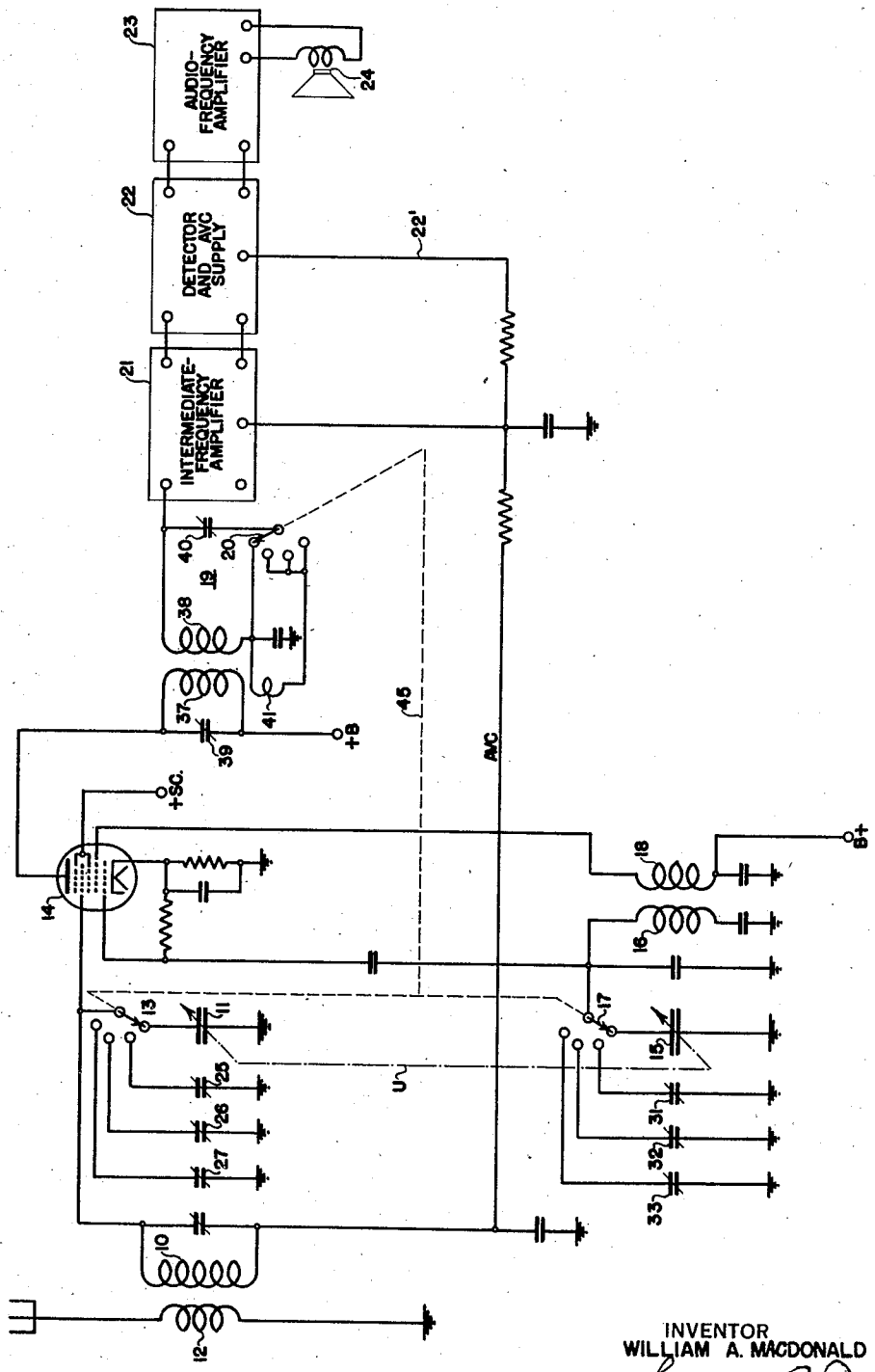
Feb. 28, 1939. W. A. MacDONALD 2,148,633

