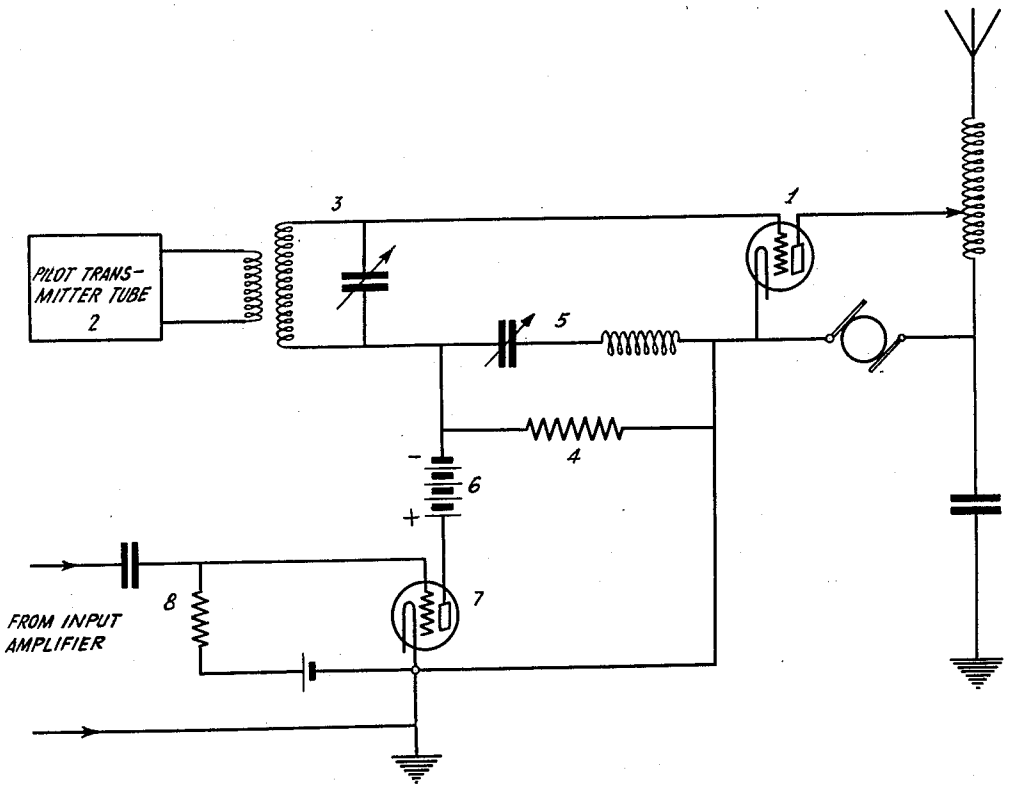
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MODULATION SYSTEM

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MODULATION SYSTEM

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Modulation in the grid circuit of a separately or self-excited tube transmitter is based upon the curvature of the tube characteristic which, owing to the simultaneous action of the radio frequency carrier wave and the modulating audio frequency upon one and the same grid, results in a modulation of the radio frequency carrier wave, provided the working quantities have been properly chosen. In radio circuit practice arrangements are usually made so that the grid of the radio frequency tube is severed for direct current by a blocking condenser, and so that draining to the filament is insured by the audio frequency controlled modulator tube, for example, the grid direct current modulation method of W. Schäffer.

This modulation scheme which is most popular at the present time involves the great demerit that the filament of the modulator tube must be joined with the grid of the radio frequency tube. This circumstance requires for the heating of the modulator tube a heating battery which must be electrically insulated from the cathode heating of the transmitter tube and that of the audio frequency cascade if such are provided, said battery besides being at radio frequency potential against ground and causing undesirable damping owing to inevitable earth capacitance, especialy where high modulating frequencies are dealt with as occurring, e. g., in picture telegraphy and in television work. For the same reason it is moreover not readily feasible to use resistance-condenser coupling between the audio frequency input amplifier and the modulator tube as is desirable in cases of this nature where a wide frequency band is to serve for modulation, and where transformer coupling would therefore be inadmissible.

These drawbacks, according to the invention, are obviated in the circuit scheme hereinafter to be described by reference to the single figure of the accompanying drawing, which forms a part of the present disclosure.

Now referring to the drawing, it will be seen that the grid of the radio frequency tube 1 acting, for instance, directly upon an antenna is excited by radio frequency energy from the pilot transmitter tube 2 by way of coupling means 3. Of course, by a slight change in the circuit which need not be set forth in this place, it is also possible to operate the scheme without the pilot tube. The grid direct current which is always present for operating at optimum efficiency, can be made to leak off by way of an ohmic resistance or an inductive reactance 4 connected between the grid and cathode of tube 1 and suitably shunted or bridged for radio frequency by a series resonance unit 5 formed of a capacity and inductance unit tuned to the transmission wave. Now, in order to obtain modulation the resistance 4 is connected also in the plate circuit of an amplifier tube 7 provided with a distinct plate potential source 6. The cathode of tube 7 is connected directly to the cathode of tube 1. The amplifier tube 7 is in turn controlled by way of a resistance-condenser coupling 8 fed with modulating alternating current potential by way of an input amplifier not shown. It will be seen that owing to the changing alternating current potential drop across the resistance 4 which is produced by the audio frequency variable plate current of tube 7, a varying grid potential is applied to the wave generator tube 1, and this results in the desired modulation. All of the audio frequency and radio frequency tubes, including, if desired, the pilot tube, may have their filaments grounded and the filaments may be supplied from a joint battery. Stray ground capacities do not exist. If desired, the plate current source 6 which has audio frequency potential to ground may be replaced in known manner by a condenser which in turn is fed by way of choke coils.

Having now described my invention, what I claim and desire to secure by Letters Patent is the folowing:—

1. In a modulation system, a thermionic tube adapted to relay carrier waves, a series tuned circuit connected in the input circuit of said tube, said series tuned circuit being series resonant to the carrier wave and having one terminal connected to the cathode of said relay tube, a controlling tube having its cathode connected to one terminal of said series tuned circuit and to the cathode of said first named relay tube and its anode connected to the other terminal of said series tuned circuit, and an impedance element connected in shunt with said tuned circuit and across the output of said control tube whereby variations in the output energy of said controlling tube produce correspondingly varied voltage drops in said resistor for producing varying grid bias on said modulating tube.

2. Means for modulating carrier frequency waves being relayed by a thermionic tube having a control grid and cathode and a circuit responsive to the carrier frequency to be relayed connected with said control grid comprising, a series tuned circuit including capacity and inductance connected between said first named circuit and the cathode of said tube, a resistance connected in parallel with said series tuned circuit, a thermionic tube having its cathode connected to the terminal of said resistance adjacent the cathode of said first named tube and its anode connected to the other terminal of said resistance, and means for impressing current, the potential of which varies at signal frequency, on the input electrodes of said last named tube.

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