

Jan. 9, 1940.

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2,186,455

SOUND AND TELEVISION RECEIVING SYSTEM

Filed Oct. 24, 1936

2 Sheets-Sheet 2

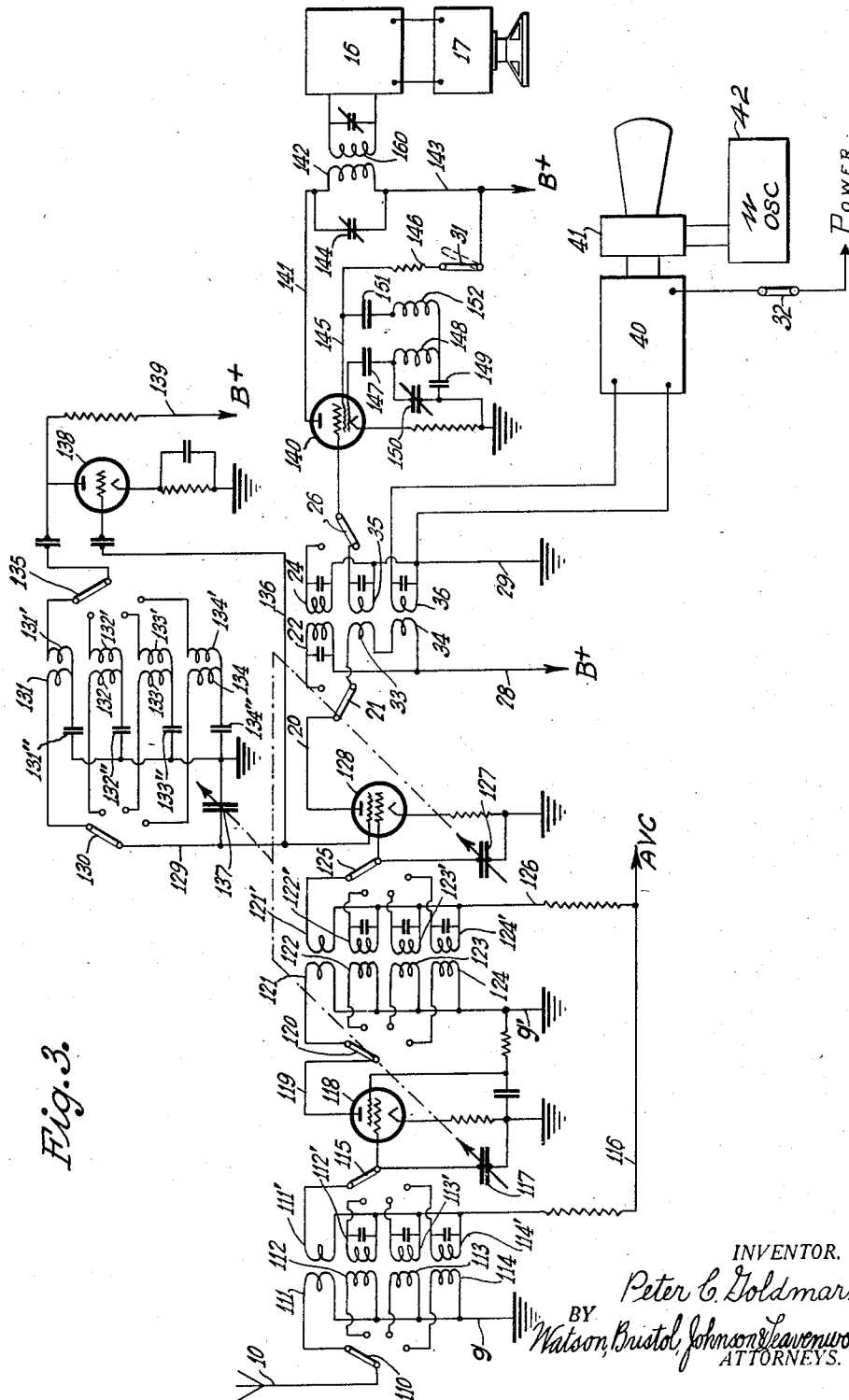


Fig. 3.

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UNITED STATES PATENT OFFICE

2,186,455

SOUND AND TELEVISION RECEIVING
SYSTEM

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Application October 24, 1936, Serial No. 107,345

12 Claims. (Cl. 178—5.8)

This invention relates to radio receiving systems adapted to receive both ultra short waves and ordinary broadcast waves, and particularly to a radio receiving system adapted for the reception of combined sound and television signals as well as ordinary broadcast sound signals.

The invention has for its object generally an improved construction and arrangement of parts whereby a relatively small number of the same coupled stages may be used, either for the reception of ultra short waves, or of ordinary broadcast waves with a high degree of fidelity and efficiency.

