

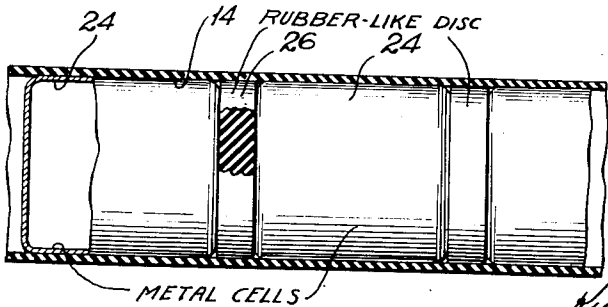
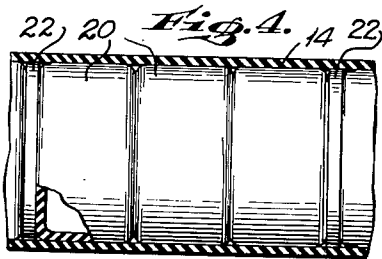
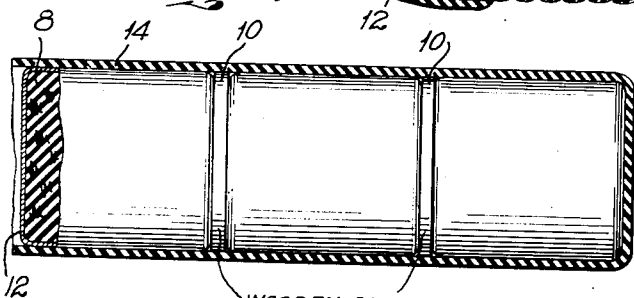
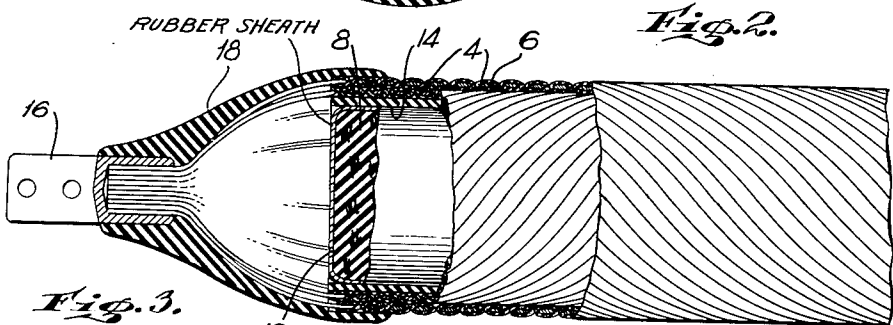
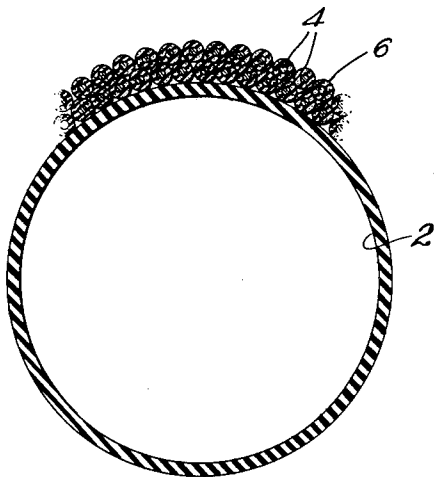
March 12, 1946.

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2,396,268

BUOYANT ELECTRODE

Filed Feb. 12, 1942



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2,396,268

BUOYANT ELECTRODE

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Application February 12, 1942, Serial No. 430,572

10 Claims. (Cl. 174-103)

This invention is directed to an improvement in electrodes, and in particular to electrodes for buoyant cables.

More specifically my invention relates to electrodes for cables which are intended to be floated upon the surface of sea-water, the desideratum being the provision of a construction wherein the electrode is in physical contact with the water.

It has been suggested prior to my invention to provide a buoyant electrode essentially comprising a buoyant center of some sort with a bare copper wire laid about its exterior. I have found, however, that such an electrode is unsatisfactory from a life standpoint in that the copper wire rapidly corrodes, unfitting the electrode for its intended use.

The present construction provides a buoyant electrode in which the conductor of the electrode is made up of a plurality of small wires of copper, for example, each being enclosed in a rubber, natural and/or synthetic, and rubber-like, non-metallic, water-resistant materials containing graphite, carbon black, minute metal particles or other good electrically conducting material, in such quantity as to reduce the resistance of the compound to a value whereby an enclosure is provided for each wire of the electrode which is radially conducting, and through which current will pass radially of the electrode all the way from the conductor to the outside surface of the enclosure, to provide a continuous, radial, low resistance path from conductor to sea-water.

