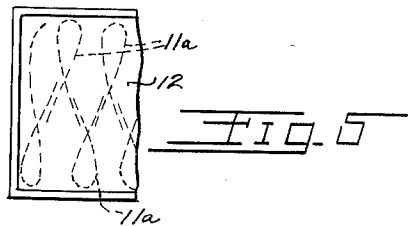
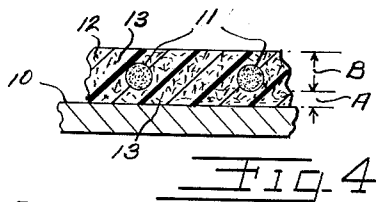
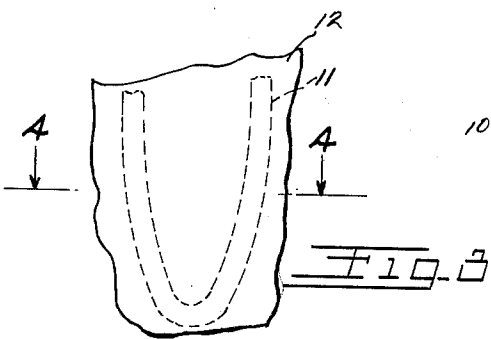
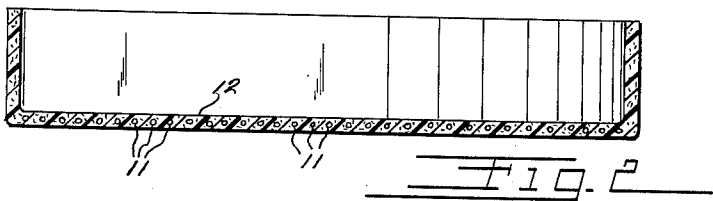
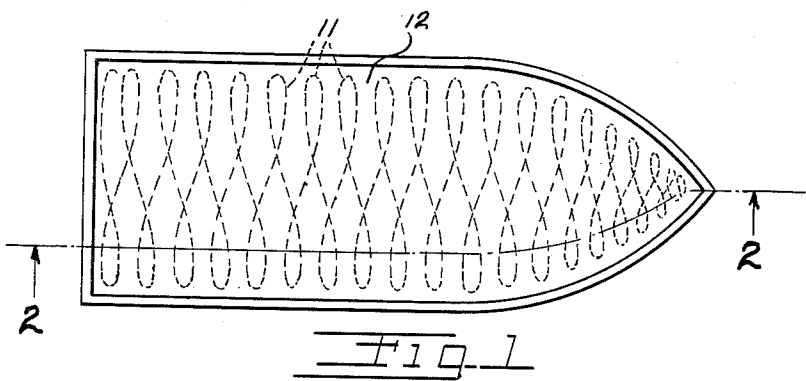


Sept. 10, 1963

DE WITT ELDRED
REINFORCED WALL STRUCTURE
Filed May 23, 1960

3,103,018



INVENTOR.
DE WITT ELDRED
BY
Meyer, Baldwin, Doran & Young
ATTORNEYS

1

3,103,018

REINFORCED WALL STRUCTURE

Dewitt Eldred, Cleveland, Ohio, assignor to Rand Development Corporation, Cleveland, Ohio, a corporation of Ohio

Filed May 23, 1960, Ser. No. 30,910

9 Claims. (Cl. 9-6)

This invention relates to improvements in a reinforced wall structure.

One of the objects of the present invention is to provide a novel panel structure having plural strand rope-like lengths of reinforcing material embedded in a matrix of self-supporting synthetic resin material.

An additional object of the present invention is to provide a panel structure as set forth above wherein short lengths of fibers are embedded in the same matrix.

A specific application of the present invention is in the construction of a boat hull adapted to travel in a path and comprising at least a portion of this hull having plural strand rope-like lengths of reinforcing material embedded in a matrix of self-supporting material, with these lengths extending generally cross-wise of the normal path of travel of the boat.