TUNING AND SELECTIVITY CONTROL

Filed Oct. 21, 1937



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Patented Feb. 28, 1939 2,148,633

UNITED STATES PATENT OFFICE

2,148,633

TUNING AND SELECTIVITY CONTROL

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Application October 21, 1937, Serial No. 170,143

7 Claims. (Cl. 250—20)

This invention relates to modulated-carrier signal receivers and particularly to receivers tunable over a band of frequencies and comprising fixed tuned means for tuning the receiver to any of a plurality of predetermined preferred stations.

In certain receivers, tunable over a given frequency band, it is desirable to incorporate in the receiver a number of fixed tuned means which can be selectively switched into the receiver circuit for the reception of any of a number of preferred stations. Since a receiver tunable over a given frequency band can be accurately tuned for reception of any desired signal, it is generally desirable that the selectors of such receiver having a relatively narrow frequency-response characteristic to avoid interference from undesired signals. In such receivers not incorporating automatic frequency control, difficulty is encountered if fixed tuned selector circuits are switched into the receiver circuit because it is impossible to maintain the desired degree of tuning accuracy under all conditions of receiver operation. Thus, mistuning of the receiver may be due to aging of the fixed tuned circuits, drift of the oscillator frequency as the receiver warms up, or other causes.

It is an object of the present invention, therefore, to provide a receiver having an improved tuning and selectivity control system whereby the selectivity of the receiver is adjusted in accordance with the susceptibility of the receiver to tuning misadjustments.

It is a further object of the invention to provide a tunable receiver including an arrangement for selecting any of a number of preset tuning means and for simultaneously conditioning the receiver for the optimum selectivity for each particular station being received.

In accordance with the present invention, a modulated-carrier signal receiver comprises, in addition to conventional tuning means, a plurality of preset tuning means and means for selectively including any of the preset tuning means to tune the receiver to any of a number of preferred signals. The receiver also includes a band-pass selector for translating the desired signals, means for adjusting the selectivity of the band-pass selector, and means for simultaneously actuating the selecting means for the preset tuning means and the selectivity-adjusting means, thereby to adjust the selectivity of the receiver in accordance with the susceptibility of the receiver to tuning misadjustments. In a preferred embodiment of the invention, the receiver is of the superheterodyne type and the means for tuning the receiver is included in both the radio-frequency selector and in the frequency changer for changing the carrier frequency of a selected signal to a substantially fixed predetermined or intermediate frequency, while the adjustable band-pass selector is arranged to translate the signal at the intermediate carrier frequency.

For a better understanding of the invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

The single figure of the drawing is a circuit diagram, partly schematic, of a complete superheterodyne receiver embodying the invention.

Referring more particularly to the drawing, there is shown schematically a superheterodyne receiver including a tunable radio-frequency selector comprising an inductance 10 and a condenser 11, the inductance 10 being mutually coupled to an inductance 12 in an antenna-ground circuit. There is provided a switch 13 which, when in the position shown, couples selector 10, 11 to the input circuit of a frequency changer or oscillator-modulator 14. Oscillator-modulator 14 is provided with a tunable oscillation circuit 15, 16 coupled to the oscillator input of tube 14 by means of a switch 17, when in the position shown. An inductance 18 in the oscillator-anode circuit of tube 14 is inductively coupled to inductance 16 to provide a feed-back circuit for the oscillation circuit 15, 16 in a conventional manner. A uni-control mechanism represented by the dotted line U is provided for condensers 11 and 15. Coupled to the output circuit of oscillator-modulator 14, in cascade, are a band-pass selector 19, an intermediate-frequency amplifier 21 of any desired number of stages, a detector and automatic amplification control or A. V. C. supply 22, audio-frequency amplifier 23, and sound reproducer 24. The A. V. C. supply 22 is connected by way of a lead 22' to the signal-input grid of oscillator-modulator 14 and to the grids of one or more of the vacuum tubes of intermediate-frequency amplifier 21. It will be understood that the several parts of the system illustrated schematically may be conventional in their construction and operation, the details of which are well known in the art, rendering description thereof unnecessary herein.

