May 20, 1969 R. G. VOGELSANG 3,444,568

LATTICE CORE/FOUNDATION FOR BOAT HULLS

Filed May 11, 1966

FIG. 1

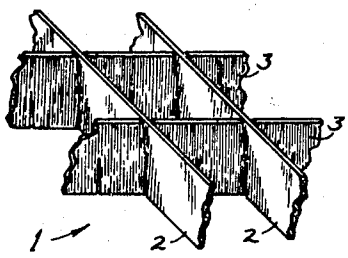


FIG. 2

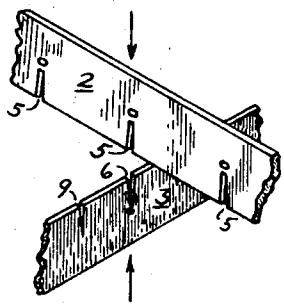


FIG. 3

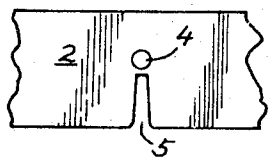


FIG. 4

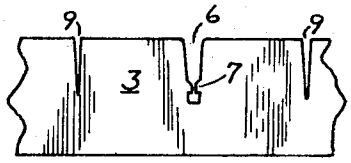


FIG. 5

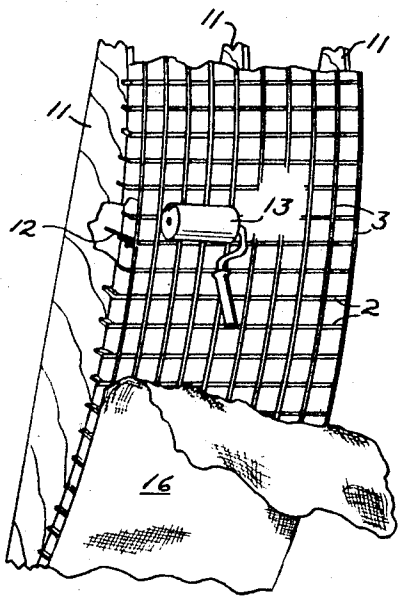
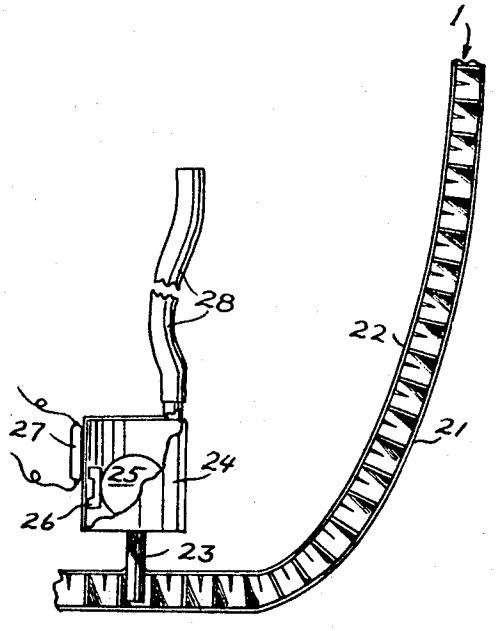


FIG. 6



INVENTOR
ROGER G. VOGELSANG
William H. Le Whitt
ATTORNEY

United States Patent Office

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LATTICE CORE/FOUNDATION FOR BOAT HULLS

Roger G. Vogelsang, 105 Honeycreek Road, Ada, Mich. 49301

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ABSTRACT OF THE DISCLOSURE

A wall construction for a boat hull formed of flexible sheet material cemented in place on each side of a primary lattice unit formed of a plurality of mutually intersecting straight strips fitted together by notches in their respective edges, with certain of such notches being tapered to permit curving and contouring of the wall into the form of a boat hull; also, certain of the strips define apertures between their respective edges permitting the passage by gravity through the lattice unit of water or fluids collecting between the sheet material cemented to the sides of the lattice.

This invention relates to boat hulls and the structural reinforcing thereof and in particular a core structure which is used primarily as a foundation for the hull or other objects originally formed.

The object of this invention is to provide a rapid means of forming, fabrication with integral reinforcing in a laminated built-up structure.

Current means of building large boat hulls incorporate large male and/or female molds which are usually matched and always very expensive. This invention eliminates this costly means of fabrication by permitting direct laminate layup on a lattice-type core foundation to be disclosed herewith.

As "one of a kind" marine hull fabrication is very expensive to cast or die layup, this invention discloses practical and very inexpensive wooden hull forms to serve as frames on which the core unit of this invention is stapled and which in turn forms the entire hull foundation. Subsequent external layup consisting of a rolled or brushed initial coat of cementitious material applied to the external edges of the core and then the initial laminate layup of reinforcing material or fabric thereupon. Subsequent layers of said reinforcements to the desired thickness or strength may be applied thereafter, to which a final coat of finish is preferably applied.

After the original frames or the other hull-forming members are removed, usually after turning the semi-completed hull over, the tip of the staples or the like used to attach the core to the forms are either bent over or pruned off, to permit an inner coat of cementitious material to be applied to the core for subsequent interior laminate layup, like the outer side to suit for relative required strength.

