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S. D. SLOGGETT ET AL

1,973,298

RADIO TRANSMITTING AND RECEIVING SYSTEM

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Fig. 1

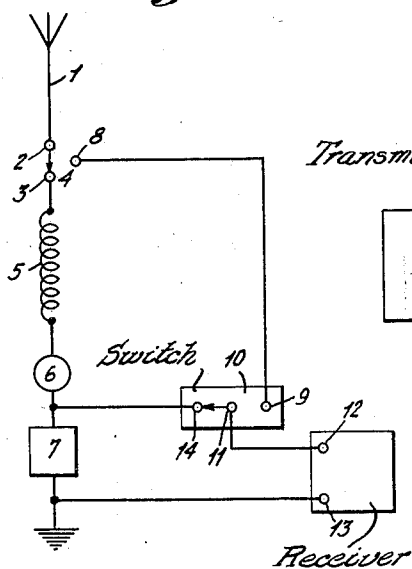


Fig. 2

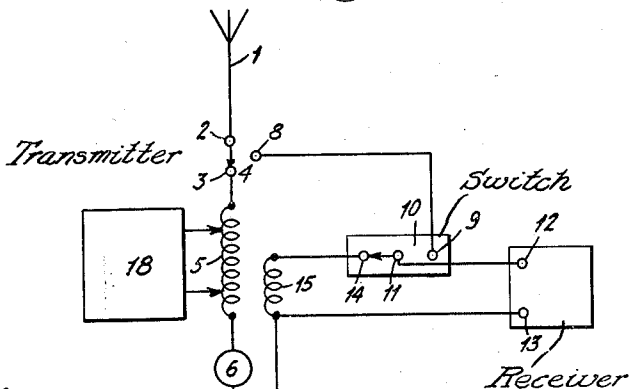
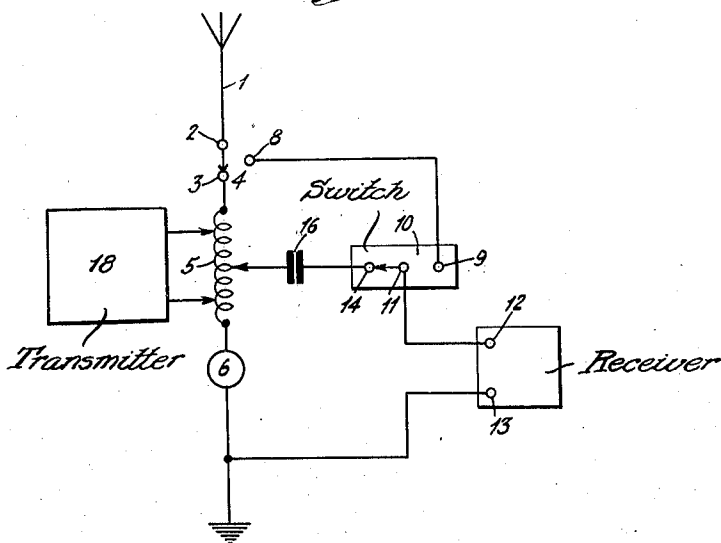


Fig. 3



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RADIO TRANSMITTING AND RECEIVING
SYSTEM

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1 Claim. (Cl. 250—13)

This invention relates to radio transmitting and receiving systems and although not limited to its application thereto is particularly adapted for use in connection with radio transmitting and receiving systems as installed upon shipboard.

Although other proposals have been made, in the majority of transmitting and receiving systems as at present employed upon shipboard there are utilized separate transmitting and receiving aerials and a relay is provided for the purpose of changing over the circuits for transmission to reception and vice versa, this relay being ordinarily employed to break circuits which are of necessity of comparatively heavy duty. The use of such relays involves considerable expense both in first costs and maintenance costs and the principal object of the present invention is to provide an improved system whereby what is generally termed "listening through" may be accomplished without the use of such a relay.

According to this invention an ordinarily provided transmitting aerial as is used in a complete radio transmitting and receiving installation is utilized also for receiving purposes, the input voltage for the receiver being derived from an impedance connected in or coupled to the transmitter aerial circuit and between the ground point thereof and a point just above ground potential of the circuit.

The invention is illustrated in the accompanying drawing which shows diagrammatically three arrangements in accordance therewith, wherein Fig. 1 shows the receiver connected across an inserted impedance in the antenna, Fig. 2 shows the receiver inductively coupled to the antenna, and Fig. 3 shows capacitive coupling between the receiver and antenna.

