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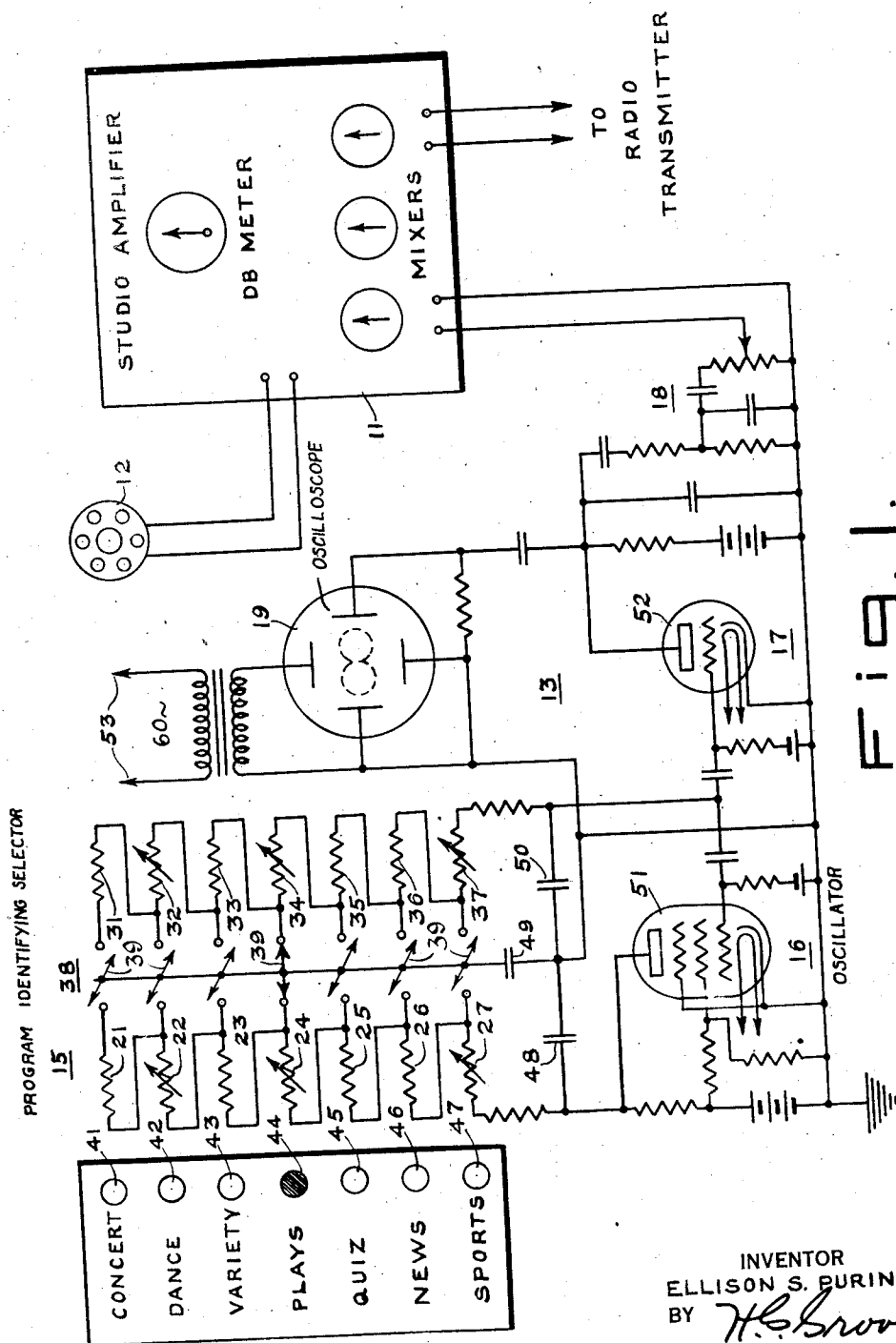
E. S. PURINGTON

