

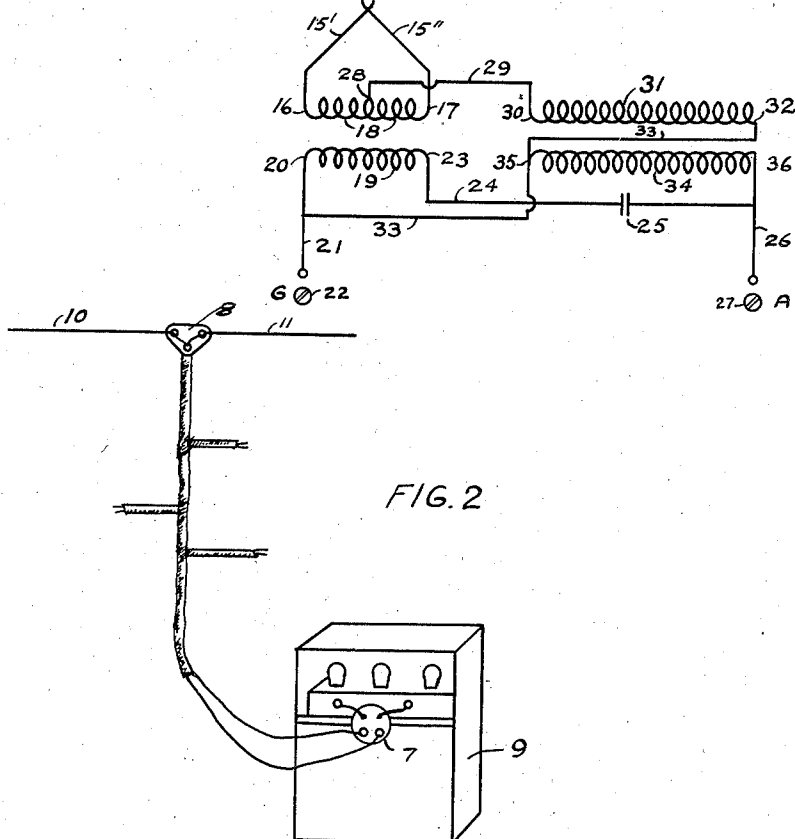
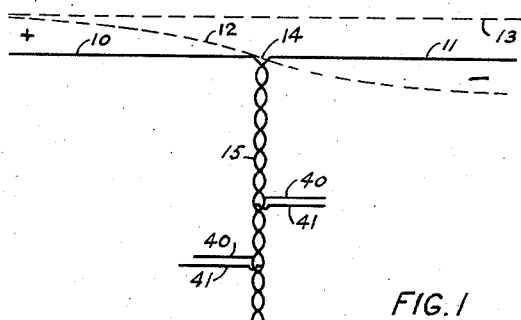
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RADIO RECEIVING SYSTEM

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RADIO RECEIVING SYSTEM

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1 Claim. (Cl. 250—33)

The present invention relates to radio receiving systems of the type adapted to receive simultaneously or alternately, and without manual switching, short or high frequency signals and long or broadcasting signals; such systems involving automatic separation, by suitable wave-band selective devices, of any mixed short and long wave signals imposed upon the antenna, before transmission thereof to the input windings of the radio set.

The invention further relates to systems of the character mentioned in which signals imposed upon an antenna remote from local disturbances are conveyed to the radio set by a transmission line so designed as to minimize any disturbing effects in the short wave circuits arising from local electrical equipment; thus to effect noise reduction.

Heretofore such systems have involved both an antenna coupler and a set coupler, and have required separate antenna connections, or taps, for lead-in of short and long wave signals; all resulting in an unnecessary complication of elements and expense to the user.

In systems of the character mentioned a di-pole antenna is ordinarily employed, that is to say, an antenna, of preferably one-half short wave length, in two oppositely branching parts which at any instant are of opposite polarity as to short waves imposed thereon, but of like polarity as to long waves imposed thereon. For short wave reception such branches are electrically connected by a loop which includes as part thereof the transmission line, which with the antenna constitutes a short wave circuit from positive phase in one antenna branch to negative phase in the other.

