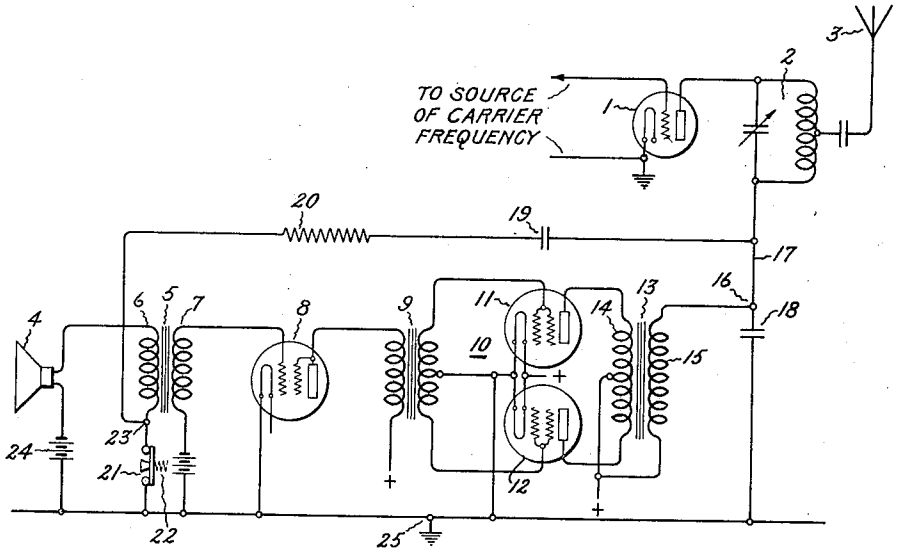
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RINGING CIRCUIT FOR RADIOTRANSMITTERS

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RINGING CIRCUIT FOR RADIO-TRANSMITTERS

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My invention relates to radio telephone transmitter apparatus and particularly to so-called howler or ringing circuits for such apparatus. Its general object is the provision of an improved ringing circuit particularly for short-wave radio transmitters such as used in connection with police automobiles.

A radio telephone transmitter apparatus as usually employed for the above-mentioned police car and similar purposes comprises a source of high frequency carrier waves connected to a power amplifier, a microphone connected to a speech amplifier apparatus through a microphone coupling transformer, and a modulator connected through an output transformer to the carrier wave power amplifier.

It has been suggested heretofore to incorporate a ringing or so-called howler circuit in a transmitter of the above-described character for the purpose of calling the attention of the operator of a distant receiving apparatus, with whom the operator of the transmitter wishes to establish radio telephonic communication.

Prior systems of this kind, however, have had the disadvantage that considerable complication of the transmitter circuits has been required. Further, difficulty has been encountered in such ringing systems in maintaining constant a desired audio modulating frequency by means of the ringing circuit.

In accordance with my present invention these and other difficulties are overcome by the provision of a simple ringing circuit, requiring no additional relays and a negligible additional amount of wiring, comprising a capacitive reactance and a high resistance in series with the microphone and the primary of the microphone coupling transformer, and a switch means normally closed to permit usual telephonic communication through the transmitter and adapted to be opened to permit the initiation of oscillations, at a predetermined constant audio frequency, which modulate the carrier wave at this predetermined frequency.

My invention will be better understood from the following description when considered in connection with the accompanying drawing and its scope will be set forth in the appended claims.

Referring to the drawing, the single figure thereof is a diagrammatic representation of a radio telephone transmitter circuit in which my invention has been embodied.

In the drawing, carrier waves preferably of a frequency in the short-wave bands are impressed, from a source not shown, on a power amplifier 1 having an output circuit 2 connected to an antenna 3. The numeral 4 designates a microphone, or similar speech signal input means, which is coupled, through a microphone coupling transformer 5 having a primary winding 6 and secondary winding 7, to a speech amplifier apparatus such as an amplifier tube 8. The amplifier 8 is coupled through an amplifier transformer 9 to a modulator apparatus 10 which may comprise a pair of push pull modulator tubes 11, 12 and an output transformer 13 having a primary winding 14 and a secondary winding 15.

A terminal of the output transformer 13, as the high voltage terminal 16 of a secondary winding 15 is connected through a lead 17 to the output circuit 2 of carrier frequency power amplifier 1. A condenser 18, of .001 microfarad capacity, for example, is preferably connected across the output of the modulator 10.

