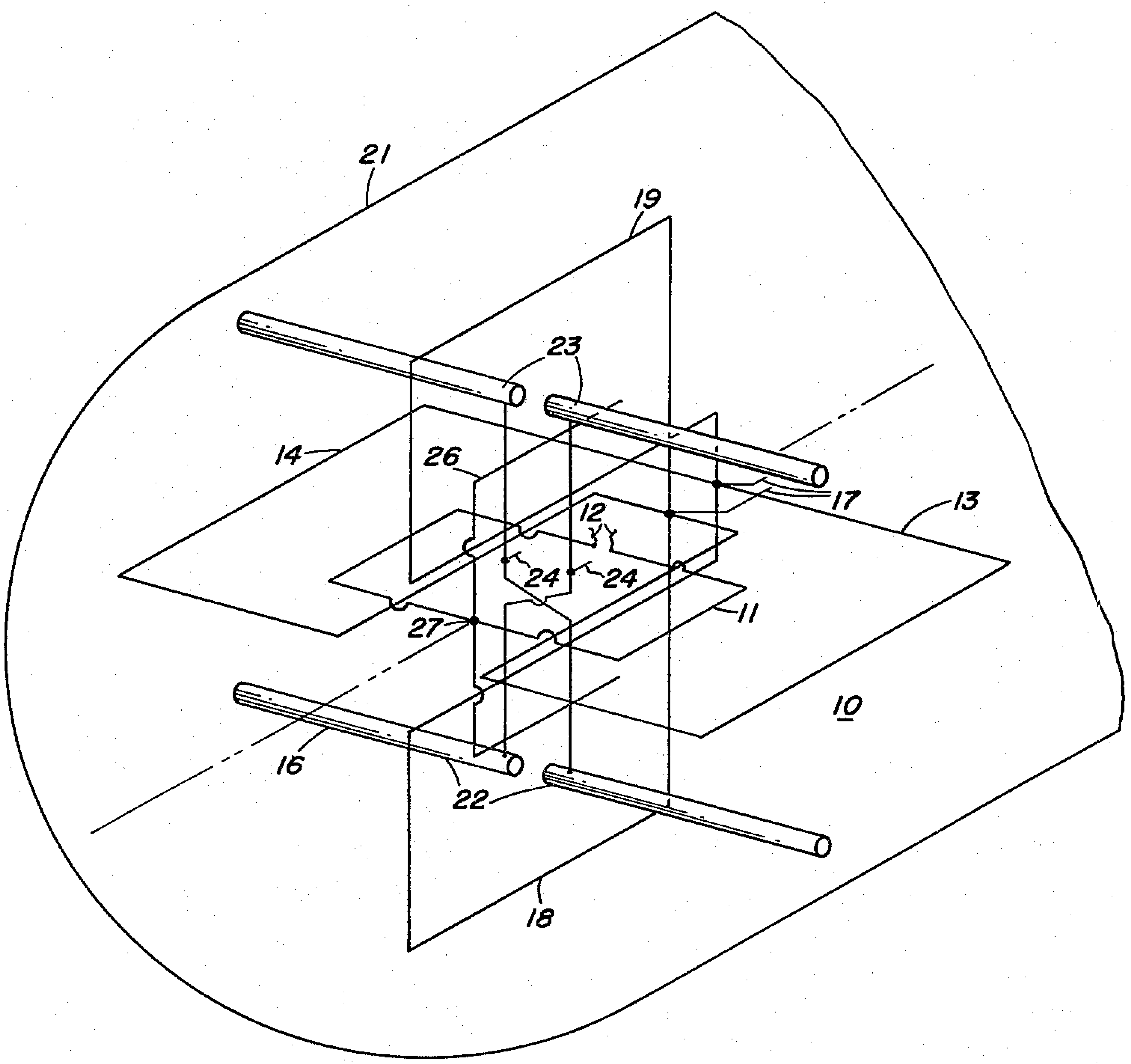
Aug. 8, 1961 N. SHYHALLA ET AL 2,995,752

DIRECTION-FINDING ANTENNA

Filed Jan. 29, 1960



Inventors
NICHOLAS SHYHALLA
RICHARD J. BLUM

By R. J. Tomplins

Attorney

United States Patent Office

2,995,752

Patented Aug. 8, 1961

2,995,752
DIRECTION-FINDING ANTENNA

Nicholas Shyhalla, Niagara Falls, and Richard J. Blum, Buffalo, N.Y., assignors, by mesne assignments, to the United States of America as represented by the Secretary of the Navy

Filed Jan. 29, 1960, Ser. No. 5,573
3 Claims. (Cl. 343—114)

The present invention relates to direction-finding antennas and more particularly to very high frequency direction-finding antennas for use on aircrafts or missiles.

