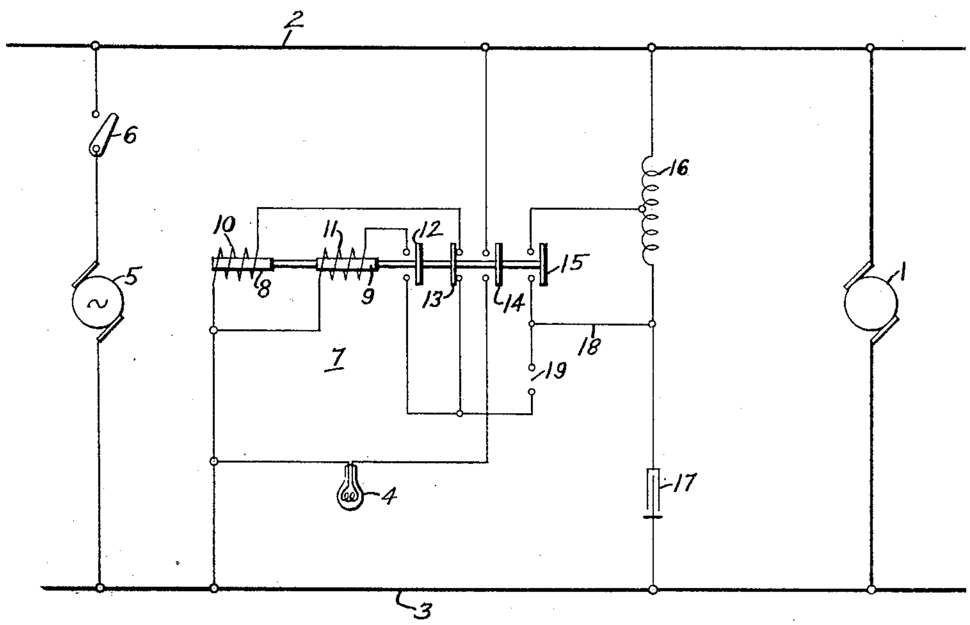
March 3, 1931. L. W. CHUBB 1,795,009

STREET LIGHTING RELAY

Filed Dec. 17, 1927



INVENTOR
Lewis W. Chubb

BY
[signature]
ATTORNEY

Patented Mar. 3, 1931

1,795,009

UNITED STATES PATENT OFFICE

LEWIS W. CHUBB, OF EDGEWOOD, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

STREET-LIGHTING RELAY

Application filed December 17, 1927. Serial No. 240,841.

My invention deals with a relay system for controlling the connection of electrical devices to a source of energy from a distant point.

The principal object of my invention is to provide suitable means for controlling the connection of various electrical devices to a source of supply from a remote control point.

Another object of my invention is to utilize a superposed, high-frequency, control current to govern the connection of electrical devices to a source of supply.

A further object of my invention is to utilize the voltage across a portion of a series resonant circuit to control the operation of a relay for connecting an electrical device to a supply source and for disconnecting it therefrom.

In accordance with my invention, I provide, in addition to the main source of current for an electrical device, an auxiliary source of control current, preferably of high frequency. The control current is superposed upon the conductors carrying the main current by any suitable means. Adjacent the device to be controlled, I connect a relay in series with a spark gap across the condensive portion of a series resonant circuit connected to the main line conductors. When the high-frequency control current to which the tuned circuit is resonant is applied to the main line conductors, the voltage across the condensive portion of the resonant circuit is sufficient to break down the spark gap and operate the relay.

The relay is adapted, when energized, to connect the desired electrical device to the main source of current, and, simultaneously, to short circuit a portion of the inductance in the tuned circuit and to transfer the relay connection so that the relay and its associated tuned circuit are then responsive to a high-frequency control current of a frequency different from that first employed.

The application of the second-mentioned high-frequency control current results in a similar operation of the relay to disconnect the electrical device from its source of supply.

For a more complete description of my invention, reference should be had to the accompanying drawing, the single figure of which is a diagram illustrating the circuit and the apparatus which I employ to accomplish the above-mentioned objects.

