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L. ESPENSCHIED

HALF DUPLEX MORSE CARRIER SYSTEM

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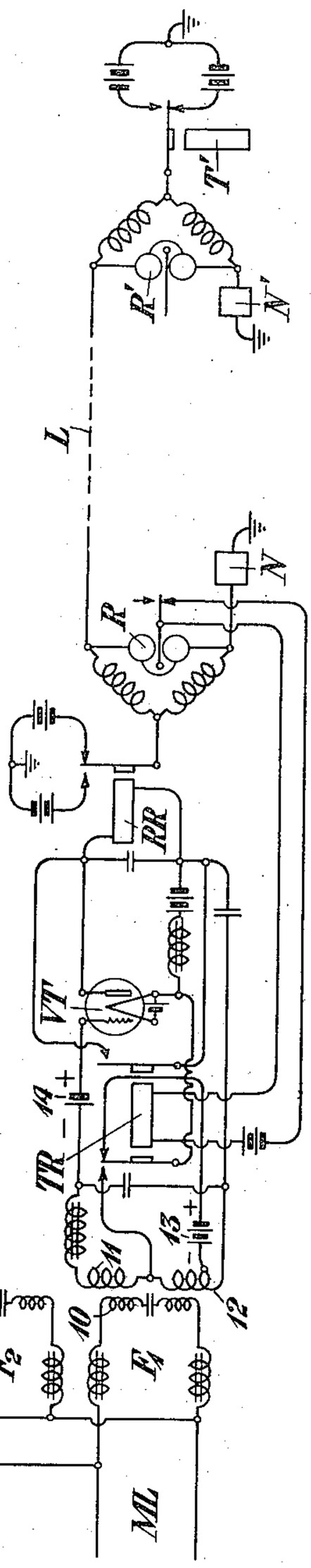

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By his Attorney
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UNITED STATES PATENT OFFICE.

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HALF-DUPLEX MORSE CARRIER SYSTEM.

Application filed August 11, 1921. Serial No. 491,512.

To all whom it may concern:

Be it known that I, LLOYD ESPENSCHIED, residing at Queens, in the county of Queens and State of New York, have invented certain Improvements in Half-Duplex Morse Carrier Systems, of which the following is a specification.

This invention relates to signaling systems, and more particularly to multiplex signaling systems employing carrier currents for transmission purposes.

One of the purposes of this invention is to produce a simple form of repeating apparatus for repeating between a Morse carrier channel and an ordinary Morse circuit. A salient feature of the terminal arrangement resides in the employment of a vacuum tube which may function as a receiving detector for repeating from the carrier channel to the Morse line, and as a generator of oscillations for repeating from the Morse line to the carrier channel.

Other and further features of the invention will be clear from the following description, when read in connection with the accompanying drawing, the figure of which illustrates a circuit arrangement embodying the principles of the invention.

Referring to the drawing, ML designates a main transmission line over which carrier currents may be transmitted. Tuned circuits F_1, F_2, F_3, etc., are associated with the line for separating the various carrier transmissions into the proper local channels. The local apparatus associated with but one of the selective devices is illustrated, but it will be understood that similar apparatus will be provided for each channel. The apparatus associated with the selective device F_1 includes a vacuum tube VT of the usual three-element type, which by means of its associated circuits, may be used for repeating between the main line ML and an ordinary Morse line L. The circuits of the vacuum tube VT include windings 11 and 12 which are inductively associated with a winding 10 of the tuned circuit F_1 for the purpose of establishing a feed-back connection between the grid and plate of the tube.

A transmitting relay TR is provided, said relay controlling the circuits of the tube over its contacts. The relay as shown is normally energized and in this condition, established a connection from the filament of the tube to an intermediate point of the winding 12, so that a lesser degree of coupling exists between the grid and plate circuits under these conditions than under the oscillating condition to be described later. The connection to the intermediate point of the winding 12 includes an auxiliary battery 13, which when connected in series with the usual grid battery 14, impresses such a potential upon the grid as to render it most efficient as a reamplifying detector. When the transmitting relay TR is deenergized, it opens the connection established at the intermediate point of the winding 12 and establishes a connection to the junction point between the windings 11 and 12. The coupling between the grid and plate circuits is now sufficient to cause singing, and the battery 13 being no longer connected to the grid, the potential upon the grid is such as to render the vacuum tube most efficient as an oscillator, so that it now generates oscillations of carrier frequency for transmission to the main line ML.

