

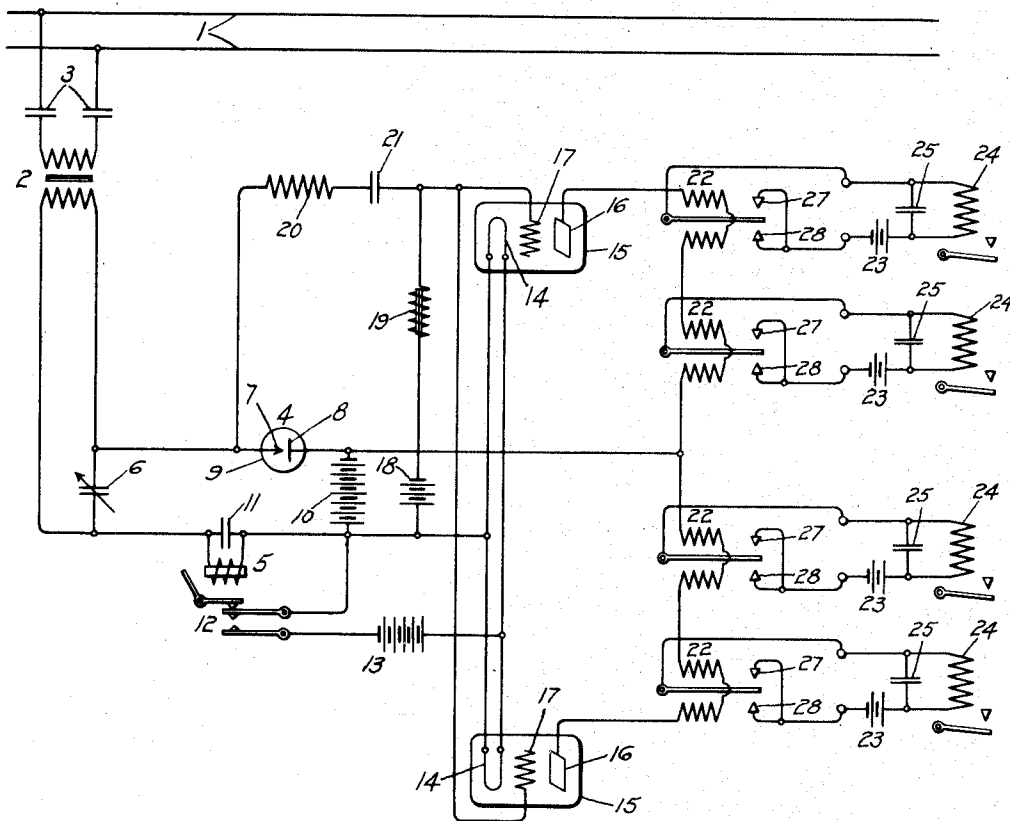
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E. F. CARTER

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REMOTE CONTROL CARRIER CURRENT SYSTEM

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UNITED STATES PATENT OFFICE.

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REMOTE-CONTROL CARRIER-CURRENT SYSTEM.

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My present invention relates to a remote control system and more particularly to the remote control of a circuit or signal by means of carrier current.

5 It is an object of my invention to provide a control system which will be more selective than the usual systems employing carrier current for the control of distant switching means.

10 I accomplish this object by providing a receiver which includes a plurality of tuned audio frequency relays associated with the output circuit of a 3-element electron discharge device, and a control circuit. When
15 a certain high frequency carrier current is supplied to the receiver the control circuit is energized and operates to close a circuit to light the filament of the electron discharge device. When modulated carrier frequency
20 current is now supplied to the receiver the carrier or radio frequency current will maintain the supply of current to the hot filament of the electron discharge device, while audio frequency energy will be supplied to
25 the grid. The particular relay in the output circuit of the 3-element tube which is tuned to the audio frequency supplied to the grid will now be actuated.

The novel features which I believe to be
30 characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation will best be understood by reference to the following description taken in connection with
35 the accompanying drawing in which the figure shows diagrammatically a circuit organization whereby my invention may be carried into effect.

40 Referring to the drawing, I have indicated at 1 a pair of feeders of a system of distribution. Associated with the mains 1 is a receiver which is supplied with high frequency current through a transformer 2.
45 The primary winding of the transformer is connected to the distribution system through blocking condensers 3, while the secondary winding thereof is connected to a control circuit including a discharge device 4 and a relay 5. A variable condenser 6 is associated
50 with the secondary winding and tunes it to the carrier frequency employed.

