

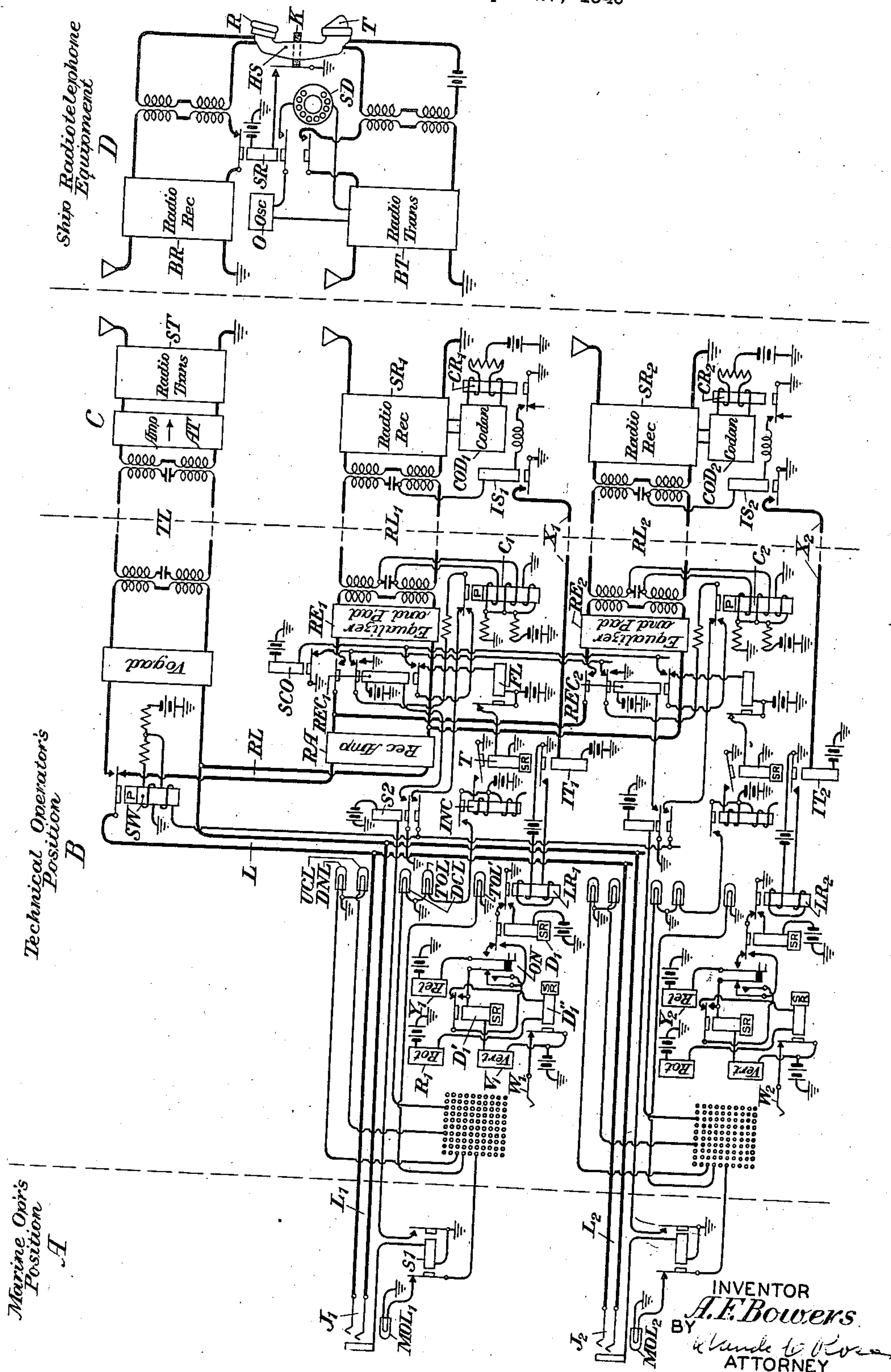
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RADIO TELEPHONE SYSTEM

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RADIO TELEPHONE SYSTEM

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This invention relates to radio systems, and particularly to radio telephone systems adapted for communication between ships and points ashore.

In such systems, it is frequently the practice to only transmit the carrier wave in a given direction when talking in that direction, the so-called "cut carrier" method of operation. This method of operation permits the use of a relatively simple scheme for signaling the shore station. If, in such a system, the ship operator desires to call the shore station (or stations, where more than one shore station is provided), he may do so, simply by causing the carrier to be sent from ship to shore. The carrier, when received by the shore station, causes a lamp or other signal to be actuated at the technical operator's position and at the shore traffic operator's position, sometimes referred to as the marine operator's position. In a system operating according to this plan, each time the ship subscriber talks the transmission of the carrier necessary for this purpose would result in re-actuating the signal. The circuit is therefore so arranged that when the marine operator ashore answers the call, the signal lamp or other signaling device will be rendered inoperative so it does not respond to future transmissions of the carrier as long as the connection remains established during the establishment of the connection.

