Jan. 18, 1938. A. A. LINSELL 2,105,789

RADIO RECEIVER

Filed May 16, 1933

Fig. 1

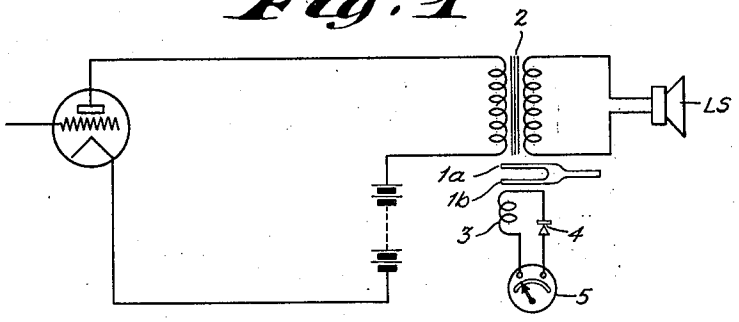


Fig. 2

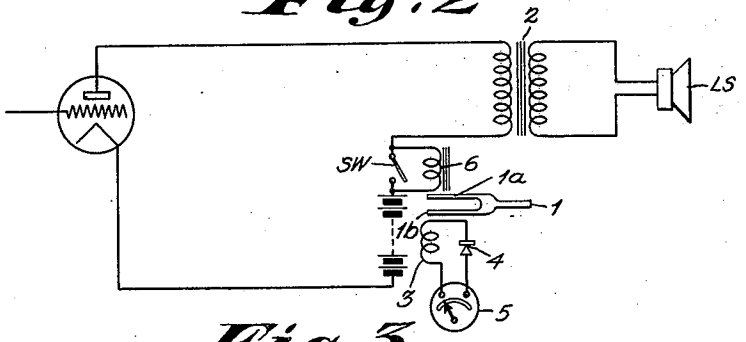


Fig. 3

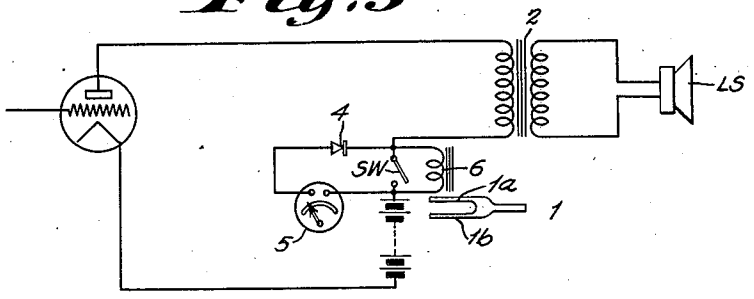
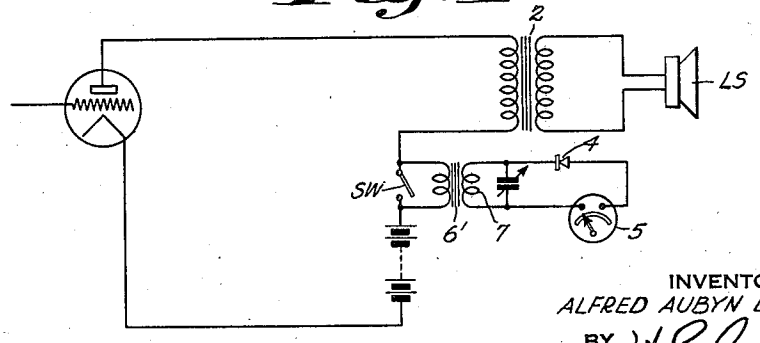


Fig. 4



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RADIO RECEIVER

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Application May 16, 1933, Serial No. 671,329
In Great Britain May 25, 1932

5 Claims. (Cl. 250—20)

This invention relates to radio receivers and more particularly to broadcast receivers and has for its object to provide a receiver which may be relatively easily and accurately tuned by comparatively unskilled persons to the wavelength of a desired transmitting station.