More specifically, an object of the invention is to provide a system of coupled stages for amplifying, heterodyning and detecting either ultra short waves, that may carry combined sound and television signals, or an ordinary broadcast wave, that may carry sound alone, in a manner which is both sensitive and selective.

Another object of the invention is to provide an arrangement of coupled stages that may be used in cascade for a plurality of intermediate frequencies resulting from the heterodyning of radio frequencies both in ultra short wave region and in the ordinary broadcast region.

Another object is to provide an arrangement of cascaded heterodyning stages for operating on received radio signals of frequencies from widely different bands, one of which heterodyning stages may have its heterodyning frequency discontinued when the received frequency is of a predetermined low value.

Another object is to provide an improved coupling for heterodyning stages in cascade in a manner such that there are parts specifically adapted to pass intermediate frequencies of high and low values.

Still another object is to provide an arrangement employing a cascaded pair of heterodyning stages adapted to produce intermediate frequencies of high and low values together with means for discontinuing the heterodyning frequency in one of the stages when the low valued intermediate frequency is produced in the other.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements and arrangement of parts, which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had

to the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a view, mainly diagrammatic, showing a radio receiving system for receiving both ultra short waves and ordinary broadcast waves, in accordance with the invention;

Fig. 2 is a similar view showing a modified form of the invention shown in Fig. 1, adapted for the reception of either combined sound and television signals or of ordinary broadcast sound signals; and

Fig. 3 is a diagrammatic wiring diagram showing an arrangement of stages for carrying into effect the selective reception of either combined sound and television signals or ordinary broadcast sound signals, the latter including a plurality of bands so as to achieve so-called "all-wave reception."

When receiving radio signals over relatively wide bands, or in bands with closely located stations, and a high degree of selectivity and sensitivity is desired, it is now quite general practice to heterodyne or beat the incoming signal with a locally generated oscillation in order to obtain a signal having a beat or intermediate frequency that is relatively free of interference and may be readily amplified to the desired volume. In the case of relatively high frequency incoming signals, for example, those utilized in television broadcasts, it is desirable to employ a relatively high intermediate frequency in order to obtain sufficient separation of the so-called "image frequency" to enable it to be filtered out successfully. For incoming signals on somewhat lower carrier frequencies, for example, those used in ordinary sole-sound broadcasts, a lower intermediate frequency is desirable since more efficient amplification, employing fewer stages, can be obtained at lower intermediate frequencies. Also, the higher the intermediate frequency, the less selective the receiver becomes. The image frequency can still be satisfactorily eliminated despite the employment of the relatively low intermediate frequency due to the lower frequencies of the received signals.

In the systems of the present invention, the advantages of a high intermediate frequency for high frequency incoming signals, for example, those used in television, may be secured; and also the advantages of a relatively low intermediate frequency for broadcasts on lower frequency carriers can be obtained.

In accordance with the practice of the present invention, two heterodyning stages are provided

in cascade so as to operate in succession on any high valued incoming signal frequency in order to give a final desired low valued intermediate frequency. When receiving a low-valued incoming frequency, however, the stages operate as a heterodyning stage in cascade with an amplifier, a low valued intermediate frequency being produced in the first heterodyning stage. The two heterodyning stages for this purpose have a special coupling arranged to pass high and low valued intermediate frequencies in separate paths respectively, whereby close coupling and high efficiency may be obtained. When a low valued incoming frequency is received, the heterodyning in the first of these stages gives the low valued intermediate frequency. In such case the heterodyning action of the second heterodyning stage is discontinued, so that amplification alone takes place. Thus the second heterodyning-detector stage is utilized as an amplifier even though it is no longer necessary for heterodyne-detection, thus securing additional sensitivity for sole-sound broadcasts, where distance reception is desirable. The control of the two paths is achieved by a special switching arrangement which is also coordinated with the oscillating circuit of the second heterodyning stage so as to discontinue the heterodyning frequency when the path passing the low valued intermediate frequency is selected. Thus, for example, if a low valued incoming signal frequency is being received and the first heterodyning stage gives an intermediate frequency of 456 kc., then the second heterodyning stage would not apply any heterodyning frequency but would merely amplify and pass on the intermediate frequency of 456 kc.

Referring now to the drawings and more particularly to Fig. 1, 10 denotes an antenna designed to pick up radio signal energy and to supply the same to a suitable radio frequency amplifier 11, which may comprise one or more stages, as may be desired. The amplified radio frequency is fed into the mixer 12 of the first heterodyning stage which has an associated oscillator indicated at 13. The resulting frequency from the first heterodyning stage is passed to a second stage having a mixer 14 and an oscillator 15. From thence the intermediate frequency is passed to output stages which may comprise a detecting stage 16 and amplifying and reproducing stages 17. The oscillator 13 is shown as having a pair of oscillation circuits 18 and 18' which are selectively put into operation by means of a selector switch 19. The radio frequency amplifier 11 and the oscillator 13 may be tunable, as shown for example in Fig. 3, so as to select desired signals within the bands for which the receiver is designed.