For long wave reception, the section of the loop immediately adjacent the antenna has heretofore not been employed, but has been blocked off to long waves by placement of condensers in both branches thereof. Hence the necessity for the above mentioned separate long wave tap or lead-in from the antenna. This long wave tap, suitably grounded, has heretofore been coupled by a transformer to the transmission line in such manner that the latter for long waves provides a closed circuit requiring a second transformer for pick-up of the long waves at the radio set.

An object of the present invention is a system in which, for long waves as well as for short waves, the transmission line may be a loop having connection at two points to the antenna; thus using two already existent short-wave antenna connections as replacements for the single connection formerly employed to couple the transmission line to the antenna for long wave reception, and while eliminating a connection, never-

theless vastly increasing long-wave reception by using the lead-ins as an antenna.

It will be understood that in a set-up such as just described, the transmission line, as to long waves, is no longer a closed circuit coupled through one transformer to the antenna and through another transformer to the radio set, but may be considered as a pair of conductors arranged in parallel from the antenna and uniting at the electrical center of the transmission loop. From this center there may be a lead to the primary of a long wave transformer in the set coupler, and thence to ground. The electrical center of the transmission line is preferably the midpoint of the primary of a short wave transformer in the set coupler.

Another object of the invention is therefore a system in which, for the simultaneous or alternate transmission to a set apparatus of long and short waves, mixed on the antenna, but automatically unmixed or separated in the system, there is no necessity for a coupler to the antenna as well as one to the set; but on the contrary is a system in which a single coupler suffices, and in the use of which much expensive, complicated and relatively inaccessible equipment, and duplication of transformer and other parts, is avoided.

A further object of the invention is a system having the advantages mentioned, but in which, by reason of a lay-out and form of the transmission line and associated elements, any disturbing effects in the short-wave circuits arising from extraneous local electrical equipment are minimized or neutralized to effect a reduction of noise, which if present might seriously impair short wave reception.

Other and further objects and features of the invention will more fully appear upon reference to the accompanying drawing, in which:

Fig. 1 is a diagrammatic view of a system embodying the present invention.

Fig. 2 is a view in elevation showing the exterior appearance of the parts in their relative positions.

Referring to the drawing, a di-pole antenna in two branches 10 and 11 is shown so remote from the radio set 9 as to be clear of local disturbances. The overall length of the antenna 10—11 is preferably of the order of one-half short wave length, so that a short wave, indicated in dotted lines at 12, on striking the antenna will at a given instant have its positive phase in one of the branches 10—11 and its negative phase in the other. A long wave is indicated in dotted lines at 13, showing, for the instant, positive phase as to both antenna branches 10 and 11. The antenna branches are supported by an insulation piece 8, see Fig. 2, through openings in which the two antenna ends are passed, to be continued by the branches 15' and 15'' of the transmission

line 15 leading to the radio set. The antenna divisions 10 and 11 are shown as electrically spaced at 14. The branches 15' and 15'' of the transmission line are preferably twisted, to form the single cable 15, see Fig. 2, from the antenna to the set coupler box 7.

Inside the coupler box 7, the transmission line forms a loop, see Fig. 1, and cross-connecting the branches 15' and 15'' at their ends 16 and 17 is the primary 18 of a transformer. The secondary 19 of this transformer has one end 20 connected to a lead 21 adapted to be plugged into the ground contact 22 of the radio set 9. The other end 23 of the secondary 19 connects with a conductor 24, having therein a condenser 25, which in turn connects with a lead 26 adapted to be plugged into the antenna contact 27 of the radio set.

The high frequency or short wave signals entering the transmission line make the circuit thereof from positive to negative side of the antenna, through the primary 18, thus creating impulses in the secondary 19 which pass by way of the condenser 25 to antenna contact 27, and by way of lead 21 to ground contact 22 of the set. Secondary 19 is matched to the short wave input winding, not shown, of the radio set.

