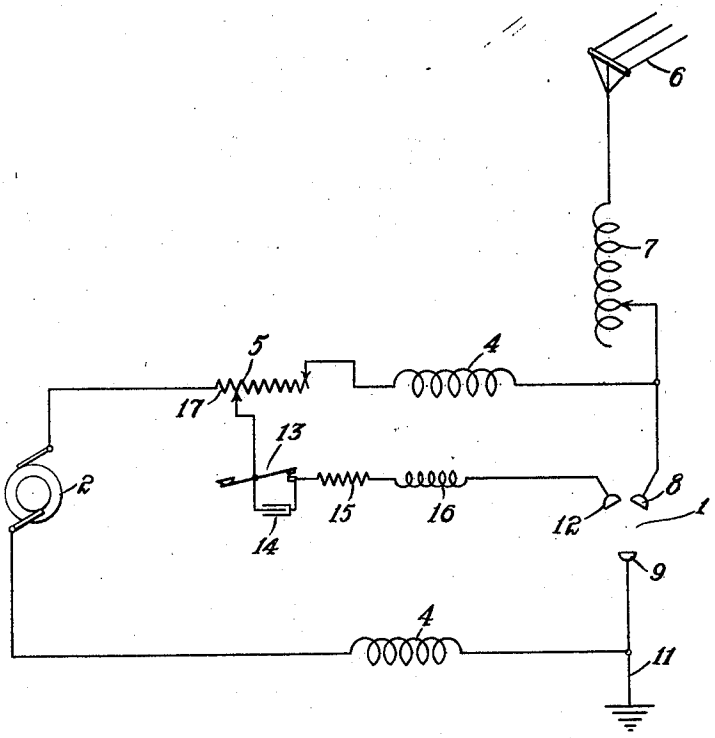
Jan. 15, 1924. 1,480,659

Q. A. BRACKETT

SIGNALING SYSTEM

Filed Dec. 7, 1920



WITNESSES:

H. T. Shelhamer

H. L. Godfrey

INVENTOR

Quincy A. Brackett

BY

Merle G. Starr

ATTORNEY

Patented Jan. 15, 1924. 1,480,659

UNITED STATES PATENT OFFICE.

QUINCY A. BRACKETT, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

SIGNALING SYSTEM.

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To all whom it may concern:

Be it known that I, QUINCY A. BRACKETT, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Signaling Systems, of which the following is a specification.

My invention relates to wireless-telegraph-transmission systems and it has particular relation to systems of control that are adapted to control the radiation of energy from arc systems.

The object of my invention is to provide a control system for arc generators that shall be simple in construction and reliable in operation.

Hitherto, in wireless transmission stations, the energy radiated from arc systems has been controlled by means of the compensation-wave method and the absorption method.

In the compensation-wave method of control, the period of the antenna circuit or, in other words, the length of the radiated wave, is controlled by varying the effective inductance of the antenna circuit. This method of control has the disadvantage of causing the radiation of energy at two wave lengths.

In the absorption-circuit method of control, the oscillating current produced by the arc is caused to oscillate either in the antenna circuit or in the absorption circuit, depending on the energy-loss in the one or the other circuit being the greater. In order to effect the transfer of energy, readily, from one circuit to the other, the periods of the two circuits must be very nearly equal. The result is that forced oscillations are induced in the antenna circuit while the absorbing circuit is functioning, thereby causing a certain amount of energy to be radiated.

According to my invention, I employ a system of control which permits of the radiation of energy at one wave length and effectively prevents radiation by forced oscillations.

The desired result is accomplished by employing a system of control whereby an arc is swung from an anode connected to a radiating circuit to a second anode connected to a non-radiating circuit. The non-radiating circuit may be either of the oscillating type or of the non-oscillating type. In the operation of my invention, I employ a circuit of the latter type.

A better understanding of my invention may be had by referring to the accompanying drawing, in which:

The single figure is a diagrammatic representation of a radio-telegraph-transmission system showing the arrangement of the control system embodying my invention.

Referring to the drawing, the transmission system includes an arc generator 1 which is connected to a source of energy 2 through a pair of reactance coils 4 and an adjustable resistor 5. A radiating circuit includes a radiating antenna 6, a variable inductor 7, an anode 8 and a cathode 9 of the arc generator 1 and a ground conductor 11. The arc generator 1 comprises a pair of anodes 8 and 12 and the cathode 9.

