Sept. 7, 1937. G. RODWIN 2,092,474

RADIO TELEPHONE MONITORING SYSTEM

Filed Dec. 9, 1936 2 Sheets-Sheet 1

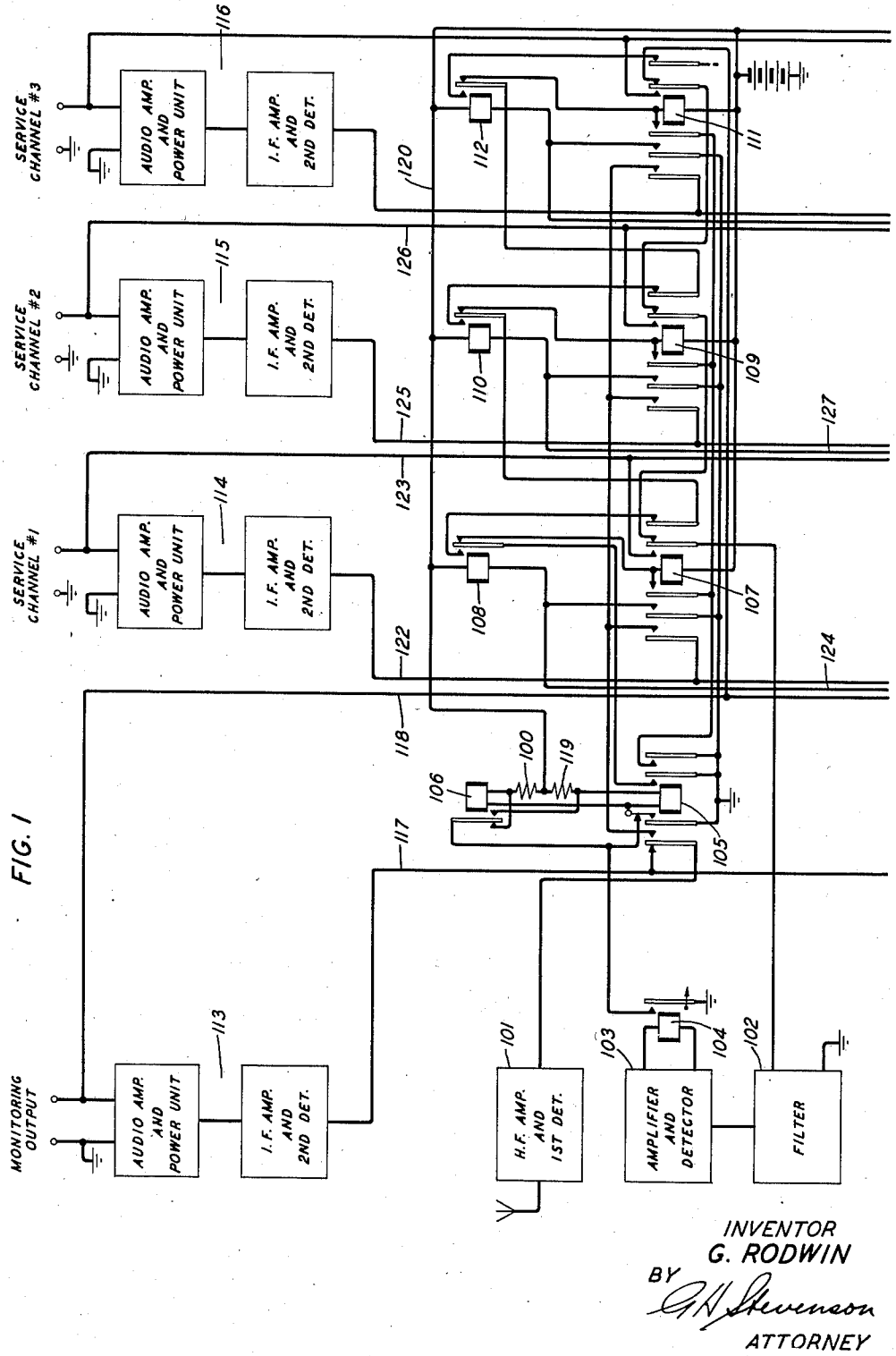

FIG. 1

INVENTOR
G. RODWIN
BY G. H. Stevenson
ATTORNEY

Sept. 7, 1937. G. RODWIN 2,092,474

RADIO TELEPHONE MONITORING SYSTEM

Filed Dec. 9, 1936 2 Sheets-Sheet 2

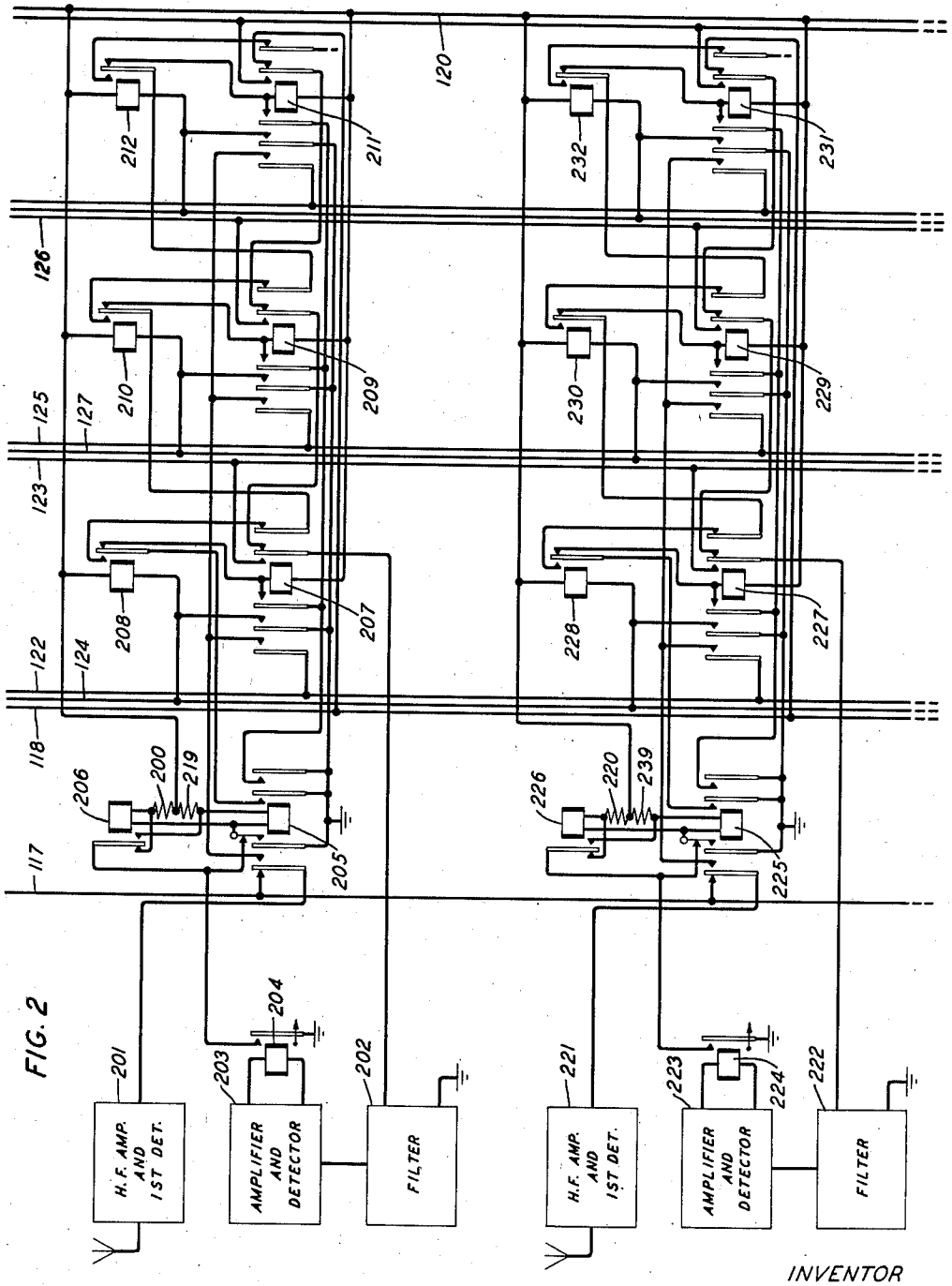

FIG. 2

INVENTOR
G. RODWIN
BY
G. H. Stevenson
ATTORNEY

Patented Sept. 7, 1937 2,092,474

UNITED STATES PATENT OFFICE

2,092,474

RADIO TELEPHONE MONITORING SYSTEM

George Rodwin, Randall Manor, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application December 9, 1936, Serial No. 114,908

11 Claims. (Cl. 250—20)

This invention relates to radio telephone circuits and more particularly to facilities for enabling monitoring to be accomplished on a plurality of radio telephone receiving channels which are used on a shared time basis.

