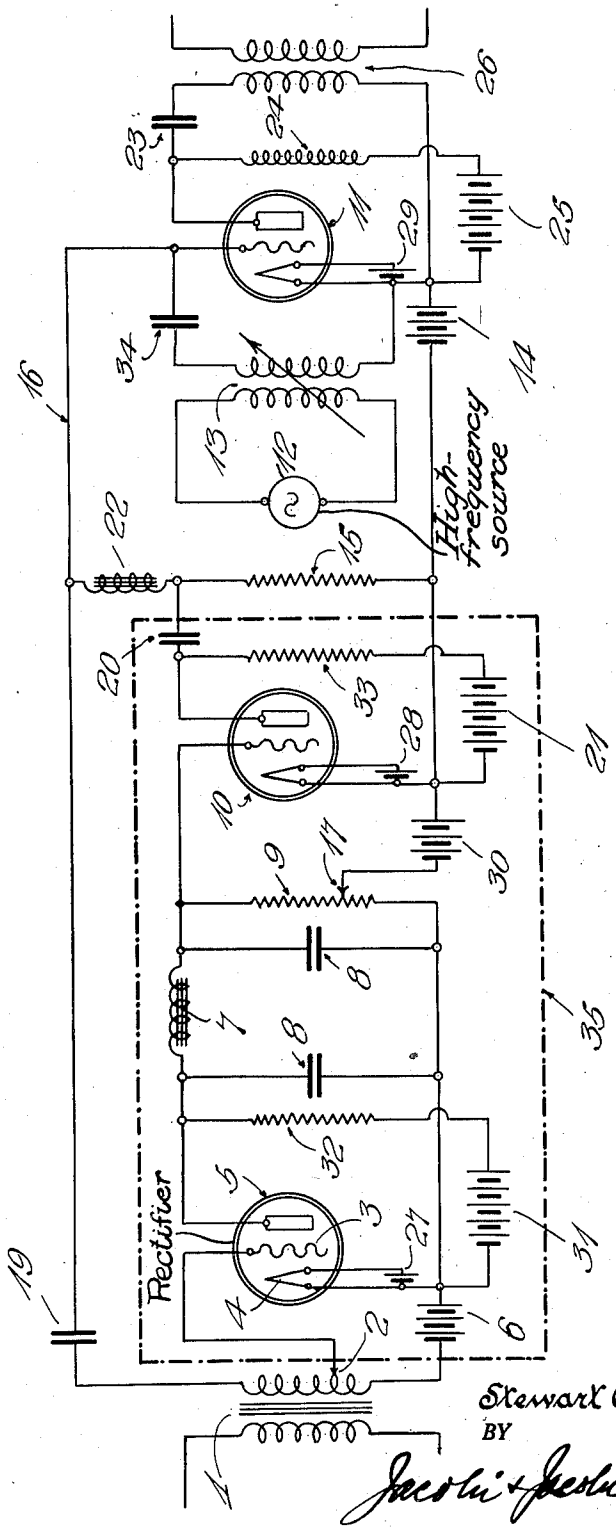
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AUTOMATIC HIGH FREQUENCY CARRIER CONTROL

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AUTOMATIC HIGH FREQUENCY CARRIER CONTROL

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6 Claims. (Cl. 179—171)

This invention relates to new and useful improvements in the art of signal transmission by high frequency carrier means and more particularly to an automatic control for said means.

The object of this invention is to provide an apparatus to control the voltage of the high frequency carrier, concurrent with and by means of the modulating signal.

With this object in view, my invention consists in the novel features of construction, combination and arrangement of parts as will be hereinafter referred to and more particularly pointed out in the specification and claims.

In the drawing, forming a part of this application:

The figure is a schematic view of my invention showing its application to use.

In describing the invention, I shall refer to the accompanying schematic drawing forming a part of this application.

In usual cases where a high-frequency carrier wave is modulated by a signal of lower frequency, the signal voltage varies over a wide range and it is necessary to generate a carrier of high voltage to accommodate the peak voltages of the signal. These peak voltages ordinarily occur only at wide time intervals so that for average modulation signal the carrier voltage is unnecessarily high. As a result the average degree of modulation may only be from ten to thirty per cent. Consequently, the output energy is composed largely of comparatively useless carrier. For some purposes this high ratio of carrier to signal voltage presents serious difficulties to the proper operation of adjunctive apparatus.

