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SUBMARINE ANTENNA

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Fig. 1

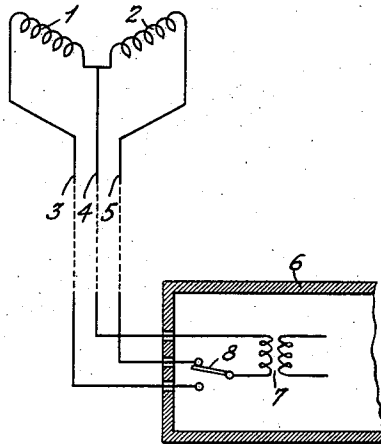


Fig. 1a

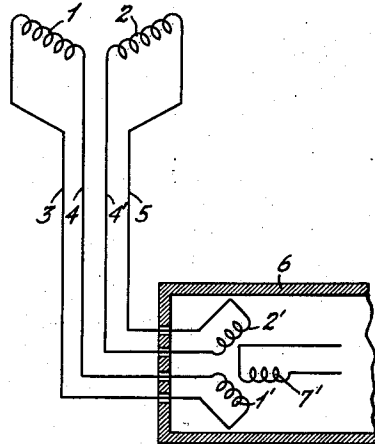


Fig. 2

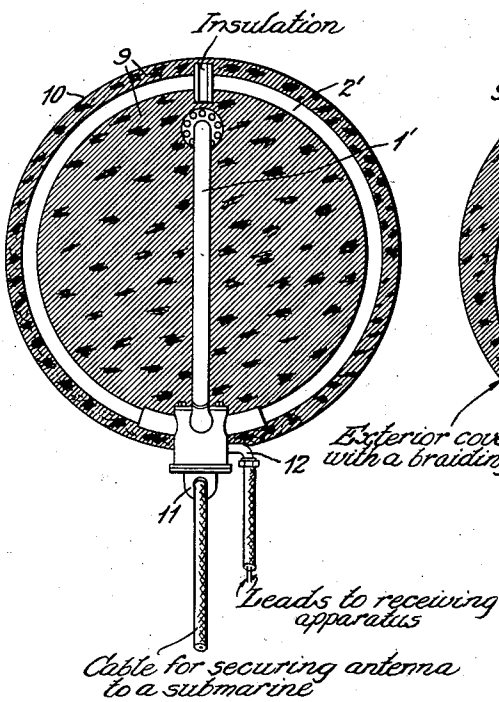
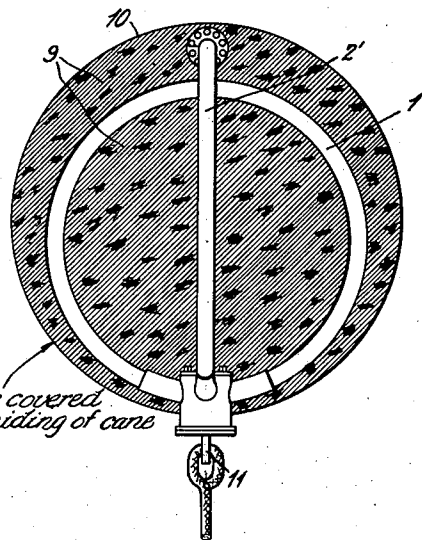


Fig. 2a



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SUBMARINE ANTENNA

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In Germany January 19, 1932

5 Claims. (Cl. 250—33)

This invention relates to an antenna for submarines, which is supported by means of a spherical buoy or float.

It is known in the art that communication between a submerged submarine and the outside world is possible by the use of a so-called buoy antenna, the part of the latter designed to pick up or to send out the electromagnetic energy being carried upward from the submerged boat into the upper strata of water carrying denser fields, or even wholly or partly above the water level, by a balloon-shaped or spherical float or buoy, the assembly being pulled or hauled down when desired by means of a cable connection and a winch. Because of the mobility of the buoy it is not customary to employ a loop or frame aerial, for the incoming volume received by such an antenna would be subject to constant fluctuations, but rather a non-directional antenna consisting of a vertical mast or an umbrella structure (see for instance, German Patent No. 466,307 and German Patent No. 305,513). However, it has been found that also this type of aerial is rather variable in its sensitiveness, especially in a rough sea because the inclination of such an antenna is then subject to undue changes.

According to this invention, a far more uniform and stable reception is realizable if upon the buoy or float a plurality of coil or loop or frame antennae, preferably two such antennae placed in vertical planes at right angles to each other rather than one linear mast-like or an umbrella-shaped antenna, said two coils being adapted to be switched in and out at will from the interior of the boat, or simultaneously just like the receiver coils of a goniometer.

This scheme offers the following merits:

Upon rotation of the buoy about its vertical axis, conditions will always be so that one coil of the buoy antenna will come closer to the position of the maximum volume than the other or others, while at the same time it is possible to choose and connect at will from the interior of the boat the particular coil whose incoming volume at any given instant appears preferable or is maximum. Even if the coil in question should not be just in the plane corresponding to maximum volume, its receiving powers nevertheless will be far larger than that of a linear antenna, provided the number of turns and the dimensions have been properly chosen. An open antenna would have to be of considerable height, if adequate energy is to be picked up. It would be visible a long way off, and this is a circumstance undesirable in most cases. Another point is that the center of grav-

ity of such a buoy antenna would be rather high, with the consequence that, if the sea be rough, appreciable swings would happen, and this would be the source of continual changes in the conditions of tuning and the energy absorption, and cause difficulties in the attempt to establish regular reception.

