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N. M. RUST

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MODULATION SYSTEM

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Fig. 1

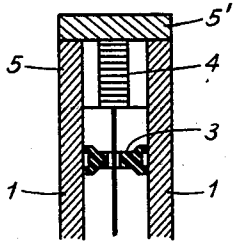


Fig. 2

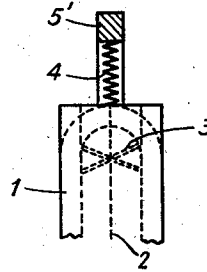


Fig. 3

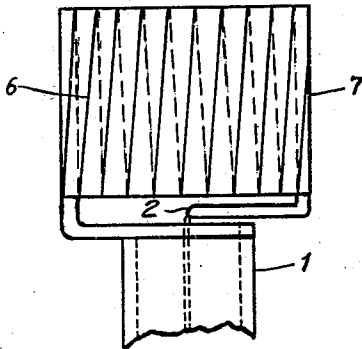
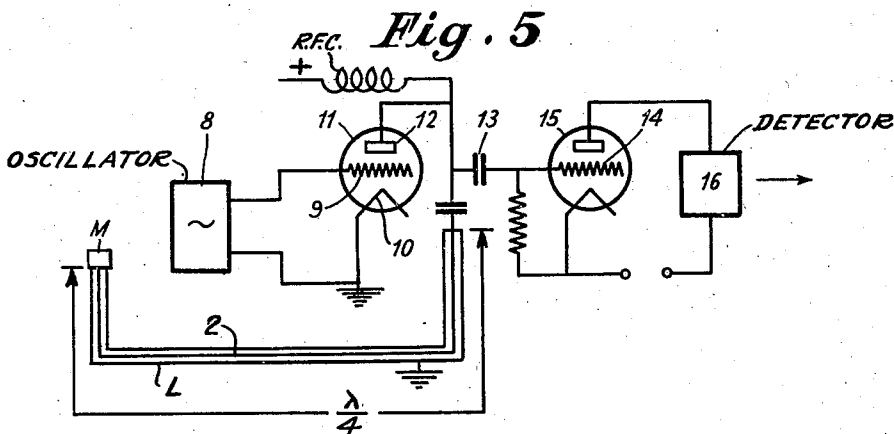
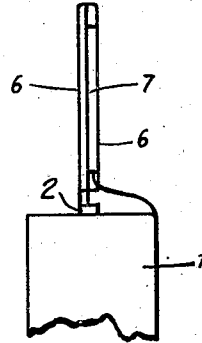


Fig. 4



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MODULATION SYSTEM

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4 Claims. (Cl. 179—171.5)

This invention relates to microphones and circuit arrangements incorporating the same.

It has been proposed in microphone arrangements to eliminate baffle and similar effects due to the size of the microphone relative to the wave length of the sound to be picked up thereby arranging the microphone in association with an acoustic conduit of small physical dimensions relative to the wave lengths of the higher frequency sounds. In this way, the pickup of the microphone is caused to be, to all intents and purposes, the same as or very nearly similar to the pickup which would be obtained if it were actuated by sound waves in free space without any baffle effects.

The present invention may be regarded as providing an electrical arrangement somewhat analogous to the acoustic arrangement just described, and according to this invention a microphone or microphone member is utilized as an acoustically variable impedance in an electrical line of a predetermined length in relation to electrical energy which is fed thereto, so that acoustically produced relatively small changes in the impedance of the microphone or microphone member may be caused to produce relatively large changes in the degree of modulation imparted to the energy fed to the line and microphone or microphone member combination.

The invention is illustrated in the accompanying schematic drawing wherein Figures 1 and 2 illustrate a velocity microphone of the magneto-phone type for use in my improved modulation system. Figures 3 and 4 illustrate a pressure microphone of the inductance type suitable for use in my invention while Figure 5 illustrates a wave modulator of an improved type using microphones of the type illustrated in Figures 1, 2, 3 and 4.

In one way of carrying out this invention, a so-called ribbon armature microphone of the magneto-phone type is mounted without the normally provided magnet system at the end of an electrical line a quarter of a wave length long (at a predetermined frequency) the microphone being so arranged that deflections of its ribbon due to incident sound waves causes changes in its inductance. The change in inductance is caused by air waves, which deflect the ribbon just as they do in the ordinary type of ribbon microphone in which minor currents are generated by making the ribbon cut a strong magnetic field supplied by a permanent magnet. Also, any deflection of the ribbon will alter the inductance of the system comprising the vertical

uprights 5, cross bar 5' and ribbon 4. This alteration of inductance may be of relatively small order. In fact, as well known in the prior art, in all microphone devices, the changes in electrical characteristics are small and are suitably amplified to give desired output. The microphone is mounted directly at the end of the quarter wave length line so that no microphone leads are necessary and the line is fed with alternating current energy at the said predetermined frequency. For example, in the arrangement illustrated in Figs. 1 and 2 (which are mutually perpendicular views) the quarter wave length line consists of two concentric conductors 1, 2, each a quarter wave long, one being within the other and held in spaced relation thereto by means of an insulating member 3. The inner conductor 2 is directly attached at one end to one end of the crimped conductive armature ribbon 4 of a ribbon microphone, the other end of said ribbon being attached to the cross member of a conductive U-shaped bridge piece 5 whose limbs contact directly with the adjacent end of the outer tubular conductor 1 of the quarter wave line. In Fig. 2, for the sake of clarity, the limbs of the U are not shown. If desired, the space between the inner and outer conductors 1, 2, of the line may for acoustic reasons be filled in with cotton wool or the like and for the same reasons the interior construction at the end of the line adjacent the ribbon armature may be of rounded form as shown by the dash line in Fig. 2. With this arrangement when sound strikes the ribbon armature inductance changes occur and these inductance changes directly affect the impedance at the end of the quarter wave line. Since there are no leads between the microphone armature and the line no "swamping effects" due to the lead self-inductances or self-capacities will be experienced.

