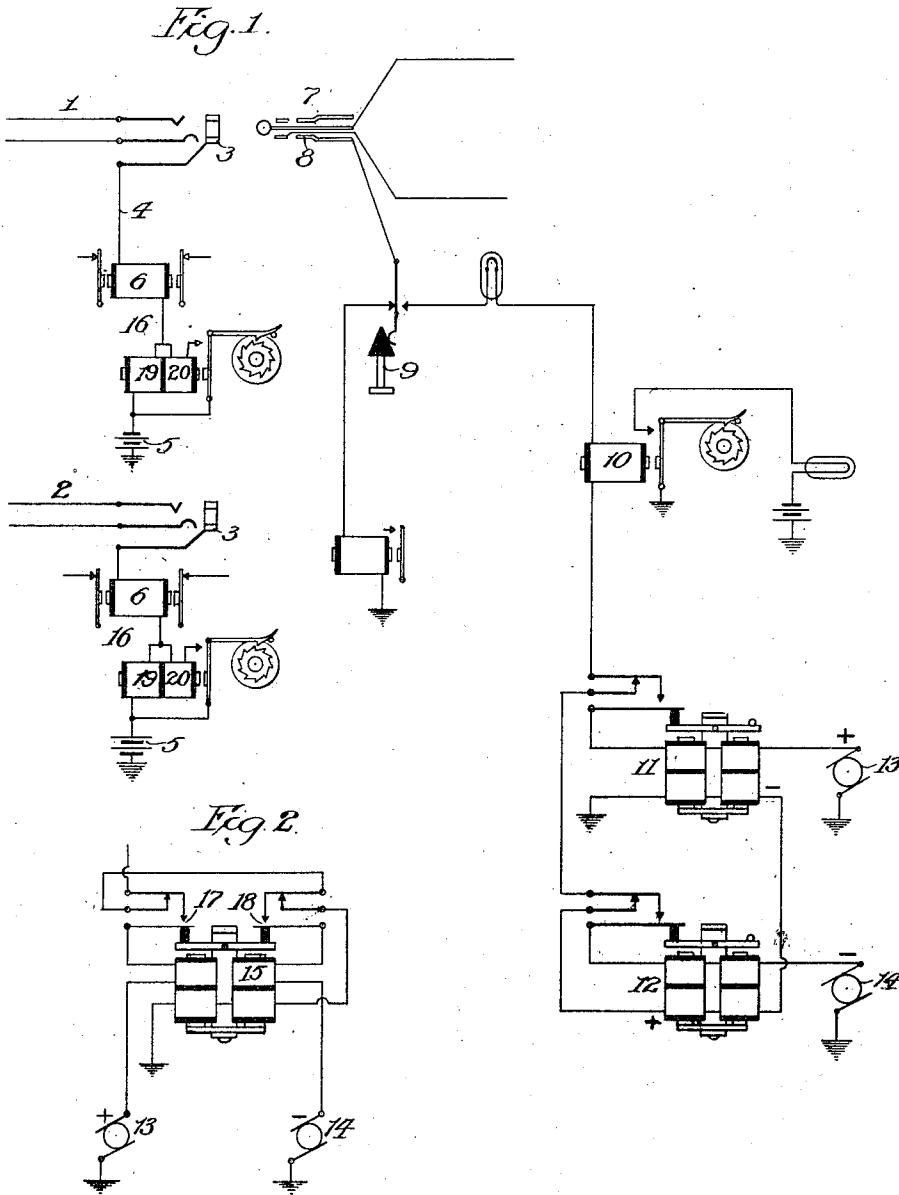


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SERVICE METER CIRCUIT FOR TELEPHONE EXCHANGE SYSTEMS.
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UNITED STATES PATENT OFFICE.

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SERVICE-METER CIRCUIT FOR TELEPHONE-EXCHANGE SYSTEMS.

