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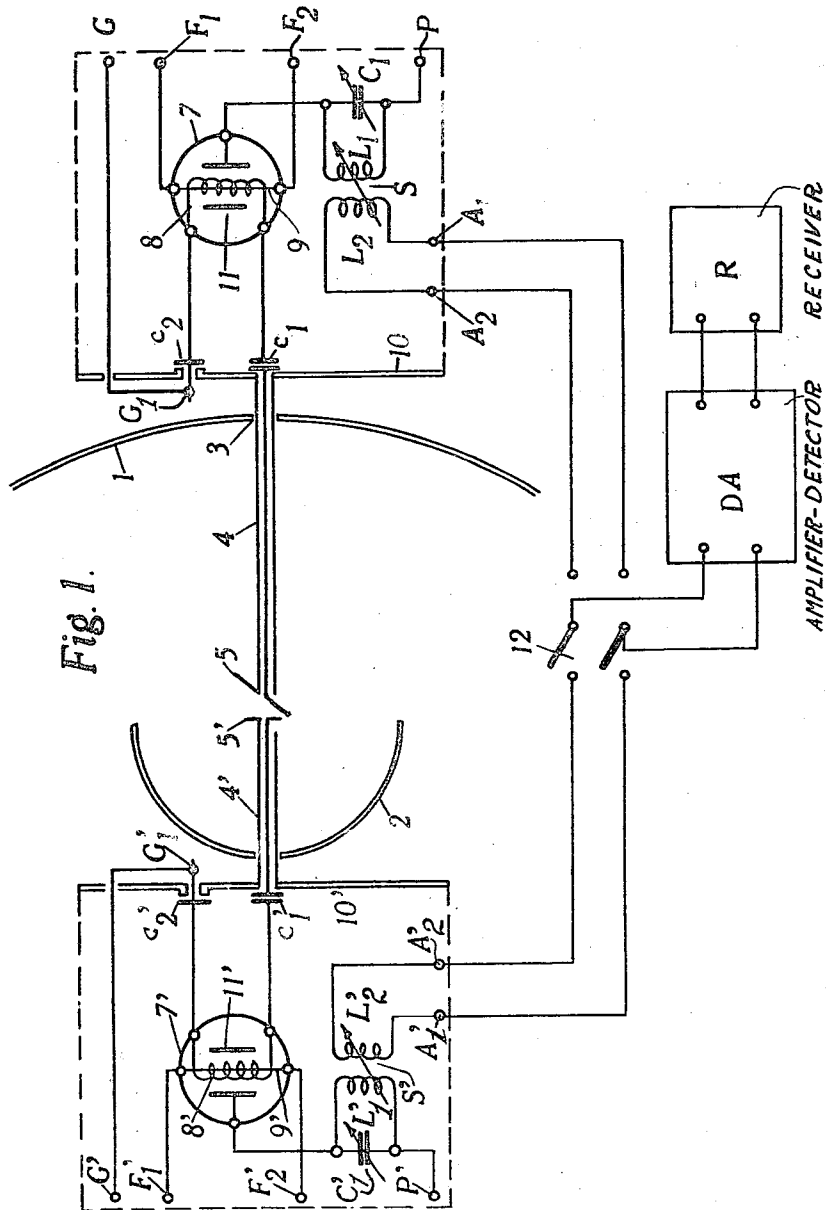
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HIGH FREQUENCY WAVE TRANSMISSION SYSTEM

