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HIGH FREQUENCY CO-AXIAL DISTRIBUTOR AND SYSTEM

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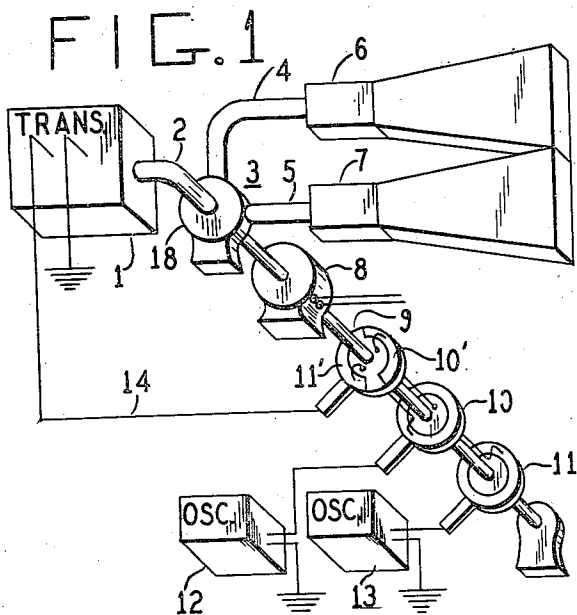


FIG. 2

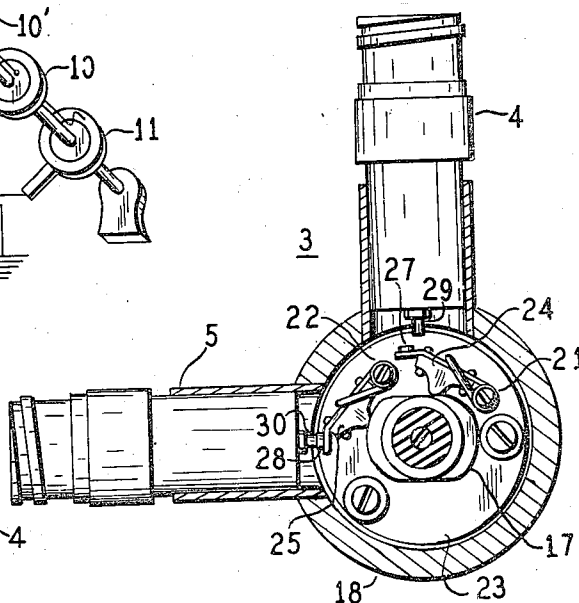


FIG. 3

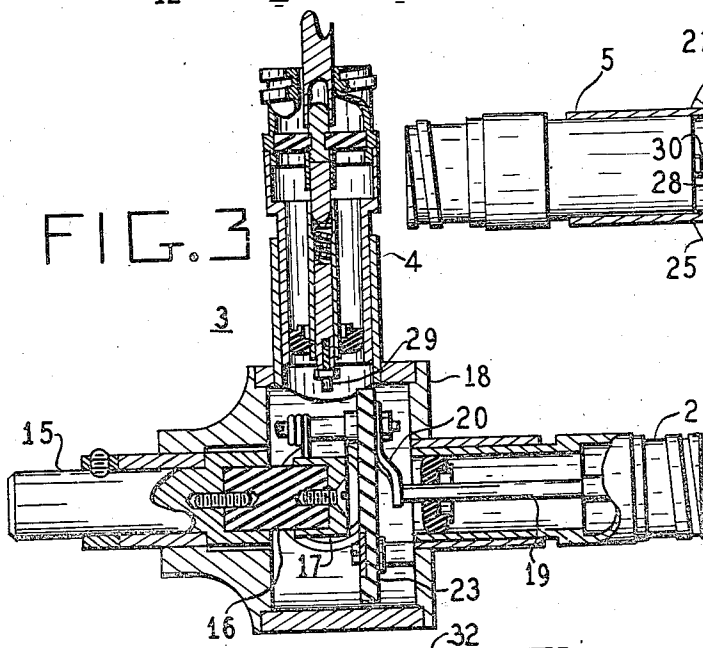
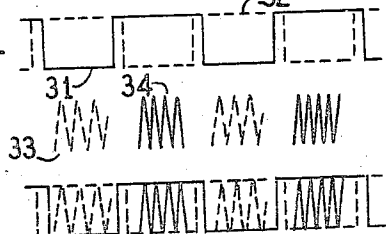


FIG. 4



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HIGH-FREQUENCY COAXIAL DISTRIBUTOR
AND SYSTEM

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Application November 27, 1940, Serial No. 367,330

12 Claims. (Cl. 250—11)

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This invention relates, generally, to the distribution of radio frequency energy from a source or transmitter to two or more co-axial line loads, and the invention has reference more particularly to a novel high frequency co-axial distributor and system employing the same.