2,368,778

AUTOMATIC PROGRAM SELECTOR

Filed June 16, 1942

5 Sheets-Sheet 1



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5 Sheets-Sheet 2

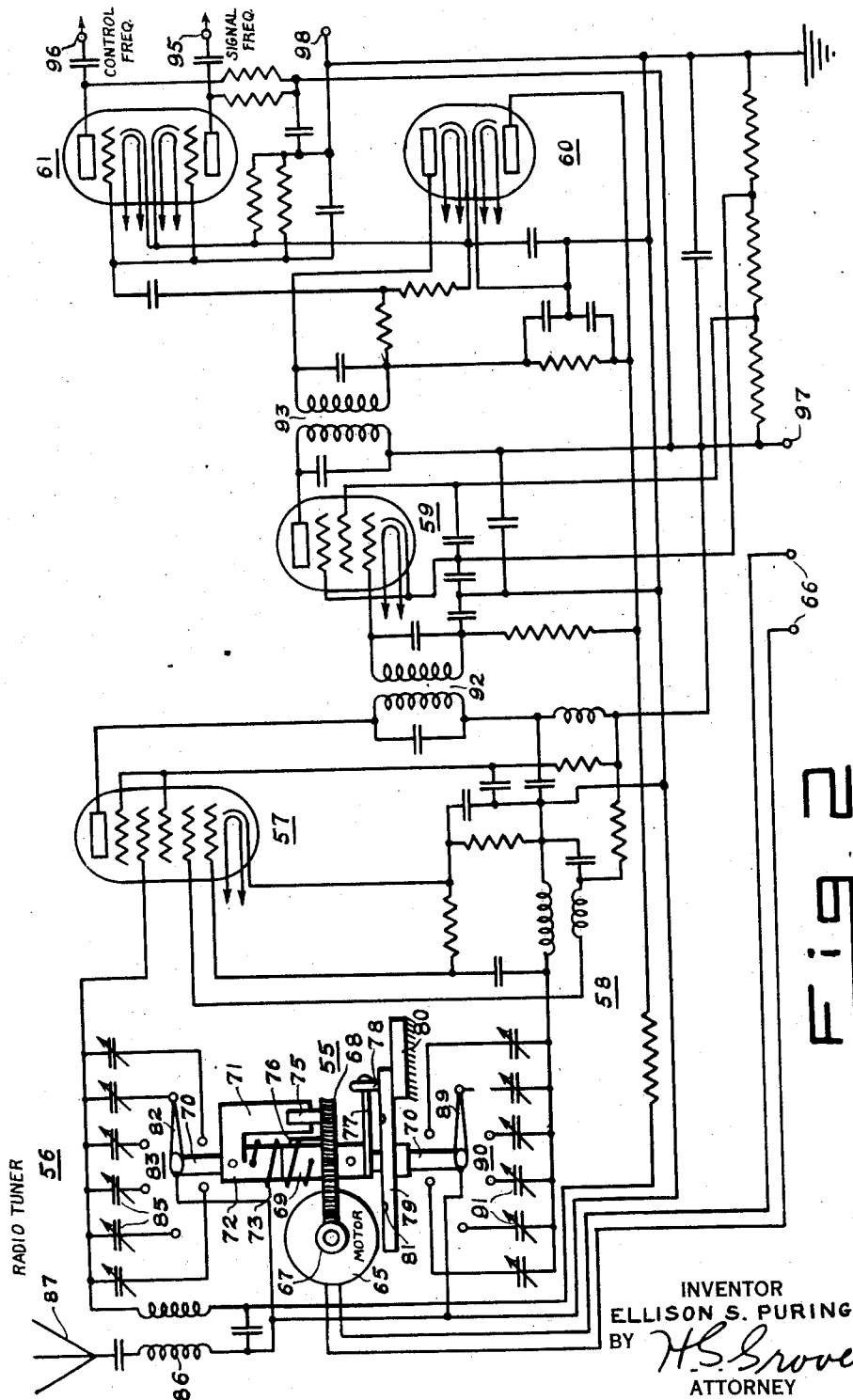


Fig. 2

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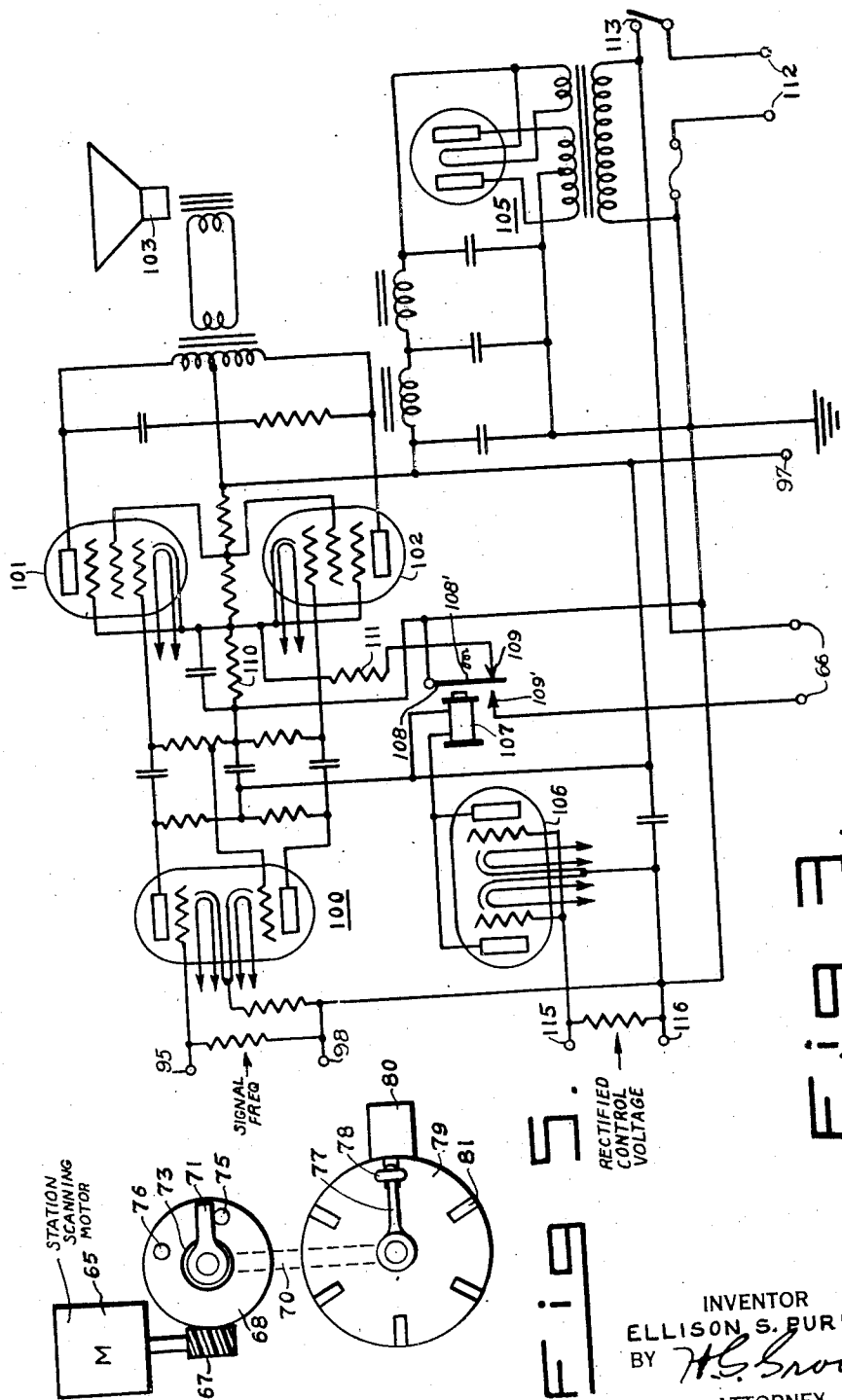


Fig. 5.