A key 13, a condenser 14 for shunting the key 13, resistor 15 and iductor 16 are included in a circuit which extends from the anode 12 of the arc generator 1 to the resistor 5. The condenser 14 prevents sparking between the stationary and movable contactor members of the key 13. The resistance of resistor 15 and portion 17 of resistor 5 is substantially equal to the total antenna resistance. This resistance is the sum of the so-called "dielectric-absorption resistance," the ohmic resistance and the radiation resistance. The choke coils 4 prevent the high-frequency oscillations from passing through the generator 2. In order to simplify my invention, I have not shown means for producing a magnetic field and other arc refinements well known to the art.

The operation of the system is as follows:

Upon a supply of energy to the anodes 8 and 12 and the cathode 9, an arc is established between anode 12 and cathode 9 in any manner well known to the art. The circuit, which includes the generator 2, portion 17 of resistor 5, key 13, condenser 14,

resistor 15, inductor 16, anode 12, cathode 9 and inductor 4, functions as an ordinary direct-current arc circuit. Thus, with the operating key 13 closed, substantially no energy is radiated from the antenna circuit.

Upon opening the key 13, the arc is swung from anode 12 to anode 8. By reason of the well known negative-resistance characteristic of an arc, when shunted by an inductance and a capacitance, high-frequency oscillations are generated in the antenna circuit. Therefore, with key 13 open, a maximum amount of energy is radiated from the antenna circuit.

Upon closing of the key 13, the arc is again transferred from anode 8 to anode 12 to establish an arc of the non-oscillating type. The transfer of the arc from anode 8 to anode 12 is readily effected because of the well known preference of an arc for a circuit causing stable operation to a circuit causing unstable operation. I have found that the transfer of the arc may be more readily effected by making the combined resistance of resistor 15 and portion 17 of resistor 5 less than that of resistor 5.

It can thus be seen that, with the key 13 closed, substantially no energy is radiated from the antenna circuit, but that, on opening the key, an arc is formed between anode 8 and cathode 9 to supply a maximum amount of energy to the radiating-antenna circuit.

One advantage of my arrangement is the increase in the operating efficiency of an arc when supplying energy to an antenna circuit. This increase in efficiency is due to the fact that the anode 8 is maintained in a cooler state than has heretofore been possible without the use of some auxiliary means.

Another advantage of my arrangement lies in the fact that a constant load is maintained on the source of energy during both the radiating and non-radiating periods.

Still another advantage of my arrangement is that a relatively small current is broken by the key 13 during a signaling operation, thereby reducing the sparking at the contacts of the key to a minimum value.

Still a further advantage of my arrangement is the provision of a controlling circuit permitting a capacitance to be connected in shunt relation to a key to cause a still further reduction in the sparking at the contacts thereof.

While I have shown a specific type of arc-generator in the transmission system embodying my invention, it is apparent that various modifications in the arrangement of the anodes with respect to the cathode may be employed without departing from the spirit of my invention. I desire, therefore, that only such limitations shall be imposed thereon as are indicated in the appended claims.

I claim as my invention:

1. The method of arc signaling which consists in selectively supplying energy either to an oscillatory circuit or to a non-oscillatory circuit while maintaining uninterrupted operation of the arc.

2. The method of arc signaling which consists in selectively transferring an arc from an anode connected to an oscillatory circuit to a second anode connected to a non-oscillatory circuit to control the radiation of energy from said oscillatory circuit.

3. In a system of signaling, the method of selectively transferring an arc from an anode connected to an oscillatory circuit to a second anode connected to a non-oscillatory circuit which consists in varying the resistance of the non-oscillatory circuit.

4. In an arc generator, a pair of anodes, a cathode, a radiating circuit connected in shunt relation to one of said pair of anodes and said cathode and a supply circuit so connected to said pair of anodes and said cathode that the idle anode is at a relatively higher voltage than the working anode, whereby the arc may be transferred more readily from one anode to the other.

5. In an arc generator, a pair of anodes, a cathode, a radiating circuit connected in shunt relation to one of said pair of anodes and said cathode and means for transferring the arc from one of said anodes to the other.

6. An arc-system for radio signaling comprising two electrodes between which an arc is formed, a radiating circuit connected in shunt relation thereto, a third electrode and means whereby the arc may be transferred from one of said pair of electrodes to said third electrode.

7. An arc-system for radio signaling comprising two electrodes between which an arc is formed, a radiating circuit connected in shunt relation thereto, a third electrode and means whereby the arc may be transferred from one of said pair of electrodes to said third electrode to selectively control the flow of energy in the radiating circuit.

8. An arc-system for radio signaling comprising a pair of electrodes between which an arc is formed, a circuit for supplying energy to said arc, and a radiating circuit, both in parallel and shunted around said pair of electrodes, a third electrode and means whereby the arc may be transferred from one of said pair of electrodes to said third electrode to control the flow of current in the radiating circuit.