Filed May 7, 1937

3 Sheets-Sheet 1



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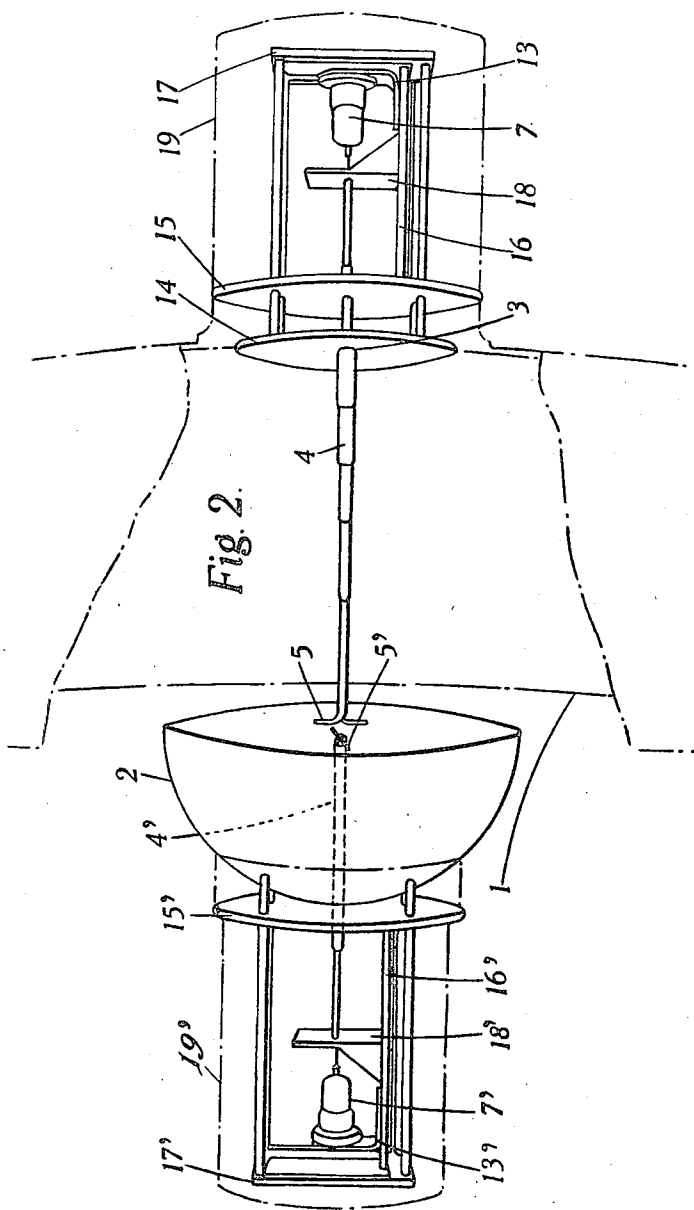
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HIGH FREQUENCY WAVE TRANSMISSION SYSTEM

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3 Sheets-Sheet 2



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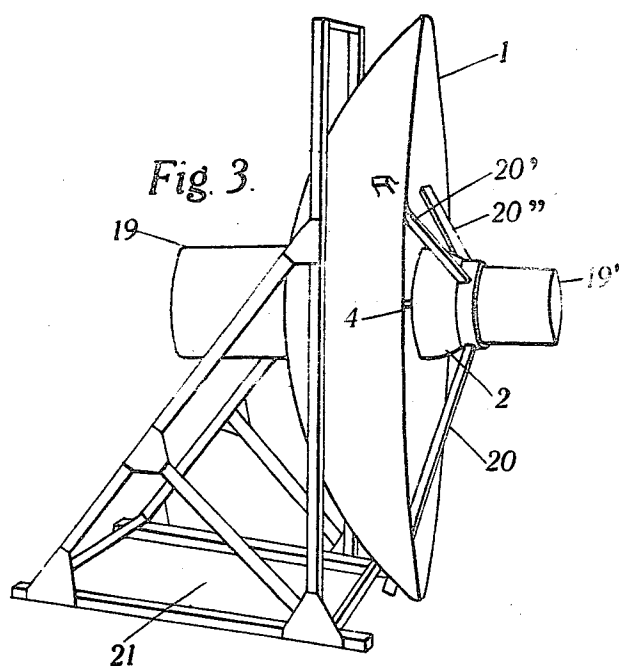
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HIGH FREQUENCY WAVE TRANSMISSION SYSTEM

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3 Sheets-Sheet 3



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HIGH FREQUENCY WAVE TRANSMISSION
SYSTEMAndre Gabriel Clavier, Paris, France, assignor to
International Standard Electric Corporation,
New York, N. Y.Application May 7, 1937, Serial No. 141,263
In France June 26, 1936

4 Claims. (Cl. 250—11)

The present invention relates to improvements in very high frequency signalling systems and particularly to those of such systems employed to establish 2-way communication.

The invention will be described in its application to ultra-short wave transmissions; it is well known that in this case electro-optical systems such as reflectors are used with advantage, on a focus of which is placed a transmitting or receiving system of electro-magnetic waves.

It is particularly the object of the invention to reduce to the minimum the number of reflector devices required for a system providing a plurality of connections, for example a system providing a 2-way connection.