966,733.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ALBERT M. BULLARD, citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Service-Meter Circuits for Telephone-Exchange Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to apparatus and circuits for operating service meters in telephone exchange systems. It has application especially to systems of the automatic or semi-automatic type, in which each set of line terminals includes a contact-piece known as the test-contact, to which electrical potential from a battery is normally applied.

It has been proposed in certain cases to distinguish lines of different characteristics or different multiple terminals of the same line in such a system by potential of different polarities applied to the test contacts, and by such different polarities to automatically determine certain operations of the switching apparatus.

In telephone exchange systems of the ordinary "manual" type, the subscriber's service meter, if located at the central office, is usually connected in the ground branch which includes the cut-off relay of the line. The meter is of the marginal type, and is unaffected by the current which works the cut-off relay, but is operated by current of extra strength which the operator applies by means of a key associated with her cord circuit. This arrangement cannot well be applied to a case where, as above mentioned, the branch from the test contact of the line is connected to the free pole of a battery which may be of one polarity for some lines and of the opposite polarity for others, for the reason that this battery would sometimes oppose the current applied by the operator's key and so prevent the operation of the service meter.

In accordance with the present invention, I provide two sources of current of opposite polarity associated with the connecting device or cord circuit, the application of which is selectively determined by polarized relay apparatus responsive to the potential existing at the test contact of the line.

In the accompanying drawing, Figure 1 is a diagram illustrating the line terminals

or springjacks of two telephone lines equipped with service meters, and an operator's connecting plug with its associated apparatus for operating the service meter of any line. Fig. 2 is a diagram showing an alternative polarized relay apparatus, which may be used instead of the two polarized relays shown in Fig. 1.

The same reference numerals indicate the same parts in both figures.

Each of the subscriber's lines 1 and 2, shown in the diagram, has the test ring 3 of its springjack connected to a branch 4 leading to the free pole of a grounded battery 5, the usual cut-off relay 6 and a marginal service meter 16 being included in this branch. In the case of line 1, however, the positive pole of the battery is the one that is grounded, while in the case of line 2, it is the negative pole of the battery that is grounded.

The operator's answering plug 7 has a sleeve contact piece 8 which is adapted to engage the test ring 3 of any springjack into which the plug is inserted. The operator is provided with a key 9 for causing the operation of the service meter of any line with which connection has been made. This key is adapted when actuated to close a branch extending from the sleeve 8 through the "operator's position meter" 10, and through the polarized relay apparatus to ground, such polarized relay apparatus being responsive to the current received from the test contact of the jack.

In the apparatus shown in Fig. 1, there are two polarized relays, 11 and 12, one responding to positive current and the other to negative current. Each relay is arranged to operate contacts which open the normal branch through the energizing windings of both relays, and close an alternative branch through a special locking winding of the operated relay to the free pole of a generator 13 or 14, as the case may be.

The relay 11, which responds to negative current received from the test ring of the jack, is adapted to extend the branch circuit to the positive pole of the generator; and the relay 12 which responds to positive current, extends the branch circuit to the negative pole of the generator. Thus, upon depression of the key 9, positive current from generator 13 or negative current from generator 14 is applied to the service meter 16

of the line with which connection has been made, according as the potential existing upon the test ring of the springjack of such line is negative or positive. In either case, the polarity of the generator current is thus automatically selected to assist instead of opposing the battery 5 associated with the line.

Each of the polarized relays is provided with a locking winding in the circuit which it closes from the corresponding generator, these locking windings being so connected that the magnetization produced by the generator current therein will cause the armature to maintain the contact closed by which such current is applied.

In Fig. 2 I have illustrated a modified form of polarized relay apparatus in which a single relay 15 takes the place of the two relays shown in Fig. 1. The armature of this relay is arranged to operate one or the other of two sets of switch springs 17, 18, according as said armature is tilted in one direction or the other, whereby current from generator 13 or generator 14 may be applied, according as the current received from the test ring of the jack is of one polarity or the other.

The subscriber's service meter or registering apparatus 16 is of the marginal type, and will not respond to current from battery 5, but will be operated by current from either generator 13 or 14. It is provided with a high-resistance energizing winding 19, and a low resistance locking winding 20, in a shunt about said high resistance winding, said shunt being controlled by a relay contact closed in the operation of the meter.