This method of signaling has involved the difficulty in practice that false operation of the signal lamps at the positions of the marine operator and technical operator occurs in response to interfering frequencies which happen to fall within the band accepted by the shore receivers' range of the communication system. To some extent this difficulty may be reduced by narrowing the band to which the signal-actuating apparatus is responsive. But even so, false operation of the signal frequently occurs, due to interfering stations sending out harmonics which happen to fall within the narrow band through which is passed the carrier of the system in question. This false operation of the signal at the marine operator's position causes the operator to plug in frequently to answer calls that are non-existent, thus increasing the amount of work that the operator must do.

In accordance with the present invention it is proposed to overcome this difficulty by providing the subscriber at the ship station with a code-sending device such as a dial, so that when he sends his carrier to the shore station he may

interrupt it in accordance with a code. At the shore station, equipment including a selective switch is then provided so that the marine operator's signal will only respond to successions of carrier spurts corresponding to the code. Continuous interference or occasional spurts of interfering current will therefore be less apt to cause false operation of the signal. The dial need only be used at the beginning of the call because the operator extinguishes the signal as soon as she plugs in to answer the call.

Since a selective switch is provided at the shore station to operate the signal in response to dialing, different codes may be used to operate other signals in addition to the one to the marine operator. For example, another code may be used to signal the technical operator, if desired. In addition there are several special signals such as distress calls, urgent calls and calls indicating dangers to navigation that may be made by merely dialing other suitable codes to operate special lamps or other signals indicating such special calls.

The invention may now be more fully understood from the following description, when read in connection with the drawing, in which a schematic layout of a ship-to-shore radio telephone system embodying the invention is illustrated.

In the drawing, the marine operator's position ashore is shown at A and the apparatus at the technical operator's position is illustrated at B. The shore radio transmitting and receiving equipment is usually at some distance from the operators' positions and is illustrated at C. The equipment aboard ship is indicated schematically at D.

The apparatus at station D includes a radio receiver BR, normally conditioned to receive, and a radio transmitter BT, which is normally inoperative. As the radio receiver and radio transmitter are well known types of apparatus, they are schematically represented in the diagram as simple boxes. A handset HS is also provided, the receiver R of the handset being connected through a transformer to the output of the radio receiver BR. Likewise the transmitter T of the handset is connected through a transformer to the input of the radio transmitter BT. An oscillator O is associated with the radio transmitter BT and forms a part thereof. The purpose of the oscillator is to supply the carrier frequency and it is normally disabled so that the carrier frequency is only sent out when the radio transmitter is used in talking from ship to shore.

A push button K is provided on the handset,

and a relay SR, controlled by the push button, exercises control over the circuits of the radio receiver, radio transmitter and oscillator by means of its contacts. Normally the relay SR is deenergized and the circuit of the radio receiver is rendered operative at the upper back contact of the relay. When, however, it is desired to call the operator or speak into the transmitter T, the push button K is operated to energize the relay SR, which at its upper contact opens the circuit of the radio receiver and thereby disables it, while at the same time the lower front contact of the relay SR closes the circuit of the radio transmitter BT. Likewise the middle front contact of the relay SR closes the circuit of the oscillator O so that the carrier current is now supplied to the radio transmitter. By merely manipulating the key K the talker can disable the radio receiver and render the radio transmitter operative while he talks, and upon releasing the key the condition is reversed so that the radio transmitter is disabled and the receiver is placed in operative condition to receive talk coming from the shore station.

As will appear later, this switching operation, with its consequent control of the carrier, is used at the shore station to alternately permit transmission to and from the radio transmitter and radio receiver respectively. This control is effected in such a way that the radio receiver ashore is normally conditioned to receive and the path to the transmitter is disabled. When no carrier is being sent out by the ship station the operator ashore may, by plugging in, condition the transmitter so that the ship may be signaled. If the land station is not calling, however, the receiver ashore will receive the carrier sent out from the ship when its operator actuates the key K to call. After the call has been answered by the shore operator and the carrier sent out from the ship ceases, the normal condition is reversed and the radio transmitter ashore is put in operative condition and the receiver disabled. Thus it is evident that the switching operation between radio transmitter and radio receiver, both aboard ship and on shore, is under the direct control of the key K on shipboard.

The radio transmitting and receiving apparatus ashore is indicated schematically at C. The system illustrated by way of example is a telephone system adapted for communication with ships operating within a limited area such as a harbor, and includes a single radio transmitter ST, which may be of any known type and is illustrated as a simple box. A voice frequency amplifier AT is associated with the radio transmitter ST. This equipment is connected by means of a wire line TL to switching, signaling and controlling apparatus at the marine operator's position A and the technical operator's position B. Although the ship moves about so that it is in different positions both as to direction and distance with respect to the radio transmitter ashore, it has been found that a single transmitter, located at a fixed position, is sufficient for transmission from the shore to a ship at any reasonable location.