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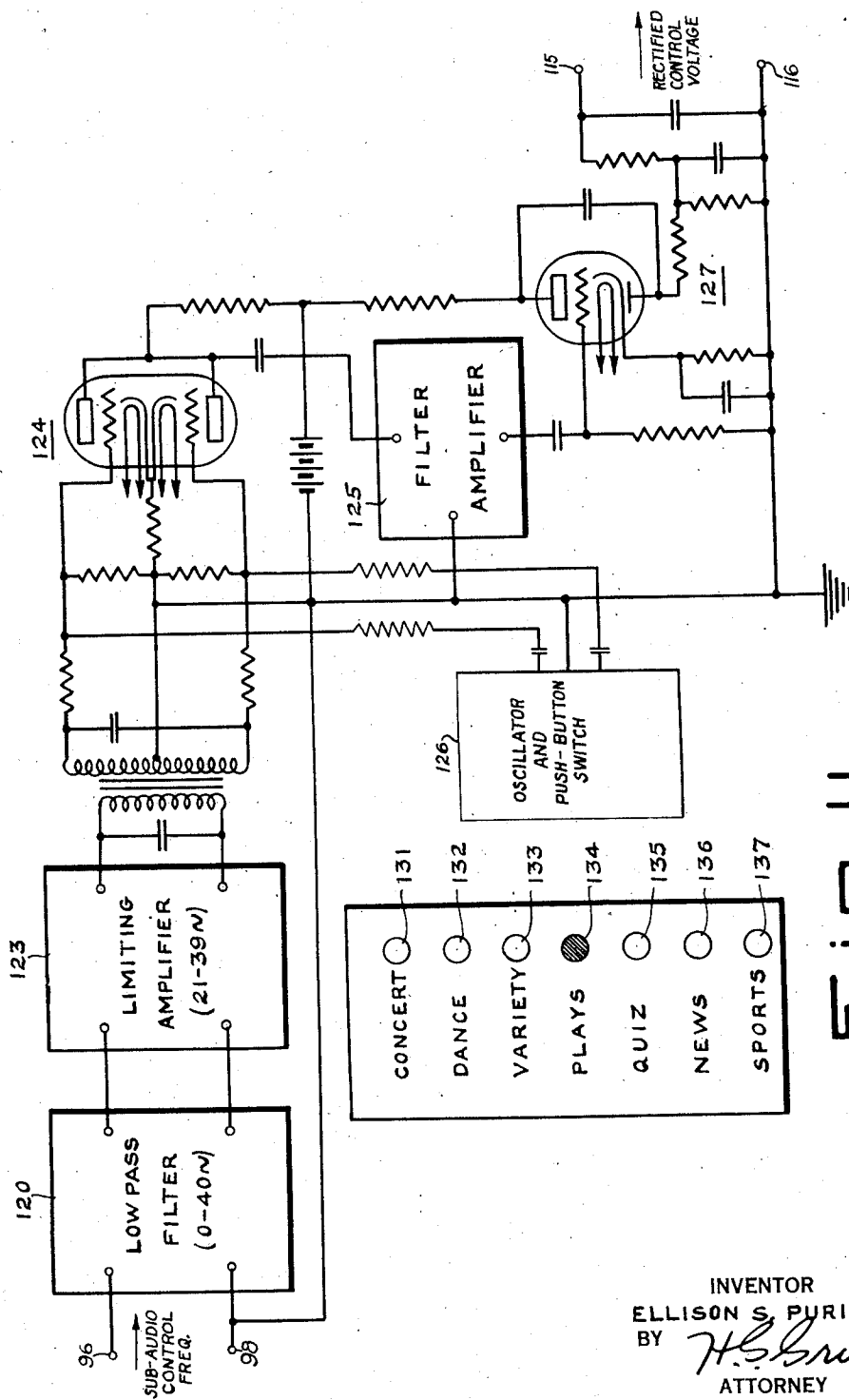
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AUTOMATIC PROGRAM SELECTOR

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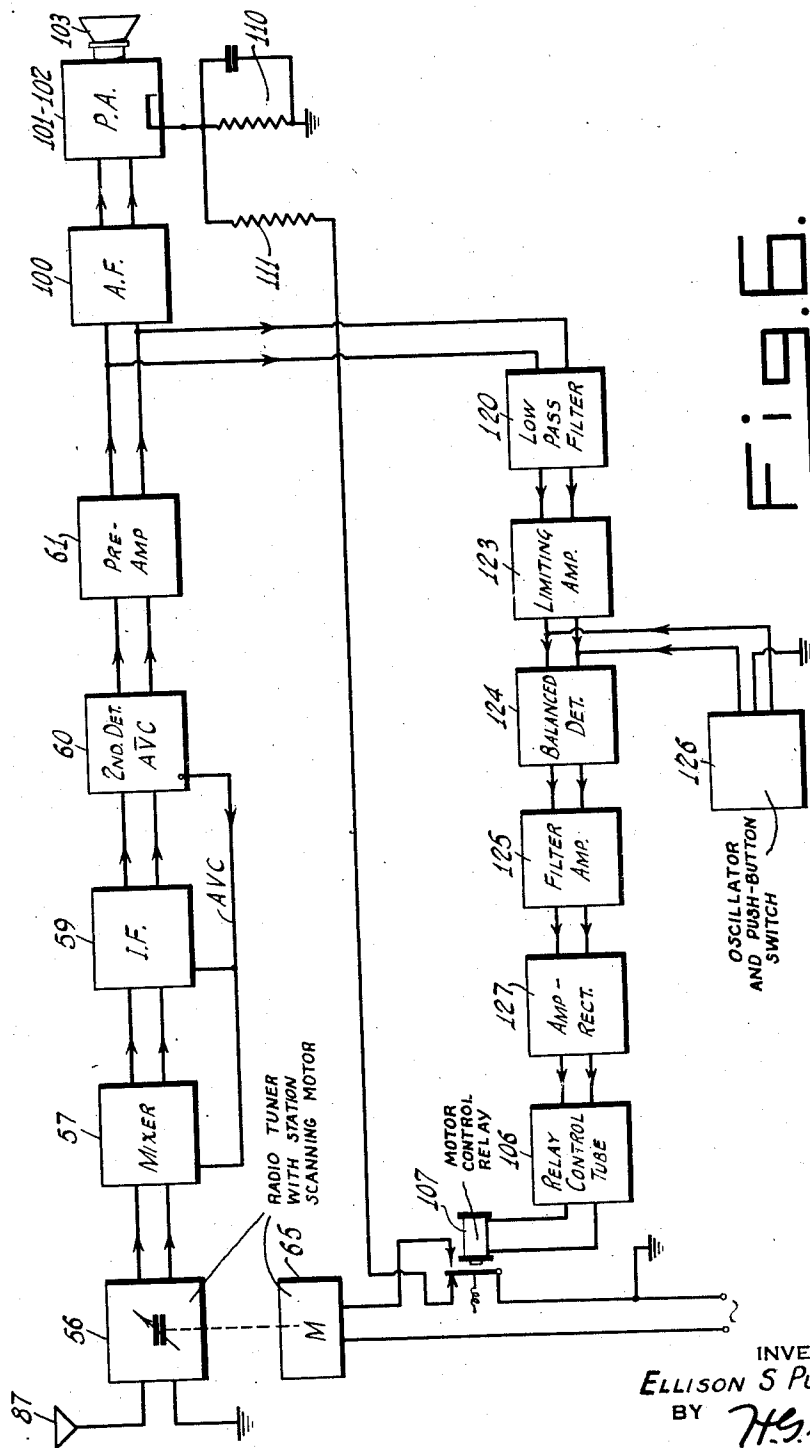
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AUTOMATIC PROGRAM SELECTOR

Filed June 16, 1942

5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,368,778

AUTOMATIC PROGRAM SELECTOR

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Application June 16, 1942, Serial No. 447,215

17 Claims. (Cl. 250—2)

This invention relates to communication systems and more particularly to a system for automatically selecting a desired type of program.

