July 16, 1940. A. J. BUSCH ET AL 2,208,357

TELEPHONE METER CONTROL SYSTEM

Filed Jan. 13, 1939 2 Sheets-Sheet 1

FIG. 1

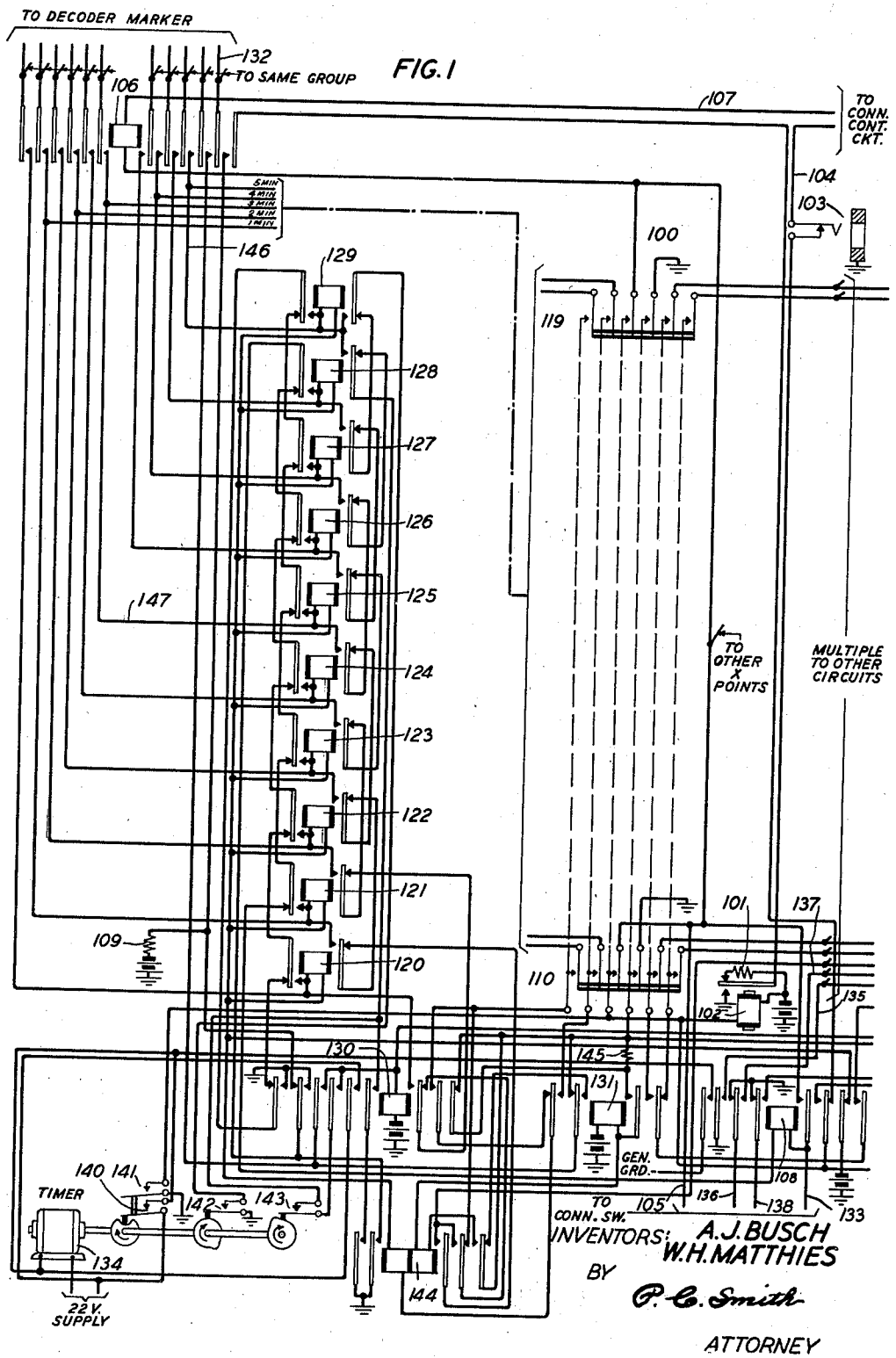

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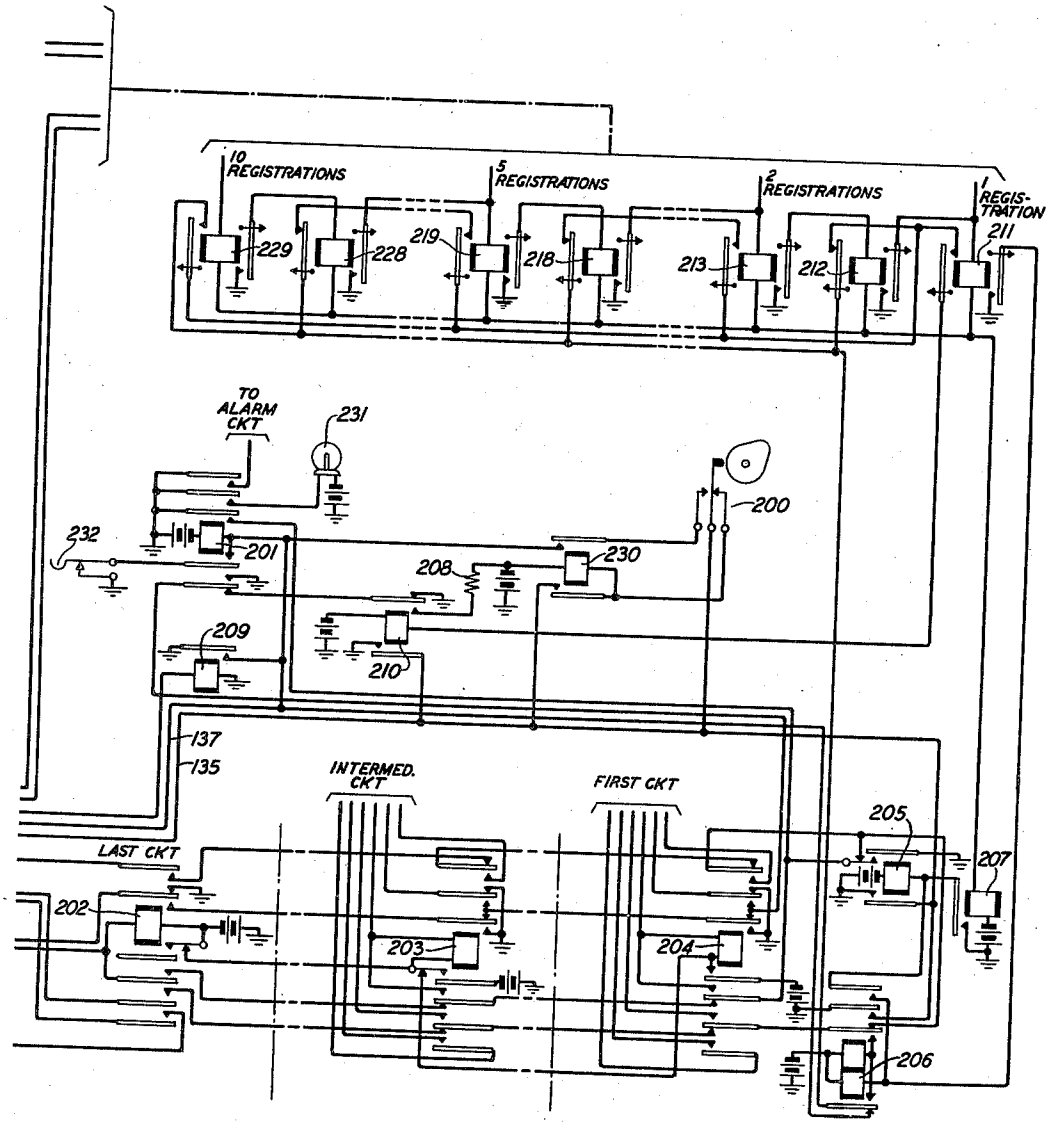
FIG. 2



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TELEPHONE METER CONTROL SYSTEM

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Application January 13, 1939, Serial No. 250,700

15 Claims. (Cl. 179—7.1)

This invention relates to telephone systems and particularly to those in which message registers are used for assessing charges for the service rendered.

The object of the invention is to simplify and improve the equipment for recording information concerning the destination of a call and for utilizing this information to assess charges on the basis of the zone called and also on the basis of the duration of the call.

