

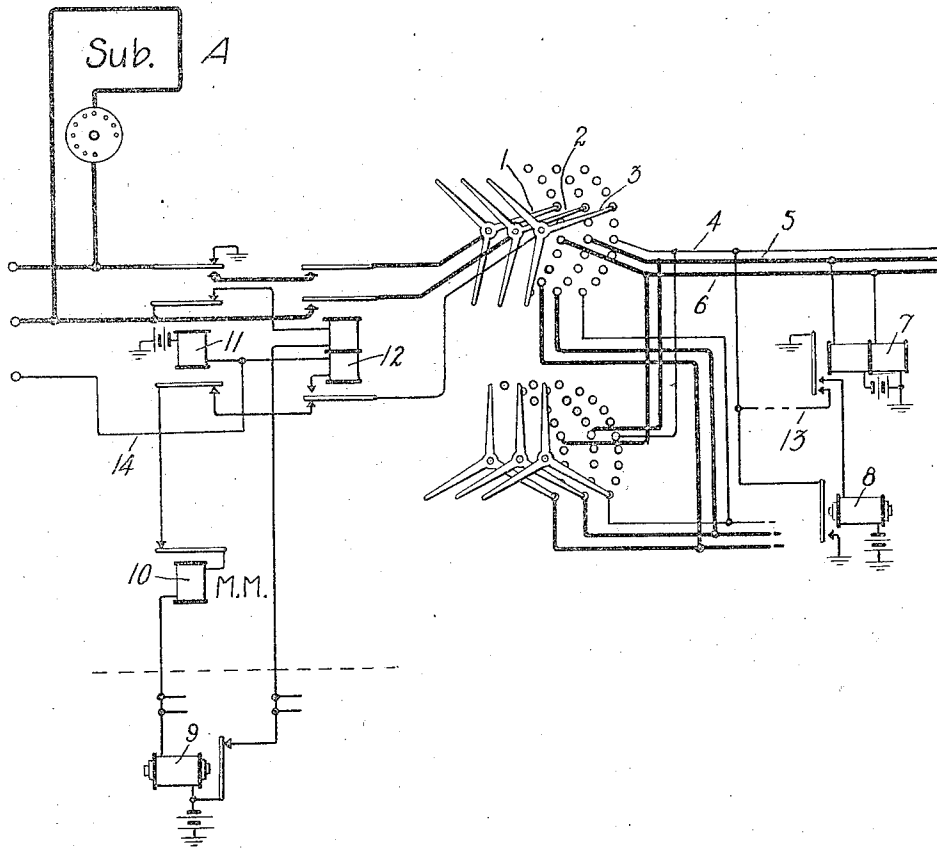
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E. H. CLARK

TELEPHONE SYSTEM

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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

Application filed February 7, 1919. Serial No. 275,617.

To all whom it may concern:

Be it known that I, EDGAR H. CLARK, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Telephone Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to improvements in telephone systems and has particular reference to a line switch therefor.

In known constructions of rotary line switches individual to subscribers' lines, it has been customary to employ several relays which commercially materially increase the cost of production. Also, in switches of this character, a possibility of double connections exists when two calls are made simultaneously.

An object of the present invention is to provide a line switch employing a minimum number of relays and in which the possibility of a double connection, due to simultaneous calls, is reduced.

Another object is to facilitate the establishment of a connection by providing an improved switch which has no normal position and which preselects a trunk leading to an idle selector.

The inventive idea involved is capable of receiving a variety of expressions, one of which, for the purpose of illustrating the invention, is shown in the accompanying drawings; but it is to be expressly understood that such drawing is employed merely for the description of the invention as a whole and not to define the limits thereof, reference being had to the appended claims for this purpose.

The drawing illustrates diagrammatically a circuit for the line switch embodying the present invention and so much of a selector switch as is necessary to a complete understanding of the invention.

