

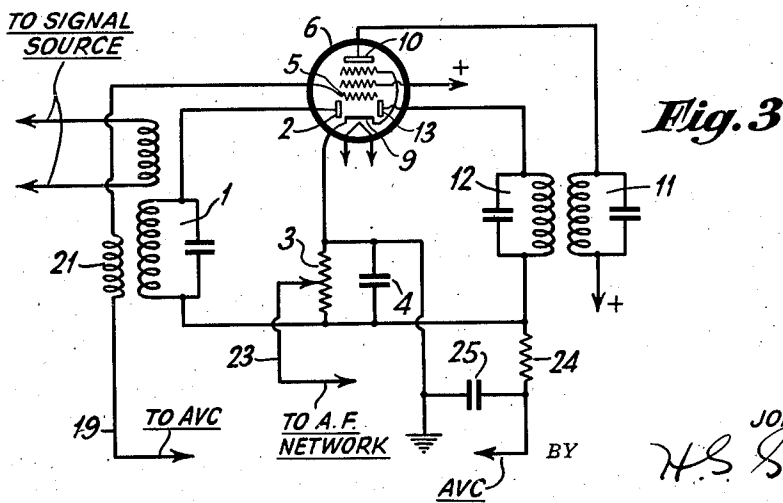
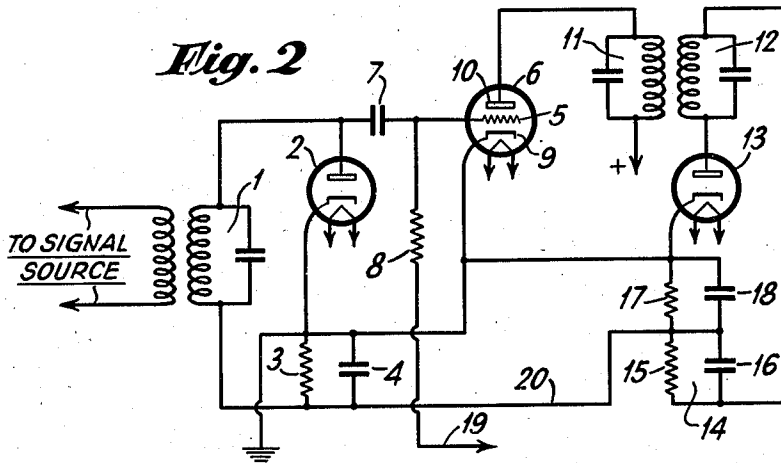
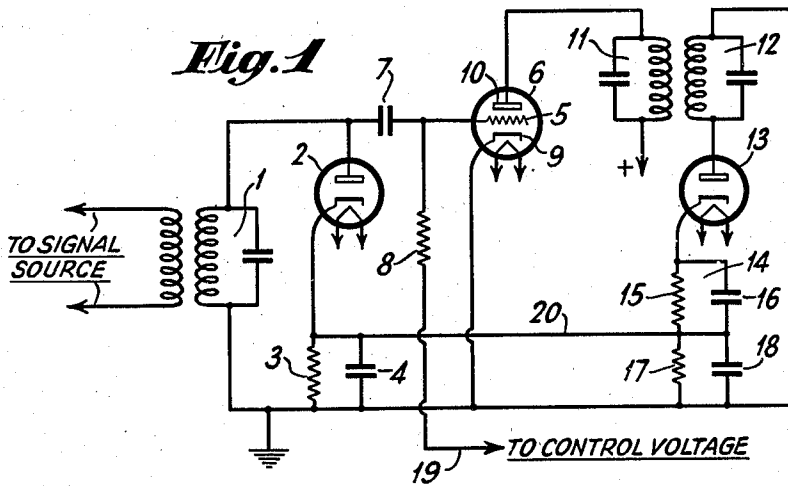
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SELECTIVITY CONTROL CIRCUIT

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SELECTIVITY CONTROL CIRCUIT

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The invention relates to a circuit arrangement comprising an oscillatory circuit to which are supplied amplitude modulated oscillations and which is damped by a control voltage-dependent resistance, this circuit being particularly suitable for use in a radio receiver whose band width can be adjusted by hand or automatically, at least one of the oscillatory circuits determining the selectivity being damped by a control voltage-dependent resistance.

