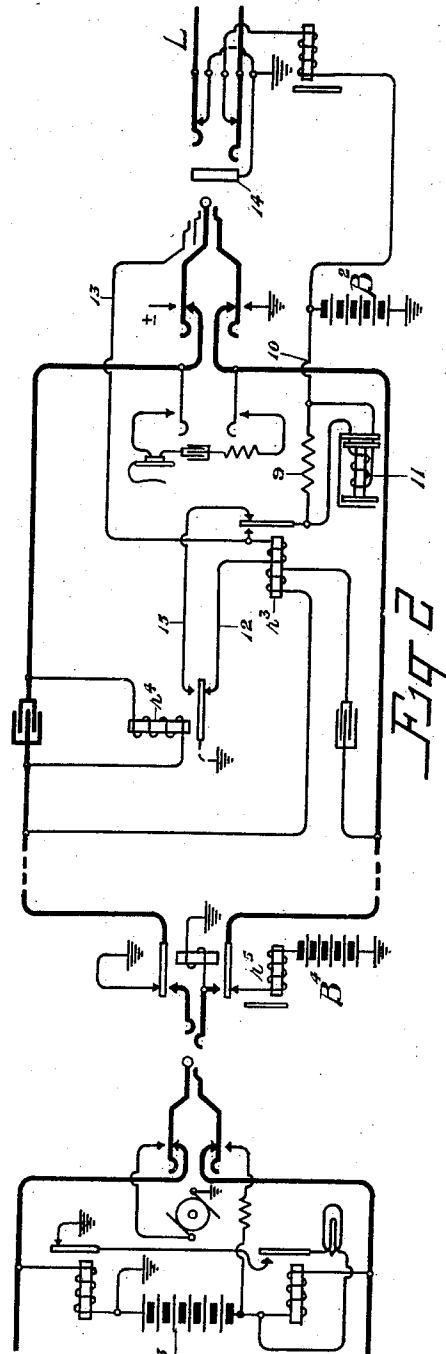
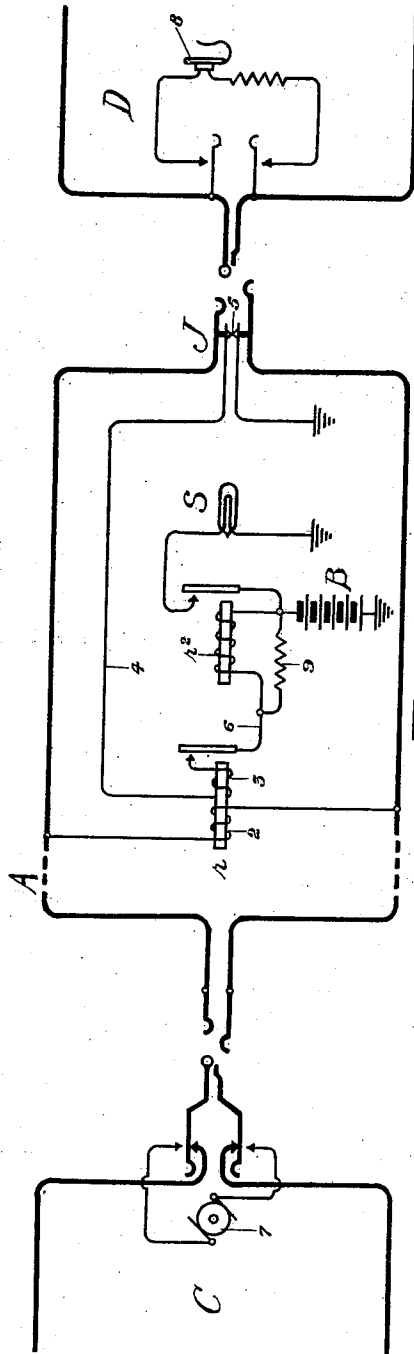


No. 861,340.

PATENTED JULY 30, 1907.

C. S. WINSTON.
TELEPHONE APPARATUS.
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TELEPHONE APPARATUS.

No. 861,340.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CHARLES S. WINSTON, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Telephone Apparatus, of which the following is a specification.

My invention relates to improvements in telephone apparatus and particularly to means for preventing the extra current or "kick" of a magnet coil from affecting other apparatus in the circuit of the coil. It is well known that when a current flowing through a magnet coil is varied the turns of the coil react upon another inductively to produce what is known as the extra current or kick. This current is found in practice to interfere more or less with the proper operation of other apparatus in the same or related circuits, and my invention is designed to prevent such interference. In carrying out the invention I prefer to place a non-inductive resistance in parallel with the coil thus subjected to varying current by means of which the currents induced by the said coil are short circuited and do not flow in the remainder of the circuit to affect other apparatus that may be located therein. I have found this arrangement of value in connection with circuits wherein a relay provided with a locking winding is initially operated by alternating current through its main winding and where the circuit of said locking winding contains the magnet of a signaling or other device. In such cases, the current in the main coil induces a corresponding current in the locking coil, which current flows through said magnet coil in the locking circuit and the kick or extra current from the latter caused by such induced current flows back through the locking winding and deenergizes said relay and opens its locking circuit, thus defeating the object of the locking circuit. By placing such a non-inductive resistance around the magnet in the locking circuit, however, all trouble is avoided since such extra currents do not then pass through the said locking winding but are confined locally to the coil and resistance.