In general the invention relates to an automatic program selector used in connection with a receiver in which manually operated means are provided which condition the automatic program selector mechanism so as to be responsive to a predetermined transmitted signal indicative of the type of program to be transmitted.

The invention is an improvement over the system disclosed and claimed in Hammond Patent No. 2,052,708 which is assigned to the same assignee as this application.

In the present invention the classification of programs may be, for example, concert, dance, variety, plays, quiz, news and sports. Each of these types of programs is distinguished in the transmission by a definite sub-audible frequency. When the carrier is modulated by a concert program, it will be, for example, modulated also at a sub-audible rate of 21 cycles, for identification of the type of program by a receiver mechanism. For a dance program, the accompanying frequency would be, for example, 24 cycles, et cetera. In general the lower designating frequencies are assigned to those types of programs for which low audible frequencies are desirable.

These signals are produced by a push button type oscillator located in the studio and are injected into the studio amplifier at a suitable level, for example, in place of a high level sound source such as phonograph pickup. This signal is mixed with the program which it identifies, with the sub-audible frequency, for example, at a level of -20 to -25 db. with respect to the program.

The receiver comprises a radio tuner of the pretuned type with a rotary motor driven scanner which tunes in each station participating in succession. During operation there will be produced in the audio portion of the receiver program energy of audible frequency and possible control energy of sub-audible frequency. The program energy is fed to an audio amplifier and the possible control energy to a control circuit, which has a set of push buttons similarly marked to those at the transmitter. These set up the operating conditions of the control circuit so that its output will be energized only if the transmitter push button of the station being received is set to the same type of program as the push button of the receiver. With energization of the control circuit output a relay included therein is operated to stop the scanning motor thereby causing the motor-actuated radio tuner to be tuned to

a broadcasting station transmitting the preselected type of program.

If a particular type of program happens to be transmitted by more than one broadcasting station at a given time, the station first to be received by the tuner during its scanning operation will be the one to which the receiver will be tuned. In other words, if the operating carrier frequency of two stations transmitting the same type of program are 770 and 880 kilocycles and the previous setting of the tuner happened to be at, say, 660 kc., then the station operating at 770 kc. will be the one to be tuned in, assuming that the tuning range of the receiver is scanned in the direction of higher frequencies. However, if scanning occurs in the direction of lower frequencies, the received station will be that operating at 880 kc.

If a broadcast station is tuned in by the motor-actuated radio tuner and the program is not of the desired and preselected type, the relay in the control circuit output will not operate and the motor will continue to tune in other broadcast stations until one transmitting the desired and preselected type of program is found. If after a sufficient lapse of time it becomes evident to the receiver-operator that no broadcasting station is transmitting the desired type of program, he may choose to push a button to preselect a different type of program.

The invention also consists in certain new and original features of construction and combinations of parts hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which

Figure 1 illustrates diagrammatically the circuits of the transmitter;

Figure 2 illustrates diagrammatically the circuits of the receiver tuner and scanner;

Figure 3 illustrates diagrammatically the circuits of the receiver audio amplifier and relay;

Figure 4 illustrates diagrammatically the control circuits;

Figure 5 is a schematic plan view of the scanning apparatus; and

Figure 6 is a block diagram of the receiving system showing the interconnection of the several component parts represented in Figures 2 to 5.

Like reference characters denote like parts in the several figures of the drawings.

In the following description and in the claims parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

Referring to the accompanying drawings and more particularly to Figure 1 the transmitter is shown as comprising a studio amplifier 11, a program microphone 12 and a program identifying circuit 13, which includes a selector 15, an oscillator 16, a buffer-amplifier 17, a filter 18 and an oscilloscope 19.

The selector 15 comprises two sets of resistors 21—27 and 31—37, each set being connected in series and to the contact points of a multiple push-button switch shown schematically at 38. Corresponding switch contact points have associated therewith one of a plurality of bridge contacts 39 which are operated selectively by a plurality of push buttons 41—47 in a well known manner, so that when a push button is depressed the corresponding contact 39 will engage the corresponding points of the resistor assemblies. In the position shown the push button 44 for "plays" has been depressed moving the corresponding bridge contact 39 into engagement with the contact points of the resistors 24 and 34. The resistors 22, 24, 27, 32, 34 and 37 are shown as adjustable for the purposes of adjusting the sub-audible frequencies.

The oscillator 16 is of the resistance-capacitance phase inverting type with three capacitors 48, 49 and 50 and the two resistor assemblies 21—27 and 31—37 forming a resistance-capacitance low pass filter, which feeds energy from the plate to the grid of the oscillator tube 51. The buffer-amplifier 17 includes an amplifier tube 52 which is connected in parallel with the grid of the oscillator tube 51. The filter 18 is a resistor-capacitor band pass network which is connected to the mixing circuits of the studio amplifier 11. The amplifier 17 is also connected to a pair of opposite plates of the oscilloscope 19 the other plates of which are connected to a source of 60 cycle current 53.

Operation of Figure 1

In the operation of the transmitter shown in Figure 1 the oscillator 16 is of the resistance-capacitance phase inverting type which feeds energy from the plate to the grid of the tube 51, which oscillates at a frequency for which the grid is substantially out of phase with the plate voltage. Because of the low pass functioning of the feed back circuit the output is relatively free from harmonics. The frequencies set up by the selector 15 are so arranged that a lower frequency is secured by increasing the resistance in the circuit between both sets of filter condensers 48—50. When the contact 39 engages the contact points of the resistors 21 and 31 a frequency of 21 cycles is produced. When the contact 39 engages the contact points of the resistors 22—32, 23—33, 24—34, 25—35, 26—36 and 27—37 frequencies of 24, 27, 30, 33, 36 and 39 cycles respectively will be produced.