9. An arc-system for radio signaling comprising a pair of electrodes between between which an arc is formed, a circuit for supplying energy to said arc, said circuit including a resistor and an inductor, and a radiating circuit both in parallel and shunted around said pair of electrodes, a

third electrode and means whereby the arc may be transferred from one of said pair of electrodes to said third electrode to control the flow of current in the radiating circuit.

10. An arc-system for radio signaling comprising two electrodes between which an arc is formed, a radiating circuit connected in shunt relation thereto, a third electrode and key-controlled means whereby the arc may be transferred from one of said pair of electrodes to said third electrode.

11. An arc system for radio signaling comprising a pair of electrodes between which an arc is formed, a third electrode, a circuit for supplying energy to said pair of electrodes, said circuit containing an inductor and a resistor, and a radiating system both in parallel and shunted around said pair of electrodes, and a circuit to which the arc may be transferred, said circuit containing said third electrode, one of said first-named pair of electrodes, a resistor, a key, a portion of said first-named resistor, a translating device and an inductor.

12. An arc system for radio signaling comprising a pair of electrodes between which an arc is formed, a third electrode, a circuit for supplying energy to said pair of electrodes, said circuit containing an inductor and a resistor, and a radiating system both in parallel and shunted around said pair of electrodes, and a circuit to which the arc may be transferred, said circuit containing said third electrode, one of said first-named pair of electrodes, an inductor, a resistor, the resistance of which is substantially equal to the total antenna resistance, a key, a portion of said first-named resistor and a translating device.

13. An arc-system for radio signaling comprising a pair of electrodes between which an arc is formed, a third electrode, a circuit for supplying energy to said pair of electrodes, said circuit containing an inductor, a resistor and a translating device connected in series relation, and a radiating system both in parallel and shunted around said pair of electrodes, and a circuit to which the arc may be transferred, said circuit containing said third electrode, one of said first-named pair of electrodes, a resistor, a key, a portion of said first-named resistor and a translating device.

14. An arc-system for radio signaling comprising a pair of electrodes between which an arc is formed, a third electrode, a circuit for supplying energy to said pair of electrodes, said circuit containing an inductor, a resistor and a translating device, and a radiating system both in parallel and shunted around said pair of electrodes, and a circuit to which the arc may be transferred, said circuit having connected in series relation said third electrode, one of said pair of electrodes, a resistor, a key, a portion of said first-named resistor and a translating device.

15. An arc-system for radio signaling comprising a pair of electrodes between which an arc is formed, a third electrode, a circuit for supplying energy to said pair of electrodes, said circuit containing an inductor, a resistor and a translating device, and a radiating system both in parallel and shunted around said pair of electrodes, and a circuit to which the arc may be transferred, said circuit containing said third electrode, one of said pair of electrodes which serves as cathode, a resistor, a key, a portion of said first-named resistor and a translating device.

16. The method of signaling which consists in selectively changing the condition of an arc stream from an oscillatory state to a non-oscillatory state while maintaining the continuity of said arc stream.

17. The method of signaling which consists in selectively causing an arc to energize an oscillatory circuit and a non-oscillatory circuit while continuously maintaining the continuity of the arc stream.

18. The method of signaling which consists in selectively changing the condition of an arc stream from an oscillatory state to a non-oscillatory state, maintaining the continuity of said arc stream during said change and further maintaining the load on the source of supply substantially constant.

19. The method of signaling which consists in impressing upon an idle anode connected to a substantially non-oscillatory circuit a relatively higher voltage than that upon a working anode connected to a non-oscillatory circuit to transfer the arc from the one anode to the other.

20. In an arc generator, a cathode element, a pair of normally stationary anode elements co-operating therewith and means for transferring an arc between said elements from one anode to the other.

21. In an arc generator, a cathode element, a pair of normally stationary anode elements co-operating therewith and means for transferring an arc between said elements from one anode to the other while maintaining the continuity of the arc.

22. In combination, an arc generator comprising a pair of anode elements and a co-operating cathode, means for establishing an arc between one of said anode elements and said cathode, means for causing said arc to assume an oscillatory condition, means for transferring said arc from the operating anode element to the non-operating anode element and means for changing the operating condition of the arc.

23. In combination, an arc generator comprising a pair of anode elements and a co-

operating cathode, means for establishing an arc between one of said anode elements and said cathode, means for causing said arc to assume an oscillatory state and means for transferring said arc from the operating anode element to the idle anode element while maintaining the continuity of the arc, said last mentioned means including means for changing the arc from an oscillatory state to a non-oscillatory state.

In testimony whereof, I have hereunto subscribed my name this 30th day of November 1920.

QUINCY A. BRACKETT.