It is believed that the invention will be best understood by describing the operation. In order that the wipers or brushes of the line switch will, at all times, be in electrical engagement with terminals of a trunk leading to an idle selector switch, and thus decrease the time required in establishing a connection, it is proposed to step the wipers or brushes of the switch, while the associated subscriber's telephone line is idle, from one set of terminals to the terminals

of an idle trunk when the trunk connected to the first set becomes busy. Assume that the telephone line of sub-station A is idle and that the wipers 1, 2 and 3 of the line switch associated with such telephone line are in electrical engagement with terminals to which conductors 4, 5 and 6 are connected. In this instance, should the selector switch to which said conductors lead be seized by another line switch, line relay 7 and slow-to-release relay 8 of the selector switch will become energized in the well-known manner. A circuit will then be established which may be traced from grounded battery, winding of slow-to-release relay 9, common to a group of telephone lines and line switches including the line and switch of substation A, winding of motor magnet 10, armature and back contact thereof, lower armature and back contact of cutoff relay 11, lower armature and back contact of line relay 12, wiper 3, conductors 4 and 13, front contact and armature of line relay 7 of the selector switch to ground. Magnet 10, being self-interrupting, operates in the well-known manner to step wipers 1, 2 and 3 of the line switch onto the next succeeding set of terminals where the same will remain if the trunk connected to said terminals is idle. Should this trunk be busy, a circuit similar to the one just described will be closed to step the wipers onto the next set of terminals, and this operation continues until an idle trunk is reached. Relay 9 also becomes energized in the above-traced circuit and since this relay is common to a plurality of line switches, it is obvious that, in attracting its armature, the same will prevent operation of any line switch during the time that an idle trunk is being sought. It is therefore apparent that the line switch preselects a trunk leading to an idle selector and therefore prepares a circuit for the establishment of a connection when a call is initiated at the subscriber's substation individual to the line switch.

Assuming now that the subscriber at sub-station A removes his receiver to initiate a call and that wipers 1, 2 and 3 are in electrical engagement with the terminals of conductors 4, 5 and 6, a circuit will be established extending from grounded battery, armature and back contact of relay 9, upper winding of line relay 12, back contact and innermost upper armature of cutoff re-

lay 11, apparatus at substation A, outermost upper armature and back contact of relay 11 to ground. Relay 12 is energized and in attracting its lower armature, interrupts the stepping circuit for the switch. By attracting its upper armatures, said relay prepares the subscriber's telephone line for extension to the first selector switch. Energization of relay 12 also establishes a circuit extending from grounded battery, left winding of line relay 7, conductor 5, wiper 2, innermost upper armature and front contact of relay 12, apparatus at substation A, outermost upper armature and back contact of relay 11 to ground. Relay 7 operates and immediately places ground upon conductor 13 which provides a busy potential to prevent seizure of the selector switch by another line switch. Slow-to-release relay 8 of the selector switch also energizes over a circuit extending from grounded battery, winding of relay 8, front contact and armature of relay 7 to ground. Placing ground upon the armature of relay 8, maintains the busy test condition throughout the operation of the selector switch. Upon energization of relay 7, a circuit is also established for cutoff relay 11 which may be traced from grounded battery, winding of relay 11, lower winding, front contact and lower armature of relay 12, wiper 3, conductors 4 and 13, front contact and armature of relay 7 to ground. Relay 11 is energized to complete the extension of the subscriber's line to the selector switch, and relay 12 is locked by the energizing circuit for relay 11. By attracting its lower armature, relay 11 further interrupts the stepping circuit for the wipers of the line switch. The subscriber may now proceed to operate his impulse sending device in the well-known manner to control the operation of a train of switches employed in establishing a connection to a called subscriber's line. The busy condition of substation A will be denoted by ground at the armature of either of the relays 7 or 8, which ground is placed upon the test terminal of the substation through conductor 4, wiper 3, lower armature and front contact of relay 12, winding of said relay and conductor 14.

At the termination of conversation, relays 7 and 8 of the selector switch become deenergized in the well-known manner, and upon removal of ground from their armatures, the holding circuit for relay 12 and energizing circuit for relay 11 is broken. Upon the release of the armatures of said relays, the parts will again be in normal position, with wipers 1, 2 and 3 in electrical engagement with conductors 4, 5 and 6 leading to an idle selector switch.