The coupling for the cascaded heterodyning stages is shown as comprising a circuit having a conductor 20, leading from the output of the stage 12 with a switch 21 in series that may be moved selectively across the terminals of coupling coils 22 and 23 which are designed respectively to pass low valued and high valued intermediate frequencies. The coil 22 is in inductive association with another coil 24 while the coil 23 is in similar inductive association with a coil 25. Coils 24 and 25 have terminals which are selectively engaged by a switch 26 that is in series with the conductor 27 leading to the input of the second mixer. The other terminals of the coils 22 and 23 have a common conductor 28 leading to a plus pole of the B-supply, while coils 24

and 25 similarly have a common conductor 29 that leads to ground.

The second oscillator 15 applies a heterodyning frequency of constant value. To this end, the oscillator has a fixed tuned oscillating circuit comprising suitable elements of inductance and capacitance, shown generally at 30, together with a control switch 31 which when closed causes the oscillator to function but when open causes the discontinuance of the oscillations.

To understand the mode of operation of this form of invention, let it be assumed that an ultra short wave signal on a carrier of 50 mc. is being received by the antenna 10 and amplified at 11. Then, if it be assumed that when switch 19 puts circuit 18' into operation, a heterodyning frequency of 53 mc. is generated, this then gives an intermediate frequency of 3 mc. as output. If now switches 21 and 26 are moved to the terminals of coupled coils 23—25 and switch 31 closed, this high valued intermediate frequency is fed into the second mixer by way of coils 23—25. If now the second oscillator generates a heterodyning frequency of 3456 kc., then a second intermediate frequency of 456 kc. will be fed into the detecting stage 16, the output from which may be reproduced as desired.

If again it be assumed that the radio frequency amplifier 11 is picking up an ordinary broadcast signal on a frequency of 1200 kc., the oscillator 13 is changed over by means of switch 19 to circuit 18 so as to deliver a different heterodyning frequency, for example, 1656 kc., switches 21, 26 and 31 being now changed to the full-line positions shown in Fig. 1. An intermediate frequency of 456 kc. is then had from the stage 12 which is fed by way of the coupled coils 22—24 into the second mixer. Since switch 31 is now open, no heterodyning frequency is impressed and this signal is merely amplified and passed on to the detector 16. By this arrangement, it is seen that the coupled stages are in service at all times, even when receiving signals from the widely different bands, as taken in the above examples.

In Fig. 2 is shown an arrangement in which stages are provided for reproducing both sound and vision signals. Here, means are provided between the heterodyning stages for separating sound and vision signals, whereby when receiving an ordinary broadcast band the sound signals may be reproduced alone, or if receiving an ultra short wave, the sound and vision signals thereafter traverse separate paths; the sound path being common to that of the ordinary sole-sound broadcast signals. The radio frequency amplifying stages are here shown at 11, and the first heterodyning stage with mixer at 12. The second mixer is shown at 14 and has coupled sound detecting and amplifying stages 16 and 17. An IF amplifier for the vision signal is shown at 40. This vision IF amplifier feeds into an output stage 41. Output stage 41 may include the customary detector to obtain the vision signals, and a suitable amplifier if desired. The stage 41 also may have an associated saw-toothed oscillator 42 for actuating and synchronizing the scansion where a cathode ray tube is employed.

Here, the coupling for low frequency signals comprises associated coils 22—24, as in Fig. 1; for high frequency signals associated windings 33 and 34 are provided, which are in series between the other terminal of switch 21 and the conductor 28. Inductively associated with winding 33 is a winding 35 which is connected be-

tween the other terminal of switch 28 and the conductor 29. Also there is a winding 36 inductively associated with the winding 34 that is grounded on one side and connected across the vision IF amplifier 40. By this arrangement, the ordinary broadcast signals are passed by way of the coupling coils 22—24 into the second mixer which operates as a simple amplifier. If, on the other hand, the switches are moved to put the coupled coils 33—35 and 34—36 in service, then both heterodyning stages 12 and 14 are adapted to operate in succession when an ultra short wave signal is received, and the sound and vision components are separated and separately amplified and reproduced.