Since it is not always possible to use a high power transmitter on board ship, it is desirable to have several receiving stations located at different convenient points along the shore, so that in transmitting from ship to shore the nearest convenient shore receiving station can be used. Consequently at C two radio receivers, SR₁ and

SR₂, are schematically shown. These receivers are of a known type and are therefore illustrated by block diagrams. It will be understood, of course, that more than two radio receivers may be provided if desired. These receivers SR₁ and SR₂ are connected by means of lines RL₁ and RL₂, respectively, with the apparatus at the technical operator's position.

Each radio receiver ashore is provided with a codan (shown schematically at COD₁ and COD₂). The codan is of a known type and is therefore shown as a simple block. It receives its name from the fact that it is a carrier operated device which is as unresponsive as possible to noise, the name codan being formed from the initial letters of the phrase "carrier operated device anti-noise." The normal function of the codan is to insert a high loss in the output of the radio receiver with which it is associated when no carrier signal is being received. As this is a function with which the present invention is not concerned, such controlling apparatus, which is well known in the art, is not illustrated.

Each codan is provided with a so-called codan relay illustrated at CR₁ in the case of receiver SR₁, and at CR₂ in the case of receiver SR₂. The codan relay may have two windings, one of these windings being responsive to a rectified current resulting from the selected carrier, and the other being responsive to a rectified current resulting from noise. The circuit of the codan which controls the carrier responsive winding may be made sharply selective to the carrier while circuit controlling the noise responsive winding is made receptive to all frequencies within the side-band range except in the immediate vicinity of the carrier. The result is that the codan relay has its armature thrown in one direction by means of the rectified noise currents when no carrier is being received. When, however, the carrier current comes in and is rectified, the rectified current in the carrier responsive winding of the codan relay causes the latter winding to predominate in its effect over the other winding and swing the armature of the relay to the opposite position. As shown, when the codan relay pulls up in response to the reception of carrier, its armature connects ground to a simplex circuit extending over the line RL₁ or RL₂ as the case may be, connecting the radio receiver to the technical operator's position.

The current thus transmitted over the simplex circuit is used at the technical operator's position to perform various functions, including the actuation of a signal at the technical operator's position. Also it has been the practice, prior to the present invention, to use this current to actuate the signal lamp at the marine operator's position A. In accordance with the present invention, however, a relay IS₁ is included in the simplex circuit operated by the codan relay which establishes an auxiliary circuit (X₁ in the case of radio receiver SR₁) leading to the technical operator's position, where the circuit may be used to effect the setting of a switch under the control of the dial aboard ship, as will be described later.

An example of apparatus for switching, signaling and otherwise controlling the transmission circuits is located at A and B—principally at the latter position. A common transmission path or line L may be provided and this may be switched to a transmitting line TL leading to the radio transmitter ST or to a receiving path RL leading to a receiving amplifier RA, the input of which

is branched to each of several lines RL₁, RL₂, etc., leading to individual radio receivers such as SR₁ and SR₂. The line L may be optionally switched to the transmission path TL or the receiving path RL under the control of a polar relay SW, which is under the control of the push button K at the ship station D. The transmitting path TL may also include a so-called vogad for automatically adjusting the gain of the transmission path in a manner well known in the art, its name being derived by using the initials of the expression "voice operated gain adjusting device." This device is well known and, as it is not concerned with the present invention, is illustrated by a conventional box or rectangle.

As already stated, the input of the receiving amplified RA in the receiving path RL may be branched to several transmission paths leading to individual radio receivers. Each of these paths may include an equalizer and pad network of well known type, illustrated at RE₁ and RE₂. The present invention is not concerned with the details of these pieces of equipment and, as they are well known, they are merely represented symbolically.

A polar relay C₁ is associated with the path RL₁ and a similar relay C₂ is associated with the path RL₂. Each of these relays has a lower biasing winding. The upper winding in each case is connected to the simplex circuit previously described as controlled by the codan relays CR₁ and CR₂. The middle winding is connected to another simplex circuit with which we are not here concerned, so that it has not been illustrated. For purposes of the present invention it is sufficient to know that when the codan relay CR₁, for example, connects ground to the simplex circuit associated with the upper winding of the polar relay C₁, the armature of said relay will be shifted from its back contact to its front contact to produce certain effects which will be described in more detail later.

One of these effects is to cause the operation of the technical operator's lamp TOL when the carrier (or interference) causes the operation of the codan relay. In systems of the prior art the actuation of the relay C₁ also energized the signal lamp at the marine operator's position to apprise the operator that an incoming call was being made from the ship at D. Since, however, the codan sometimes operated in response to interference, false signals would be received by the marine operator and to avoid this the marine operator's call lamp MOL₁ and MOL₂ are actuated by a dial-controlled switching arrangement about to be described. Whether the lamp MOL₁ or the lamp MOL₂ is to be used depends upon which one of the receivers SR₁ or SR₂ is close enough to the ship at D to receive its signal.

