

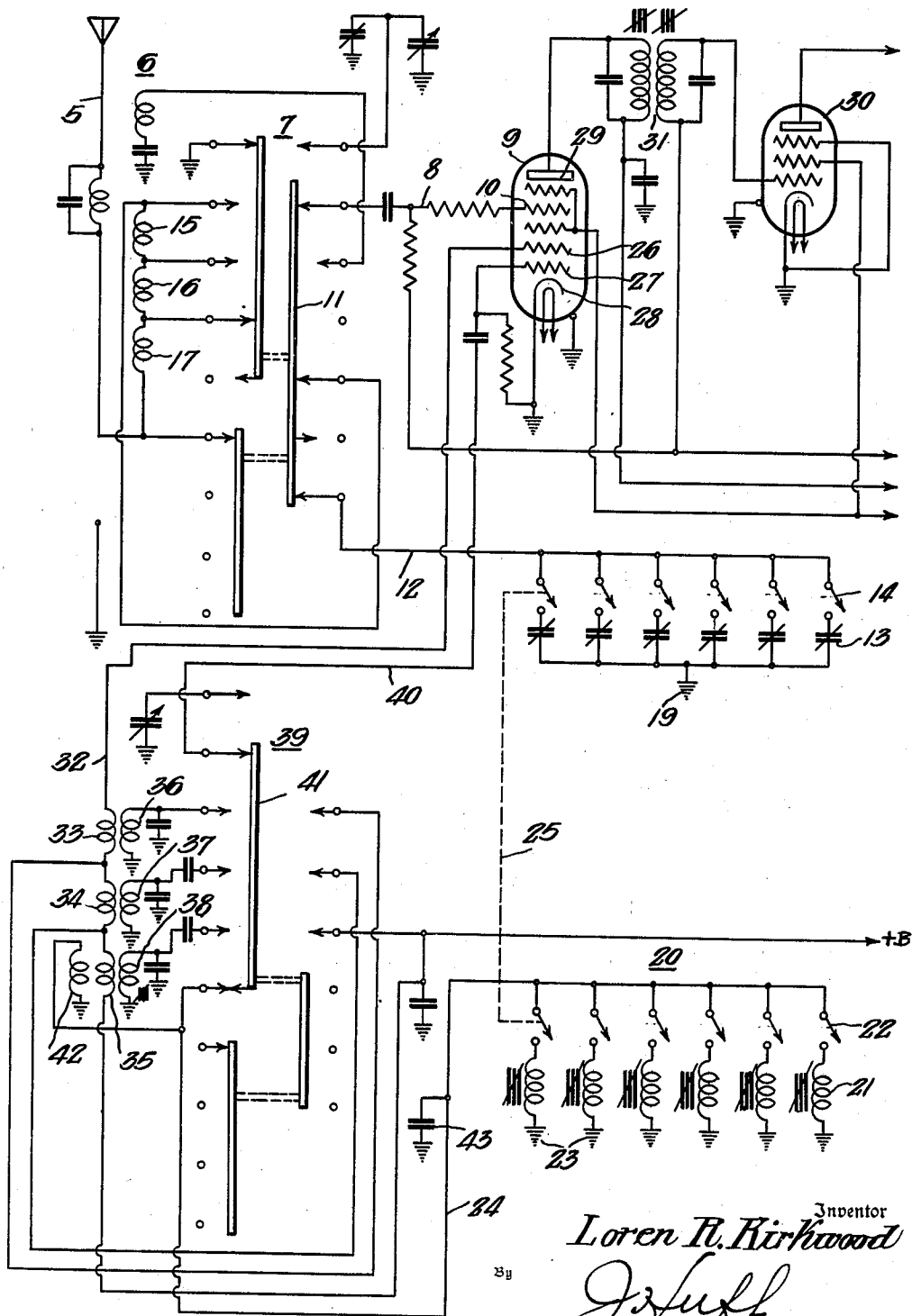
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OSCILLATOR TUNING SYSTEM

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OSCILLATOR TUNING SYSTEM

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4 Claims. (Cl. 250—36)

The present invention relates to an oscillator tuning system for superheterodyne receivers and the like, provided with preselection or so-called push-button tuning, and has for its object to provide an improved oscillator tuning system adapted for this use.

In tuning systems for present-day radio receivers, there is provided, in addition to the multiple wave band switching for short wave reception, additional means for tuning in the broadcast band, for example, to a plurality of preselected frequencies corresponding to the major broadcast stations available at the receiver location. In carrying out this type of tuning, various circuit tuning elements are arranged to be connected into circuit by push-button switches to effect the necessary frequency change in the signal receiving circuits of the receiver.

In a superheterodyne receiver, the selective switching of the oscillator circuits may become complicated for the reason that the oscillator involves not only a tunable signal circuit, that is, the oscillator grid circuit, but also includes a feedback circuit and means therein for maintaining the oscillations throughout the tuning range of the receiver.

