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M. PONTE

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HIGH FREQUENCY TRANSMITTER

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Fig. 1

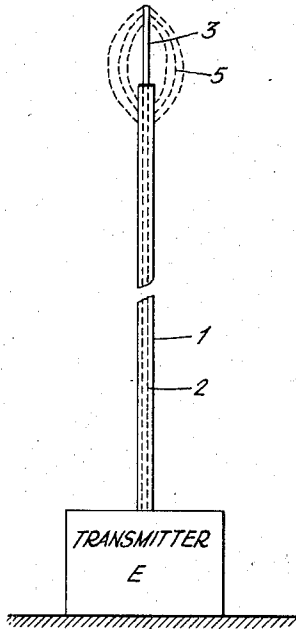


Fig. 2

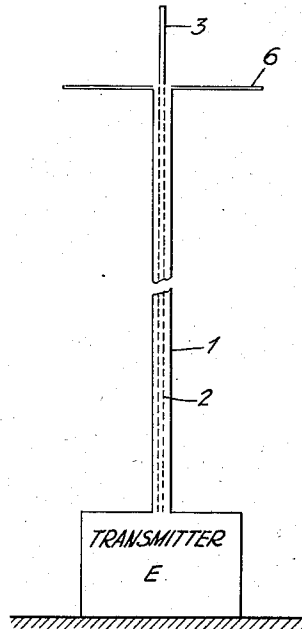


Fig. 2a

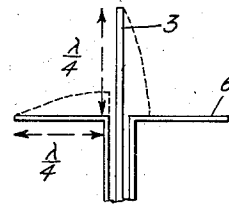


Fig. 4

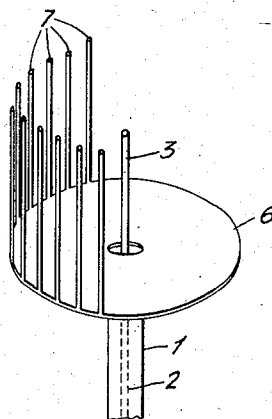
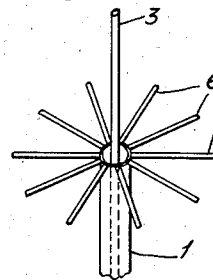


Fig. 5



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HIGH FREQUENCY TRANSMITTER

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5 Claims. (Cl. 250—11)

The present system is concerned with radio frequency transmitting arrangements, or more precisely speaking, with the transmission of energy radiated off from a transmitting aerial.

5 In short wave communication it is often necessary to feed energy to an antenna which is located at a height above ground which may be relatively great compared with the wave length (say, equal to about ten times this wave). The
10 high frequency apparatus is sometimes located in a place where there are extraneous disturbances which interfere with radiations from the antenna. At other times it is desired to avoid such obstacles as may oppose radiation. In such
15 cases it is necessary to resort to the transmission of energy to the antenna by what is known as a feeder or downlead.

However, in this scheme there is encountered one difficulty, which is due to the fact that the
20 radiating antenna constituted, for example, by a strand of conductor wires fed by one of the wires of the downlead or feeder, is liable to form a dissymmetric system; the displacement current issuing from the antenna finds a path closed by
25 way of the feeder on which are set up standing waves and which begins to radiate, whence disturbances due to such feeders that are well known in practice, and which reside especially in the impossibility to transmit energy to the antenna, the energy becoming very low as soon as the feeder
30 attains a length of one to two wave lengths.

The present invention discloses means adapted to eliminate all radiation from the feeder and to
35 insure the efficient transmission of energy to antennas located at considerable heights above ground compared with the wave length. The invention consists in arrangement, at the end of the feeder located nearest the antenna end, a
40 conductive surface associated with the end of the feeder which is not connected directly with the antenna the dimensions of which will appear from the description which follows.

The invention shall be explained in this case
45 by the example of a tubular vertical feeder which, from a mechanical viewpoint is the best suited for the problem herein solved, though it is to be understood that the principles underlying this invention are applicable to any kind of feeder
50 having any direction and associated with any kind of antenna.

