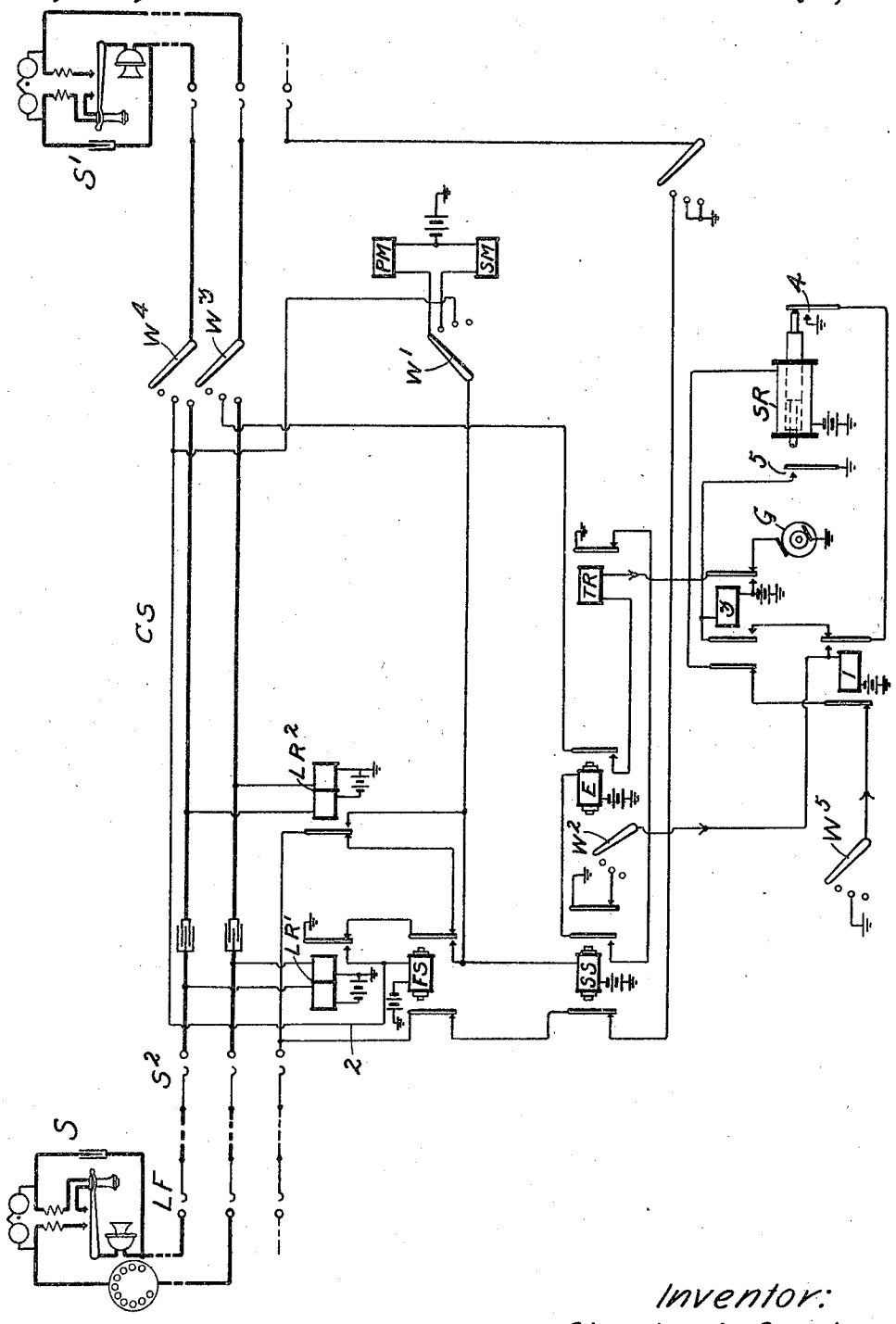
C. L. GOODRUM.

SIGNALING DEVICE.

APPLICATION FILED MAY 14, 1917.

1,383,802.

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UNITED STATES PATENT OFFICE.

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SIGNALING DEVICE.

1,383,802. Specification of Letters Patent. Patented July 5, 1921.

Application filed May 14, 1917. Serial No. 168,441.

To all whom it may concern:

Be it known that I, CHARLES L. GOODRUM, 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 Signaling Devices, of which the following is a full, clear, concise, and exact description.

This invention relates to signaling devices of the kind used in machine switching telephone systems for ringing telephone bells, and has for its object the provision of means whereby a called subscriber's bell may be rung immediately that the connector switch has placed its wipers upon the terminals of the desired party's line.

According to the modern practice in telephone systems, ringing current is applied, not continuously, but for short periods of time interspersed with periods known as silent intervals. In such systems it often happens that a second line is seized while the ringing machine is passing through a silent interval, in which case there is a delay before the second called party is rung. In the interest of efficient and rapid service this situation is to be deplored, it being thought best to cause the called party's bell to be rung immediately.