In operation, let it be assumed that combined television and sound signals are being picked up by the antenna 10 and that the vision signal is on a carrier of 50 mc. and that the associated sound signal is on a carrier of 52 mc. Switch 19 will be moved to circuit 18' to have the oscillator produce a high valued heterodyning frequency of, for example, 55 mc.; switch 21, being in contact with the terminal of coil 33, intermediate frequencies of 5 mc. carrying the vision signal and 3 mc. carrying the sound signal will then be fed to the coupling coils. By tuning these couplers, coils 33—35 may be made to pass the 3 mc. signals to the mixer 14, while the 5 mc. signals are passed into the vision IF amplifier 40. If now switch 31 puts oscillator 15 in service, its heterodyning frequency will deliver, for example, 3456 kc. Hence, a second intermediate frequency will be fed from the second heterodyning stage at 456 kc. into the detector 16. When low frequency signal energy is being picked up, the sound reproducing stages operate as described in connection with Fig. 1. The radio frequency amplifier 11 and the oscillator 13 may be tunable, as shown for example in Fig. 3, so as to select desired signals within the bands for which the receiver is designed.

In Fig. 3, a detailed wiring diagram is shown, having a specific arrangement of stages and windings for picking up and reproducing signal energy from a plurality of bands including a sound-television band. Here, each stage and the interstage coupling comprise parts coordinated so that they may be simultaneously changed over and receive any desired signal in a particular band in a manner which is both sensitive and selective. Here, the antenna 10 has in series with it a selecting switch 110 adapted to make contact with the respective terminals of a plurality of coils here shown, by way of example, as four sets of coils which have a common connection to ground at *g*. These four coils are shown as windings 111, 112, 113, and 114, and have corresponding inductively associated windings 111', 112', 113', and 114'. These latter have terminals that are selectively contacted by the blade of a switch 115, the other side of these coils having a common conductor 116 leading through suitable impedance to an automatic volume control or other source of potential. These coils have a variable tuning condenser 117 that is connected between the switch 115 and ground, the switch being connected to the control element or grid of an amplifying tube 118. From the plate element of tube 118 a conductor 119 leads to a selecting switch 120 of the mixer 12. This stage has coils arranged as counterparts of those in the radio frequency amplifying stage in order similarly to pass signals from the several bands that may be picked up. Accordingly, switch 120 is shown as

arranged to contact one terminal of each of coils or windings 121, 122, 123, and 124 that have a common ground connection *g'*. The inductively associated component windings are shown at 121', 122', 123', and 124', one terminal of each of the latter being contacted by means of a switch 125, the other terminal having a common connection 126 leading to the automatic volume control. These coils are similarly tuned by means of a variable condenser 127 that is connected between the switch 125 and ground. The switch in turn is connected to the control element or grid of a tube 128 which is preferably of the multi-control electrode type; an extra grid being here shown as connected by conductor 129 to a switch 130. This latter is arranged selectively to contact terminals of sections of inductance associated with the oscillator 13. These sections of inductance comprise windings 131, 132, 133, and 134, there being corresponding inductively associated windings 131', 132', 133', and 134'. Windings 131 and 131' have a common connection through a condenser 131'' to ground, there being condensers 132'', 133'', and 134'', similarly connected for each of the other sets of windings. The windings 131', 132', etc., are selectively connected by means of a switch 135 with a plate element of the tube 138, the grid element being similarly connected by a conductor 136 to the conductor 129. A tuning condenser 137 for the oscillator is connected between ground and the conductor 129. For convenience in tuning, the condensers 117, 127, and 137 are preferably ganged together so as to be moved simultaneously. The plate element of tube 138 is also preferably connected by means of a conductor 139 with a pole of the B-supply or other source of potential.

The conductor 20 is shown in this figure as leading from the plate element of tube 128 to the switch 21, this switch being movable alternately to the terminals associated with the coupled coils 22—24 or with coils 33—35 and 34—36, coils 33 and 34 being in series. Switch 26, which swings across the terminals associated with windings 24 and 35, is connected to a control grid of the tube 140 of the second heterodyning stage which is also preferably of the multi-control electrode type and adapted to serve as a combined oscillator and amplifier and is arranged to employ so-called "electron coupling." By such an arrangement the single tube serves both as oscillator and amplifier; hence there are no tubes of the system out of service when the stage operates solely as an amplifier. From the plate element of tube 140 a conductor 141 leads to one terminal of the coupling inductance 142, the other terminal of which is connected by way of conductor 143 to the B-supply or other source of potential. Shunted across the terminals of inductance 142 is a condenser 144 for tuning purposes.

Where the tube 140 is of the pentagrid converter variety, there is connected to one of the oscillator plate grids a conductor 145 which has in series a resistance 146 and the switch 31, the whole being interposed between such grid and the conductor 143. Between a second oscillator-grid and a point leading to ground is connected a condenser 147, an inductance 148 and a second condenser 149, all in series, the inductance 148 and condenser 149 being preferably shunted by means of a trimming condenser 150 employed for tuning purposes. This condenser is only variable over small limits; the stage being a fixed oscillator. Between conductor 145 and condenser 149 are connected another condenser 151 and in-

ductance 152 in series; the latter inductance being inductively associated with inductance 148.