In such a construction it will be appreciated that while, as explained, radial conductivity from electrode to sea-water is preserved, corrosive action on the conductor from physical contact with the water is prevented, the material in which each wire of the electrode is independently enclosed being highly water-resistant.

In the accompanying drawing I have illustrated several embodiments of my invention:

Fig. 1 is a cross section through an electrode constructed in accordance with the invention;

Fig. 2 is a part sectional elevational view of another embodiment of the invention;

Figs. 3, 4 and 5 are sectional elevational fragmentary views of various types of centers which may be employed.

Referring to the embodiment of my invention as illustrated in Fig. 1: 2 designates a flexible center, which in this construction takes the form of a hose-like flexible member of rubber or other suitable rubber-like material.

Inasmuch as the conductors of the electrode are to be laid up about this hollow center or

core, the latter must be so constructed as to hold its shape during and after the application of the conductors. In a core, for example, having an outside diameter of 3" and employing vulcanized rubber similar to that used in ordinary rubber hose, I find a wall thickness of .250" sufficient for my purpose. As an alternative the center may have a thinner wall thickness and contain air under pressure.

Laid about the buoyant center 2 are two layers of small copper wires or strands 4, each wire or strand of each layer being individually enclosed in a sheath 6 of electrically conducting, highly waterproof, non-metallic material, such as rubber, natural or synthetic, and rubber-like materials, containing graphite, carbon black, minute metal particles or other suitable highly conducting material, in sufficient quantity to provide a radially conducting path all the way from the conductor to the surface of the enclosing material. The wires 4 of one layer are laid up about the center in the opposite direction to those of the other layer. The size of the wire employed and the thickness of the conducting sheath 6 for each wire may, of course, be varied within wide limits, but I may say that in an electrode having a buoyant center 3" outside diameter, I have found wires or strands .064" in diameter and sheathed in conducting rubber to an outside diameter of .15" to be satisfactory.

Of course, it is to be understood that in practice it is necessary so to proportion the parts that the weight to volume ratio will be such as to render the electrode buoyant in a medium such as ordinary sea-water.

In practice one end of the electrode will be connected in a suitable watertight fashion to the buoyant cable which is to supply electric energy to the electrode, the trailing end of the electrode being hermetically sealed, so that entry of water into the center of the electrode through the ends is prevented.

It will be seen from the foregoing that my construction presents very decided advantages over prior constructions in that corrosion of the wires or strands 4 from contact with the element in which the electrode is floated is prevented by the conducting, non-metallic, waterproof sheath 6 in which each wire or strand 4 is individually enclosed.

It will be appreciated, furthermore, that by reason of the fact that a plurality of small wires or strands constitute the electrode conductor, the rupture of one wire or even several will not unfit the electrode for use.

In the construction illustrated in Figs. 2 and 3 I provide a construction in buoyant electrodes similar to that just described, except that in this embodiment of the invention I provide a different type of buoyant center.

The buoyant center here employed consists of short lengths of buoyant cellular rubber members 8 alternating with wooden discs 10. Each cellular rubber core member 8 is preferably completely enclosed in a thin rubber sheath 12. In the manufacture of cellular rubber it is customary to compound a mixture of rubber stock and one of several materials which upon heating will generate a gas thereby to form myriads of cells in the rubber mass, each of these cells containing gas under pressure. To retard diffusion of the gas out of the mass and to prevent the escape of any gas that may be released due to rupture of the surface and near-surface cells of the rubber members 8, I encase each member in the impermeate, relatively gas impervious sheath or envelope 12 above referred to.

The core members are enclosed in a rubber-like, water-resistant sheath 14 and the conducting wires or strands 4 each enclosed in its electrically conducting, non-metallic, water-resistant sheath 6 are laid up about the sheath 14.

It will be appreciated that one end of this electrode is attached to a buoyant cable, while the trailing end is hermetically sealed. While any one of many methods or constructions may be employed to attach the electrode to a buoyant cable, one method of construction has been illustrated by way of example. At the end of the electrode which is to be secured to the cable, the wires or strands 4 are bared and led to a metal connector 16 into which they may be secured permanently in any suitable fashion.

The bared conductor strands or wires 4 are then covered in a waterproof covering 18 which may be rubber or rubber-like material, for instance, the ends of this covering or sleeve being vulcanized or otherwise hermetically sealed to the connector 16 and to the conducting rubber-like material 6 adjacent the rear end of the bared or stripped portion of the conductor strands.

While the flexible buoyant core or center construction may vary in dimensions over a wide range, I have found a construction to be satisfactory in which the rubber members 8 have been 3" x 3" separated by wooden discs 10 which are 1/4" thick, the whole enclosed in a sheath 14 having a 1/8" wall.

