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PRESELECTION TUNING SYSTEM

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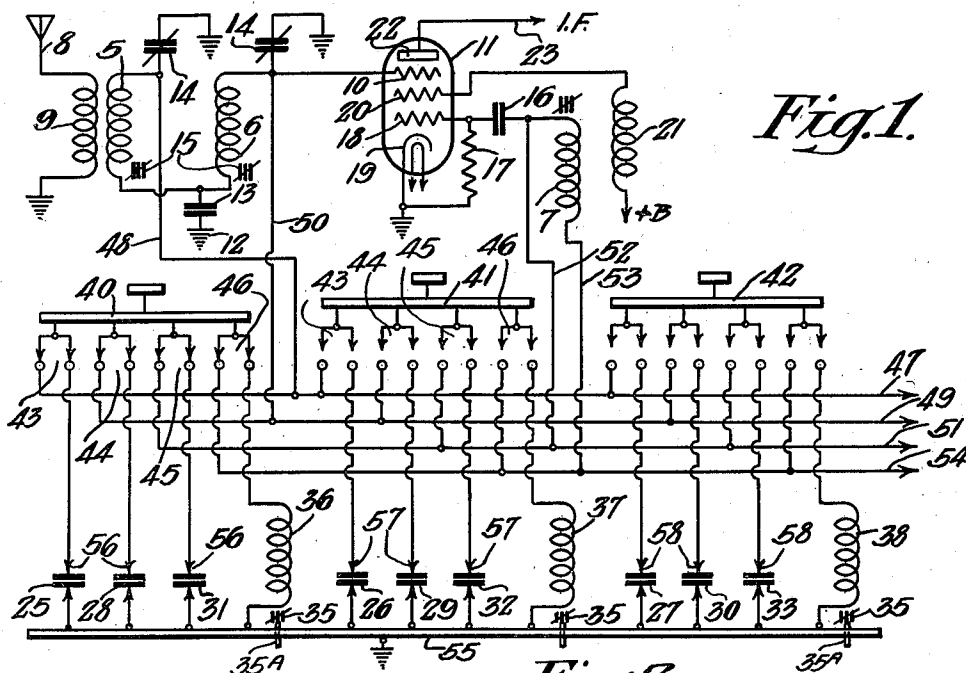


Fig. 1.

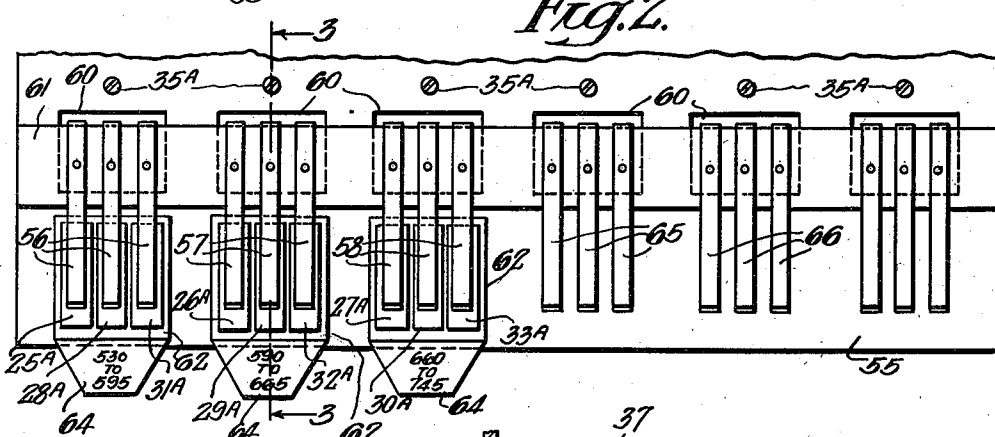


Fig. 2.

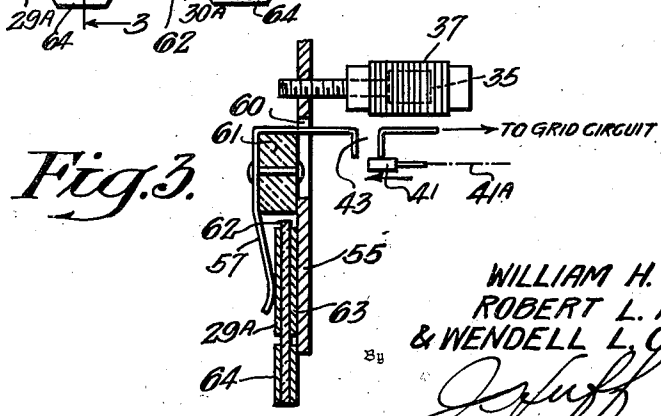


Fig. 3.