Other objects and advantages of the present invention will be set forth in the accompanying specification as applied to the drawings and the essential features thereof will be defined in the appended claims.

While this invention may be applied to any type of structural panel, I have chosen to describe the same as applied to a boat of the type to which an outboard motor is customarily attached but this should not be considered in any way a limitation of the use of this invention.

In the drawings,

FIG. 1 is a top plan view of a boat showing a pattern of plural strand rope-like lengths of reinforcing material embedded in a matrix of self-supporting material forming the bottom of the boat;

FIG. 2 is a transverse sectional view of the same taken along the line 2-2 of FIG. 1;

FIG. 3 is a fragmental top plan view greatly enlarged of one of the loops of rope-like material shown in FIG. 1;

FIG. 4 is a transverse sectional view taken along the line 4-4 of FIG. 3; while

FIG. 5 is a fragmental top plan view similar to a portion of FIG. 1 showing another manner of laying the rope-like lengths of reinforcing material.

It is a well-known fact that structural panels of reinforced synthetic resin material do not have any extremely high tear resistance if a sharp article is embedded into the structure and pulled lengthwise thereof. The present invention attacks this problem by embedding rope-like lengths of reinforcing material in a synthetic resin matrix so that any sharp instrument trying to cut through the matrix will encounter one of the rope-like lengths and the tearing action will be obstructed at that point. This is shown for instance in FIGS. 1 and 2 where a crude type of boat is illustrated with the rope-like lengths of reinforcing material extending cross-wise of the bottom of the boat so that if the boat should strike a sharp rock, the rock could not tear the bottom of the boat but instead would be resisted by the first of the rope-like lengths struck by the rock.

A preferred manner of constructing the boat of FIGS. 1 and 2, or a structural panel embodying this invention, utilizes the spray-up method as disclosed and claimed in United States Patent No. 2,933,125, granted April 19, 1960 to David F. Anderson, although it will be understood by those skilled in this art that other means could be utilized to practice my invention. Utilizing equipment such as that disclosed in the above-mentioned Anderson

2

patent, a suitable synthetic resin is sprayed upon a suitable mold surface and then the rope-like lengths of reinforcing material are laid down either in the pattern of FIG. 1, or that of FIG. 5, or any other suitable pattern. I prefer some generally regular pattern so that the panel will end up with a certain uniformity.

Suitable synthetic resins for my purpose include polyester, epoxy and isophthalic resins. A more specific example would be the resins that fall into the group of chemical compositions where polymerization is caused by the addition, or cross-linking of a material reacting with the basic resin. An example would be an unsaturated polyester which is cross-linked by the mixing with the polyester of styrene, or the cross-linking agent might be an allyl monomer such as diallyl phthalate or triallyl cyanurate.

For the rope-like lengths of reinforcing material, I may use glass, sisal fibers, asbestos or such synthetic fibers as rayon, nylon and Orlon. I prefer not to use Dacron because the fine fibers of this synthetic material tend to carry air into the laminate.

A preferred material for the rope-like lengths of reinforcing material is a glass roving, one form of which I have used having 60 "ends" or strands twisted giving about .060 inch diameter for the roving. Each of the strands in said roving would have approximately 200 filaments, each of which had a diameter of 0.00039 inch. This is only an example as will be understood by those skilled in this art.

Utilizing the above materials and having available the equipment as taught in the above-mentioned United States patent No. 2,933,125 or that disclosed and claimed in the copending application of John J. Nawalanic, Serial No. 22,891, filed April 18, 1960, entitled Means and Method for Depositing Roving in Fiber-Resin Laminate, one proceeds as follows. On a male form adapted to fit the interior of the boat shown in FIGS. 1 and 2, or on a flat sheet of metal if a panel is to be constructed, one first deposits the layer marked A in FIG. 4 on the mold 10. The rope-like material 11 is then deposited either by hand or utilizing the structure for feeding continuous roving as taught in the above-mentioned copending application of John J. Nawalanic. After this the additional layer B indicated in FIG. 4 is sprayed up using any suitable self-supporting resin such as epoxy, isophthalic, or the unsaturated polyester resins linked with styrene or one of the allyl monomers. This builds up a matrix 12 of the desired thickness of the panel, bottom of the boat, or other desired structure.