In the drawing, a main supply source, such as a generator 1, supplies current to main-line conductors 2 and 3. At any distance from the main source 1 is a lamp 4, the connection of which to the main conductors 2 and 3, it is desired to control from a convenient control station.

A source of control current 5 may be connected to the main line conductors 2 and 3 by the closing of a switch 6. Instead of being connected directly to the line conductors, the source 5 may be connected thereto through a transformer. The source 5 should be capable of generating alternating current of high frequency, for example, 500 cycles. The main source 1 may be either a direct-current generator or a low-frequency, alternating current generator.

The connection of the lamp 4 to the main conductors 2 and 3 is controlled by a relay, indicated generally at 7. The relay 7 consists of a pair of armatures 8 and 9, controlled by operating coils 10 and 11. Associated with the armatures and adapted to be operated by them, are the contacts 12, 13, 14 and 15. These moving contacts engage suitable fixed contacts to connect the lamp 4 to the supply source, as will be more fully described hereinafter.

A tuned circuit, consisting of an inductance 16 and a condenser 17, is connected across the main conductors 2 and 3 adjacent to the lamp 4 or other device to be controlled. The tuned circuit may, however, be connected to the line conductors through a suitable transformer. When the relay 7 occupies the position illustrated, the moving contact 13 engages its associated fixed contacts and completes a circuit across the condenser 17 consisting of conductor 18, a spark gap 19, the contact 13 and the operating coil 10 of the relay 7. Instead of the open spark gap shown at 19, a vacuum gap may, of course, be substituted.

The contact 12 is adapted, when closed, to connect the operating coil 11 of the relay 7 in

series with the spark gap 19. The contact 14, when moved into engagement with its associated fixed contacts, connects the lamp 4, or other electrical device directly to the main conductors 2 and 3. Obviously, a transformer may be employed between the device 4 and conductors 2 and 3 if the line voltage is different from that for which the device 4 is designed. The contact 15, when it engages its associated fixed contacts, short circuits a portion of the inductance 16 for a purpose to be described later.

Having described the circuits and apparatus embodying my invention, I shall now outline the operation.

Assuming first that the relay is in the position illustrated, the closure of the switch 6 will connect the high-frequency generator 5 to the main conductors 2 and 3, impressing a low voltage of resonant frequency on the tuned circuit consisting of the inductance 16 and the condenser 17. As is well known, the application of a low voltage of resonant frequency to a tuned circuit will cause a voltage of considerable magnitude to appear across the condensive and inductive portions of the circuit. I make use of this principle by connecting the spark gap 19 in series with the operating coil 10 of the relay 7 across the condenser 17. As a result of this scheme of connections, when a resonant voltage is applied to the tuned circuit, the voltage across the condenser 17 is sufficient to break down the spark gap 19, resulting in a momentary energization of the operating coil 10 of the relay 7.

The energization of the coil 10 causes the armature 8 and its associated mechanism to be attracted, to close the contacts 12, 14 and 15 and to open the contact 13. The closing of the contact 14 connects the electrial device 4 directly to the supply lines 2 and 3. The contact 12, when it engages its associated fixed contacts, connects the coil 11 of the relay 7 in series with the spark gap 19, and the contact 15 short circuits a portion of the inductance 16, to make the tuned circuit resonant to a frequency different from that employed to connect the device 4 to the source 1.

The lamp 4, or other equivalent device, is now directly connected to the main conductors 2 and 3 and is supplied with energy from the source 1. The relay 7 and the associated tuned circuit are so adjusted that the application to the main conductors 2 and 3, of a control current of a suitable frequency, different from that first employed, will operate the relay to disconnect the lamp 4 from the source of supply.

The operation of my system to disconnect device 4 from a source of supply is similar to that which causes the device to be connected to the source. The frequency of the source 5 is varied until resonance is obtained in the tuned circuit, and the low voltage of resonant frequency across the tuned circuit causes a high voltage to appear across the condenser 17, with the result that the spark gap 19 is broken down, and the coil 11 of the relay 7 is momentarily energized to open contacts 12, 14 and 15 and to close the contact 13. The device 4 is thereupon disconnected from the source of supply and the relay 7 is restored to its original position.