On the contrary, in the case of an antenna according to the invention, the visibility is low because of its comparatively small dimensions and its low location below or on the surface of the sea, and even heavy seas will occasion only little effect upon the incoming signal strength seeing that the swings in reference to the vertical axis are here relatively small because of the low center of gravity. Also in case of selective use of one or some of the receiver coils, the one actually employed and located closest to the plane of the maximum volume, assuming even like angles of swing and inclination in reference to the vertical as in an open antenna, is far less sensitive in reception to such swings so much more so, the closer the plane of swings comes to the plane of maximum signal strength. In the case of simultaneous use of the receiver coils mounted on the buoy in a goniometer circuit scheme, the rotation of the buoy about its vertical axis exercises no harmful effect at all so far as the incoming volume is concerned, if the explorer coil mounted inside the boat is always set to maximum reception.

A better understanding of this invention will be had by referring to the drawing, of which,

Fig. 1 shows a circuit diagram of a crossed coil antenna with a switch located within the hull of the boat so as to choose at will either coil antenna.

Fig. 1a shows a circuit diagram of an arrangement for the simultaneous use of both coils which is provided with field coils and a search coil located within the hull of the boat.

Fig. 2 is an elevation of the improved new antenna arrangement of this invention.

Fig. 2a is a side elevation of Fig. 2.

Fig. 1 of the drawing by way of example, shows a circuit arrangement of an antenna according to this invention. 1 and 2 denote here two coil or loop antennae mounted upon or in a buoy which by means of leads 3, 4, 5, disposed inside a cable are united with the receiver apparatus inside the submarine, if desired, by way of a transformer 7. By means of a switch 8 it is possible to switch in from the submarine the particular coil whose incoming energy happens to be the largest.

The float or buoy, as known in the art, may comprise one or more parts; it may be a solid (full) body made from specially light material,

such as cork, wood, or the like, or else it may be a hollow, evacuated or gas-filled body. The shape thereof is more or less immaterial. The windings of the loop antenna may be connected with the buoy or part thereof in some suitable manner (below, on, above, or laterally) though the preferable scheme is to accommodate the windings of the coil inside the buoy.

Figs. 2 and 2a, for instance, show an embodiment of the said sort. 1 and 2 are protective pipes wherein the two coils or loops placed at right angles to each other are accommodated, most suitably sealed air-, water-, and weather-tight. The protective pipes 1 and 2, as known in the art, may consist either of a suitable insulator or else of metal, optionally with non-metallic gaps. The buoy in the present case is of spherical form, and its interior 9 is filled with suitable low-weight material such as particles of cork. The outer shell 10 may preferably consist of a sort of material immune from mechanical and other attacks, for example, a braiding of cane. But the buoy could also consist of a metallic body being interiorly exhausted or filled with air. In this case the metallic buoy must most suitably consist of at least two shells in such a way that the upper one and the lower one are insulated from each other and are hermetically joined by flanges. In turn, each of these hemi-spherical shells could consist of two or more segments insulated from one another. The ascent and the hauling down of the antenna may be accomplished by the aid of a wire rope which is attached to an eyelet on the buoy. The electric connections of the coils are brought through an outlet piece 12. As to the rest, these wires could also be disposed adjacent to or inside the holding rope and thus be brought into the receiver, the said holding rope in that case being designed as a cable.

Fig. 1a shows another key diagram of a further embodiment covering the case of the simultaneous use of the two receiving coils 1 and 2 supported by the buoy. The latter are associated by way of the leads 3, 4, and 4', 5 (of which two, for instance, 4 and 4' may be united) with the field coils 1' and 2' mounted inside the hull of the boat, with which, in known manner, a rotatable search coil 7' is in variable inductive relation. The position of the said coil 7' may always be adapted to the turning of the buoy so that at all times the incoming volume will be of maximum amount.

It is to be noted in this connection that while this arrangement closely resembles the known goniometer scheme, it can nevertheless not form such a device. The latter is intended for direction-finding work, and the two loops for reception corresponding to loops 1 and 2 in the drawing have a known fixed orientation in reference to the observation point or to the hull of the

vessel. In the buoy antenna of the kind here disclosed, on the contrary, the two receiving coils alter their position all the time in reference to the observation point or operator's room so that no direction-finding is thus feasible.

I claim:

1. A floating antenna adapted for use with a submarine comprising a solid spherical floating body, two crossed coils with conductive turns within a protective pipe, each of said coils being of a different diameter and located in planes at right angles to each other and located within said spherical floating body, mechanical securing means fastened to said body, and cable connection means from said solid spherical floating body and arranged so as to provide securing means and electrical connection to said submarine.

2. A floating antenna adapted for use with a submarine, comprising a solid spherical body composed of cork, two crossed loops placed in planes at right angles to each other and located within said spherical body, mechanical securing means comprising an eye fastened to said body, and cable connection means from said solid spherical body and arranged so as to provide securing means and electrical connection to said submarine.

3. A floating antenna adapted for use with a submarine, comprising a spherical body composed of cork, the exterior of which is covered with a braiding of cane, two crossed loops placed in planes at right angles to each other and located within said spherical body, mechanical securing means fastened to said body, and cable connection means from said solid spherical body arranged so as to provide securing means and electrical connection to said submarine.

4. A floating antenna adapted for use with a submarine comprising a solid spherical floating body, two crossed coils with conductor turns within an insulating protective pipe, each coil being of a different diameter and located in planes at right angles to each other and located within said spherical floating body, mechanical securing means fastened to said body, and cable connection means from said solid spherical body and arranged so as to provide securing means and electrical connection to said submarine.

5. A floating antenna adapted for use with a submarine comprising a solid spherical floating body, two crossed coils with conductor turns within a metallic protective pipe with a non-metallic gap, each of said coils being of a different diameter and located in planes at right angles to each other and located within said spherical floating body, mechanical securing means fastened to said body, and cable connection means from said solid spherical body and arranged so as to provide securing means and electrical connection to said submarine.

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