In the above described embodiment, wherein the microphone ribbon acts as a variable inductance, the microphone is a so-called velocity microphone. Of course, so-called pressure microphone arrangements could be employed. For example, a "pressure inductance" microphone armature might be constituted by a diaphragm supported on a thin collodion film or, as shown in Figs. 3 and 4, by a thin strip 6 of foil conductor wound round and supported on a thin collodion or similar film 7. The ends of the foil strip 6 are electrically connected to the outside of conductor 1 and inner conductor 2, thus completing the electrical circuit.

The invention is not limited to the use of

microphone members as acoustically variable inductances; for example, a condenser microphone could be employed with similar results at the end of a line a half wave length long.

5 Arrangements such as those above described and illustrated can be employed in circuits such as that illustrated in Fig. 5.

Referring to Fig. 5, a high frequency oscillator 8, for example an oscillator operating on a wave length of 15 meters, is connected to apply an oscillatory input between grid 9 and cathode 10 of a tube 11 whose plate circuit includes an electrical line L of the nature described above and illustrated in Figs. 1, 2 and 3, terminated by a microphone member as above described. The plate circuit connections through line L will be obvious to those skilled in the art and needs no detailed description. Briefly, however, one member of line L say the inner conductor is connected by the usual blocking condenser as shown to the anode 12; this circuit being completed by connecting the other member say the outer conductor to the cathode 10 and to ground. Where the microphone member is such as to operate as an acoustically variable inductance, the line should be a quarter of a wave length long or an odd multiple thereof to obtain the maximum voltage variation at the terminal end of the line. Where the microphone member is of the variable condenser type, the line should be a half wave length long or a multiple thereof to obtain the maximum voltage variation at the terminal end of the line.

The anode 12 of the tube 11 is capacity coupled by a condenser 13 to the grid 14 of a further tube 15 and it will be appreciated that the input to this further tube will consist of the high frequency energy modulated by means of the microphone-line combination in accordance with incident sound upon the microphone. This modulated high frequency is taken from the anode circuit of the tube 15 and detected at 16 the detected signals, of course, constituting the required audio frequency. Figure 5 is a highly simplified circuit diagram showing only those parts required for an understanding of this invention. Potential for the anode may be supplied through an inductance RFC although no anode potential sources are shown and only the line-microphone combination LM is shown in the anode circuit of the tube 11.

It will be appreciated that with arrangements in accordance with this invention, difficulties due to microphone leads may be practically completely avoided, while furthermore, relatively large outputs can be obtained for quite small sound inputs.

What is claimed is:

1. In an ultra high frequency modulating system a circuit in which ultra high frequency electrical wave energy to be modulated is flowing, a line comprising two conductors each connected

at one end to points on said circuit, said line having an electrical length equal to an integral number of quarter wave lengths of the wave energy flowing in the circuit, a ribbon microphone and means connecting the ribbon of said microphone to the other ends of the conductors of said line for varying the impedance of the other end of said line in accordance with the modulating potentials whereby characteristic changes in the impedance at the circuit end of said line are produced to thereby modulate said ultra high frequency electrical current flowing in said circuit.

2. In an ultra high frequency signalling system a source of ultra high frequency wave energy, a utilization circuit coupled thereto to be energized by wave energy therefrom, a source of modulating potentials and means for modulating the ultra high frequency wave energy energizing said utilizing means, comprising a transmission line including two concentric conductors each connected to said ultra high frequency source, a ribbon microphone, and means connecting the ribbon of said microphone directly between points on said conductors, said microphone when subjected to sound waves acting through said line to effect modulation of said wave energy.

3. In a modulating system, a source of ultra high frequency wave energy, a utilization circuit, an electron discharge device having input electrodes coupled to said source of ultra high frequency wave energy and output electrodes coupled to said utilization circuit, a line the length of which is an integral number of quarter wave lengths of the wave energy of said source, said line comprising two concentric conductors the outer conductor of which is tubular, means connecting adjacent terminals of said conductors between electrodes in said discharge device and means connecting a ribbon microphone between the other ends of said conductors.

4. In a modulation system circuit wherein ultra high frequency wave energy to be modulated is flowing, a line comprising an inner conductor surrounded by and insulated from an outer tubular conductor, a ribbon microphone connected directly between one end of said inner conductor and the adjacent end of said outer conductor, and means connecting the free end of said inner conductor and said outer conductor to said ultra high frequency circuit, said inner conductor being an odd number of quarter wave lengths of the ultra high frequency wave energy flowing in said circuit whereby changes in inductance of the ribbon will cause corresponding changes in impedance between the end of the said inner conductor connected to said ultra high frequency circuit and the outer conductor to thereby modulate the ultra high frequency wave energy flowing in said circuit.

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