Inductively associated with the winding 142 is a winding 160 in order that this heterodyning and IF stage may be coupled to the subsequent IF detecting and amplifying stages, here shown as in Fig. 2, and denoted 16 and 17, respectively. To the coil 36 there is also shown coupled and IF amplifying stage 40. The output of this stage passes into a suitable detecting and output stage 41, with which a suitable saw tooth oscillator 42 may be associated, as in Fig. 2.

In the arrangement shown in Fig. 3, it is not only desirable to gang together the condensers 117, 127, and 137 for simultaneous operation, but it is also desirable to gang together the switches 110, 115, 120, 125, 130, and 135 for simultaneous operation and to have switches 21, 26, 31, and 32 ganged together and connected to the switches 110, 115, 120, 125, 130, and 135 with a mechanical lost-motion connection of a character such that when switch 110 is moved to engage the terminal of coil 111, then switches of the group 21, 26, 31 will move into engagement with the terminals of coils 33—34, 35—36 and of connection 146 and connection 147, but when switch 110 is moved to engage with any of the other terminals of its set, switches 21, 26, 31, and 32 are moved into their alternate positions and remain there; switch 31 discontinuing the heterodyning frequency for such positions and switch 32 discontinuing the power for the vision part of the receiver. Any suitable mechanical connection that effects such movements may be employed, and since such are known, the showing of the same is omitted from the drawings in the interests of clearness of illustration but is assumed to be present in the description of the operation given below.

In operation, let it be assumed that coupled coils 111—111' and 121—121' pass the band of ultra short waves, for example, the band from 30 to 100 mc.; that coils 112—112' and 122—122' pass a band of ordinary broadcast waves, for example, the band from 10 to 30 mc.; that coils 113—113' and 123—123' pass an adjacent band of ordinary broadcast waves, for example, the band from 1.5 to 10 mc.; and that coils 114—114' and 124—124' pass another adjacent band of ordinary broadcast waves, for example, the band from 540 kc. to 1.5 mc.

Then, when switch 110 is moved to the full-line position shown in the drawings, coils 111—111', 121—121' are in service, also coils 131—131' and coils 33—35 and 34—36. The oscillating circuits associated with tube 140 will also be operating by reason of the closed position of switch 31. If now the ganged condensers be tuned so as to pick up a combined sound and television signal on carriers, for example, of 50 mc. for the vision signal and 52 mc. for the sound signal, this set of signals will be passed through the top sets of coils shown and heterodyned in the tube 128 by the frequency supplied by the oscillator having tube 138. If this oscillator is made to track the sound signal at 3 mc., the locally generated frequency provided by coils 131—131' and condenser 137 is 55 mc. An intermediate frequency for sound of 3 mc. is fed into coils 33 and 34 while an intermediate frequency for vision of 5 mc. is similarly fed into these coils. By tuning these coils with capacitance elements as shown, the 3 mc. intermediate frequency may be made to pass by way of coupled coils 33—35 to the second mixer tube at 140 while the 5 mc.

intermediate frequency is passed by way of coupled coils 34—36 to the vision amplifying and reproducing stages 40 and 41.

If when switch 31 is closed the mixer 140 generates a locally generated frequency of 3456 kc., then a second intermediate frequency of 456 kc. may be led off and fed into the sound detecting and reproducing stages 16 and 17.

If now switch 110 is moved to contact with a terminal of coil 114 (or any one of coils 112, 113, 110 and 114) switches 115, 120, 125, 130, and 135 will move to similar positions; switches 21 and 26 will be moved to their alternate positions; and switch 31 will be moved to open position. The lower tracking frequency of the oscillating stage 15 having tube 138 is, of course, determined by the design and is such as to give the desired low valued intermediate frequency when receiving an ordinary broadcast sound signal. Let it be assumed, for example, that a sound signal of 810 kc. is to be picked up, then the tuning is effected by the simultaneous movement of condensers 117, 127 and 137 which when done causes the oscillator to track at a frequency giving the desired low valued intermediate frequency. In the example given, if this intermediate frequency be 456 kc., then the heterodyning frequency is 1266. This low valued intermediate frequency is, of course, passed through coupling coils 22—24 into the second mixing tube 140 which now operates as a simple amplifier since switch 31 is open; switch 32 being also open. This signal is then detected and further amplified and reproduced at 17. Of course, additional intermediate frequency amplification may be employed between the second heterodyne-detector stage and the final detector 16, as is customary in the art, in order to secure added sensitivity and volume. This may also be done in Figs. 1 and 2.