Figure 1 illustrates a known type of antenna arrangement, and Figure 2 an antenna system in
55 accordance with the present invention. Figures 2a, 3 and 4 show different embodiments, in ac-

cordance with the invention, for preventing undesired radiation from the feeder.

In Figure 1 is shown a short wave transmitter E which, for the purposes of sending, is connected to an antenna 3 constituted of a one quarter
5 wave length strand or a strand having any other length, the radiation resistance of which may be adapted to the impedance of the feeder. This antenna must be located above the ground at a
10 height that may be very great compared with the wave length. The sender, on the contrary, should stay on the ground or may even be buried, the antenna being connected with the transmitter
15 by a tubular feeder formed of an exterior tube or pipe 1 and a central conductor 2, with the antenna 3 being joined to said central conductor. It will thus be seen that no matter what the adaptation of the antenna, tube 1 is the seat of
20 standing waves located outside the tube; hence, the latter absorbs a considerable amount of energy, so much so, indeed, that if the line exceeds from one to two wave lengths the energy transmitted or fed to the antenna becomes only a
25 small fraction of the energy produced by the transmitter. This fact must be ascribed to displacement currents issued from the antenna owing to the existence of lines of force 5, which represent currents whose paths become closed on the outside of the feeder.

Now, according to the invention, this inconvenience is completely obviated by adding to the
30 feeder or downlead, in a way as shown in Figure 2, a conducting surface 6 connected with tube 1 and, in the simplest scheme, carried by it. The optimum dimensions of this disk depend upon the
35 length of the aerial; in the case of an antenna 3 equal to one quarter wave length, both theory and actual practice prove that the best form to be chosen for the surface is that of a disk having a
40 diameter equal to $\lambda:2$; indeed, in this instance, the distribution of currents in the antenna and in the disk will be of a form as shown in Figure 2a, and there will be no return path for the current on the outside of the downlead 1.

With such an arrangement as disclosed in
45 Figure 2 it is found that as the feeder does not occasion any disturbances, the same may be made of considerable lengths compared with the wave length, while insuring at the same time good efficiency of transmission or feed to the antenna.
50 The efficiency of the arrangement of this invention is clearly demonstrated by the following example: A transmitter E working on an 80-cm. wave furnished with a downlead of 5 meters' length joined to an antenna of 20 cm. and pro- 55

vided with a disk 6, according to this invention, of 40 cm. diameter makes it feasible to radiate from an antenna constructed as shown, a power approximately equal to that fed to the opposite end of the feeder. The removal of the disk 6, on the contrary, eliminates or suppresses all radiation of the antenna.

The optimum proportion of the disk 6 depends upon the length of the antenna 3 and may be readily ascertained by considering the distribution of the current in this antenna. In a general way, it may be chosen so as to be equal to the length of the aerial. Yet, a dimension very different therefrom may still furnish satisfactory results. For instance, in the case of an antenna having a length equal to $\lambda/4$ the diameter of the disk 6 may be reduced to $\lambda/4$ without the antenna ceasing to radiate satisfactory powers, although the latter will be less than what they are when the disk is equal to $\lambda/2$. The dimensions of the disk could also be raised without failing to obtain a satisfactory efficiency, though this case is of less practical interest inasmuch as it is desirable to have a disk of the smallest possible dimensions.

In what precedes the surface 6 is chosen of disk-shape, for this is the simplest; it will be understood that the form of the disk may be adopted at will provided that one of its dimensions will not fall below values that are too small compared with the length of the wave. For instance, it is therefore also feasible to take square plates or sheets or sheets of any other form.

Another equivalent scheme would be to substitute a bundle of wires tuned according to the ways and means known in the art, for the solid and unbroken surface 6. A system of this kind is shown in Figure 3 wherein the surface of the disk 6 is replaced by a bunch of wires the most favorable length of which will be $\lambda/4$, with the antenna being of like length. This arrangement presents the advantage that it can be knocked down (folded) and thus occupy a very reduced volume in mounting and demounting the feeder, by hinging the wires at the points where they join the feeder 1.