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PRESELECTION TUNING SYSTEM

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1 Claim. (Cl. 250—40)

The present invention relates to preselection tuning systems for radio receiving apparatus and the like. More particularly, it relates to a tuning system for a superheterodyne receiver adapted for preselection or push-button operation to tune in any one of a number of preselected signals or broadcasting stations, and has for its primary object to provide a tuning system of that type which is more readily adjustable by the user accurately to preselected signals, and in which such adjustment to other preselected signals may be made in the same manner, without complicated circuits and at low cost.

In preselection tuning systems, a plurality of tunable circuits may be provided with tuning elements such as shunt capacitors and selector switch means for connecting said tuning elements with said circuits to adjust the system for response to a plurality of differing preselected signals. In a superheterodyne receiving system it has been found that the R. F. or signal input circuits may be given a band pass characteristic in a number of relatively narrow frequency bands to cover the total frequency range of the broadcast or other signal receiving wave band if the oscillator is made adjustable in frequency for each band to provide the desired beat frequency or fixed intermediate frequency, the intermediate frequency amplifier being depended upon to provide the desired selectivity between signals in each narrow band.

In providing a preselection tuning system in accordance with the invention, a band pass R. F. or input is provided, which may be tuned to cover narrow bands of signal or R. F. frequencies along the broadcast band or tuning range, depending on the tuning reactance values connected with it such as by simple capacity elements placed across it. The oscillator is tunable by means of an adjustable core inductance to beat with the signals within that band and to produce the desired intermediate frequency. The narrow bands referred to, for example, in the broadcast range, may include signals between 530 and 595 kcs. in one band, 590 to 665 kcs. in the next band, 660 to 745 kcs. in the next higher band, and the remainder of the broadcast band in a similar manner, the whole band being covered in about ten narrow bands of from 60 to 180 kcs. in width, and the width of the bands being progressively increased toward the higher frequency end of the broadcast tuning range.

It is also an object of the invention to provide an improved preselection tuning system of the type above referred to, wherein the operation of

setting up the receiving system for response to signals in a number of such narrow bands may be greatly simplified and made available to the ordinary user of such apparatus without technical experience and knowledge, and which may be arranged to provide ready access to the adjustable portions thereof, at the same time providing a simplified circuit and tuning elements of low cost.

More specifically, it is a still further object of the present invention, to provide a push button preselection type of tuning system for radio receivers which is relatively inexpensive and is simple to set up in operation.

The invention will, however, be better understood from the following description when considered in connection with the accompanying drawing and its scope will be pointed out in the appended claim.

In the drawing,

Figure 1 is a schematic circuit diagram of a superheterodyne radio receiver provided with a tuning system embodying the invention,

Figure 2 is a plan view of a portion of the rear apron of a radio receiver chassis showing the physical arrangement of certain portions of the circuit of Figure 1, and

Figure 3 is a cross-sectional view of the apparatus of Figure 2 taken on the line 3—3 of Fig. 2, the thickness of the parts being somewhat exaggerated to illustrate more clearly their arrangement and functional relation.

Referring to Fig. 1, the receiving system comprises three tunable circuits, one containing an inductance 5, another containing an inductance 6, and a third containing an inductance 7, representing any suitable number of tunable circuits in a receiving system.

In the present example, the inductance 5 is a part of a link or band pass R. F. circuit coupled to an antenna 8 through a primary winding 9, as indicated. The inductance 6 is connected with the input circuit for the signal grid 10 of a first detector tube 11. Both inductances 5 and 6 are connected to the chassis or ground 12 through a common coupling capacitor 13 whereby signals are transferred from the circuit including the inductance 5 to the circuit including the inductance 6. The signal circuit arrangement from the antenna 11 to the control grid 10 is provided with a predetermined degree of selectivity having a band pass characteristic hereinbefore referred to and normally covering a relatively narrow frequency band within the frequency range over which the receiver is to

be operative. The inductances 5 and 6 are tuned to the highest frequency in the receiving band by adjustable shunt trimmer capacitors indicated at 14, and may be provided with movable magnetite cores 15 which may be adjusted to provide low frequency trimming of the circuits.