The output of the oscillator 16 is amplified by the amplifier 17 and is further freed from harmonics in the audio frequency band by passing through the band pass filter 18. The sub-audible frequency is then injected into the mixing circuits in the studio amplifier 11 at a suitable level where the signal is mixed with the

program it identifies, with the sub-audible frequency, for example, at a level of -20 to -25 decibels with respect to the program.

The sub-audible frequencies can be checked against the frequency of the 60 cycle source 53 by means of the oscilloscope 19. The oscilloscope 19 can be used to check the frequencies 24, 30 and 36 cycles and adjustments can be made by varying the resistors 22—32, 24—34 and 27—37 respectively. With the system set up accurately the adjustment of the resistors 27 and 37 for the 36 cycles will take care of the adjustments for the 33 and 39 cycles, the adjustment of the resistors 24 and 34 for the 30 cycles will then take care of the adjustment for the 27 cycles and the adjustment of the resistors 22 and 32 for the 24 cycles will take care of the adjustment for the 21 cycles.

It is contemplated that the push button identifying the signal will be set at the beginning of each period allotted for a program and will run throughout its operation. This is to permit a receiver to pick up a program while in progress. It is understood, however, that it is within the scope of the present invention that the transmitter and receiver can be so arranged that the control system will be operative only during the first few minutes of each broadcast period after which the receiver will be held on that particular station until the end of the period.

In Figure 1 push button 44 for "plays" is shown as being depressed. Under these conditions a sub-audible frequency of 30 cycles will be produced by the oscillator 16 and will be injected into the studio amplifier 11 where it is mixed with the program.

Figure 2 depicts the receiver tuner and scanner and comprises a motor driven scanner 55, a radio tuner 56, a first detector or frequency converter 57 having associated with it a local oscillator circuit 58, an intermediate frequency amplifier stage 59, a second detector and automatic volume control 60 and an audio and sub-audio frequency preamplifier 61.

The scanner 55 comprises a motor 65 which is supplied with current from two terminals 66. Secured to the shaft of the motor 65 is a worm 67 (Figure 5) which meshes with a worm wheel 68 which is provided with an extended hub 69. The worm wheel 68 is loosely mounted on a shaft 70 to which is secured an L-shaped member 71 having an extended hub 72. Surrounding the two hubs 69 and 72 is a coil spring 73 one end of which is secured to the hub 69 and the other end to the hub 72. Two pins 75 and 76 are mounted on the worm wheel 68 and cooperate with the member 71. Secured to the shaft 70 is an arm 77 on the outer end of which is mounted a roller 78 which rolls on a disc 79 which loosely surrounds the shaft 70 and which is carried by a bracket 80. The disc 79 is provided with a plurality of notches 81 into which the roller 78 drops when the selector is in its six positions.

Secured to the upper end of the shaft 70 is a contact arm 82 which consecutively engages the six points of a rotary switch 83. The six points of the switch 83 are connected to one side of six variable condensers 85 of the radio tuner 56. The other sides of the variable condensers 85 are connected to the secondary of a transformer 86 the primary of which is connected to the antenna 87.

Secured to the lower end of the shaft 70 is a contact arm 89 which consecutively engages the six points of a rotary switch 90. The six points

of the switch 90 are connected to one side of six variable condensers 91 which form part of the local oscillator circuit 58 which is associated with the frequency converter 57.

The output circuit of the frequency converter 57 is connected through a transformer 92 to the input circuit of the intermediate frequency amplifier 59, the output circuit of which is connected through a transformer 93 to the second detector and automatic volume control 60 which is of the twin diode type. The audio and sub-audio amplifier 61 is of the twin triode type, the plate circuit of the audio-frequency portion being connected to a terminal 95 and the plate circuit of the sub-audio frequency portion being connected to a terminal 96. A high voltage terminal 97 and a ground terminal 98 are provided.

It is within the scope of this invention to provide individual volume control for each station by providing a third rotary switch section for the rotary scanner 55. This switch could be used to control the coupling from the second detector to the audio amplifier and its purpose would be to assist the automatic volume control in establishing the same amount of sub-audible frequency output for all of the stations participating.

In Figure 3 are shown the audio amplifier, loud speaker and scanner motor-amplifier control circuits. These circuits comprise an audio amplifier 100 provided with two power tubes 101 and 102, a loud speaker 103, a power pack 105 and a relay control tube 106, which controls the operation of a relay 107.

The input circuit of the audio amplifier 100 is connected to audio frequency terminal 95 and ground terminal 98 of the audio-frequency section of pre-amplifier 61 of Fig. 2, the terminals of the input circuit of amplifier 100 being similarly numbered for that reason. The power tubes 101 and 102 are provided with two cathode-to-ground resistors 110 and 111, the former being permanently connected to ground and the latter being connected to ground through armature 108 and back contact 109 of the relay 107 when the armature is in its normally biased position as shown, due to spring 108'. The power pack 105 is supplied from terminals 112 with alternating current, which is controlled by a manually operated switch 113. The input circuit of the relay tube 106 is connected to two terminals 115 and 116 and the plate circuit is connected to the winding of the relay 107. The front contact 109' of this relay is connected to one of the motor terminals 66 which are connected to the similarly numbered terminals of Fig. 2, the other motor terminal being connected through the switch 113 to one of the power supply terminals 112.

The control circuits shown in Figure 4 comprise a low pass filter 120, a limiting amplifier 123, a balanced detector 124, a filter amplifier 125, a sub-audible frequency oscillator 126, and an amplifier-rectifier 127. The input terminals 96 and 98 of the filter 120 are connected to the similarly numbered terminals in Fig. 2 which constitute the output of the sub-audio frequency section of preamplifier 61. The output terminals 115 and 116 of amplifier-rectifier 127 are connected to the similarly numbered terminals in Fig. 3 which constitute the input to the relay control tube 106.

