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[50] **Field of Search**..... 114/67,
 222, (Inquired); 161/64

[56] **References Cited**
UNITED STATES PATENTS
 3,154,460 4/1964 Graner et al. 114/67X
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[54] **STRUCTURE WITH ANTIFOULING SURFACE**
4 Claims, 4 Drawing Figs.

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 114/67
 [51] Int. Cl..... B63b 59/00,
 B63b 1/36

ABSTRACT: The invention relates to covering the surface of a boat below the water line with short outwardly projecting bristles which dampen cavitation vortices produced by motion of a boat. The bristles may include an antifouling composition.

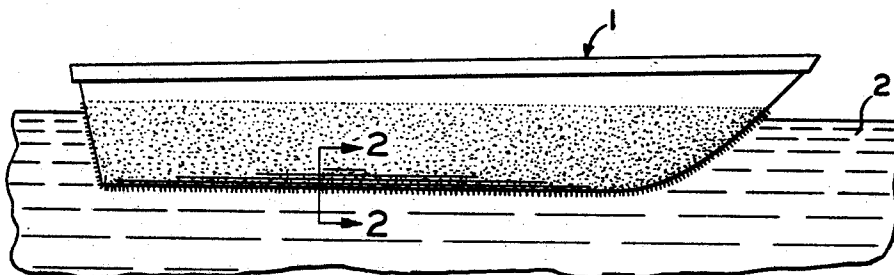


FIG. 1

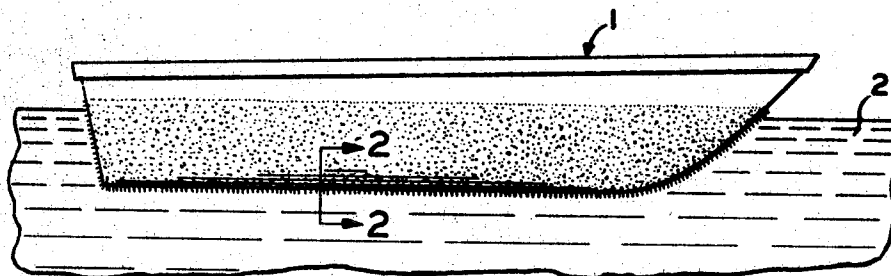


FIG. 2

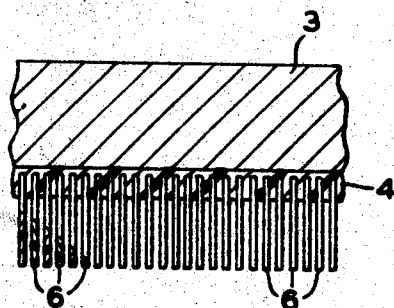
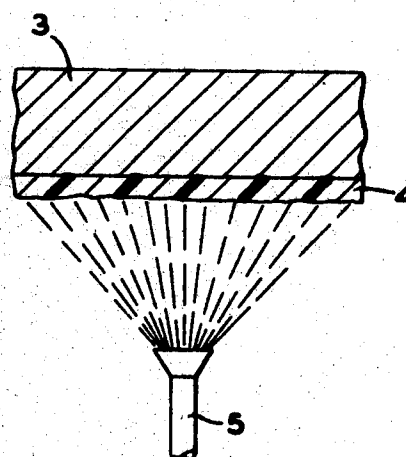
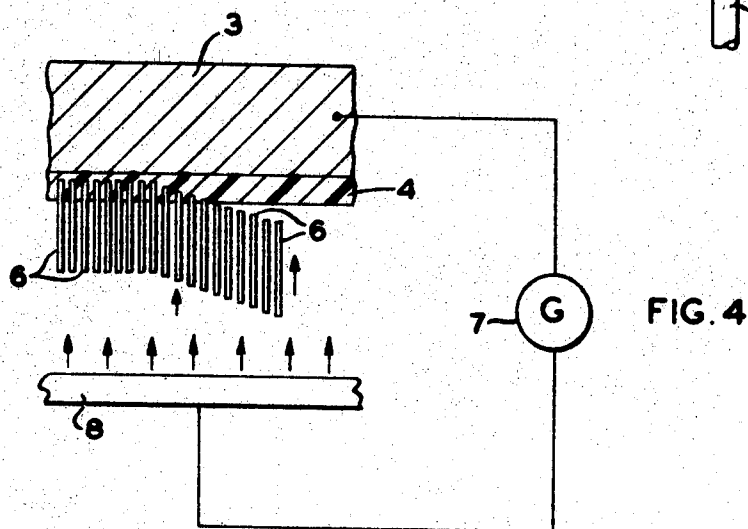


FIG. 3



STRUCTURE WITH ANTIFOULING SURFACE

This invention in its preferred form relates to the covering of the underwater portion of a boat with bristles to dampen cavitation vortexes produced by the motion of the boat through the water. Preferably these bristles comprise an antifouling composition which is slowly dissolved by the water and prevents deposition of barnacles or the like on the surface of the immersed portion of the boat. The word "boat" is used herein to refer generally to any vehicle which is moved through the water. Although the bristles are designed primarily to dampen the cavitation effect, they may be used as suppliers of the antifouling composition even on structures which are immersed in the water but are not moved through it. The composition containing the antifouling material need not be in the form of bristles but will have an exposed surface with many times the area of the surface to which it is applied.