In some instances it is desirable to use one receiver for monitoring on any one of a plurality of receiving channels each served by a different directive antenna. Each of the channels may be arranged, for example, to receive on a different carrier frequency band and to be connected to any one of a plurality of intermediate frequency service channels. Since the receiving channels are used on a shared time basis it is not necessary to provide an intermediate frequency service channel individual to each receiving channel but only as many service channels as are found necessary to handle the peak load of incoming traffic. Heretofore it has been proposed in monitoring systems of this character to provide facilities for enabling the monitoring operator to manually connect any one of a plurality of receiving channels, upon which reception has been detected, to any one of a plurality of service channels. It is the object of the present invention to render the connection of the receiving channels to available service channels entirely automatic.

While one manner in which this object may be attained is disclosed herein, it is to be understood that the disclosure is only illustrative of one embodiment of the invention and that other equivalent circuits and apparatus might be employed without departing from the scope of the invention as defined in the appended claims.

In accordance with the invention provision is made for monitoring by a single receiver on any one of a plurality of receiving channels each associated with a receiving antenna. Each receiving channel comprises high frequency amplifier and first detector panels tuned to receive on a particular high frequency band. The carrier bands transmitted from different stations may be modulated by tone signals of relatively low frequency by means of which each transmitting station may be distinctively identified. Thus, for example, four transmitting stations could be identified by four modulating tone frequencies of 600, 1050, 1500 and 1950 cycles, respectively.

In accordance with the invention, each high frequency channel has associated therewith a filter circuit tuned to respond to the modulating tone signal which is indicative that reception is incoming on that channel, a secondary amplifier and detector panel and a tone relay which is responsive if the associated filter passes the distinctive tone signal. Four intermediate frequency receiving channels are also provided three of which are used for service connections and the fourth of which is used for monitoring purposes.

Normally the output side of each high frequency channel is connected to the input side of the intermediate frequency monitoring channel and the output side of the monitoring channel is connected to the filters associated with all of the high frequency receiving channels. A group of switching relays is allotted to each high frequency receiving channel comprising as many relays as there are intermediate frequency service channels. A second group of sequence relays, comprising a relay for each service channel, is also associated with each high frequency receiving channel, the corresponding sequence relays of all of the groups being arranged to be operated in parallel whenever any receiving channel is switched into connection with the service channel to which they are allotted.

Briefly the invention functions in the following manner: If, for example, the tone relay associated with the first receiving channel becomes operated, indicating reception on that channel, and all service channels are at the time available, the tone relay in conjunction with the sequence relays associated with that channel will cause the operation of the first switching relay of the group associated with the first receiving channel to switch the first channel from the monitoring channel to the first service channel and to operate the first sequence relay of each group of sequence relays. The operation of these sequence relays bars the connection of another receiving channel to the first service channel and prepares the circuits for connecting another one of the receiving channels to the next available service channel.

Should the tone relay associated with the second receiving channel now become operated, it will, in conjunction with the sequence relays associated with that channel, cause the operation of the second switching relay of the group associated with the second receiving channel to switch the receiving channel from the monitoring channel to the second service channel and to operate the second sequence relay of each group of sequence relays. The operation of these sequence relays bars the connection of another receiving channel to the second service channel and prepares the circuits for connecting another one of the receiving channels to the next available service channel. Other receiving channels are

connected to available service channels in the same manner.

It is believed that a clearer understanding of the invention and its mode of operation may be obtained from a consideration of the following detailed description taken in connection with the accompanying drawings of which:

Figs. 1 and 2 taken together with Fig. 2 placed beneath Fig. 1, show one embodiment of the invention, Fig. 1 showing one high frequency receiving channel and the switching equipment associated therewith and the intermediate frequency monitoring and service channels; and Fig. 2 showing additional high frequency receiving channels and the switching equipment thereof.