Many broadcast transmitting stations now in operation precede the transmission of every programme by a transmission of a characteristic signal modulation, this modulation being continued for a reasonable time and being transmitted for the purpose of enabling the various persons desirous of receiving the programme to tune their sets accurately to the station in question. For example, the transmitting stations of the British Broadcasting Corporation emit a continuous audio frequency modulation of substantially constant intensity and frequency for some minutes prior to the transmission of each programme, this audio frequency modulation being generally referred to as the "tuning note". For the purpose of convenience in definition a modulation such as that just described which is transmitted for the purpose of facilitating the tuning of receivers will be referred to in the present specification as a "characteristic tuning modulation". In practice receivers which are desired to receive from a particular station emitting the characteristic tuning modulation are tuned by their respective operators until the said modulation appears to be received in the best manner, but, more particularly in the case where a receiver is highly selective and/or incorporates reaction means, this operation requires considerable skill. For example in the case of a set embodying reaction it is quite easy for an unskilled person to imagine that his set is accurately tuned when in fact the selective circuits therein are not accurately tuned but the charactertistic tuning modulation is received at good strength by reason of excessive reaction or even self-oscillation, and accordingly, when the characteristic tuning modulation ceases and the programme commences said programme will be heard in a distorted manner.

An object of the present invention is to provide a radio receiver with an indicator so arranged that an indication of correct tuning will be given only when the characteristic tuning modulation is received not only at good strength but in a relatively distortionless manner. A further feature of the invention resides in the fact that the indication given is a visual indication and that, therefore, the difficulty at present met with, namely that of judging by the sound of the characteristic tuning modulation heard in the receiver whether or not the receiver is properly tuned, is avoided.

According to this invention a radio receiver is provided with a current or voltage indicator, a device or circuit arrangement responsive to the characteristic nature of the characteristic tuning modulation for actuating said indicator, and means for energizing said responsive device or circuit arrangement from the demodulated signal current obtained in the receiver.

The responsive device or circuit arrangement may take any of a variety of forms and may be constituted by an electrical, electro-mechanical or mechanical coupling arrangement having sharply resonant characteristics at the frequency of the characteristic tuning modulation, i. e. where, as is usual, this tuning modulation is a simple continuous single frequency audio modulation the responsive device or circuit arrangement may be a tuned circuit or a tuning fork or similar resonant device whose frequency is the same as that of the characteristic tuning modulation.

The invention is illustrated in the accompanying diagrammatic drawing wherein Fig. 1 shows an audio network of a receiver embodying one form of the invention; and Figs. 2, 3 and 4 show, respectively, different modifications of the latter.

Referring to Figure 1 which shows one way of carrying out the invention there is arranged in cooperating relation with any convenient transformer in the circuits of the receiver dealing with the demodulated signals e. g. the ordinarily provided telephone transformer 2 leading to the loudspeaker LS of the receiver, a tuning fork 1 which serves as the responsive device. For example, the tuning fork may be arranged with one tine *1a* in the leakage field of the telephone or output transformer 2 of the receiver the other tine *1b* being arranged adjacent a coil 3 which is in series with an indicating instrument 5 such, for example, as a milliammeter and a small rectifier 4, for example, a copper oxide rectifier.

Obviously the leakage field of any other audio frequency transformer or coupling choke in the receiver may be similarly utilized but use of the field of the ouput choke or transformer is preferred since ordinarily this will be most suitable. The frequency of the tuning fork is the same as that of the characteristic tuning modulation and it will be seen therefore that with this arrangement maximum indication will be given by the milliammeter only when the set is properly tuned in such manner as to cause the demodulated sig-

nals corresponding to the characteristic tuning modulation and flowing through the output transformer to be substantially pure and undistorted. If, however, the set is not properly tuned but is adjusted to give large volume merely by the use of excessive reaction the characteristic tuning modulation signals will not be pure in form and in consequence the response of the tuning fork will be reduced. Means may be provided for cutting the tuning fork out of action when the receiver is in use for receiving an ordinary programme; for example, a mechanical gripping or damping device (not shown) may be associated with the tines of the fork to prevent vibration and/or the fork may be placed in a sound proof box (not shown). In a slightly modified arrangement shown in Figure 2 the leakage field of the output transformer 2 is not employed for driving the fork 1 the said fork being instead driven by a specially provided coil 6 in series with the primary of the output transformer 2. In this arrangement it is preferable to provide a push button or other switch SW connected across the coil 6 so that the said coil may be short circuited when the receiver is in ordinary use. In a still further modification illustrated in Figure 3 a series circuit consisting of the rectifier 4 and the milliammeter 5 is connected across a specially provided coil 6 in series with the primary of the output transformer 2 and the tuning fork 1 is arranged with one tine 1*a* adjacent this specially provided coil, i. e. the rectifier and milliammeter are no longer in a coupled secondary circuit. As before this specially provided coil may be arranged to be short circuited or otherwise cut out of circuit e. g. by the switch SW when the tuning operation is finished.

