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GROUND FOR MARINE RADIO
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Fig. 1.

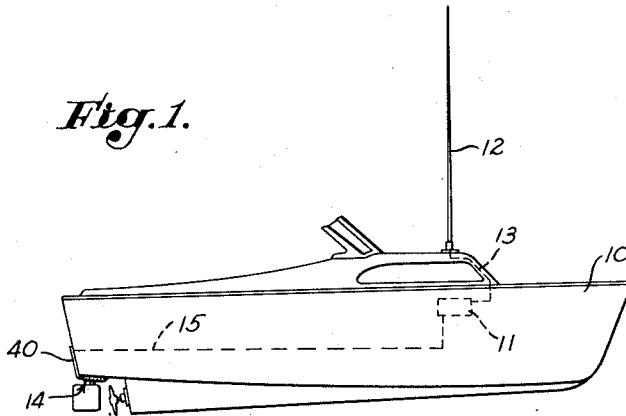


Fig. 4.

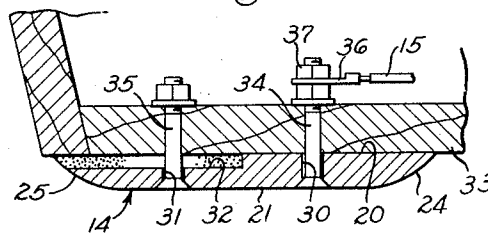


Fig. 5.

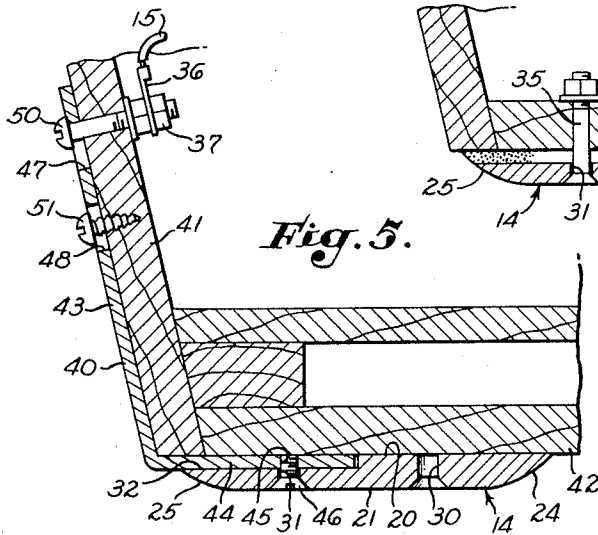


Fig. 3.

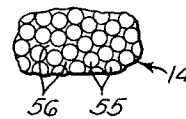
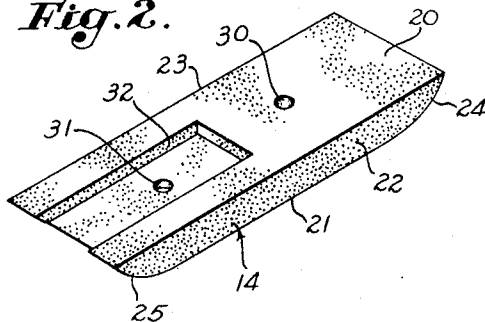


Fig. 2.



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1

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GROUND FOR MARINE RADIO

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3 Claims. (Cl. 174—6)

This invention relates to a ground for a marine radio which is suitable for attaching to the hull of the boat in which the radio is carried.

A good ground requires a large surface area for contact with the water and the customary manner of providing a ground for a marine radio at the present time is to attach a piece of sheet copper to the bottom of the hull of the boat. Such a sheet ordinarily has an area in the range of six to fifteen square feet. Both the cost of the material and the installation make such grounds expensive. The sheet of copper is difficult to install on plywood and plastic hulls and particularly on double bottom hulls. Furthermore, the sheet grounds provide maintenance problems both in connection with marine growth and hull leakage.

It is an object of the invention to provide a marine radio ground for attaching to the hull of a boat which is inexpensive to manufacture and to install and one which permits maximum ground area independent of boat size. A further object is to provide such a ground which is small and light weight and which requires only one or two holes for installation. Another object is to provide such a ground which can be mounted easily and quickly on plywood and plastic hulls and on hulls using double bottoms.

It is an object of the invention to provide a marine radio ground which can be carried on the bottom of a hull by a bracket which is mounted to the transom.