The invention will be better understood by means of the following description made in relation with the attached drawings in which:

Fig. 1 shows the application of the invention in the case of the use of two receivers on different wave-lengths employing the same electro-optical system of wave concentration.

Fig. 2 shows in perspective the mechanical arrangement of the apparatus employing a circuit in accordance with Fig. 1, and finally

Fig. 3 is an external view showing the wave concentration system as well as the housings or protective means enclosing two receivers which are employed with the same electro-optical system.

In the embodiment which is about to be described it is assumed for simplicity that two receivers are to be used at one station, but it is of course understood that the invention can without difficulty be applied to a unit or station having two transmitters, or to one having a transmitter and a receiver employing a single electro-optical system.

All these devices, and in particular those described by way of example are characterized by the following facts:

1. The two antennae are disposed perpendicular to each other and are placed in the same focal region of the system.

2. Each of the transmitting or receiving tubes is placed behind one of the reflectors of the system and connected to its corresponding antenna over a transmission line which passes through the corresponding reflector, the two transmission lines preferably lying along adjacent segments of the same axis so as to cause a minimum of disturbance in the conformation of the fields.

3. Only two electro-optical systems are required for effecting duplex 2-way communication.

If, on the other hand it were desired to employ four reflector systems the present invention would permit the use of two frequencies for the transmission and two frequencies for the reception and thus it would be possible to effect either two separate 2-way communications or to make use of

different frequencies according to conditions of propagation and thus to obtain a greater period of service by the judicious choice of these frequencies. It is known in practice that the fading effects which are produced on the ultra-short waves vary in accordance with the frequency, and that by suitably changing the frequency these difficulties may be to a great extent reduced.

In Fig. 1, the electro-optical system is shown in the form of a parabolic mirror 1 on the focus of which is centred a spherical mirror 2. The parabolic reflector is provided in its apex with an opening 3 permitting the passage of a transmission line shown in the form of concentric conductors but which might be of any other suitable type.

This transmission line terminates in a radiation element shown in the form of a half-wave antenna 5 and at its other end through two coupling condensers c_1 and c_2 to the oscillating electrode 8 of a tube 7 capable of producing or receiving ultra-high-frequency oscillations. This tube comprises an electron-emitting electrode 9 which is fed by means of a suitable source between the terminals F_1 and F_2 . The oscillating electrode 8 is fed with direct current by a conductor G_1 terminating outside a screening plate 10. The conductor G_1 is not traversed by the high frequency oscillations. Finally, the tube 7 comprises a reflecting electrode 11 which is connected through a parallel oscillatory circuit L_1 , C_1 tuned to a suitable intermediate frequency (which may be much lower than that of the ultra-high-frequency service employed) to a source of supply P. The intermediate frequency oscillations produced in the circuit L_1 , C_1 can be transferred by electro-magnetic coupling between the coils L_2 and L_1 of transformer S. The oscillations produced in the circuit of coil L_2 can be brought by means of switching means such as 12 to a low frequency amplifier-detector device DA, whose output discharge is applied to a suitable utilization apparatus R. The switch 12 is shown in schematic form as governed by hand but it is clear that its control might be effected in any other suitable manner.

In the focal region where the antenna 5 is situated there has also been placed, in the embodiment illustrated in Fig. 1, another radiation element 5' perpendicular to the first. The element 5' is associated with transmission line 4' passing through a spherical reflector 2 and terminating on coupled condensers c'_1 and c'_2 which are associated with an ultra-high-frequency tube similar to that shown on the right of Fig. 1. The elements of this tube in the associated circuits are designated by the same reference signs as those of similar elements of Fig. 1, but distinguished by primes.

In the case of Fig. 1 the two tubes employed 60

are both receivers but it is clear that it would be possible to associate with the radiation elements 5 and 5', either two transmitters, or a transmitter and a receiver. Moreover, the relative positions with respect to the electro-optical system of the transmitters or receivers are immaterial. The electro-optical system is shown as consisting of a parabolic mirror plus a spherical mirror disposed so that its center lies at the focus of said parabolic mirror, but it must be understood that wave concentration systems of different form might be employed.

The embodiment of Fig. 1 comprises the so-called Clavier ultra-short-wave generating tubes, which operate generally on the Gill-Morell principle with Lecher tuning, but which are provided with lead-ins at both ends of the helical oscillatory electrode and are connected with the Lecher tuning circuit across these lead-ins. It should however be understood that other types of tubes may be employed and that the invention is not limited in its application to the case of waves produced by the electronic movement inside vacuum tubes.