In many modern radio receivers the selectivity can be accommodated to the receiving conditions. For this purpose the selectivity, or the band width, of one or more oscillatory circuits, or bandpass filters constituted by oscillatory circuits, is controlled by control either of the coupling or of the damping of these circuits, or by both at the same time.

It is often desired to effect this control in accordance with a control voltage determined by the receiving conditions. Upon receiving a powerful local transmitter it will be desirable to operate with a wide band, whereas upon reception of weak, or very distant, receivers it will be desirable to operate with a narrow band. In this case the voltage of the usual automatic volume control network may be used with success as a control voltage. It is, also, possible that it is desired to control the selectivity in accordance with the intensity of transmitters operating with a neighbouring frequency. In this case a suitable control voltage may be taken from oscillatory circuits tuned to these neighbouring frequency transmitters.

It has already been proposed to alter the damping of a circuit, whose selectivity must be controlled in accordance with a control voltage, by connecting in parallel with the circuit a discharge tube whose internal resistance depends on the control voltage supplied to the control grid. In this case, however, only a comparatively small resistance variation is obtainable with which, moreover, the created resistance is not linear so that other means have been looked for. The object of the present invention is to procure a linear resistance which depends on the control voltage, and has a larger control range for damping an oscillatory circuit.

According to the invention this resistance is constituted, therefore, by a diode connected to the oscillatory circuit and operating with a negative bias which is equal to the amplitude of the amplitude-modulated oscillations supplied to the diode, and is supplied by a second diode to which the amplitude modulated oscillations are sup-

plied through the intermediary of an amplifier whose amplification is controlled in accordance with the control voltage.

According to a further feature of the invention the diode supplying the bias is connected to the amplifier through a coupling element whose range of transmission includes the range of transmission of the oscillatory circuit to be damped, all frequencies of said range being uniformly transmitted.

The output circuit of the diode which damps the oscillatory circuit and is fed from an oscillatory circuit either interposed in the output circuit of the amplifier or coupled to this output circuit, and the output circuit of the diode supplying the negative bias for the first-mentioned diode may have a common resistance. The cathodes of the two diodes are preferably connected to ground. As an alternative, both diodes may have a common load resistance from part of which is taken the low frequency voltage, and together with an amplifying system they may have a common cathode.

The invention will be more clearly understood by reference to the accompanying drawing, given by way of example, wherein Figs. 1 and 2 represent two forms of construction of a circuit arrangement according to the invention, and Fig. 3 shows how the circuit according to the invention can be carried out in practice. In the drawing corresponding parts in the various figures bear the same reference numbers.

In Fig. 1 the reference numeral 1 denotes the oscillatory circuit which can be damped by a resistance depending on a control voltage. In parallel with this circuit 1 is connected a diode 2 in series with the parallel connection of resistance 3 and condenser 4. The control grid 5 of an amplifying tube 6 is supplied, through condenser 7, with alternating voltage from the oscillatory circuit 1 and, through resistance 8 and conductor 19, with a direct current control voltage for controlling the amplification of the amplifying tube 6. The cathode 9 of the amplifying tube 6 is connected to the grounded end of the oscillatory circuit 1. The anode 10 of the amplifying tube is connected through an oscillatory circuit 11 to a voltage which is positive with respect to ground. The oscillatory circuit 11 together with an oscillatory circuit 12 coupled thereto constitutes a bandpass filter whose range of transmission is wider than that of the oscillatory circuit 1 in the state in which this circuit is damped most. The oscillatory circuit 12 feeds a diode 13 in series with a network 14, and the

latter consists of the parallel connection of resistance 15 and condenser 16 in series with the parallel connection of resistance 17 and condenser 18. The time constants of the three parallel connections 3-4, 15-16, 17-18 are preferably equal. The end of the resistance 3 not connected to ground is connected through a conductor 20 to the junction of resistances 15 and 17.

