March 1, 1938. W. KAUTTER 2,109,536

METHOD OF STRAY COMPENSATION IN TUNED ANTENNAE

Filed Oct. 24, 1934

Fig. 1

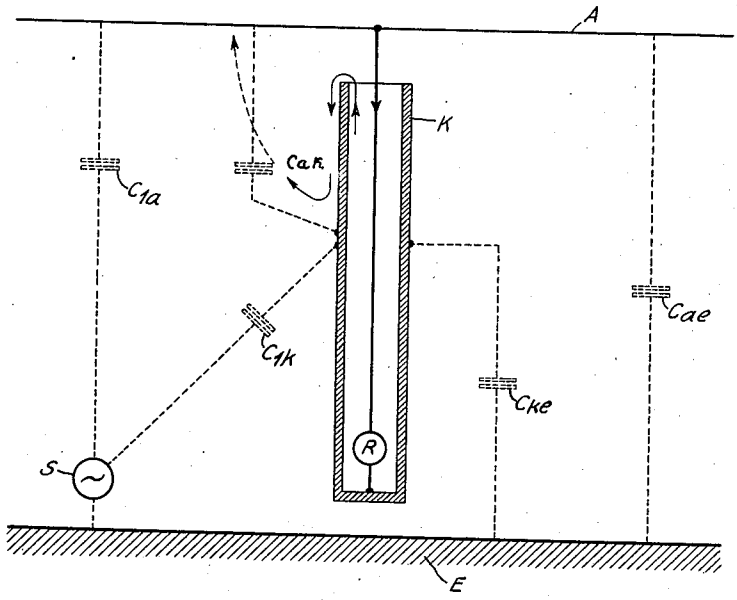


Fig. 3

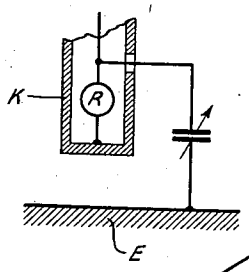


Fig. 2

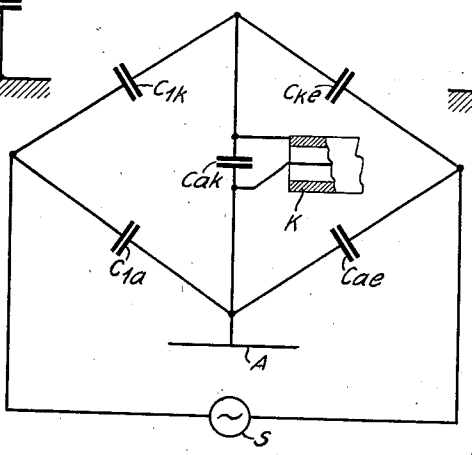
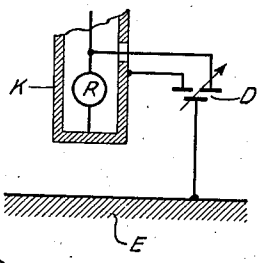


Fig. 4



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METHOD OF STRAY COMPENSATION IN TUNED ANTENNAE

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3 Claims. (Cl. 250—33)

In order that perfect reception may be insured in large cities and in order that, to that end, stray and interfering actions present in buildings may be eliminated, the suggestion has been made to mount a high aerial upon the top of a building located inside a district subject to a little interference, and to statically shield the down leads to the receivers. These down leads consist of high frequency cables which comprise a conductor and a conductive shield or envelope surrounding the said conductor, the envelope being united with the ground terminal of the receiver, while the inner conductor is connected with the antenna terminal.

Now, it has been discovered that reception by no means is freest from interference when the cable sheath or envelope, or the receiver casing is grounded. The reasons underlying this finding and fact shall be explained hereinafter.

In the accompanying drawing Fig. 1 illustrates schematically a receiver and an associated antenna system which will serve to explain the invention; Fig. 2 shows the system of Fig. 1 redrawn in a different way but is electrically equivalent thereto; Fig. 3 is a portion of the antenna system embodying one modification of the invention; and Fig. 4 is a like portion of the antenna system but embodying a different modification of the invention.

Now, referring first to Fig. 1, A denotes an antenna, and the energy picked up by it is to be fed to the receiver R by way of the radio frequency cable or down lead K. If the connection between the cable and the receiver be properly made the shielding of the receiver is so intimately united with the envelope of the cable that the representation as shown in the drawing will be admissible according to which the receiver, as it were, is accommodated inside the cable. The presupposition is that the cable fundamentally has been correctly constructed.

The current fed to the receiver R by way of the inner conductor of the cable flows up on the inside of the cable envelope and down again on the outside thereof. Incidentally its value becomes gradually smaller inasmuch as more and more flows off to the antenna by virtue of capacity between it and the envelope. In this way the current through the outer layer of the envelope decreases as the distance from the antenna increases. What may be remarked in this connection is that the dimensions of broadcast antennae are always small in contrast with the wave lengths so that it is permissible to regard the strictly distributed capacitances as concentrated or lumped, and to disregard inductances. In this manner the scheme shown in Fig. 1 is obtained.

An interferer S which, on the one hand, is grounded directly or capacitively, on the other hand is in coupling relationship, by reason of the stray electric field around it, by way of the leakage capacities C*la* and C*lk* (being of an order of magnitude up to 30 micro-microfarads) with the antenna and the outside of the cable sheath. The antenna and the cable envelope are connected directly with earth through capacitances C*ae* and C*ke*, and there further exists between antenna and outside of the cable envelope a direct capacitance C*ak*.

In Fig. 2 the capacitances just enumerated are shown in a different way, and it can be seen that they are contained in the arms of a Wheatstone bridge. In one diagonal is included the interfering E. M. F. S., in the other the receiver connected by way of the cable, and in parallel relation thereto the capacitance C*ak* between antenna and outside envelope of the cable. By choosing suitable dimensions a state of bridge balance is establishable in which the receiver is uncoupled or neutralized in regard to the interfering source.

Now, what is suggested according to this invention is to make one or more of the existent capacities variable, and to thus insure outbalancing for at least one of the major disturbing sources.

So far as the solution of the idea underlying the invention is concerned there exist a great many fundamentally known possibilities. If the balance is to be produced by increasing C*ke*, then a rotary condenser is included between cable and earth. On the other hand, that is to say, when C*ke* is already too high the capacitance between antenna and earth must be raised, and this is accomplishable, e. g., as shown in Fig. 3 by that the inner conductor is brought out directly at the receiver and is united with earth by way of a rotary condenser. Another possible scheme is indicated in Fig. 4. In this arrangement C*ke* and C*ae* are simultaneously varied by the agency of the differential condenser D.

What I claim is:

1. An aerial system comprising the combination of an antenna, a lead-in extending from the antenna to a radio communication device, a metallic shield surrounding said lead-in and being coupled to earth by the natural capacity between said shield and earth and a variable con-

denser having one side connected to ground and its other side directly connected to said lead-in at a point near said radio device.

2. An aerial system which is subject to undesired disturbances from a local source of voltage comprising the combination of an antenna, a lead-in from said antenna to a radio communication device and a metallic shield surrounding said lead-in the total capacity between said shield and ground being such that when mutiplied by the capacity between the antenna and the local voltage source, the product is equal to the capacity between the local voltage source and said shield multiplied by the capacity between the antenna and ground whereby disturbances from said local voltage source are prevented from affecting said radio device.

3. An antenna system comprising an antenna lead, shielding means for said lead, and a differential condenser for capacitively connecting said lead and said shielding means to ground.

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