It is to be understood that although in order to simplify the disclosure only three high frequency receiving channels and three intermediate frequency service channels have been illustrated, as many other high frequency channels would be supplied as might be found necessary to receive transmission from other transmitting stations and as many other service channels would be supplied as might be found necessary to handle the traffic load.

Referring to the drawings, it will be assumed that monitoring on three high frequency receiving channels is required, these high frequency channels being schematically illustrated by the boxes **101**, **201** and **221** and each comprising a receiving antenna system, a high frequency amplifier panel and a first detector panel. Also associated with each high frequency channel is a filter circuit, a tone signal amplifier panel and a tone signal detector panel. The filter circuits are disclosed schematically by the boxes **102**, **202** and **222** and the amplifier and detector panels by the boxes **103**, **203** and **223**.

Four intermediate frequency receiving channels **113**, **114**, **115** and **116** are provided each comprising an intermediate frequency amplifier, second detector, audio frequency amplifier and power unit as indicated by the boxes. One of these channels **113** serves as a monitoring channel and is normally connected on its input side in parallel to the output side of each of the high frequency receiving channels and on its output side to a suitable monitoring device such as a loud speaker and in parallel to the filter circuits associated with all of the high frequency receiving channels. The other three intermediate frequency channels **114**, **115**, and **116** are connected on their output sides to service channels.

Associated with each high frequency channel are a tone relay, two control relays, a group of three switching relays and a group of three sequence relays. The switching relays are effective when operated to connect the output side of the particular channel with the input side of any one of the three intermediate frequency service channels **114**, **115** and **116** and at the same time to dissociate the particular channel from the monitoring channel. For example, relay **107** when operated, connects channel **101** to service channel **114**; relay **109** when operated, connects channel **101** to service channel **115**; and relay **111** when operated, connects channel **101** to service channel **116**. Similarly relay **207** is effective to connect channel **201** to service channel **114**; relay **209** is effective to connect channel **201** to service channel **115**; and relay **211** is effective to connect channel **201** to service channel **116**.

The group of sequence relays associated with each high frequency receiving channel serves to bar the connection of a second high frequency channel to any service channel to which another high frequency channel is at the time connected. The sequence relays of each group are paired with the switching relays of the same high frequency channel and corresponding relays of all of the groups of sequence relays are arranged to be operated in parallel. For example the sequence relay **108** is paired with switching relay **107** and is operated in parallel with the corresponding sequence relays **208** and **228** of the other groups when any one of the switching relays **107**, **207** or **227** is operated to connect one of the high frequency channels with service channel **114**. Similarly, sequence relay **110** is paired with switching relay **109** and is operated in parallel with the corresponding sequence relays **210** and **230** of the other groups when any one of the switching relays **109**, **209** or **229** is operated to connect one of the high frequency channels with service channel **115**.

Having now described the apparatus of the monitoring system, the manner in which it functions will now be described. It will be assumed that all of the service channels are available for use and that all of the switching relays are therefore unoperated. The output side of high frequency receiving channel **101** is therefore connected over the outer left back contact of relay **105** to conductor **117** and thence to the input side of the monitoring channel **113** and the output side of the monitoring channel is connected over conductor **118**, thence in series over the inner right back contacts of switching relays **111**, **109** and **107** to the filter circuit **102**; the output side of the high frequency receiving channel **201** is connected over the outer left back contact of relay **205** to conductor **117** and thence to the input side of monitoring channel **113** and the output side of the monitoring channel is connected over conductor **118**, thence in series over the inner right back contacts of switching relays **211**, **209** and **207** to the filter circuit **202**; and the output side of the high frequency receiving channel **221** is connected over the outer left back contact of relay **225** to conductor **117** and thence to the input side of monitoring channel **113** and the output side of the monitoring channel is connected over conductor **118**, thence in series over the inner right back contacts of switching relays **231**, **229** and **227** to the filter circuit **222**. Thus normally, the monitoring channel **113** is connected in parallel to each of the high frequency receiving channels and to each of the filter circuits associated therewith.

