

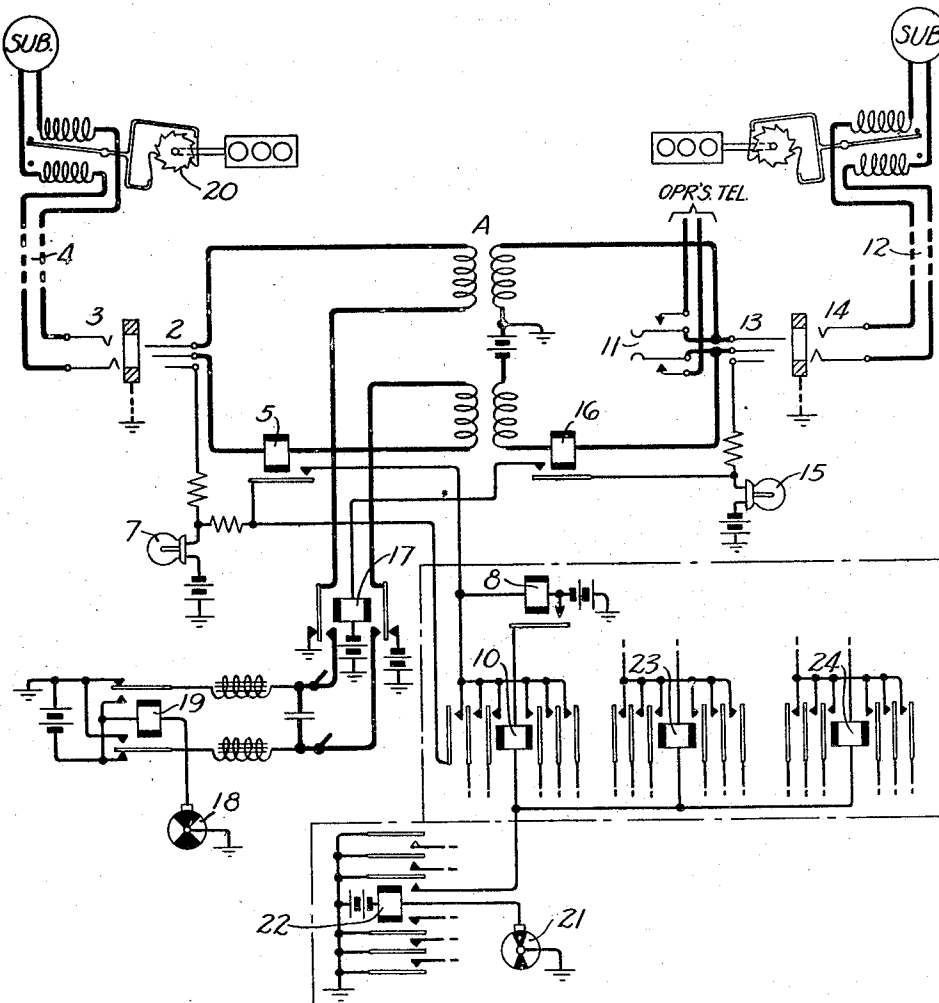
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C. B. FOWLER

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TELEPHONE EXCHANGE SYSTEM

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INVENTOR
C. B. FOWLER
BY *[Signature]*
ATTORNEY

UNITED STATES PATENT OFFICE

CLARENCE B. FOWLER, OF QUEENS VILLAGE, NEW YORK, ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

TELEPHONE EXCHANGE SYSTEM

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This invention relates to telephone exchange systems and particularly to systems in which the service charge is based on the duration of conversation.

The objects are to effect economy in the use of equipment and to secure greater reliability in the operation of the central office controlling circuits.

It has been proposed in the past to charge a calling subscriber for the service rendered by means of a meter, located at his substation, which operates in response to reversals of current in the calling line at successive intervals during the period the conversational connection is established between his line and the called line. To this end a current reversing device is provided at the central office and is rendered effective either when connection is completed to the calling line, as by the insertion of the answering plug of a cord circuit, or when the called party answers. In systems involving operators' cord circuits, the process of reversing current may result in the repeated release and operation of the answering supervisory relay, causing the lamp to flicker.

