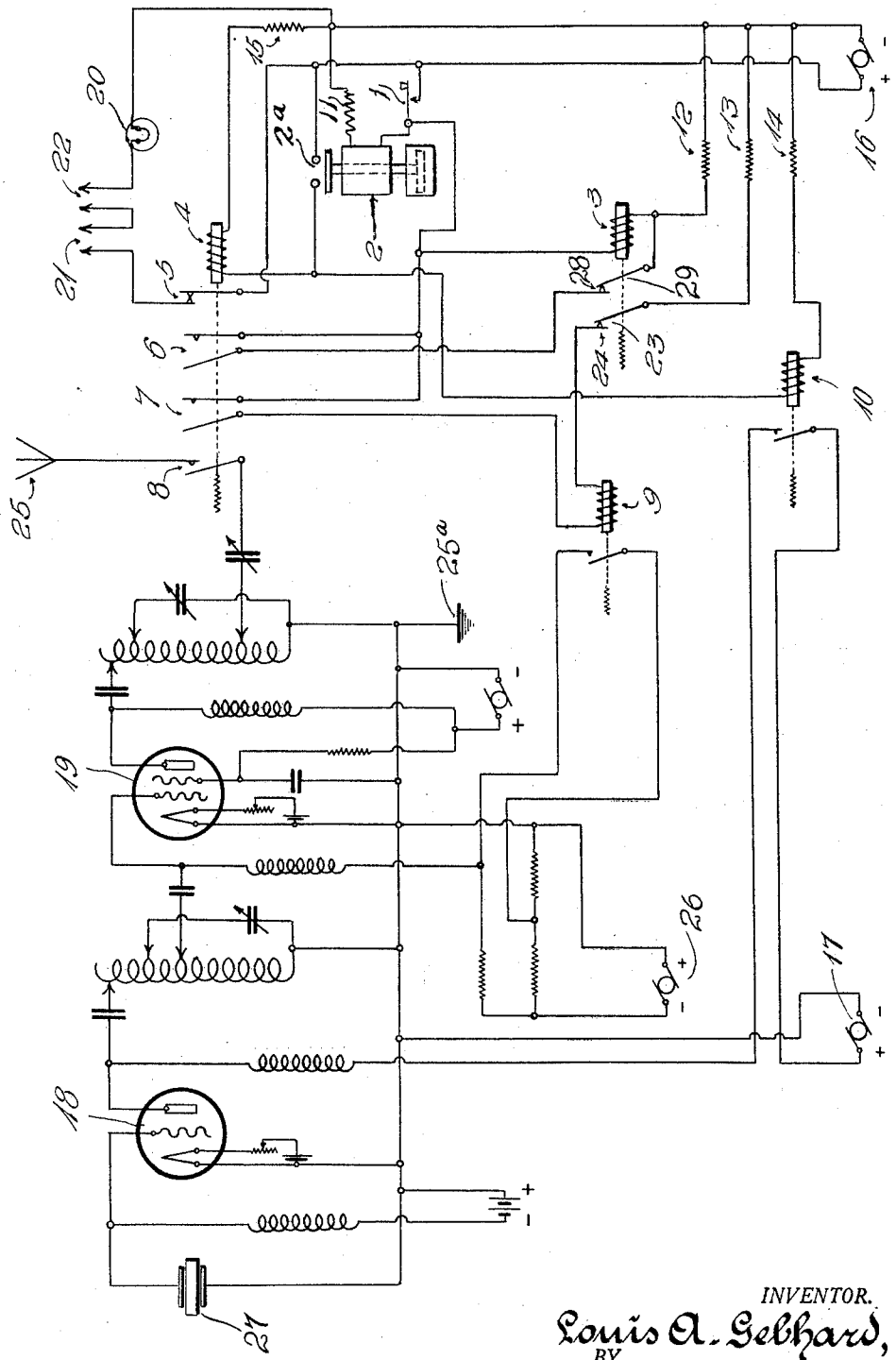
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ANTENNA RELAY AND CONTROL SYSTEM

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ANTENNA RELAY AND CONTROL SYSTEM

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My invention relates broadly to antenna relays and control systems for high frequency transmitters.

One of the objects of my invention is to provide an antenna relay and control circuit for high frequency transmitters whereby no energy is transmitted when the operating key is opened for an appreciable time.

Another object of my invention is to provide a relay system whereby the antenna circuit is normally open when the transmitting key is not operated and whereby the antenna circuit is normally closed when the transmitting key is normally operated.