While any suitable dial-controlled switch may be utilized, the switch herein illustrated is of the up-and-around type frequently used in step-by-step automatic switching systems. The switches which control the lamps MOL₁ and MOL₂, respectively, are separately controlled through the radio receivers SR₁ and SR₂. As they are identical, however, only one need be described. The switch which is controlled from the receiving radio receiver SR₁, for example, comprises a wiper W₁ shown at position B, which, under the control of a vertical stepping magnet V₁, may be stepped vertically to the level of any one of ten banks of contacts, each having ten contacts in each bank. This action is taken by the switch in response to the first digit sent

by the dial SD at the ship station D. In response to the second digit dialed, the wiper W₁ will be rotated step-by-step by the rotary magnet R₁ to a particular contact in the vertical row or level to which the wiper has been previously elevated.

As shown, if the number 50 is dialed, the first five impulses will elevate the wiper W₁ to the fifth row of contacts, and the succeeding ten impulses will rotate the wiper to the tenth contact in that row to complete the circuit of the marine operator's lamp MOL₁, thereby indicating that a call has come in. When the train of carrier waves sent out from the ship comes to an end the release magnet Y₁ restores the switch to normal in a well-known manner. The stepping of the switch is controlled by relay IT₁, connected to an auxiliary circuit X₁ leading to the distant radio receiver SR₁ and operated by the relay IS₁ under the control of the codan relay CR₁. A similar relay IT₂, controlling the switch associated with the path L₂, is operated over an auxiliary circuit X₂ from the radio receiver SR₂.

The marine operator is provided with jacks J₁ and J₂ for completing the connection in the case of a call signal received from either of the radio receivers illustrated, it being understood that any desired number of radio receivers may be employed, in which case there will be an additional jack for each additional receiver. If the dial signal is received by the radio receiver SR₁ so that the marine operator's lamp MOL₁ is actuated, the marine operator will plug in to the jack J₁. If, on the other hand, the signal is received from the radio receiver SR₂, the operator will go in on the jack J₂.

As soon as the operator plugs in, the sleeve relay S₁ is operated to disable the signal lamp. The relay S₁ may also be provided with an extra contact to open the circuit by which relay IT₁ operates relay LR₁, thus preventing operation of the switch during conversation. Relay S₁ also actuates a secondary relay S₂. The latter in conjunction with the polar relay C₁ controls certain switching operations which will be more fully described later. By one of these switching operations the common receiving circuit RL is extended to the receiving branch path circuit leading to the radio receiver which is receiving the signal from the ship. Another of these switching operations, which is ultimately controlled by the push button K at the ship station, is the switching of the common path L between the transmitting path TL and the receiving path RL. The relay REC₁ completes the connection from the common receiving path RL to the individual receiving path RL₁, and the corresponding relay associated with the receiving path RL₂ will (in case the signal is being received from the radio receiver SR₂) connect the common receiving path RL to the individual receiving path RL₂.

Further details of the system will be better apprehended from a description of the operation, which is as follows:

Let us suppose that the ship at D is located nearer to the radio receiver SR₁ than to the radio receiver SR₂. In the normal condition of the circuit the polar relay SW is actuated only by its upper or balancing winding and holds its armature in such a position as to close the connection from the common path L to the common receiving path RL, the transmitting path TL being disconnected from the common path L. At the ship station, in the normal condition of

the circuit, the push button K is not actuated and consequently the relay SR is deenergized, so that the radio receiver BR is in receiving condition. When this condition obtains, the radio transmitter BT is disabled.

If, now, some one aboard ship desires to telephone, he presses the push button K and operates the dial SD to dial the combination which will operate the marine operator's line lamp. In the instance illustrated, this will be accomplished by dialing 50. As soon as the push button is operated the relay SR is energized to open the circuit of the radio receiver BR and close the circuit of the radio transmitter BT. At the same time it also closes the circuit of the oscillator O to supply the carrier to the radio transmitter. The carrier, upon being transmitted, will be received by the radio receiver SR₁ and will operate the codan relay CR₁, which in turn completes a circuit through the relay IS₁ over the lower side of the path RL₁ to the upper winding of the polar relay C₁. This causes the polar relay C₁ to shift its armature to its lower contact. This completes a circuit for the relay FL from battery through said relay over the lower back contact of the relay REC₁, front contact of polar relay C₁, upper back contact of relay REC₁, and back contact of relay SCO to ground. Relay FL opens the circuit of normally energized slow release relay T, which completes a circuit through the upper winding of the relay INC. Relay INC completes the circuit for the lamp TOL at the technical operator's position.

In circuits employed prior to the present invention the connection above described was extended also to the marine operator's lamp MOL₁. With the circuit wired in accordance with the present invention, any condition that operates the codan relay CR₁ will operate the lamp TOL at the technical operator's position, whether it be the ship calling or an interfering condition, but the marine operator's lamp MOL₁ will not be operated.

