

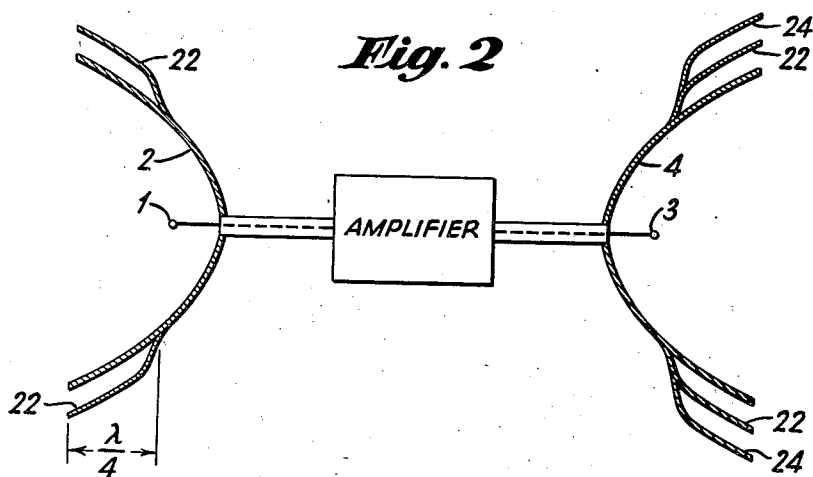
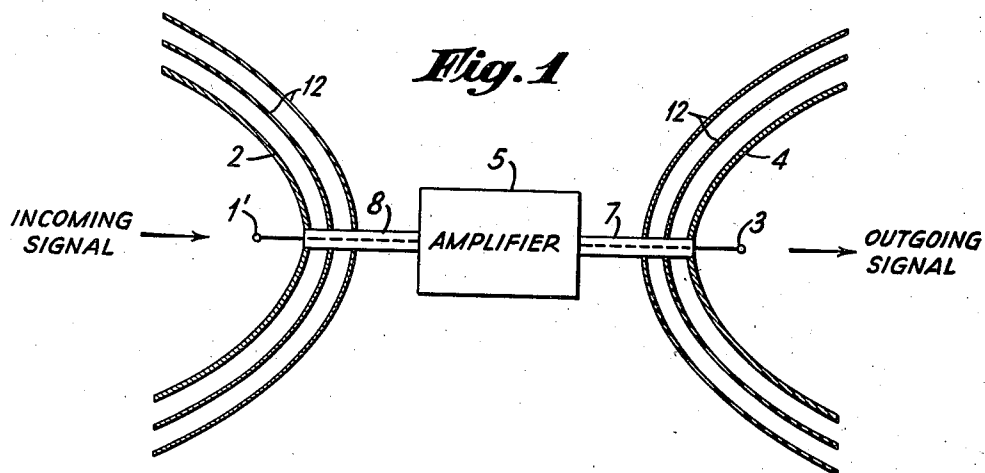
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RADIO RELAY REPEATER

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RADIO RELAY REPEATER

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9 Claims. (Cl. 250-15)

This invention relates to high frequency relay systems and, more particularly, to ultra high frequency radio relaying systems which do not utilize signal conversion.

In radio relaying by ultra high frequencies it is desirable to carry the radio signal along a chain of relay stations without resorting to frequency conversion. This may be done by receiving the incoming signal energy by a directional antenna, amplifying and retransmitting the signal from another directional antenna having its direction of maximum response directed away from the receiving antenna, at each relay station. In a system of this character the amplifying structure at each relay station becomes a straight radio frequency amplifier. The limit of amplification obtained at a relay station of this type is governed by the amount of feedback of energy from the output to the input. There are several ways in which this feedback takes place. Shielding and neutralizing between the stages may be insufficient or the deviation of the surrounding land from a perfect flat surface may cause reflections which carry radiation back from the transmitting antenna into the receiving antenna. However, amplifying circuits have been so perfected that internal feedback within the amplifier itself is no longer a governing factor. It has also been determined that in most circumstances the external feedback due to the nature of the surroundings is also negligible. The most formidable cause of limitation of amplification due to feedback resides at present in the radiation effect from the edges of the antenna reflectors and it is an object of the present invention to reduce such edge radiation.

An object of the present invention is to increase the efficiency of ultra high frequency relay stations by reducing the amount of feedback from the transmitting antenna to the receiving antenna.

A further object of the invention is to receive, amplify and retransmit ultra high frequency radio signals without frequency conversion and without feedback taking place between the transmitting and receiving antennas.

The present invention provides radiation traps around the periphery of the concentrating reflectors, or wave directive structures, around the transmitting and receiving antennas of an ultra high frequency radio relay station in order to limit re-radiation from the edges of such reflectors or wave directive structures.