The inductance 7 is included in the oscillator circuit for the receiver and is coupled through a grid capacitor 16 and a grid resistor 17 to the oscillator grid 18 which, in the present example, is included within the tube 11 and provided with a common cathode 19 with the detector. Feedback for producing oscillations is provided by utilizing the screen grid 20 as an anode and coupling it through a feedback winding 21 with the inductance 7 as indicated. While the detector and oscillator may be of any suitable type, the tube 11 is of the combined detector-oscillator type and the resulting intermediate frequency signals are taken from the anode indicated at 22 through the I. F. output circuit 23.

The inductances 5 and 6 for the R. F. band pass circuits between the signal input circuit 8 and the control grid 10 are further tunable within the several desired pass bands by means of fixed reactance elements, such as capacitors indicated at 25, 26 and 27, adapted to be connected across the inductance 5 and fixed capacitors indicated at 28, 29 and 30 adapted to be connected across the inductance 6. The tuning of the oscillator is correspondingly adjusted to bring its operating frequency within the proper range to produce the desired intermediate frequency, by means of similar fixed capacitors 31, 32 and 33 which are arranged to be connected in shunt with the tuning inductance 7.

Within each of the pass bands established by the capacitors across the tuned circuits comprising R. F. inductances 5 and 6, the oscillator tuning is adjusted to the correct value by movement of magnetite cores indicated at 35 within additional oscillator tuning inductances indicated at 36, 37 and 38, respectively, which are arranged to be connected in series with the main tuning inductance 7.

Any suitable switching arrangement may be provided for conjointly connecting the inductances and capacitors for each frequency band with the tuned circuits. In the present example, a plurality of multiple contact push button switches are shown at 40, 41 and 42 representing any suitable number of push buttons corresponding in number to the number of signals or broadcasting stations to be received. Since each of the push buttons must control the application of three shunt capacitors to the three tuning inductances 5, 6 and 7 and the insertion of a series inductance in circuit with the inductance 7, each of the buttons is provided with four sets of contacts 43, 44, 45 and 46.

One contact of each set of contacts 43 is connected in parallel to a bus lead 47 which is connected through a lead 48 with the high potential side of the inductance 5, and the remaining contact of each set is connected with one of the capacitors 25, 26 and 27 as shown. Likewise, one contact of each set of contacts 44 is connected with a bus lead 49 and through a lead 50 with the high potential side of the tuning inductance 6, while the remaining contacts of each set is connected with one of the tuning capacitors 28, 29 and 30.

In a similar manner, the sets of contacts 45 in each push button switch is arranged to connect the capacitors 31, 32 and 33 selectively with a

bus wire 51 which is connected through a lead 52 with the high potential side of the oscillator tuning inductance 7. The series connection for the oscillator tuning inductances 36—38 with the main tuning inductance 7, is provided through the remaining sets of contacts 46 in each push button switch, a lead 53 being connected with a bus wire 54 in turn connected with one contact of each of the sets of contacts 46, while the remaining contacts are connected with the individual inductances 36, 37 and 38.

All of the tuning capacitors 25 to 33, inclusive, and the tuning inductances 36—38, inclusive, are connected to the chassis or ground 55, thereby simplifying the circuit connection for these tuning elements. Additional push button switches which may be provided for additional signals or broadcasting stations to be received, are connected to the bus wires 47, 49, 51 and 54 and the chassis 55 in a similar manner to those shown in the drawing. Ordinarily, eight push buttons are provided for eight different stations, although in the present example, only three are shown for the purpose of simplifying the drawing.

When one of the push button switches is closed, such as the switch 40, as shown, the capacitors 25 and 28 are connected in shunt with the inductances 5 and 6 respectively to tune the band-pass circuits for response to signals in a relatively narrow tuning band, such as from 530 to 595 kilocycles, whereby received signals within that band are applied to the detector grid 10.

The oscillator tuning is brought within a corresponding band or range differing from the pass band of the R. F. circuits by the amount of the intermediate frequency, by means of the shunt capacitor 31. Within the selected pass band, the series inductance 36 is adjusted by means of the core 35 over a variable tuning range covering the selected pass band, whereby the oscillator may be tuned to beat with any desired signal to be received within that band.

When the switch 41 is closed, the capacitors 26, 29, 32 and the inductance 37 in a similar manner, may tune the R. F. band pass circuits and the oscillator within the same or a differing frequency range with respect to that provided by the switch 40, the exact response frequency in each band being determined by adjustment of the core 35 of the coil 31. Likewise, when the switch 42 is closed the capacitors 27, 30 and 33 and the inductance 38 may provide the same or another tuning range for the band pass and oscillator circuits.