Neglecting for the moment the particular operation of the selectivity control means embodying the present invention, the above-described

system includes the features of a conventional superheterodyne receiver; the operation of such receiver being well knowr in the art, a detailed explanation thereof is deemed unnecessary. In brief, however, a desired modulated-carrier signal intercepted by the antenna circuit including inductance 12 is selected in radio-frequency selector 10, 11 and converted by frequency changer 14 to an intermediate-frequency signal. The intermediate-frequency signal is selected and amplified by selector 19 and intermediate-frequency amplifier 21, and translated therefrom to the detector and A. V. C. supply 22 wherein the audio frequencies of modulation and automatic amplification control potentials are derived. The audio frequencies of modulation are further amplified in amplifier 23 and delivered to sound reproducer 24 for reproduction in the usual manner. Biasing potentials developed by the A. V. C. supply 22 in a well-understood manner are applied to the several tubes in the preceding portions of the receiver by way of conductor 22' and are effective to control the amplification in such tubes, thereby to maintain the amplitude of the signal input to the detector within a relatively narrow range or substantially constant for a wide range of received signal amplitudes.

Referring now more particularly to the parts of the system comprising the present invention, the inductance 16 of the radio-frequency selector may be selectively tuned to any of a number of predetermined preferred signals by means of condensers 25, 26, and 27 which may be selectively connected in the selector circuit by the operation of switch 13 to the appropriate position. For tuning the frequency-determining circuit of the oscillator to a frequency corresponding to reception of the predetermined signals, the inductance 16 is tunable by fixed condensers 31, 32, and 33 which may be selectively connected in the frequency-determining circuit of modulator 14 by the operation of switch 17 to its appropriate position.

Band-pass selector 19 in the intermediate-frequency channel of the receiver comprises a primary circuit consisting of condenser 39 and an inductance 37 and inductively coupled to a secondary circuit consisting of a condenser 40 and an inductance 38, each circuit being tuned to the intermediate frequency. In order that the coupling between the circuits 37, 39 and 38, 40 may be increased when the receiver is conditioned to operate with any of the preset tuning condensers, there is provided an auxiliary inductance 41, inductively coupled to inductance 37. Inductance 41 may be included in the tuned circuit 38, 40 by operation of switch 20 from the position shown to any of its other positions. Switches 13, 17, and 20 are provided with a unicontrol means represented by the dotted line 45.

In considering the operation of the feature of the receiver described above, it will be seen that, with the switches 13, 17, and 20 in the positions shown, the receiver can be tuned over a band of frequencies by means of unicontrolled condensers 11 and 15. With the switch 20 in this position, the coupling between the circuits 37, 39 and 38, 40 is solely that between inductances 37, 38 which is so proportioned that the selector 19 provides a relatively narrow frequency response. By means of unicontrol mechanism 45, switches 13, 17, and 20 can be operated to their successive positions, thereby disconnecting condensers 11 and 15 from the receiver circuit and substituting therefor any desired ones of the fixed tuned condensers 25, 26, 27 and 31, 32, 33, respectively, to condition the receiver for the reception of any particular predetermined signal. As the switch 20 is simultaneously operated to its successive positions, the inductance 41 is included in the secondary circuit 38, 40 and the coupling between the tuned circuits 37, 39 and 38, 40 is correspondingly increased, thereby to provide a selector circuit which has a materially broader frequency-response characteristic effective to compensate for amounts of mistuning which may be ordinarily encountered. While the switch 20 is effective to change the coupling between tuned circuits 37, 39 and 38, 40 to the same extent, in each of its positions other than that shown, it will be understood that the invention is not so limited, and that a separate auxiliary coil corresponding to inductance 41 may be provided for each of the switch positions or that the switch 20 may alter the coupling between circuits 37, 39 and 38, 40 in any other well-known manner.

