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2,028,857

ELECTRICAL COMMUNICATION SYSTEM

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Fig. 1.

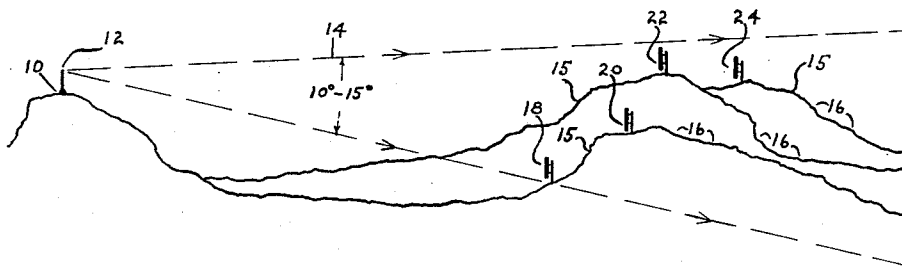


Fig. 2.

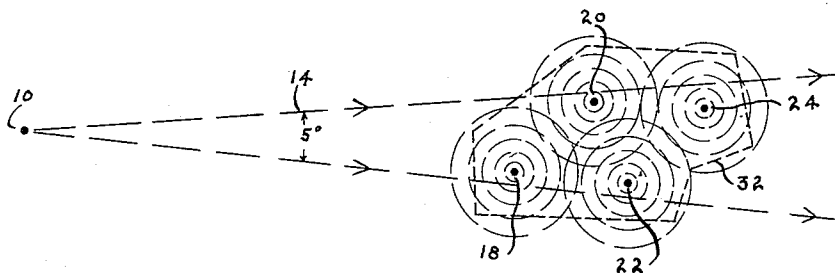
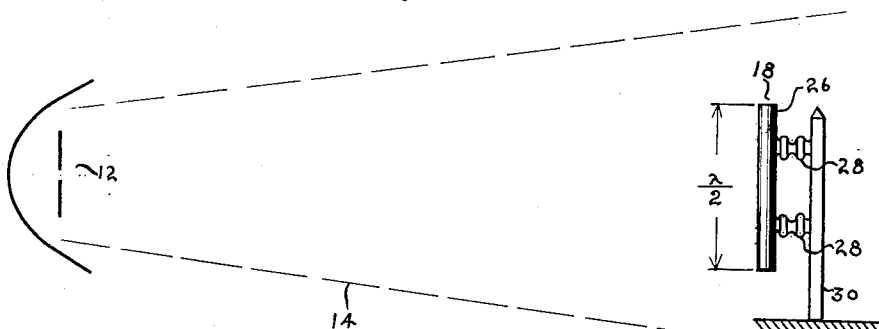


Fig. 3.



UNITED STATES PATENT OFFICE

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ELECTRICAL COMMUNICATION SYSTEM

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1 Claim. (Cl. 250—15)

My invention relates to improvements in electrical communication systems and, more particularly, to those systems wherein the signals are transmitted on ultra-short Hertzian waves.

5 In systems of the character referred to, such, for example, as a television system, the various advantages of employing ultra-short Hertzian waves, to carry the picture and synchronizing signals, are somewhat offset by the fact that these waves, when propagated from a transmitting station on one side of a group of tall buildings, a mountain, or other obstruction, are not effective for reception by receiving stations located on the opposite sides of such obstructions.

15 It has been proposed to avoid this difficulty by employing a master transmitting station to supply signals to a number of distantly located receiving stations, each of the latter operating through relaying apparatus and amplifiers to supply one of a number of rebroadcasting stations, so located with respect to the various intervening obstructions that all zones are effectively supplied with signals. These systems, however, require amplifying apparatus, and entail substantial expense for maintenance personnel.

25 With the foregoing in mind, it is one of the objects of my invention to provide an improved system of the character referred to without using additional amplifying apparatus which necessitates maintenance personnel.

30 Other objects and advantages will hereinafter appear.

In accordance with my invention, the signals are transmitted on ultra-short Hertzian waves from a single transmitting station embodying a suitable directive antenna which emits a narrow beam concentrated in both the horizontal and vertical directions. A group of receiving-rebroadcasting antennas are located at a distance from the transmitting station, and within a zone covered by the signal beam. Each antenna of this group is of the non-directional type, effective to pick-up power from the directed, concentrated signal beam, so to speak, and to radiate a substantial percentage of this power in all directions over a given zone of generally circular area, from the antenna as a center.

