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D. J. MOORE

3,228,030

SHIELDED ANTENNA

Filed June 11, 1965

FIG. 1.

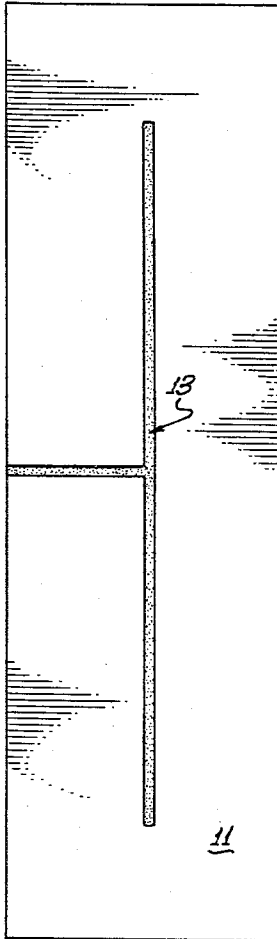


FIG. 3.

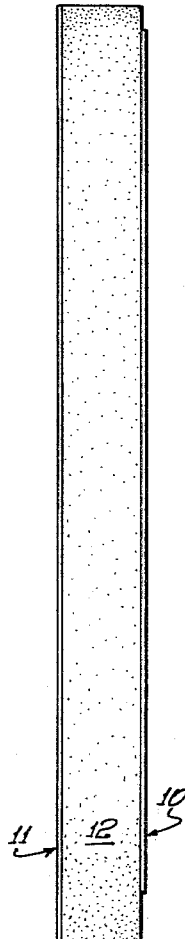


FIG. 2.

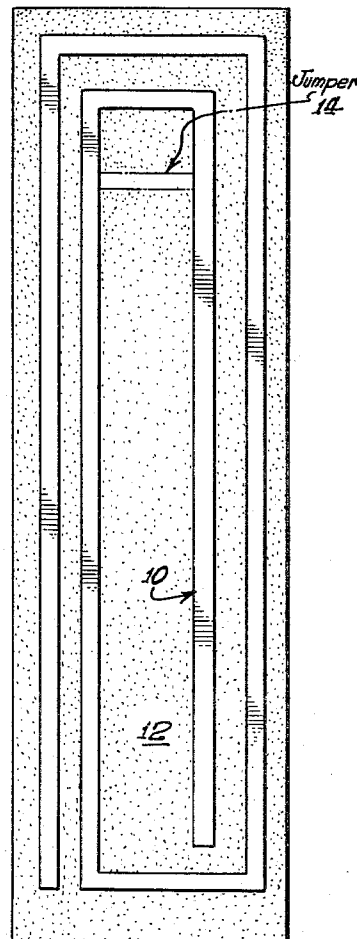
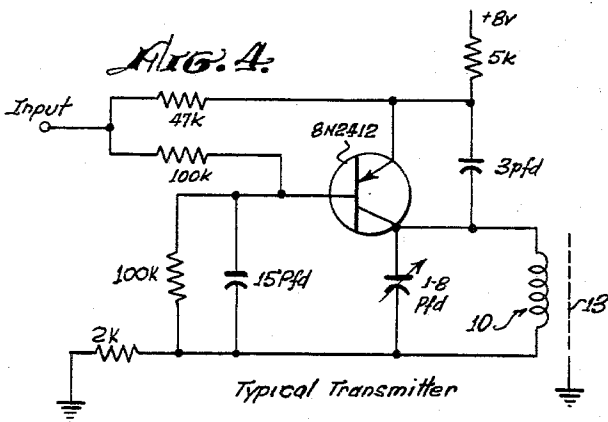


FIG. 4.



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3,228,030

SHIELDED ANTENNA

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This invention relates to antenna systems and more particularly to a slot form of antenna particularly useful for radiation of microwave energy.

Early microwave antenna systems required expensive conductor systems employing waveguides or coaxial cables. As technical development has reached into higher and higher frequencies, the precision requirements of these types of radiation systems have become very exacting, thereby rendering difficult the manufacture of satisfactory microwave antennas.

As technology advanced, microwave antenna systems were developed of a character readily adapted for use of printed circuit techniques. This principle, as exemplified by U.S. Patent No. 2,654,842, employs as the radiating element of the antenna system a conductor, known commonly as a line conductor, which is small in width compared with a second conductor, known commonly as a grounded conductor. The conductors are spaced apart by a dielectric. By making the ground conductor considerably wider than the line conductor, an image effect is produced which provides in effect an electric and magnetic field distribution between the two conductors. The width of the line and the spacing between the line and the ground conductor. The conductors are spaced apart of the transmission path.

The antenna of the present invention is basically a two element antenna which has a flat "tank" coil sandwiched close to a flat plane Faraday shield. This antenna can be used in a small package for transmitting and receiving RF signals. The antenna is shielded and minimizes detuning effect when placed next to a non-ferrous body.

The antenna of this invention is particularly adapted for use with telemetry equipment for monitoring the functions of living bodies. In such applications, signals generated by the body are received and transmitted by the instant antenna to a receiver such as a signal meter or oscilloscope where the body functions can be viewed to determine any abnormal reactions or conditions.

