

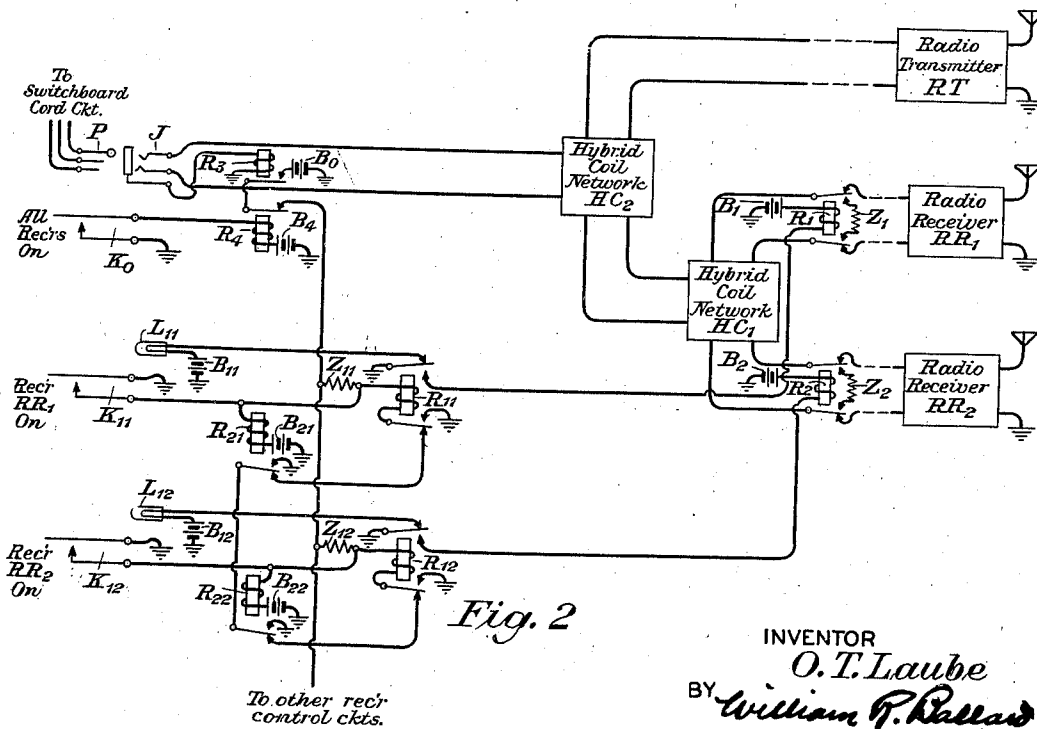
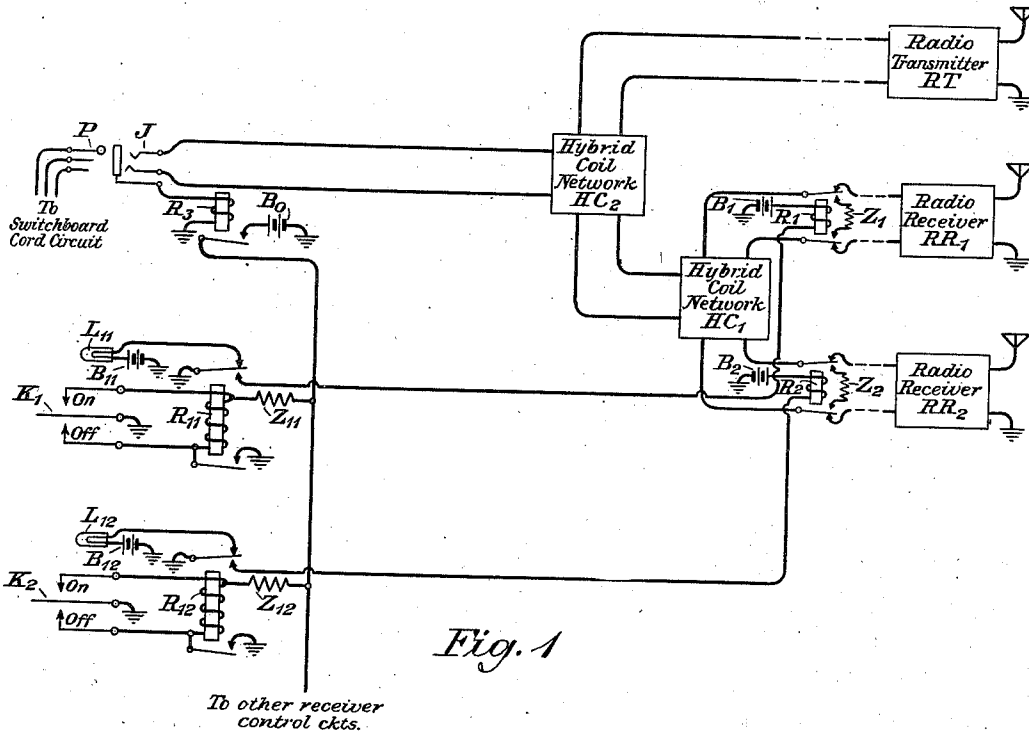
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O. T. LAUBE

