June 24, 1930. E. F. W. ALEXANDERSON 1,768,433

RADIOTELEGRAPHY

Filed Aug. 9, 1926

Fig. 1.

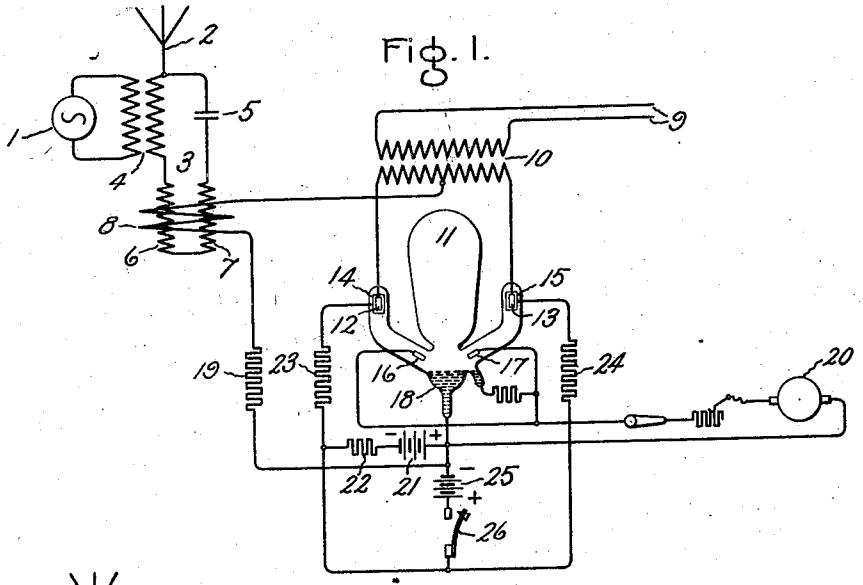
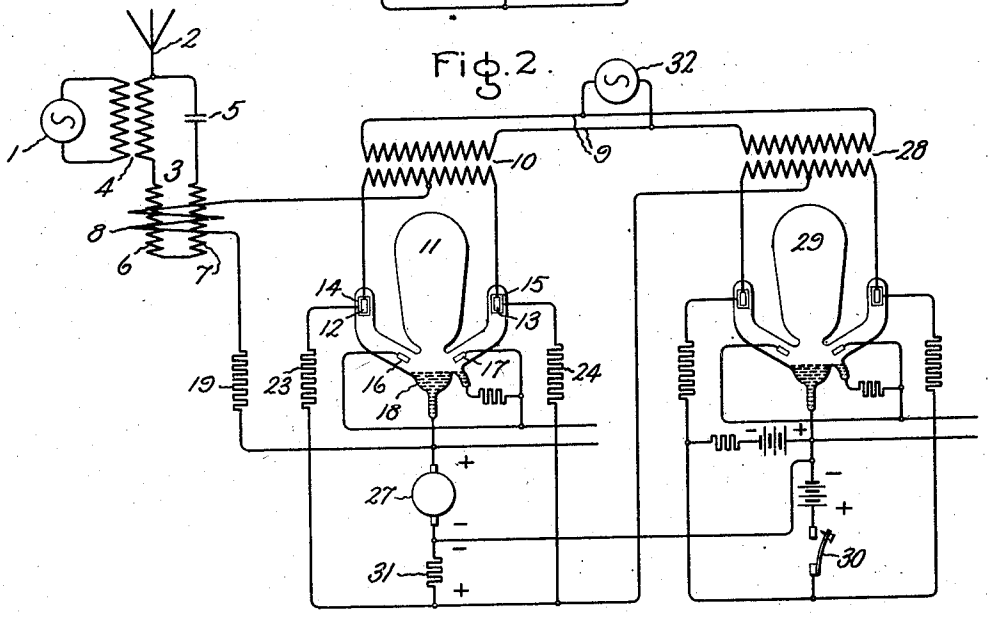


Fig. 2.



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Patented June 24, 1930 1,768,433

UNITED STATES PATENT OFFICE

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RADIOTELEGRAPHY

Application filed August 9, 1926. Serial No. 128,268.