If it were possible at all times during operation to supply a carrier voltage which would be depressed to a predetermined value by the modulating signal voltage, the above objections would be overcome.

The present invention provides a method which accomplishes this. In order to raise and lower the carrier voltage synchronously with the rise and fall of the modulating signal voltage, it is apparent that the control means must utilize the signal itself. The grid voltage of the mixing or modulator tube offers a means whereby the high frequency carrier voltage may be thus controlled. The method by which this is accomplished can be more readily understood by a discussion of the drawing.

The numeral 1 indicates the output transformer of an audio amplifier and shall be considered the source of the modulating signal. The secondary of this transformer is tapped at 2 and a small portion of the modulation signal is impressed across the grid 3 and filament 4 of the vacuum tube 5. The grid circuit of the vacuum tube 5 is provided with a biasing battery 6. With no impressed signal the battery 6 is of sufficient voltage to bias the grid of the tube 5 to a point where substantially no plate current flows. Thus an alternating voltage from the secondary of transformer 1 impressed on the grid of tube 5 is rectified and amplified. The output of tube 5 is filtered by means of the choke coil 7 and the condensers 8 and flows through the resistor 9. The potential established across resistor 9 is amplified in tube 10.

The modulator tube is shown at 11. A high frequency generator is shown at 12. This may be a vacuum tube oscillator or any other device for producing high frequency oscillations. The high frequency voltage generated at 12 is impressed on the grid of tube 11 through the medium of the variable coupling means shown at 13. By means of the variable coupling 13 and the grid bias battery designated by the numeral 14 the high frequency current flowing in the plate circuit of tube 11 may be adjusted to any predetermined value within the limits of the tube. It will be noted from the drawing that the grid bias current from the battery 14 passes through the resistor 15 and therein encounters the rectified signal output from tube 10 flowing in the opposite direction. It follows that the stronger the output signal from tube 10 the less negative the grid of tube 11 is maintained and the stronger the high frequency current in the plate circuit of tube 11 becomes.

The main portion of the modulation signal is impressed on the grid of tube 11 as shown at 16 and modulates the high frequency current introduced therein from generator 12. As described above, the high frequency component varies in value in accordance with the value of the modulating signal. The proportion of high frequency component to modulation component may be adjusted by varying the amount of the rectified control signal at 17. This may also be accomplished by varying the amplification of tube 10. It remains then to delay the arrival of the main portion of the signal until the control portion has had sufficient time to cause adjustment of the carrier value. This is done by including a time delay device in the main signal circuit in any known manner. This delay device is shown in the drawing as a condenser and is designated by the numeral 19.

It is understood, of course, that the well known precautions to be taken to isolate the various cir-

cuits properly and in selecting the proper values for the various resistances, inductances, and capacities to prevent undesirable resonance, distortion and time lag. Thus, the condenser 20 is included to prevent the voltage from the plate battery 21 from reaching the grid of the tube 11. The choke coil 22 is provided to isolate the main modulation signal from the plate circuit of tube 10. Condenser 23 and choke coil 24 separate the current from plate battery 25 and the modulated high frequency current flowing through the coupling 26. The filament batteries of the various tubes are shown respectively at 27, 28, and 29. At 30 is shown a grid biasing battery for tube 10. The plate battery for tube 5 is shown at 31. The resistances 32 and 33 are provided to isolate the battery circuits of the tubes 5 and 10. Condenser 34 prevents feed-back of the signal into the oscillator circuit.

That portion of the device disclosed which constitutes essentially my invention is shown in the drawing surrounded by the broken line 35.

Having thus described the invention, what is claimed is:

1. In a system for controlling carrier frequency current amplitude in accordance with the amplitude of modulating signal current, a source of signal current, a source of carrier frequency current, a modulator tube having its input connected to said source of carrier frequency current, an input transformer having its primary connected to said source of signal current, a time-delay condenser connected between one terminal of the secondary of said input transformer and the grid of said modulator tube, the other terminal of the secondary of said input transformer being connected to the filament of said modulator tube, an intermediate tap on the secondary winding of said input transformer, a rectifier tube having its grid connected to said intermediate tap on said secondary winding, the filament of said rectifier tube being connected to one terminal of the secondary of said input transformer, and a circuit comprising a series condenser connected between the output of said rectifier tube and the input of said modulator tube.

