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TUNING ARRANGEMENT FOR AUTOMOBILE RADIOS

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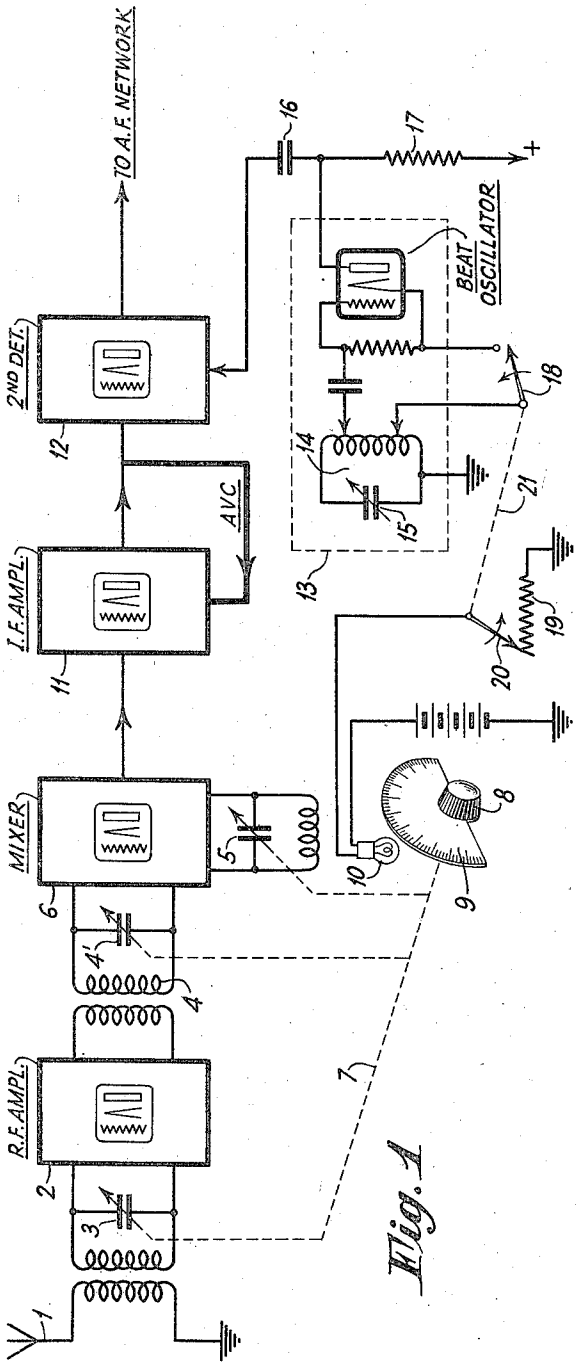

Fig. 1

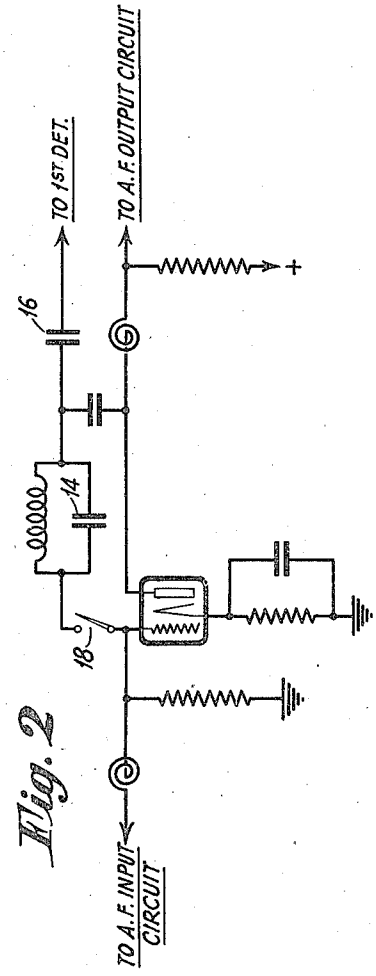

Fig. 2

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TUNING ARRANGEMENT FOR AUTOMOBILE RADIOS

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5 Claims. (Cl. 250—20)

My present invention relates to tuning arrangements for radio receivers of the automobile type, and more particularly to a device for facilitating the tuning of an automobile radio receiver.