Heretofore, it has been extremely difficult to distribute ultra high frequency electromagnetic energy to two or more loads intermittently or successively from a single source inasmuch as devices heretofore used required accurate matching of the loads to the transmitter or supply and also required tuning means, etc.

The principal object of the present invention is to provide a novel high frequency co-axial distributor suitable for use in distributing ultra high frequency electromagnetic energy from a suitable source to two or more loads or co-axial lines in succession or intermittently.

Another object of the present invention is to provide means for utilizing such co-axial distributor in supplying a modulated carrier of the order of 10^9 cycles per sec. alternately to a pair of electromagnetic directional radiators, whereby overlapping differently modulated electromagnetic beams are produced.

Other objects and advantages will become apparent as the description proceeds.

In the drawing:

Fig. 1 is a perspective view of the co-axial distributor of this invention and of a system using the same.

Fig. 2 is a partial sectional view of the distributor.

Fig. 3 is a partial sectional view taken at right angles to the structure of Fig. 2.

Fig. 4 illustrates diagrammatically the manner in which the carrier frequency is supplied to loads and the manner in which the modulations are superimposed thereon.

Like characters of reference are used in all the above figures to designate corresponding parts.

Referring now to the drawing, the reference numeral 1 designates an ultra high frequency generator or transmitter as of the type disclosed in application Serial #168,355, filed October 11, 1937, by Russell H. Varian, now Patent No. 2,242,275, issued May 20, 1941. The output of transmitter 1 is shown supplied through a concentric or co-axial line 2 to a distributor 3, which distributor is operative electrically or mechanically to alternately supply this high frequency energy through co-axial lines 4 and 5 to loads such as directional radiators or horns 6 and 7. A motor 8 is shown for operating the mechanical

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distributor 3 and for rotating commutators 9, 10, and 11. Commutators 10 and 11 have contact rings connected through brushes shown to modulating signal oscillators 12 and 13. The contact rings of commutators 10 and 11 are respectively connected to conducting segments 11' and 10' of commutator 9, which segments are alternately connected by a brush through lead 14 to generator 1 for modulating the output of this generator with the frequencies produced by oscillators 12 and 13.

The detailed construction of the co-axial distributor is shown in Figs. 2 and 3. In these figures the shaft 15 is adapted to be driven by the motor 8 and is connected through an insulating block 16 as of "Isolantite" to a cam 17 for rotating the latter within a casing 18. The co-axial line 2 supplying the high frequency energy to the distributor 3 has its inner conductor 19 connected by a spring contact means 20 to conducting posts 21 and 22 carried by an insulating disc 23 of low loss dielectric material. The posts 21 and 22 have cam followers 24 and 25 of insulating material pivoted thereon which followers are spring urged against the cam 17. These cam followers 24 and 25 have contact strips electrically connected with posts 21 and 22, which contact strips carry contact points 27 and 28 for respectively engaging the ends of the inner conductors 29 and 30 of co-axial load lines 4 and 5.

Thus, as shaft 15 revolves under the action of motor 8, the contact points 27 and 28 will successively engage the ends of inner conductors 29 and 30 of lines 4 and 5, thereby successively supplying energy to these two lines. In Fig. 2 the load co-axial lines 4 and 5 are shown displaced 90° apart, although it is to be understood that the angle therebetween may be made anything that is to be desired, depending upon the requirements of any particular installation. Also, the casing 18 may be provided with additional load co-axial lines if desired. The cam 17 is so shaped as to give the desired time intervals of engagement of the contact points with the respective co-axial line inner conductors. This cam is so designed that one contact point such as contact point 27 makes or engages an instant before the other contact point 28 breaks its engagement with the conductor 30. As thusly constructed the transmitter or generator 1 is never without a load so that contact sparking is reduced to a minimum. Maximum power from the transmitter or generator is given to each load in turn except for momentary overlappings. There

is a slight leakage into the open channel such as channel 4 of Fig. 2 with the contacts in the positions shown in the figure due to unavoidable capacitance between points, but this leakage can be reduced to a very small amount of some 2%-3%, for example, by proper design. The distributor of this invention generally requires no accurate matching of the loads to the transmitter nor does it require any tuning and, therefore, is highly desirable for many uses, and has been found particularly desirable as a distributor for micro-wave energy of the order of 10^9 cycles per sec.