Reference will now be made for a more complete understanding of the invention to the fol-

lowing detailed description, which is accompanied by a drawing in which Figure 1 illustrates diagrammatically one form of my invention and Figure 2 illustrates a modification of the invention.

The most direct way of eliminating edge radiation from the reflecting reflectors of an ultra high frequency relay station is shown in Figure 1 wherein the incoming signal is received on receiving antenna 1 within concentrating reflector 2 and conveyed through transmission line 8 to amplifier 5. After the signals are amplified in amplifier 5 the signal is conveyed through transmission line 7 to antenna 3 which, in conjunction with the concentrating reflector 4, re-radiates the signal without a change of frequency. Transmission lines 7 and 8 while shown as balanced shielded lines may be of any other suitable form such as concentric cables, balanced two-wire lines, and so forth. Due to the induced current in reflector 4 of the transmitting antenna 3, its edges tend to radiate part of the transmitting energy in all directions instead of in a beam as indicated by the signal L. This energy is picked up by the edges of reflector 2 and thus transferred to the receiving antenna 1, causing feedback through the amplifier. In order to reduce this edge radiation, according to one embodiment of my invention, I provide concentric reflector shields 12 around each of the antenna reflectors. While, for the sake of simplicity, the figure may be considered to show in section reflectors in the form of paraboloids obviously, of course, the reflectors may be parabolic cylinders with the radiating elements along an axis thereof, if desired. In some cases circular forms may be sufficiently directive. The reflector shields 12 need, of course, not conform closely in shape to the main reflectors 2 and 4 since they are in effect of a shielding nature only.

A modification of my invention is shown in Figure 2 wherein each of the concentrating reflectors 2 and 4 is provided with impedance traps 22. These consist of metal strips having a width equal to a quarter of the length of the operating wave and bonded to the reflector along one edge, forming a frame around the entire borders of the reflector system.

As a further modification, and as shown in the righthand portion of Figure 2, second high impedance trap 24 may be arranged around the first trap 22, thus increasing the impedance to any desired amount. The spacing between the edges of the reflectors 2 and 4 and over the edge of the quarter wave trap is not critical and may

be governed entirely by considerations of ease of manufacture.

While I have particularly described and illustrated several embodiments of my invention, it is to be clearly understood that my invention is not limited thereto but that modifications may be made within the scope of the invention.

I claim:

1. In a radio repeating station, an antenna including wave directive structure and means for eliminating radiation from the edges of such structure, said means including a resonant structure tuned to offer a high impedance to the operating frequency of said antenna at said edges.

2. In a radio repeating station, an antenna including wave directive structure and means for eliminating radiation from the edges of such structure, said means including a conductive strip having a width equal to a quarter of the length of the operating wave surrounding said edges.

3. In a radio repeating station, an antenna including wave directive structure and means for eliminating radiation from the edges of such structure, said means including a conductive strip having a width equal to a quarter of the length of the operating wave surrounding said edges and connected to said structure along its edge remote from the edge of said structure.

4. In combination with a radio repeating station having a receiving antenna and a transmitting antenna within concentrating reflectors of means for preventing the edges of the reflector surrounding said receiving antenna from being excited from said transmitting antenna, said means comprising a resonant structure presenting a high impedance to the operating frequency of said transmitting antenna at the edges of at least one of said reflectors.

5. In combination with an antenna having a

concentrating reflector at least partially surrounding said antenna of means for eliminating radiation from the edges of said reflector, said means comprising a resonant structure tuned to offer a high impedance to the operating frequency of said antenna at said edges.

6. In combination with an antenna having a concentrating reflector at least partially surrounding said antenna of means for eliminating radiation from the edges of said reflector comprising a conductive strip having a width equal to one quarter of the length of the operating wave surrounding said edges.

7. In combination with an antenna having a concentrating reflector at least partially surrounding said antenna of means for eliminating radiation from the edges of said reflector comprising a plurality of conductive strips having a width equal to one quarter of the length of the operating wave surrounding said edges.

8. In combination with an antenna having a concentrating reflector at least partially surrounding said antenna of means for eliminating radiation from the edges of said reflector comprising a conductive strip having a width equal to one quarter of the length of the operating wave surrounding said edges and connected to said reflector along its edge remote from the edge of said reflector.

9. In combination with an antenna having a concentrating reflector at least partially surrounding said antenna of means for eliminating radiation from the edges of said reflector comprising a plurality of conductive strips having a width equal to one quarter of the length of the operating wave surrounding said edges and connected to said reflector along the edges remote from the edge of said reflector.

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