It is an object of the invention to provide a marine radio ground of small size, such as a block in the order of 1/2 x 2 x 6 inches which has the same grounding efficiency as the conventional large sheet of copper. Another object is to provide a ground which provides a large total surface for contact with the water while having a small exterior surface area.

It is an object of the invention to provide a ground in the form of a block of material which has a large number of open channels or passages extending from the exterior to the interior thereof, which passages have electrically conductive walls. Another object is to provide such a ground in which the passages are of a size to permit passage of water therethrough. A further object of the invention is to provide such a ground formed of a plurality of spherical conductors with adjacent conductors in contact with each other and fused together at their surfaces to form a rigid block.

The invention also comprises novel details of construction and novel combinations and arrangements of parts together with other objects, advantages, features, and results, which will more fully appear in the course of the following description. The drawing merely shows and the description merely describes preferred embodiments of the present invention which are given by way of illustration or example.

In the drawing:

Fig. 1 is a side view of a boat showing the ground of the invention installed thereon;

2

Fig. 2 is an isometric view of a preferred embodiment of the invention;

Fig. 3 is an enlarged view of a section of Fig. 2;

Fig. 4 is a partial sectional view showing the ground of Fig. 2 installed on the hull of a boat; and

Fig. 5 is a partial sectional view showing an alternative installation of the ground.

A typical boat 10 is shown in Fig. 1 with a marine radio 11 installed therein. The radio is connected to an antenna 12 by a lead 13 and to ground 14 by a lead 15.

The ground 14 is carried on the hull of the boat below the water line so that the ground will be in contact with the water. While the ground 14 may take any shape, a preferred form is shown in Fig. 2. The ground is in the shape of a block rectangular in plan with a flat top 20 for mounting against the bottom of a boat, a flat bottom 21, straight sides 22, 23, a half-rounded front end 24, and a half-rounded rear end 25. The ground is ordinarily mounted on the boat with the longitudinal axis of the ground parallel to the fore and aft axis of the boat as shown in Figs. 4 and 5, with the half-rounded ends of the ground providing a smooth transition from hull to ground.

Mounting holes 30, 31 are provided in the ground, preferably being countersunk at the bottom surface 21, and a mounting recess 32 is provided in the top surface 20 adjacent the rear end of the ground. The unit may be bolted to a bottom 33 of a boat as shown in Fig. 4, by means of two bolts 34, 35 passing through the openings 30, 31 and corresponding openings in the bottom of the boat. Conventional nuts and washers are used on the bolts 34, 35 and the conductor 15 is terminated in a terminal 36 which is fixed on the bolt 34 by a second nut 37. The ground 14 may be mounted at any location on the hull of a boat by this method.

In Fig. 5, the ground 14 is shown mounted on a double bottom hull by means of a transom bracket 40. This bracket is formed to lie against a transom 41 and a bottom 42 of the boat with an arm 43 of the bracket extending upwardly along the transom and another arm 44 extending forwardly along the bottom. The recess 32 in the ground 14 is dimensioned to receive the arm 44 of the bracket 40 and a threaded opening 45 in the arm 44 is aligned with the opening 31 in the ground so that the ground may be mounted on the bracket by means of a screw 46. Two openings 47, 48, which are preferably slotted to permit adjustment, are provided in the arm 43 of the bracket for mounting of the bracket to the transom. A bolt 50 positioned in the opening 47 and a corresponding opening in the transom is fixed in position with a conventional nut and washer and also carries the terminal 36 and nut 37 for the conductor 15. Another bolt may be used in connection with the opening 48. However, it is preferred to use a screw 51 so that only a single hole need be made through the transom. This manner of mounting the ground to the transom may, of course, be used with either single or double bottom hulls.

The ground itself provides a large area for contact with the water in relation to the exterior surface area of the ground block. The block is a water-permeable unit having a large number of passages or channels extending from the exterior to the interior thereof. The block or at least the walls of the passages are of electrically conductive material to provide conduction between the water and the lead 15. The block is preferably mounted on a hull as shown in Figs. 4 and 5 so that the sides and ends as well as the bottom are exposed to the water, permitting flow through the passages and eliminating entrapment of air therein.