Preferably, in building up the matrix 12, the teachings of the above-mentioned United States patent to David F. Anderson, or of the copending patent application of John J. Nawalanic are utilized to deposit chopped fibers in the matrix. These fibers have been indicated at 13 in FIG. 4. This gives a very strong matrix and coupled with the rope-like strands 11 provides a panel structure which is very difficult to tear at right angles to the rope-like strands.

In FIGS. 1 and 2, I have shown the rope-like strands 11 on the bottom of the boat only although it is obvious that they could be extended up the sides of the boat also if desired. It is usually the bottom of a boat such as this which is subject to tearing.

The pattern of the rope-like strands of FIG. 1 is that of a continuous length, alternately looped, toward and away from the operator as clearly shown in FIG. 1. Another manner of arranging the rope-like strand is indicated in FIG. 5 where each of the strands 11a is a single loop and with the ends crossing and with the crossed ends lying parallel at the center of the boat. It should be noted that in both FIG. 1 and FIG. 5 the rope-like strands are close

enough to each other to have a mutually supporting relationship. By this I mean that before one of the strands is pulled very far during a tearing action, the tearing tool, or rock, will strike against a second rope-like strand so that two strands together present a great resistance. As mentioned above, in a preferred form a roving having 60 strands with 200 filaments in each strand presents 12,000 filaments in parallel relationship which gives great resistance to shearing action cross-wise of each strand.

It should be understood that my invention is not limited to the exact pattern of strand shown in FIGS. 1 and 5 but other suitable arrangements of these strands in mutually supporting relationship are contemplated by my invention.

It will be understood by those skilled in this art that if structural panels are made according to this invention, the strands 11 may be of a color to provide a desired pattern when embedded in a relatively clear matrix of another color or of a clear resin. Furthermore, the chopped fibers 13 could be of the same color as the strands 11 or could be of a different color to give an overall mottling appearance to the panel.

What is claimed is:

1. Boat construction for a boat hull adapted to travel in a path and comprising at least a portion of said hull having plural strand rope-like lengths of reinforcing fibrous material embedded in a matrix of self-supporting material, said lengths lying in a substantially regular pattern with the major portion of said lengths extending generally crosswise of said normal path of travel.

2. Boat construction as in claim 1 wherein said ropelike lengths present a substantially continuous barrier crosswise of said normal path of travel.

3. Boat construction as in claim 1 wherein said rope-

like lengths present a series of substantially continuous barriers crosswise of said normal path of travel and spaced in said hull portion in the direction of said path.

4. Boat construction as in claim 3 wherein a plurality of said barriers lie generally in a common plane.

5. Boat construction for a boat hull adapted to travel in a path and comprising the bottom of said hull having a continuous rope-like length of reinforcing fibrous material extending back and forth a plurality of times crosswise of said normal path of travel and substantially across said hull bottom and embedded in a matrix of self-supporting material.

6. Boat construction as in claim 5 wherein said reinforcing material comprises plural strands of glass fiber.

7. Boat construction as in claim 5 wherein said matrix is a thermosetting synthetic resin.

8. Boat construction as in claim 5 wherein said matrix is a thermosetting resin reinforced by a large number of short fibers embedded in said resin.

9. Boat construction as in claim 8 wherein said matrix is a thermosetting resin reinforced by a large number of short fibers embedded in said resin, and said rope-like lengths of reinforcing material are composed of plural strands of glass fiber.

References Cited in the file of this patent

UNITED STATES PATENTS

1,400,078	Kempton	Dec. 13, 1921
2,428,654	Collins	Oct. 7, 1947
2,477,555	Roberts et al.	July 26, 1949
2,577,214	Stayter	Dec. 4, 1951
2,731,066	Hogendobler et al.	Jan. 17, 1956