

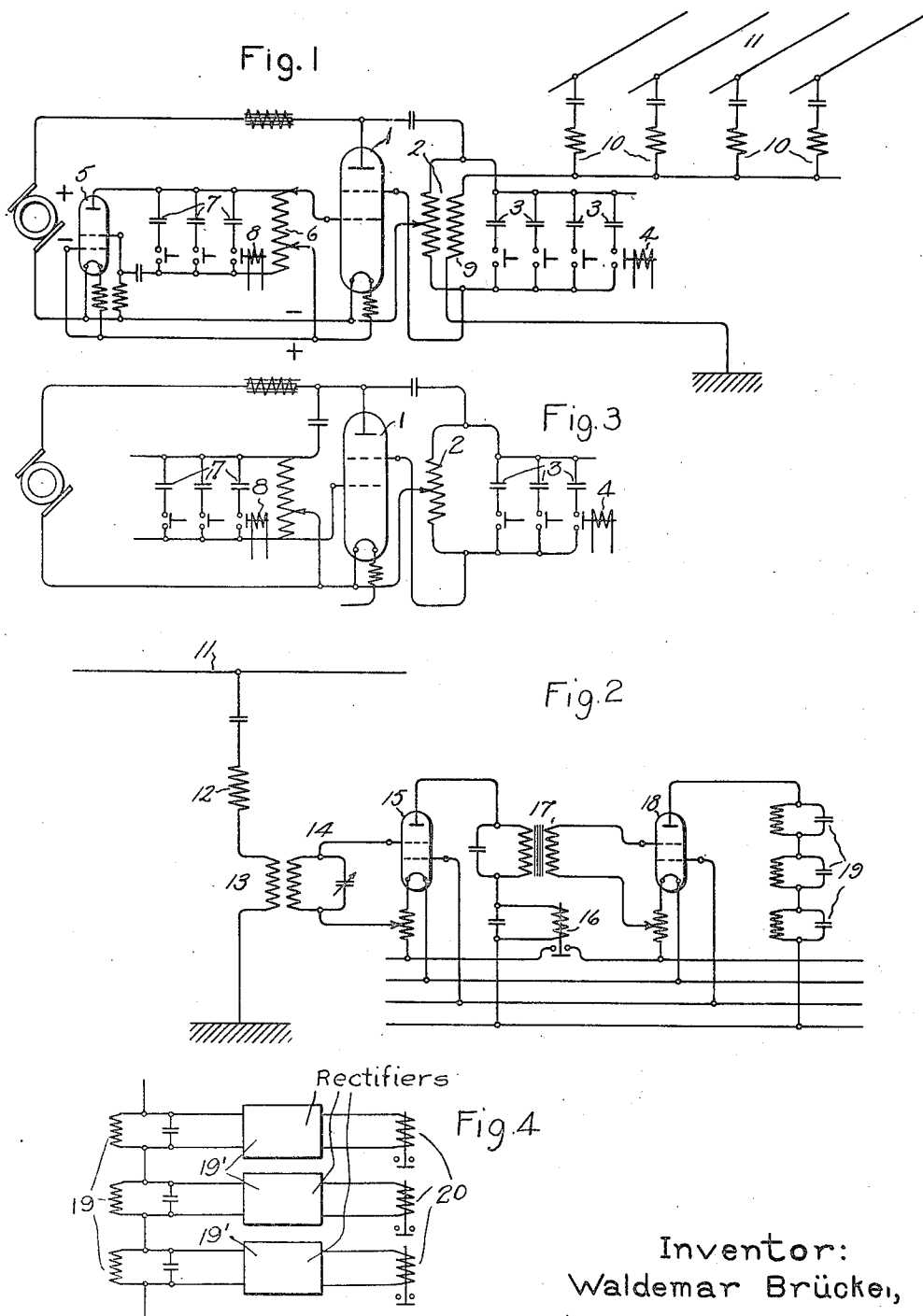
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MULTIPLEX SIGNALING SYSTEM

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UNITED STATES PATENT OFFICE

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MULTIPLEX SIGNALING SYSTEM

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My present invention relates to signaling systems, and more particularly to multiplex signaling.

It is well known that a multiplex utilization of a wire signaling or remote control may be accomplished by effecting the individual remote operations by alternating currents of different frequencies as in alternating current multiplex telegraphy. The number of connections which may be established and operated without interference over one continuous wire is limited by the range of frequency which is practically available on the particular wire. Limitations of this nature often arise when a number of different signals are to be transmitted over one continuous wire from one station to several other stations. In such cases the total number of signals to be transmitted determines the number of different frequencies required, and often operation is impossible even with a small number of signals for each station.

According to the present invention operation under such conditions is made possible by resorting to the use of modulated high frequency waves. The high frequency waves serve to connect the transmitter with the individual receiving stations while the modulated frequencies serve to separate the individual signals supplied to any one receiving station from one another.

