Feb. 11, 1930. L. SHAPIRO 1,746,446

MULTIPLEX RADIORECEIVER

Filed July 11, 1925

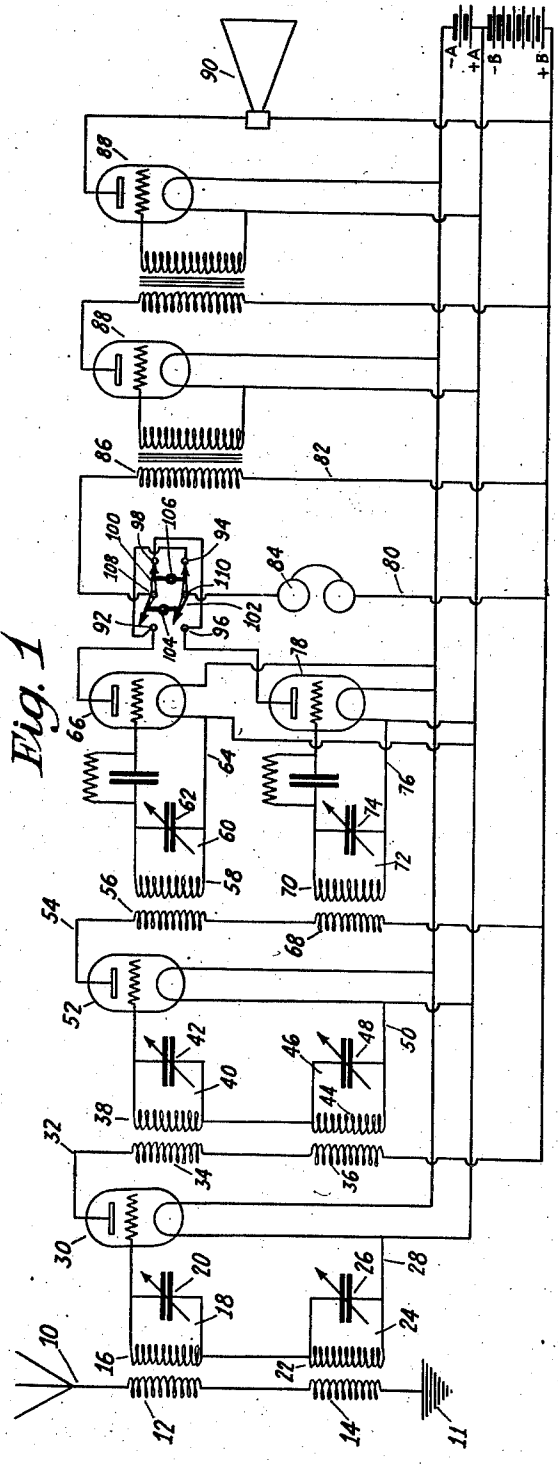


Fig. 1

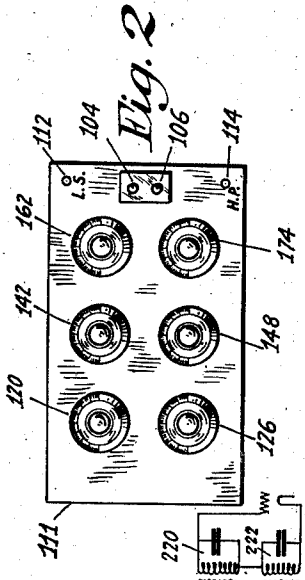


Fig. 2

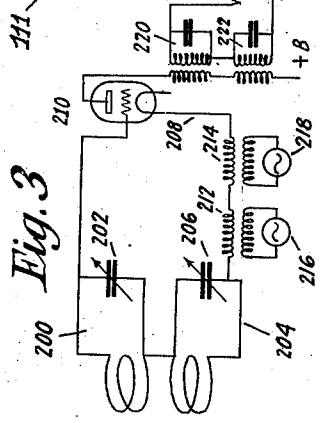


Fig. 3

INVENTOR
L. SHAPIRO
BY Dyrr Adams
ATTORNEY

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UNITED STATES PATENT OFFICE

LAZARUS SHAPIRO, OF NEW YORK, N. Y., ASSIGNOR TO RADIO CORPORATION OF AMERICA, A CORPORATION OF DELAWARE

MULTIPLEX RADIORECEIVER

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This invention relates to multiplex radio receivers intended more particularly for use in the reception of speech and music transmitted by broadcasting stations.