The use of a combined mixing and oscillating tube at 140 is seen to simplify the second heterodyning stage employed in accordance with the invention, since neither tuning of the oscillating nor of the receiving circuits of this stage is employed. When this stage operates as an amplifier, it receives an intermediate frequency of constant value whatever the frequency of the incoming signal, which intermediate frequency, in the example given above, is 456 kc. The received intermediate frequency is also constant in value when the stage is operating as a heterodyning stage, which, in the example given above, is 3 mc. when any ultra short wave is being received.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a radio receiving system adapted for the reception of both a band of ultra short waves and a band of ordinary broadcast waves, the combination comprising means for receiving incoming radio frequency signal energy and selecting a radio frequency from one of said bands, means including a first heterodyning stage coupled to said receiving means for converting the radio frequency into an intermediate frequency, means including a second heterodyning stage connected to receive said intermediate frequency, sound re-

producing output means coupled to said second heterodyning stage, coupling means for coupling said heterodyning stages in cascade and having portions for passing separately high valued and low valued intermediate frequencies, said high valued portion including two sets of coupling coils, only one of which is connected to said second heterodyning stage, an independent output means connected to the other of said sets of coupling coils, switch means having members for selecting a path through said coupling means, and a coordinated member associated with said second heterodyning stage for discontinuing the heterodyning frequency when a low valued intermediate frequency is being passed.

2. In a radio receiving system adapted for the reception of both a band of ultra short waves and a band of ordinary broadcast waves, the combination comprising means for receiving incoming radio frequency signal energy and selecting and amplifying a radio frequency from one of said bands, means including a first heterodyning stage coupled to said receiving means for converting the radio frequency into an intermediate frequency, means including a second heterodyning stage connected to receive said intermediate frequency, sound reproducing output means coupled to said second heterodyning stage, coupling means for coupling said heterodyning stages in cascade and having portions for passing separately relatively high valued and relatively low valued intermediate frequencies, said high valued portion including two sets of coupling coils, only one of which is connected to said second heterodyning stage, an independent output means connected to the other of said sets of coupling coils, switching means arranged for selecting a path through said coupling means, and a second switching means associated with said second heterodyning stage connected with said first-named switch members so that the heterodyning frequency is discontinued when a low valued intermediate frequency is being passed.

3. In a radio receiving system adapted for the reception of ultra short waves that carry associated sound and television signals and ordinary broadcast waves that carry sound signals alone, the combination comprising a radio frequency amplifying stage having input and output coupling coils adapted for the passage of signals within a band of ultra short waves and a plurality of sets of input and output coils adapted for the passage of signals within a plurality of ordinary broadcast bands, a first heterodyning stage having a plurality of sets of coupling coils associated with said first-named coupling coils arranged to convert ultra short waves carrying sound and television signals into high valued intermediate frequencies and ordinary broadcast waves into a common low valued intermediate frequency, a second heterodyning stage having associated sound amplifying and reproducing means coupled to receive its output, vision stages having vision amplifying and reproducing stages, coupling means interposed between said heterodyning and vision stages in a manner such that said second heterodyning stage and said vision stages are each cascaded upon said first heterodyning stage, said coupling means being provided with portions for the passage of said high valued and low valued intermediate frequencies respectively, said high valued portion only including a coupling to said vision stages, means for simultaneously tuning said radio frequency amplifying stage and said first heterodyning stage, and

switch means for selecting a path through said coupling means.

4. In a radio receiving system adapted for the reception of ultra short waves that carry associated sound and television signals and ordinary sound broadcast waves that carry sound signals alone, the combination comprising a radio frequency amplifying stage having input and output coupling coils adapted for the passage of signals within a band of ultra short waves and a plurality of sets of input and output coils adapted for the passage of signals within a plurality of ordinary broadcast bands, a first heterodyning stage having a plurality of sets of coupling coils associated with said output coupling coils arranged to convert associated sound-television signals on ultra short waves into high valued intermediate frequencies and ordinary sound broadcast waves into a common low valued intermediate frequency, a second heterodyning stage having associated sound amplifying and reproducing means coupled to receive its output, vision stages having vision amplifying and reproducing stages, coupling means interposed between said heterodyning and vision stages in a manner such that said second heterodyning stage and said vision stages are each cascaded upon said first heterodyning stage, said coupling means being provided with portions for the passage of said high valued and low valued intermediate frequencies respectively, said high valued portion only being coupled to said vision stages, means for simultaneously tuning said radio frequency amplifying stage and said first heterodyning stage, switch means for selecting a path through said coupling means provided with a mechanical coupling with said tuning means and arranged to establish the path for the passage of the low valued intermediate frequency to the second heterodyning stage for all ordinary broadcast bands and a path for the high valued intermediate frequency for the sound-television band, and a coordinated switch associated with said second heterodyning stage for discontinuing the heterodyning frequency when the low valued intermediate frequency is being passed.