The novel core foundation disclosed herewith further permits "weeping" of moisture which may collect within the laminate walls, such for an example due to condensation and/or leakage through the outer hull laminate.

Such moisture may pass by gravity through the core structure and is thereby drained to the lower portions of the hull, where it may be conveniently pumped out by an appropriate drain tube. Of advantage in northern or colder climates where seasonal hauling usually is the practice, the degree of water removal to preclude likely freeze damage will serve as an indicator to the previous seasons outer laminate damage.

It may be noted that a continuous float-type alarm may be employed to monitor current conditions of outer hull integrity during crafts use thereby giving prompt notice of damage to said hull. Further, leakage of crafts integral tankage is also monitored as such inner laminate which forms said tankage walls will upon leakage permit tankage fluids to migrate through the core structure to the said alarming device.

The core structure of this invention constitutes a machine-manufactured lattice unit which is uniform or consistent as far as dimensional rigidity and strength. As the lattice structure may be fabricated of a number of specific types of reinforced plastic materials, both the reinforcement and plastic composition types will be omitted herein as broad and varied applications utilizing this invention will dictate many different structural capacities and therefore equivalent to meet those demands.

This invention is described or disclosed in a preferred form and application, however it is understood not to be limited to this form or application as shown in the following drawings. In the drawings:

FIGURE 1 is a fragmentary perspective view showing a portion of the structural lattice and the relative construction thereof;

FIGURE 2 is an exploded fragmentary perspective view showing the two cross member pieces of the lattice of FIGURE 1, reflecting the preferred integral design thereof for mechanical mating;

FIGURE 3 is an enlarged fragmentary elevation of a portion of the structure seen in FIGURE 2;

FIGURE 4 is an enlarged fragmentary elevation of another portion of the structure seen in FIGURE 2;

FIGURE 5 is a fragmentary perspective view of a section of the lattice structure showing initial construction details and illustrating a preferred form and external laminate layup; and

FIGURE 6 is a cross sectional and elevation of the completed layup of said lattice foundation hull, with associated elements.

In FIGURE 1, a perspective view of a portion of lattice core structure **1** reflects the two basic pieces of which the lattice is formed. These are lateral members or strips **2** and cross pieces **3**, which are positioned approximately normal to each other and are mechanically locked together at points of intersection.

In FIGURE 2, lateral members **2** is seen to have a "weep" or drainage hole **4** near the center portion of said lateral strip **2**, and a somewhat tapered or convergent notch **5** in line with said hole **4**. The notch **5** is cut on a taper to permit shaping of the core by relative pivoting of a strip inserted into a convergent notch, and thereby provide ease of assembly and bending, as will be further disclosed later in the text.

The cross strip, or piece 3 has a notch 6 which is also tapered, like notch 5 above but notch 6 has two converging projections 7 at its base so that the notch has communication with an aperture 4 in the cross piece when assembled. The notch depth of strips 2 and 3 is so cut to permit a flush condition of the outer edges of the strips when assembled. The width of the said notches at the center of the strips is substantially that of the mating strip member, but the notches each diverge or taper outward from that point to permit relative pivoting of the strips to shape the lattice round curves on the hull-forming means to which they are conformed and temporarily affixed. Like said notches 5 and 6 for flexure purposes, notch 9 is cut between said locking notches to permit further flexure of cross piece 3, and will be disclosed further in a later portion of the text.

In FIGURE 5, a desired number of rib-like frame or station forms 11, preferably sawed from wood to the desired hull contour are illustrated in the way they are used to constitute the entire skeleton of said hull. These forms create a frame on which the lattice 1 is attached as by staples 12. As lattice structure 1 may be prefabricated in the desired hull lengths, different sections of the lattice may be joined by leaving open one or more series of outer edge notches along the entire length of a lattice section for subsequent insertion of the next mating lattice section at said lapping area. A suitable hand notching tool could also be employed to permit hand notching the lateral strip 2 (to which new or added panel will be attached) on the external side of such strip after it has been stapled to its form.

When the hull is to have compound curves, use of another cut-off tool will permit cutting the cross member strips in strategic areas to permit lateral strips 2 to either converge or diverge slightly, so as to maintain consistent curvature with the form. In widely converging areas, such a cut-off tool may be used to cut and remove wedge sections from the lattice panel, of which may constitute removal of one or more lateral strips which tend to run parallel to one another in the said converging area. When a diverging section may be needed to fit certain compound curves, a small section of wedge shaped lattice panel may be employed to fill the resulting gaps.

It may be seen in FIGURE 5 that cross strips 3 run vertically, with the aforesaid or unoccupied notches 9 facing inward. As the assembling notches 5 and 6 of both lattice members 2 and 3 have a degree of taper, so does this notch 9, except that its taper converges to a point (FIGURE 4). The degree of taper in all cases is to allow the bending of the lattice in an edgewise plane, cross member 3 being bent the largest degree when applied in the vertical orientation. As most marine craft have their major curvature in the vertical plane, yet need the greatest rigidity in the lateral plane, it may be seen that the invention's novel combination suits both dynamic problems easily. It could be said that the more "stretchable" lattice members (with integral more stretchable reinforcements) would accommodate a more sharply curved form than the higher rigidity members as constituted in the other plane which need not follow equally sharp curvatures.