It will now be assumed that reception is incoming on the high frequency receiving channel **101** and that the modulating tone signal incoming thereover is detected and impressed on the monitoring operator's monitoring device and upon the filter circuit **102** which is tuned to pass only a tone signal of the frequency incoming over receiving channel **101**. The filter circuits **202** and **222** associated with the other receiving channels **201** and **221** will not pass this tone signaling frequency. The monitoring operator hearing the distinctive tone signal is now apprised of the fact that reception is incoming over the first receiving channel **101**.

Since the filter circuit **102** passes this tone signaling frequency, the amplifier and detector circuits **103** respond to cause the operation of tone relay **104** which establishes a circuit from ground at its contacts over the inner left normal

contacts and winding of relay 105 through resistance 119 to battery on bus-bar 120 and in parallel through the winding of relay 106 and resistance 100 to battery on bus-bar 120. Relay 105 thereupon operates and locks over its inner left alternate contacts to ground. Relay 106 does not operate at this time since its winding is shunted over its own back contact to ground at the contacts of relay 104 so long as relay 104 remains operated in response to the incoming tone signal.

Relay 105 upon operating establishes an operating circuit for switching relay 107 extending from battery through the winding of relay 107, back contact of the sequence relay 108 paired therewith, to ground at the inner right front contact of relay 105 and a locking circuit for switching relay 107 which is effective as soon as relay 107 operates extending from battery through the winding and inner left front contact of relay 107 to ground at the outer right front contact of relay 105. At its outer left back contact relay 105 disconnects the output side of the receiving channel 101 from the monitoring channel 113 and at its outer left front contact connects the output side of the receiving channel 101 over the outer left front contact of switching relay 107, now operated, to conductor 122 and thence to the input side of the first intermediate frequency service channel 114. The modulating tone signal is now impressed upon the service channel 114 and from the output side thereof over conductor 123, the inner right front contact of switching relay 107 to the filter circuit 102 thereby maintaining the tone relay 104 operated so long as the tone signal persists. Relay 104 is made slightly slow to release in order that it may hold its contacts closed until after relay 107 has operated.

Relay 107 at its middle left front contact connects ground to conductor 124 thereby establishing parallel operating circuits through the windings of sequence relays 108, 208 and 228 to battery on the bus-bar 120. Relay 108 upon operating opens the initial operating circuit of switching relay 107 and prepares the operating circuit for switching relay 109, but, since switching relay 107 is operated, the circuit of relay 109 is open at the outer right back contact of relay 107. Sequence relay 208 upon operating opens at its back contact the operating circuit of switching relay 207 and at its front contact prepares the operating circuit of switching relay 209. Similarly sequence relay 228 opens at its back contact the operating circuit of switching relay 227 and at its front contact prepares the operating circuit of switching relay 229. Thus the operation of the sequence relays 208 and 228 bars the connection of another high frequency receiving channel to the service channel 114 and allots the next service channel 115 for connection to another high frequency channel.

Upon the discontinuance of the tone signal, tone relay 104 releases thereby removing the shunt from the winding of relay 106 which thereupon operates in a circuit from battery on bus-bar 120, resistance 100, winding of relay 106, inner left alternate contacts of relay 105 to ground. Relays 105, 106, 107, 108, 208 and 228 now remain operated during the continuance of reception over the high frequency receiving channel 101.

When the transmitting station desires to discontinue transmission, the modulating tone signal is again transmitted, is received in the service channel 114 and is passed by the filter circuit 102 to cause the reoperation of tone relay 104. Relay 104 upon operating connects ground over its contacts and the front contact of relay 106 to a point between resistance 119 and the winding of relay 105 thereby shunting the winding of relay 105 which thereupon releases. Following the release of relay 105, relay 106 is maintained operated so long as the tone relay 104 is operated in a locking circuit extending from ground over the contacts of relay 104, the normal contacts of relay 105, winding of relay 106, resistance 100 to battery on bus-bar 120. Relay 105 upon releasing also opens the locking circuit of switching relay 107 and the operating circuits of sequence relays 108, 208 and 228 which now release, relay 107 upon releasing disconnecting the receiving channel 101 from the service channel 114. Upon the discontinuance of the tone signal, relay 104 releases in turn releasing relay 106. The circuits are now in their normal condition.

