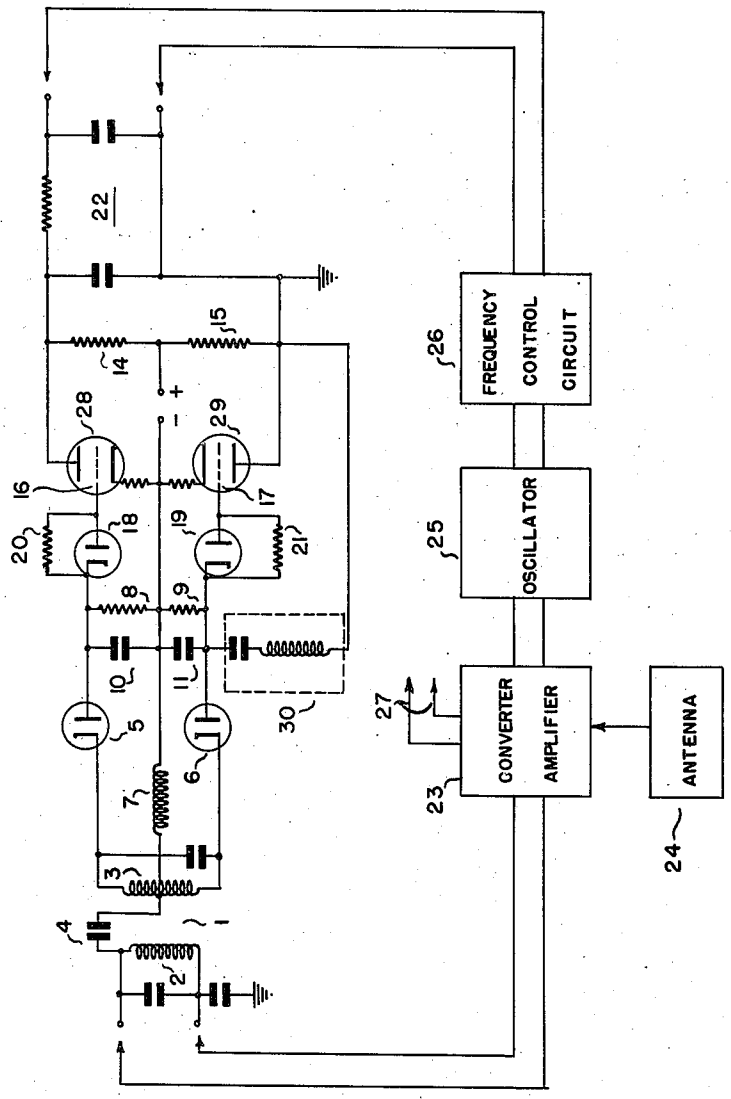
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AUTOMATIC FREQUENCY CONTROL CIRCUIT

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AUTOMATIC FREQUENCY CONTROL CIRCUIT

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5 Claims. (Cl. 250—20)

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This invention relates to frequency responsive circuits operative in dependency on interrupted signals. It is particularly directed to the problem of maintaining the response during the period of signal interruption.

As is known, frequency responsive circuits are employed in a variety of applications, such, for instance, as frequency meters and for automatic frequency control of receivers. For the latter purpose the present invention is primarily intend for application in radar systems. It is also of high utility in C. W. code reception and other types of pulse communication.

Accordingly, the object of the invention is to provide means of maintaining a continuous indication of the frequency of an interrupted signal.

The invention will be further understood with reference to the exemplary embodiment shown in the drawing.

The invention comprises a frequency discriminator network including input transformer 1 having tuned primary 2 for receiving the interrupted signal and tuned split secondary 3. The midtap of the secondary is coupled to the input by condenser 4. Transformer 1 feeds diodes 5 and 6 through connections including R. F. choke 7. The input signal frequency circuit is completed through series resonant component 30 to ground. The diode outputs are differentially connected in series resistors 8 and 9 shunted by condensers 10 and 11 respectively. The components described constitute a Foster-Seeley discriminator, which has been selected for the purposes of illustration.