Heretofore, so far as known by applicant, radio receivers employed in the reception of broadcasted matter, although differing widely in many other respects, have all been so constructed as to enable reception to be accomplished at any given time from a single broadcasting station only. Frequently, however, one or more members of a group listening in on a broadcast receiver would prefer to listen to matter being broadcasted by a station other than the one which the majority of the group have elected to hear. Moreover, many other conditions arise in the use of broadcast receivers in which it would be very desirable to enable different members of a group to listen simultaneously to different broadcasting stations. For example, when one has guests whom he is entertaining by broadcast matter from the loud speaker of a radio set, it would be a great advantage for him to be able to listen in on other stations, if it could be done without interference with the entertainment being provided over the loud speaker, by use of head phones to ascertain whether any of such stations are sending out material which in his judgment would be more entertaining to his guests than the music or speech being received. If it were ascertained that more entertaining matter was being broadcasted by another station, he would then change the loud speaker reception to the other station, whereas if he were satisfied that the matter being received was probably more entertaining to his guests than anything else on the air at the time, he would have been enabled to learn that fact without having broken into the entertainment.

The important advantages mentioned above can now only be obtained by the use of two entirely separate broadcast receivers.

It is an object of this invention to provide a radio receiving set which affords the above-mentioned and other important advantages not possessed by receiving sets as heretofore constructed.

It is a further object of the invention to provide a multiplex broadcast receiver which not only has these advantages but which also can be constructed and maintained at a cost little greater than that of a receiver enabling reception from only one broadcasting station at a time.

In pursuance of these objects, an important feature of the invention resides in the provision of means for receiving signals transmitted from a broadcasting station operating on a predetermined wave length and means including elements of said first-mentioned means for simultaneously receiving signals transmitted from another broadcasting station operating on a different wave length. The employment in one receiving means of elements common to the other is very important in enabling the improved receiver to be constructed and maintained cheaply. As shown, the receiving means comprise separate detectors and common vacuum tube emplifying means and are arranged in the form of separate receiving channels each comprising tuning elements enabling the channel to be tuned over a desired broadcast range.

A further feature of the invention resides in the combination with a plurality of detectors corresponding in number with the separate messages desired to be received simultaneously of a sound translating device and means for alternatively connecting the device with the detectors. This feature of the invention, as well as certain other of its features, is not restricted to use in a multiplex broadcast receiver. On the contrary, such feature may be useful as a safety provision in receiving sets of other types to enable reception from any transmitter to be continued over another receiving channel when for any reason satisfactory reception cannot be obtained over a receiving channel previously in use.

In accordance with a still further and more specific feature of the invention, it aims to provide in combination with means for simultaneously receiving independent messages transmitted on different wave lengths, loud speaker connections, head phone connections, and means operable alternatively, on the one hand, to connect the loud speaker connection

with one of said receiving means and the head phone connections with the other of said receiving means, and, on the other hand, to connect the head phone connections with the first-mentioned receiving means and the loud speaker connections to the last-mentioned receiving means. In the illustrated embodiment of the invention, the means for controlling the connections between the loud speaker and head phones and the receiving means is in the form of a double-throw switch so arranged that if one listening in on one station by means of the head phones believes that the matter being received will be more entertaining to others than the matter then being brought in over the loud speaker, he may by throwing the switch connect the loud speaker with the station which previously had been connected with the head phones and at the same time connect the head phones with the station previously heard over the loud speaker.

Other objects and features of the invention will appear as the description proceeds and will be pointed out in the appended claims.

In the drawings,

Fig. 1 is a diagrammatic representation of one embodiment of the invention;

Fig. 2 is a front view of a panel on which the control elements of the receiver are mounted; and

Fig. 3 is a diagram showing how the invention may be employed with superheterodyne reception.

The illustrated embodiment of the invention comprises an antenna 10 connected to ground 11 through inductances 12 and 14. The inductance 12 constitutes the primary winding of a transformer, the secondary winding 16 of which is contained in a closed circuit 18 which also includes a variable condenser 20. The inductance 14, on the other hand, constitutes the primary winding of a second transformer, the secondary winding 22 of which is contained in a closed circuit 24 which also includes a variable condenser 26. Closed circuits 18 and 24 are connected in the input circuit 28 of a vacuum tube amplifier 30.

The output circuit 32 of the tube 30 includes windings 34 and 36, the former of which is coupled to a secondary winding 38 connected in a closed circuit 40 also containing a variable condenser 42, and the latter of which is coupled with a secondary winding 44 connected in a closed circuit 46 also including a variable condenser 48. As shown, closed circuits 40 and 46 are connected in the input circuit 50 of a second vacuum tube amplifier 52.

The output circuit 54 of the tube 52 includes a primary winding 56 coupled with a secondary winding 58. The winding 58 is contained in a closed circuit 60 which also includes a variable condenser 62. The closed circuit 60 is connected in the input circuit 64 of a detector 66 which, as shown, is a vacuum tube detector of a well known type.