In place of using a tuning fork as the responsive device any other convenient resonant device or circuit arrangement may be employed; for example as shown in Figure 4 a tuned circuit 7 of low damping tuned to the frequency of the characteristic tuning modulation may be employed in place of the tuning fork, the output from this circuit (which includes the secondary of a transformer 6') being rectified and utilized to actuate the indicator. As before this tuned circuit may be arranged to be short circuited or otherwise cut out of circuit by the switch SW when the tuning operation is finished. Again, in place of a tuning fork, a reed or other mechanical or electro-mechanical vibratory resonant member of low damping may be employed as the responsive device.

It will be seen that arrangements in accordance with this invention enable tuning to be accomplished in a very simple and satisfactory manner, the low frequency output from the receiver being utilized to give an indication to the operator of the set as to when the high frequency tuning elements of that set are accurately adjusted. In general, in operating a set embodying the present invention the high frequency tuning circuit or circuits, or the equivalent selective means preceding the demodulating detector, should be adjusted as closely as possible to the wave length to be received using as little reaction as possible, and then, if the volume is insufficient, the amount of reaction should be increased up to a point preceding that at which the indicator, after reaching a maximum indication, begins to reduce its indication due to a pure note no longer being received.

I claim:

1. Radio receiving apparatus including an audio frequency circuit, a transformer in said circuit said transformer having primary and secondary windings, a loudspeaker adapted to be energized from said secondary winding, a tuning fork having one tine adjacent said transformer and actuated thereby, a circuit having a reactance element located adjacent the other tine of said tuning fork and actuated thereby, and an indicating device in said second circuit.

2. Radio receiving apparatus comprising an audio frequency circuit, a transformer having its primary winding in said circuit, a loudspeaker connected to the secondary winding of said transformer, a second winding in said audio frequency circuit adapted to be energized by a characteristic tuning audio modulation current when the latter appears in the audio circuit, means for short-circuiting said second winding when said apparatus has been tuned to develop the maximum tuning current in the said second winding, a tuning fork actuated from said second winding and sharply resonant to the frequency of said tuning current, a circuit actuated from said tuning fork to develop a flow of current when said fork is actuated by said tuning current, and indicating means in the last mentioned circuit.

3. Radio receiving apparatus including an audio frequency circuit, a loudspeaker and a transformer connecting said loudspeaker with said audio frequency circuit, a second transformer, connections connecting the primary winding of said second transformer in said audio frequency circuit, means operable to short circuit the primary winding of said second transformer, a circuit connected to the secondary winding of said transformer, said circuit including a condenser connected in parallel with said secondary winding to form a tuned circuit resonant at a predetermined frequency, and an indicating meter in the last mentioned circuit.

4. In a receiving system of the type adapted to receive a characteristic tuning modulation in the form of a continuous audio frequency modulation prior to normal intelligence modulated carrier waves, an audio frequency circuit wherein the said tuning modulation currents flow, a visual indicating network for facilitating accurate tuning of the system, said network comprising a rectifier connected in circuit with an indicator, and a highly selective device, sharply resonant solely to said tuning modulation frequency, electrically associated with the indicating network and audio circuit and causing maximum current flow in the indicating network when the receiver has been tuned to develop the maximum tuning modulation current in said audio circuit.

5. In a receiving system of the type adapted to receive a characteristic tuning modulation in the form of a continuous audio frequency modulation prior to normal intelligence modulated carrier waves, an audio frequency circuit wherein the said tuning modulation currents flow, a visual indicating network for facilitating accurate tuning of the system, said network comprising a rectifier connected in circuit with an indicator, and a highly selective device, sharply resonant solely to said tuning modulation frequency, electrically associated with the indicating network and audio circuit and causing maximum current flow in the indicating network when the receiver has been tuned to develop the maximum tuning modulation current in said audio circuit, and means for rendering the indicating network inoperative.

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