The invention includes still other improvements in circuit arrangements all of which will be pointed out in the detailed description and claims in connection with the accompanying drawing forming part of this specification in which the same reference characters are used throughout to designate like parts, and in which:

Figure 1 is a diagram of a telephone trunk or transfer circuit embodying one form of the improvements, and Fig. 2 is a similar view of a different trunk circuit showing another application of a part of my improvements.

Referring to Fig. 1, A indicates a trunk or transfer circuit extending between two central offices or switchboard sections; C, a cord circuit of which only the call-

ing end is shown, and D another cord circuit of which only the answering end is shown. These cords are adapted to be connected with the two ends of the trunk for the ordinary purposes of establishing connections for conversation thereover.

A relay r is located at the D end of the trunk and is provided with a main or actuating winding 2 bridged between the main conductors of the trunk and with a locking winding 3, one terminal of which is joined by conductor 4 with one of the normally closed contacts 5 of the jack J of the trunk, the other of which contacts is grounded. The second terminal of the said locking winding is connected to the forward contact of the spring of said relay r , and the spring is united by wire 6 with one end of the winding of a signal controlling relay r^2 whose other terminal, is joined directly to the live pole of the battery B. The relay r^2 controls through its normally open contacts the local circuit of the signal S associated with the corresponding end of the trunk.

The operation of the apparatus so far described is as follows: Assuming the connection for conversation to have been initiated at the left, the insertion of the plug of the cord circuit C into the jack of the trunk and the immediate depression or operation of the ringing key causes current from the alternating ringing generator 7 to flow over the trunk and through the actuating winding of relay r thereby energizing the said relay and causing it to close the circuit through the relay r^2 to in turn close the circuit of and operate lamp S to attract the attention of the operator at the section D. This circuit of relay r^2 also includes the locking winding 3 of relay r which is intended to maintain said relay energized even after the ringing current is cut off from generator 7 to cause the continued operation of signal S until the operator notices the same and answers by inserting the plug of her cord circuit and connecting her head telephone 8 therewith, the insertion of the said plug opening contacts 5 of jack J to thereby deenergize both relays r and r^2 . It is found in practice, however, that the said locking circuit does not remain closed for the reason that the varying ringing current through coil 2 of relay r induces a similar current in the said locking winding, and such changing current through relay r^2 causes a kick or an extra current therefrom to flow in said locking circuit and when of the proper direction to neutralize the effect of the battery current in said locking winding and permit the opening of the relay contacts. Thus the object of the locking circuit is defeated and the signal S is prematurely retired or never exposed. In order to overcome this trouble I place a non-inductive resistance 9 around the said relay r^2 which is subjected to such varying currents whereby the kicks or extra currents are short cir-

cued and do not flow through the locking winding of relay r . The windings of relay r may have 500 ohms each, the relay r^2 , 500 ohms, resistance 9, 200 ohms, and the battery 24 volts. Under these conditions
 5 the said relay r is not tripped by the kick of r^2 and the system operates in the intended manner as above described.

In Fig. 2, the invention is shown applied to a different arrangement of circuits. The connection of the
 10 cord circuit at the left with the trunk jack and the immediate operation of the ringing key causes current from the ringing generator to flow over the trunk and through the main winding of relay r^3 corresponding to relay r of Fig. 1. The attraction of its spring completes
 15 a circuit from battery B^2 , over conductor 10, through the winding of the mechanical signal 11 corresponding to relay r^2 of Fig. 1, and thence through the locking winding of relay r^3 , conductor 12 and the normal contact of relay r^3 to ground. The current in this path
 20 keeps the signal 11 and relay r^3 energized, and to prevent the opening of this locking circuit due to the inductive surge of current from the coil of signal 11 caused by the ringing current, the non-inductive resistance 9 is connected in parallel with said signal 11
 25 to thereby short circuit the said surges of current. Now, when the operator listens in and obtains the order and inserts the plug of the trunk in the jack of the line L, the said locking winding of relay r^3 is short circuited through the third strand 13 of the trunk cord
 30 and the grounded ring 14 of the line jack, thus permitting the spring of relay r^3 to drop back and engage its normal contact which is connected by conductor 15 with the forward contact of relay r^4 . The subscriber on line L is called in the usual way and when he re-
 35 sponds current from the battery B^3 in the cord circuit flows over the complete metallic circuit formed by the trunk and line and operates relay r^4 , thereby again energizing signal 11 which shows to the incoming operator that the called subscriber has responded.

At the termination of the conversation the return of the subscriber's telephone deenergizes the relay r^4 as well as the tip cord circuit supervisory relay to thus light the cord circuit supervisory lamp and to retire the mechanical signal 11. Thus both operators are in-
 45 formed of the end of the conversation, and the plugs are taken down and all parts restored to normal condition.