While there has been described what is at present considered to be the preferred embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A modulated-carrier signal receiver comprising a first means for tuning the receiver over a predetermined band of frequencies, fixed tuned means for tuning the receiver to a predetermined frequency, means for selectively including said first tuning means or said fixed tuned means in the receiver circuit, a band-pass selector, and means for overcoming undesirable effects of mistuning of the receiver when tuned by said fixed tuned means comprising means for adjusting the band-pass characteristics of said selector and uni-control means for actuating said selecting means and said band-pass adjusting means.

2. A modulated-carrier signal receiver comprising a first means for tuning the receiver over a predetermined band of frequencies, a plurality of fixed tuned means for tuning the receiver to any of a plurality of predetermined frequencies, means for selectiveiy including said first or one of said fixed tuned means in the receiver circuit, a band-pass selector, and means for overcoming undesirable effects of mistuning of the receiver when tuned by one of said fixed tuned means comprising means for adjusting the band-pass characteristics of said selector and unicontrol means for actuating in a predetermined relation said selecting means and said band-pass adjusting means.

3. A modulated-carrier signal receiver comprising a first means for tuning the receiver over a predetermined band of frequencies, a plurality of fixed tuned means for tuning the receiver to any of a plurality of predetermined frequencies, means for selectively including said first or any of said fixed tuned means in the receiver circuit, a band-pass selector, and means for overcoming undesirable effects of mistuning of the receiver when tuned by one of said fixed tuned means comprising means for adjusting the band-pass characteristics of said selector in steps and uni-control means for actuating in a predetermined relation said selecting means and said band-pass adjusting means.

4. A modulated-carrier signal receiver comprising means for tuning the receiver over a prede-

termined band of frequencies, fixed tuned means for tuning the receiver to a predetermined frequency, means for selectively including said tuning means or said fixed tuned means in the receiver circuit, a signal-translating channel having band-pass characteristics, and means for overcoming undesirable effects of mistuning of the receiver when tuned by said fixed tuned means comprising means for adjusting the band-pass characteristics of said channel and unicontrol means for actuating said selecting means and said band-pass adjusting means.

5. In a modulated-carrier signal receiver of the superheterodyne type comprising an intermediate-frequency channel having band-pass characteristics, a first means for tuning the receiver over a predetermined band of frequencies, a fixed tuned means for tuning the receiver to a predetermined frequency, means for selectively including said first tuning means or said fixed tuned means in the receiver circuit, and means for overcoming undesirable effects of mistuning of the receiver when tuned by said fixed tuned means comprising means for adjusting the band-pass characteristics of said channel and unicontrol means for actuating said selecting means and said band-pass adjusting means.

6. A modulated-carrier signal receiver comprising means for tuning the receiver over a predetermined band of frequencies, fixed tuned means for tuning the receiver to a predetermined frequency, means for selectively including said first tuning means or said fixed tuned means in the receiver circuit, a band-pass selector, and means for overcoming undesirable effects of mistuning of the receiver when tuned by said fixed tuned means comprising means for adjusting the band-pass characteristics of said selector, said selector having a minimum band width substantially less than the band width of said fixed tuned means, and unicontrol means for actuating said selecting means and said band-pass adjusting means.

7. In a modulated-carrier signal receiver of the superheterodyne type comprising an intermediate-frequency channel, a first means for tuning the receiver over a predetermined band of frequencies, a fixed tuned means for tuning the receiver to a predetermined frequency, means for selectively including said tuning means or said fixed tuned means in the receiver circuit, a band-pass selector included in said channel, and means for overcoming undesirable effects of mistuning of the receiver when tuned by said fixed tuned means comprising means for adjusting the band-pass characteristics of said selector, the minimum band width of said selector being less than that of said fixed tuned means, and unicontrol means for actuating said selecting means and said band-pass adjusting means.

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