It has been proposed heretofore to provide a plurality of zone and time-controlled message register operating devices in common to a group of conversational trunks. Such a system is shown in the patent to F. J. Scudder 2,089,438, granted August 10, 1937. In the arrangement of this patent, whenever a call is made involving one of the trunks, an idle message register operating device is chosen and connected by selective switches to the calling trunk. This idle device is also connected, independently of the trunk, to the common digit recording mechanism in which the dialed number has been recorded, and receives the zone information from it directly. However, the zone and timing devices employed in this arrangement include a plurality of zone timing cams each controlled by a zone clutch magnet and all controlled by a master clutch magnet and driving mechanism which may require considerable adjustment to maintain them in efficient operating condition.

In accordance with the present invention, a zone and timing device is provided which requires very little maintenance attention.

More specifically, it provides a cross-bar type switch for recording the zone and for controlling, in accordance therewith, the number of operations of the subscriber's message register and the length of the talking periods.

In addition, the same magnets which control the setting of the zone register switch, function in cooperation with a clock-type interrupter to measure the talking periods.

Furthermore, the number of registrations is controlled by a set of relays. When it is desired to operate the proper subscriber's message register, the proper number of relays are operated in succession under the control of the closed switch cross-point of the cross-bar switch and are then released in the same order, the releasing time of the first relay of a pair measuring the pulse of metering current and the releasing time of the second relay of the pair measuring the interval between pulses.

These and other features of the invention will become more apparent from a consideration of the following description in connection with the accompanying drawings, in which

Fig. 1 shows the zone register switch and control quipment; and

Fig. 2 shows the message register control relays.

No attempt has been made to show the conversational trunk, the subscriber's message register, the digit recording mechanism nor the switches for connecting them with the zone and timing device, since the present circuits are adapted for insertion in the disclosure of the above-mentioned Scudder patent, to which reference is hereby made. The conductors **107**, **104**, **105**, **136**, **138** and **133** correspond to conductors **921**, **915**, **923**, **932**, **1011** and **1012**, respectively, of the Scudder patent. The conductors marked "To decoder marker" correspond to conductors **1015** to **1019** of the above-mentioned patent, provision being made for ten zones instead of the five zones shown in the patent.

When a subscriber initiates a call, his line is automatically connected to an idle district trunk circuit and to an idle subscriber's register sender. The designation of the wanted station, as dialed by the calling subscriber, is recorded on the register mechanism of the sender, which associates itself with an idle decoder marker. The sender thereupon transmits to the decoder marker such information regarding the destination of the call as this latter circuit requires for performing its functions in the extension of the connection. Information is also passed from the sender to the marker regarding the number of the district frame containing the particular district trunk circuit selected for use on this call, and the marker thereupon establishes connections between itself and that district frame.

From the office code information received from the sender, the marker determines the zone in which the exchange serving the called station is located and operates a corresponding zone relay. The marker also passes a signal to the district trunk which then causes the meter control circuit to test for an idle zone and timing circuit.

A zone and timing circuit is marked idle by battery connected through resistance **101**, over the back contact of magnet **102**, contact of jack **103** to conductor **104**.

When an idle zone and timing circuit is found, the switch connecting it with the district trunk circuit is operated and the connection is locked under the control of the district trunk circuit.

A branch of this locking circuit extends over conductor 105, through the winding of relay 106 and conductor 107, operating relay 106 to connect the zone and timing circuit through the district frame connector to the zone relays of the marker.

The zone and timing circuit is provided with a cross-bar register switch 100 having one vertical row of ten cross-points 110 to 119. Each cross-point is prepared by the corresponding select magnet 120 to 129 and is closed by hold magnet 102.

With relay 106 operated, select magnets 120 to 129 are connected to the zone relays in the marker. In accordance with the zone relay operated, ground is connected to the winding of one of the select magnets, for example, magnet 120. With magnet 120 operated, a circuit is closed for hold magnet 102 extending from battery through the winding of hold magnet 102, inner right back contact of 108, outer right contact of relay 106, in parallel with battery through resistance 109, inner left back contact of relay 130, left back contacts of select magnets 128, 126, 124 and 122, left front contact of magnet 120 to ground over the operating circuit of that magnet. Hold magnet 102 closes cross-point 110, thereby closing a holding circuit for itself over the fourth contact from the right of the cross-point and conductor 105 to ground under the control of the district trunk circuit.

Hold magnet 102 disconnects battery from conductor 104, thereby removing the idle indication and connects ground to that conductor as an added precaution to prevent the possibility of seizing the timing circuit while it is in use.