My invention relates to radiotelegraphy, and has for its principal object the provision of an improved system that is capable of accurately transmitting signals at a comparatively high rate of speed.

It is customary to supply energy to an antenna from a high frequency source and to control this energy by change in the saturation of a variable impedance device such as a magnetic amplifier which is connected to the antenna in series or parallel with the high frequency source and is provided with a saturation or exciting winding energized in accordance with the signals to be transmitted. This method of controlling the energy supplied to the antenna involves the use of means for controlling the circuit of the exciting winding. Such circuit control means should be capable of clearly defining the periods of energization and deenergizataion of the exciting winding and should be capable of opening and closing at a high rate of speed in order to permit the rapid transmission of signals. Various circuit control means have been provided in the past for controlling the saturation of the impedance device or magnetic amplifier but the operation of many of these control means has not been altogether satisfactory for the reason that they either do not operate with sufficient rapidity or are incapable of controlling currents large enough to saturate the magnetic amplifier.

In patent No 1,675,987, of Albert H. Mittag, issued July 3, 1928, is disclosed a signal control system wherein current is transmitted from a direct current source to the exciting winding of a magnetic amplifier through a vapor electric device provided with grids for controlling the transmission of current between its cathode and its anodes, one of the anodes being connected in series with the exciting winding and the other anode being connected in a circuit independently of the exciting winding. During operation of this system, potentials varying in accordance with the signals to be transmitted are applied to the grids, and the currents of the device are shifted from one anode to another at the beginning of the signal and in the reverse direction at the end of the signal. As stated in the aforesaid application, this system is capable of transmitting signals at a rate corresponding to approximately 250 words per minute. I have found that this rate may be increased materially by utilizing current supplied from a high frequency source and rectified by a vapor electric device provided with grids energized in accordance with the signals to be transmitted.

My invention will be better understood from the following description when considered in accordance with the accompanying drawings and its scope will be pointed out in the appended claims.

Referring to the drawings, Fig. 1 shows a signal transmitting system wherein my invention has been embodied; and Fig. 2 shows a modified embodiment of the invention.

Fig. 1 shows a signal control system wherein current is supplied from a high frequency source 1 to a consumption circuit shown as an antenna 2. This current is controlled by a magnetic amplifier 3 which is connected to the secondary circuit of an antenna transformer 4 through a condenser 5 and is provided with oppositely wound operating coils 6 and 7 and with an exciting or saturation coil 8. With these connections, the magnitude of the current supplied to the antenna 1 is determined by the magnetic amplifier impedance which is controlled by the current transmitted through the saturation winding 8.

Current is supplied to the winding 8 from a suitable high frequency source through supply busses 9, a transformer 10 and a vapor electric device 11. The device 11 is provided with anodes 12 and 13, grids 14 and 15, exciting electrodes 16 and 17, and a vaporizable cathode 18. It will be observed that the cathode 18 is connected to the anodes 12 and 13 through an impedance device 19, exciting coil 8 and opposite halves of the secondary circuit of the transformer 10, is connected to the exciting electrodes 16 and 17 through a source of excitation shown as a generator 20, and is connected to grids 14 and 15 through a source 21, an impedance

device 22 and through impedances 23 and 24 respectively. A source 25 is arranged to be connected in shunt to the source 21 and impedance device 22 by means of a switch or key 26 which may be operated either manually or in any other suitable manner.

With the busses 9 energized and the connections as illustrated, no current is supplied to the exciting coil 8 for the reason that the grids 14 and 15 are charged to a negative potential by the source 21. Upon closure of the key 26, however, the grids 14 and 15 are charged to a positive potential by the source 25 and current is immediately transmitted through the device 11 to the exciting coil 8, thereby producing an immediate increase in the current supplied from the source 1 to the antenna 2. When the key 26 is opened, the antenna current is restored to its normal value. The closing and opening of the key 26 thus initiates and terminates the signal.