The operation of this circuit arrangement is as follows: The alternating voltage set up across the circuit 1 is rectified by the diode 2 and yields a voltage across the resistance 3 which voltage substantially corresponds to the amplitude of this alternating voltage if, as it is supposed, the diode 2 operates with peak detection. The alternating voltage supplied to the amplifying tube 6 is amplified and supplied to the circuit 12 through the intermediary of the circuit 11 inserted in the anode circuit of the amplifying tube 6. The alternating voltage occurring across the circuit 12 is rectified by the diode 13 so that across the series connection of resistances 15 and 17 a voltage is set up which corresponds to the amplitude of the alternating voltage set up across the circuit 12. Since a definite control voltage is supplied through the conductor 19 and resistance 8 to the control grid 5 of the amplifying tube 6 a definite amplification factor is established. Consequently the voltage set up across the series connection of resistances 15 and 17 is higher than the voltage set up across the resistance 3 if the amplification between the circuits 1 and 12 exceeds one. For a definite value of the amplification of the amplifying tube 6 the ratio of the resistances 15 and 17 is so chosen that the voltage set up across the resistance 17 corresponds at every moment to the voltage set up across the resistance 3. In this case no current flows through the conductor 20 so that the two diodes operate independently of one another. The resistance by means of which the oscillatory circuit 1 is damped in this case is one half of the resistance 3, as appears from a Fourier analysis of the current impulses transmitted in peak detection. If, however, amplification of the amplifying tube 6 is decreased owing to an increase of the negative grid bias the voltage across the resistance 17 also decreases so that a compensation current begins to flow through the conductor 20 by which current the oscillatory circuit 1 is more loaded. As a result thereof this circuit is more damped owing to which the width of the range of transmission increases and the selectivity decreases. In the extreme case in which the amplification of the amplifying tube 6 is one, the resistance by means of which the oscillatory circuit 1 is damped is one half of the resistance of the parallel connection of resistances 3 and 17. If in contradistinction thereto the amplification of the amplifying tube 6 is increased a current traverses the conductor 20 in the reverse direction, as a result of which the diode 2 need supply less current to the resistance 3 so that in this case the oscillatory circuit 1 is less damped.

This circuit arrangement has the drawback that the cathodes of the diodes and of the amplifying tube 6 have different potentials. In the circuit arrangement shown in Fig. 2 all of the three cathodes are at one potential, the connections of the diode 2 and of the circuit 1 to the resistance 3, and the connections of the diode 13 and of the circuit 12 to the series connection of resistances 15 and 17 have been interchanged.

This yields the advantage that the two diodes can be lodged in the same bulb as the amplifying system of the amplifying tube 6 so that a single cathode is sufficient. However, this circuit arrangement has the drawback that the low frequency voltage set up across the resistance 3 also acts in the control grid circuit of the amplifying tube 6 so that it is advisable to combine a small condenser 7 and a high resistance 8 to form a high pass filter and to connect them before the control grid 5 in such a manner that they are not liable to nuisance. The resistance 8 is connected in parallel with the oscillatory circuit 1 so that this resistance must be high in order that it may not affect the operation of the diode 2 and of the resistance 3.

Fig. 3 shows a simplified form of construction of the circuit described above. In fact, instead of comparing the voltage across the resistance 3 with the voltage across part of the load resistance of the diode 13 it is also possible to compare the voltage across the resistance 3 with the voltage across the whole load resistance of the diode 13 if only care be taken that such a part of the voltage is supplied through the oscillatory circuit 1 to the control grid of the amplifying tube 6 that the voltage across the circuit 12 has the correct value.

In this circuit arrangement a single resistance 3 and a single condenser for the two diodes 2 and 13 is sufficient. The alternating voltage to be supplied to the control grid 5 may be taken from the oscillatory circuit, 1, for instance, by means of a small coil 21 coupled to this circuit.

Finally a part of the low frequency voltage developed across the resistance 3 can be taken off and supplied through a conductor 23 to the low frequency amplifier (not shown) and a control voltage for automatic volume control (AVC) may be taken in a known manner from the resistance 3 across a network consisting of resistance 24 and condenser 25.

What I claim is:

1. In combination with a common tuned high frequency input circuit, means for controlling the damping thereof comprising a first rectifier connected across the circuit and developing a uni-directional voltage from high frequency energy, a second rectifier coupled to said common circuit and developing a second uni-directional voltage from high frequency energy thereof, and means connecting said two rectifiers whereby a uni-directional current is caused to flow through said common circuit in a sense dependent on the relative magnitudes of said voltages.

2. In combination with a common tuned high frequency input circuit, means for controlling the damping thereof comprising a first rectifier connected across the circuit and developing a uni-directional voltage from high frequency energy, a second rectifier coupled to said common circuit and developing a second uni-directional voltage from high frequency energy thereof, means connecting said two rectifiers whereby a uni-directional current is caused to flow through said common circuit in a sense dependent on the relative magnitudes of said voltages, and means for controlling the magnitude of said second voltage.