Ground is connected over the third contact from the right of the cross-point, inner left back contact of relay 131, fifth right contact of relay 106 to conductor 132, thus transmitting to the marker the information that the zone information has been locked in at the control circuit. Having received the signal over conductor 132 and completed its other functions, the marker disconnects itself from the control circuit and releases select magnet 120.

When the called subscriber answers, the district trunk circuit connects ground to conductor 133, operating relay 108 over the back contacts of all of the select magnets as a test that the operated select magnet has been properly released. The circuit may be traced from ground over conductor 133, winding of relay 108, over the left back contacts of magnets 121, 123, 125, 127 and 129, over the outer left back contact of relay 130, left back contacts of magnets 120, 122, 124, 126 and 128, inner left back contact of relay 130 to battery through resistance 109. Relay 108 locks over its inner right contact to conductor 105 and connects generator ground over its outer left contact to the motor 134 of the timer. This motor is of the synchronous type commonly employed in clocks and, therefore, measures the conversational periods with accuracy.

At its third left armature, relay 108 connects ground over conductor 135 to interrupter 200 to control a time alarm. At its second left armature it disconnects ground from conductor 136 and extends conductor 136 over conductor 137 to the winding of relay 201 as a test against double connections. At its inner left contact relay 108 removes ground from conductor 136 over which the message register pulses are to be transmitted and extends conductor 138 to the inner upper armature of relay 202, where it is also connected to ground.

At its second right contact relay 108 opens the operating circuit for hold magnet 102 and closes a circuit for seizing the meter control circuit of Fig. 2. This circuit may be traced from battery through the winding of relay 202, second right contact of relay 108, and over the cross-point 110, following the locking circuit of hold magnet 102, to ground on conductor 105. Relay 202 disconnects battery from the windings of relays 203, 204, etc., to prevent the seizure of the meter control circuit by another zone and timing circuit. Relay 202 extends its operating ground over its own second lower front contact, second lower back contacts of relays 203, 204, etc., normal contact of relay 205, upper back contact of relay 206, outer lower back contacts of relays 204, 203, etc., third lower front contact of relay 202, to the winding of relay 130 and battery. The function of relay 130 will be described hereinafter.

There is one meter control circuit for five zone and timing circuits, since the meter control circuit functions for only a small portion of the time during which the zone and timing circuit is held by the district trunk. For each zone and timing circuit there is a relay, such as relay 202, and these relays are arranged in a chain. Relay 202 has the preferential position and relay 203 has preference over relay 204. As described above, relay 202 opens the operating circuit of the relays lower in the chain and operates relay 130 over the back contacts of these other relays. When the meter control circuit has completed its function, relay 202 releases, permitting any other relay in the chain to operate and seize the meter control circuit for use with the corresponding zone and timing circuit.

The meter control circuit comprises a meter control relay 210 and a chain of nineteen slow-to-release relays 211 to 229. The windings of alternate relays are cross-connected to the first contacts of the cross-points on zone switch 100 in accordance with the number of charges to be made for the initial talking period of a call to that zone and to the second contacts of the zone switch cross-points in accordance with the number of charges to be made for each overtime talking period.

Assuming, by way of example, that cross-point 110 represents a zone for which five charges are made for an initial talking period of five minutes and two charges are made for each overtime period of three minutes, the first contact of cross-point 110 will be connected to the winding of relay 219 and the second cross-point to the winding of relay 213.

When relay 202 operates to connect the zone and timing circuit with the meter control circuit, a circuit is closed from battery through the winding of relay 207, winding of relay 219, first contact of cross-point 110, right back contact of relay 131, outer right front contact of relay 108, outer upper front contact of relay 202, outer upper back contacts of relays 203, 204, etc., normal contacts of relay 205, inner lower back contacts of relays 204, 203, etc., second lower front contact of relay 202 and thence to ground over the operating circuit of relay 202.

Relay 219 operates in this circuit and closes an obvious circuit for relay 218. Relay 218 operates the next relay in the chain, and the succeeding relays operate in turn followed by relays 213, 212 and 211. Relay 207 operates in series with these relays, in turn operating relay 205.

Relay 205 opens the operating circuit of relay 219 and closes a holding ground for relay 202 over its alternate contact, inner lower back contacts of relays 204, 203, etc., and the inner lower front contact of relay 202.