It will now be assumed that while reception is being received over the high frequency channel 101 and service channel 114, at which time switching relay 107 and sequence relays 108, 208 and 228 are operated as previously described, reception is received on the high frequency channel 201, the output side of which is associated with the input side of the monitoring channel 113 over the outer left back contact of relay 205 and conductor 117. The modulating tone signal will now be detected in the monitoring channel apprising the monitoring operator that reception is being received and the signaling tone will be impressed from the output side of the monitoring channel 113, over conductor 118, in series over the inner right back contacts of switching relays 211, 209 and 207 upon the filter circuit 202. Filter circuit 202 will pass the tone signal whereupon the detector and amplifier circuits 203 will respond to cause the operation of tone relay 204. The tone signal will also be impressed upon filter circuit 222 over conductor 118 and the inner right back contacts of switching relays 231, 229 and 227 but without effect since filter circuit 222 is so tuned as not to pass the signaling tone received over either channel 101 or channel 201. With switching relay 107 operated as assumed, the tone signal does not reach filter circuit 102.

Relay 204 upon operating now establishes a circuit from ground over its contacts, the inner left normal contacts and winding of relay 205, resistance 219 to battery on bus-bar 120 and in parallel through the winding of relay 206 and resistance 200 to battery on bus-bar 120. Relay 205 thereupon operates and locks over its inner left alternate contacts to ground, but relay 206 does not operate since its winding is shunted in a circuit extending over its own back contact so long as relay 204 remains operated in response to the incoming tone signal.

With relay 205 and sequence relay 208 both operated, the operating circuit of switching relay 209 is established and may be traced from battery on bus-bar 120, winding of relay 209, back contact of sequence relay 210, outer right back contact of switching relay 207, front contact of sequence relay 208 to ground at the inner right contact of relay 205. Relay 209 upon operating now locks over its inner left front contact to ground at the outer right front contact of relay 205. At its outer left back contact, relay 205 disconnects the output side of the receiving channel 201 from the monitoring channel 113 and at its outer left front contact connects the output side of receiving channel 201 over the outer left front contact of switching relay 209,

now operated, conductor 125 and thence to the second intermediate frequency service channel 115. The modulating tone signal is now impressed on the service channel 115 and from the output side thereof over conductor 126, the inner right front contact of switching relay 209, the inner right back contact of switching relay 207 to the filter circuit 202 thereby maintaining the tone relay 204 operated so long as the tone signal persists.

Relay 209 at its middle left front contact connects ground to conductor 127 thereby establishing parallel operating circuits through the windings of sequence relays 110, 210 and 230 to battery on bus-bar 120. Relay 210 upon operating opens the initial operating circuit of switching relay 209 and prepares the operating circuit for switching relay 211, but, since switching relay 209 is operated, the circuit of relay 211 is open at the outer right back contact of relay 209. Sequence relay 110 upon operating opens at its back contact the operating circuit of switching relay 109 and at its front contact prepares the operating circuit of switching relay 111. Similarly, sequence relay 230 opens at its back contact the operating circuit of switching relay 229 and at its front contact prepares the operating circuit of switching relay 231. Thus the operation of sequence relays 110 and 230 bars the connection of any other high frequency receiving channel to the service channel 115 and allots the next service channel 116 for connection to another high frequency channel.

Upon the discontinuance of the tone signal over receiving channel 201, relay 204 releases thereby removing the shunt from the winding of relay 206 which thereupon operates in a circuit from battery on bus-bar 120, resistance 200, winding of relay 106, inner left alternate contacts of relay 205 to ground. Relays 205, 206, 209, 110, 210, and 230 now remain operated during the continuance of reception over channel 201. When the transmitting station desires to discontinue transmission, the tone signal is again transmitted, is received in the service channel 115 and is passed by the filter circuit 202 to cause the reoperation of tone relay 204. Relay 204 upon operating connects ground over its contacts and the front contact of relay 206 to a point between resistance 219 and the winding of relay 205 thereby shunting the winding of relay 205 which thereupon releases. Following the release of relay 205, relay 206 is maintained operated so long as tone relay 204 is operated in a locking circuit extending from ground over the contacts of relay 204, the normal contacts of relay 205, winding of relay 206, resistance 200 to battery on bus-bar 120. Relay 205 upon releasing also opens the locking circuit of switching relay 209 and the operating circuits of sequence relays 110, 210 and 230 which now release. Relay 209 upon releasing disconnects the receiving channel 201 from the service channel 115. Upon the discontinuance of the tone signal, relay 204 releases in turn releasing relay 206.

