

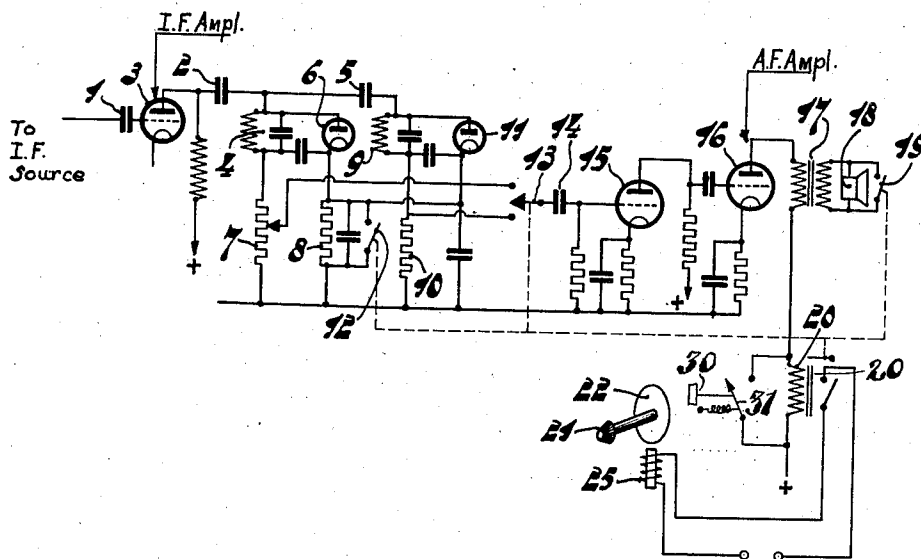
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CIRCUIT ARRANGEMENT FOR FACILITATING THE TUNING OF RADIO RECEIVING SETS

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CIRCUIT ARRANGEMENT FOR FACILITATING THE TUNING OF RADIO RECEIVING SETS

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This invention relates to a circuit arrangement facilitating the tuning of radio receiving sets by means of a relay responding to correct tuning. The relay may, for instance, either actuate a relay such as a brake or be constructed as a brake, due to which the control knob is braked after correct tuning and any further adjustment is counteracted. Moreover the relay may allow reproduction only with correct tuning, by insuring, for instance, that the short-circuited or inoperative loudspeaker is not rendered operative until then. The relay can be energized by a current which flows only with correct tuning and is produced by a device comprising one or more sharply tuned circuits. The current to which the relay responds will generally have to be amplified. For this purpose a direct current amplifier comprising one or more amplifying tubes may be used.

Such an arrangement has the drawback that a separate amplifier is required for the relay current, since the amplifiers for high frequency—intermediate frequency—and low frequency currents already available are usually designed only for alternating current supply. Direct current amplifiers have the additional drawback, that the supply of anode and grid voltages often entails difficulties.

According to the invention the relay is caused to respond by making use of the voltage impulse which occurs with correct tuning, a relay being used which remains in the working position after disappearance of the voltage impulse operating the relay. Thus use is made not only of the current itself, which continues flowing with correct tuning, but also of a current variation occurring with correct tuning.

One advantage is that the available amplifiers may serve for amplification of the relay current also when they are connected only for the amplification of alternating currents. For amplifying the voltage impulse preferably the low frequency amplifier is used.

To facilitate tuning the arrangement preferably comprises a braking device by which after correct tuning any further adjustment of the tuning members is counteracted, so that the knob cannot be turned past the desired station. In a simple manner a device may be provided for making the relay inoperative again, which is necessary when it is desired to tune to another station. The device facilitating the tuning may at the same time be arranged in such a manner that the loudspeaker is inoperative as long as tuning has not been effected and is operated only after tuning.

The invention will be more clearly under-

stood by reference to the accompanying drawing representing, by way of example, one embodiment thereof, the set being supposed to be arranged as a superheterodyne receiver.

The intermediate frequency currents are supplied through a condenser 1 to the grid of an intermediate frequency amplifying valve 3. The anode circuit of this tube is coupled through a choke and a condenser 2 to a circuit 4 tuned to the intermediate frequency carrier wave. By means of a condenser 5 a circuit 9 of excellent quality and also tuned to the intermediate frequency is coupled with the circuit 4. The circuits are combined with rectifiers 6 and 11 rectifying the voltages set up. In addition the circuit of the rectifier 6 comprises resistances 7 and 8. Furthermore the resistance 8 forms part of the circuit of the rectifier 11 and is connected to set up a negative bias in this circuit. Due to this and in connection with the size of the condenser 5 the voltages occurring over the circuit 9 can be rectified only with correct tuning. The arrangement may be designed so that rectification occurs within a frequency range, for instance, of about 800 cycles. Hence, within this rather narrow range a direct voltage will occur through the resistance 10 forming part of the circuit of the rectifier 11. The rectifiers 6 and 11, with the associated input circuits 4 and 9 respectively, function as described in my U. S. Patent 2,108,420 issued February 15, 1938. The circuit 9 is more selective than circuit 4, and, therefore, the voltage across resistor 10 will not develop until the I. F. carrier value is very close to the assigned value. Further, the voltage developed across resistor 8 acts to delay the rectification action by rectifier 11 until the I. F. carrier amplitude is sufficient to overcome the delay bias. In this way the braking action on tuning knob 21 is made sharp.