In the very high frequency range (30 to 300 megacycles) the coupling between the missile or airframe in which an antenna is mounted and the antennas become important where the antenna must be small with respect to wavelength. An example of such an antenna would be one that would fit inside a fifteen inch diameter missile of between two and three half-wavelengths long. If the whole system is visualized as radiating, the undesirable radiation contributed by the missile is very strong and overrides the radiation of the small directional antennas. As a result, the use of known antenna configurations would cause the missile to home (when used as a seeker) on ambiguous nulls.

An object of the present invention is the provision of an antenna system which is decoupled from its mount to eliminate interference from the mount.

Another object is to provide a receiving antenna for receiving signals in the very high frequency range without interference from the antenna mount.

A further object of the invention is the provision of an antenna system which is decoupled from its mount by means of antenna configuration and compensating elements.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing wherein there is shown a preferred embodiment of the invention.

The antenna configuration shown is for receiving radio command signals for controlling a missile or aircraft in which the antenna configuration may be mounted. Antenna **10** consists of three components for sense, right-left, and up-down signals. The sense element of antenna **10** is a single symmetrical horizontal loop **11** and compensating element **26** located in the center of antenna **10**. The output from loop **11** is fed to a balun (balance to unbalance transformer), not shown, by a two conductor balanced transmission line **12**. The right-left antenna consists of horizontal loops **13**, **14** and vertical loops **18** and **19**. Horizontal loops **13** and **14** and vertical loops **18** and **19** are symmetrically spaced about missile axis **16**. Loops **13**, **14** are connected differentially through a balanced two wire transmission line **17** to a balun, not shown. A pair of loops **18**, **19** are mounted in a vertical plane and connected in parallel with loops **13**, **14** to cancel the coupling between the missile body **21** and loops **13**, **14**. Loops **18**, **19** are insensitive to horizontally polarized signals so they do not affect the antenna pattern for this polarization.

The up-down antenna consists of a pair of horizontal dipoles **22**, **23** mounted symmetrically about center line **16** in a vertical plane. The output from dipoles **22**, **23** is coupled out of phase through balanced two wire line **24**.

Compensating element **26** is fastened to loop **11** at **27** to

compensate for the capacitance between sense loop **11** and right-left loops **13**, **14**, **18**, and **19**.

In use, when antenna assembly **10** is pointed directly toward a radiating source, only sense element **11** provides an output since for this condition elements **13**, **14** and **22**, **23** are at the null. As the direction in which antenna **10** is pointed varies from the radiating source, error signals will be produced by the difference in signal strength received by elements **13**, **14** or **22**, **23**. The output of loops **13**, **14** represents the left-right error signal which is zero for straight ahead and is proportional to the difference in the time of arrival of the radiating signal at loops **13** and **14**. The output signal from dipoles **22**, **23** represents up-down error signals and is obtained in the same manner as the left-right error signals. These error signals are fed to a control circuit, not shown, for controlling the flight of an aircraft or missile.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A directional radio receiving antenna system for receiving very high frequency signals comprising a rectangular loop for sensing a beam of radio energy, a first pair of rectangular loops for sensing deviations from said beam of radio energy in the horizontal plane, a pair of dipoles for sensing deviations from said beam of radio energy in the vertical plane, a second pair of loops connected to said first pair of loops for cancelling any coupling between said first pair of loops and the mounting means for said antenna system and a U-shaped member connected to said first rectangular loop for compensating for the capacitance between said first horizontal loop and said first and second pairs of horizontal loops.

2. A directional radio receiving antenna system adapted to be mounted on an airframe for receiving very high frequency signals comprising a horizontal loop for sensing a beam of radio energy, first antenna means for sensing deviations from said beam in the horizontal plane, second antenna means for sensing deviations from said beam in the vertical plane, a U-shaped element connected to and perpendicular to said horizontal loop for compensating for the capacitance between said horizontal loop and said first antenna means, and additional compensating means connected to said first antenna means for decoupling said first antenna means from said antenna mount.

3. A directional radio receiving antenna system adapted to be mounted on an airframe for receiving very high frequency signals comprising first antenna means for sensing a beam of radio energy, a pair of horizontal loops mounted symmetrically about the airframe axis for sensing deviations from said beam in the horizontal plane, second antenna means for sensing deviations from said beam in the vertical plane, first compensating means connected to said first antenna means for compensating for the capacitance between said first antenna means and said pair of horizontal loops, and a pair of vertical loops mounted symmetrically about the airframe axis and connected in parallel with said horizontal loops for decoupling said horizontal loops from said antenna mount.

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