Still another object of my invention is to provide a relay system whereby energy is not transmitted when the key is first depressed but where the second depression causes energy to be transmitted.

Other and further objects of my invention are to provide suitable arrangements of relays and circuit arrangements electrically controlled and automatically operated whereby the entire transmitter is controlled by a single transmitting key.

A better understanding of my invention can be had from the specification hereinafter following and by reference to the accompanying drawing which is a schematic circuit diagram of the antenna relay and control systems of my invention.

In high frequency space radio transmitting systems a source of constant frequency signalling energy, usually derived from a thermionic tube and piezo electric crystal circuit, ordinarily delivers its output to thermionic tube amplifier circuits. The output of such amplifier circuits is delivered to a space radio radiating system. The constant frequency oscillator system is shown in the accompanying drawing comprising thermionic tube 18, the piezo electric crystal 27 and associated energizing and oscillation circuits. The output of the constant frequency oscillator system is delivered to the input circuit of thermionic tube amplifier 19. The output circuit of thermionic tube 19 is usually delivered to a space radio radiating system comprising antenna 25 and ground 25*a*. The biasing potential supplied thermionic tube amplifier 19 is usually controlled by the key circuit operated in accordance with certain code combinations. The generated signaling energy from constant frequency oscillator 18 is radiated from antenna 25, however, irrespective of the key control and the operation of the amplifier circuit. This is due to the inter-electrode capacity of thermionic tube 19. Such radiation of the energy from the constant frequency oscillator causes interference with nearby receiving stations and should be avoided. Keying control of the constant frequency oscillator to accomplish the transmission of the code characters is not desirable. The antenna relay and control system of my invention avoids the foregoing disadvantage of the usual arrangement and has many advantages as will appear from the specification following.

The main control key 1 is connected in series with a source of energy 16 and the electromagnet of relay 2. Included also, in series with the electromagnet of relay 2 is provided a current limiting resistance 11. The energization of relay 2 causes contact members 2*a* to close. The closing of contact members 2*a* completes the energization of the electromagnet of relay 4 with current limiting resistance 15 connected in series. A time delay mechanism such as is commonly referred to as a dash-pot is attached to armature and contact members 2*a* which causes slow movement and hence considerable time elapses before relay 4 is energized or deenergized when key 1 is closed or opened. Contact members 5, 6, 7 and 8 are actuated by relay 4. Relay 3 is connected in parallel through resistor 12 with the electromagnet of relay 2 and is simultaneously energized in common with the energization of relay 2

by key 1. Since relay 2 is retarded and relay 3 is not retarded and the energization of their respective electromagnets is simultaneous, contact members 23 and 24 open simultaneously with the first depression of key 1. Contact members 23 and 24 are connected in series with the electromagnet of relay 9 and with current limiting resistors 13. The opening of these contact members 23 and 24, therefore, makes energization of relay 9 impossible. Relay 9 is provided with an armature and contact members connected with source of biasing potential 26. This source of biasing potential controls the operation of amplifier 19. Until relay 2 has overcome the small retarding force exerted by the dash-pot attached to armature 2*a*, contact members 6, 7 and 8 are open. The winding of relay 9 is also connected in series with contact members 7.

As relay 2 becomes closed, contact members 6, 7 and 8 are closed. Antenna 25 is now connected with amplifier 19 by contact members 8. Contacts 7 are closed which connects one side of electromagnet 9 with the load side of key 1. The other terminal from electromagnet 9 is connected to contact member 24. Contact member 23 was separated from contact member 24 during the first depression of key 1, however, after electromagnet 4 is energized contact members 6 are closed thereby completing the circuit to contact 28. If key 1 is now released for a moment relay 3 instantly releases its contacts to their closed positions, and the delayed action of relay 2 keeps the contacts of relay 4 all closed. Through contact 6, connection is established between members 28, 29 thus short circuiting electromagnet 3. With contact members 7 and contact members 23, 24 in closed positions, electromagnet 9 may be energized or deenergized by the operation of key 1 providing the key is not left open long enough for the dash-pot to release. The depressing of key 1 operates the armature of relay 9 and hence controls the operation of amplifier 19. Electromagnetic relay 10 has its winding connected in parallel with the winding of relay 4, thereby causing the anode supply to constant frequency oscillator 18 to be completed simultaneously with the closing of contact members 8 connected with the antenna circuit. Should key 1 be left in the opened position for an appreciable length of time, time delay relay 2 will open thereby causing the deenergization of antenna relay 4. The deenergization of relay 4 disconnects antenna 25 from amplifier 19, simultaneously removes the short circuiting of relay 3, opens the circuit to relay 9 and opens the circuit to relay 10. Again depressing key 1 energizes relay 3, opening contacts 23, 24 and 28, 29. Providing key 1 is depressed for a sufficiently long period or coded for several characters, retarded relay 2 will have completed the energizing circuit to electromagnet 4.