Whether the signal frequencies or broadcasting stations are to be received within the same or differing pass bands depends upon the capacity values inserted in circuit with the selector switches 40, 41, 42, etc. If, for example, the tuning capacitors 27, 30 and 33 are larger than the capacitors 26, 29 and 32, the tuning response for the selector switches 41 and 42 will be in a differing pass band and if they are the same, inductances 37 and 38 may be adjusted to select differing signals or broadcasting stations within the same pass band.

The receiver is thus readily adjustable for response in the same or differing pass bands, by changing the values of the tuning reactances or capacitors 25 to 33 inclusive. In order to facilitate such adjustment or change, the capacitors 25, 28 and 31 are grouped and arranged as a unit to be inserted between contacts 56 and the chassis or ground 55. In a similar manner, the capacitors

26, 29 and 32 and the capacitors 27, 30 and 33 are grouped and arranged in units to be inserted between the chassis or ground 55 and contacts 57 and 58, respectively.

Referring to Figs. 2 and 3, along with Fig. 1, like reference numerals refer to like parts and circuit elements throughout. It will be seen that the contacts 56, 57 and 58 may be arranged to project through openings 60 in the rear apron of the receiver chassis 55 in closely spaced groups and may be arranged in the form of clips mounted on an insulating bar 61 along the openings 60 in such a manner that the capacitors may be inserted between the free ends of the clips and the surface of the chassis 55.

The tuning capacitors 25—28—31 are provided by capacitor plates or electrodes of conducting material 25a, 28a and 31a mounted as a unit in spaced parallel relation to each other on a card or plate of thin dielectric material 62 in positions to be engaged by the clips 56 when the plate is inserted between them and the chassis surface 55. The opposite side of the plate of dielectric material is covered by a common ground plate or electrode 63 which engages the chassis surface and forms the opposite plate or electrode of the capacitor unit common to all of the capacitor plates in the unit.

A metallic or other suitable tab or handle for the capacitor unit is provided by coating the card or plate of insulating material as indicated at 64, this coating being adapted to receive an imprint or suitable marking to indicate the tuning range provided by the capacitor unit such as from 530 to 595 kcs., as indicated for the unit 62.

Similar units are provided for the contact clips 57, 58 having capacitor plates corresponding to the capacitors indicated in Fig. 1 and all are formed in a similar manner to be made interchangeable. Additional contact clips for additional tuning selector switches are indicated at 65 and 66.

The oscillator inductances 36, 37 and 38 are arranged adjacent to the contact clips, as, for example, directly above the tuning capacitor clips each in association with its R. F. tuning group of contacts, with the adjustment screws for the cores projecting through the chassis apron, as indicated at 35a. One of the oscillator tuning inductances 37 and the movable core 35 therefore are indicated in Fig. 3.

The switch arrangement preferably is provided in connection with the selector switches 40, 41 and 42 by making one end of the contact clips on the interior side of the chassis form one contact of the pairs of switch contacts, one of which for the switch 41, is indicated at 43 in Fig. 3. This arrangement between the capacitor clips and the switch contacts serves to make the connection leads short, as is desirable.

With the receiver arrangement shown, the contact clips for each push-button switch are accessible at the rear of the receiver chassis and, when setting up the receiver for a plurality of differing signals or broadcasting stations to be received by push-button tuning, a capacitor unit providing the proper pass band within which the signals are to be received is inserted under the clip for the particular push-button desired for that station or signal and the oscillator frequency is adjusted to the correct value by moving the magnetite core by the adjustment screw 35A directly above the capacitor clip.

It will be seen that, with a group of capacitor units or tuning cards as shown, a receiver provided with a push-button tuning system may readily be adjusted for tuning in a number of preselected signals or broadcasting stations without requiring any technical knowledge or skill.

We claim as our invention:

In a superheterodyne receiver, the combination of a tunable band pass input circuit selectively responsive to signals in a plurality of different relatively narrow spaced frequency bands, a tunable oscillator circuit for said receiver comprising a plurality of adjustable tuning coils selectively connectable in circuit therewith and permanently installed in the receiver, means for shifting the band pass response of said circuits and the tuning range of said oscillator in said different spaced frequency bands comprising a plurality of interchangeable tuning capacitor units selectively insertable in said oscillator and band pass circuits, said capacitor units including fixed capacitors which resonate with the adjustable oscillator coils in said different spaced frequency bands, and said oscillator coils being adjustable for tuning said oscillator circuit through all of said bands.

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