It is, therefore, a further object of the present invention to provide a simplified oscillator tuning system adapted for preselection of a plurality of frequencies within the tuning range of the oscillator and a circuit therefor which is controllable by selective switching of parallel-connected tuning elements.

It is also an object of the invention to provide an oscillator tuning system for a superheterodyne receiver which is tunable to a plurality of predetermined frequencies by inductance elements having adjustable tuning cores, such as ferro-magnetic cores, movable within the coils or inductances to provide a stabilized tuning system adapted to maintain tuning adjustment and to be tunable accurately to preselected frequencies.

It is an additional object of the present invention to provide a tuning system for preselection tuning in a superheterodyne receiver, whereby the oscillator circuit may be tuned to preselected frequencies by single inductances or coils connectable by simple switching means across a tuning control circuit, thereby to eliminate complicated circuits in the feedback arrangement of the oscillator and to permit low-cost coil construction and switching.

A preselection tuning system of the type to which the present invention relates is shown and

described in a copending application of K. A. Chittick and M. C. Jones, Serial No. 199,106, filed March 31, 1938, and assigned to the same assignee as this application.

The invention will be better understood from the following description, when considered in connection with the accompanying drawing, and its scope is indicated by the appended claims.

In the drawing, the figure is a schematic circuit diagram of the signal receiving portion of a superheterodyne receiver provided with an oscillator tuning system embodying the invention.

Referring to the drawing, the signal collecting circuit 5 is arranged to be coupled through inductance elements 6 and a range selector switch 7, with the input or grid circuit 8 of a combined first detector and oscillator tube 9, the signal input grid of which is indicated at 10.

With the switch 7 in the position shown, the grid circuit 8 is connected through a switching element 11 with a push-button or preselector circuit 12 containing a plurality of adjustable capacitors 13 connected in parallel to the circuit through push-button switches 14. The capacitors are adjustable to different values to tune the signal input circuit comprising the inductance elements 15 and 16. Signal energy from the circuit 5 is applied to the inductance elements 15 and 16 through a coupling winding 17. The secondary circuit, comprising the inductances 15 and 16, is tuned by connecting the various capacitors 13 in shunt therewith by selectively closing the switches 14, thereby tuning the signal input circuit of the receiver to different signal channels.

It will be noted that the preselection tuning is provided by a unit comprising the capacitors 13 and the switches 14 connectable in circuit through a single circuit connection 12 and a chassis or ground connection indicated at 19.

A similar switching arrangement may be provided for the oscillator portion of the receiver system and this is indicated at 20 and comprises a series of adjustable core tuning inductances 21 and selector switches 22 therefor, whereby any one of the inductances 21 may be connected between ground or chassis 23 and a tuning control lead 24, corresponding to the tuning control lead 12 for the RF or signal input circuit.

As indicated in the drawing, the switches 22 and 14 are operable in pairs, being mechanically connected for operation as indicated by the dotted line 25, whereby the oscillator tuning and the RF tuning are changed simultaneously to

produce the required intermediate frequency from the selected signal. In order to simplify the drawing, the other mechanical connections are omitted. The inductance elements 21 are preferably adjustable by means of movable cores containing magnetic material and the adjustment is preferably made at the grounded end of each of these coils, whereby the tuning of each coil does not affect the tuning of the other coils.

In the present example, the oscillator tube elements are included within the tube 9 and comprise an electrode or grid 26 as the oscillator anode, a control grid 27 as the oscillator grid, and a cathode 28 common to the first detector elements 10 and an output anode 29, the latter being coupled to the first IF amplifier tube 30 through a tuned coupling transformer 31.

The oscillator feedback or anode circuit indicated at 32 includes windings 33, 34 and 35 for the short wave, medium wave and broadcast tuning band secondaries 36, 37 and 38 respectively, with which they are coupled as indicated. The primary or feedback windings 33—35 and the secondary windings 36—38 are controlled by a switch section 39 jointly operable with the switch section 7 for wave band change. In the position shown, the switch section 39 provides a connection for the oscillator grid through a grid circuit lead 40 and a switch element 41 with the oscillator tuning control circuit 23—24.

With this arrangement, it will be seen that the inductance turning elements 21 may selectively be connected into the oscillator tuning circuit to tune the same to a plurality of differing frequencies by selectively closing the switches 22. In order to provide feedback for a circuit of this type, the feedback winding 35 associated with the tuning inductance 38 for the broadcast band is also associated with and coupled to a third winding 42, which is connected in parallel with the preselection circuit 23—24 and a fixed shunt tuning capacitor 43. For the preselection tuning operation, the feedback from the oscillator anode to the grid is provided between the coils 35 and 42, regardless of the coil selected by the switches 22 for tuning the oscillator grid circuit.