Referring first to Figure 1 which shows one way of carrying out the invention an aerial 1 ordinarily provided as a transmitting aerial is connected through two of the contacts 2, 3, of a two-way switch 4 (when said switch is in the desired listening in position) and then through a transmitting aerial tuning inductance 5 an aerial ammeter 6 and an inserted impedance 7 to earth i. e. to the earth bolt on the ship in the case of a ship installation. The remaining contact 8 of the switch 4 is connected to a contact 9 of a further two way switch 10. The contact 9 may be termed the main aerial contact. The contact 11 of the second two-way switch 10 to which the switch arm is permanently connected, is connected to the aerial terminal 12 of the receiving set, the earth terminal 13 in this set being connected to earth. The remaining contact 14 of the switch 10 which

may be termed the listening in contact is connected to the junction point of the impedance 7 and the aerial ammeter 6.

The switches 4 and 10 are shown in the position which nominally is referred to as the position of "listening in". The listening in position may be defined as the art of making use for receiving purposes of space intervals between the dots and dashes in the Morse code during the transmission of a telegraphic message. That is to say, that during the actual transmission of a dot or a dash the receiver is not in actual operation, but immediately after a dot or dash ceases to be transmitted from the transmitter the receiver will immediately become operative. Thus it is possible during the actual transmission of the station for another station to break in and, if necessary, stop the transmission. Furthermore, the purpose of the switches 4 and 10 is to enable the receiver to be placed directly in the antenna circuit when it is desirable not to use the listening in position. For instance, owing to the actual decrement of the antenna circuit when connected in the position shown in Figure 1 of the drawing, the voltage input of the receiver would be very small indeed on any frequency other than that to which the antenna is tuned by the transmitting aerial tuning inductance 5. Therefore, it is necessary when receiving on the lower wave lengths to have the aerial placed directly to the receiver or in the non-listening in position.

It will be seen that when the switches are in position for "listening through" the total voltage obtained by the radio receiver is that set up across the inserted impedance 7. For the position of "listening through" the switches 4 and 10 are put in the positions shown in Figure 1 and it will be seen that when the switches are in these positions advantage is taken of the fact that the normal transmitting aerial system 1 (which is also employed for receiving purposes) is a tuned system with relation to the incoming wave length. Further, since the aerial tuning inductances employed to tune an aerial for transmitting purposes are ordinarily manufactured with considerable care so as to have exceedingly low losses, the use of such an inductance in the manner described, for receiving purposes, results in high efficiency and very considerable selectivity without increased costs, and this is a practical advantage of considerable importance. A further advantage is that the inserted impedance 7 may be readily designed in such manner that the voltage set up between the aerial and earth terminals of the set by a received signal is actually higher than would

be obtained were the two-way switches changed over into positions in which the aerial terminal on the receiving set is connected directly to the aerial. A further though minor advantage is that interference by induction is frequently minimized by reason of the fact that any low frequency induction present will develop only a comparatively small potential across the inserted impedance. The detailed construction of the said impedance will depend upon circumstances and the said impedance may be predominantly resistive, capacitative or inductive as circumstances may dictate. Although in the arrangement described transmission will give rise to voltages across the receiver terminals, in practice these voltages should not ever exceed about 100 volts so that from the point of view of damage to the apparatus, this is of little or no importance as it has been found in actual practice that an input of up to 100 volts on the grid of a screen grid valve does not noticeably effect the receiver in which grid leaks and grid condensers are not employed. The only question is one of saturation and provided the time constants of the circuits are very high saturation disappears almost at once. In many cases in which the device has been employed, satisfactory results have even been obtained from a simple reaction detector circuit.

In a modified arrangement shown in Figure 2 the receiver is arranged to be inductively coupled to the aerial tuning inductance. In this arrangement the earth terminal 13 of the receiver is connected to earth and to the lower end of a coupling coil 15 inductively coupled to the aerial tuning inductance 5 to which a transmitter 18 is coupled. The other end of this coupling coil is connected to the listening in contact 14, all the other connections being as in the first described embodiment.

In yet a further arrangement shown in Figure 3, capacity coupling is resorted to. In this arrangement the earth terminal 13 of the receiver is connected as before to earth, but the listening in contact 14 is connected through a coupling condenser 16 to a point (which may be variable) upon the aerial tuning inductance 5, other connections being as before except for the addition of the transmitter 18 which is diagrammatically shown coupled to the aerial tuning inductance 5.

In both the two last described embodiments the coupling i. e. the magnetic coupling in the former of the two said embodiments, and the capacity coupling in the latter, may be made variable if desired.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

A combined transmitting and receiving system comprising an aerial, a transmitting tuning inductance, a receiver, an antenna switch having two contacting positions, one position of said antenna switch connecting the aerial to said transmitting tuning inductance the other position of said antenna switch having a connection to a receiver switch, a coupling coil inductively coupled to said tuning inductance, said receiver switch connected to the high side of said coupling coil and to the aerial terminal of said receiver, the lower side of said coupling coil connected to ground and the ground terminal of said receiver so that said aerial is utilized for both transmitting and receiving purposes when said antenna switch is in the position connecting the aerial with said transmitting tuning inductance.

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