In accordance with the present invention, it is necessary for the caller at D to do something more than merely press the key K in order to call the marine operator at A. After depressing the key K the caller must next operate the dial SD to interrupt the carrier in accordance with a code. In the present instance it will be assumed that the code dialed is 50. This will first interrupt the carrier five times. The fifth interruption is followed by a spurt of carrier, and then the carrier is interrupted ten times in succession. It will be noted that when the carrier is sent out by depressing the key K, the codan relay CR₁ operates the relay IS₁. This in turn completes a circuit from ground over the front contact of said relay and over the conductor X₁ (which may be a simplex circuit derived from a spare pair), and through the winding of the relay IT₁ to battery. Relay IT₁ completes a circuit for the pulsing relay LR₁, which at its front contact completes a circuit for the slow release relay D₁, which will be held up during interruptions of the carrier due to dialing. A circuit is prepared for the vertical magnet V₁ over the front contact of the slow release relay D₁, but this circuit is not completed so long as the carrier remains uninterrupted.

When the dial SD is operated, the first interruption of the carrier causes a momentary release of the relay IS₁ at C, with the consequent release of the relay IT₁ at B. The armature of the pulsing relay LR₁ falls off and completes a

circuit over its back contact from ground, over the front contact of slow release relay D₁, over the normal left-hand contact of the off-normal switch ON, through slow release relay D₁' and through the vertical relay V₁ to battery. The pulse through the vertical magnet V₁ lifts the wiper W₁ one step, bringing it on a level with the first row of contacts. At the end of the impulse the armature of the pulsing relay LR₁ is again drawn up and is followed by the second interruption of the carrier, which again causes the armature of relay LR₁ to fall back and complete a circuit from ground over the back contact of said relay, over the front contact of the relay D₁ and over the left-hand alternate contact of the off-normal switch (ON), and thence over the front contact of slow release relay D₁', through the winding of relay D₁' and through the vertical magnet V₁ to battery. This second pulse through the vertical relay elevates the wiper W₁ another step. It will be noted that the pulsing circuit for the vertical magnet V₁ is now completed over the front contact of the slow release relay D₁', which remains energized during pulsing interruptions of the carrier. Successive interruptions of the carrier in dialing the digit 5 send additional pulses over the back contact of the pulsing relay LR₁ and through the vertical magnet V₁, over the circuit just described, thus stepping the wiper W₁ to the fifth row of contacts of the switch.

At the end of the fifth interruption the carrier is transmitted for a longer time than during the periods between dialing impulses and this permits the slow release relay D₁' to fall off so that its armature is on its back contact. When the caller at station D dials the first interruption of the ten impulses representing zero, the first interruption causes the pulsing relay LR₁ to fall off as before. This time it completes a circuit from ground, over the front contact of the slow release relay D₁, over the left hand alternate contact of the off-normal switch ON, over the back contact of the slow release relay D₁', through the slow release relay D₁' and through the rotary magnet R₁ to battery. The slow release relay D₁' opens the circuit from battery to the wiper W₁ during the rotary stepping operation and holds it open until the end of the series of interruptions due to dialing. This first impulse through the rotary magnet R₁ steps the wiper W₁ horizontal to the first contact in the fifth row, and successive interruptions of the carrier, due to dialing, successively advance this wiper horizontally until it rests upon the last contact of the fifth row.

At the end of the dialing operation the slow release relay D₁' falls off and a circuit is completed from battery over the back contact of said relay, over the wiper W₁ and the tenth contact in the fifth row, and over the back contact of the relay S₁ to the lamp MOL₁, causing the lamp to glow to apprise the marine operator that a call has come in. If desired another lamp, located at the technical operator's position, may be used in parallel with the lamp MOL₁ beyond the left-hand armature of relay S₁, so that the technical operator's position will be signalled also by this dialing operation. It will be noted that the slow release relay D₁ is maintained energized from the time the carrier is applied at station D through all of the momentary interruptions due to dialing, until such time as the carrier is interrupted by releasing the key K.

As soon as the marine operator notes that the

lamp MOL₁ is glowing, she knows that a call has come in through the radio receiver SR₁. Of course, had the call come in through the radio receiver station SR₂, the dialing operation would have actuated the wiper W₂ associated with the circuit L₂ and would have caused the lamp MOL₂ to glow, which would have indicated a call from the radio receiver SR₂. The operator now plugs into the jack J₁, thus operating the relay S₁ over the sleeve circuit. At its left-hand armature the relay S₁ opens the circuit of the signal lamp MOL₁ and at its right-hand front contact it completes a circuit through the relay S₂.

Relay S₂ at its upper front contact completes a circuit from ground through the winding of relay REC₁ which at its upper contact extends the circuit RL to the branch circuit RL₁ leading to the output of radio receiver SR₁. At its middle contact relay REC₁ shifts the ground connection for the armature of the polar relay C₁ from the back contact of the relay SCO to the front contact of the middle armature of relay REC₁. At its lower front contact relay REC₁ opens the circuit of relay FL which, acting through relays T and INC, opens the circuit of the lamp TOL at the technical operator's position. The lower armature of the relay REC₁ at its front contact completes the circuit from ground over its middle front contact, over the front contact of the polar relay C₁ (carrier now being received so that this relay is actuated), over the lower front contact of relay REC₁, and through the winding of relay SCO, which latter relay is operated.

