

UNITED STATES PATENT OFFICE

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TELEPHONE SYSTEM

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This invention relates to telephone systems and more particularly to telephone systems in which magneto telephone lines are employed.

Switchboards in which magneto telephone lines terminate may have either of two types of signals, known as visuals, for indicating when a magneto telephone line originates a call. These visual signals take either the form of a switchboard lamp or a mechanical indicator known as a drop. Where the size of such switchboards is small, it is not customary to have an attendant actively on duty at night and for this reason there is provided a code alarm to signal the operator when said telephone lines originate calls. Frequently such magneto telephone lines have a plurality of substations connected thereto, the several subscribers on a line being assigned a distinctive code ring, by which any subscriber thereon may be signalled. In the case where a mechanical indicator or drop is used, every call originated on a line actuates its associated drop so that even if one subscriber on a line code signals another subscriber on the same line, the mechanical drop is actuated, and this is true in spite of the fact that such a telephone connection is not completed at the switchboard. Since the attendant during the night period does not take any part in extending a call between subscribers on such a line, the line drop thereof remains in its operated position. However, where such a magneto line has but a single substation thereon, the attendant, even during the night, must complete the connection. In such a case, if the drops of several telephone lines have been actuated when the subscribers on any of said lines were calling each other, then it is necessary for the attendant to listen in on all of the magneto lines where the drops have been operated. Such operation materially slows up the process of extending an individual magneto telephone line and is generally unsatisfactory. Consequently, where a commercial source of current is available, it is desirable to replace the mechanical drops by line lamps at the switchboard. However, in such an arrangement, it is undesirable during the night period for the line lamp of a line to be lighted when one

subscriber on that line is calling another for in that case, the attendant at the exchange recognizing from the code call alarm that one subscriber on a line is signalling another thereon, does not attend to the connection and consequently the line lamp of that line is left burning until it is extinguished by the attendant at some later time. This results in a needless use of current, materially reduces the life of the lamp and falsely indicates to the attendant that the telephone line is awaiting attention. Such a condition, however, does not apply to individual telephone magneto lines, that is telephone lines having but a single substation thereon, for in that case the attendant must take part in completing the call, and extinguishes the line lamp at that time.

The present invention makes use of all the advantages of the line lamp signalling arrangement in a magneto telephone system but prevents the needless burning of the line lamp of a line where one subscriber thereon is calling another.

The main feature of the present invention resides in providing a lamp signal for each signal station magneto telephone line and a line lamp for each multi-station magneto telephone line, but in connection with the last-mentioned group of lines, switching means are provided whereby the line lamps thereof may be disabled during any desired period of the day when the attendant is not actively on duty.

The drawing diagrammatically represents a multi-station magneto telephone line and a single station magneto telephone line terminating at a control exchange in a switchboard provided with a plurality of cord circuits of which one only is indicated. It will be understood that a plurality of such telephone lines terminate in the exchange, although only two of them have been indicated. It will be noted at the central exchange that there is provided a night alarm controlled by a night alarm key whereby during certain periods the attendant may connect this alarm to attract his attention. At the central exchange, there is also provided a code alarm in the form of a buzzer con-

trolled by a code alarm key or switch which also serves to disable the line lamps of the multi-station lines during the time that the code alarm is rendered effective by the code alarm key. During the normal periods the initiation of a call on any of said telephone lines, lights its associated line lamp but during periods when the attendant is not actively on duty the line lamps of such multi-station lines are disabled, although the line lamps of individual station lines are effective at all times.