When relay 211 operates, it closes a circuit through the lower winding of relay 206. At its uppermost contact, relay 206 provides a holding circuit for relay 205 under the control of relay 211. At its middle upper contact relay 206 connects a supplementary ground to conductor 135, and at its inner upper armature opens the circuit of relay 130 and closes a holding circuit for itself in parallel with that of relay 130 to the cross-point 110 under the control of relay 202. Relay 206 also extends this holding ground over its lower front contact to the left armature of the even-numbered relay preceding relay 219 in the chain. Since this relay is unoperated, similar to relay 228, ground is extended over the back contact of that relay and the left front contacts of relays 219 and 211 to the winding of relay 210 and battery. Relay 210 in operating disconnects ground at its back contact and connects battery through resistance 208, over its upper front contact, lower back contact of relay 201, inner upper back contacts of relays 204, 203, etc., inner upper front contact of relay 202, inner left front contact of relay 108 to conductor 138 and thence to the subscriber's message register.

Since relay 205 has opened the circuit of relay 219, the circuit of relay 210 is held closed only during the releasing time of slow-to-release relay 219. When relay 219 releases, it opens the circuit of relay 218, which in turn releases after an interval to reclose the circuit of relay 210 over the back contact of relay 218 and the front contact of the following odd numbered relay, which is operated. Therefore, the releasing time of the even-numbered relays, such as relay 218, measures the spacing intervals between impulses of metering current. The release of relay 213 measures the fourth metering impulse; that of relay 212 measures the spacing interval, while that of relay 211 measures the fifth and last impulse. When relay 211 releases, it opens the circuit of relay 205, which opens the holding circuit of relay 202, permitting that relay to release and open the holding circuit of relay 206. Relay 207 also releases when the circuit of relay 211 is opened so that the meter control circuit has been restored to normal and is now ready for use by some other zone and timing circuit.

When relay 202 operated, it closed, as above mentioned, a circuit from battery through the winding of relay 130, middle lower front contact of relay 202, outer lower back contacts of relays 203, 204, etc., back contact of relay 206, normal contacts of relay 205, inner lower back contacts of relays 204, 203, etc., inner lower front contact of relay 202, middle right front contact of relay 108, fourth contact of cross-point 110 to ground over conductor 105. Relay 130 operates in this circuit and locks over its fourth left contact, inner left back contact of relay 131 to ground over the third contact of cross-point 110. Relay 130 opens the operating circuit of relay 108 which releases. With relay 108 released, the original energizing circuit of the timer is opened but a substitute circuit is provided over the second left contact of relay 130. Relay 108, when released, also restores battery to the windings of the select magnets 120 to 129.

The clock-type timer was started by the operation of relay 108, as above described. The motor 134 drives cams for operating contacts 140, 141, 142, and 143, which make one revolution in a minute. No timer is arranged to return to a normal position, in which position cam contacts 140, 141, 142 and 143 are open. When the motor moves away from normal, cam contacts 140 close an energizing circuit for the motor to ensure a complete revolution of the cams into their normal position and cam contacts 141 provide a holding circuit for the hold magnet 102 to prevent its premature release.

The cam contacts 142 close for a short interval when the timer moves off normal. A little less than thirty seconds later, cam contacts 143 close and then open precisely thirty seconds after cam contacts 142 open. In this way, cam contacts 142 and 143 operate alternately at thirty-second intervals. When cam contacts 142 close for the first time, they complete a circuit from ground thereover, right back contacts of select magnets 129, 127, 125, 123 and 121, inner right front contact of relay 130, winding of select magnet 120, outer right back contact of relay 108 to battery. Magnet 120 operates in this circuit and locks over its left front contact, left back contacts of magnets 122, 124, 126 and 128, to ground at the fifth left contact of relay 130.

Thirty seconds later, when cam contacts 143 close, a circuit is completed from ground at the third contact of cross-point 110, inner left back contact of relay 131, fourth and third left contacts of relay 130, cam contacts 143, right back contacts of magnets 128, 126, 124 and 122, right front contact of magnet 120 to the winding of magnet 121 and battery. Magnet 121 locks over its left front contact and the left back contacts of magnets 123, 125, 127 and 129 to ground at the outermost left front contact of relay 130.

The second closure of the cam contacts 142 operates magnet 122 which locks and releases magnet 120. Similarly, the second closure of cam contacts 143 operates magnet 123 and releases magnet 121. Therefore, at the end of each minute of conversation one of the odd-numbered magnets is operated.