This condition obtains so long as the push button K is actuated by the caller at station D. Consequently, from the time the operator answers the call at jack J₁ until the push button is released the relay REC₁ maintains a connection from the common receiving circuit RL, over the upper front contact of the relay REC₁, to the receiving circuit RL₁ connected to the radio receiver SR₁ at station C. The relay corresponding to REC₁, associated with the receiving circuit RL₂ is not actuated, and consequently the latter circuit is not connected to the common receiving circuit RL. It will also be noted that the circuit through the lower winding of the polar relay SW is held open by the polar relay C₁ because its armature is on its front contact so long as the carrier persists. Consequently, the radio receiver SR₁ is during this period connected over the receiving circuit RL₁ through the equalizer pad RE₁ over the upper front contact of the relay REC₁, through the receiving amplifier RA, over the common receiving circuit RL, and over the lower or front contact of the polar relay SW, and thence over the common circuit L to the branch L₁ of said circuit leading to the jack J₁. The operator is now able to hear anything said by the caller at station D.

In order that the caller at station D may know that the operator is asking him for information as to the connection desired, he must, as soon as he has dialed the operator, release the push button K, thus disabling his transmitter BT and putting his radio receiver BR in operating position. This is done through the release of the relay SR. The consequent interruption of the carrier at the radio transmitter BT causes the codan relay CR₁ to fall off and release the relay IS₁ at C and open the circuit through the upper winding of the polar relay C₁ at B. Polar relay C₁ now shifts its armature to its upper back

contact and thereby completes a circuit from ground over the middle front contact of relay REC₁, over the upper contact of the polar relay C₁, over the lower contact of relay S₂, and through the lower winding of the polar relay SW to battery. This shifts the armature of the polar relay from its lower contact to its upper contact, thereby opening the receiver connection through RL and completing the connection from the jack J₁, over the circuit L₁, common circuit L, and over the transmitting circuit TL to the radio transmitter ST. The operator is now able to talk to the caller at D from the radio transmitter ST through the radio receiver BR.

The release of the relay IS₁, just referred to, and which resulted from the release of the key K at D, disconnects ground from the circuit X₁ and thereby causes the release of the relay IT₁. This in turn releases the pulsing relay LR₁, whose armature is restored to its back contact, and as soon as the slow release relay D₁ releases, a circuit is completed from ground over the back contact of the pulsing relay LR₁, over the back contact of the relay D₁, over the right-hand contact of the off-normal switch ON, through the release magnet Y₁ to battery. The release magnet now restores the switch wiper W₁ to normal so that switching apparatus is now ready to respond to a new dialing operation.

The caller at D, having heard the operator challenge his call, now pushes the button K, with the result that the relay SR disables his radio receiver BR and applies carrier to his radio transmitter. This operates the codan relay CR₁, and again completes the circuit from ground through the relay IS₁ and over the simplex circuit of the pair RL₁, through the upper winding of the polar relay C₁. Polar relay C₁ now shifts its armature to its lower or front position and this opens the circuit of the lower winding of the polar relay SW. The relay SW accordingly shifts its armature to its lower contact and the circuit from the jack J₁ is now shifted from the transmitting line TL to the receiving line RL₁ and the caller is able to talk to the operator.

After the operator has completed the connection the caller may talk to the party with whom he is connected by operating the key K to transmit the carrier and releasing the key whenever he wishes to hear the response of the called party.

The relay REC₁ of course remains operated so long as the connection is established at the jack J₁. When the called party hangs up his receiver, the operator may receive a disconnect signal and withdraw the plug from the jack J₁. This releases the relay S₁, which in turn releases the relay S₂. Relay S₂, upon being restored to normal, opens the circuit of the relay REC₁, which releases and opens the circuit of relay SCO so that the apparatus is restored to normal.

It will, of course, be evident that when no call is being sent out from the ship station at D and with the apparatus at stations A and B in normal condition, the circuit L will be conditioned to receive, as the lower winding of the polar relay SW will be open-circuited at the contacts of the relay S₂ and corresponding relays. The biasing winding of said relay SW will therefore pull the armature to its lower contact, completing the circuit from the path L to the path RL. Under these conditions the marine operator at A may at any time signal the ship by plugging into the jack J₁, thus energizing relays S₁ and S₂ in succession, so that a circuit is completed

from ground over the back contact of relay SCO, over the middle back contact of the polar relay C₁, the upper or back contact of the polar relay C₁, and over the lower front contact of relay S₂ through the lower winding of the polar relay SW. The current through the lower winding of the polar relay SW will shift its armature so that the path L will be connected to the transmitting path TL. The operator may now signal over the path TL by signaling equipment (not shown) and can, of course, talk over said path and through the radio transmitter ST at station C and radio station BR at station D in an obvious manner.