5. A radio receiver adapted to receive and reproduce signals on carriers within widely separated frequency bands comprising, in combination, a first heterodyning stage including an oscillator, said heterodyning stage being adapted to convert a signal on a relatively high frequency carrier to a relatively high-valued intermediate frequency and to convert a signal on a relatively low frequency carrier to a relatively low-valued intermediate frequency, a second heterodyning stage fed from said first heterodyning stage and including an oscillator, and detecting and reproducing stages fed from said second heterodyning stage, said second heterodyning stage being adapted to heterodyne a high-valued intermediate frequency signal supplied from said first heterodyning stage to convert it to a low-valued intermediate frequency signal for reproduction in the subsequent stages, and adapted alternatively to amplify a low-valued intermediate frequency signal supplied from said first heterodyning stage by the discontinuing of the oscillator frequency so that the low-valued intermediate frequency signal may be reproduced in the subsequent stages.

6. A radio receiver adapted to receive and reproduce signals on carriers within widely separated frequency bands comprising, in combination,

tion, a radio frequency amplifier tunable to select a signal within a desired frequency band, a first heterodyning stage fed from said radio frequency amplifier and including an oscillator, said oscillator being tunable to convert signals in a selected relatively high frequency band to a selected relatively high-valued intermediate frequency and to convert signals in a selected relatively low frequency band to a selected relatively low-valued intermediate frequency, a second heterodyning stage including an oscillator associated therewith, means for feeding said second heterodyning stage with signals from said first heterodyning stage, detecting and output stages fed from said second heterodyning stage, and means for supplying a heterodyning frequency to said second heterodyning stage from its associated oscillator when said high-valued intermediate frequency is supplied to it and for discontinuing the heterodyning frequency when said low-valued intermediate frequency is supplied to it.

7. A radio receiver adapted to receive sound broadcast signals on a carrier within a sound broadcast band and sound-television signals on a pair of associated carriers within a television broadcast band which comprises, in combination, a radio frequency amplifier tunable to either sound broadcast signals or to associated pairs of sound and television signals, a first heterodyning stage fed from said radio frequency amplifier and including an oscillator, said oscillator being tunable to convert sound broadcast signals within a sound broadcast band to a selected relatively low-valued intermediate frequency and to convert an associated pair of sound-television signals within a television broadcast band to an associated pair of relatively high-valued intermediate frequency signals, sound stages including a second heterodyning stage having an associated oscillator and detecting and sound reproducing stages, means operable to supply said sound stages with either said low-valued intermediate frequency signal or the sound component of said high-valued intermediate frequency signals, said sound stages being adapted to reproduce signals received at said low-valued intermediate frequency when the frequency produced by the last-named oscillator is discontinued and to convert the said high-valued intermediate frequency signal of the said sound component to said low-valued intermediate frequency signal for reproduction thereof when the oscillator frequency is applied to the second heterodyning stage, means for discontinuing the heterodyning frequency of said sound stages when they are supplied with said low-valued intermediate frequency signal, television stages adapted to receive and reproduce television signals, and means for supplying said television stages with the television component of the said high-valued intermediate frequency signals for reproduction thereof.

8. A radio receiver adapted to receive and reproduce signals on carriers within a plurality of frequency bands comprising, in combination, a first heterodyne-detector stage having an oscillator associated therewith, said heterodyne-detector stage being tunable to convert received signals within a relatively high frequency band to a selected relatively high-valued intermediate frequency signal and to convert received signals within a relatively low frequency band to a selected relatively low-valued intermediate frequency signal, a second heterodyne-detector stage connected to be fed with signals from said first

heterodyne-detector stage and having an oscillator of substantially fixed frequency associated therewith, detecting and output stages connected to be fed from said second heterodyne-detector stage, and means for supplying and discontinuing the oscillation frequency from the second-named oscillator to said second heterodyne-detector stage, said second heterodyne-detector stage being designed and constructed, when supplied with said oscillation frequency, to convert a high-valued intermediate frequency signal fed thereto to a low-valued intermediate frequency signal having substantially the same frequency as that of the first-mentioned relatively low-valued intermediate frequency signal for reproduction in the subsequent stages, and alternatively to amplify a low-valued intermediate frequency signal fed thereto from the first heterodyne-detector stage when the said oscillation frequency is discontinued so that the low-valued intermediate frequency signal may be reproduced in the subsequent stages.