The sixth and fifth contacts of the cross-points of zone switch 100 are used for determining the length of the initial and overtime periods respectively. To this end, they are cross-connected, as desired, to the windings of the odd-numbered select magnets. Such, as assumed above, the initial talking period for the zone identified by cross-point 110 is five minutes, the sixth contact of cross-point 110 is connected to the winding of magnet 129.

Therefore, when at the end of an elapsed five-minute talking interval, cam contacts 143 close to operate magnet 129, a parallel circuit extends over conductor 146, sixth contact of cross-point 110, outer right front contact of relay 130, left back contact of relay 131, left winding of relay 144, outer right back contact of relay 108 to battery. Relay 144 operates in this circuit and closes a holding circuit for itself from battery through the winding of relay 131, right winding and outer right front contact of relay 144, to ground over the third contact of cross-point 110. Relay 131 closes a holding circuit for itself over its inner right contact and resistance 145 to ground over the third contact of cross-point 110. Because of the presence of resistance 145, relay 144 remains operated temporarily, supplying temporary grounds for holding magnet 129 operated and magnet 128 locked.

The operation of relay 131 indicates the termi-

nation of the initial talking period and the start of the overtime periods. The operation of relay 131 opens the locking circuit of relay 139, causing that relay to release and close a shunt around resistance 145, thereby causing relay 144 to release. Magnets 128 and 129 also release. A circuit is now closed from ground on conductor 133, through the winding of relay 108, over the back contacts of the select magnets and relay 130 to battery, as previously traced.

Relay 108 calls in the meter control circuit as previously described. At this time, however, with relay 131 operated to indicate an overtime charge, the circuit of relay 207 extends through the winding of relay 213, second contact of cross-point 110, outer right front contact of relay 131, outer right front contact of relay 108 and thence, as previously traced, to ground over the operating circuit of relay 202. Relay 213 operates, causing relays 212, 211 and 205 to operate in turn. As before, relay 205 opens the circuit of relay 213 and relays 213, 212, 211 and 205 also release in turn. Relay 213 operated closes the circuit of relay 210 which sends out an impulse of metering current. When relay 213 releases the metering impulse is terminated. The release of relay 212 starts the next impulse and the release of relay 211 terminates the impulse. Two impulses of metering current are, therefore, transmitted as the charge for the first overtime period.

The operation of relay 202 reoperates relay 130 which controls the timing of the first overtime period and releases relays 108 and 202 to restore the meter control circuit to common use. Relay 130 also opens the shunt around resistance 145 to permit relay 144 to hold when operated.

Under the assumption that the overtime periods set by cross-point 110 are three minutes, the fifth contact of the cross-point will be cross-connected to the winding of magnet 125, and the circuit of relay 144 may be traced from battery at the outer right back contact of relay 108, left winding of relay 144, outer left front contact of relay 131, fifth contact of cross-point 110 to conductor 147. At the end of three minutes, cam contacts 143 connect ground to the winding of magnet 125 and to conductor 147, thereby operating relay 144 to cause the transmission of another set of metering impulses. Relay 131 remains operated, but relays 108, 202, 130 and 144 function as above described at three-minute intervals until the call is terminated.

When the call ends, the district trunk disconnects ground from conductors 105 and 133. Hold magnet 102 remains operated over cam contacts 141 until the timer returns to normal to prevent mutilation of a timing operation on the next call. With hold magnet 102 operated, relay 108, if operated, completes its function and relay 130, if operated, remains operated to prevent seizure of the meter control circuit until it has restored to normal. Relay 131 is also held operated until the cross-point is opened. Ground remains connected to the busy test conductor 104 over the contact of magnet 102 and to the holding conductor 105 from cam contacts 141 until the circuit is normal, to prevent premature reseizure of the circuit.

Relays 201 and 230 with interrupter 200 serve to sound an alarm if the meter control circuit fails to release promptly. Relay 108 grounds conductor 135 and interrupter 200 when it operates to seize the meter control circuit. Metering relay 210 connects ground to conductor 135 when it operates as do relays 205 and 206. Therefore, this conductor remains grounded if any of these relays fail to release. When interrupter 200 closes its right contact following the connection of ground to conductor 135, it completes a circuit for relay 230 which locks to conductor 135. When interrupter 200 next closes its left contact, it connects ground over the upper contact of relay 230 to the winding of relay 201 which locks under the control of release key 232, lights lamp 231, sounds an alarm, grounds the metering conductor 138 and closes a locking circuit for relay 202 to prevent seizure of the circuit by any other zone and timing circuit while it is in trouble.