The dial equipment at ship station D and the step-by-step switching equipment at station B may be utilized for other purposes than those already described. For example, with the circuit as shown, the ship operator can send a signal to indicate dangers to navigation by dialing 80. This will cause the wiper W₁ (or W₂ as the case may be) to be elevated to the eighth row of contacts and stepped around to the tenth contact in that row, thus completing a circuit for the lamp DNL at the technical operator's position, and, if desired, other lamps may be connected to the same circuit located at other positions where it is desired that this signal shall appear. An urgent call may be indicated by dialing 07, which requires ten interruptions and will step the switch wiper W₁ to the tenth row, and the seven impulses following will step it around to the seventh contact in that row, completing the circuit in the urgent call lamp UCL. This lamp, and other lamps on the same circuit may be wired to appear at any desired point. A distress call may be made by dialing 03, in which case the wiper W₁ will be stepped up in the tenth row and the third contact in that row, completing the circuit of the distress call lamp DCL, which likewise may be wired to appear at any desired point. If it is desired to dial the technical operator directly without calling the marine operator a lamp TOL' may be actuated by dialing the code 70, for example.

Instead of lamps it will be understood that audible signals such as gongs may be used, or if preferred, both gongs and lamps may be employed.

What is claimed is:

1. In a ship shore radio telephone system, a land radio station having paths from a common terminal to a normally disabled radio transmitter and to a radio receiver normally conditioned for operation, means operable at will to extend said common terminal to a land circuit, a ship station having a normally disabled radio transmitter and a radio receiver normally conditioned for operation, means at said ship station to disable the radio receiver thereat and to condition said radio transmitter at the ship station to send out a carrier wave, means at said land station conditioned by the extension of a connection from the common terminal of said land radio station to a land circuit to maintain the radio transmitter at the land station in disabled condition only when the carrier frequency is being received from the ship station, and operable only when so conditioned to disable the radio receiver at the land station and to condition the radio transmitter thereat for operation when no carrier is transmitted from the ship station, a supervisory signal device at the common terminal of said land station, and means to inter-

rupt the carrier from the ship station in accordance with a code, said supervisory signal device at said common terminal being actuated only in response to said code.

2. In a ship shore radio telephone system, a land radio station having paths from a common terminal to a normally disabled radio transmitter and to a radio receiver normally conditioned for operation, means operable at will to extend said common terminal to a land circuit, a ship station having a normally disabled radio transmitter and a radio receiver normally conditioned for operation, means at said ship station to disable the radio receiver thereat and to condition said radio transmitter at the ship station to send out a carrier wave, means at said land station conditioned by the extension of a connection from the common terminal of said land radio station to a land circuit to maintain the radio transmitter at the land station in disabled condition only when the carrier frequency is being received from the ship station, and operable only when so conditioned to disable the radio receiver at the land station to condition the radio transmitter thereat for operation when no carrier is transmitted from the ship station, a signal means at the land station responsive to a current of carrier frequency from the ship station or from an interfering station to produce a signal at the land station, a supervisory signal device at the common terminal of said land station, means to interrupt the carrier from the ship station in accordance with a code, and means at the land station responsive to the code but unresponsive to interference to actuate said supervisory signal device at said common terminal.

3. In a ship shore radio telephone system, a land radio station having paths from a common terminal to a normally disabled radio transmitter and to a radio receiver normally conditioned for operation, means operable at will to extend said common terminal to a land circuit, a ship station having a normally disabled radio transmitter and a radio receiver normally conditioned for operation, means at said ship station to disable the radio receiver thereat and to condition said radio transmitter at the ship station to send out a carrier wave, means at said land station conditioned by the extension of a connection from the common terminal of said land station to a land circuit to maintain the radio transmitter at the land station in disabled condition only when the carrier frequency is being received from the ship station, and operable when so conditioned to disable the radio receiver at the land station and to condition the radio transmitter thereat for operation when no carrier is transmitted from the ship station, a signal means at the land station responsive to a current of carrier frequency from the ship station or from an interfering station to produce a signal at the land station, a supervisory signal device at the common terminal of said land station, means at the ship station to interrupt the carrier sent out from the ship station in accordance with a code, a selective arrangement at the land station arranged to actuate said supervisory signal in response to the carrier frequency from the ship when interrupted in accordance with a particular code, but not actuating said signal in response to steady carrier, or carrier interrupted by a different code, or in response to interference.

4. In a ship shore radio telephone system, a land radio station having a normally disabled radio transmitter and a plurality of radio receivers each normally conditioned for operation, a short controlling and switching point at which connections may be completed from a land circuit to said transmitter and from any of said receivers to said land circuit, a ship station having a normally disabled radio transmitter and a radio receiver normally conditioned for operation, means at said ship station to disable the radio receiver thereat and to condition said radio transmitter at the ship station to send out a carrier wave, means conditioned by the extension of a connection to a land circuit through said controlling and switching point to maintain the radio transmitter at the land station in disabled condition only when the carrier frequency is being received by one of said radio receivers at the land station, and operable only when so conditioned to disable all of said radio receivers at the land station and condition the radio transmitter thereat for operation when no carrier is transmitted from the ship station, a supervisory signal device at said switching point, and means to interrupt the carrier from the ship station in accordance with a code to actuate said supervisory signal device at said switching point.