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CONTROL CIRCUIT FOR RADIO RECEIVERS

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INVENTOR
O. T. Laube
BY William G. Ballard
ATTORNEY

UNITED STATES PATENT OFFICE

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CONTROL CIRCUIT FOR RADIO RECEIVERS

Otto Theodore Laube, East Orange, N. J., assignor to American Telephone and Telegraph Company, a corporation of New York

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This invention relates to signaling systems. More particularly, this invention relates to signaling systems employing means for selectively receiving signals impressed upon two or more receiving devices.

In radio signaling systems suitable for use at coastal harbor stations, for example, it appears desirable to provide two or more radio receivers located at various points so that low power ship transmitters in the service area may always be within reliable signal range of some one of the various receivers. In setting up such an arrangement the output circuits of the various receivers may be wired to a common terminal in such a way that a signal received by any one of the various receivers will be heard by the operator.

In an arrangement of the type just referred to it has been found that the signal-to-noise ratio at the common terminal to which the various receiver circuits are wired will be determined largely by the poorest of the signals of any individual radio receiver. Thus, if but one of the various receivers has a low signal-to-noise ratio, the signals at the common terminal may become practically unintelligible and the operator will be unable to decipher the signals even though the same signals may be received satisfactorily by one or more of the other receivers.

According to the present invention, these conditions which oftentimes prevent the reception of signals may be removed by incorporating into the receiving system suitable means for selecting that receiver which delivers the best signals and for excluding the outputs of all other receivers from the system. With such an arrangement all of the various receivers will always be available for monitoring purposes to receive signals from a ship transmitter within the service area, but immediately after a call is received from such a ship transmitter, the receiver delivering the best output may be selected, if desired, or the outputs of two or more receivers may be combined, if preferred, while the remaining receivers are disconnected from the circuit. In that case signals of good quality may be received and the outputs of receivers which are not delivering good signal energy may be eliminated. After a call is completed, however, all of the receivers are returned to the monitoring condition automatically and thus held available for another call.

It is one of the objects of this invention to employ a plurality of radio or other receivers to simultaneously monitor one or more radio or

other transmitters and to select the receiver delivering the best signal output and transmit its signals while disconnecting the remaining receivers from the circuit.

It is another object of this invention to combine the outputs of two or more radio receivers of a plurality of such receivers and transmit the combined output of the selected receivers while disconnecting the remaining receivers from the circuit.

It is another object of this invention to provide arrangements to re-connect all of the various receivers to the circuit after a call has been completed so that all of the receivers will be available to receive another call.

The remaining objects and features of this invention may be better understood from the detailed description hereinafter following, when read in connection with the accompanying drawing showing two embodiments of this invention merely for the purpose of illustration, Figure 1 illustrating one form of circuit arrangement for controlling the outputs of two or more radio receivers and Fig. 2 illustrating a modified arrangement to accomplish the same end.

Referring to Fig. 1 of the drawing, a radio transmitter RT is associated with a plurality of radio receivers RR_1 and RR_2 , only two of which are shown merely for the purpose of illustration. The transmitter and the various receivers may form part of a coastal harbor radio telephone system arranged so that signals may be transmitted by an operator from a common point through the transmitter RT and signals received by the various receivers RR_1 , RR_2 , etc.

