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COMPACT HIGH FREQUENCY DIPOLE

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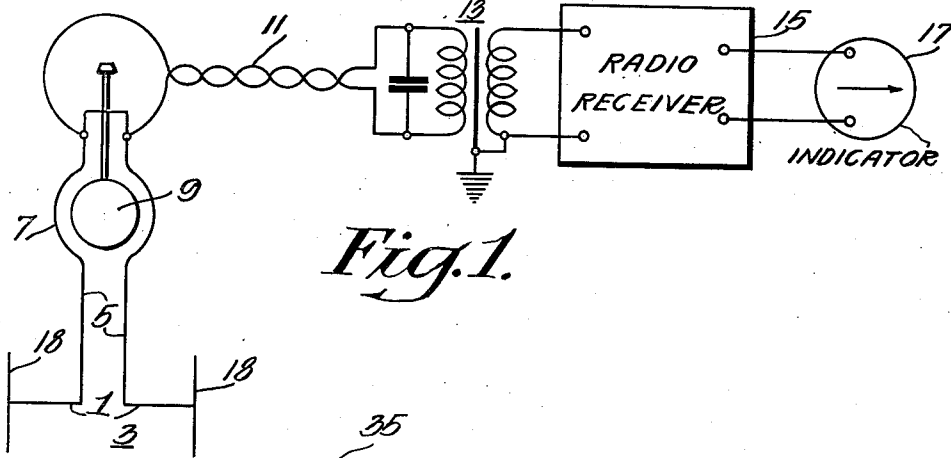


Fig. 1.

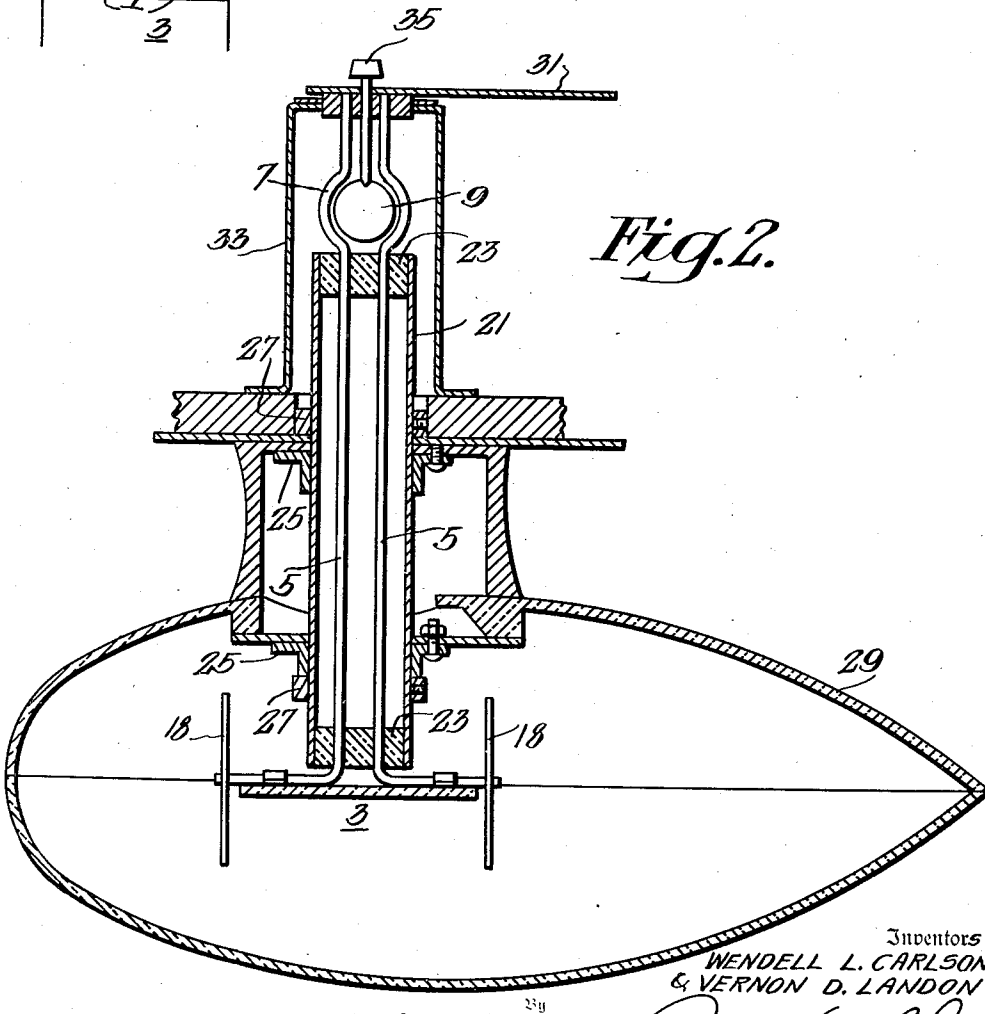


Fig. 2.

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COMPACT HIGH FREQUENCY DIPOLE

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8 Claims. (Cl. 250—33)

This invention relates to a compact high frequency dipole antenna of a design which is especially useful for aircraft direction finders.

Direction finding with dipole antennas is old but the use of high frequency horizontally polarized waves has presented new problems. A dipole which is fixed in space and which is fixedly tuned is not especially difficult to design. When the dipole is dirigible, is tunable and is limited to a small streamline housing, a conventional design is impractical.

Therefore, it is one of the objects of this invention to provide a dipole of suitable design for use on aircraft. Another object is to provide a compact dirigible and tunable dipole. Another object is to provide a compact dirigible dipole with tuning means so constructed and arranged that the symmetrical properties of the antenna are not altered substantially by the tuning.