The modern automobile radio receiver generally utilizes a flexible type of tuning control shaft, as well as a station indication dial which is illuminated by a pilot light. When the driver wishes to change the tuning of the receiver by observing the dial setting, it is necessary for him to take his eyes off the road. Again, with the flexible type of tuning control mechanism, the dial setting is more or less dependent on the direction of approach so that tuning must be done by ear. As is well known, with the modern type of set, using automatic volume control (AVC) an excellent ear is required to effect a reasonably good tuning adjustment. Furthermore, the dial light is distracting to the driver. During night driving a bright light in the immediate locality of the driver's eye creates a highly disturbing obstacle to safe driving.

Accordingly, it is one of the main objects of my present invention to provide in an automobile radio receiver, a control mechanism which permits bright illumination of the tuning dial solely during the act of tuning the set, and additionally permits rapid and accurate tuning without the necessity of the driver taking his eyes from the road.

Another important object of this invention may be said to reside in the provision of a radio receiver, particularly adapted for automobile use, which receiver is not only provided with a tuning mechanism for tuning the receiver over a range of signal frequencies, but is additionally provided with an auxiliary device which performs a dual function; one of these functions comprises the production of a beat note when the receiver is off resonance, and the other function comprising brightly illuminating the receiver tuning dial during the production of the aforesaid beat note.

Another object of the invention is to provide in a radio receiver provided with a tuning means, a beat oscillator which is adapted to impress upon the detector of the receiver, oscillations adapted to produce a beat note with the signal energy which beat note has a frequency proportional to the amount by which the receiver is off tune at any setting of the tuning mechanism, the tuning dial of the receiver being provided with an illuminating device which is normally dim, and a single means being provided for increasing the brightness of illumination of the tuning dial and for rendering operative the beat oscillator for accurate tuning of the receiver.

Still other objects of the invention are to improve generally the efficiency and reliability of receivers of the automobile type, and more especially to provide a receiver of the latter type which is not only economically manufactured and assembled, but is durable and reliable in operation.

The novel features which I believe to be characteristic of my invention are set forth in particularity in the appended claims; the invention itself, however, as to both its organization and method of operation will best be understood by reference to the following description taken in connection with the drawing in which I have indicated diagrammatically several circuit organizations whereby my invention may be carried into effect.

For the drawing, Fig. 1 shows a receiver embodying the invention, Fig. 2 shows a modification.

Referring now to the accompanying drawing, there is shown in the latter a receiver of the super-heterodyne type; the receiver comprises the conventional and well-known networks usually employed in the modern broadcast receiver installed in an automobile. In general, the receiver comprises a signal collector 1, and the latter may be any of the well-known types of automobile antenna. The collected signals are impressed upon a tunable radio frequency amplifier tube, and the numeral 3 denotes the variable tuning condensers of the amplifier circuits. The amplifier may comprise one, or more, amplifying tubes, and the amplified signals are impressed upon the tunable input circuit 4 of the mixer network. The variable condenser 4' tunes the input circuit 4, and the numeral 5 designotes the variable tuning condenser of the local oscillator circuit. The mixer network 6 may be of the composite local oscillator-first detector type which commonly employs a 6A7 tube. On the other hand, separate tubes may be used in the well-known manner for these functions.

Regardless of the construction of the networks up to the input of the IF amplifier, the rotors of the variable condensers 3, 4 and 5, are arranged for mechanical uni-control tuning adjustment. The dotted lines 7 denote such mechanical uni-control, and it will be understood that numeral 7 may denote the usual rigid rotor shaft. Furthermore, it may designate the flexible control cable employed between the tuning knob and the

variable condensers, as is common in automobile radio receivers wherein the tuning knob is located at a distance from the variable condensers.

The tuning control shaft 7 is provided with a tuning knob 8, and there is usually mechanically associated with the shaft 7 and knob 8 the station indicator dial 9. The numeral 10 denotes the dial illuminating bulb, and the latter is commonly disposed adjacent the dial 9 so as to brightly illuminate the dial. In such position, the total light reflected from dial 9 is sufficient to be distracting to the eye at night.