3. In combination with a common tuned high frequency input circuit, means for controlling the damping thereof comprising a first rectifier connected across the circuit and developing a uni-directional voltage from high frequency energy, a second rectifier coupled to said common

circuit and developing a second uni-directional voltage from high frequency energy thereof, and means connecting said two rectifiers whereby a uni-directional current is caused to flow through said common circuit in a sense dependent on the relative magnitudes of said voltages, and a band-pass network of relatively wider frequency width than said high frequency input circuit coupling said second rectifier to the latter in cascade.

4. In combination with a common tuned high frequency input circuit, means for controlling the damping thereof comprising a first rectifier connected across the circuit and developing a uni-directional voltage from high frequency energy, a second rectifier coupled to said common circuit and developing a second uni-directional voltage from high frequency energy thereof, means connecting said two rectifiers whereby a uni-directional current is caused to flow through said common circuit in a sense dependent on the relative magnitudes of said voltages, an electron discharge tube having input electrodes coupled to said input circuit, said tube output electrodes being coupled to said second rectifier, and means for varying the gain of said tube.

5. In combination with a common tuned high frequency input circuit, means for controlling the damping thereof comprising a first rectifier connected across the circuit and developing a uni-directional voltage from high frequency energy, a second rectifier coupled to said common circuit and developing a second uni-directional voltage from high frequency energy thereof, means connecting said two rectifiers whereby a uni-directional current is caused to flow through said common circuit in a sense dependent on the relative magnitudes of said voltages, said two rectifiers each being a diode, and a common tube envelope housing the electrodes of the two diodes.

6. In combination with a common tuned high frequency input circuit, means for controlling the damping thereof comprising a first rectifier connected across the circuit and developing a uni-directional voltage from high frequency energy, a second rectifier coupled to said common circuit and developing a second uni-directional voltage from high frequency energy thereof, means connecting said two rectifiers whereby a uni-directional current is caused to flow through said common circuit in a sense dependent on the relative magnitudes of said voltages, means impressing an audio-modulated carrier voltage on said input circuit, and means deriving an audio voltage from the rectified output of said first rectifier.

7. In combination with a common signal input

circuit whose selectivity is to be varied, a rectifier provided with a load resistor connected across the signal circuit and developing a rectified voltage across said resistor, a second rectifier having a rectified output circuit which includes solely said load resistor, means coupling the second rectifier to said signal input circuit to impress signal energy in the latter on the second rectifier, and signal-responsive means for regulating the relative magnitudes of the rectified output voltages of said two rectifiers.

8. In combination with a common signal input circuit whose selectivity is to be varied, a rectifier provided with a load resistor connected across the signal circuit and developing a rectified voltage across said resistor, a second rectifier having a rectified output circuit which includes solely said load resistor, means coupling the second rectifier to said signal input circuit to impress signal energy in the latter on the second rectifier, means for regulating the relative magnitudes of the rectified output voltages of said two rectifiers, said coupling means including a tube, and said regulating means comprising a signal-responsive gain regulation connection to said tube.

9. In a signal-modulated carrier system, a common carrier-tuned input circuit, a diode carrier energy rectifier, provided with an output load impedance, coupled to said circuit, a second diode carrier-energy rectifier coupled to said input circuit to rectify carrier energy thereof, a second output load impedance in circuit with the second diode rectifier, a carrier-tuned network having a wide pass band coupling said second diode to said carrier-tuned circuit, direct current voltage connections between said two impedances, and means for varying the rectified voltage developed across said second impedance.

10. In a signal-modulated carrier system, a common carrier-tuned input circuit, a diode carrier energy rectifier, provided with an output load impedance, coupled to said circuit, a second diode carrier-energy rectifier coupled to said input circuit to rectify carrier energy thereof, a second output load impedance in circuit with the second diode rectifier, a carrier-tuned network having a wide pass band coupling said second diode to said carrier-tuned circuit, direct-current voltage connections between said two impedances, means for varying the rectified voltage developed across said second impedance, said varying means comprising a tube coupled between said wide band network and said carrier-tuned circuit, and means for varying the tube

gain.

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