According to the present invention, an improvement is secured over prior systems by the provision of an equipment common to a number of cord circuits so arranged that the contacts of the supervisory relays of all related cords are shunted by short-circuits applied during the period the source of current is in a reversed condition. This permits the supervisory relays to release without causing the lamps to flicker.

This invention has been shown in the accompanying drawing in which it has been incorporated in a cord circuit well known in the art. A calling subscriber's line and a called subscriber's line have also been shown equipped with service meters.

A description of a connection through this cord circuit from a calling subscriber to a called subscriber will now be made. When the operator inserts plug 2 of cord circuit A into jack 3 of a calling subscriber's line 4, the supervisory relay 5 is operated, over an obvious circuit through the subscriber's loop and the supervisory lamp 7 which would ordi-

narily be lighted in the usual manner through the sleeve circuit will therefore not be lighted in this case due to the short circuit established therefore by the operation of relay 5. Relay 5 in operating causes relay 8 to operate in a circuit from battery, winding of relay 8, armature and front contact of relay 5, to ground through the sleeve circuit. Relay 8 is common to a plurality of cord circuits such as A and will presently cause the operation of another relay 10 which is also common to the same plurality of cord circuits as will hereinafter be described.

The operator now actuates a talking key 11 to connect her telephone set across the tip and ring conductors of the cord to ascertain the number of the desired subscriber. When the operator receives this number she may complete the connection to the wanted subscriber's line 12 by inserting plug 13 into jack 14. The supervisory lamp 15 is thereby lighted through the sleeve circuit. The subscriber may now be rung in the usual manner through the operation of a ringing key (not shown) and when the subscriber answers the call the supervisory relay 16 operates through the subscriber's loop in the usual manner. Relay 16 in operating establishes a circuit for the operation of relay 17 from battery, winding of this relay, armature and front contact of relay 16, to ground through the sleeve circuit at plug 13 and jack 15. The operation of relay 17 disconnects the normal talking battery supply from the tip and ring conductors of the cord and connects these conductors to the meter operating battery which also serves as the talking battery for the calling subscriber's line while the called subscriber's line is connected thereto. The polarity of this battery is reversed at periodic intervals under control of interrupter 18 and relay 19, as is well known in the art, and cause the periodic operation of the meter 20 in the calling subscriber's line to register a call.

Referring now again to the effect produced by the operation of relay 8. The interrupter 21 and relay 22 are common to a large number of cord circuits such as A and preferably common to all cord circuits in an exchange, whereas relays such as 10, 23 and 24 are indi-

vidual to smaller groups of cord circuits. Relays 10, 23, and 24 have been shown as common to six cords each. The interrupters 21 and 18 are constantly rotating at the same speed. The live segments of interrupter 21 are larger than the live segments of interrupter 18 and are so arranged that during a portion of the time relay 22 is operated by interrupter 21, relay 19 is operated by interrupter 18. When relay 22 is operated, the circuit partially closed by the operation of relay 8, will be completed to ground to cause the operation of relay 10. Relays 23 and 24 will also be operated during this period provided the relays corresponding to relay 8 for other groups are operated. When relay 10 operates a short-circuit is closed around the armature and front contact of the supervisory relay 5 so as to prevent the circuit for lamp 7 to be completed during the reversal of the battery, which might occur if relay 5 is released while this reversal is taking place. That is the interrupter 21 is so arranged in relation to interrupter 18 that relays 22 and 10 will only be operated while the battery is reversed. Consequently lamp 7 will not give false indications during the period a connection is established.

When the called subscriber disconnects, the supervisory relay 16 is released which causes the release of relay 17 to disconnect the meter operating and talking battery and cause the normal talking battery for the calling subscriber's line to be replaced when the calling subscriber hangs up his receiver on the hook, relay 5 will release and lamp 7 light to indicate this condition. The operator may then remove the plug 2 from jack 3, and plug 13 from jack 14 in the usual manner.

It should be understood that while the invention has only been illustrated in connection with one cord circuit, it may readily be applied to other circuits without departing from the spirit thereof.