The sub-audible frequency oscillator 126 which may be structurally identical with oscillator 16 at the transmitter is so designed that it can produce frequencies ranging from 33 cycles to 51

cycles. The frequencies produced by oscillator 126 are controlled as in the case of oscillator 16 by a plurality of push buttons 131-137 which are identified as "concert," "dance," et cetera and which when depressed cause frequencies of 33, 36, 39, 42, 45, 48 and 51 cycles, respectively, to be produced. It will be noted that the frequency corresponding to any receiver button (concert, dance, etc.) is 12 cycles per second greater than the frequency corresponding to the like-designated transmitter button (concert, dance, etc.).

The connections above described between the various component parts will be clear from Figure 6 which is a block diagram of the over-all receiving system and wherein parts corresponding to like parts in Figures 2 to 5 are denoted by the same reference characters.

Operation of Figures 2, 3, 4 and 5

In the operation of the receiver shown in Figures 2-5 when it is desired to receive any particular type of program, such for example as "plays," the corresponding push button, in this case 134, is depressed and the switch 113 closed. The depression of the push button 134 causes oscillator 126 to produce a frequency of 42 cycles which will be impressed upon the grids of the balanced detector tube 124.

The closing of the switch 113 will cause the energization of the relay 107 as soon as the filaments of the tube 106 have heated up, which will complete a circuit from the A. C. terminals 112 through the front contact 109' of the relay 107, terminals 66 to the motor 65 which will start rotating. The rotation of the motor 65 causes a slow rotation of the worm wheel 68 and hub 69 in a counter-clockwise direction as seen in Figure 5, which in turn causes the spring 73 to be wound up. This motion applies a turning moment in the same direction to the hub 72 and member 71 which is resisted by the holding moment of the roller 78 in one of the notches 81. After the wheel 68 has been rotated through slightly less than one sixth of a revolution the pin 75 will engage the member 71 and will cause the roller 78 to move out of the notch 81. As soon as this occurs the holding moment of the roller 78 will be reduced and the tension of the wound up spring 73 will cause the member 71 to rotate in a counter-clockwise direction until it engages the pin 76 at which time the roller 78 will drop into the next notch 81.

In this way the shaft 70 together with the two contact arms 82 and 89 are caused to move intermittently through a sixth of a revolution so that the contact arms 82 and 89 successively engage the points of the switches 83 and 90 respectively. The contact arms 82 and 89 will remain in engagement with each point of their respective switches 83 and 90 for a predetermined interval of time which for example may be six seconds.

During this interval of time each of the six participating transmitting stations will be tuned in by means of the corresponding condenser 85 and the local oscillator circuit 58 will be tuned by the corresponding condenser 91 to produce the proper heterodyne frequency for that particular station which will vary from the station frequency by the frequency of the intermediate circuit 59. The intermediate frequency modulated by the control frequency will then pass through the transformer 92 and will be amplified by the intermediate circuit 59 after which the amplified energy will pass through the trans-

former 83 and be impressed upon the detector portion of the tube 60 and the grids of the preamplifier 61.

The second detector and automatic volume control 60 is of the delayed automatic volume control type in which the cathode bias of the twin triode tube of the preamplifier 61 holds the cathode of the rectifier portion of the twin diode tube 60 positive with respect to ground and the plate of the lower portion of this tube holds the automatic volume control line substantially at ground potential until the rectifier is actuated by a strong enough signal to make the plate of the lower diode negative with respect to its grounded cathode. That is the automatic volume control action is not operative on weak signals.

The audio and sub-audio frequency signals from the terminal 95 pass to the similarly numbered terminal of Figure 3 and are amplified by the tube 100 and the two power tubes 101 and 102. The sub-audio signal is relatively weak in relation to the audio signal and much of it is filtered out by the filter network between the audio amplifier 100 and the power tubes 101 and 102. While the scanner 55 is operating the relay 107 is energized and the cathodes of the tubes 101 and 102 are connected to ground through the resistor 110. Under these conditions the cathodes of the tubes 101 and 102 have a sufficient positive bias to prevent the audio frequency tones from the radio tuner operating into the loud speaker 103. In this way the loud speaker 103 remains inoperative while the scanner 55 is in operation.

The sub-audio and audio frequency signals from the terminal 96 pass to the similarly numbered terminal of Figure 4 and through the low pass filter 120 where the audio frequencies are filtered out. The sub-audio frequencies then pass through the limiting amplifier 123 so that they will be impressed on the tube of the balanced detector 124 at the same general level regardless of the station which is under examination. Energy from the sub-audible oscillator 126 is also impressed upon the grids of the tube of the detector 124.

In this case the push button 134 is shown as being depressed, so that oscillator energy of 42 cycles is impressed upon the detector 124. The difference between the sub-audible energy received and that produced by oscillator 126 passes through the filter amplifier 125 which is centered at 12 cycles and is designed to reject sufficiently well at 9 and 15 cycles. The output of this filter is impressed upon the amplifier-rectifier 127.

As long as the difference between the received sub-audible signal and the signal produced by oscillator 126 is not 12 cycles little or no D. C. negative voltage will be produced at the terminals 115 and 116 so that little or no D. C. voltage is applied to the grids of the relay tube 106. Under these conditions sufficient plate current flows through the relay 107 to maintain it energized and the scanner 55 will continue to operate.

When, however, the sub-audible signal received from the transmitter shown in Figure 1 has a frequency of 30 cycles corresponding to the depression of the push button 44 for "plays" the difference between this sub-audible frequency and that produced by oscillator 126 will be 12 cycles. The output energy of 12 cycles from the detector 124 will then pass through the filter amplifier 125 and will be impressed upon the amplifier-rectifier 127 producing sufficient nega-

tive voltage at the terminals 115 and 116 to decrease the plate current of the relay tube 106 to deenergize the relay 107.

As soon as this occurs the armature 108 of the relay 107 is caused to move to the right (as viewed in Fig. 3) by action of spring 108' breaking the circuit to the scanner motor 55 which immediately stops, leaving the contact arm 82 in engagement with the proper condenser 85 to tune in the station broadcasting "plays." At the same time the armature will engage the back contact 109 of the relay 107 which will bridge the resistor 111 across the resistor 110 which gives the power tubes 101 and 102, the proper bias so as to cause them to deliver power to the loud speaker 103. In this way the desired radio program is delivered by the loud speaker 103.