It is believed that the invention will best be understood by describing the operations involved in completing telephone calls from several types of lines. Let it first be assumed that the subscriber S' on the multi-station magneto line A originates a call to subscriber on another line, which is effected by turning the handle of his magneto generator 5. This causes alternating current to flow through one conductor 6 of the line, through the upper contacts of the jack J, left hand winding of the relay 7, middle contacts of the jack, conductor 8, and thence over the other side of the magneto 5. The relay 7 is energized in this circuit and closes a locking circuit for itself through its right hand winding, continuity spring and contact of relay 9, front contact and armature of relay 7 to the grounded battery. In multiple with this circuit, relay 9 is actuated from grounded battery, armature and front contact of relay 7, continuity spring, contact and winding of relay 9, lowermost contacts of jack J, conductor 10, winding of the pilot relay 13 to ground. This circuit energizes the relay 9 which locks itself operated from grounded battery, its left hand armature, contact and winding, and thence over conductor 10 to ground, as previously described. The relay 7, it will be understood, responds to the impulse of the code ringing current developed by the magneto generator 5 and in the intervals when the generator is not transmitting current over the conductors 6 and 8 of the line, the armature of the relay 7 is in its normal position, wherein it closes a circuit from grounded battery, armature and back contact of relay 7, right hand armature and front contact of relay 9, line lamp 12, individual to the line A, conductor 14 to ground at contacts 11 of the code alarm key, which is assumed to be in its normal position.

On noting the lighting of the lamp 12, the operator inserts the answering plug P of a cord circuit, such as C, into the jack J, whereby plug P opens the normally closed contacts of the jack to disconnect the relay 7 from further control of the line A and also opens the locking circuit of the relay 9 which in turn extinguishes the line lamp 12. The attendant then operates listening key LK to connect operator's telephone set (not shown) to the cord circuit taken for use and then

ascertains the designation of the wanted subscriber and inserts the plug P' of the answering end of the cord circuit into the jack J' of the called line. The attendant then applies, to the called line, generator or other signalling current through the contacts of the ringing key 15 to actuate the bell of the called substation.

At the termination of the conversation, the calling subscriber actuates his magneto generator 5 and thereby energizes the upper winding of relay 16 in the cord circuit. On energization, this relay locks itself operated from the grounded battery through its lower winding, contacts 17 of the listening key LK, front contact and armature of relay 16, thence over conductor 18, to ground through the winding of relay 40. The operation of the relay 16 lights the answering supervisory relay 18 to give a disconnect signal. Similarly when the called subscriber terminates the call, he actuates the magneto generator (not shown) at his substation, which energizes the calling supervisory relay 20 through its upper winding over the two sides of the called line. Relay 20, when actuated, locks itself operated from grounded battery, through its lower winding, contacts 21 of the listening key, front contact and armature of relay 20 and thence over conductor 18, to ground through the winding of relay 40. The relay 20, when operated, lights the disconnect lamp 21 associated with the calling end of the cord circuit, this lamp being lighted over a circuit from the grounded battery, front contact and armature of relay 20, and thence to ground over conductor 18. The lighting of supervisory lamps 19 and 20, is a signal to the attendant to disestablish the connection by removing plugs P and P' from the jacks J and J'.

When a calling subscriber S₁, on an individual station line, desires to call, the connection is completed in the manner thus described and then disestablishment of the connection is effected in the manner already set forth.

Let it be assumed that the subscriber at substation S' on the line A desires to signal substation S₃ on his own line. The call is initiated by operating the magneto generator 5 at this substation to generate code ringing impulses corresponding to the designation of the subscriber's station S₃. Normally the initiation of such a call lights the line lamp 12. The line lamp 12 repeats the code impulses and the attendant recognizes from the code lighting of this lamp that the call is for a subscriber on the same line, and therefore, does not insert the answering plug of the cord circuit into the jack of the calling line. However, if the attendant fails to recognize the code lighting of the lamp, he may by inserting the answering plug of the cord circuit into the jack of the calling line and by actuating the

listening key LK of this cord circuit, ascertain the number of the wanted subscriber.

In accordance with the present invention, an arrangement is provided whereby it is necessary for an attendant during the night or other quiet periods to cooperate in the connection when one subscriber on a multi-station line desires to converse with another subscriber on the same line. In accordance with the usual practice, substations on the same line are assigned distinctive ringing codes and means are provided at the exchange in the form of a code alarm, effective at night, and under certain conditions controlled by a code alarm key, to repeat such code rings. During such periods, the attendant on noting such code ringing for a substation on the same line as a substation originating a call, pays no attention to it, but in the case of the individual line, it is essential for the operator to cooperate in the extension of the call.