What is claimed is:

1. In a telephone system, calling lines, called lines, connecting circuits for interconnecting the calling lines with said called lines, registers for the calling lines, a source of current for supplying the calling lines, means for periodically changing the condition of the flow of current in the calling lines to operate the registers thereof, supervisory relays, one for each connecting circuit and arranged to be included in the calling line circuit during conversation, signals, each controlled by a respective one of said relays, and means common to a number of said connecting circuits for removing said signals from the control of the corresponding relays during the period the current in the calling lines is in a changed condition.

2. In a telephone system, calling lines, called lines, meters for said lines, connecting circuits for connecting a calling line with a

called line including a supervisory relay and a signal, meter operating means comprising a battery reversing device arranged to operate the meter of the calling subscriber's line when a connection is established and the battery is reversed, means for maintaining the supervisory relay operated when a connection is established, means for maintaining said signal in non-operated condition when said supervisory relay is operated, and means common to a number of said connecting circuits for maintaining the signal in non-operated condition when the battery reversal takes place.

3. In a telephone system, calling lines, called lines, meters for said lines, connecting circuits for connecting a calling line with a called line including a supervisory relay and a signal, meter operating means including a battery reversing device and arranged to operate the meter of the calling subscriber's line when a connection is established and the battery is reversed, means for maintaining the supervisory relay operated while a connection is established and no battery reversal takes place, means for maintaining the signal in a non-operated condition in response to the operation of the supervisory relay, and means common to a plurality of connecting circuits for maintaining the signal in a non-operated condition if said relay is released during reversal of current.

4. In a telephone system, calling lines, called lines, meters for said lines, connecting circuits for connecting calling lines with called lines, a supervisory relay and a signal for each connecting circuit, a meter operating device including an interrupter, a battery supply and means controlled by said interrupter for alternately reversing connections from said battery supply to said calling line to operate the meter thereat, means for maintaining said signal in a non-operated condition in response to the operation of the supervisory relay, means for maintaining said supervisory relay operated in response to the connection from said battery when applied to the calling line in one direction or the other, an interrupter common to a plurality of connecting circuits, said second interrupter being synchronized with said first interrupter to maintain said signal in non-operated condition when current from said battery is reversed from one direction to the other.

5. In a telephone system, calling lines, called lines, meters for said lines, connecting circuits for connecting a calling line with a called line including a supervisory relay and a signal, meter operating means including a battery reversing device, means for maintaining the supervisory relay operated while a connection is established when no battery reversal takes place, means for maintaining the signal in a non-operated condition

tion in response to the operation of the supervisory relay, and means common to a plurality of connecting circuits for maintaining the signal in non-operated condition during and for a slightly longer period than the
5 period of reversal of battery.

6. In a telephone system, calling lines, called lines, meters for said lines, connecting circuits for connecting a calling line with
10 a called line, a supervisory relay and a signal for each connecting circuit, an interrupter, a battery supply, means controlled by said interrupter for alternately reversing connections from said battery supply to said calling line to operate the meter thereof, means
15 for maintaining said supervisory relay operated in response to the connection from said battery supply when applied to the calling line in one direction or the other, means
20 for maintaining said signal in a non-operated condition in response to the operation of the supervisory relay, another interrupter common to a plurality of connecting circuits for maintaining said signal in non-operated
25 condition, and means for synchronizing said interrupters so that the period of maintaining said signal in non-operated condition by said second interrupter overlaps the period of reversal of current from said battery to
30 the line.

7. In a telephone system, calling lines, called lines, meters of said lines, connecting circuits for connecting a calling line with a
35 a called line including a supervisory relay and a signal, meter operating means including a battery reversing device and an interrupter, means for maintaining the supervisory relay operated while a connection is established and no battery reversal takes place, means
40 for maintaining the signal in a non-operated condition in response to the operation of the supervisory relay, and means common to a plurality of connecting circuits including
45 another interrupter for controlling the maintenance of the signal in a non-operated condition for the period during which the reversal of current from said battery to the line takes place.

In witness whereof, I hereunto subscribe
50 my name this 10th day of February, 1930.

CLARENCE B. FOWLER.

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