The discharge device 4 comprises two dissimilar electrodes 7 and 8 enclosed in a re-

55 ceptacle 9 which is filled with a suitable gas, such as neon or other inert gas, at a definite pressure, the particular gas and pressure being so chosen, that if a certain definite potential is impressed on electrodes 7 and 8, a
60 discharge will take place and current will flow between the two electrodes as long as the potential is maintained. Because of the dissimilar structure of electrodes 7 and 8, current will flow in the control circuit in one
65 direction only. A constant potential is impressed on the discharge device by means of a source of energy 10. The potential thus impressed upon the discharge device is chosen at a value somewhat below that at which
70 a discharge will take place between the electrodes 7 and 8. However, when radio frequency current is supplied to the control circuit, the additional potential supplied by the
75 received current will be sufficient to produce a discharge through device 4 and cause a current to flow from the source 10 through relay 5 as long as the high frequency current is received. Since only one-half of the alternating wave supplied to the control circuit
80 flows therethrough, I employ a condenser 11 in shunt with relay 5 in order to prevent deenergization of the relay during the other half of the alternative wave. Energization of relay 5 actuates a switch 12 to close a circuit from a source of energy 13 to the cathodes or hot filaments 14 of a plurality of
85 thermionic valves 15, each of which includes, in addition to the cathode, the usual plate 16 and grid 17.

A negative bias is normally supplied to
90 the grid of each valve through a circuit which includes a source of energy 18 and a choke coil 19. The grid or control element 17 of each valve is further connected through a radio frequency choke coil 20 and
95 a blocking condenser 21 to the secondary winding of the transformer 2. The choke coil prevents the supply of radio frequency energy to the grid, while the blocking condenser prevents the discharge of battery 18
100 through choke coils 19 and 20.

The output circuit of each valve includes a plurality of tuned vibratory relays 22 each of which is responsive to a certain audio frequency current. Each relay 22 controls a
105 circuit, including a battery 23 and a winding 24. Winding 24 may control a switch or signal as desired. Since relay 22 is a vi-

bratory relay, I connect condenser 25 in shunt with winding 24 in order to prevent deenergization of the latter winding when the movable arm of the relay 22 is not in engagement with either of its cooperating contacts 27 or 28.

In the operation of my invention I superimpose high frequency carrier current on the system of distribution 1, from a transmitter, not shown. When the carrier frequency is supplied to the control circuit of the receiver a discharge takes place through the device 4 and current is supplied from battery 10 to relay 5. Energization of relay 5 closes a circuit for the hot filaments 14 of the electric valves 15. Modulated carrier frequency current is now supplied to the receiver. The discharge 4 acts as a rectifier of the radio frequency current and the audio frequency component of the modulated wave is supplied to the grids 17 of the electric valves 15. Pulsatory, audio frequency current will now be supplied to the output circuit of the 3-element tubes 15 and will actuate the relay which is tuned to that frequency.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In combination, an electron discharge device comprising an anode, cathode, and control element, an output circuit including a tuned relay connected to the discharge device, a control circuit, means in said control circuit responsive to carrier frequency energy for controlling the supply of current to heat the cathode, and means for supplying modulating frequency energy from said control circuit to the control element of the discharge device to thereby control the energization of said tuned relay.

2. In combination, a plurality of tuned audio frequency relays, means including an electron discharge device for selectively controlling the operation of said relays, said device including a filamentary cathode, an anode and a grid, means responsive to radio frequency energy for controlling the heating of the cathode, and means whereby audio frequency energy may be supplied to the grid.

3. In combination, a plurality of tuned audio frequency relays, means including an electron discharge device for selectively controlling the operation of said relays, said device including a filamentary cathode, an anode and a grid, a control circuit, means for supplying modulated carrier frequency energy to said control circuit, means in said circuit responsive to carrier frequency for controlling the heating of the cathode, and means whereby modulating frequency energy

may be supplied from said control circuit to said grid.

4. In combination, a system of distribution, a carrier current receiver associated with said system, said receiver including a plurality of tuned relays and an electron discharge device, the discharge device including a cathode, an anode and a grid, means whereby modulated carrier energy may be supplied to the receiver, means responsive to carrier frequency energy for closing a circuit to the cathode and means for supplying modulating frequency energy to the grid to thereby selectively control the operation of the tuned relays.

5. In combination, an electric valve comprising a cathode, an anode and a grid, an output circuit including a tuned relay connected to said valve, means controlling the energization of said cathode, said means comprising a control circuit including a discharge device and a relay, a source of potential connected to said discharge device, the value of the potential being somewhat lower than that required to break down the discharge device and produce a flow of current in the control circuit, means whereby carrier current may be supplied to said control circuit to thereby impress on the control circuit a potential great enough to cause current to flow therethrough from said source to energize said relay and to close a circuit for said cathode, and a connection between the control circuit and grid whereby modulating frequency energy may be supplied to said grid.

6. In combination, a valve comprising a cathode, an anode and a grid, an output circuit including a tuned relay connected to said valve, means controlling the energization of said cathode, said means comprising a control circuit including a discharge device and a relay, a source of potential connected to said discharge device, the value of the potential being somewhat lower than that required to break down the discharge device and produce a flow of current in the control circuit, means whereby carrier current may be supplied to said control circuit to thereby impress on the control circuit a potential great enough to cause current to flow therethrough from said source to energize said relay and to close a circuit for said cathode, and means whereby modulating frequency energy may be supplied to said grid, said means including a connection between said grid and the control circuit.

In witness whereof, I have hereunto set my hand this 17th day of August, 1925.

EMMETT F. CARTER.