In practice, the coil 35 is wound over the coil 42 to provide the feedback to maintain oscillations for each of the adjusted tuning frequencies established by the parallel-connected inductances 21. The winding coil 42 is approximately 15 times larger in inductance than the coils 21, at the low frequency end of the broadcast or receiving range. Thus, the effect of range reduction is minimized as the inductances 21 are connected in parallel with the feedback coupling inductance or winding 42.

The advantages of this type of circuit are that only single coil units are required for fixed or preselection tuning, thus making for a lower cost coil system, and the elimination of feedback circuits for the anode involving series capacitors. Also, with fixed feedback provided by one coupling unit and fixed tuning provided by other single units of the magnetite movable core type, greater oscillator stability is provided, and the lining up of the receiver is maintained over a greater period without correction. The system, furthermore, does not interfere with the tuning of the oscillator and receiver circuits in other frequency ranges for medium and short wave tuning, and involves merely but one additional contact on the wave band change switches for connecting in the tuning of the preselection circuit, since it is provided by a single wire con-

nection and utilizes parallel-connected and grounded tuning elements in both the oscillator and r. f. circuits.

From the foregoing description, it will be seen that, for preselection or push-button tuning of a radio receiver of the superheterodyne type, the oscillator may be provided with a feedback circuit which includes a single feedback winding 35 coupled with the tunable oscillator grid circuit inductance 38 and with a fixed-tuned, high inductance 42 in the oscillator grid circuit as a feedback coupling winding. Switching means, preferably as part of a wave band change switch, is provided for selectively connecting the oscillator grid circuit with either of said grid circuit inductances, and effective feedback is provided for maintaining oscillations throughout a predetermined tuning range. With this circuit arrangement, it will be seen that preselection tuning of the oscillator may be simplified to the same extent as the preselection tuning of the r. f. or signal input circuit or circuits, by a signal circuit including a plurality of grounded, parallel single coil inductance windings and switching means for connecting the same in parallel with the high inductance grid feedback winding, and adjusting the tuning exactly to the desired frequencies by means of the movable cores which may be placed preferably adjacent to the grounded ends of the parallel-connected preselection tuning inductances.

I claim as my invention:

1. In a tunable oscillator circuit, the combination of a feedback winding, a fixed tuning inductance coupled therewith to receive feedback energy therefrom, a plurality of preselected variable tuning inductances preadjusted to such values that when connected in circuit with said fixed tuning inductance the oscillator circuit is tuned to preselected signal frequencies, means for selectively connecting said variable tuning inductances in circuit with said fixed tuning inductance, a second fixed tuning inductance coupled with said feedback winding to receive feedback energy therefrom jointly with said first named tuning inductance, means for variably tuning said second fixed inductance through a predetermined frequency range, and means for selectively connecting said tuning inductances in said oscillator circuit thereby to effect a change in the tuning without changing connections with said feedback winding.

2. In a tunable oscillator, the combination of an anode circuit, a feedback winding in said circuit, a pair of main tuning inductances coupled therewith to receive feedback energy therefrom, one of said inductances having a relatively high inductance value, means for tuning said oscillator to a series of preselected fixed signal frequencies comprising a plurality of preselected and preadjusted tuning inductances having selective connections in circuit with said one main tuning inductance, and means for variably tuning the second one of said first named inductances to tune said oscillator through a predetermined variable tuning range without changing the feedback circuit connections therein.

3. In a tunable oscillator system for superheterodyne receivers and the like means providing preselection tuning therefor comprising an oscillator anode-cathode circuit, an oscillator grid-cathode circuit, a feedback winding in said first-named circuit, a feedback coupling winding and a main tuning inductance selectively connectable in said second-named circuit, said wind-

ing and said inductance being coupled to said feedback winding to receive oscillations therefrom over a predetermined tuning range, a plurality of individually adjustable single coil tuning windings connected at one end each with the cathode end of said feedback coupling winding and each having an opposite free end, a tuning control circuit lead connected with the opposite end of said feedback coupling winding, means for connecting said lead with the free end of each of said tuning inductance coils selectively, and means including a movable core element for each of said tuning coils for adjusting said oscillator for response at a plurality of differing frequencies, and the inductance of said feedback coupling winding being greater than the tuning windings at the low frequency end of the tuning range of the system.

4. In a multiple wave band tunable oscillator

system for superheterodyne receivers and the like, the combination of an oscillator tube having an anode, a cathode and a control grid, an inductance winding connected between the grid and the cathode, a feedback winding connected between the anode and the cathode and coupled to the first-named winding for generating oscillations, and means for tuning said oscillator to a plurality of predetermined frequencies, comprising a plurality of preadjusted shunt tuning windings for said inductance winding, means for selectively connecting said tuning windings in parallel with said first-named inductance winding, and means providing a grid-cathode circuit for said oscillator variably tunable through a predetermined frequency range having an inductance winding connectable between the grid and cathode and coupled to said feedback winding.

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