During the night or other quiet period when it is unnecessary for the operator to cooperate in a connection between subscribers on the same line, it is, therefore, unnecessary to light the line lamp of a multi-station line and there is provided a key 24 which renders effective the code alarm and which disables the line lamps, such as 12, of the multi-station lines. When this key is operated to reverse the condition of its contacts, contacts 11 are opened and thereby interrupt the lighting circuit for the multi-station line lamps, such as 12. At this time, a night alarm in the form of a bell 25 is rendered effective at the contacts 26 of this key to awaken the attendant. With the contacts 26 closed, whenever any subscriber on the exchange initiates a call on either a multi-station line or an individual line, the pilot relays, such as 13 and 24, are energized to operate the night alarm. But in the case of multi-station lines, when any of these lines originate a call, a code alarm buzzer 28 repeats the code which the calling subscriber generates. This buzzer has its circuit completed through the front contact and armature of the slow-releasing relay 29 which relay in turn is energized from ground, its winding, contacts of the code alarm key, conductor 31, front contact and armature of relay 7 to grounded battery, and since the armature of relay 7 follows the code impulses, relay 29 will likewise follow these impulses and repeat the code signal. The attendant on noting from the code alarm that a subscriber is calling another station on the same line, pays no further attention to the call.

When the exchange is to revert to normal service, the attendant restores the contacts of the night alarm key 26 and the code alarm key 24 to the position shown in the drawing. This disables the night alarm and the code alarm and also renders the line lamps, such

as 12, of multi-station lines again effective to signal the initiation of calls thereon.

What I claim is:

1. In a telephone system, an operator's position, multi-station lines and single station lines terminating at said operator's position, a line lamp for each of said lines, and means at said position for disabling the lamps of the multi-station lines while permitting the lamps of the individual lines to remain operative.

2. In a telephone system, an operator's position, multi-station lines and single station lines terminating at said operator's position, a line lamp for each of said lines, an audible signal at said position, and means for disabling the lamp signals of the multi-station lines and for substituting therefor said audible signal.

3. In a telephone system, having multi-station telephone lines and individual station telephone lines, terminating in an operator's position, wherein calls are originated by transmitting code impulses of alternating current which comprises actuating an illuminating signal in the case of calls originating on the individual station lines, and generating audible signals in accordance with the code impulses transmitted over multi-station telephone lines.

4. In a telephone system provided with multi-station magneto telephone lines and individual station magneto telephone lines, the method of signalling the attendant on the initiation of a call which comprises visually and audibly signalling the attendant on the initiation of a call on an individual station line and audibly signalling the attendant without visual signalling of the initiation of calls from multi-station magneto telephone lines.

5. In a telephone system provided with multi-station magneto telephone lines, an individual station magneto telephone line, the method of indicating the initiation of calls on said telephone lines which comprises visually indicating to the attendant the initiation of calls on all of said telephone lines during a certain period, visually and audibly signalling the attendant during another period of the initiation of calls over individual station lines, and audibly signalling the attendant without visual signalling during said last-mentioned period of the initiation of calls on said multi-station lines.

6. In a telephone system provided with multi-station magneto telephone lines and individual station magneto telephone lines, the method of indicating to an attendant that calls are being originated over said lines which comprises visually signalling the attendant during a certain period of the initiation of calls over any of said telephone lines, visually and audibly signalling said attendant of the initiation of calls over individual

station lines during a certain other period, audibly signalling said attendant in the absence of visual signalling of the initiation of calls over said multi-station lines during said last-mentioned period, said audible signalling indicating when a call on a multi-station line is intended for another substation on this same line.

7. In a telephone system provided with multi-station magneto telephone lines and individual station magneto telephone lines, the method of indicating to an attendant that calls are being originated over said lines, which comprises visually signalling the attendant of the initiation of calls over any of said lines during a certain period; said visual signalling being of a distinctive character when one station on a telephone line initiates a call for another station on the same line, visually and audibly signalling said attendant of the initiation of calls over individual station lines during a certain other period, audibly signalling said attendant in the absence of visual signalling of the initiation of calls over said multi-station lines during said last-mentioned period, said audible signalling indicating when a call on the multi-station line is intended for another substation on this same line.

In witness whereof, I hereunto subscribe my name this 28th day of May, A. D. 1931.

JOHN H. FITZGERALD.

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