If it is now desired to change the program to "news" the push-button 136 of the sub-audible frequency generator 126 is depressed. Energy of 48 cycles will then be impressed upon the grids of the detector 124. This produces a frequency in the plate circuit of 18 cycles with the 30 cycles from the transmitter. This 18 cycle energy does not pass through the filter amplifier 125 so that little or no D. C. voltage will be applied to the grids of the relay tube 106 which will allow sufficient plate current to flow to energize the relay 107. This will cause the armature 108 to move to the left thus closing the circuit to the motor 55 which will start the scanner 55 in operation. At the same time the resistor 111 will be disconnected thus making the loud speaker 103 inoperative.

The scanner 55 will then proceed to scan the various participating stations until it is tuned in to a transmitting station at which the push button 46 for "news" has been depressed and which is, therefore, transmitting a sub-audible frequency of 36 cycles. When this 36 cycle energy is received and combined in the detector 124 with the 48 cycle energy produced by the sub-audible frequency oscillator 126 energy of 12 cycles will be produced in the plate circuit of the detector 124. This 12 cycle energy will pass through the filter-amplifier 125 which will cause sufficient negative voltage to be applied to the grids of the relay tube 106 to deenergize the relay 107. As soon as this occurs the scanner motor 55 will be stopped and the loud speaker 103 will be made operative, as already described, to cause the "news" program to be produced by the loud speaker 103.

It is thus seen that a system is provided in which any desired type of program may be selected by merely depressing a push button on the receiver which will cause the selector to become operative and test out each one of the participating stations in succession until the station having the desired program is discovered at which time the selector will be automatically stopped and the loud speaker made operative. In this way the loud speaker will be maintained silent during the scanning process and will become operative only when the desired type of program has been selected.

Although only a few of the various forms in which this invention may be embodied have been shown herein, it is to be understood that the invention is not limited to any specific construction but might be embodied in various forms without departing from the spirit of the invention or the scope of the appended claims.

What I claim is:

1. The method of program selection in radio

broadcasting and the like which comprises assigning a distinctive sub-audible frequency to each particular type of program, as for example, concert, dance music, news, sports, etc. to be transmitted from various stations, transmitting the program and the particular sub-audible frequency corresponding to the type of program to be transmitted from the various stations, and utilizing the transmitted sub-audible frequency at the receiver for automatically adjusting the tuning of the receiver to one of the broadcasting stations transmitting a desired type of program.

2. The method of automatically adjusting a radio receiver for the reception of a desired one of a plurality of signal-modulated carrier frequencies, each of which is accompanied by a characteristic control frequency, which consists in deriving the control frequency which accompanies that signal-modulated carrier frequency desired to be received, selectively producing at the receiver a second control frequency characteristic of the signal frequency desired to be received, heterodyning the two control frequencies, rectifying the resultant beat frequency, and controlling by means of the rectified current the adjustment of the receiver to the desired signal-modulated frequency.

3. The method of automatically adjusting the tuning of a receiver to a desired one of a plurality of signal-modulated carrier frequencies, each of which is accompanied by a sub-audible control frequency, which consists in deriving the control frequency which accompanies that signal-modulated carrier frequency desired to be received, selectively producing at the receiver a second sub-audible control frequency correlated with the control frequency of the signal frequency desired to be received, heterodyning the two control frequencies, rectifying the resultant beat frequency, and controlling by means of the rectified current the tuning of the receiver to the desired signal-modulated frequency.

4. Mechanism for automatically tuning a radio receiver to a selected one of a plurality of transmitters each carrying a particular type of program which is identified by a simultaneously transmitted characteristic potential receiver control-signal, comprising mechanically driven scanning means for intermittently and successively tuning said receiver to said plurality of transmitters, selective preset means constructed and arranged for conditioning the receiver so that said potential control-signal can exercise actual control to automatically tune the receiver to the program corresponding to the operated selective means, and means responsive to said control so constructed and arranged that the scanning means is made inoperative when the receiver is tuned to a transmitter carrying the said particular type of program.

5. Mechanism for automatically tuning a radio receiver according to the invention defined in claim 4, said receiver having a signal indicating device, wherein means are effective while the scanning means is in operation to cause the signal indicating device of the receiver to be non-responsive.

6. A system of broadcast transmission and reception comprising a transmitter provided with means for producing a code signal characteristic of the type of program being broadcast and simultaneously transmitting said code signal and program, the receiver comprising a program channel for selecting a desired program, said channel including a tuning device, and means

responsive to the characteristic code signal for effecting adjustment of the tuning device.

7. A system of broadcast transmission and reception comprising a transmitter provided with means for selectively producing one of a plurality of control signals which is indicative of the type of program being broadcast and simultaneously transmitting said control signal and program, the receiver comprising a program channel and a control signal channel, said channel including a tuning device, and means included in the latter channel responsive to the control signal for effecting adjustment of the tuning device.

8. In a radio receiver, means for automatically adjusting the tuning of the receiver to a desired one of a plurality of signal-modulated carrier frequencies, each of which is accompanied by a sub-audible control frequency different from the others, means at the receiver for deriving the sub-audible control frequency which accompanies that signal-modulated carrier frequency desired to be received, means for selectively producing at the receiver a second sub-audible control frequency correlated with the derived sub-audible control frequency, means for heterodyning the two control frequencies, means rectifying the resultant beat frequency, and means under the control of the rectifying means for adjusting the tuning of the receiver to the desired signal frequency.

9. In a system of broadcasting wherein the various programs likely to be broadcast are grouped in classes and each class is assigned an identifying characteristic, preferably a distinctive sub-audible frequency to be broadcast by the transmitter during at least a portion of the transmitted program, a receiver including tuning mechanism, means including a device for actuating the tuning mechanism adapted to become operative upon receipt of a sub-audible frequency other than the one that corresponds to the particular class of program desired, and means operative upon receipt of the sub-audible frequency corresponding to the desired class of program constructed and arranged to render said tuning mechanism actuating means inoperative and the receiver responsive to a transmitting station broadcasting the desired program.

10. In a broadcast transmission system of the type wherein an auxiliary signal indicative of the class of program is transmitted from the transmitter along with the program modulations on the same radio channel and is utilized at a receiving point to effect reception by the receiver of a particular class of program, a generating device adapted to produce one of a plurality of different auxiliary signals, means for causing the selective operation of said device at one auxiliary signal, and means for connecting said generating device to the transmitter for impressing the selected auxiliary signal upon the transmitter, whereby the selected auxiliary signal and the program of which it is indicative are simultaneously radiated from the transmitter on the same radio channel.