In order to provide a howler signal from the transmitter apparatus above described, I have incorporated therein a ringing circuit comprising a capacitor 19, a resistor 20, and a switch 21 held normally in closed position as by a spring 22. The condenser 19 and resistor 20 are connected in series between a high voltage point of the output of modulator 10 and a terminal 23 of the primary 6 of microphone coupling transformer 5. In this series connection one side of condenser 19 may be connected to the high voltage terminal 16 of secondary winding 15 and the other side of condenser 19 may be connected through resistor 20 to primary winding 6. The ringing circuit connection is thus such that the elements, condenser 19, resistor 20, microphone transformer primary winding 6, and microphone 4 and its current source 24, are in series relation between a low voltage point as ground point 25 and the high voltage output point 16 of the space discharge apparatus including modulator 10.

In normal or telephonic operation of the system illustrated in the figure, a carrier frequency is impressed on the input circuit of carrier wave or power amplifier 1; switch 21 being in its illustrated closed position, speech or other audio signals from microphone 4 are impressed through transformer 5, speech amplifier 8 and transformer 9 on modulator 10; the modulating speech signal is impressed through lead 17 on the output circuit 2 of power amplifier tube 1 thereby to modulate the carrier wave; and the speech modulated carrier is transmitted from antenna 3. In this normal telephonic operation of the transmitter, therefore, the microphone resistance controls the

modulation of the transmitter in the usual manner in such apparatus.

When, however, the operator of the transmitter wishes to call the attention of the operator at a distant receiving apparatus, the transmitter operator presses open the push-button switch 21, thereby opening the microphone circuit which includes microphone 4 and primary winding 6 of the microphone coupling transformer 5. The resistance of microphone 4, with switch 21 open, therefore, no longer controls the modulation of the transmitter, but oscillations are now initiated, and maintained as long as switch 21 is held open, in the ringing or howler circuit which comprises the output transformer 13 of modulator 10, condenser 19, resistor 20, primary winding 6 of the microphone transformer, microphone 4 and its current source 24, and ground, these oscillations being impressed on the output circuit 2 of carrier wave amplifier 1, and the carrier wave, modulated by the ringing oscillation, being transmitted from the antenna, to be picked up by the distant receiver.

The ringing oscillations occur at a frequency determined by the input inductance of microphone transformer 5, the capacitance of condenser 19, and also by other constants of the ringing circuit. I have found that, in practice, the frequency of oscillation can be varied over a large audio range by variation of the capacitance 19. For example, in an apparatus constructed as above described I have adjusted capacitance 19 for 1000 cycles per second in the ringing circuit and have found that for this frequency the capacitance 19 required was approximately .002 microfarad.

The resistor 20 controls the amplitude of oscillation and I have found that in the apparatus requiring the above mentioned capacitance 19 approximately 1 megohm in resistor 20 permits 100% modulation of the transmitter.

It is to be particularly observed that in the ringing or howler circuit arrangement above-described in accordance with my invention, by reason of the connection of the circuit elements, condenser 19 and resistor 20, to the primary winding 6 of microphone transformer 5, when switch 21 is opened to initiate the desired ringing oscillation the microphone resistance is positively included in series with the relatvely high ringing-circuit resistance represented by resistor 20. Even though the microphone resistance varies over a considerable range, as it tends to do in practical cases, the ringing oscillations are not thereby affected appreciably, by reason of the presence in the circuit of the relatively extremely high resistance of fixed resistor 20, the effect of the relatively low microphone resistance in series with this high resistance being negligible. If, however, the ringing circuit connections were such that microphone 4 was not included in the oscillation circuit, as by connection, for example, of this circuit to the grid of the microphone amplifier tube 8, then since the microphone resistance varies over a considerable range, the reflected impedance of the amplifier grid would correspondingly vary, causing an undesired variation in the ringing circuit oscillations.

My invention has been described herein in a particular embodiment for purposes of illustration. It is to be understood, however, that the invention is susceptible of various changes and modifications and that by the appended claims I intend to cover any such modifications as fall 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. In a transmitter apparatus, the combination with a space discharge tube apparatus, a microphone, and means to couple said microphone to said tube apparatus including a coupling transformer having a primary winding, of a switch means connected between said primary winding and said microphone, and a ringing circuit connection including a condenser and a resistor connected between the output of said tube apparatus and said primary winding to set up oscillations in said apparatus when said switch is opened.

2. In a transmitting apparatus, the combination with a modulator having an output transformer, a microphone, a signal amplifier, and a microphone transformer coupling said microphone and said amplifier and having a primary winding, of a condenser, a resistor, a connection means connecting said condenser and said resistor in series with said primary winding and said microphone, and a switch means connected between said microphone and the connection point of said primary winding and said connection means.

3. In a transmitting apparatus, the combination with a modulator having an output transformer, a signal amplifier, a microphone, and a coupling transformer between said amplifier and microphone having a primary winding, of a ringing circuit including a condenser and a resistor connected in series between a terminal of said modulator output transformer and a terminal of said primary winding, and a switch means connected between said primary winding terminal and a ground point of said apparatus.

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