Those skilled in the art are fully aware of the fact that the local oscillator circuit commonly employs means for maintaining the IF energy in the output of the first detector substantially constant in frequency value, regardless of the position of adjustment of the tuning knob 8. The IF energy, which may have a frequency value of from 75 k. c. to 500 k. c., is impressed upon the IF amplifier 11, and the latter may comprise one, or more, amplifier tubes. It will be understood that the input and output circuits of each of the IF amplifier tubes is fixedly resonant to the operating IF. The amplifying IF energy is then impressed upon the second detector 12, and the detected currents are utilized in one, or more, stages of audio amplification, the latter being followed by any desired type of reproducer.

An automatic volume control network may be employed. Such a network, schematically designated by the letters AVC, functions to maintain the signal amplitude at the input of detector 12 substantially uniform over a wide range of signal amplitude variation at the collector 1. It is not believed necessary to describe the construction of such an AVC network in detail; it is sufficient to point out that a rectifier is used to detect some of the IF energy, and the direct current voltage component of the detected energy is employed to bias as many as desired of the pre-second detector tubes to reduce their gain as the signal amplitude increases. Such a control arrangement is of especial value in automobile receivers because fading effects are readily compensated for.

As stated above, when driving an automobile in the night time, the illumination from dial 9 is distracting to the driver. Further, it is difficult to adjust the tuning knob 8 without watching the dial 9. These facts render it more difficult accurately and speedily to tune the radio receiver and yet maintain safety during driving in the night. These disadvantages are overcome by the present invention, in that a beat oscillator is provided for permitting determination of accuracy of tuning by ear. The beat oscillator is disposed within the dotted rectangle 13. It will be observed to comprise an oscillator circuit of the Hartney type. It is not believed necessary to describe the construction of the oscillator since it is very well known to those skilled in the art. The resonant circuit 14 of the beat oscillator determines the frequency of oscillations. The condenser 15 is adjusted, as a factory or service adjustment, so as to tune the circuit 14 accurately to the IF.

The oscillations from the "zero beat" oscillator are impressed upon the second detector input circuit through a coupling condenser 16, the plate of the oscillator tube being connected to a source of positive potential through resistor 17. A switch 18 is provided in the cathode lead to the tuned circuit 14. When this switch 18 is open, the beat oscillator is inoperative; when it is closed, then the oscillations of IF value are impressed upon the detector 12. In the energizing circuit of bulb 10 there is disposed a rheostat which comprises the resistor 19 and the adjustable element 20.

As the adjustable element 20 is moved toward the grounded side of resistor 19 maximum current flows through bulb 10, and the latter will be at its maximum illumination. In the position shown in the drawing minimum current will flow through the bulb, and the bulb will be at dim illumination. The numeral 21 denotes a mechanical coupling device between the adjustable element of switch 18 and the adjustable element 20, and it is to be understood that these two adjustable elements may be mechanically correlated in such a manner that element 20 can only be moved along resistor 19 after the switch 18 is closed, or if desired, so that switch 18 is closed only after bulb 10 is brought to full brilliancy. Those skilled in the art are fully aware of such a switch-rheostat construction. It is believed that the schematic showing of the uni-control device 21 for actuating switch 18 and rheostat 19—20 is sufficient for the purposes of this application.

In considering the operation of the present invention, it is first pointed out that the uni-control means 21 is normally adjusted so that the auxiliary tuning, or beat, oscillator is shut off, and the illumination from bulb 10 very dim. In this position of the auxiliary tuning mechanism, as shown in the drawing, the light from bulb 10 is only bright enough to remind the user that the receiving set is turned on. Assuming now that the person driving the automobile desires to tune the set to a different station, he will change the tuning adjustment by first adjusting the device 21 so as to close switch 18, and then continue the actuation of device 21 until the adjustable element 20 slides along resistor 19 to a point such that the illumination from bulb 10 is sufficiently bright to enable the user to easily see the station designations on the face of dial 9.

The IF oscillations impressed on second detector 12 will not produce an audible beat note until the tuning knob 8 is adjusted away from a correct station setting. Between two settings of tuning knob 8, each correct for a different station, the beat note will be heard if the receiver is tuned in the vicinity of a carrier frequency, and the user of the set will be aware of the fact that the receiver is mis-tuned. As the variable condensers are adjusted towards a correct station setting, the frequency of the beat note will decrease, and at zero beat the operator will know that he has correctly adjusted the receiver. The illumination from bulb 10 enables the operator to observe what station he has tuned in by observing the usual station index element (not shown). When the desired station has been properly tuned in, the device 21 is readjusted to diminish the illumination from bulb 10, and to open switch 18.