My invention, obviously, is not limited to the single embodiment thereof disclosed herein. The relay 7, for example, may be employed to control the energization not only of a single lamp but of a plurality of lamps. When applied to a street lighting system, the relay and circuit of my invention make it possible for a large number of lamps to be connected simultaneously to a supply source from a single control station. As previously indicated, my invention is not limited to the control of street lamps but may be employed in connection with any electrical device the connection of which to a supply source it is desirable to control from a distance.

Since it is obvious that my invention is susceptible of various changes and modifications, I do not wish to be limited to the specific embodiment thereof disclosed herein except as necessitated by the scope of the appended claims and the extent of the prior art.

I claim as my invention:

1. A system for controlling the connection of an electrical device to a low-frequency source of supply comprising an auxiliary source of high-frequency voltage, a tuned circuit resonant to the frequency of said auxiliary source connected thereto and means responsive to a predetermined voltage and connected to the tuned circuit for causing the said device to be connected to the main source and for simultaneously changing the connections to said tuned circuit, whereby said means may be operated, by a voltage of different frequency, to disconnect the device from the main source.

2. A system for controlling the connection of an electrical device to a low-frequency, main supply source comprising an auxiliary source of variable high-frequency voltage, a tuned circuit, and means connected thereto, responsive to a predetermined voltage which is impressed thereon when voltage of resonant frequency is applied to the tuned circuit, for causing the said device to be connected to said main source and for simultaneously adjusting said tuned circuit to be resonant to a different high frequency, whereby the said relay may be operated to disconnect the said device from said main supply source.

3. A system for controlling the operation of a relay for connecting an electrical device to a main, low-frequency supply source comprising an auxiliary source of variable high-frequency voltage, a tuned circuit, consisting

of a condenser and an inductance, connected thereto, said relay being connected across said condenser, in series with a spark gap, and being adapted to operate, on the break-down of said gap, to connect said device to said main source and to change the connections to said tuned circuit, whereby it becomes resonant to a voltage of a different high frequency.

4. The combination with a circuit tuned to resonance with a predetermined frequency and a relay responsive to the voltage across a portion of said tuned circuit, of means operated by said relay for changing the connections of said tuned circuit so that it is resonant to a different frequency.

5. A relay system comprising a main low-frequency source of energy and an electrical device adapted to be connected thereto and disconnected therefrom by the operation of a relay having two operating coils, one of which is connected in series with a spark gap across the condensive portion of a tuned circuit comprising a condenser and an inductance connected to an auxiliary source of high frequency, said relay having contacts for connecting the said device to the main source of energy, for shunting a portion of said inductance and for connecting the other of said operating coils to the tuned circuit in series with the spark gap, respectively, whereby the relay may be operated to connect said device to said main source by impressing a voltage of one frequency on the tuned circuit and to disconnect the device from the main source by impressing on the tuned circuit a voltage of different frequency.

6. In a remote-control system for an electric device, the combination with a switch for connecting said device to a supply circuit, of means including a tuned circuit and a spark gap in parallel with a portion of said tuned circuit responsive to alternating current of a predetermined frequency for operating said switch and a contact actuated by said switch for changing the connections of said tuned circuit to cause it to be responsive to alternating current of a different predetermined frequency.

7. A remote-control system for an electrical device comprising a switch for connecting said device to a supply circuit, means including a tuned circuit responsive to alternating current of a predetermined frequency for operating said switch and means actuated by said switch for so changing said tuned circuit as to cause it to be responsive to another predetermined frequency.

8. In a remote-control system, an electrical device, a switch for connecting said device to a supply circuit, means responsive to an alternating current of a predetermined frequency for operating said switch and means actuated by said switch for adapting said first-mentioned means to be responsive to an alternating current of another predetermined frequency.

9. The combination, in a receiving system, of a circuit, means for tuning said circuit to respond to current of each of a plurality of frequencies, means responsive to potential on said circuit having each of said frequencies for producing a desired operation and for actuating said means to tune said circuit to respond to current of a different one of said frequencies.

In testimony whereof, I have hereunto subscribed my name this 15th day of December, 1927.

LEWIS W. CHUBB.