The invention will be described by reference to the accompanying drawing in which Figure 1 is a schematic diagram of one embodiment of the invention; and Figure 2 is an elevational view, partly in section, of an antenna designed in accordance with the invention. Similar reference numerals will be used to indicate similar elements in the figures.

Referring to Figure 1, the arms 1 of a dipole antenna 3 are connected to the conductors 5 of a tunable transmission line. The resonant transmission line includes a bulged section 7 which is formed by oppositely extending arcs formed by bending the conductors 5. A tuning disc 9 is mounted within the bulged section 7 so that the transmission line may be tuned by rotating the disc about an axis passing through its diameter. A conventional transmission line 11 is connected to the tunable line 5 at points where a suitable impedance match is found. The second line is terminated at shielded transformer 13, having a symmetrical primary relative to the shield. The secondary of the transformer is connected to a radio receiver 15 and hence to an indicator 17.

If the dipole were made of the conventional length for receiving waves of the order of 125 megacycles it would be approximately 1.2 meters long. While this length would not be a factor in installations where space is not at a premium or where the drag due to the airspeed was not an important element, the length does not lend itself to the small streamline antenna housings used on modern aircraft. The solution of this difficulty, for the chosen example in accordance with the present invention, is to reduce the length of the dipole to about six inches, tune the

line connected thereto, and mount copper discs 18 on the ends of the dipole. The discs may be of copper about four inches in diameter and one thirty second of an inch in thickness. The dimensions are determined by the practical operating conditions. The dipole length is thus reduced to $\frac{1}{8}$ of the normal length; nevertheless, the effectiveness is 75 percent of a full length dipole because the radiation resistance is reduced and the Q of the circuit is increased. These factors increasing the efficiency are offset by the lower induced voltage. It should be understood that the antenna resonant circuit includes the arms 1, discs 18, conductors 5, and tuning disc 9. Of these the unshielded parts are the effective reception or radiation elements.

By way of example, Fig. 2 illustrates one practical embodiment of the invention. The lower portion 19 of the transmission line is mounted within a shield member 21. Insulation members 23 support the line at the ends of the shield. The shield is mounted within bearings 25 and held in position by collars 27. The dipole 3 is rotated within an insulated streamline housing 29 by means of the handle 31 mounted on the disc 33 which terminates the transmission line. The bulged portion 7 of the transmission line is housed within a second shield member 33. The tuning disc 9 is suitably connected to a tuning knob 35 which rotates with the dipole. Tuning and dipole azimuth scales may be associated with the controls.

Thus the invention has been described as a dipole which has been shortened from a half wave to a sixteenth of a wave length. The dipole is made dirigible within a compact streamline housing. The resonant transmission line connected to the dipole includes a bulged section within which is positioned a tuning disc. The line and disc are shielded. The symmetry of the device is not affected by tuning or azimuth position. The disc members either for the dipole or tuning may be made of any desired geometric form instead of circular. The antenna is preferably symmetrically balanced so that in phase voltages reaching the transmission line do not induce voltages on the receiver.

What is claimed is:

1. A dipole antenna including in combination a pair of dipole conductors, a pair of conductive members secured respectively to the outer ends of said conductors, a transmission line connected to said dipole conductors and including a bulged section, and a tuning member located within said bulged section and consisting of a movable mem-

ber mutually coupled to said bulged section for varying the effective length of said line.

2. A dipole antenna including in combination a pair of dipole conductors having an overall length substantially less than half the operating wave length, a pair of conductive members secured respectively to the outer ends of said conductors, a transmission line connected to said dipole conductors and including a bulged section, and a tuning member located within said bulged section and consisting of a movable metal member mutually coupled to said bulged section.

3. A dipole antenna including in combination a pair of dipole conductors, a pair of conductive discs having diameters equal to a substantial portion of the dipole length secured to the outer ends of said conductors, a transmission line connected to said dipole conductors and including a bulged section, and a tuning member consisting of a metal disc mutually coupled to and rotatably mounted within said bulged section.

4. A dipole antenna including in combination a pair of dipole conductors having an overall length substantially less than half the operating wave length, a pair of conductive discs having diameters of the order of said dipole length secured to the outer ends of said conductors, a transmission line connected to said dipole conductors and including a bulged section, and a tuning member consisting of a member mutually coupled to and rotatably mounted within said bulged section.

5. A dipole antenna including in combination a pair of dipole conductors, a pair of conductive members secured to the outer ends of said conductors, a transmission line connected to said

dipole conductors and including a bulged section, a tuning member consisting of a movable metal member mutually coupled to and located within said bulged section, and means shielding said transmission line.

6. A dipole antenna including in combination a pair of dipole conductors, a pair of conductive members secured to the outer ends of said conductors, a transmission line connected to said dipole conductors and including a bulged section, a tuning member consisting of a movable metal disc mutually coupled to and located within said bulged section, means shielding said transmission line and said tuning member.

7. A dipole antenna including in combination a pair of dipole conductors having an overall length substantially less than the operating wave length, a pair of conductive discs having diameters of the order of two-thirds of said dipole length secured to the outer ends of said conductors, a transmission line connected to said dipole conductors and including a bulged section, a tuning member rotatably mounted within said bulged section, means shielding said transmission line and said tuning member, and an insulated streamline housing enclosing said dipole antenna.

8. A dipole antenna including in combination a pair of dipole conductors, a pair of conductive members secured to the outer ends of said conductors, a transmission line connected to said dipole conductors, and a tuning member consisting of a movable member mutually coupled to and located within said transmission line.

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