Relay 209 is connected over the inner right contacts of relay 144 to right armatures of the select magnets 120 to 129 to test for the presence of a false battery which might lead to incorrect timing. If operated, relay 209 operates the alarm relay 201 directly.

What is claimed is:

1. In a telephone system in which a calling line and called lines in a plurality of zones are connected by automatic switches under the control of registrations set up in common control equipment and a charge is made for such connections in accordance with the respective zones, charge controlling means for operating a charging means individual to the calling line comprising a cross-bar zone registering switch operable by said common control equipment in accordance with said registrations and means operated over said cross-bar switch for timing and charging for telephone connections.

2. In a telephone system in which a calling line and called lines in a plurality of zones are connected by automatic switches under the control of registrations set up in common control equipment and a charge is made for such connections in accordance with the respective zones, charge controlling means for operating a charging means individual to the calling line comprising a cross-bar zone registering switch operable by said common control equipment in accordance with said registrations, means operated over said cross-bar switch for operating said charging means in accordance with the zone, timing means, means operated in response to the establishment of a connection to start said timing means and means operated over said cross-bar switch for causing the reoperation of said charging means following a predetermined operation of said timing means.

3. In a telephone system in which a calling line and called lines in a plurality of zones are connected by automatic switches under the control of registrations set up in common control equipment and a charge is made for such connections in accordance with the respective zones, charge controlling means for operating a charging means individual to a calling line comprising a cross-bar switch having a plurality of cross-points, means operated in accordance with the zone registration in said common control equipment to prepare a corresponding cross-point, timing means, means operated in response to the establishment of a connection to close said cross-point and to start said timing means, means operated in response to the closure of said cross-point for operating said charging means in accordance with said zone, and means operated over said cross-point for causing the reoperation of said charging means following a predetermined operation of said timing means.

4. In a telephone system in which a calling line and called lines in a plurality of zones are connected by automatic switches under the con-

trol of registrations set up in common control equipment and a charge is made for such connections in accordance with the respective zones, charge controlling means for operating a charging means individual to a calling line comprising a cross-bar switch having a plurality of cross-points, each cross-point including a plurality of contacts, means operated in accordance with the zone registration in said common control equipment to prepare a corresponding cross-point, timing means, means operated in response to the establishment of a connection to close said cross-point and to start said timing means, means operated over a pair of contact sets of said cross-point for determining the number of operations of said charging means and for measuring an initial conversational time interval in accordance therewith, and means operated over an additional pair of contact sets of said cross-point for determining the number of operations of said charging means for additional conversational periods and for measuring the time of said additional conversational periods.

5. In a telephone system in which a calling line and called lines in a plurality of zones are connected by automatic switches under the control of registrations set up in common control equipment and a charge is made for such connections in accordance with the respective zones, charge controlling means for operating a charging means individual to the calling line comprising a cross-bar zone registering switch operable by said common control equipment, a chain of relays, means responsive to the operation of said cross-bar switch to operate a predetermined number of said relays and to operate said charging means, and means controlled by pairs of said relays for releasing and reoperating said charging means.

6. In a telephone system in which a calling line and called lines in a plurality of zones are connected by automatic switches under the control of registrations set up in common control equipment and a charge is made for such connections in accordance with the respective zones, charge controlling means for operating a charging means individual to the calling line comprising a cross-bar zone registering switch operable by said common control equipment, a chain of relays, means responsive to the operation of said cross-bar switch to operate a predetermined number of said relays in succession, means responsive to the operation of the last of said relays to operate said charging means and to release the first of said relays, and means controlled by pairs of relays in releasing for releasing and reoperating said charging means.

7. In a telephone systems in which a calling line and called lines in a plurality of zones are connected by automatic switches under the control of registrations set up in common control equipment and a charge is made for such connections in accordance with the respective zones, charge controlling means for operating a charging means individual to the calling line comprising a cross-bar zone registering switch operable by said common control equipment, a chain of relays, means responsive to the operation of said cross-bar switch to operate a predetermined number of said relays in succession, means responsive to the operation of the last of said relays to operate said charging means and to release the first of said relays, and means controlled by pairs of said relays in releasing for releasing and reoperating said charging means, said relays being slow to release and the releasing time of alternate relays measuring the operating time for said charging means.