The ability of dolphins to swim at high speeds is attributed to the fact that their skins are adapted to conform to the currents generated by their swimming through the water. Thus the skin is supposed to contain many small bodies of oil which is displaced when pressure is applied to areas of the skin by currents generated as the fish swims through the water. Covering the outer surface of the boat with bristles similarly dampens the cavitation effect and reduces the friction generated by movement of the boat through the water.

A desirable means for preventing the fouling of the immersed surface is to include in the bristles a material which has only slight water solubility and is thus slowly dissolved into the water and prevents the deposition of barnacles, etc. The bristles have such a large surface exposed to the water that the antifouling composition may be quite insoluble; much less soluble than an antifouling composition used in a paint.

The bristles are advantageously formed from monofilament polypropylene, polyethylene, polyvinylchloride, or other polyvinyl or other plastic, and may range in length from about 2 to 30mm. and have a diameter in the range of about 0.02 to 0.5mm. The plastic from which the filaments are formed may include such antifouling compositions as cuprous oxide, bis-(tri-n-butyltin) oxide, tri-n-butyllead acetate and/or trialkyl lead acetate. Such materials are mentioned only as illustrative of those that may be employed. Other antifouling agents may be used. The amount used will depend upon whether the boat is to be used in fresh or salt water and whether the boat is to be used in a warmer or cooler climate. With cuprous oxide, for example, about 20 to 70 weight per cent, based on the weight of the bristles, will be satisfactory in temperate climates. The antifouling agent is preferably added to the plastic as a solution, but may be in finely divided form, as in the case of cuprous oxide.

The invention is further described in connection with the accompanying drawings; in which

FIG. 1 illustrates a boat in a body of water;

FIG. 2 is a section through the side or bottom of the boat and shows one end of each bristle imbedded in an adhesive;

FIG. 3 shows one method of applying the adhesive to the boat structure; and

FIG. 4 is a crude illustration of one means of attaching the fibers to the adhesive-covered surface of the boat.

The boat 1 may be of any construction. It may be a wooden rowboat or a metal-fishing boat or a canvas canoe or even a

large steamship or battleship. The body of water 2 may be fresh water or salt water. The antifouling composition is, of course, useful only if the body of water contains aquatic life adapted to form a deposit on the surface of the boat.

FIG. 2 is an enlarged section on the line 2-2 of FIG. 1. The skin of the boat 3 may be wood, metal, canvas, etc. It is covered with a layer of adhesive 4 which may be polyurethane or an epoxy adhesive or other moderately flexible water-insoluble adhesive, preferably one which cures at room temperature.

The adhesive may be applied in any suitable manner but is preferably applied by spraying from a suitable nozzle such as nozzle 5 shown in FIG. 3. The bristles 6 are applied while the coating is still plastic.

The bristles may be polypropylene, polyethylene or a vinyl composition, or any other water-insoluble flexible plastic composition. There are various means for deposition such bristles perpendicularly in an adhesive-covered surface. Figure 4, for instance, utilizes an electrostatic field generated by the high voltage generator 7. As the bristles are elevated from a plate 8 connected to one terminal, the other terminal being connected with the metallic skin 3 of the boat or a metal plate inside of a canvas skin, etc., they are aligned perpendicularly. An electrostatic field generated by direct current has been utilized in various ways for the aligning of bristles or the like as they are deposited in an adhesive covered surface. Using certain procedures, it will be desirable to have the bristles contain a metallic pigment such as titanium dioxide. Any suitable procedure may be used, and any suitable pretreatment of the bristles may be used to assist in the deposition of the bristles.

Any antifouling ingredient which would be slowly dissolved from the bristles may be incorporated in the bristle composition to prevent the fouling of the boat surface, or it may be applied to the bristles as a firmly adherent, water insoluble, flexible coating.

I claim:

1. A structure intended for immersion in salt or fresh water which contains aquatic life adapted to form a deposit on the water-immersed surface, which structure has, on the outer surface below the water line, a covering which comprises an antifouling composition which is slowly soluble in the water and which will gradually be dissolved thereby when the structure is immersed therein, the exposed surface of said covering being many times the area of the surface which it covers.

2. A boat which has a multiplicity of bristles projecting from its outer surface below the water line, the bristles being sufficiently close together to dampen cavitation vortexes produced by movement of the boat through water.

3. The boat of claim 2 in which the bristles contain an antifouling composition which will be gradually dissolved by water in which the boat is immersed.

4. The dolphin effect which permits cavitation of the skin to accommodate currents generated by passage of an object through water is utilized by covering the immersed surface of a boat with bristles; these bristles may contain an antifouling composition of low water solubility; such antifouling compositions may be used in a covering of a body immersed in water but not intended for movement through the water, which covering has an exposed surface which is many times the area of the surface to which it is applied.