In the system shown in Fig. 1 the radio frequency energy from the transmitter 1 is supplied through the distributor 3 and lines 4 and 5 to the loads or horns 6 and 7 which may be used in a blind landing system, for example. The oscillators 12 and 13 are adapted to supply the desired modulation to each horn and yet no modulated signal is transmitted during the contact overlapped period. This is accomplished through the use of proper commutator or switching means as shown in Fig. 1. In Fig. 4 solid line 31 shows the high frequency carrier as supplied by the distributor to horn 6, for example, whereas the dotted line 32 shows this carrier as supplied by the distributor to horn 7. The two modulations 33 and 34 are supplied by oscillators 12 and 13 to modulate the carrier supplied to the horns 6 and 7, respectively. Thus modulation 33 modulates the carrier 32, whereas modulation 34 modulates the carrier 31. This modulation is chopped off by commutator segments 10' and 11' so that there is no modulation during the contact overlapping periods.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In apparatus of the character described, a distributor comprising a casing, a co-axial supply line connected to said casing for supplying high frequency energy, a plurality of co-axial load lines connected to said casing for receiving high frequency energy passing therethrough from said supply line, separately movable contact means within said casing for connecting said supply line to each of said load lines, and motor driven cam means for intermittently actuating said movable contact means to effect intermittent supply of high frequency energy to said co-axial load lines.

2. In apparatus of the character described, a distributor comprising a casing, a co-axial supply line connected to said casing for supplying high frequency energy, a plurality of co-axial load lines connected to said casing for receiving high frequency energy passing therethrough from said supply line, contact means within said casing for connecting said supply line to said load lines in succession, said contact means comprising cam followers carrying contacts for engaging the axial leads of said co-axial load lines, said cam followers being connected to the axial lead of said supply line and motor driven cam means within said casing for actuating said cam followers in succession.

3. In apparatus of the character described, a co-axial line distributor comprising a casing with

inner conducting means, a co-axial supply line connected to said casing and having an axial conductor connected to said inner conducting means, a plurality of load circuits including co-axial lines connected to said casing and having inner conductors terminating therein, a plurality of movable contact means within said casing, each corresponding to one of said inner conductors and each connected to said inner conducting means, and motor means operable to successively and intermittently connect said contact means each in abutting relation to the free ends of its corresponding inner conductor.

4. Apparatus as in claim 3, wherein said motor means is operable to connect said contact means in such manner that the connection of each of said contact means is at least partially concurrent with the connection of the succeeding- and preceding-connected contact means.

5. In apparatus of the character described, a coaxial line distributor comprising a casing, a coaxial supply line connected to said casing and having an axial conductor extending within said casing, a plurality of load circuits including co-axial lines connected to said casing and having inner conductors terminating therein, a plurality of movable contact means within said casing, each corresponding to one of said inner conductors and each connected to said axial conductor, and means operable to successively and intermittently connect each of said contact means in abutting relation to the free end of its corresponding inner conductor.

6. Apparatus as in claim 5, wherein said last-named connecting means connects each of said contact means to its corresponding inner conductor in such manner that the connection of each of said contact means is at least partially concurrent to the connection of a preceding- and succeeding-connected contact means.

7. High frequency energy radiating apparatus, comprising a pair of radiators having overlapping directional radiation patterns, a source of high frequency energy, and means for connecting said source alternately to each of said radiating means in such manner that the period of energy supply to each of said radiating means overlaps the period of energy supply to the other of said radiating means.

8. High frequency energy radiating means as in claim 7, further including a pair of modulation signal sources, and means for supplying respective modulation signals to modulate said energy supplied to respective antennas only during the periods that said energy supply is connected to but one of said radiators.

9. High frequency energy radiating apparatus as in claim 7, wherein said energy connecting means comprises a casing, a coaxial supply line connected between said casing and said energy source and having an axial conductor, a pair of coaxial lines connected between said casing and respective ones of said radiating means and having inner conductors terminating within said casing, movable contact means within said casing, and means operable to intermittently connect said contact means in abutting relation to the free ends of said inner conductors, whereby energy from said source is supplied intermittently and successively to said radiating means through said load lines in overlapping periods.

10. In the method of transferring the flow of modulated radio-frequency carrier energy from a first path to a second path, the steps comprising in the following order, discontinuing the

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modulation of said carrier energy, directing said carrier energy to flow along said second path, discontinuing the flow of said carrier energy to said first path, and thereupon again modulating said carrier energy.

11. In the method of transferring the flow of modulated radio-frequency carrier energy from a first antenna to a second antenna, the steps comprising discontinuing the modulation of said carrier energy, and directing said carrier energy to flow to said second antenna, thereupon discontinuing the flow of carrier energy to said first path, and again modulating said carrier energy.

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12. In the method of transferring the flow of modulated radio-frequency carrier energy from a first antenna to a second antenna, the steps comprising directing said carrier energy to flow to said second antenna and discontinuing the modulation of said carrier energy, then discontinuing the flow of carrier energy to said first path, and thereupon modulating said carrier energy in a manner distinctive from said discontinued modulation.

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