One of the features of the system consists in the fact that the transmission lines 4 and 4' are placed end to end in line with each other and in an axis of symmetry of the wave-concentrating system and that two radiating systems such as 5 and 5' are placed in the same focal region; this arrangement ensures minimum disturbance in the distribution of the fields associated with each of the two antennae.

Fig. 2 shows the mechanical construction of an arrangement employing features of the system shown in Fig. 1. In this embodiment there is shown, inside the parabolic mirror 1 which is partially cut away, the manner in which the two tubes employed on the same electro-optical system are supported. 2 represents the spherical mirror, 5 and 5' the two antennae and 4 and 4' the corresponding transmission lines. The two tubes 7, 7' are shown supported by supports 13 and 13' which are adapted to be displaced along grooves in frame members 17, 17' for the adjustment of the length of the electric circuits and consequently of their tuning. Each such unit of tube, support, and frame is connected to its respective reflector by means of a pair of disks 14 and 15 or 15' and another one (not shown) within reflector 2. The two disks of each pair bear respectively against the inner and outer surfaces of the corresponding reflector. Four rods 16 or 16' constituting part of the frame 17 or 17' are extended to the disks and attached thereto thus providing a rigid arrangement.

The high-frequency output connections of the tubes 7 and 7' are limited by the screen 18 and 18' to the length suitable for the wavelength employed. The mounting assembly of each tube can be protected if desired by a metal cap 19 or 19' for ensuring the tightness of the system and its resistance to weather conditions, the apparatus being normally intended to operate in the open air and perhaps even to be movable or portable.

The general appearance of the device is shown in Fig. 3 on which the caps 19 and 19' are shown and also the arms 20, 20' and 20'' serving to maintain the cap 19' in the axis of the reflector system 1-2. The unit of the electro-optical system can be held in position by means of a suitably reinforced metal frame such as 21, but it is

obvious that other supporting arrangements can also be employed.

It is obvious that the invention is not limited to the arrangements described and that it is capable of other applications than those described.

What is claimed is:

1. Ultra-high-frequency antenna system for separate radiant action in a common direction with respect to two different waves, comprising two mutually perpendicular half-wave antennae disposed adjacent to one another, focussing means for concentrating the radiant actions of said antennae in a common direction substantially perpendicular to both said antennae, and two transmission lines each connected to one of said antennae, said two lines being disposed end to end along a common axis, substantially perpendicular to both said antennae and extending in opposite directions from said antennae, whereby these lines have a minimum mutual interaction.

2. Ultra-high-frequency wave translating system comprising two mutually perpendicular half-wave antennae disposed adjacent to one another focussing means for concentrating the radiant actions of said antennae in a common direction substantially perpendicular to both said antennae, two transmission lines each connected to one of said antennae, said two lines being disposed end to end along a common axis substantially perpendicular to both said antennae and extending in opposite directions from said antennae, whereby these lines have a minimum mutual interaction, and two wave translating devices disposed substantially on said common axis, one in front of and one behind said antennae, and each connected to one of said lines.

3. System according to claim 2, in which said focussing means comprise two opposed reflectors, one in front of and one behind said antennae, and in which one of said translating devices is disposed in front of the front reflector and the other of said translating devices is disposed behind the rear reflector, each of the said transmission lines extending through one reflector.

4. Ultra-high-frequency wave translating system comprising two mutually perpendicular antennae disposed adjacent to one another, a rear reflector disposed behind said antennae and a substantially smaller front reflector disposed in front of said antennae, said reflectors being shaped to electro-optically concentrate the radiant action of each one of said antenna in a forward direction substantially perpendicular to both said antennae by the cooperative reflecting action of both reflectors, a first and a second ultra-high-frequency wave translating device, each including a vacuum tube connected for electron oscillation, said first device being substantially centrally disposed in front of said front reflector and said second device being disposed behind said rear reflector, a first transmission line extending through said front reflector along a central axis substantially perpendicular to both said antennae and connecting said first translating device with one of said antennae, and a second transmission line disposed end-on with respect to said first line and extending through said rear reflector along substantially the same axis and connecting said second translating device with the other of said antennae.

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