From the mid-point 28 of the primary 18 a line 29 connects with one end 30 of primary 31 of a second transformer, the other end 32 of this primary connecting through a line 33 to the previously mentioned lead 21, and so to the ground contact 22 of the radio set. The secondary 34 of this second transformer connects at its end 35 to the ground connection 33, and at its end 36 to the previously mentioned lead 26 to the antenna contact 27 of the radio set.

Broadcasting or long wave signals striking both sides 10 and 11 of the antenna in the same phase flow in the same direction simultaneously through both branches 15' and 15'' of the transmission line and in opposite direction through the primary 18 of the short wave transformer to mid-point 28 thereof, and thence by line 29 to and through the primary 31 of the long wave transformer and to ground through 21 and 22. The long waves cancel each other out in the primary 18 of the short wave transformer so as not to energize the secondary 19 thereof, but energize the secondary 34 of the long wave transformer. Secondary 34 is matched to the long wave input winding, not shown, of the radio set.

The inductance of the primary 31 of the long wave transformer is sufficiently high to block passage of short waves therethrough, and the condenser 25 blocks passage of long waves through the secondary 19 of the short wave transformer. Thus long and short waves, mixed in the antenna, and simultaneously or alternately passed into the transmission line, are selectively and automatically, and without any manual switching means, taken up by the appropriate transformer, and so separated or unmixed in the coupler box 7, which contains all parts shown in Fig. 1 except the transmission line and antenna.

Currents generated in the transmission line by external and local electrical equipment will not give rise to appreciable noises in the short wave circuits of the radio set because such currents will pass in the same direction in the two branches 15' and 15'' of the transmission line, and entering the primary 18 of the short wave transformer in opposite directions will neutralize or cancel each other out so far as the secondary 19 of that transformer is concerned. The branches 15' and 15'' of the transmission line

are preferably twisted, so that from whatever direction the disturbance comes, its effects in the two branches will be equal, and balance each other in the two sides of the primary 18.

The present invention makes possible the operation of any number of receivers or radio sets from a single antenna. One receiver only may be used with a straight wire antenna having a single wire downlead, because the relatively high impedance of such antenna and downlead must be matched by the input leads of the receiver, and the antenna tuned by the input circuit of the receiver. In such a system a second receiver would put the antenna out of tune, mismatching the input, with resultant large decrease of signal strength. On the other hand, when there is employed the coupler and duplex transmission line, above described, the coupler is matched to the transmission line, and the output of the coupler matched to the radio receiver input. Any number of couplers may therefore be matched to the impedance of the transmission line, with negligible loss of signal strength.

What is meant by the above is that in the present system the impedance of the primary 18 of the short wave transformer is matched to the impedance of the transmission line; and the impedances of the secondary 34 of the long wave transformer and the secondary 19 of the short wave transformer are matched to the impedances respectively of the long and short wave primaries in the radio set. The impedance of the transmission line will depend upon the relative positioning and size of the lines 15' and 15'', and this will be a predetermined or selected factor in the system. Of course, the impedance of the transmission line would to some degree be affected as the number of couplers connected thereto is increased. It has been found, however, in practice that when the number of couplers connected and matched to the impedance of the transmission line is more than say five; then additional couplers to any desired number may be connected to the line without noticeably affecting signal strength. Mismatching of such additional couplers with the transmission line will not be such as to affect to an appreciable degree the efficiency of the system.

In Fig. 1 of the drawings, lines 40 and 41 indicate leads to a plurality of additional couplers and radio sets, not shown, but which may be similar to that hereinbefore described. Thus the only grounding required in the present system is to the ground contacts of the several radio sets. Except through the radio sets the antenna requires no grounding.

I claim:

In a radio receiving system, a short wave transformer, a di-pole antenna, a transmission line loop, including the primary of said transformer, connecting the sides of the antenna, leads from the secondary of said transformer for connection respectively to the ground and antenna contacts of a radio set, a capacity in said set antenna lead to block passage of long waves therethrough, a second transformer having the primary thereof connected on the one-hand to said transmission loop and on the other hand to said lead for the set ground contact, the primary of said second transformer having sufficient inductance therein to block passage of short waves therethrough, and leads from the secondary of said second transformer for connection respectively to the ground and antenna contacts of said radio set.

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