The output circuit 54 of the second vacuum tube amplifier 52 also includes a winding 68 arranged in series with the above-mentioned winding 56. The winding 68 constitutes the primary of a transformer, the secondary winding 70 of which is connected in a closed circuit 72 which also includes a variable condenser 74. The circuit 72 is connected in the input circuit 76 of a detector 78 also illustrated as a vacuum tube detector.

Output circuits 80 and 82 are provided for the detectors 66 and 78, said circuits having connected therein respectively head phones 84 and a winding 86 coupled through audio frequency amplifiers 88 to a loud speaker 90.

In accordance with an important feature of the invention, means are provided whereby, if desired, the output circuit 80 may be connected with the vacuum tube detector 66 and the circuit 82 simultaneously connected with the detector 78, or as an alternative arrangement, the output circuit 80 may be connected with the detector 78 and the circuit 82 simultaneously connected with the detector 66. A convenient exemplification of such means is shown in Fig. 1 of the drawing and comprises contacts 92 and 94 permanently connected with the plate of the detector 66, contacts 96 and 98 permanently connected with the plate of the detector 78, and a double-throw switch comprising parallel arms 100 and 102 formed of conducting material and connected by bars of insulating material provided with push-buttons 104 and 106, Figs. 1 and 2. As shown, the contact surfaces of the members 92, 94, 96 and 98 are assumed to lie substantially in a plane. Accordingly, the parts of the arms 100 and 102 at opposite sides of their pivot points 108 and 110 are disposed at an angle to each other somewhat less than 180°, so that when pressure is exerted on one of the buttons 104 or 106 to press the arms into engagement with one set of contacts 92, 96 or 94, 98, the arms are thereby caused to become disengaged from the other set of contacts. The pivot points 108 and 110 are permanently connected to the circuits 82 and 80 respectively.

The variable condensers 20, 42 and 62 may be adjusted by dials 120, 142 and 162, Fig. 2, to vary the tuning of the closed circuits 18, 40 and 60 through a desired broadcast range. Similarly, the variable condensers 26, 48 and 74 may be regulated by dials 126, 148 and 174, Fig. 2, to vary the tuning of the closed circuits 24, 46 and 72 through the desired broadcast range. Preferably, and as shown, Fig. 2, the dials 120, 142 and 162, on the one hand, and the dials 126, 148 and 174 on the other are mounted in separate groups on a single panel 111.

In Fig. 1, the head phones 84 and loud speaker 90 are shown diagrammatically as integral parts of the receiver. This invention does not, however, seek to mark any departure from the usual practice of constructing head phones and loud speakers separate from the main body of a receiving set. Accordingly, there is shown in Fig. 2 a socket 112 adapted to receive the plug of a loud speaker and a second socket 114 designed to receive the plug of a set of head phones.

As shown in Fig. 1 of the drawing, the conducting arms 100 and 102 of the switch are engaged with the contacts 94 and 98. Consequently, the output circuit 80 with its head phones or head phone connections 84 is connected on the output side of the detector 66, and the circuit 82 coupled with the loud speaker 90 is connected on the output side of the detector 78. Accordingly, if the closed circuits 24, 46 and 72, constituting with the detector 78 one receiving channel, are each tuned to a wave length of, for example, 455 meters, a message being transmitted from a broadcasting station operating on a wave length of 455 meters will be reproduced by the loud speaker 90, whereas if the closed circuits 18, 40 and 60, which constitute with the detector 66 a separate receiving channel, are tuned to a frequency corresponding with a wave length of, for example, 492 meters, a message being broadcasted from a station operating at a wave length of 492 meters will be reproduced at the head phones 84.

If now the button 104, Figs. 1 and 2, is pushed in thereby disengaging the arms 100 and 102 from contacts 94 and 98 and engaging the arms with contacts 92 and 96, the loud speaker 90 will be disconnected from the detector 78 and connected with the detector 66, and the head phones 84 will be disconnected from the detector 66 and connected on the output side of the detector 78. Consequently, carrying on the assumption made above, a message broadcasted on a wave length of 455 meters will now be received on the head phones 84, and a message broadcasted on a wave length of 492 meters will be heard over the loud speaker 90.