Cementitious material such as polyester or epoxy resin is next applied to the outer side of the lattice 1 as by a roller 13 (FIGURE 5) thereby coating all external edges of the lattice structure. As the roller application of the cement would tend to preclude surplus amounts of said cement content at the application site, it is preferred to prevent possible filling of weep hole 4 within and between the associated member joints. Prudent brush manipulation may be done, or pre-wetting the to be applied reinforcing laminate material may be employed for subsequent application to eliminaate surplus cementitious quantities when layed on the lattice structure.

Whatever the method employed, reinforcing fabric 16 such as Fiberglas matt or cloth is then promptly applied

over the cement coated areas and smoothed into place. Additional subsequent external layups or laminates may proceed as rapidly as practical, and when cured and finished, physical manipulation of the entire hull may be accomplished for removal of the internal frames.

After the removal of said frame forms, the inside surface of the semi-completed hull may be coated with cementitious materials in the same manner as previously described on the external surface, and subsequent internal laminate plies of reinforcing fabric or materials applied in like manner as aforesaid.

In FIGURE 6, a completed sectional view reflects the hull structure with external laminate 21 and internal laminate 22, as cemented on core structure 1. A drain tube 23 strategically located at the lower relative portion of the hull permits evacuation of any accumulated moisture or fluids as may seep into said core structure from without or within said hull structure. As the removal of any water is imperative to preclude likely damage of the structure during the freezing temperatures as may be encountered in the colder climates, said drainage would preclude such liability.

A water sensing or switch mechanism 24 which constitutes a float 25 with affixed magnet 26 permits continuous monitoring capabilities of any such entrance of fluids into said device. A reed type magnetic switch 27 will actuate upon float with magnet 26 rise, thus permitting the operation of a pump or the operation of a warning lamp for the marine crafts operator. As the vent tube 28 rises above the normal water line of the said craft as installed thereupon, water entrance as by a possible crack in the external hull laminate would not enter the inner portion of the craft yet permit operation of the warning or switching function of said device 24. Vent tube 28 also permits trapped air to escape said float housing 24 to permit said water rise in same, and as well permits ease of accessibility for such pumping or evacuation of such entrapped water within said hull.

In conclusion it may be seen that the embodiments of this invention create a simple construction means with a foundation core structure of which is designed and fabricated to permit water or fluid migration to lower regions of a completed hull structure utilizing same, by the integral locking holes as incorporated therewith. It may be further seen that a very high strength to weight ratio is available with this type of construction thereby compounding the relative merits and value of this invention.

As versatility is of major concern to various alternate applications, the lateral and cross members of the lattice structure may vary stretch-wise to accommodate said various and diversified applications. Where high rigidity and little flexure is desired, a lesser stretchable with higher tensile strength reinforcement as used within the lattice members itself may be used. Directional orientation of these various greater or lesser stretchable members to accommodate required various bending or strength parameters of the finished laminated product utilizing this lattice core structure may be realized. Such various reinforcements available currently like polypropylene fibers, Dacron, Dynel and glass fibers constitute these various strength or stretch characteristics, and may be utilized efficiently in the many cementitious materials available like the polyester resins and epoxy cements, each being used as the filler in such a lattice strip member.

Of the foregoing disclosure, other elements and combination of elements may appear obvious to those skilled in the art, so to obtain all the benefits hereby described, I claim:

1. In a boat hull, a wall construction comprising: a primary lattice unit formed of a plurality of generally

straight and generally orthogonally intersecting strips; said strips having notched edges at points of mutual intersection and interfitting together by engagement of such notches; at least some of said notches being tapered to permit curved contouring of said lattice unit; said lattice unit having a curvingly contoured shape defining a boat hull; and at least one layer of nominally flexible sheet material cemented in place over said lattice unit to form a skin thereon.

2. The wall construction defined in claim 1, including at least one layer of said sheet material applied to each side of said lattice unit and cemented thereto at substantially all points of contact with said strips.

3. The wall construction defined in claim 2, wherein at least some of said strips have an aperture formed therein to permit the passage by gravity through the lattice unit of any water or fluids collected between the said sheet material secured to the sides of the lattice unit.

References Cited

UNITED STATES PATENTS

1,887,814	11/1932	Le Gall	52—615
2,464,442	3/1949	De Roo	52—668 X
2,813,050	11/1957	Hickson	9—6 X
2,960,197	11/1960	Langhans	52—615

OTHER REFERENCES

Leslie: "Sea King," in Boat Builders Handbook, 1955, pp. 156–161.

Tune: "Egg Crate," "Paddle Board," Popular Mechanics, July 1957, pp. 149—152.

MILTON BUCHLER, *Primary Examiner.*

R. A. DORNON, *Assistant Examiner.*

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