The radio receiver RR_1 is connected to one of the input circuits of a hybrid coil network HC_1 through the armatures and back contacts of a relay R_1 . Similarly, the output circuit of the radio receiver RR_2 is connected to another input circuit of the same hybrid coil network HC_1 through the armatures and back contacts of a relay R_2 . The hybrid coil network HC_1 is of the type described in Patents Nos. 1,780,962 and 1,780,963, issued November 11, 1930, to A. Bailey et al. Such a hybrid coil network may be employed to combine the outputs of the two radio receivers RR_1 and RR_2 and the combined energy may be transmitted to a receiving or other circuit, as will be described more fully hereinafter. It will be understood that the hybrid coil network referred to is but one form of combining circuit and that other combining circuits may be used instead thereof.

The output circuit of the hybrid coil network

HC₁ is connected to the input circuit of a hybrid coil network HC₂. The radio transmitter RT is connected to the output circuit of the same hybrid coil network HC₂. The tip and ring contacts of the jack J are connected to the third circuit of the hybrid coil network HC₂. A telephone circuit (not shown) of well known type is connected by means of a plug to the jack J so that telephone or other signals may be transmitted through the network HC₂ to the transmitter RT for transmission through space, while signals received at either or both of the input circuits of the network HC₂ may be received over the tip and ring contacts of the jack J by the operator's circuit connected thereto. The hybrid coil network HC₂ may be of any well known type, for example, of the familiar three-winding transformer type.

The sleeve contact of the jack J is connected to the winding of a relay R₃ in such a way that current may be transmitted through the winding of this relay whenever the plug P is inserted into the jack J. The armature of this relay connects a battery B₀ to the windings of two or more relays designated R₁₁, R₁₂, etc., through corresponding resistors Z₁₁ and Z₁₂, respectively. The terminals of the winding of relay R₁₁ are connected to the "on" and "off" contacts of a non-locking key K₁, the armature of which is grounded. Similarly, the terminals of the winding of the relay R₁₂ are connected to the "on" and "off" contacts of a non-locking key K₂, the armature of which is also grounded. The upper armatures and back contacts of relays R₁₁ and R₁₂, respectively, control the circuits of lamps L₁₁ and L₁₂, current for illuminating lamp L₁₁ being provided by battery B₁₁ while battery B₁₂ supplies the current to illuminate lamp L₁₂. A single battery may replace batteries B₁₁ and B₁₂ if so desired. The relays R₁₁ and R₁₂ are normally unoperated and, therefore, the lamps L₁₁ and L₁₂ are normally illuminated.

The upper make contact of relay R₁₁ is connected to one terminal of the winding of relay R₁, the other terminal of which is connected to a battery B₁, as shown. Similarly, the upper make contact of the relay R₁₂ is connected in circuit with the winding of relay R₂ and a battery B₂. Both relays R₁ and R₂ are normally unoperated so that both radio receivers RR₁ and RR₂ are connected to the respective input circuits of the hybrid coil network HC₁. When the relay R₁ is operated the radio receiver RR₁ is disconnected from the corresponding input circuit of the network HC₁ and an impedance Z₁ is substituted therefor. Similarly, the operation of relay R₂ will disconnect the radio receiver RR₂ from the corresponding input circuit of the network HC₁ and substitute the impedance Z₂ therefor. The impedances Z₁ and Z₂ are shown in the form of resistors merely for the sake of simplicity but may be devices having inductance, capacitance and resistance which correspond to the inductance, capacitance and resistance components in the output circuits of the receivers RR₁ and RR₂, respectively.

When a signal is received by one or more of the various radio receivers RR₁, RR₂, etc., the operator may plug the cord circuit into the jack J to receive the call. When this happens the relay R₃ will operate to connect the battery B₀ to the windings of relays R₁₁ and R₁₂ in parallel through resistors Z₁₁ and Z₁₂, respectively. The outputs of the receivers RR₁, RR₂, etc., will be combined in the network HC₁ and the combined

energy will be transmitted through the network HC₂ to the operator's circuit which is plugged into the jack J.