It will, therefore, be seen that the zero beat oscillator permits rapid and accurate tuning and overcomes difficulty in accurate tuning caused by back-lash commonly encountered in tuning automobile radio receivers. The discomfort due to the bright illumination from bulb 10 is avoided by having it dimly illuminating dial 9 during substantially all reception periods between times when tuning is altered.

While a separate tube has been disclosed for use in the "zero beat" oscillator, it is to be under-

stood that the IF oscillations may be generated in a tube already present in the receiver. For example, one of the audio frequency amplifier tubes, which is not subject to AVC action, can be employed. This is preferable because the AVC action might cause the oscillations to vary in strength. Such a network is shown in Fig. 2. Additionally, if the beating oscillations are only desired on weaker stations, the AVC action can be taken advantage of by employing one of the radio, or IF, amplifiers to produce the oscillations for the tuning beat note. It is believed that those skilled in the art will readily be able to construct these latter circuits.

While I have indicated and described several systems for carrying my invention into effect, it will be apparent to one skilled in the art that my invention is by no means limited to the particular organizations shown and described, but that many modifications may be made without departing from the scope of my invention, as set forth in the appended claims.

What I claim is:

1. In a receiver of the type including a detector and means for tuning the receiver through a range of desired signal frequencies, reproducer means coupled to the detector output, a source of illumination associated with the receiver, an oscillator constructed and arranged to produce oscillations of a selected signal frequency, means for impressing said oscillations upon the detector input thereby to produce an audio beat note in the detector output when the frequency of the signal energy impressed on the detector is slightly different from the frequency of said oscillations, and a single manually adjustable means independent of said tuning means for controlling the intensity of illumination from said source and the operation of said oscillator.

2. In a receiver of the type including a detector and means for tuning the receiver through a range of desired signal frequencies, reproducer means coupled to the detector output, a source of illumination associated with the receiver, an oscillator constructed and arranged to produce oscillations of a selected signal frequency, means for impressing said oscillations upon the detector input thereby to produce an audio beat note in the detector output when the frequency of the signal energy impressed on the detector is slightly different from the frequency of said oscillations, and a single means other than said tuning means for controlling the intensity of illumination from said source and the operation of said oscillator, a station indicating dial mechanically associated with said tuning means, said illumination source being disposed adjacent the dial to illuminate the latter.

3. In a receiver of the type including a detector and means for tuning the receiver through a range of desired signal frequencies, reproducer means coupled to the detector output, a source of illumination associated with the receiver, an oscillator constructed and arranged to produce oscillations of a selected signal frequency, means for impressing said oscillations upon the detector input thereby to produce an audio beat note in the detector output when the frequency of the signal energy impressed on the detector is slightly different from the frequency of said oscillations, and a single means other than said tuning means for controlling the intensity of illumination from said source and the operation of said oscillator, a station indication dial mechanically associated with said tuning means, said illumination source illuminating the said dial, means for varying the intensity of illumination from said source, means for controlling the operation of the oscillator, and said single means simultaneously controlling said last two means.

4. A superheterodyne receiver of the type including a source of intermediate frequency energy and a second detector, means for varying the tuning of the receiver through a predetermined range of signal frequencies, a beat note oscillator, producing oscillations at the operating intermediate frequency, reactively coupled to the second detector input, means for rendering the beat oscillator ineffective at will, a station indication dial mechanically associated with said tuning means, a source of illumination for said dial, means for controlling the intensity of illumination from said source, and a single manually adjustable control means independent of said tuning means for adjusting the illumination control means to increase the intensity of illumination subsequent to adjustment of the beat oscillator control means to render the latter effective.

5. In a radio receiver of the superheterodyne type provided with means for tuning the receiver to different carrier frequencies in a desired signal frequency range, an intermediate frequency network, a second detector network, a station indicator device adjustable with said tuning means, and a source of illumination for said indicator device; means for varying the intensity of said illumination, an oscillator adapted to produce oscillations of said intermediate frequency, means for impressing the oscillations on said detector network thereby to produce an audio beat note when said tuning means is adjusted to tune the receiver in the vicinity of a carrier frequency, means for controlling the oscillator operation, and a manually operable device other than said tuning means for actuating said illumination varying means and oscillator control means in a predetermined sequence.

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