When the set is not tuned the switch 13 is in its lowest position. On turning the tuning knob the voltage set up across the resistance 10 is supplied to the grid of the low frequency amplifying valve 15. It is amplified once more by the terminal valve 16 and has such a polarity that it causes an increase of anode current of the terminal valve. The anode circuit of the terminal valve comprises the primary winding of the transformer 17, to which is connected a loudspeaker 18, and in addition a relay winding 20. The relay does not respond to the normal anode current. If, however, the said voltage impulse occurs at the grid of the low frequency amplifying valve, the relay will respond due to the increase of anode

current, whereby the device facilitating the tuning is operated. In this form of construction said device consists of a braking magnet 25 acting on a disc 22 which is mounted on the shaft of the tuning knob 21, due to which any further movement of the knob is counteracted.

Furthermore the relay is combined with a switching device by which the switches 12, 13 and 19 are operated when the relay responds. The switch 12 is connected in parallel with the resistance 8 and causes a short-circuit of this resistance upon response of the relay, due to which the galvanic coupling between the two rectifying circuits is removed. The switch 13 is changed over to the upper contact due to which the control contact on the resistance 7 is made to contact with the condenser 14. The loudspeaker 18, which is short-circuited by a switch 19 when the set is not tuned, is operated. In this case the arrangement is adapted for normal reception, the rectifier 6 serving for rectification of the intermediate frequency oscillations. By shifting the contact on the resistance 7 the sound strength can be controlled. The current impulse operating the relay ceases after correct tuning. However, the relay is arranged in such a manner that after this current impulse ceases it remains in the working position by the action of the normal anode current of the tube 16. The voltage impulse at the grid of the tube 15 is stronger as the tuning knob is more quickly turned.

When the set is to be tuned to another station the relay is first of all brought again into the position of rest. This may, for instance be effected by means of a pressing knob 30 operating a contact 31 due to which the excitation of the coil 20 ceases.

What I claim is:

1. In a receiver comprising a high frequency signal current source, a first rectifier coupled to said source and including means for deriving a rectified voltage from the signals, a second rectifier of higher selectivity than the first rectifier coupled to said source and including means for deriving a second rectified voltage from the signals, an audio amplifier, switch means constructed to couple the audio amplifier to either of said voltage deriving means, an adjustable tuning device for the receiver, means, responsive to an increase in the audio amplifier current flow caused by development of the second rectified voltage, for preventing adjustment of the tuning device, and additional means, responsive to said increase, for adjusting said switch means to couple said audio amplifier solely to said first rectifier voltage deriving means.

2. In a receiver comprising a high frequency signal current source, a first rectifier coupled to said source and including means for deriving a rectified voltage from the signals, a second rectifier of higher selectivity than the first rectifier coupled to said source and including means for deriving a second rectified voltage from the signals, an audio amplifier, switch means constructed to couple the audio amplifier to either of said voltage deriving means, an adjustable tuning device for the receiver, means, responsive to an increase in the audio amplifier current flow caused by development of the second rectified voltage, for preventing adjustment of the tuning device, additional means, responsive to said increase, for adjusting said switch means to couple said audio amplifier solely to said first rectifier voltage de-

riving means, means applying at least a portion of the first rectified voltage to the second rectifier to delay rectification thereby, and means, responsive to said increase, for rendering said applying means ineffective.

3. In a receiver comprising a high frequency signal current source, a first rectifier coupled to said source and including means for deriving a rectified voltage from the signals, a second rectifier of higher selectivity than the first rectifier coupled to said source and including means for deriving a second rectified voltage from the signals, an audio amplifier, switch means constructed to couple the audio amplifier to either of said voltage deriving means, an adjustable tuning device for the receiver, means, responsive to an increase in the audio amplifier current flow caused by development of the second rectified voltage, for preventing adjustment of the tuning device, and additional means, responsive to said increase, for adjusting said switch means to couple said audio amplifier solely to said first rectifier voltage deriving means, a sound reproducer coupled to the audio amplifier, a device for normally preventing sound reproduction by the reproducer, and means, responsive to said increase, for rendering said last device ineffective whereby said reproducer is operative.

4. In a superheterodyne receiver having an intermediate frequency transmission network, a second detector circuit having a load element for developing audio voltage, a second load element for deriving a direct current voltage from rectified intermediate frequency current, a rectifier of higher selectivity than the detector and including a third load element for deriving a rectified voltage from said current, means applying the said direct current voltage to said rectifier as a delay bias, an audio amplifier, a switch device constructed and arranged to couple the amplifier to either said first or third load elements, a reproducer coupled to the amplifier, means for controlling the operation of the reproducer, an adjustable tuning device for the receiver, and means, responsive to a predetermined increase of the audio amplifier space current, for concurrently preventing adjustment of the tuning device, rendering the delay bias ineffective, adjusting said switch device to couple the amplifier to said first load element, and adjusting said reproducer controlling means to permit operation of the reproducer.

5. In a receiver comprising a high frequency signal current source, a first rectifier coupled to said source and including means for deriving a rectified voltage from the signals, a second rectifier of higher selectivity than the first rectifier coupled to said source and including means for deriving a second rectified voltage from the signals, an audio amplifier, switch means constructed to couple the audio amplifier to either of said voltage deriving means, an adjustable tuning device for the receiver, means, responsive to an increase in the audio amplifier current flow caused by development of the second rectified voltage, for preventing adjustment of the tuning device, additional means, responsive to said increase, for adjusting said switch means to couple said audio amplifier solely to said first rectifier voltage deriving means, and an auxiliary device for rendering said responsive means ineffective thereby to permit tuning device adjustment.

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