Nov. 27, 1951 R. J. LENSE 2,576,128

MAN-PACK ANTENNA

Filed April 3, 1948

FIG. 1

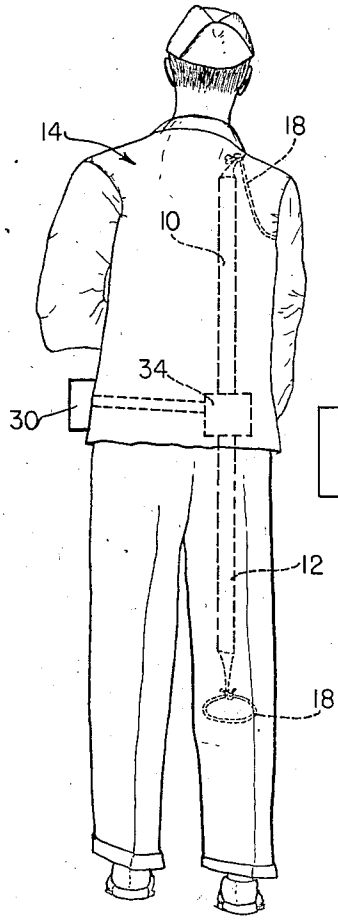


FIG. 2

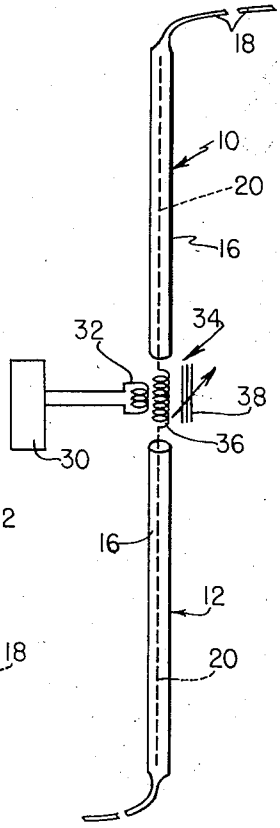


FIG. 3

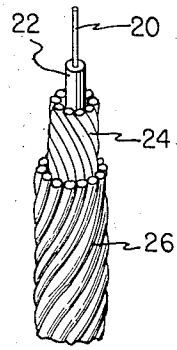
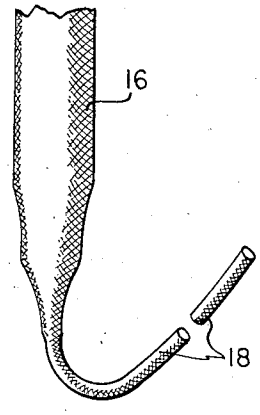


FIG. 4



INVENTOR.
Ralph J. Lense

BY
Thomas L. Mueller
Atty.

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MAN-PACK ANTENNA

Ralph J. Lense, Deerfield, Ill., assignor to Motorola, Inc., Chicago, Ill., a corporation of Illinois

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6 Claims. (Cl. 250—33)

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This invention relates to antennas for portable radio equipment and the like, and it has particular reference to an antenna adapted to be worn with or concealed under the clothing of the user.

There are some situations in which wearable antennas are very desirable. In military usage, for example, a concealed antenna is highly advantageous because it gives no indication to the enemy that a communication set is being carried on the person. Such an antenna also has the advantage that there are no projecting parts which are likely to become caught on obstructions or which are exposed to rain, mud or the like. However, there has been a serious problem of keeping the capacity between the antenna and the body of the wearer sufficiently low so that the antenna will not be critical in its operation. Prior antennas were affected by movements of the wearer and were sensitive to the varying body capacities of different individuals.

An object of the present invention is to provide an improved wearable antenna constructed so that a very low capacity exists between the antenna conductor and the body of the wearer whereby the tuning of the antenna is quite broad.

Another object is to provide a novel man-pack antenna which is extremely flexible so as not to hamper the movements of the wearer.

A still further object is to provide an improved wearable antenna of simple and economical construction in which the antenna capacity has a low, substantially constant value unaffected by different body capacities and positions of use.

A primary feature of the invention is the formation of sufficient air cells or spaces in the antenna insulation so that the dielectric between the antenna conductor and the wearer's body is mostly air.

Another feature of the invention consists in providing two layers of dielectric tubing (spaghetti insulation) which are spirally wound in opposite directions around the antenna conductor.

Still another feature is the provision of an outer serving which has an extended end or pigtail that can be fastened about a part of the wearer's body.

The foregoing and other objects, features and advantages of the invention will be apparent from a study of the following description taken in connection with the accompanying drawing, wherein:

Fig. 1 is a partially schematic elevational view of a person equipped with a concealed man-pack antenna constructed in accordance with and embodying the principles of the invention;

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Fig. 2 is a schematic illustration of a portable radio system utilizing such an antenna;

Fig. 3 is a cut-away view of the antenna structure; and

Fig. 4 is a detail view of the extended end or pigtail of the antenna.

In practicing the invention, an insulated antenna conductor is covered by two layers of spaghetti insulation which are spirally wound in opposite directions, and an outer serving of fabric, rubber or other suitable material, is placed over the spirally wound layers. The capacity of the antenna is low since the dielectric is mostly air. Two similar antenna sections are employed, one being adapted to extend along the upper portion of the wearer's body, while the other depends from the wearer's waist adjacent one of his legs, thereby affording a dipole. By means of the pigtail at the upper end of the antenna the upper section is fastened to the wearer's shoulder, and the lower section is similarly fastened to the wearer's leg. The upper and lower antenna sections are connected together by a variable inductor which constitutes the primary of an input transformer for a receiver or other piece of radio equipment carried by the wearer. The antenna has very broad tuning so that it is not sensitive to changes of body capacity or movements of the wearer.