Should reception now be received on the high frequency channel 221 with both service channels 114 and 115 in use, channel 221 will become connected to the third service channel 116 through the operation of relays 225, 226 and the switching relay 231 in a similar manner. It will, however, be assumed that at the time reception is received on channel 221, the second service channel 115 has again become available but that the first service channel 114 is unavailable. When relays 224 and 225 operate, with sequence relay 228 still operated and sequence relay 230 released, the circuit of switching relay 229 is established from battery on bus-bar 120, winding of relay 229, back contact of sequence relay 230, outer right back contact of switching relay 227, front contact of sequence relay 228 to ground at the inner right front contact of relay 225. Relay 229 upon operating locks over its inner left front contact to ground at the outer right contact of relay 225, connects the output side of channel 221 over its outer left front contact and conductor 125 to the input side of service channel 115 and over its middle left front contact establishes parallel operating circuits for sequence relays 110, 210 and 230. These sequence relays thereupon operate and function as previously described to bar the connection of another high frequency receiving channel to the service channel 115 and to prepare circuits for allotting the next service channel 116 for use on the next call.

From the foregoing description, it will be apparent that the monitoring circuits are entirely automatic in their operation and that the monitoring operator is not required to perform any manual switching operations to associate high frequency receiving channels on which reception is present to available intermediate frequency service channels and is therefore enabled to devote his entire attention to the adjustment of the control apparatus of the channels for the best reception.

What is claimed is:

1. In a signaling system, a plurality of high frequency receiving channels, a monitoring channel, said monitoring channel being normally connected with each of said receiving channels, a plurality of intermediate frequency service channels, means for switching any one of said receiving channels from connection with said monitoring channel into connection with any one of said service channels, and means responsive to reception on any one of said receiving channels to operate said switching means.

2. In a signaling system, a plurality of high frequency receiving channels, a monitoring channel, said monitoring channel being normally connected with each of said receiving channels, a plurality of intermediate frequency service channels, means for switching any one of said receiving channels from connection with said monitoring channel into connection with any one of said service channels, means for allotting said service channels for use, and means responsive to reception on any one of said receiving channels to operate said switching means to connect said receiving channel to an allotted one of said service channels.

3. In a signaling system, a plurality of high frequency receiving channels, means associated with each of said channels responsive respectively to a different signaling frequency, a monitoring channel, said monitoring channel being normally connected with each of said receiving channels and with each of said associated responsive means, a plurality of intermediate frequency service channels, and means for switching any one of said receiving channels and associated responsive means from connection with said monitoring channel into connection with any one of said service channels, said switching means being controlled by the responsive means of a receiving channel when reception is present on such channel.

4. In a signaling system, a plurality of high

frequency receiving channels, means associated with each of said channels responsive respectively to a different signaling frequency, a monitoring channel, said monitoring channel being normally connected with each of said receiving channels and with each of said associated responsive means, a plurality of intermediate frequency service channels, means for switching any one of said receiving channels and associated responsive means from connection with said monitoring channel into connection with any one of said service channels, means for allotting said service channels for use, and means controlled by the responsive means of a receiving channel when reception is present on such channel to operate said switching means to connect said receiving channel to an allotted one of said service channels.

5. In a signaling system, a plurality of high frequency receiving channels, means associated with each of said channels responsive respectively to a different signaling frequency, a monitoring channel, said monitoring channel being normally connected on its input side to each of said receiving channels and on its output side to each of said responsive means, a plurality of intermediate frequency service channels, a group of switching relays associated with each of said receiving channels, each relay of a group being individualized to a different one of said service channels, and means controlled by the responsive means of a receiving channel on which reception is present to disconnect said channel from the input side of said monitoring channel and to operate one of said switching relays to connect said receiving channel to the input side of a service channel and to transfer the connection of the responsive means of said receiving channel from the output side of said monitoring channel to the output side of said service channel.

