

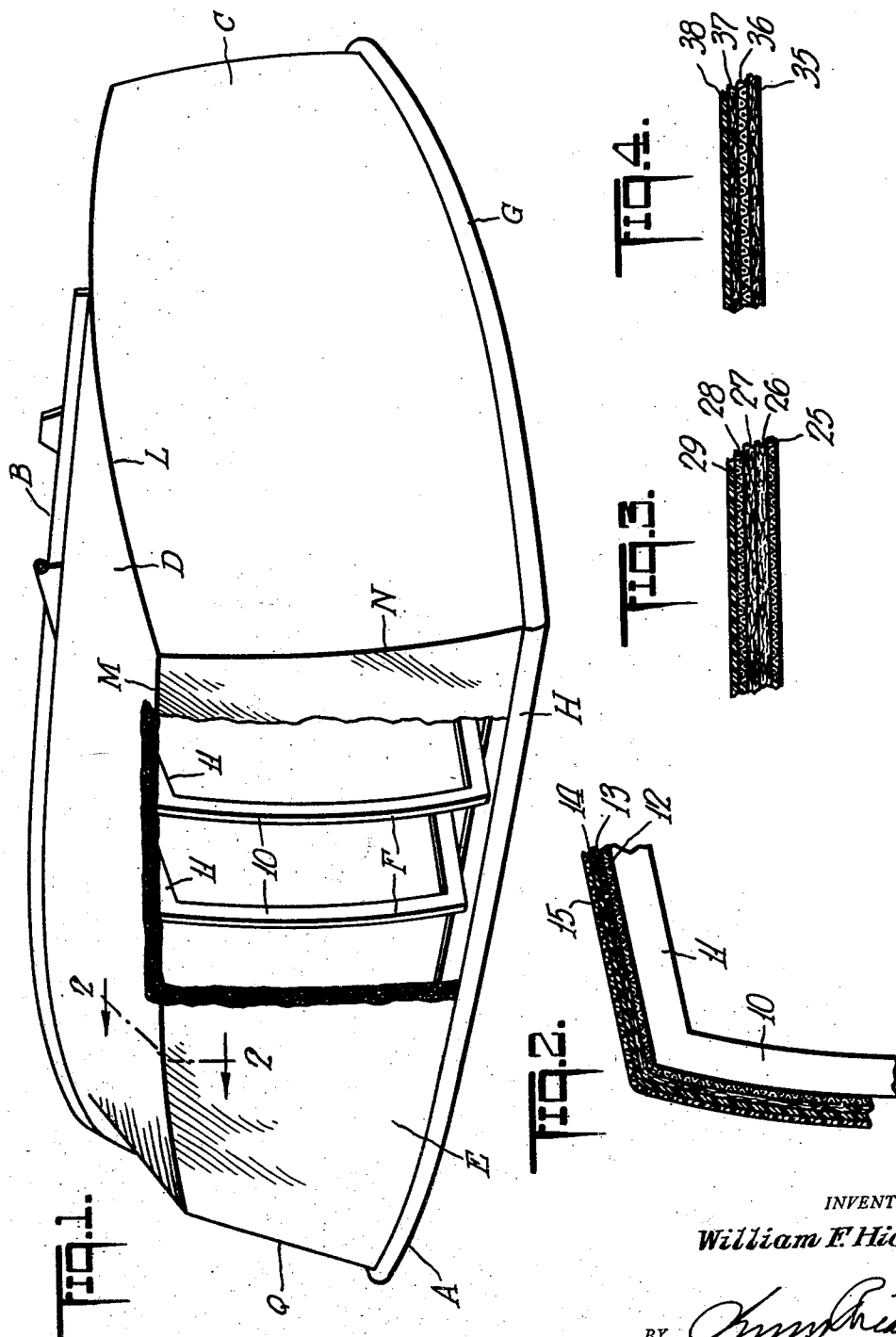
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PLASTIC BOATS AND METHODS OF MANUFACTURING SAME

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PLASTIC BOATS AND METHODS OF MANUFACTURING SAME

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The present invention relates to plastic boats and methods of manufacturing same.

It is among the objects of the present invention to provide inexpensive durable boat constructions, the hull and interior structure whereof will be able to withstand the long periods of exposure to water as well as the buffeting which is experienced in placing said boats on skids and landing and in normal usage upon rough waters.

Another object is to provide novel lightweight durable high strength inexpensive boat constructions of plastic materials which may be utilized not only for the hull but also for the decks, cabins, and other associated equipment.