A meter 10 is provided for all the connecting circuits of an operator's position. This meter is also marginal and will not be operated by current from battery 5, nor by current from either generator unless the subscriber's meter is first operated to shunt out the high resistance winding 19.

Ordinarily, the operator will not depress the service-meter key 9 until the termination of a conversation. When she does so, current from either generator 13 or 14 (according to the polarity of current which is received from the test ring of the jack by the polarized relay apparatus) will be applied in the local circuit, energizing the magnet of the subscriber's meter 16. As this meter is operated and closes the shunt of its high resistance winding, the operator's position meter 10 receives increased current and is operated. When the operator's meter 10 thus indicates that the call has been properly registered upon the subscriber's meter, the operator will withdraw the plug from the springjack of the line.

Claims:

1. In a telephone system, the combination with lines each having a marginal service meter associated therewith, and a terminal

to which battery potential is applied through such meter, of an operator's connecting device for making connection with the terminal of any line, sources of current of different polarity associated with the operator's connecting device, a key for applying the same to operate the service meter of the line to which connection has been made, and polarized relay apparatus adapted automatically to select the source of current to be applied by said key.

2. The combination with line terminals and a connecting device adapted to be united therewith, of a local circuit completed in making connection with any line terminal, said circuit including a branch associated with such line terminal and a branch associated with the connecting device, a source of current in the branch associated with each line terminal, adapted to apply to the branch associated with the connecting device a potential of one polarity or the other according to the line to which connection is made, a device to be operated in the line-terminal branch, polarized relay apparatus in the connecting branch, and means controlled thereby for operating said device in the line-terminal branch.

3. In a telephone system in which a contact-piece for each line is connected by a branch through a service meter to a battery, the polarity being different for different lines, the service meter being unresponsive to current from said battery, polarized relay apparatus in a branch adapted to be brought into circuit with the first mentioned branch by a connecting device, and sources of current of different polarity adapted to be connected in the circuit by said polarized relay apparatus, according to the alternative operation thereof, whereby current may be applied to said first-mentioned branch, of proper polarity to assist the battery in such branch and operate the service meter.

4. In a telephone system, the combination with line terminals each having a contact-piece from which a branch extends through the magnet of a marginal service meter to a battery which is insufficient to operate said meter, the polarity of such battery being different for different lines, of a connecting device and two polarized relays brought thereby into circuit with the branch associated with any line-terminal in making connection with such line, said relays having sources of current of opposite polarity, respectively, associated therewith, each relay having a locking winding and contacts adapted to connect its associated source of current through its locking winding to the service meter branch of the line to which connection has been made; whereby the polarity of current to be applied to said service meter branch is automatically determined.

5. The combination with telephone lines

of different classes, each having registering apparatus, of a terminal for each line, and means for establishing a distinctive electrical condition at such terminal according to the class of line, a device for making connection with the line, sources of current of differing character, and automatic means associated with the connecting device adapted in response to the distinctive electrical condition at the terminal of the line to which connection is made, to select the source of current to be applied to such line.

6. The combination with telephone lines each having associated registering apparatus and a terminal to which potential is applied through said apparatus, of a device for making connection with the terminals of the lines, sources of current of different polarity associated with the connecting device, and which may be applied to the registering apparatus of a line with which connection has been made, and automatic means

for selecting the source of current to be applied to the connected line.

7. In a telephone system, the combination with a plurality of telephone lines terminating in an exchange, register apparatus associated with each of said lines, a source of current connected to a terminal of each of said lines through said register apparatus, switching apparatus adapted to extend the circuit of said lines, sources of current of different polarity associated with said switching apparatus, one of which sources of current is adapted to operate the register apparatus of an extended line and automatic means for selecting such source of current.

In witness whereof, I, hereunto subscribe my name this 24th day of July A. D., 1908.

ALBERT M. BULLARD.

Witnesses:

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WM. H. YOUNG.