What is claimed is:

1. In a telephone system, telephone lines, a non-numerical switch individual to each of

said lines, trunk lines accessible in common to said switches, wipers for each of said switches normally in electrical engagement with the terminals of a trunk line whereby one or more of said trunk lines are preselected for the use of different lines having access thereto, and means effective when a trunk line is taken for use over the wipers of one of said switches for advancing the wipers of such other switches as are at the time in engagement therewith to preselect the next succeeding idle trunk line.

2. In a telephone system, telephone lines, a non-numerical switch individual to each of said lines, trunk lines accessible in common to said switches, wipers for each of said switches normally in electrical engagement with the terminals of a trunk line whereby one or more of said trunk lines are preselected for the use of different lines having access thereto, means effective when a trunk line is taken for use over the wipers of one of said switches for advancing the wipers of such other switches as are at the time in engagement therewith to preselect the next succeeding idle trunk line, and means for extending a calling telephone line to the trunk line taken for use and for rendering the preselecting means of the switch individual thereto ineffective.

3. In a telephone system, a telephone line, a non-numerical switch individual to said line, trunk lines leading from said switch, wipers for said switch normally in electrical engagement with one of said trunk lines, means individual to said non-numerical switch for operating the wipers thereof to preselect a trunk line, and a relay operative upon its energization for extending said telephone line and for rendering the last named means ineffective.

4. In a telephone system, telephone lines, a non-numerical switch individual to each line, a group of trunk lines leading from said switches, wipers for each of said switches normally in electrical engagement with the terminals of a trunk line, whereby one or more of said trunk lines are preselected for the use of different lines having access thereto, operating means effective when a trunk line is taken for use over the wipers of one of said switches for advancing the wipers of such other switches as are at the time in engagement therewith to preselect the next succeeding idle trunk line, a relay operative upon its energization for extending said telephone line, and a circuit for said operating means extending through an armature of said relay, said circuit being opened when said relay is operated to extend the telephone line.

5. In a telephone system, telephone lines, a non-numerical switch individual to each of said lines, trunk lines accessible in common to said switches, wipers for each of said

switches normally in electrical engagement with the terminals of a trunk line whereby one or more of said trunk lines are preselected for the use of different lines having access thereto, means individual to each of said switches and effective when a trunk line is taken for use over the wipers of one of said switches for advancing the wipers of such other switches as are at the time in engagement therewith to preselect the next succeeding idle trunk line, a relay for extending a calling telephone line and for rendering the preselecting means of the switch individual thereto ineffective, and means for rendering said relay ineffective during the operation of such switch.

6. In a telephone system, a group of telephone lines, a non-numerical switch individual to each line, trunk lines leading from each of said switches, wipers for each switch always in electrical engagement with one of said trunk lines, means individual to each non-numerical switch for operating the wipers thereof to preselect an idle trunk line, means for extending the telephone line associated with each non-numerical switch and for controlling said operating means, and a relay common to the group of non-numerical switches associated with said telephone lines for controlling the operation of the last-named means of each non-numerical switch.

7. In a telephone system, a group of telephone lines, a non-numerical switch individual to each line, trunk lines leading from

each non-numerical switch, wipers for each switch always in electrical engagement with one of said trunk lines, a motor magnet individual to each non-numerical switch for operating the wipers thereof to preselect an idle trunk line, a relay for each non-numerical switch for extending the associated telephone line, a controlling circuit for said motor magnet extending through an armature of said relay, a second relay common to the group of non-numerical switches associated with said telephone lines, and a circuit for the first-named relay controlled by said second relay.

8. In a telephone system, a telephone line, a non-numerical switch individual to said line, a group of trunk lines leading from said switch, wipers for said switch always in electrical engagement with one of said trunk lines, means individual to said switch, effective when the trunk line with which said wipers are engaged is taken for use for operating said wipers to preselect the next succeeding idle trunk line of said group, a relay for extending said telephone line and for rendering the last named means ineffective, and means for rendering said relay ineffective during the operation of the wipers of said switch.

In witness whereof, I hereunto subscribe my name this 30th day of January, A. D. 1919.

EDGAR H. CLARK.