The plate circuit of the vacuum tube includes a receiving relay RR for responding to signals detected by the tube when functioning as a detector, and this relay RR is arranged to operate as a transmitting relay at one end of the Morse line L. The winding of relay RR may be short circuited by relay TR to prevent it from operating when the tube is oscillating. The Morse line L is provided with the usual balanced bridge equipment at each terminal. The balanced bridge equipment includes two inductances, one connected to the line L and the other to a balancing network N with the transmitting circuit under the control of the relay RR connected to the junction point of the inductances. A receiving relay R is bridged across neutral points between the line L and the network N as regards the transmitting circuit. At the distant terminal, the balancing bridge arrangement includes inductances similarly arranged with respect to the line L and a balancing network N′. A transmitting circuit under the control of a transmitter T′ is connected to the junction points of the inductances, and a polar receiving relay R′ is bridged across neutral points between the line L and the network N′.

The operation is as follows: Under normal conditions the contact controlled by the polar receiving relay R maintains the circuit

of the transmitting relay TR closed so that the vacuum tube circuits are adjusted for the reamplifying detecting operation. Consequently, when carrier currents are transmitted from the main line through the tuned circuit F_1 to the grid circuit of the vacuum tube, signals are detected from the carrier currents by the vacuum tube and reamplified. The reamplified signals operate the receiving relay RR, which vibrates its armature in response to the signals to transmit positive and negative impulses over the line L. These impulses do not actuate the receiving relay R but actuate the receiving relay R′ at the distant end, so that the operator at the distant station may receive the signals. When it is desired to transmit signals from the distant station, the transmitter T′ is operated to transmit positive and negative impulses over the line L. These impulses actuate the polar relay R. The relay R responds to each impulse of the polarity corresponding to a dot or dash to open the circuit of the transmitting relay TR, which establishes a connection between the filament of the tube and the junction point between the windings 11 and 12. The vacuum tube now functions as a generator of oscillations, which oscillations are transmitted to the main line ML through the tuned circuit F_1.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations, widely different from those illustrated, without departing from the spirit of the invention as defined in the following claims.

What is claimed is:

1. In a signaling system, a carrier transmission circuit, a low frequency Morse line extending from a terminal of said carrier circuit to a distant station and a repeating apparatus for associating said carrier transmission circuit and said Morse line, said repeating apparatus including a translating device which under certain conditions functions as a detector to translate carrier signals incoming over the carrier circuit into Morse signals for transmission over the low frequency Morse line, said translating device functioning in response to signals incoming over the Morse line to generate oscillations for transmission to the carrier line.

2. In a signaling system, a carrier transmission circuit, a low frequency Morse line extending from a terminal of said carrier circuit to a distant station, and a repeating apparatus for associating said carrier transmission circuit and said Morse line, said repeating apparatus including a vacuum tube which under certain conditions functions as a detector to translate carrier signals incoming over the carrier circuit into Morse signals for transmission over the low frequency Morse line, said vacuum tube functioning in response to signals incoming over the Morse line to generate oscillations for transmission to the carrier line.

3. In a signaling system, a carrier transmission circuit, a low frequency Morse line extending from a terminal of said carrier circuit to a distant station and repeating apparatus for interconnecting said carrier circuit and said Morse line, said repeating apparatus comprising a translating device and circuits for said translating device whereby it may operate either as a detector or as a generator of oscillations, means associated with said translating device and responsive to Morse signals detected by said translating device for transmitting Morse signals over said Morse line, and controlling means responsive to signals incoming over said Morse line to cause said translating device to function as a generator of oscillations for transmission over the carrier circuit.

4. In a signaling system, a carrier transmission circuit, a low frequency Morse line extending from a terminal of said carrier circuit to a distant station and repeating apparatus for interconnecting said carrier circuit and said Morse line, said repeating apparatus comprising a vacuum tube and circuit for said vacuum tube whereby it may operate either as a detector or as a generator of oscillations, means associated with said vacuum tube and responsive to Morse signals detected by said vacuum tube for transmitting Morse signals over said Morse line, and controlling means responsive to signals incoming over said Morse line to cause said vacuum tube to function as a generator of oscillations for transmission over the carrier circuit.

In testimony whereof, I have signed my name to this specification this 9th day of August, 1921.

LLOYD ESPENSCHIED.