8. In a telephone system in which a calling line and called lines in a plurality of zones are connected by automatic switches under the control of registrations set up in common control equipment and a charge is made for such connections in accordance with the respective zones, charge controlling means for operating a charging means individual to the calling line comprising a cross-bar zone registering switch operable by said common control equipment, a chain of relays, means responsive to the operation of said cross-bar switch to operate a predetermined number of said relays in succession, means responsive to the operation of the last of said relays to operate said charging means and to release the first of said relays, means controlled by pairs of said relays in releasing for releasing and reoperating said charging means, timing means and means for reoperating a number of said chain of relays under the control of said cross-bar switch and said timing means.

9. In a telephone system, a zone and overtime metering control circuit comprising a cross-bar switch having a plurality of cross-points, a plurality of select magnets for preparing said cross-points and a hold magnet individual to said metering control circuit, means to operate one of said select magnets and said hold magnet to operate one of said cross-points as a zone registration, timing means and means to subsequently operate a plurality of said select magnets under the control of said timing means to measure a time interval.

10. In a telephone system, a zone and overtime metering control circuit comprising a cross-bar switch having a plurality of cross-points, a plurality of select magnets for preparing said cross-points and a hold magnet individual to said metering control circuit, means to operate one of said select magnets and said hold magnet to operate one of said cross-points as a zone registration, timing means, means to subsequently operate a plurality of said select magnets under the control of said timing means to measure a time interval, and means under the control of said cross-point and said select magnets to terminate said time interval.

11. In a telephone system, a zone and overtime metering control circuit comprising a cross-bar switch having a plurality of cross-points, each cross-point including a plurality of contacts, a plurality of select magnets for preparing said cross-points and a hold magnet individual to said metering control circuit, means to operate one of said select magnets and said hold magnet to operate one of said cross-points as a zone registration, timing means, means to subsequently operate a plurality of said select magnets under the control of said timing means to measure a time interval, means operated under the control of one contact of said cross-point and said select magnets to terminate said time interval, and means to operate said terminating means over a different contact of said cross-point to terminate additional time intervals.

12. In a telephone system, a zone and overtime metering control circuit comprising a cross-bar switch having a plurality of cross-points, a plurality of select magnets for preparing said cross-points and a hold magnet individual to said metering control circuit, means to operate one of said select magnets and said hold magnet to

operate one of said cross-points as a zone registration, timing means, means to subsequently operate a plurality of said select magnets under the control of said timing means to measure a time interval, and means under the control of said cross-point operated in parallel with one of said select magnets to terminate said time interval.

13. In a telephone system, a zone and overtime metering control circuit comprising a cross-bar switch having a plurality of cross-points, each cross-point including a plurality of contacts, a plurality of select magnets for preparing said cross-points and a hold magnet individual to said metering control circuit, means to operate one of said select magnets and said hold magnet to operate one of said cross-points as a zone registration, timing means, means to subsequently operate a plurality of said select magnets under the control of said timing means to measure a time interval, means operated in parallel with one of said select magnets under the control of one contact of said cross-point to terminate said time interval, and means to operate said terminating means in parallel with a desired one of said select magnets over a different contact of said cross-point to terminate additional time intervals.

14. In a telephone system, a zone and overtime metering control circuit for controlling the operation of a subscriber's message register comprising a cross-bar switch having a plurality of cross-points, each cross-point including a plurality of contacts, select magnets for controlling the operation of a particular cross-point as a zone registration, timing means, means for subsequently placing said select magnets under the control of said timing means, a chain of relays, means for operating said subscriber's message register under the control of said chain of relays, means for marking said select magnets and said chain of relays for operation over certain contacts of said cross-points, means for rendering said certain contacts of said cross-point effective in response to the establishment of a telephone connection, and means for subsequently rendering other contacts of said cross-point effective in response to the operation of said timing means for marking said select magnets and chain of relays for reoperation.

15. In a telephone system in which a calling line and called lines in a plurality of zones are connected by automatic switches under the control of registrations set up in a common control equipment and a charge is made for such connections in accordance with the respective zones, a plurality of charge controlling means, an idle one of which is associable with an established connection, each of said controlling means comprising a cross-bar zone registering switch operable by the common control equipment, an impulse transmitting means common to said plurality of charge controlling means, means for associating said common impulse transmitting means with the charge controlling means seized for use and means responsive to the operation of the cross-bar register switch of said charge controlling means for controlling said impulse transmitting means to transmit impulses for operating the charging means of the calling line.

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