As is well-known, the voltages developed across resistors 8 and 9 are of opposite polarity and of magnitudes dependent upon the phase relations of the direct and coupled signals present in each diode network. These phase relations are determined by the relation of the frequency of the input signal to the frequency to which transformer 1 is tuned.

The voltages developed across resistors 8 and 9 are employed to control the outputs of triodes 28 and 29 which are also differentially combined in series resistors 14 and 15. The control elements 16 and 17 of triodes 28 and 29 respectively are fed the control voltages developed on resistors 8 and 9 through unilaterally conductive diodes 18 and 19. Each diode maintains its associated control element at this peak negative voltage determined by the frequency of the signal pulse fed to coupling transformer 1. This control voltage is maintained on the control element substantially until the subsequent pulse is received, due to the fact that the discharge time constant of the

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capacity associated with the control elements is very large because of the blocking action of the diodes.

In order to control this discharge period, and to permit either control element to follow a decreasingly negative discriminator signal, each diode may be shunted by a resistor shown at 20 and 21 respectively, which is of the order of a number of megohms. Consequently each control element is charged by a very low time constant circuit, substantially having a resistance equal to resistors 8 and 9, and is discharged at the desired high time constant rate. The output developed across resistors 14 and 15 is therefore such as to substantially preserve the response during the period of input signal interruption. The circuit output may be filtered by network 22.

Shown in the drawing are associated components for using the system in automatic frequency control of an impulse receiver 23 fed by antenna 24. The receiver is of the heterodyne type including an oscillator 25 and its frequency control means 26. The latter component may be a reactance tube or a controlled voltage supply where the oscillator frequency is sensitive to voltage variation. The converted frequency is fed to input coupling transformer 1 and the main receiver output taken off by line 27.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. In a frequency responsive circuit for operation by successive discrete wave groups, discriminator means operative to supply a control voltage in dependency on the frequency of the signal, a vacuum tube including a control element, and means for feeding the control voltage to the control element including impedance means having a very low charging time constant and a very high discharge time constant, whereby the control voltage corresponding to the frequency of a wave group is substantially maintained until the arrival of a subsequent wave group.

2. An automatic frequency control circuit for impulse reception including discriminator means operative to furnish a control voltage variable in dependency upon the frequency of a signal, vacuum tube means responsive to said control voltage including control electrode means and cathode means, and unilateral impedance means connected between the control electrode means and the cathode means receiving the control voltage

and being operative to furnish a negative charge to the control electrode means and block the removal of said charge therethrough, and signal frequency control means responsive to the output of the vacuum tube means.

3. An automatic frequency control circuit for impulse reception including discriminator means operative to furnish a control voltage variable in dependency upon the frequency of a signal, vacuum tube means responsive to said control voltage including control electrode means and cathode means, unilateral impedance means connected between the control electrode means and the cathode means receiving the control voltage and being operative to furnish a negative charge to the control electrode means and block the removal of said charge therethrough, and high impedance means connected between the control electrode means and the cathode means for controlling the discharge of said electrode.

4. An automatic frequency control circuit for impulse reception including discriminator means operative to furnish a voltage of variable amplitude and polarity in dependency on the extent and direction of departure of a signal from a reference frequency, a pair of vacuum tubes including control elements, means responsive to the

output of the discriminator means including a pair of unilateral impedances operative to supply negative bias to said tubes in dependency on said output, and means differentially combining the outputs of said vacuum tubes.

5. A frequency responsive circuit for supplying a continuous control voltage in dependency on the frequency of successively applied discrete wave groups, including frequency discriminator means operative during application of a wave group to provide an output of polarity and amplitude determined by the frequency of said wave group, a pair of differentially connected vacuum tubes including control elements and cathode elements, a pair of unilateral impedances connected to feed a negative charge to the control elements and to block the return of said charge to the cathode elements, and means for feeding the output of the frequency discriminator to the control elements through the unilateral impedances, whereby the characteristic voltage determined by the discriminator response to the frequency of one wave group is substantially maintained on the control electrodes until the arrival of the subsequent wave group.

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