11. In a broadcast transmission system of the type wherein a sub-audible frequency indicative of the class of program is transmitted from the transmitter and utilized at a receiving point to effect the reception by the receiver of a particular class of program, a vacuum tube generator adapted to produce one of a plurality of sub-audible frequencies, means for causing the selective operation of the generator at one frequency, and means for connecting said generator to the trans-

mitter for impressing the selected sub-audible frequency upon the transmitter, whereby the latter frequency and the program of which it is indicative are simultaneously radiated from the transmitter, means at the receiver for deriving the transmitted sub-audible frequency, means at the receiver for producing a sub-audible frequency which is correlated with the derived sub-audible frequency, means for combining said two frequencies to derive a control potential, and means for utilizing said control potential to condition the receiver for the reception of the desired class of program.

12. In a broadcasting system, a transmitter adapted to transmit various classes of programs and a receiver adapted to receive such programs, selectively-operable means at the transmitter for producing a sub-audible frequency characteristic of the class of program to be transmitted, the transmitter carrier being modulated by said characteristic frequency and the program, means at the receiver for deriving the transmitted sub-audible frequency, selectively-operable means at the receiver for producing a second sub-audible frequency correlated with the derived sub-audible frequency, and means responsive to the conjoint action of said two sub-audible frequencies for effecting adjusting of the receiver to receive the class of program corresponding to the operated selective means.

13. In a broadcasting system, a transmitter adapted to transmit various classes of programs and a receiver adapted to receive automatically a selected one of such programs, selectively-operable means at the transmitter for producing a sub-audible frequency characteristic of the class of program to be transmitted, the transmitter carrier being modulated by said characteristic frequency and the program, means at the receiver for deriving the transmitted sub-audible frequency, selectively-operable means at the receiver for producing a second sub-audible frequency correlated with the derived sub-audible frequency, signal translating means adapted to be normally ineffective, and means responsive to the conjoint action of said two sub-audible frequencies for effecting adjustment of the receiver to receive the class of program corresponding to the operated selective means and to cause the signal translating means to become effective.

14. A radio receiver comprising tuning means for adjusting the receiver for the reception of predetermined signal-modulated carrier frequencies, each of said carrier frequencies having superimposed thereon a predetermined identifying sub-audible control frequency supplied by the transmitter, means at the receiver for deriving the identifying sub-audible frequency from the selected signal-modulated carrier frequency, a motor for actuating the tuning means, a plurality of selectors each corresponding to one of the predetermined carrier frequencies to be received, means under the control of each selector for producing a distinctive sub-audible frequency, the identifying sub-audible control frequency accompanying the received carrier frequency having a definite relation to the sub-audible frequency produced by the selector corresponding to said carrier frequency, means for heterodyning said two sub-audible frequencies, means for deriving a voltage proportional to the resultant beat frequency, and control means for the motor adapted to maintain the motor energized and to actuate the tuning means so long as the derived voltage results from the combination of two sub-audible

frequencies which do not have a predetermined definite relation, said control means being adapted, when the derived voltage results from the combination of two sub-audible frequencies which have a predetermined definite relation, to adjust the tuning means to a predetermined carrier frequency position and to deenergize the motor.

15. A radio receiver comprising tuning means for adjusting the receiver for the reception of predetermined signal-modulated carrier frequencies, each of said carrier frequencies having superimposed thereon a predetermined identifying sub-audible control frequency supplied by the transmitter, means at the receiver for deriving the identifying sub-audible frequency from the selected signal-modulated carrier frequency, a motor for actuating the tuning means, a plurality of selectors each corresponding to one of the predetermined carrier frequencies to be received, means under the control of each selector for producing a distinctive sub-audible frequency, the identifying sub-audible control frequency accompanying the received carrier frequency having a definite relation to the sub-audible frequency produced by the selector corresponding to said carrier frequency, a branch circuit comprising means whereby the carrier frequencies are derived and reproduced, a second branch circuit comprising means whereby the control frequency is derived and mixed with the frequency produced by the selector, means for deriving a voltage corresponding to the combined frequencies, and control means for the motor adapted to maintain the motor energized and thus actuating the tuning means so long as the derived voltage results from the combination of two sub-audible frequencies which do not have a predetermined definite relation, said control means being adapted, when the derived voltage results from the combination of two sub-audible frequencies which have a predetermined definite relation, to adjust the tuning means to a predetermined carrier frequency position and to deenergize the motor.

16. A radio receiver for automatically selecting a carrier wave which is signal modulated by a desired type of program and control-modulated by a sub-audible frequency identifying and accompanying the desired type of program, comprising means for tuning to and receiving the energy of a carrier wave, means for producing signal energy and sub-audible control energy corresponding to modulation of said received energy, local sub-audible frequency oscillator means selectively preset to produce energy of a frequency differing from the control frequency corresponding to the desired type of program by a fixed frequency value, a control circuit responsive to energy only of said fixed frequency value, heterodyne means for producing energy of a frequency equal to the difference of the locally produced sub-audible frequency and the sub-audible frequency derived from the modulations of the received carrier wave, to which the receiver is tuned, means for impressing said difference frequency energy upon said control circuit, and means under control of said control circuit for causing the receiver to select another carrier wave unless the said difference frequency is equal to said fixed frequency value.

17. A radio receiver for automatically selecting a carrier wave which is signal-modulated by a desired type of program and control-modulated by a sub-audible frequency identifying and accompanying the desired type of program, com-

prising means for tuning to and receiving the energy of a carrier wave, means for producing signal energy and sub-audible control energy corresponding to modulation of said received energy, local sub-audible frequency oscillator means selectively preset to produce energy of a frequency differing from the control frequency corresponding to the desired type of program by a fixed frequency value, a fixed characteristic relay-operating control circuit permanently and selectively responsive to energy only of said fixed frequency value, heterodyne means for producing energy

5 of a frequency equal to the difference of the locally produced sub-audible frequency and the sub-audible frequency derived from the modulations of the received carrier wave, to which the receiver is tuned, means for impressing said difference frequency energy upon said fixed characteristic relay-operating control circuit, and means causing the receiver to select another carrier wave unless the said difference frequency is
10 equal to said fixed frequency value.

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