It will be likewise understood that any other kind of feeder or downlead could be employed without departing from the spirit of the invention.

Finally, according to the invention the disk 6 which must be absolutely provided in order to insure radiation of the antenna, could also serve to support a device which allows of directing the waves sent out from the aerial by the adoption of such ways and means as are well known in the prior art. For instance, as shown in Figure 4, there could be fixed upon the disk an assembly of tuned wires 7. The best embodiment would consist in choosing for the edge of the disk which supports the wires a parabolic shape, though in the case of an antenna equal to $\lambda/4$ satisfactory results are even obtained by making the wires 7 of a length equal to $\lambda/4$ upon the middle of the periphery of a disk having itself a radius equal to $\lambda/4$. The reflector likewise could consist of a solid lamina attached upon the rim of the disk or by some other equivalent means imparting directive properties to the assembly. It will moreover appear that the assembly thus designed is capable of rotation and will thus be adapted, for instance, to the building of beacons supported upon tall vertical rods, a design that may be necessary where such short waves are concerned as are here being considered.

The invention likewise could be applied to receivers, with the sense of transmission or feeding being inverted.

In the form of a novel industrial product, the invention could be incorporated in a transmitter of, say, 80 centimeters, with the transmitter entirely concealed (for instance, according to the purpose to be attained, it may be in a room or hall without direct vision). Transmission may be insured by a feeder furnished with means according to this invention to an antenna located at fairly great height to be directly visible for the purpose and the same could be equipped with directional means according to the invention. The height at which the antenna is mounted may be quite considerable compared with the wave length, say, ten times this length.

Having thus described my invention, I claim:

1. Short wave transmitter comprising, in combination an oscillation generator, a radiating dissymmetrical aerial located at a level different from that at which said oscillation generator is located, the level difference being of the order of several of the transmitted wavelengths, a feeder interconnecting the generator and the aerial comprising a lead connected to the aerial and a screen surrounding said lead, and means to prevent the closure on the screen of the lines of force from the aerial whereby radiation from said screen is suppressed.

2. Short wave transmitter comprising, in combination, an oscillation generator, a radiating dissymmetrical aerial located at a level different from that at which said oscillation generator is located, the level difference being of the order of several of the transmitted wavelengths, a feeder interconnecting the generator and the aerial comprising a lead connected to the aerial and a screen surrounding said lead, and a conducting surface conductively connected with the generator and located at that end of the said feeder which is connected with the aerial, said surface being of such dimension and disposition as to suppress radiation from the screen due to the closure on it of the lines of force from the aerial.

3. Short wave transmitter comprising, in combination, an oscillation generator, a radiating dissymmetrical vertical aerial located at a level different from that at which said oscillation generator is located, the level difference being of the order of several of the transmitted wavelengths, a feeder interconnecting the generator and the aerial comprising a lead connected to the aerial and a screen surrounding said lead, and a horizontal conducting surface conductively connected with the generator and located at that end of the said feeder which is connected with the aerial, the dimension of said surface being of the order of twice the aerial length.

4. Short wave transmitter comprising, in combination, an oscillation generator, a radiating dissymmetrical vertical aerial located at a level different from that at which said oscillation generator is located, the level difference being of the order of several of the transmitted wavelengths, a feeder interconnecting the generator and the aerial comprising a lead connected to the aerial and a screen surrounding said lead, and a group of wires which have lengths individually equal to that of the aerial, said wires extending radially in a horizontal plane at that end of the feeder which is connected with the aerial and conductively connected with the generator.

5. Short wave transmitter comprising, in com-

5 bination, an oscillation generator, a radiating dissymmetrical aerial located at a level different from that at which said oscillation generator is located, the level difference being of the order of several of the transmitted wavelengths, a feeder interconnecting the generator and the aerial comprising a lead connected to the aerial and a screen surrounding said lead, a conducting surface conductively connected with the

generator and located at that end of the feeder which is connected with the aerial, said surface being of such dimension and disposition as to suppress radiation from said screen due to the closure on it of the lines of force from the aerials, and means to ensure the directiveness of the transmission, said means being carried by said surface. 5

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