If the operator desires to cut off the radio receiver RR₁ he will move the armature of the key K₁ to its "off" contact momentarily. The relay R₁₁ will then be operated, current flowing from the battery B₀ through the armature and contact of relay R₃, resistor Z₁₁, the winding of relay R₁₁, the "off" contact of armature of key K₁, and ground. The operation of relay R₁₁ will open the circuit of the lamp L₁₁ at the upper back contact of this relay, at the same time connecting ground to the lower terminal of the winding of relay R₁₁ for the purpose of locking up the relay R₁₁. The closure of the upper make contact of relay R₁₁ will cause the relay R₁ to operate, current flowing from battery B₁, through the winding of relay R₁, and over the make contact and armature of relay R₁₁ and ground. The operation of relay R₁ will disconnect the radio receiver RR₁ from the circuit and replace that receiver with the impedance Z₁. In that case the signals received by the radio receiver RR₂ will be transmitted through the networks HC₁ and HC₂ to the exclusion of the signals that may be impressed upon the radio receiver RR₁.

Similarly, by moving the armature of key K₂ to its "off" contact momentarily, the radio receiver RR₂ may be disconnected from the hybrid coil network HC₁ and the impedance Z₂ substituted therefor. At the same time the lamp L₁₂ will be extinguished by the opening of the circuit of the upper back contact of the relay R₁₂ and the relay R₁₂ will be locked up by the closure of the lower make contact thereof.

If the operator desires to reconnect the radio receiver RR₁ to the hybrid coil network HC₁ he will merely throw the armature of the key K₁ in reversed direction to its "on" contact momentarily. When this happens the upper terminal of the winding of relay R₁₁ will be grounded through the "on" contact and armature of key K₁. The relay R₁₁ will, therefore, release. The lamp L₁₁ will then become reilluminated by the closure of the circuit of the upper back contact of the relay. The relay R₁ will become released upon the opening of the upper make contact of relay R₁₁ and therefore the impedance Z₁ will be disconnected from the hybrid coil network HC₁ and the receiver RR₁ substituted therefor. Similarly, by reversing the position of the armature of the key K₂ and moving it to its "on" contact momentarily, the lamp L₁₂ will become illuminated, the relay R₁₂ released, the relay R₂ released, the impedance Z₂ disconnected from the corresponding input circuit of network HC₁ and the radio receiver RR₂ substituted for the impedance Z₂.

The radio receivers RR₁ and RR₂ are the only two receivers shown in the drawing but, as already explained, other receivers may be added to the system. If two other receivers are employed they may be connected to a hybrid coil network similar to the one designated HC₁ and the output of the additional hybrid coil network combined with that of the output of the network HC₁ in still another hybrid coil network which may be connected to the three-winding coil network HC₂, as illustrated and explained in the patents to A. Bailey et al., above designated. Of course, as many more radio receivers may be connected to the system as may be found desirable.

The arrangement in Fig. 1 of the drawing

permits the output of one of the radio receivers such as RR_1 to be transmitted through the hybrid coil networks HC_1 and HC_2 to the operator's set to the exclusion of the outputs of all other radio receivers. It will be understood, also, that the output of the radio receiver RR_2 may be thus selectively transmitted to the operator's set to the exclusion of the outputs of the other radio receivers. Similarly, if three or more radio receivers are employed, the outputs of any two or more of these various receivers may be combined and transmitted through the hybrid coil network HC_2 to the operator's set while the outputs of the remaining receivers are suppressed or eliminated from the operator's circuit. When a call has been completed the operator's plug P will be removed from the jack J and all of the various radio receivers will be returned to their monitoring condition to receive signals simultaneously from any radio transmitter within the service area.

Fig. 2 illustrates a modification of the arrangement shown in Fig. 1. As in Fig. 1 relays R_{11} and R_{12} control relays R_1 and R_2 , respectively, which in turn connect the receivers RR_1 and RR_2 to the hybrid coil network HC_1 or substitute the corresponding impedances Z_1 and Z_2 respectively, for the receivers RR_1 and RR_2 .