9. A radio receiver adapted to receive sound broadcast signals on carriers within a sound broadcast band and associated sound and television signals on associated carriers within a television broadcast band which comprises, in combination, a first heterodyne-detector stage including an oscillator and adapted to receive signals at broadcast frequencies, said heterodyne-detector stage being tunable to convert a sound signal within a sound broadcast band to a relatively low-valued intermediate frequency signal and to convert an associated pair of sound and television signals within a television broadcast band to an associated pair of relatively high-valued intermediate frequency signals, sound stages including a second heterodyne-detector stage having an associated oscillator, and detecting and sound reproducing stages fed from said second heterodyne-detector stage, means for feeding said second heterodyne-detector stage with sound signals from said first heterodyne-detector stage, means for supplying and discontinuing the oscillation frequency from the second-named oscillator to said second heterodyne-detector stage, said second heterodyne-detector stage being adapted, when supplied with said oscillation frequency, to convert a high-valued intermediate frequency sound signal fed thereto to a low-valued intermediate frequency sound signal having substantially the same frequency as that of the first-mentioned relatively low-valued intermediate frequency signal for reproduction in the subsequent stages, and adapted alternatively to amplify a low-valued intermediate frequency sound signal fed thereto from the first heterodyne-detector stage when the said oscillation frequency is discontinued so that the low-valued intermediate frequency sound signal may be reproduced in the subsequent stages, television stages adapted to receive and reproduce television signals fed thereto from said first heterodyne-detector stage, and means for feeding television signals from the first heterodyne-detector stage to said television stages.

10. In a radio receiving system adapted for the reception of both a band of ultra short waves and a band of longer waves, the combination comprising means for receiving incoming radio frequency signal energy and selecting a radio frequency from one of said bands, means including a first heterodyning stage coupled to said receiving means for converting the radio frequency into an intermediate frequency, the second-named means being tunable to convert a radio frequency within

said ultra short wave band to a relatively high-valued intermediate frequency and, alternatively, to convert a radio frequency within said longer wave band to a relatively low-valued intermediate frequency, a second heterodyning stage constructed to convert a signal at said relatively high-valued intermediate frequency to said relatively low-valued intermediate frequency, detecting and output means coupled to said second heterodyning stage, coupling means interposed between said heterodyning stages for coupling them in cascade, said coupling means having a plurality of paths for passing selectively relatively high and relatively low valued intermediate frequencies from said first stage to said second stage, switch means associated with said coupling means for alternatively selecting one of said paths through said coupling means, and a coordinated member associated with said second heterodyning stage for discontinuing the heterodyning frequency when a low valued intermediate frequency is being passed, said second heterodyning stage being constructed to function as an amplifying stage when the heterodyning frequency therefor is discontinued.

11. A radio receiver adapted to receive and reproduce signals on carriers within a plurality of frequency bands comprising, in combination, a first heterodyne-detector stage having an oscillator associated therewith, said heterodyne-detector stage being tunable to convert a received signal within a relatively high frequency band to a relatively high-valued intermediate frequency and to convert a received signal within a relatively low frequency band to a relatively low-valued intermediate frequency, a second heterodyne-detector stage fed from said first heterodyne-detector stage and including an oscillator, detecting and reproducing stages fed from said second heterodyne-detector stage, means for alternatively rendering the second-named oscillator operative and inoperative, said second heterodyne-detector stage being constructed and adapted when the second-named oscillator is rendered inoperative to amplify a low-valued intermediate frequency signal supplied from said first heterodyne-detector stage for reproduction in the subsequent stages and, alternatively, to

heterodyne a high-valued intermediate frequency signal supplied from the first heterodyne-detector stage to convert it to the last-mentioned low-valued intermediate frequency for reproduction in the subsequent stages when the second-named oscillator is rendered operative.

12. A radio receiver adapted to receive sound broadcast signals on carriers within a sound broadcast band and associated sound-and-television signals on associated carriers within a television broadcast band which comprises, in combination, a first heterodyne-detector stage including an oscillator and adapted to receive signals at broadcast frequencies, said heterodyne-detector stage being tunable to convert a sound signal within a sound broadcast band to a relatively low-valued intermediate frequency signal and to convert an associated pair of sound and television signals within a television broadcast band to an associated pair of relatively high-valued intermediate frequency signals, sound stages including a second heterodyne-detector stage having an associated oscillator, detecting and sound reproducing stages fed from said second heterodyne-detector stage, means for feeding said second heterodyne-detector stage with the sound signals from said first heterodyne-detector stage, means for alternatively rendering the second-named oscillator operative and inoperative, said second heterodyne-detector stage being constructed and adapted when the second-named oscillator is rendered inoperative to amplify a low-valued intermediate frequency signal supplied from said first heterodyne-detector stage for reproduction in the subsequent stages and, alternatively, to heterodyne a high-valued intermediate frequency signal supplied from the first heterodyne-detector stage to convert it to the last-mentioned low-valued intermediate frequency for reproduction in the subsequent stages when the second-named oscillator is rendered operative, television stages adapted to receive and reproduce television signals fed thereto from said first heterodyne-detector stage, and means for feeding television signals from the first heterodyne-detector stage to said television stages.

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