A feature of the present invention is the provision of a slow-acting relay, which controls the ringing and silent intervals in the signaling device. According to this feature, the ringing current is applied to a line immediately upon its seizure, and is only cut off to allow the time for a silent interval when the slow-acting relay has completed its travel. During the return movement of the slow-acting relay, silent battery current is supplied in place of the ringing current in the well-known manner.

An additional feature is the employment of a relay unresponsive to the first demand on the ringing device but responsive to all additional demands, whereby the slow acting relay is halted in its operation regardless of the stage of operation and caused to return to normal, and whereby ringing current is instantly supplied to the connector switch which has made the additional demand on the device.

It is thought the invention will best be understood from the following detailed description, reference being had to the accompanying drawing, in which a calling substation, an indicated line finder switch, an indicated selector switch, a connector switch embodying the features of this invention, and a called substation are diagrammatically represented.

The calling substation is represented by the character S, the called substation by the character S^1, the line finder by the character LF, the first selector by the character S^2, and the connector switch by the character CS. The source of ringing current is the generator G, and the slow-acting relay, which controls the periodical application of the ringing current, is represented by the character SR.

Upon the removal of the receiver from the hook at the calling substation, the line finder switch is actuated in the well-known manner, after which, through the manipulation of the dial switch at the calling substation, the first selector S^2 is caused to seize the connector switch CS, whereupon a circuit is established from ground, the right-hand winding of relay LR^1, the lower limb of the telephone line, through the apparatus of the calling substation to the upper limb of the telephone line, through the left-hand winding of the relay LR^1 to battery and ground. Relay LR^1 attracts its armature and establishes a circuit for the energization of the first slow relay FS from ground, the armature and alternate contact of relay LR^1, the winding of relay FS to battery and ground. Relay FS attracts its armatures and prepares a circuit for the energization of the second slow relay SS.

Upon the manipulation of the dial switch at the calling subscriber's substation, the armature of relay LR^1 is caused to vibrate in the well-known manner. Upon its first retraction, a circuit is established from ground, the armature and normal contact of relay LR^1, the right-hand armature and alternate contact of relay FS to a point where the circuit divides, extending in one direction, through the side-switch wiper W^1 and its first position contact, winding of the primary magnet PM to battery and ground, and in the other direction, through the second slow relay SS to battery and ground. Magnet PM responds to each retraction of the armature of the relay LR^1, but the relay SS, being slow to release, holds its armatures

in their attracted position. During the attraction of its armatures by the relay SS, a circuit is established from ground, the contact and armature of the tripping relay TR, the inner right-hand contact and armature of the second slow relay SS, the winding of escape magnet E to battery and ground. Upon the termination of this series of impulses, relay LR^1, by holding its armature permanently attracted for a considerable period of time, opens the previously traced circuit for the energization of relay SS. Relay SS retracts its armatures, and, by thus opening the circuit of the escape magnet E, allows it to retract its armature, thereby moving the side-switch wipers into their second position.

Upon the next manipulation of the dial switch at the calling subscriber's substation, the secondary magnet SM is operated in the manner similar to the operation of the primary magnet, and during this operation the second slow relay SS is energized as before. The escape magnet E is also energized, and, at the end of the second series of impulses, upon deënergization, it moves the side-switch wipers into the third position.

A circuit is now established from ground, the outer right-hand armature and contact of relay SS, the third position contact and side-switch wiper W^2, the winding of relay 1 to battery and ground. Relay 1 momentarily attracts its armatures, since the circuit just described is almost immediately broken through a circuit which is set up from ground, the armature and alternate contact of relay LR^1, the conductor 2, the third position contact and side-switch wiper W^1, the winding of second slow relay SS to battery and ground. The function of this impulse given to relay 1 will be described hereinafter.

In position 3 of the side switch, ringing current from the generator G will flow through the normal contact and right-hand armature of the relay 3, the winding of tripping relay TR, the contact and armature of escape magnet E, which is energized by the action of second slow relay SS, through the third position contact and side-switch wiper W^3, the brushes of the connector switch, the call bell of the called subscriber's substation S^1, the side-switch wiper W^4 and its third position contact, through the conductor 2, the alternate contact and armature of the relay LR^1 to ground. The called subscriber's bell will, therefore, immediately begin to ring.

At the same time a circuit is established from ground, the third position contact and side-switch wiper W^5, the contact and left-hand armature of the relay 1, the contact and the outer left-hand armature of the relay 3, the winding of the slow relay SR to battery and ground. Relay SR is energized in this circuit, and the consequent actuation of its moving element immediately causes the actuation of the contacts 4.