When the operator's plug P is inserted in the jack J , relay R_3 operates so that battery B_0 may be connected through the armature and contact of the relay R_4 to the windings of relays R_{11} and R_{12} (and to other relays which may be connected to the circuit) through the corresponding resistors Z_{11} and Z_{12} , respectively. The key K_0 controls the operation of the relay R_4 . Keys K_{11} and K_{12} control the operation of relays R_{21} and R_{22} , respectively, the latter relays being associated with the corresponding relays R_{11} and R_{12} . As the relays R_{11} and R_{12} are normally unoperated, the lamps L_{11} and L_{12} are normally illuminated, as already described with respect to Fig. 1.

Before the operator's plug P is inserted into the jack J , relay R_3 is unoperated and therefore the relays R_{11} and R_{12} will be unoperated and will remain unoperated. But after the operator's plug P is inserted into the jack J and relay R_3 is operated, the relays R_{11} and R_{12} may only then be operated, and this will be described more fully hereinafter.

While the operator's plug is inserted into the jack J the key K_{11} may be closed momentarily. The relay R_{21} will then operate, current flowing from battery B_2 through the winding of relay R_{21} over the contacts of key K_{11} and ground. The operation of relay R_{21} opens the circuit of relay R_{11} at the back contact of relay R_{21} , thereby preventing the operation of relay R_{11} . The release of relay R_{11} will cause the lamp L_{11} to be illuminated or to remain illuminated if previously in this condition. At the same time the armature of relay R_{21} becomes grounded at its "make" contact and causes the operation of relay R_{12} , current for the relay R_{12} being provided by the battery B_0 connected to the contact of relay R_3 the current flowing over the armature and contact of relay R_4 through resistor Z_{12} , over the winding of relay R_{12} , the armature and back contact of relay R_{12} , the armature and back contact of relay R_{22} , the armature and make contact of relay R_{11} and ground. Hence relay R_{12} will operate and its operation will cause the relay R_2 to operate, which in turn will disconnect the receiver RR_2 from the input circuit of the hybrid coil network HC_1 and replace the receiver RR_2

with the impedance Z_2 . Thus the operation of key K_{11} will remove the radio receiver RR_2 from the circuit as well as all other receivers except the radio receiver RR_1 .

The operation of key K_{12} will cause the operation of relay R_{22} , current flowing from battery B_2 , through the winding of relay R_{22} , over the contacts of key K_{12} and ground. The operation of relay R_{22} will open the circuit of relay R_{12} at the back contact of relay R_{22} so that relay R_{12} will remain unoperated. The lamp L_{12} will therefore be illuminated. The release of relay R_{12} will cause the receiver RR_2 to be connected to the input circuit of the network HC_1 . The operation of relay R_{22} will place ground on the "make" contact of the relay and cause relay R_{11} to operate. The current for relay R_{11} is supplied by battery B_0 through the contact and armature of relay R_3 , over the armature and contact of relay R_4 , resistor Z_{11} , the winding of relay R_{11} , the armature and back contact of relay R_{11} , the armature and make contact of relay R_{22} and ground. The closure of the make contact of relay R_{11} will connect ground to the lower terminal of the winding of this relay and lock up the relay. The operation of relay R_{11} will cause the operation of relay R_1 , as in the case of Fig. 1, and disconnect the radio receiver RR_1 from the hybrid coil network HC_1 and substitute the impedance Z_1 for the radio receiver RR_1 . Thus the operation of key K_{12} will disconnect the receiver RR_1 from the circuit as well as all other receivers except the radio receiver RR_2 .

It has thus been shown that the closure of key K_{11} causes the operation of relays R_{21} and R_{12} and allows the relay R_{11} to remain unoperated, this condition being indicated by the illumination of lamp L_{11} . It has also been shown that the operation of key K_{12} causes the operation of relay R_{22} and relay R_{11} , causing the relay R_{12} to remain unoperated, this condition being indicated by the illumination of lamp L_{12} .