My invention resides in a system of the character hereinafter described and claimed.

50 For the purpose of illustrating my invention, an embodiment thereof is shown in the drawing, wherein

Figure 1 is a simplified pictorial view of a communication system embodying my invention;

Fig. 2 is a diagrammatic plan view of the system shown in Fig. 1;

Fig. 3 is an enlarged detail view of the system shown in Fig. 1; and

Fig. 4 is a diagrammatic view, showing a modification.

With reference to Fig. 1, a single transmitting station 10 operates to transmit signals on ultra-short Hertzian waves, and includes a suitable directive antenna 12 from which the signal waves are propagated in the general form of a directed beam 14. It is proposed to use a directive antenna of one of the known designs which concentrates the beam within an angle of about five degrees in the horizontal plane and from ten to fifteen degrees in the vertical plane, as indicated in Figs. 1 and 2.

If there are obstructions in the path of the beam, such as a group of tall structures, or, for example, mountain ranges designated by the reference numerals 15, there would ordinarily be "dead" zones 16 on the far sides of these obstructions. The reason for this is that the signal waves radiate from the antenna 12 along relatively straight paths, and are reflected or absorbed by the obstructions to cause the "dead" zones 16 on the far sides.

For the purpose of supplying signals to any zones such as 16, and to cover any desired area with signals of uniform intensity, I propose to set up a group of receiving-rebroadcasting antennas such as 18, 20, 22, and 24, each located in the zone of the beam 14.

Each of the receiving-rebroadcasting antennas, such, for example, as the antenna 18 shown in more detail in Fig. 3, may comprise a copper tube 26 half a wave-length long and supported in a vertical position from insulators 28 attached to a mast 30.

With regard more particularly to the details of construction and the operating characteristics of suitable types of antennas, to serve the specified purposes in the disclosed embodiment of my invention, reference may be made to the technical papers on this subject published in the Proceedings of the Institute of Radio Engineers, issue of September 1930, pages 1502 to 1536, issue of July 1931, pages 1184 to 1215, and issue of October of 1931, pages 1773 to 1842.

In operation, each of the antennas 18, 20, 22, and 24 is effective to pick-up the transmitted signal waves and rebroadcast the same at substantially equal intensity in all directions, as indicated in Fig. 2. The theory of operation, which accounts for this action, is fully analyzed and

explained in an article by Henry C. Forbes, published in the Proceedings of The Institute of Radio Engineers, issue of June 1925.

By suitably locating the antennas 18, 20, 22, and 24, any desired area, such as a city area 32, may be supplied uniformly with signals, regardless of existing obstructions within the area or between any zone therein and the transmitting station 10. As indicated in Fig. 2, the respective zones covered by the individual receiving-rebroadcasting antennas jointly embrace an area substantially greater than the projected area of that section or portion of the beam signal whereat these antennas are located.

In some cases, it might be expedient to locate the transmitting station so that the entire city area is embraced by the beam 14. It is also proposed that the transmitting station might be located at the center of the city area, and constructed to emit several power beams in different directions to as many different groups of receiving-rebroadcasting antennas, the latter being effective to supply signals, at substantially uniform intensity, over zones comprising the city area.

It also lies within the scope of my invention to utilize directive antennas for reception and to connect these antennas to individual transmitting, non-directional antennas, through individual

transmission lines devoid of amplifying devices. Such modifications is shown in Fig. 4, wherein 34 is a suitable directive antenna which is substituted for each of the receiving-rebroadcasting antennas in Fig. 1. As shown, a suitable non-directional antenna 36 is connected directly, to each of the respective antennas 34, through individual transmission lines 38 devoid of amplifying devices. Each of the antennas 34 is located in the zone of the beam 14, and the antennas 36 are distributed to cover the desired area, such as the area 32 in Fig. 2. In this connection, it will be understood that the antennas 36 need not necessarily be located in the zone of the beam 14.

I claim as my invention:

A system for the transmission of wireless signals comprising in combination a directive high frequency transmitting station, a plurality of distant directive receiving stations disposed in the path of propagation of the signals, a plurality of non-directive substantially vertical re-radiating tuned antennæ, one for each of the receiving stations, and non-amplifying energy-transfer connections between each one of the directive receiving stations and its associated non-directive re-radiating antenna, whereby the service area of the transmitting station may be increased.

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