In a certain period of time, which may be accurately adjusted, the moving element of the relay SR will complete its travel and close the contact 5, whereupon a circuit will be established from ground, the contact 5, the winding of relay 3 to battery and ground. Relay 3, by attracting its armatures, first switches the lead, supplying ringing current through the connector switch to the called subscriber's substation from the generator G, to the silent battery at its alternate contact. At the same time it establishes a holding circuit from ground, the contact 4, the right-hand armature and normal contact of relay 1, the inner left-hand armature and contact of relay 3, the winding of relay 3 to battery and ground. This circuit will then be maintained until relay SR returns its moving element to the normal position, since, upon the actuation of relay 3, its energizing circuit was broken at the outer left-hand armature and contact of relay 3.

Relay SR, upon reaching its normal position, will open contact 4, relay 3 will be deënergized, and relay SR will again be energized. The operations described will take place again and again until the called subscriber, in response to the summons of his bell, removes his receiver from its hook. Thereupon the current flowing through the tripping relay TR is increased to such an extent that the relay TR attracts its armature, thereby opening the circuit of the escape magnet E, which, in turn, causes the movement of the side-switch wipers into their fourth position, whereupon conversation between the two subscribers may take place.

The lead extending between the side-switch wiper W^5 and the contact of the left-hand armature of relay 1 is a common lead, that is, it extends to several similar side-switch wipers in similar connector switches. The same is true of the lead between the side-switch wiper W^2 and the winding of relay 1. The same is also true of the lead between the tripping relay TR and the right hand armature of relay 3.

If, now, while this ringing device is operating in the manner described, another connector switch supplied from the same device, places its side-switch wipers in the third position, ringing current will be immediately supplied in response to this additional demand. Suppose the relay SR were on its backward movement, that is, while the relay 3 were energized and the supply of current from the generator G were cut off. Then the impulses supplied to the relay 1 over the side-switch wiper W^2, as before described, by energizing the relay 1, would cause it to attract its armatures, and this

time remain in the actuated position due to the closed condition of the contact 4. The opening of the holding circuit for the relay 3 at the right-hand armature and normal contact of relay 1, will thereupon immediately cause the switching of the current supply through relay TR from silent battery to ringing current.

If the relay SR were on its forward travel, and perhaps very near the end of its forward travel, the same operation would take place, that is, the relay 1 would become energized and open the potential holding circuit of relay 3. It would also open at its left-hand armature and contact, the energizing circuit for the relay SR, whereupon it would immediately begin to return to its normal position. The ringing interval, then, in this instance would be somewhat longer than usual, but this is not considered a disadvantage.

The release of the established connection, forming no part of the present invention, will not be described, such operation being well known to those skilled in the art.

What is claimed is:

1. In a telephone system, a signaling device for actuating the call bells of the subscribers' lines comprising a source of ringing current, means for switching said source of ringing current on and off subscribers' lines periodically, a relay for controlling the lengths of said periods, a second relay unresponsive to the initial and responsive to additional demands on said device for causing the instant switching on of said ringing current at each demand.

2. In a telephone system, telephone lines, each having a call bell, automatic switches for interconnecting said lines, a ringing device common to said switches for actuating the call bells of said lines, said device comprising a source of ringing current, means for switching said source of ringing current on and off said lines, a relay for periodically causing the actuation of said means, and a relay unresponsive to the initial and responsive to additional demands on said device for causing the instant switching on of said ringing current on each new demand regardless of the stage of operation of said switching means or said period-controlling relay.

3. In a telephone exchange system, the combination with telephone lines, a connector switch wherein said lines terminate, a ringing current generator associated therewith, an interrupting device comprising a switching means and a relay for periodically actuating said switching means, said device being normally in circuit with said generator, and means for setting said connector switch on said lines, of means operated, due to the connector switch being set on a selected line, for instantly applying ringing current from said generator to said line irrespective of the stage of operation of said interrupting device.

4. In a telephone exchange system, the combination with telephone lines, a connector switch wherein said lines terminate, a ringing current generator associated therewith, an interrupting device comprising a switching means and a relay for periodically controlling said switching means, said switching means being normally in circuit with said generator, and means for setting said connector switch on said lines, of means switching in response to the setting of the connector switch on a selected line for instantly connecting the said generator to the selected line regardless of the stage of operation of said interrupting device.

5. In a telephone system, a plurality of telephone lines each having a call bell, automatic switches for interconnecting said lines, a signaling device comprising a source of ringing current and means for applying said source to said lines so as to give periodic ringing and silent intervals, a relay for controlling the lengths of said periods, and a second relay successively rendered operative and inoperative by virtue of an automatic switch being set upon one of said lines, such momentary operation of said relay acting upon said signaling device to cause said ringing current to be instantly applied to said line regardless of the stage of operation of said device.

In witness whereof I hereunto subscribe my name this 8th day of May, A. D. 1917.

CHARLES L. GOODRUM