A still further object is to provide novel reinforced seaworthy boat constructions which will withstand the buffeting of waves and rough water and at the same time be capable of being dragged upon skids, rough or stony beaches without injury and which will resiliently resist collision with other boats, rocks or docking facilities without puncture or weakening of the hull structure.

Still further objects and advantages will appear in the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In accomplishing the above objects, it has been found most satisfactory to provide a frame or base structure which may be made of steel, wood or other suitable construction, which will give the outline or curvature of the hull construction.

Desirably, placed upon this hull construction is a netting or matting such as a wire screening, or less preferably, various types of fabric or glass fibre matting or nettings which will form a base upon which the liquefied plastic or resinous materials may be sprayed or otherwise applied.

The preferred form of resin or plastic which is employed is a liquefied resinous material which will solidify upon being sprayed or applied to the base network, either as a result of being air dried or as a result of cooling or for both reasons.

Desirably, in the preferred form, a stiff wire mesh is employed which will conform to the basic steel or wooden framework for the boat and give the proper curvature or slope of the sides and bottom of the boat.

This wire mesh, for example, may consist of woven wire having diameter range from $\frac{1}{8}$ of one inch to as much as $\frac{1}{16}$ of one inch, and is desirably formed over an entire framework with the edges of the wire mesh clipped to adjacent sections and without substantial overlapping except at the junctions.

In using a wire mesh, it has generally been found most satisfactory to have the strands which extend transversely to the major axis of the boat of substantially greater stiffness than the strands which extend longitudinally and parallel to the major axis of the boat.

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Desirably, the longitudinal strands may have a diameter which is $\frac{1}{4}$ to $\frac{3}{4}$ of the transverse strands.

If desired, extra reinforcement bars or strands may be welded or clipped to the basic wire mesh which has been placed upon the boat frame. Then upon this basic structure with interior frame still in position an air-hardening resinous material is sprayed or painted.

Desirably, a styrene type polyester resin is employed in which the solvent consisting of styrene or some other suitable hardening resinous component is employed.

Normally the viscosity of the resinous or plastic solution is such that it will not penetrate beyond the base screen and so that it will not pass through the interstices of the mesh which is spread upon the boat framework.

Layer after layer of resinous material may be sprayed or painted on to the screen after the initial layer is applied and until the desired thickness of hull is obtained.

Where a lining is desired for the hull and where better assurance is desired that none of the resinous or plastic solution will penetrate past the screen, before the base structural screening is placed upon the boat framework, there is positioned a very fine flexible mesh of either a light gauge wire screening, such as copper screening or even a woven textile or glass fibre material which will act as interior facing and limit the flow of the sprayed plastic or resinous solution.

It has been found that matting material also may be employed for this purpose and particularly glass fibre matting materials and these lightweight screening materials or textile or glass fibre netting fabrics or matting may be applied interiorly or exteriorly of the basic structural screen frame which is laid upon the boat frame structure.

In the preferred construction as additional layers of resin are sprayed upon the basic structure additional layers of netted or matting fibres are placed upon the structure and also locked into place by continued additional plastic or resinous coatings.

To give the strongest construction it has been found that the relative layers of netting, particularly of the structural screening, may be placed upon the hull in such a way that the weave thereof will be at a bias in alternate layers with a variation of angle from 30° to 60° .

To give some of the preferred constructions, a wire screen may first be placed upon the boat frame as if it were the same as sheets of steel and the sheets of wire screening are connected together by means of wire ties or clips. Then a fibre glass matting is placed over the screen and fastened to it at various points to hold it in position. Finally a polyester type of liquid plastic material is sprayed upon the combination of glass fibre matting and wire screening and allowed to harden.

The hull of the boat may then be lifted from the frame and which includes in its hull structure the reinforcing wire screen which will give unusual toughness, hardness and durability to the hull structure.

As an alternative method, two layers of screen may be employed with an intervening glass fibre matting, with the screens having a weave at bias to one another and the trilaminate may be sprayed with the polyester solution and allowed to harden.

Instead of the glass fibre matting being placed between the structural screening, it is also possible to sandwich the structural screening between two layers of glass fibre matting.

Both the interior and exterior of the boat may be finished by layers of finely woven glass cloth sprayed with a plastic solution and if desired, such plastic solution may contain a suspended pigment to give the desired finish and color.

The entire surface may be finally buffed or ground for smoothness.

The wire mesh may be made of a combination of materials and for some purposes combinations of wire and textile or glass fibres may be employed.

Stainless steel wire, copper wire, mild steel wire, galvanized steel wire, and aluminum wire, may all be employed of either the same gauge for both filling and warp or of different gauges so that the filling direction is much stiffer and stronger, than the warp direction, or vice versa.