The novel features which I believe to be 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 together with future objects and advantages thereof will best be understood by reference to the following specification taken in connection with the accompanying drawing in which Fig. 1 shows diagrammatically a transmitter associated with a plurality of transmission lines, while Fig. 2 shows a receiving station associated with one of the transmission lines. Fig. 3 shows a modified form of the transmitter and Fig. 4 shows a detail of the receiver.

Referring to the drawing, I have indicated at 1 a high frequency oscillating generator or tube connected to a high frequency oscillating output circuit 2 which may be adjusted for various wave lengths by means of a plurality of condensers 3. The connection of any desired condenser with the tube may be effected by means of relays 4, controlled from a remote point, or in any manner desired. The high frequency oscillating tube 1 may be influenced in its operation by means of a special grid which is connected to an additional tube or modulator 5. As in the case of tube 1, there is connected to this additional tube a low frequency oscillating output circuit 6 which may include condensers 7 which are adapted to be connected in circuit by means of relays 8.

If a relay 4 and a relay 8 are operated, a particular high frequency oscillation is produced which is modulated with the corresponding low frequency. The modulated high frequency oscillation is supplied through the inductive coupling 9 and resonant circuits 10 to the wires 11 of a system of distribution, over which communication, with the particular high frequency wave, is to take place.

The high frequency wave produced by the transmitter reaches the corresponding receiving station at the other end of wire 11 and excites a high frequency oscillating circuit 14 by way of a resonant connection 12 and inductive coupling 13. These oscillations are rectified and amplified by a receiving tube 15 which is continuously in circuit. With pure high frequency waves, a pure direct current is obtained in the primary of transformer 17, while with modulated high frequency waves a direct current with the superposed alternating current of the modulation frequency is obtained there. The direct current component excites a relay 16 by which the current sources for the other tubes are connected. The superposed alternating current, on the other hand, appears in the secondary winding of transformer 17 and is supplied to the grid of the next amplifier tube 18. Oscillating circuits 19 are connected in the plate circuit of tube 18 and are tuned to the individual modulation frequencies. These circuits may contain the actual output relays for the circuits of the individual intended signals. The

relays may be thermal or soft iron relays, or any type desired. Additional rectifier tubes may be connected with the individual oscillating circuits for the purpose of converting the alternating current into direct current, and in order to make it feasible to use a direct current relay as the output relay, the advantage of this arrangement being that a very accurate and rapid effect may be obtained where precise manipulations are desired. This arrangement is illustrated in Fig. 4, in which each of the tuned circuits 19 are connected to the input circuit of a rectifier 19' which includes in its output circuit a relay 20.

The transmitter may be simplified by using the same tube for the production of both the high and the low frequency current. Such an arrangement is shown in Fig. 3, in which the oscillatory circuit 7, 6 is connected in the same manner in which the oscillator output circuit 2 is connected with the exception that the other of the two control electrodes is employed.

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

1. In a signaling system, an electron discharge high frequency generator having a plurality of electrodes, a modulating generator connected to supply oscillations between two of said electrodes, said modulating generator having an output oscillating circuit, and means associated with said circuit to vary at will the frequency of current supplied to modulate the output of the high frequency generator whereby the output from said generator is continuously modulated at will by any one of a plurality of frequencies.

2. In a signaling system, a high frequency generator having an oscillating output circuit, means for varying the frequency of the current in the output circuit, a modulating generator having an oscillating output circuit continuously connected to said high frequency generator, and means associated with the output circuit of the modulating generator for varying at will the frequency of the current supplied to modulate the output of the high frequency generator whereby the output from said first generator has any one of a plurality of frequencies and is continuously modulated by any one of a plurality of modulating frequencies at will.

3. In a signaling system, a transmitter comprising an electron discharge device having an anode, cathode and two control elements or grids, said device having an output oscillating circuit which is connected to one of said control elements, a modulating generator connected to the other of said control elements of the discharge device, and means for varying the frequency of the current supplied from the modulating generator to said control element.

4. In combination, an oscillation generator comprising an electron discharge device hav-

ing an anode, a cathode and a plurality of additional electrodes interposed between the anode and cathode, independent oscillating circuits connected to each of said additional electrodes, said circuits being tuned to different frequencies and connected to have oscillations excited therein through action of said discharge device, and a load circuit associated with one of said oscillating circuits whereby oscillations having the frequency of said one oscillating circuit is supplied to said load circuit bearing modulations in accordance with the frequency of another of said oscillating circuits.

5. In a signaling system, a transmitter comprising an electron discharge device having an anode, a cathode and two control elements or grids interposed between said cathode and anode, means connected to said cathode, anode and one of said control elements to cause said device to produce oscillations of high frequency, means for modulating said oscillations with oscillations of a different frequency, said means comprising an oscillatory circuit connected to said cathode and the other of said control elements and means whereby oscillations determined in frequency by the constants of said oscillatory circuit are excited therein.

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

WALDEMAR BRÜCKEL.