6. In a signaling system, a plurality of high frequency receiving channels, means associated with each of said channels responsive respectively to a different signaling frequency, a monitoring channel, said monitoring channel being normally connected with each of said receiving channels and with each of said associated responsive means, a plurality of intermediate frequency service channels, means for switching any one of said receiving channels and associated responsive means from connection with said monitoring channel into connection with any one of said service channels, said switching means being controlled by the responsive means of the receiving channel when reception is present on such channel, and means controlled by the responsive means of the receiving channel which has been connected with a service channel for releasing said switching means when transmission is to be terminated.

7. In a signaling system, a plurality of high frequency receiving channels, means associated with each of said channels responsive respectively to a different signaling frequency, a monitoring channel, said monitoring channel being normally connected on its input side to each of said receiving channels and on its output side to each of said responsive means, a plurality of intermediate frequency service channels, means for switching any one of said receiving channels and associated responsive means from connection with said monitoring channel into connection respectively with the input and output sides of any one of said service channels, said switching means being controlled by the responsive means of a receiving channel when reception is present on such channel, and means controlled by the responsive means of a receiving channel which has been connected with a service channel for releasing said switching means when transmission is to be terminated.

8. In a signaling system, a plurality of high frequency receiving channels, means associated with each of said channels responsive respectively to a different signaling frequency, a monitoring channel, said monitoring channel being normally connected with each of said receiving channels and with each of said associated responsive means, a plurality of intermediate frequency service channels, means for switching any one of said receiving channels and associated responsive means from connection with said monitoring channel into connection with any one of said service channels, means for allotting said service channels for use, and means controlled by the responsive means of a receiving channel when reception is present on such channel to operate said switching means to connect said receiving channel to an allotted one of said service channels and to operate said allotting means to bar the connection of another receiving channel to said connected service channel and to allot another service channel for use.

9. In a signaling system, a plurality of high frequency receiving channels, means associated with each of said channels responsive respectively to a different signaling frequency, a monitoring channel, said monitoring channel being normally connected with each of said receiving channels and with each of said associated responsive means, a plurality of intermediate frequency service channels, a group of switching relays and a group of sequence relays associated with each receiving channel, one relay of each group being individualized to a different one of said service channels, means controlled by the responsive means of a receiving channel on which reception is present to disconnect said receiving channel from said monitoring channel and to operate the switching relay of the group associated with such receiving channel which is individual to an available service channel to connect said receiving channel to said available service channel and to transfer the responsive means of said receiving channel from said monitoring channel to said service channel, and means controlled by said operated switching relay for operating the sequence relays of all groups individual to the connected service channel to bar the connection of another receiving channel to said connected service channel and to allot another service channel for use.

10. In a signaling system, a plurality of high frequency receiving channels, a tuned circuit and a tone relay responsive thereto associated with each receiving channel, said circuits being tuned to be responsive to different signaling frequencies, a plurality of intermediate frequency service channels, a group of switching relays and a group of sequence relays associated with each receiving channel, one relay of each group being individualized to a different one of said service channels, means controlled by the tone relay of a receiving channel on which reception is present to operate the switching relay of the group associated with such receiving channel which is individual to an available service channel to connect said receiving channel to said available service channel, and means controlled by said operated switching relay for operating the sequence relays of all groups individual to the connected service channel to bar the connection of another receiv-

ing channel to said connected service channel and to allot another service channel for use.

11. In a signaling system, a plurality of high frequency receiving channels, a tuned circuit and a tone relay responsive thereto associated with each receiving channel, said circuits being tuned to be responsive to different signaling frequencies, a monitoring channel, said monitoring channel being normally connected with each of said receiving channels and with each of said associated tuned circuits, a plurality of intermediate frequency service channels, a group of switching relays and a group of sequence relays associated with each receiving channel, one relay of each group being individualized to a different one of said service channels, means controlled by the tone relay of a receiving channel on which reception is present to disconnect said receiving channel from said monitoring channel and to operate the switching relay of the group associated with such receiving channel which is individual to an available service channel to connect said receiving channel to such available service channel and to transfer the tuned circuit of said receiving channel from said monitoring channel to said service channel, and means controlled by said operated switching relay for operating the sequence relays of all groups individual to the connected service channel to bar the connection of another receiving channel to said connected service channel and to allot another service channel for use.

GEORGE RODWIN.