It will be understood, of course, that as pointed out in connection with Fig. 1 the electrode in the last analysis must have such a weight to volume ratio as to render it buoyant.

The electrode possesses all of the advantages which I have pointed out in connection with Fig. 1, its resistance to crushing or collapsing being higher than the electrode of Fig. 1 owing to the different type of buoyant center employed.

The buoyant electrode center illustrated in Fig. 4 consists of hollow, non-metallic members 20 containing air or other gas under a slight pressure, and interspersed wooden discs 22. The assembly of hollow members and wooden discs may be enclosed in a rubber or rubber-like sheath 14. The electrode conductors in this embodiment of my invention are of the same type and laid about the sheath 14 in the same manner as described in connection with Fig. 2.

The buoyant electrode center illustrated in Fig. 5 is composed of a plurality of hollow metal cells

24 alternated with non-metallic rubber-like discs 26, the assembly preferably being enclosed in a sheath of rubber or rubber-like material designated 14. The electrode conductors in this embodiment of my invention are of the same type and laid about the sheath 14 in the same manner as described in connection with Fig. 2.

It is to be understood that changes may be made in the details of construction and arrangement of parts as hereinabove described without departing from the spirit and scope of my invention.

What I claim is:

1. A buoyant electrode for buoyant cables, said electrode comprising a buoyant center or core, and an electrode conductor, enclosed in a non-metallic, electric conducting, water-resistant material, about said buoyant core or center, said electrode having such a weight to volume ratio as will render it buoyant in sea water.
2. A buoyant electrode for buoyant cables, said electrode comprising a buoyant center or core, and an electrode conductor comprising a plurality of wires or strands laid up around said center or core, each strand being enclosed in a non-metallic, water-resistant material of low electrical resistance, said electrode having such a weight to volume ratio as will render it buoyant in sea water.
3. A buoyant electrode comprising a buoyant center, and an electrode conductor comprising a plurality of layers of conducting wires laid about said center, said wires being enclosed in a non-metallic, water-resistant material of low electrical resistance, said electrode having such a weight to volume ratio as will render it buoyant in sea water.
4. A buoyant electrode comprising a buoyant center, and an electrode conductor comprising a plurality of layers of conducting wires or strands laid about said center, the wire of one layer being laid up oppositely to the wire of the other layer, said conducting wires or strands being enclosed in a non-metallic, water-resistant material of low electrical resistance, said electrode having such a weight to volume ratio as will render it buoyant in sea water.
5. A buoyant electrode comprising a buoyant center or core, and an electrode conductor comprising a plurality of layers of conducting wires or strands laid about said center, each wire or strand being individually enclosed in a non-metallic, water-resistant material of low electrical resistance, the weight to volume ratio of said electrode being such as to render the electrode buoyant in sea water.
6. A buoyant electrode comprising an electrode conductor made up of a plurality of small wires or strands, each of which is enclosed in a non-metallic, water-resistant material of low electrical resistance, the weight to volume ratio of the electrode being such as to render the electrode buoyant in sea water.
7. A buoyant electrode comprising a buoyant center comprising an elongated cellular member made up of a plurality of resilient members with intercalated relatively rigid members, and a plurality of wires or strands laid up about said cellular member, said wires or strands being individually enclosed in a non-metallic, water-resistant material of low electrical resistance, said covered wires constituting the electrode conductor, the weight to volume ratio of the electrode being such as to render the electrode buoyant in sea water.

8. A buoyant electrode comprising a buoyant center made up of a plurality of short lengths of non-metallic cellular material with intermediate relatively rigid members, an enclosing non-metallic sheath, and a plurality of wires or strands enclosed in a non-metallic, water-resistant material of low resistance laid about said sheath and constituting the electrode conductor, the weight to volume ratio of the electrode being such as to render the electrode buoyant in sea water.

9. A buoyant electrode comprising a buoyant core or center made up of a plurality of hollow non-metallic members and intercalated relatively rigid members, an enclosing non-metallic sheath, and a plurality of wires or strands enclosed in a non-metallic, water-resistant electrically con-

ducting material laid about said sheath and constituting the electrode conductor, the weight to volume ratio of the assembly being such as to render the same buoyant in sea water.

10. A buoyant electrode comprising a buoyant core or center made up of a plurality of hermetically sealed hollow members, intercalated with elastic cellular members, an enclosing sheath of rubber-like material, and a plurality of wires or strands individually enclosed in a non-metallic, water-resistant, electrically conducting material laid about said sheath and constituting the electrode conductor, the weight to volume ratio of the assembly being such as to render the same buoyant in sea water.

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