It will, furthermore, be apparent that with the loud speaker 90 connected with the detector 78 as shown in Fig. 1 of the drawing, the control dials 120, 142 and 162 of the receiving channel composed of circuits 18, 40 and 60 and detector 66 may be varied in tuning throughout a desired broadcast range, enabling broadcasting stations operating at various wave lengths to be heard on the head phones 84, while reception of matter broadcasted at a wave length of 455 meters is continued uninterruptedly over the loud speaker 90. In this manner while reception is continuously going on over the loud speaker 90, one may, by manipulating the dials 120, 140 and 162, try out various other stations and ascertain whether matter being sent out by any of them is more desirable to put on the loud speaker than is the matter being heard over it. In the event that another station is found which is desired to be heard over the loud speaker, this station may be tuned in with the use of the head phones 84 and then the button 104 may be pushed in to disconnect the loud speaker 90 from the receiving channel 24, 46, 72, 78 and to put it in communication with the station tuned in over the head phones. Of course, it will be understood that in the use of the arrangement shown in Fig. 1, when the loud speaker 90 is connected with the receiving channel 18, 40, etc., the head phones 84 are simultaneously connected with the receiving channel 24, 46, etc., so that immediately following actuation of the switch 100, 102 the station previously heard over the loud speaker will be heard over the head phones. It will also be understood that if desired one may, this time by manipulation of the dials 126, 148 and 174, vary the tuning of the receiving channel 24, 46, etc. to bring in different stations on the head phones 84 without interrupting the reproduction by the loud speaker 90 of a message being received over the receiving channel 18, 40, etc.

It is well known that one listening to a radio receiving set over an efficient pair of head phones is not likely to be much disturbed by conversation or other noises in the room about him. In fact, if spoken to by another, he has difficulty in hearing what was said to him. For this reason, one may listen over the head phones 84 to a message broadcasted by one station without being troubled to any considerable degree by matter simultaneously received from another broadcasting station over the loud speaker 90. For example, with a receiver constructed in accordance with the invention, one member of a household may listen over the head phones to a description of a sporting event, undisturbed by music being received from another broadcasting station to the enjoyment of other members of the household.

The economy effected by this invention in the reception of two messages simultaneously may be emphasized by calling attention to the fact that the invention requires but one more tube than would be required for the reception of a single message.

Referring to Fig. 3 of the drawing, the numeral 200 designates a closed circuit comprising a loop antenna and a variable condenser 202, and the numeral 204 designates a closed circuit composed of a loop antenna and a variable condenser 206. The circuits 200 and 204 are connected in the input circuit 208 of a vacuum tube detector 210. Also connected in the circuit 208 are windings 212 and 214 to which are coupled respectively local sources 216 and 218 of alternating current.

The output circuit of the detector 210 contains windings coupled respectively to circuits 220 and 222. The circuits 220 and 222 may be connected with subsequent circuits and devices in a manner analogous to the circuits 18 and 24. It should be noted, however, that the circuits 220 and 222 may not correspond in every respect with the circuits 18 and 24. For example, the circuits 220 and 222 are preferably tuned permanently to different intermediate frequencies, for example, 30,000 and 50,000 respectively, and selection of the matter received over the different receiving channels including the circuits 220 and 222 respectively is preferably accomplished, not by varying the tuning of such circuits, but by varying the tuning of the circuits 200 and 202 or the frequency of the current provided from sources 216 and 218 respectively or both. A convenient way of making such selection would be, assuming that the intermediate frequency circuit 220 is permanently tuned to a frequency of 30,000 cycles, to vary the tuning of the circuit 200 over a desired broadcast range and simultaneously to change the frequency of the current supplied from the source 216 in such a manner that the frequency of such current always differs by 30,000 cycles from that to which the circuit 200 is resonant, and similarly, assuming that the intermediate frequency circuit 222 is permanently tuned to a frequency of 50,000 cycles, to vary the tuning of the closed circuit 204 over a desired broadcast range and simultaneously change the frequency of the current provided by the source 218 to maintain such current at a frequency alway differing by 50,000 cycles from that to which the circuit 204 is resonant.

The word "message" employed in certain of the appended claims is not used as a word of limitation, but is, on the contrary, employed as a convenient term signifying speech, music or any other matter which may be sent out from a broadcasting or other transmitting station.

Having fully described my invention, what I claim is:

1. In a radio broadcast receiver, the combination of a pair of separate detector devices, an audio frequency amplifier coupled to one of said detectors, a loud speaker device connected to said amplifier, a telephone receiver connected to the other of said detectors, and reversible means simultaneously to change the connection of said audio frequency amplifier from said one detector to said other detector and to change the connection of said telephone receiver from the said other detector to said one detector, whereby two separate broadcast programs may be reproduced selectively in the same room, one upon said loud speaker device and the other upon said telephone.

2. In a radio broadcast receiver, the combination of a pair of separate detector devices, an audio frequency amplifier coupled to one of said detectors, a loud speaker device connected to said amplifier, a telephone receiver connected to the other of said detectors, and reversible means simultaneously to change the connection of said audio frequency amplifier and said loud speaker device from said one detector to said other detector, and to change the connection of said telephone receiver from said other detector to said one detector, whereby two separate broadcast programs may be reproduced selectively, one upon said loud speaker and one upon said telephone.

LAZARUS SHAPIRO.