5. In a ship shore radio telephone system, a land radio station having a normally disabled radio transmitter and a plurality of radio receivers each normally conditioned for operation, a shore controlling and switching point at which connections may be completed from a land circuit to said transmitter and from any of said receivers to a land circuit, a ship station having a normally disabled radio transmitter and a radio receiver normally conditioned for operation, means at said ship station to disable the radio receiver thereat and to condition said radio transmitter at the ship station to send out a carrier wave, means conditioned by the extension of a connection to a land circuit through said controlling and switching point to maintain the radio transmitter at the land station in disabled condition only when the carrier frequency is being received by one of said radio receivers at the land station, and operable only when so conditioned to disable all of said radio receivers at the land station and condition the radio transmitter thereat for operation when no carrier is transmitted from the ship station, a signal means at the land station responsive to a current of carrier frequency from the ship station or from an interfering station to produce a signal at the land station, a supervisory signal device at said switching point, means to interrupt the carrier from the ship station in accordance with a code, and means at the land station responsive to the code but unresponsive to interference to actuate said supervisory signal device at said switching point.

6. In a ship shore radio telephone system, a land radio station having a normally disabled radio transmitter and a plurality of radio receivers each normally conditioned for operation, a shore controlling and switching point at which connections may be completed from a land circuit to said transmitter and from any of said receivers to said land circuit, a ship station having a normally disabled radio transmitter and a radio receiver normally conditioned for operation, means at said ship station to disable the radio receiver thereat and to condition said radio transmitter at the ship station to send out a carrier wave, means conditioned by the extension of a landward connection to a land circuit through

5 said controlling and switching point to maintain the radio transmitter at the land station in disabled condition only when the carrier frequency is being received by one of said radio receivers at the land station, and operable only when so conditioned to disable the radio receivers at the land station and condition the radio transmitter thereat for operation when no carrier is transmitted from the ship station, a signal means at the land station responsive to a current of carrier frequency from the ship station or from an interfering station to produce a signal at the land station, a supervisory signal device at said switching point, means at the ship station to interrupt the carrier sent out from the ship station in accordance with a code, a selective arrangement at the land station arranged to actuate said supervisory signal device in response to the carrier frequency from the ship when interrupted in accordance with a particular code, but not actuating said signal in response to steady carrier, or carrier interrupted by a different code, or in response to interference.

7. In a ship shore radio telephone system, a land radio station having paths from a common terminal to a normally disabled radio transmitter and to a radio receiver normally conditioned for operation, means operable at will to extend said common terminal to a land circuit, a ship station having a normally disabled radio transmitter and a radio receiver normally conditioned for operation, means at said ship station to disable the radio receiver thereat and to condition said radio transmitter at the ship station to send out a carrier wave, means at said land station conditioned by the extension of a connection from the common terminal of said land radio station to a land circuit to maintain the radio transmitter at the land station in disabled condition only when the carrier frequency is being received from the ship station, and operable only when so conditioned to disable the radio receiver at the land station and to condition the radio transmitter thereat for operation when no carrier is transmitted from the ship station, a supervisory signal device at the common terminal of said land station, means to interrupt the carrier from the ship station in accordance with a code, and means at the land station responsive to the code but unresponsive to interference to actuate said supervisory signal device at said common terminal.

8. In a ship shore radio telephone system, a land radio station having paths from a common terminal to a normally disabled radio transmitter and to a radio receiver normally conditioned for operation, means operable at will to extend said common terminal to a land circuit, a ship station having a normally disabled radio transmitter and a radio receiver normally conditioned for operation, means at said ship station to disable the radio receiver thereat and to condition said radio transmitter at the ship station to send out a carrier wave, means at said land station conditioned by the extension of a connection from the common terminal of said land radio station to a land circuit to maintain the radio transmitter at the land station in disabled condition only when the carrier frequency is being received from the ship station, and operable only when so conditioned to disable the radio receiver at the land station and to condition the radio transmitter thereat for operation when no carrier is transmitted from the ship station, a supervisory signal device at the common terminal

of said land station, means at the ship station to interrupt the carrier sent out from the ship station in accordance with a code, a selective arrangement at the land station arranged to actuate said supervisory signal in response to the carrier frequency from the ship when interrupted in accordance with a particular code, but not actuating said signal in response to steady carrier, or carrier interrupted by a different code, or in response to interference.

9. In a ship shore radio telephone system, a land radio station having a normally disabled radio transmitter and a plurality of radio receivers each normally conditioned for operation, a shore controlling and switching point at which connections may be completed from a land circuit to said transmitter and from any of said receivers to said land circuit, a ship station having a normally disabled radio transmitter and a radio receiver normally conditioned for operation, means at said ship station to disable the

radio receiver thereat and to condition said radio transmitter at the ship station to send out a carrier wave, means conditioned by the extension of a connection to a land circuit through said controlling and switching point to maintain the radio transmitter at the land station in disabled condition only when the carrier frequency is being received by one of said radio receivers at the land station, and operable only when so conditioned to disable all of said radio receivers at the land station and condition the radio transmitter thereat for operation when no carrier is transmitted from the ship station, a supervisory signal device at said switching point, means to interrupt the carrier from the ship station in accordance with a code, and means responsive to the code but unresponsive to interference to actuate said supervisory signal device at said switching points.

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