If the operator's plug P should remain locked in the jack J and if it is desired to have all of the radio receivers connected to the operator's set, it is only necessary to operate the key K_0 . The operation of key K_0 will cause the operation of relay R_4 , current flowing from battery B_4 through the winding of relay R_4 over the contacts of key K_0 and ground. The operation of relay R_4 will disconnect the battery B_4 connected over the contact and armature of relay B_3 from the windings of relays R_{11} , R_{12} , etc. The relays R_{11} and R_{12} will therefore be unable to operate and therefore the receivers RR_1 and RR_2 will be connected to the hybrid coil network HC_1 . After the operator's plug P has been removed from the jack J , relay R_3 is released and the operation of key K_0 will, of course, serve no useful purpose because no current may then be supplied to the windings of relays R_{11} and R_{12} .

The circuit arrangements illustrated in Figs. 1 and 2 of the drawing have been applied to the selection of the radio receiving circuits whereby one of the radio receivers will be selected and connected to the circuit and all other radio receivers disconnected from the circuit. It will be clear, of course, that the arrangements may be employed for the selection of devices other than radio receivers, for example, detectors or other devices or circuits.

While this invention has been shown and described in certain particular arrangements merely for the purpose of illustration, it will be un-

derstood that the general principles of this invention may be applied to other and widely varied organizations without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. In a signaling system, the combination of a plurality of radio receivers located at different points and wired to a common receiving circuit where said receivers simultaneously monitor a distant station, each receiver being adjusted for receiving the same signals from said distant station, means for selecting one of said receivers and for observing its output and for disconnecting all of the other receivers from the receiving circuit, means for indicating which of the various receivers has been selected by the selecting means, and means for subsequently reconnecting all of said radio receivers to the common receiving circuit so that the outputs of all of said receivers may again be received by said common circuit.

2. The combination of a plurality of radio receivers all adapted to receive and monitor the same signals, an operator's set with which all of the radio receivers may be connected for simultaneously receiving the outputs of all of said receivers, means for selecting the receiver delivering the best output and for connecting the selected receiver to the operator's set, said means also including means for simultaneously disconnecting all of the remaining radio receivers from the operator's set, and means for subsequently reconnecting all of said radio receivers to the operator's set.

3. The combination of a plurality of radio receiving circuits all of which are simultaneously monitoring a distant station, an operator's set to which all of the receivers may be simultaneously connected so that the outputs of all of said receivers may be simultaneously received, means for selecting the radio receiver delivering the best signals and for disconnecting all other radio receivers from the operator's set, and a plurality of indicating devices each corresponding to one of the radio receivers for indicating which one of the various receivers is connected to the operator's set.

4. The combination of a plurality of radio receivers all of which may be tuned to simultaneously receive signals from a distant station, a telephone circuit to which all of the radio re-

ceivers may be connected so that the outputs of all of said receivers may be simultaneously received, means for combining the outputs of certain of said receivers for transmission to said telephone circuit and for disconnecting all of the remaining receivers from the telephone circuit, and indicating means for indicating which of the various radio receivers are connected to the telephone circuit.

5. In a signaling system, the combination of a plurality of receiving circuits all employed for simultaneously monitoring a distant mobile station, a telephone circuit, a combining network interconnecting all of the receiving circuits with the telephone circuit so that the outputs of all of the receiving circuits may be translated into audible signals, means for disconnecting from the combining network certain of said receiving circuits so that the outputs of the remaining receiving circuits will be additively combined in the combining network, and means for subsequently reconnecting all of the receiving circuits to the combining network for further monitoring the distant mobile station.

6. The combination of a plurality of receiving circuits, a plurality of impedance elements, each impedance element corresponding to one of the receiving circuits, a combining network, means for connecting all of the receiving circuits to the combining network, means for disconnecting all of the receiving circuits from the combining network except one and for replacing each disconnected receiving circuit with the corresponding impedance element, and means for subsequently disconnecting all of the various impedance elements and for reconnecting all of the various receiving circuits to the combining network.

7. In a signaling system, the combination of a plurality of interconnected radio receivers for simultaneously monitoring one or more mobile stations that may be transmitting signals, means for selecting that one of said receivers delivering the best output and observing its output and for disconnecting all other of said receivers from the interconnecting circuit, means for transmitting signals to the mobile station from which signals are being received, and means for subsequently reconnecting all of said receivers for again monitoring said mobile stations.

OTTO T. LAUBE.