In addition to the boat hull itself, it is also possible to use the invention for making decks, cabins, cabin tops, air tanks, equipment lockers, seats, vertical partitions, shields, awnings, and the like.

The construction may be used for lifeboats, pleasure boats, motor boats and is conveniently employed in ranges of sizes from twenty feet up to one hundred feet in length and five to ten feet in width.

Various keels or frame elements along the bottom or sides of the boats may be welded to the wire screening before the resinous solution is employed and the same may be done to any reinforcing metal ribs applied either interiorly or exteriorly of the boat construction.

With the foregoing and other objects in view the invention consists of the novel construction, combination and arrangement of parts as hereinafter more specifically described, and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which fall within the scope of the claims hereunto appended.

In the drawings wherein like reference characters denote corresponding parts throughout the several views:

Fig. 1 is a top perspective view of a boat construction in inverted position according to the present invention with the side partly broken away to show the laminated construction.

Fig. 2 is a fragmentary transverse sectional view upon the line 2—2 of Fig. 1 to show the detail laminated construction.

Fig. 3 is a transverse sectional view of an alternative laminated construction.

Fig. 4 is a transverse sectional view of still another alternative laminated construction.

Referring to Fig. 1, there is shown a boat A having the keel B, the back C, the bottom D and the sides E.

This boat conforms to a framework interiorly indicated at F having the side ribs 10 and the bottom ribs 11, to give the desired shape and curvature of the hull.

In forming the boat of the present invention, the screening or wire cloth 12 is first laid over the framework F and the entire wire cloth should be of such a stiffness as to be substantially form sustaining.

To the wire mesh there may then be welded keel elements B and edge structures G and H along the upper periphery of the boat. Reinforcing structures may also be applied to the corners M, L, N and Q, and these may consist of heavy wire rods or even bars which are clipped or welded or otherwise attached to the wire mesh.

Although not shown, it is possible to use a very light gauge flexible wire or cloth mesh inside of and next to the ribs 10 and 11 so as to limit the penetration of the resinous solution and also to act as an interior finish for the hull, although this may be applied after the hull has been made and removed from the framework.

On top of the wire mesh there may be applied the glass fibre matting 13.

Then the polyester air hardening resinous solution is sprayed on to the layers of wire cloth and glass fibre matting in one, two or even as many as five to ten coats.

This resinous or plastic layer is indicated diagrammatically at 14 and it is understood that it will penetrate into and extend throughout the interstices of the wire cloth 12 and the glass fibre matting 13.

Outside of the resinous layer 14 is laid a glass fibre

cloth finishing layer 15 which is also sprayed, with polyester plastic solution.

After hardening the entire structure may be removed from the framework F and finishing meshes or screening may be applied to the interior and exterior of the hull and color may be employed by means of a suspended pigment in the finishing resinous solutions, to give a final durable boat construction of lightweight with extremely low metal consumption.

It has been found that this boat construction will hold its shape under considerable buffeting and will have resilience sufficient to resist striking other boats, rocks, hard bottoms, moorings, etc. without damage or deformation of the hull.

The entire boat is a rigid resilient structure which is most seaworthy.

In Fig. 3 there is shown as an alternative construction, an interior screen 25 with two superimposed glass fibre mattings 26 and 27, an outside screen 28 and a superimposed plastic coating 29 resulting from two to ten sprayings of plastic solution.

The plastic will penetrate throughout layers 25 to 28 and after the hull is removed from the framework F, it may also be interiorly sprayed.

Referring to Fig. 4 there is shown an interior glass fibre matting 35 having a layer of screening thereover.

The screening will be held between the glass fibre mattings 35 and 37 and the resin or plastic 38 is sprayed upon this sandwich of screening 36 between glass fibre mattings 35 and 37.

The plastic in this instance will also penetrate through all three layers 35, 36, and 37.

The same system may be used for making decks, lockers, cabins, cabin tops, air tanks, equipment compartments, seats, vertical partitions, shields, awnings, and the like.

The mesh of the screening may vary from $\frac{1}{8}$ to $\frac{1}{2}$ inch and preferably for the structural screening a stiff heavy gauge hard wire cloth is employed.

Several layers of screen in superimposition may be employed preferably with the mesh extending at angles.

For reinforcement purposes $\frac{1}{4}$ inch, $\frac{3}{8}$ inch or even $\frac{1}{2}$ inch steel rods may be applied and held in position to form interior ribs or exterior ribs in the screen framework.

The screening may be applied to the frame F from rolls and it may be cut actually on the job instead of beforehand and it may be done as part of a continuous operation. Even perforated metal sheeting may be employed at various places to give additional strength.