A call coming in over line L is answered by inserting the trunk plug in the jack, thereby permitting current from battery B^4 which is the same as battery B^3 to flow
 50 over the metallic line and through the line signaling relay r^5 , to call the operator at the other office, who may attend to the connection in the usual manner.

In the above described circuit it will be observed that the relay r^3 is rendered inoperative by short circuiting its winding over the third strand of the cord instead of the more common method of utilizing an additional relay or other complicated arrangements.

While I have thus described my improvements with special reference to the details of certain forms that
 60 have been found satisfactory for commercial purposes, I do not wish to be limited thereto in all respects as it is obvious that various changes and alterations may be made therein without departing from the scope and principle of the same.

But having thus described the invention what I desire to secure by Letters Patent is:

1. The combination, with an electromagnet in a circuit subjected to varying currents, of other apparatus in the circuit of said electro-magnet, a non-inductive resistance permanently connected in parallel with said magnet to prevent the kick or extra current from the magnet coil from affecting said other apparatus, substantially as described.

2. The combination, with a relay having an actuating and a locking winding of a source of varying current adapted to send current through said actuating winding to initially operate said relay, an electromagnet and a source of steady current in the circuit of said locking winding, and a non-inductive resistance connected around the coil of said magnet whereby the extra current from the latter caused by the varying current in its circuit induced by the two windings of said relay is short circuited and the locking relay is not prevented from locking, substantially as described.

3. The combination with an electro-magnet having an actuating coil, of mechanism affected by the energization of said magnet, a source of direct current in series with said coil, means also in the circuit of said coil for varying the current through the coil, and a non-inductive resistance in parallel with the coil whereby the self-induced current from the coil will be shunted away from other parts of the circuit, substantially as described.

4. The combination with a telephone trunk circuit, of a relay associated with said circuit adapted to be actuated by varying current in said circuit, a locking winding for said relay, an electro-magnet adapted to be actuated in series with said locking winding, mechanism affected by said electro-magnet, a non-inductive resistance in parallel with said electro-magnet whereby the self-induction of said coil will not send current through said locking winding in opposition to the locking current, substantially as described.

5. The combination with a trunk circuit, of a relay associated therewith and adapted to be actuated by varying current in said circuit, a locking winding for said relay adapted to be energized by current from a steady source, an electro-magnet adapted to be placed in series with said locking winding, mechanism affected by the energization of said electro-magnet, and means associated with said electro-magnet whereby the self-induction of its coil will not send current through said locking winding in opposition to the current from said steady source, substantially as described.

6. In a telephone system, the combination with a trunk line, of a relay adapted to be actuated by varying current in said line, a locking winding for said relay adapted to be energized by steady current, an electro-magnetic device adapted to be placed in series with said locking winding, mechanism affected by the energization of said electro-magnetic device, and means whereby the self-inductive effect produced in said electro-magnetic device by the varying current induced in said locking winding will be short-circuited through a path which does not include said locking winding, substantially as described.

7. In a telephone system, the combination with a trunk line extending between different switchboard sections and terminating at its outgoing end in a jack and at its incoming end of a cord and plug, of a cord circuit adapted to connect with the outgoing end of said trunk, and a telephone line with which the incoming end is adapted to be connected, a relay associated with the incoming end of said trunk adapted to be actuated by varying current in the trunk, a locking winding for said relay, a signal adapted to be actuated in series with said locking winding, means associated with the plug for said trunk line whereby said locking winding is short-circuited by the insertion of the plug in the jack of said telephone line whereby said signal becomes effaced, a relay adapted to be actuated by current over the trunk when the called subscriber answers his call to again actuate said signal over a path which does not include said locking winding, substantially as described.

8. In a telephone system, the combination with a trunk line extending between different switchboard sections and terminating at its outgoing end in a jack and at its incoming end in a cord and plug, of a cord circuit adapted to connect with the outgoing end of said trunk, and a telephone line with which the incoming end is adapted to be connected, a relay associated with the incoming end of said trunk adapted to be actuated by varying current in the trunk, a locking winding for said relay, a magnetic signal adapted to be actuated in series with said locking winding, a non-inductive shunt for said signal adapted to short-circuit the self-induced current from its coil away from said locking winding, means associated with the plug for said trunk line whereby said locking winding is short-circuited by the insertion of the plug in the jack of said telephone line and said magnetic signal is effaced, and a relay adapted to be actuated by current over the trunk when the called subscriber answers his call to again actuate said magnetic signal over a path which does not include said locking winding, substantially as described.

9. In a telephone system, the combination with a connecting circuit, of a relay associated therewith and adapted to be actuated by varying current, a locking circuit for said relay, an electro-magnetic device in series with said locking circuit, and a source of direct current to energize said locking circuit, a non-inductive shunt about said electro-magnetic device adapted to receive the self-induced currents from the device and thereby shunt such currents away from the coil of the relay, whereby the locking circuit becomes effective, substantially as described.

Signed by me at Chicago, county of Cook and State of Illinois in the presence of two witnesses.

CHARLES S. WINSTON.

Witnesses:

ROBERT LEWIS AMES,
EDITH F. GRIER.