2. In a system for controlling carrier frequency current amplitude in accordance with the amplitude of modulating signal current, a source of signal current, a source of carrier frequency current, a modulator tube having its input connected to said source of carrier frequency current, an input transformer having its primary connected to said source of signal current, a time-delay condenser connected between one terminal of the secondary of said input transformer and the grid of said modulator tube, the other terminal of the secondary of said input transformer being connected to the filament of said modulator tube, an intermediate tap on the secondary winding of said input transformer, a rectifier tube having its grid connected to said intermediate tap on said secondary winding, a source of direct-current rectifier grid biasing potential connected between the filament of said rectifier tube and one terminal of the secondary of said input transformer, and a circuit comprising a series condenser connected between the output of said rectifier tube and the input of said modulator tube.

3. In a system for controlling carrier frequency current amplitude in accordance with the amplitude of modulating signal current, a source of signal current, a source of carrier frequency current, a modulator tube having its input connected to said source of carrier frequency current, an input transformer having its primary connected to said source of signal current, a time-delay condenser connected between one terminal of the secondary of said input transformer and the grid of said modulator tube, the other terminal of the secondary of said input transformer being connected to the filament of said modulator tube, an intermediate tap on the secondary winding of said input transformer, a rectifier tube having its grid connected to said intermediate tap on said secondary winding, a source of direct-current rectifier grid biasing potential connected between the filament of said rectifier tube and one terminal of the secondary of said input transformer, and a circuit comprising a series condenser connected between the output of said rectifier tube and the input of said modulator tube, said source of rectifier grid biasing potential being of such value that with no impressed signal substantially no current flows in the plate circuit of said rectifier tube.

4. In a system for controlling carrier frequency current amplitude in accordance with the amplitude of modulating signal current, a source of signal current, a source of carrier frequency current, a modulator tube having its input connected to said source of carrier frequency current, an input transformer having its primary connected to said source of signal current, a time-delay condenser connected between one terminal of the secondary of said input transformer and the grid of said modulator tube, the other terminal of the secondary of said input transformer being connected to the filament of said modulator tube, a source of direct-current modulator tube biasing potential and a resistor connected in series between the grid and the filament of said modulator tube, a rectifier tube, means for applying a portion of the potential across the secondary of said input transformer to the input circuit of said rectifier tube, and a circuit comprising a series condenser connecting the output of said rectifier tube across said resistor, said source of modulator tube biasing potential being connected for applying potential negative with reference to the filament to the grid of said modulator tube, and the output of said rectifier tube being connected for applying to said resistor a pulsating unidirectional potential of polarity opposed to the polarity of the potential applied to said resistor by said source of modulator tube biasing potential.

5. In a system for controlling carrier frequency current amplitude in accordance with the amplitude of modulating signal current, a source of signal current, a source of carrier frequency current, a modulator tube having its input connected to said source of carrier frequency current, an input transformer having its primary connected to said source of signal current, a time-delay condenser connected between one terminal of the secondary of said input transformer and the grid of said modulator tube, the other terminal of the secondary of said input transformer being connected to the filament of said modulator tube, an intermediate tap on the secondary winding of said input transformer, a rectifier tube having its grid connected to said intermediate tap on said secondary winding, a source of direct-current rectifier grid biasing potential connected between the filament of said rectifier tube and one terminal of the secondary of said input transformer, a source of direct current modulator tube biasing potential and a resistor connected in series between the grid and filament of said modulator tube, and a circuit comprising a series condenser

connecting the output of said rectifier tube across said resistor, said source of modulator tube biasing potential being connected for applying potential negative with reference to the filament to the grid of said modulator tube, and the output of said rectifier tube being connected for applying to said resistor a pulsating unidirectional potential of polarity opposed to the polarity of the potential applied to said resistor by said source of modulator tube biasing potential.

6. In a system for controlling carrier frequency current amplitude in accordance with the amplitude of modulating signal current, a source of signal current, a source of carrier frequency current, a modulator tube having its input connected to said source of carrier frequency current, an input transformer having its primary connected to said source of signal current, a time-delay impedance element connected between one terminal of the secondary of said input transformer and the grid of said modulator tube, the other terminal of the secondary of said input transformer being connected to the filament of said modulator tube, an intermediate tap on the secondary winding of said input transformer, a rectifier tube having its grid connected to said intermediate tap on said secondary winding, the filament of said rectifier tube being connected to one terminal of the secondary of said input transformer, and a circuit comprising a series condenser connected between the output of said rectifier tube and the input of said modulator tube.

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