As many changes could be made in the above and many widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

In the preferred embodiment, according to the above invention, it has been found most suitable to use the type of screening known as "hardware cloth," which has about $\frac{1}{2}$ " mesh spacing with threads of $\frac{1}{16}$ " diameter and in which on the outside of the screen there is positioned a layer of glass fiber matching matting which is sprayed with a styrene solution of a polyester resin consisting of various acids, such as maleic, and drying oil fatty acids, esterified with glycerol or a polyhydric alcohol.

The stiff structure which is formed may be used for closets, walls, boards, seats, partitions, truck bodies and car bodies and in general it is sea-water and corrosion resistant and is shell-proof and shatter-proof. It may even be used for protective clothing, since it will resist penetration of shell or mortar fragments.

The glass fiber when impregnated with a polyester solution gives strength to such polyester plastic and the metal and plastic together will form a firm bond as a result of the glass fiber mesh in spite of variation in contraction, depending upon change in atmospheric conditions.

Having now particularly described and ascertained the

nature of the invention, and in what manner the same is to be performed, what is claimed is:

1. A method of making a plastic boat which comprises providing a boat framework, and also providing a keel and edge structure, laying a laminated structure consisting of outside wire screening and inside glass fibre matting thereon and then spraying the same with an air hardening plastic solution and removing the plastic boat from the framework, said wire screening consisting of a form-retaining stiff wire mesh composed of woven wire having a diameter of $\frac{1}{28}$ to $\frac{1}{16}$ of an inch with the strands extending transversely to the major axis of the boat being of substantially greater stiffness than the strands which extend longitudinally and parallel to the major axis of the boat, and said screening being welded to said keel and edge structure.

2. A method of making a plastic boat which comprises providing a boat framework, and also providing a keel and edge structure, laying a screening thereover and spraying a plastic solution thereon, said screening consisting of a plurality of alternating layers of glass fibre and outside wire mesh, said wire screening consisting of a form-retaining stiff wire mesh composed of woven wire having a diameter of $\frac{1}{28}$ to $\frac{1}{16}$ of an inch with the strands extending transversely to the major axis of the boat being of substantially greater stiffness than the strands which extend longitudinally and parallel to the major axis of the boat, and said screening being welded to said keel and edge structure.

3. A plastic boat having a framework with keel and edge structures and comprising a screen forming an interior reinforcing skeleton for the boat and a plastic spray coat covering and impregnating said framework, said screen consisting of alternate layers of outside wire mesh and inside glass fibre matting, said wire screening consisting of a form-retaining stiff wire mesh composed of woven wire having a diameter of $\frac{1}{28}$ to $\frac{1}{16}$ of an inch with the strands extending transversely to the major axis of the boat being of substantially greater stiffness than the strands which extend longitudinally and parallel to the major axis of the boat, and said screening being welded to said keel and edge structure.

4. A plastic boat having a framework with keel and edge structures and comprising a screen forming an interior reinforcing skeleton for the boat and a plastic spray

coat covering and impregnating said framework, said screening consisting of inside and outside layers of wire mesh enclosing intermediate thereof two layers of glass fibre matting, said wire screening consisting of a form-retaining stiff wire mesh composed of woven wire having a diameter of $\frac{1}{28}$ to $\frac{1}{16}$ of an inch with the strands extending transversely to the major axis of the boat being of substantially greater stiffness than the strands which extend longitudinally and parallel to the major axis of the boat, and said screening being welded to said keel and edge structure.

5. A process of forming a plastic boat which comprises providing a metal framework having the shape, size and contour of the boat, laying a wire mesh thereon, having strands of diameter between $\frac{1}{28}$ and $\frac{1}{16}$ of an inch of such stiffness as to be form-sustaining, welding the keel and edge structure to the wire mesh together with reinforcement wire rods, applying over the wire mesh two superimposed glass fibre mattings, and an outside wire screening, and then spraying from two to ten coatings of a polyester resin and finally interiorly spraying the boat after removal from the framework.

6. A plastic boat construction having a framework consisting of keel and edge structures and formed of a laminated sandwich construction having inside and outside form-retaining wire mesh cloth, relatively heavy elongated metal reinforcing elements welded to said wire mesh cloth, and a plurality of layers of glass fibrous matted materials positioned between and closely contacting said wire mesh cloth, said laminated structure being impregnated with a polyester air hardening resinous solution, said wire mesh being welded to said keel and edge structures.

7. The construction of claim 6, said wire mesh consisting of hardware cloth having a mesh of about one-half inch diameter and threads of one-sixteenth inch diameter.

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