Referring now to the drawing, the antenna there shown is of the dipole type which comprises an upper section 10 and a lower section 12. The upper section 10 extends from the waist of the wearer's body 14 to a point adjacent to the wearer's shoulder, while the lower section 12 depends from the wearer's waist adjacent a leg and may terminate near the knee. Each section 10 or 12 has an outer serving 16 which is extended past the antenna proper at one end thereof to afford a pigtail 18. The pigtails 18 serve to fasten the antenna sections to the shoulder and leg, respectively, of the wearer.

Each antenna section has at its core an antenna conductor 20 which may be insulated by solid material as indicated at 22. Surrounding this core is a layer of dielectric tubing or spaghetti 24 which is spirally wound. A second layer of tubing or spaghetti 26 is spirally wound in a direction opposite to that of the first layer 24. Opposite winding of the two layers tends to balance out stresses on the antenna. The serving 16 is placed over the second layer 26.

Preferably the conductor 20 is made of stranded copper wire for flexibility. The insulation 22 is relatively thin and flexible. The tubes 24 and 26 can be made of Vinylite or other plastic material

having a wall thickness and diameter such as to achieve the maximum degree of flexibility together with adequate resistance to stresses which might tend to collapse the tubing. Because of this tubing, the dielectric between the conductor 20 and the body 14 of the user is largely air, and the resulting capacity between the antenna and the user's body is quite low. The serving 16 holds the layers of tubing in place and may be waterproofed to prevent the entrance of moisture. It may be advisable also to seal the ends of the spaghetti insulation to prevent water from being drawn therein by capillary action. However, the insulating tubes should not be glued together, as this would form a rigid cylinder and destroy the flexibility of the antenna.

The radio equipment such as the receiver 30 carried by the wearer is coupled in any suitable manner to the secondary 32 of an antenna input transformer 34 carried at the waist. The primary 36 of the transformer 34 is connected at its ends respectively to the conductors 20 in the two sections 10 and 12 of the antenna. The transformer 34 is provided with a movable core 38 for inductance tuning of the antenna system.

It will be apparent from the foregoing description that I have provided an antenna structure which is not critical and in which the tuning of the antenna is very broad, due to the low capacity between the antenna conductors and the body of the wearer. The porous or cellular contruction of the insulation gives an effective dielectric constant not substantially greater than unity. The layers of plastic tubing 24 and 26 minimize relative movement between the antenna conductors 20 and the wearer's body. The movements of the wearer are not hampered by this arrangement, and the structure is very inconspicuous when worn.

While a preferred embodiment of the invention has been disclosed herein, this obviously is capable of modification, and it is intended that the appended claims cover all modifications coming within the above described principles.

I claim:

1. A man-pack antenna of the dipole type comprising a first conductor adapted to extend vertically along the upper portion of the wearer's body, a second conductor adapted to extend vertically along the lower portion of the wearer's body, a variable inductor joining said two conductors, a plurality of layers of flexible dielectric tubing spirally wound in different directions about each of said conductors, and an outer serving for each portion of the antenna.

2. An antenna structure as set forth in claim 1, wherein the upper end of said serving is extended for fastening to the shoulder of the wearer, and the lower end of said serving is extended for fastening to the leg of the wearer.

3. An antenna adapted to be worn on a human body including in combination, flexible antenna conductor means, and insulating means for said conductor means including two layers of flexible dielectric tubing spirally wound one on top of the other in opposite directions around said conductor means and an outer serving enclosing said layers of tubing, said serving extending beyond the ends of said conductor means for securing said antenna at the opposite ends thereof to the body of the wearer, said conductor means extending over a substantial portion of the height of the user, said insulating means being so constructed that said antenna yields to bodily movements of the user and that the capacity between said conductor means and said human body is low.

4. An antenna of the dipole type adapted to be worn on the human body and to have low capacity with respect to the human body including in combination, a pair of antenna conductor means extending substantially in a line, coupling means for connecting said conductor means to an electronic device, flexible insulating means about said conductor means having a dielectric constant not substantially greater than unity, and means for supporting said antenna and securing the same to the body of the wearer, said conductor means and said insulating means being so constructed that said antenna yields to bodily movements and the capacity between said conductor means and the body is not changed substantially by said bodily movements.

5. An antenna of the dipole type adapted to be worn on the human body and to have low capacity with respect to the human body comprising, a pair of elongated conductors, coupling means connected to one end of each of said conductors, flexible insulating means about said conductor means having a dielectric constant not substantially greater than unity, and means for supporting said antenna on the body of the wearer including means for supporting said coupling means at the waist and for supporting the ends of said conductors not connected to said coupling means, one at the shoulder of the wearer and the other at the leg of the wearer, said conductor means and said insulating means being so constructed that said antenna yields to bodily movements and the capacity between said conductor means and the body is not changed substantially by bodily movements.

6. An antenna adapted to be worn on a human body, including in combination, flexible antenna conductor means, insulating means for said conductor means including a first layer of flexible dielectric tubing spirally wound about said conductor means and a second layer of flexible dielectric tubing spirally wound about said first layer in a direction opposite to the direction of said first layer, and supporting means for said antenna including a portion surrounding said layers of tubing and a portion for securing said antenna to the body of the wearer, said conducting means extending over a substantial portion of the height of the wearer, said insulating means being so constructed to provide a low capacity between said conductor means and said human body and to yield readily to movements of said human body.

RALPH J. LENSE.

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