Also, this antenna has utilization in communication systems carried on or by a living being due to the shielded arrangement which minimizes detuning effect due to the nearness of such a non-ferrous body.

Therefore, it is an object of this invention to provide an antenna.

A further object of the invention is to provide a shielded antenna capable of efficient operation when located next to a non-ferrous body.

Another object of the invention is to provide a coil antenna shielded to minimize detuning effect when placed next to a living body.

Another object of the invention is to provide a two element antenna having a flat "tank" coil sandwiched close to a flat plane Faraday shield having a T-slot configuration.

Another object of the invention is to provide a shielded antenna wherein the shield is configured to reduce possibilities of changing the oscillating frequency due to being contacted by a non-ferrous body.

Other objects of the invention will become readily apparent from the following description and accompanying drawings wherein:

FIG. 1 is a view showing the T-slot shield of the antenna of this invention;

FIG. 2 is a view showing the flat coil of the antenna;

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FIG. 3 is an end view illustrating the shield and flat coil separated by a dielectric; and

FIG. 4 is a schematic illustrating a typical transmitter circuit for the antenna of this invention.

Broadly, the present invention relates to a shielded antenna comprising a thin sheet of dielectric material sandwiched between a printed circuit tank coil on one side and a grounded Faraday shield having a T-slot on the other side.

Referring now to the drawings, FIGS. 1 to 3 illustrate a two element antenna which has a flat "tank" coil 10 sandwiched close to a flat plane Faraday shield 11 by dielectric material 12, the shield 11 being provided with a T-shaped slot 13. If desired a jumper 14 may be used to adjust the self-resonant point of the antenna. The proper selection of the dielectric, however, eliminates the need of jumper 14. The shielded antenna, for example, may be printed on a double copper clad controlled dielectric board with the coil 10 printed on one side and the shield 11 printed on the other, the dielectric 12 being Epon glass which is essentially an epoxy-type resin impregnated fiber glass material, the resin being of the laminating type produced by Shell Chemical Corporation under the trade name Epon.

The embodiment of the antenna illustrated is designed to be used in a 7 channel pulse width modulated telemetry unit for monitoring biomedical signals. The unit was built for a frequency of operation from 60 to 110 mc. The "tank" coil type antenna provides effective operation in applications having space limitations such as biomedical telemetry units. The proximity effect of a body close to an unshielded "tank" coil 10 changes the oscillating frequency proportionally to the distance between the coil and the body. The Faraday shield 11 maintains a constant oscillating frequency even though there is a large non-ferrous body near by.

The antenna illustrated has a dielectric 12 of Epon glass and a thickness of 0.125 inch. If a thinner board is used the distributed capacitance between the coil 10 and the shield 11 increases, and the "Q" of the antenna reduces to a value too low for good radiation. A thicker board will reduce the shielding effect of the Faraday shield.

The T-slot 13 in the shield 11 of the antenna increases the "Q" and radiation effect of the antenna compared to an unslotted shield, or a shield of a different slot configuration. The T-slot shield may be touched by a hand anywhere on the shield, except on the stem of the T without changing the oscillating frequency. The reason for the efficient operation of the T-slot 13 is not understood at the present time. However, tests have shown that this preferred configuration operates as set forth above.

The length of the printed coil 10 is determined by the type of epoxy board used and should be of such length that the antenna will be self-resonant at a frequency just higher than the highest frequency of the tuning range. The self-resonant point can be adjusted by the jumper 14, as pointed out above.

The operation of the transmitter circuit illustrated in FIG. 4 will be apparent to those skilled in the art and a detailed explanation of the circuit is deemed unnecessary. The values of the circuit components are exemplary only and correspond to the specific values for the antenna set forth above.

It has thus been shown that the present invention provides an antenna that can be used in a small package for transmitting and receiving R.F. signals, the antenna being shielded to minimize detuning effect when placed next to a non-ferrous body, such as a human being. Thus, the antenna has particular application in telemetry units for monitoring biomedical signals or in wireless microphones.

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While a specific example of the invention has been illustrated and described, modifications will become apparent to those skilled in the art, and it is intended to cover in the appended claims all such modifications as come within the spirit and scope of this invention.

What I claim is:

1. A shielded antenna comprising a thin sheet of dielectric material sandwiched between a printed circuit tank coil on one side and a grounded Faraday shield on the other side, said shield having a T-shaped slot therein.

2. The shielded antenna defined in claim 1, additionally including a jumper member operably connected with said tank coil for adjusting the self-resonant point of the antenna.

3. The shielded antenna defined in claim 1, wherein said dielectric material is composed of epoxy impregnated fiber glass and said tank coil and shield are copper.

4. The shielded antenna defined in claim 1, wherein said dielectric material, said tank coil, and said shield have a combined thickness of about 0.125 inch.

5. In combination with a telemetry unit for monitoring biomedical signals, an antenna comprising dielectric material with a flat tank coil and a flat plane shield operatively positioned on opposite sides thereof, said shield being provided with a T-shaped slot therein for minimizing the detuning effect on the antenna when placed next to a non-ferrous body.

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25 ELI LIEBERMAN, *Acting Primary Examiner*.