In a preferred way of forming the ground to provide the interior passages and large total surface area, the

ground 14 is constructed of a large number of conducting spheres 55 which are joined together to form a rigid block with interconnecting passages 56 between the spheres, an enlarged view of the block being shown in Fig. 3. The contact between spheres is essentially a point contact and the passages will extend throughout the block in all directions. The spheres themselves are commercially available and may be of any conducting material or material that has a conducting coating. Suitable materials include stainless steel, nickel, copper and bronze. The spheres may be plated such as by nickel plating or may be coated such as by tin or solder coating. It is preferred in the practice of the invention to use tin coated bronze spheres, as these are inexpensive and easily fused and are highly resistant to corrosion. While the term "sphere" is used in the specification and claims, it should be noted that the particles need not be perfectly spherical in the same sense as ball bearings and the like, and the presently commercial spheres are usually oval or tear shaped due to the method of manufacture. However, it should be noted that particles having flat surfaces, such as the cubes used in bearing materials, are not suitable, since the flat surfaces abut each other, forming solid barriers.

The ground may be formed by placing a plurality of the loose spheres in a mold having the shape of the desired block. The mold and spheres therein are then heated to fuse the spheres together at their points of contact to form a rigid block. Spheres having a tin or soldered coating may be fused at a much lower temperature than uncoated spheres. Of course, the temperature must be controlled so that the spheres are not completely melted, resulting in a solid plate having no passages there-through.

The resulting block will have a pebbled surface with a large number of openings between the spheres, which openings constitute the entrances to the irregular, interconnecting passages which pass through the block between the spheres, permitting water flow into the interior of the block for contact with the spheres. The holes 30, 31 may be made in the block by drilling, while the recess 32 is preferably milled.

The spheres which form the block are in contact with each other over only a small portion of their total area, resulting in a very large total surface area in relation to the exterior area of the block. For example, consider a ground having the form of a cube with a one inch side and composed of 0.05 inch diameter spheres. Allowing one face for mounting, the exterior area of the ground is five square inches. The ground will contain about 8000 spheres having a total surface area of about 60 square inches. Allowing twenty percent of the sphere surface for inter-sphere contact, an increase in area for water contact of over nine to one is achieved. Compared with a one inch square of copper sheet, an increase of forty-eight to one is obtained.

While there is not actual limitation on the size of the spheres and spheres having diameters as small as 0.0002 inch have been used successfully, the preferred range for spheres is in the order of 0.0005 to 0.125 inch in diameter. The particular size and shape of the ground itself are not critical. However, it has been found that a ground of the form shown in Fig. 2, which is one-half inch thick, two inches wide, and six inches long, will provide the same

grounding efficiency as a sheet of copper having an area of twelve square feet. Thus it is seen that a small, inexpensive and easily attached unit can be substituted for the present-day copper sheet without suffering a loss in performance.

Although exemplary embodiments of the invention have been disclosed and discussed, it will be understood that other applications of the invention are possible and that the embodiments disclosed may be subjected to various changes, modifications, and substitutions without necessarily departing from the spirit of the invention.

I claim as my invention:

1. A marine radio ground for attaching to the hull of a boat comprising: a plurality of spherical conductors with adjacent conductors in contact with each other and fused together only at their surfaces into a rigid, self-supporting, homogeneous, porous block; a transom mounting bracket having a first arm for extending along the transom of a boat in an approximately vertical direction and a second arm for extending along the bottom of the boat in an approximately horizontal direction; means for mounting said first arm on said transom; and means for mounting said block on said second arm.

2. A marine radio ground for attaching to the hull of a boat comprising: a plurality of spherical conductors with adjacent conductors in contact with each other and fused together only at their surfaces into a rigid, self-supporting, homogeneous, porous block; a transom mounting bracket having a first arm for extending along the transom of a boat in an approximately vertical direction and a second arm for extending along the bottom of the boat in an approximately horizontal direction, said block having a recess for receiving said second arm; means for mounting said block on said arm in said recess; and means for mounting said first arm on said transom with said second arm and block against said bottom.

3. In the method of fitting a boat for transmitting and receiving electromagnetic impulses, the boat having a hull, a radio, an antenna and a ground lead, the steps of attaching, to the hull of the boat so as to be in a submerged position when the boat is in the water, a ground comprising a plurality of particles having electrical conducting surfaces, said particles being in surface contact with each other and fused together only at limited portions of their surfaces, with the other portions of their surfaces mutually spaced, into a rigid, self-supporting, homogeneous, porous mass, and connecting said ground lead to said ground.

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