directly connecting said machines dependent upon the depositing of a coin in said device and means responsive to the transmission of telegraph impulses from said switching station to said local station for preventing transmission from said local station until an additional coin is deposited in said device.

27. In a teletypewriter switching system, a first and a second teletypewriter station, a coin collection device at one of said stations, a teletypewriter transmitting and receiving device at each of said stations, means responsive to the depositing of a coin in said device for establishing a continuous direct current, two-way telegraph path directly interconnecting said machines.

28. In a teletypewriter switching system, a first and a second teletypewriter local station, a central teletypewriter switching station intermediate said stations, teletypewriter transmitting and receiving machines at each of said stations, a coin collection device at one of said local stations and means at said stations for establishing a continuous direct current, two-way telegraph path extending through said machines dependent on the depositing of a coin in said device.

29. In a telegraph switching system, a local teletypewriter station, a central teletypewriter switching station, a teletypewriter transmitter and receiver at each of said stations, a teletypewriter station circuit at said local station, a teletypewriter line circuit, a teletypewriter cord circuit and a teletypewriter position circuit at said central station, a coin collection device connected to said station circuit at said local station and means, dependent upon the depositing of a coin in said device, for establishing a continuous direct current telegraph path between said teletypewriter transmitters and receivers through said circuits.

30. In a teletypewriter switching system, a teletypewriter cord circuit, a teletypewriter transmitter and receiver directly connected to said cord circuit and means connected to said cord circuit for controlling the operation of a coin collection device also connected to said cord circuit by means of an operable direct current telegraph circuit.

31. In a teletypewriter switching system, a teletypewriter cord circuit, a teletypewriter operator's position circuit including a teletypewriter

transmitter and receiver connected to said cord circuit and a coin collection control device in one of said circuits.

32. In a teletypewriter switching system, a teletypewriter cord circuit including a telegraph repeater, means for selectively associating a teletypewriter position circuit including a teletypewriter transmitter and receiver with said cord circuit and coin collection and return controlling means connected to said circuits.

33. In a teletypewriter switching system, a central teletypewriter switching station, a teletypewriter receiver thereat and coin collection controlling means connected to said receiver.

34. In a teletypewriter switching system, a local teletypewriter station, a central teletypewriter switching station, a teletypewriter transmitter and receiver at each of said stations, a coin collection device at said local station, telegraph circuit means for interconnecting said transmitters and receivers, means dependent upon the depositing of a coin in said device for operating a line calling signal at said central station and means, separate from said signal and from said transmitter and receiver at said central station, for identifying coins deposited in said device.

35. In a teletypewriter switching system, a teletypewriter local station, a teletypewriter central switching station, a telegraph path interconnecting said stations, telegraph means connected to said path for communicating between said stations, a coin collection device connected to said path at said local station and means at said central station for returning a coin deposited in said device.

36. In a teletypewriter switching system, a first and a second telegraph station, a continuous electrical telegraph path interconnecting said stations, telegraph means for communicating between said stations and means at one of said sta-

tions for controlling a coin deposited in a coin collection device connected to said path at the other of said stations.

37. In a teletypewriter switching system, a local telegraph station, a central teletypewriter switching station, a telegraph transmitter at one of said stations and a telegraph receiver at the other of said stations, a continuous electrical telegraph path interconnecting said transmitter and said receiver, a coin collection device connected to said path at one of said stations and a coin collection control means connected to said path at the other of said stations.

38. In a teletypewriter switching system, a first and a second local teletypewriter station, a central teletypewriter switching station, a teletypewriter transmitter and a teletypewriter receiver at each of said stations, means including said teletypewriter transmitter and receiver at said central switching station for establishing a continuous electrical telegraph path interconnecting said teletypewriter transmitters and receivers at said local stations and means at said central station for controlling communication over said path depending upon the prepayment of charges for individual calls.

39. In a teletypewriter switching system, a local teletypewriter station, a central teletypewriter switching station, telegraph communication means at each of said stations, a coin collection device at said local station, means for establishing a continuous, electrical telegraph path interconnecting said communication means at each of said stations, a coin collection device connected to said path at said local station, means for characterizing the denomination of coins deposited in said device at said local station and means for discriminating between the characterizations at said central station.

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