Simultaneously with the energization of electromagnet 4, electromagnet 10 is energized, which causes constant frequency oscillator 18 to be operative. After the key has been depressed and released for an instant, contact members 6, 7, 8, 23, 24, 28 and 29 are in closed positions and further operation of key 1 operates relay 9 but does not operate relay 3 because the winding of relay 3 is short-circuited, as has been explained. This makes possible the operation of amplifier 19 and the transfer of high frequency energy to antenna 25. An auxiliary armature and contact member 5 is actuated by relay 4 and adapted to operate simultaneously with the actuation of contact members 6, 7 and 8. Contact member and armature 5 are normally closed, the closing of members 6, 7 and 8 occurring simultaneously with the opening of members 5. Armature and contact member 5 are connected in series arrangement with source 16 and indicating device 20. Indicating device 20 may be an incandescent lamp bulb or any suitable warning device. Armature and contact members similar to members 5 may be connected in series with contact members 5 as indicated by the lead wires 21—22. The contact members thus connected with leads 21—22 would be normally closed, opening the circuit when the respective transmitters were energized. By such an arrangement any number of transmitters may be provided with relays similar to relay 4 having armatures and contact members similar to members 5, whereby any one of the transmitters when radiating energy would open the circuit which energizes indicating signal 20. Indicating signal 20 may be placed in the space aboard ship where the compass bearing apparatus is located. Additional signal lights may be placed near each transmitter when several transmitters are located at different distances and it is desirous to learn when any of such transmitters are operating before the others are connected to the antenna circuit.

Where several antennæ are in close proximity, the grounding of one will influence the frequency characteristics of the others. Such an indicating device would inform the attendant operator that adjustment of the antenna circuit frequency characteristics would be necessary under the circumstances.

Many modifications of the antenna relay and control systems of my invention are possible without departing from the spirit of my invention. A suitable arrangement of adding an additional armature and contact member to one of the relays would be sufficient to control the primary energizing circuits of the thermionic tubes. When such an arrangement is employed the entire control of the transmitter would be from key 1. Mo-

mentarily closing key 1 would start the transmitter, which may be at a distance, would connect the antenna to the transmitter and signal the operator at key 1 by means of signal 20 that the transmitter was in use. A pause in manipulating key 1 would close down the transmitter. A continued manipulation of the key would maintain the transmitter in operative condition. The oscillatory and amplifying arrangement shown in the accompanying drawing is schematic and merely for the purpose of illustrating the embodiments of my invention. It is to be understood, however, that my invention shall not be restricted by the foregoing specification or by the accompanying drawing but only by the scope of the appended claims.

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

1. In a high frequency space radio transmitter the combination of a plurality of relays for controlling the antenna connection to said transmitter and the energizing circuits, the relay for controlling said antenna connections also having a plurality of contacts actuated cooperatively with the contact controlling said antenna connection, an indicating circuit connected to one of said contacts, a key relay, means for rendering said keying relay effective in controlling the operation of said transmitter when one of said contacts actuated cooperatively with said antenna connection is closed, a retarded relay connected for actuation by said telegraph key, and the energizing windings of said first mentioned relays being connected to the contacts of said retarded relay.

2. In a high frequency transmitting system the combination of thermionic tubes having associated energizing circuits and space radio radiating circuits, interdependent relays connected with said circuits, auxiliary contact members of one of said relays connected for controlling an indicating device at a remote point, a key adapted to control the transmission of signaling energy according to code combinations, one of said relays being retarded in opening and closing, said key connected with said relays whereby said relays are energized by the initial operation of said key and whereby further continuous and normal operation of said key controls the transmission of said code combinations as desired.