The speed at which it is possible to transmit signals is dependent on the frequency of the current supplied through the busses 9. This is true because a negative potential on the grids 14 and 15 will prevent the starting of current through the device 11 but will not stop this current after it has once started. Each time the polarities of the anodes 12 and 13 are reversed, however, control by the grids 14 and 15 is secured. The time lag between operation of the key 26 and change in the current of the coil 8 will therefore tend to decrease as the frequency of the current supplied through busses 9 is increased. Thus, with current supplied to the transformer 10 at a frequency of about 2,000 cycles, for example, I have found that signals may be readily sent at a speed which corresponds to more than 300 words per minute. The advantages of my invention, however, are not limited to this frequency but are realized in various degrees as the frequency of the control current is changed in value. The term "high frequency" as used throughout this application is therefore intended to mean any frequency whereby the time lag between operation of the control key and change in the signal current is made short enough to materially increase the rate at which signals may be sent by other devices available to those skilled in the art.

Fig. 2 shows a signal control system which differs from that of Fig. 1 in that the source 25 is shown as a direct current generator 27 and in that control of the negative potential applied to the grids 14 and 15 by this generator is effected by control apparatus comprising a transformer 28, a vapor electric device 29, a control key 30, and an impedance device 31 which is connected between the generator 27 and the grids 14 and 15 and is arranged to produce a counter-electromotive force dependent on the current transmitted from a high frequency source 32 to the device 31. Current from the source 32 may also be supplied to the transformer 10 through which the exciting coil 8 is energized. The connections of the device 29 are substantially the same as those described in connection with Fig. 1, and it will be readily understood, without detailed explanation, that current is supplied to the device 31 only when the key 30 is in its closed position and that the effect of this current is to produce a counter-electromotive force whereby the potentials of grids 14 and 15 are changed from a negative to a positive value.

The embodiments of the invention illustrated and described herein have been selected for the purpose of clearly setting forth the principles involved. It will be apparent, however, that the invention is susceptible of being modified to meet the different conditions encountered in its use and I therefore aim to cover by the appended claims all modifications within the true spirit and scope of my invention.

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

1. The combination of a consumption device, a variable impedance device connected to said consumption device, a source of alternating current, a vapor electric device provided with a cathode and anode connected between said source and said impedance device and with a grid for controlling the current transmitted to said impedance device, means connected between said grid and cathode for biasing said grid to a negative potential, and means connected to said source for producing an electromotive force which is opposed to said negative potential whereby said grid is charged to a positive potential.

2. The combination of a consumption device, a variable impedance device connected to said consumption device, a source of alternating current, a vapor electric device provided with a cathode and anode connected between said source and said impedance device and with a grid for controlling the current transmitted to said impedance device, a direct current source connected between said grid and cathode for biasing said grid to a negative potential, a resistor connected in circuit with said direct current source, and means connected between said alternating current source and said resistor whereby a positive potential may be applied to said grid.

3. The combination of a consumption device, a variable impedance device connected to said consumption device, a source of alternating current, a vapor electric device provided with a cathode and anode connected between said source and said impedance device and with a grid for controlling

the current transmitted to said impedance device, a direct current source connected between said grid and cathode for biasing said grid to a negative potential, a resistor connected in circuit with said direct current source, and means comprising a vapor electric device connected between said alternating current source and said resistor whereby a positive potential may be applied to said grid.

4. The combination of an antenna, a source of current connected to said antenna, a variable impedance device arranged to control the current supplied from said source to said antenna, and means for controlling the impedance of said device comprising a high frequency source independent of said first source, and vapor electric means provided with an anode and cathode connected between said device and said high frequency source and with a grid arranged to be energized in accordance with the signals to be transmitted by said antenna.

5. The combination of a consumption device, a variable impedance device connected to said consumption device, means for supplying control current to said impedance device including a vapor electric device having an anode, a cathode and a grid, means for supplying high frequency alternating potential to the anode of said device, means connected between said grid and cathode for charging said grid to a negative potential and means for causing a positive potential to be applied to said grid in accordance with desired signals, the frequency of said alternating potential being sufficiently high to permit operation of said last means at high signaling speed.

In witness whereof, I have hereunto set my hand this 6th day of August, 1926.

ERNST F. W. ALEXANDERSON.