3. In a radio transmitting system, a thermionic tube, a telegraph key, a master relay and an interlock relay having their windings connected in parallel for actuation by the closing of said key, said master relay being retarded in operation, a keying relay having its contacts connected for energizing said thermionic tube, a line relay having a plurality of contacts, one of said contacts controlling the antenna circuit of said transmitting system, another of said contacts connected for short-circuiting the winding of said interlock relay when said interlock relay is in released position and said antenna circuit is closed, and another of said contacts being connected in circuit with said key, a contact of said interlock relay, and the winding of said keying relay, whereby no energy is radiated during the first depression of said key, but upon release and subsequent depression of said key signaling energy is radiated from said antenna.

4. In a radio transmitting system, a thermionic tube, a telegraph key, a master relay and an interlock relay having their windings connected in parallel for actuation by the closing of said key, said master relay being retarded in operation, a keying relay having its contacts connected for controlling the grid biasing potential of said thermionic tube, a line relay having a plurality of contacts, one of said contacts controlling the antenna circuit of said transmitting system, another of said contacts connected for short-circuiting the winding of said interlock relay when said interlock relay is in released position and said antenna circuit is closed, and another of said contacts being connected in circuit with said key, a contact of said interlock relay, and the winding of said keying relay, whereby no energy is radiated during the first depression of said key, but upon release and subsequent depression of said key signaling energy is radiated from said antenna.

5. In a radio transmitting system, a thermionic oscillator tube, a thermionic amplifier tube, a telegraph key, a master relay and an interlock relay having their windings connected in parallel for actuation by the closing of said key, said master relay being retarded in operation, a keying relay having its contacts connected for controlling the grid biasing potential of one of said tubes, a line relay having a plurality of contacts, one of said contacts controlling the antenna circuit of said transmitting system, another of said contacts connected for short-circuiting the winding of said interlock relay when said interlock relay is in released position and said antenna circuit is closed, and another of said contacts being connected in circuit with said key, a contact of said interlock relay, and the winding of said keying relay, whereby no energy is radiated during the first depression of said key, but upon release of said key signaling energy is radiated from said antenna.

6. In a radio transmitting system, a thermionic oscillator tube, a thermionic amplifier tube having cathode, anode, control grid and shielding grid electrodes, a telegraph key, a master relay and an interlock relay having their windings connected in parallel for actuation by the closing of said key, said

master relay being retarded in operation, a keying relay having its contacts connected for controlling the grid biasing potential of one of said tubes, a line relay having a plurality of contacts, one of said contacts controlling the antenna circuit of said transmitting system, another of said contacts connected for short-circuiting the winding of said interlock relay when said interlock relay is in released position and said antenna circuit is closed, and another of said contacts being connected in circuit with said key, a contact of said interlock relay, and the winding of said keying relay, whereby no energy is radiated during the first depression of said key, but upon release and subsequent depression of said key signaling energy is radiated from said antenna.

7. In a radio transmitting system, a thermionic oscillator tube, a thermionic amplifier tube having cathode, anode, control grid and shielding grid electrodes, a telegraph key, a master relay and an interlock relay having their windings connected in parallel for actuation by the closing of said key, said master relay being retarded in operation in opening and closing, a keying relay having its contacts connected for controlling the grid biasing potential of one of said tubes, a line relay having a plurality of contacts, one of said contacts controlling the antenna circuit of said transmitting system, another of said contacts connected for short-circuiting the winding of said interlock relay when said interlock relay is in released position and said antenna circuit is closed, and another of said contacts being connected in circuit with said key, a contact of said interlock relay, and the winding of said keying relay, whereby no energy is radiated during the first depression of said key, but upon release of said key signaling energy is radiated from said antenna.

8. In a radio transmitting system, a thermionic tube, a telegraph key, a retarded master relay actuated by said key, a system of control relays interlocked with said master relay, and circuits connecting said relays for closing the antenna circuit of said transmitter upon the closing of said retarded relay during the first depression of said key, and for causing said tube to deliver signaling energy to said antenna during immediately subsequent depressions of said key.

9. In a radio transmitting system, a thermionic tube, a telegraph key, a master relay and an interlock relay having their windings connected in parallel for actuation by the closing of said key, said master relay being retarded in operation in opening and closing, a keying relay having its contacts connected for energizing said thermionic tube, a line relay having a plurality of contacts, one of said contacts controlling the antenna circuit of said transmitting system, another of said contacts connected for short-circuiting the winding of said interlock relay when said interlock relay is in released position and said antenna circuit is closed, and another of said contacts being connected in circuit with said key, a contact of said interlock relay, and the winding of said keying relay, whereby no energy is radiated during the first depression of said key, but upon release and subsequent depression of said key signaling energy is radiated from said antenna.

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