

[54] **STRINGER SYSTEM FOR GLASS FIBER-REINFORCED BOAT HULLS**
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[51] Int. Cl. **B63b 5/00**
[58] Field of Search 9/6, 6.5; 114/5 F

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[57] **ABSTRACT**
Boat hulls of glass fiber-reinforced resin construction are provided with a custom-molded, rigid, synthetic foam stringer member providing an index to locate floor and interior components, support floor, enclose fuel tank, incorporate bilge drains, provide storage space, and stiffening for the hull and transom. The stringer member, adapted to fit the inner contour of the boat hull, is positioned in place in the hull and secured therein by application of a layer or layers of glass fiber-reinforced resin over the stringer member and adjacent portions of the hull. A floor member is secured to the upper surface of the stringer member and a subsequent layer or layers of glass fiber-reinforced resin applied over the floor member and joints between the floor member and the hull giving a continuous, uninterrupted surface. Additional floatation may be provided by injecting an expanding foam into one or more of the hollow spaces defined by the boat hull, floor member and stringer members. Motor mounts may be made an integral part of the stringer member where desired.

10 Claims, 6 Drawing Figures

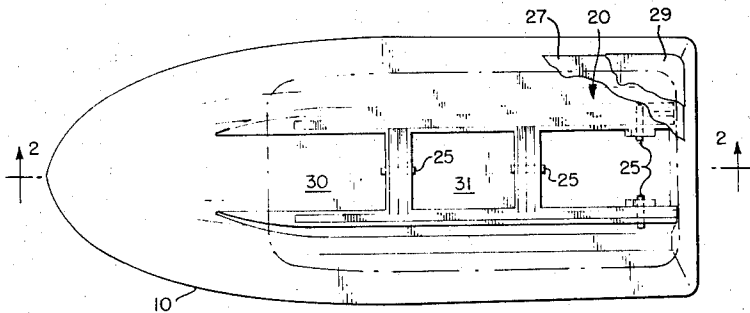


FIG. 1

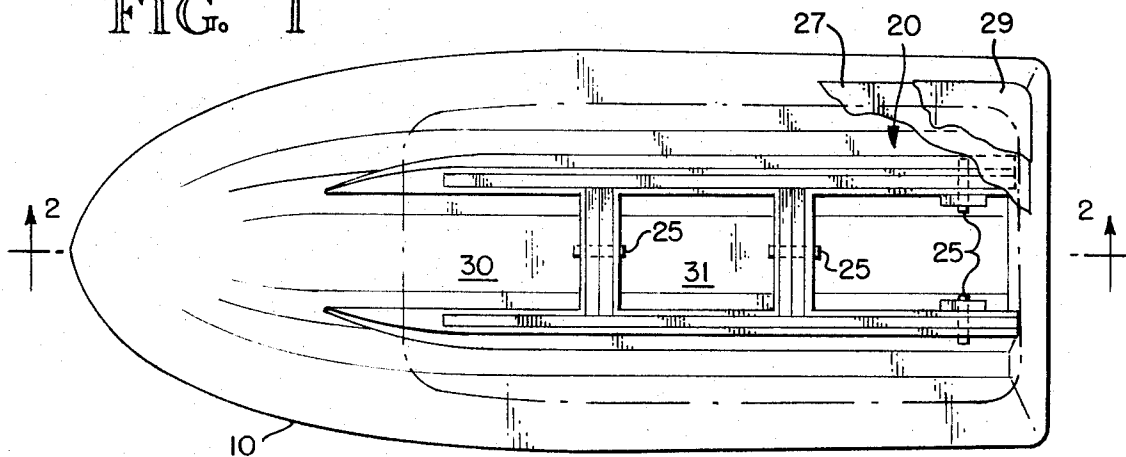
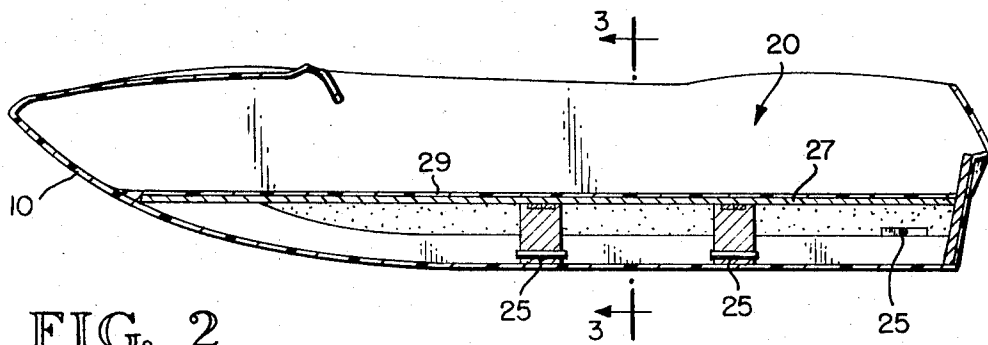


FIG. 2

FIG. 3

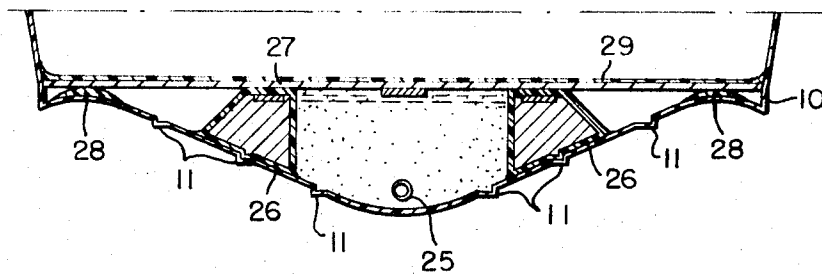


FIG. 4

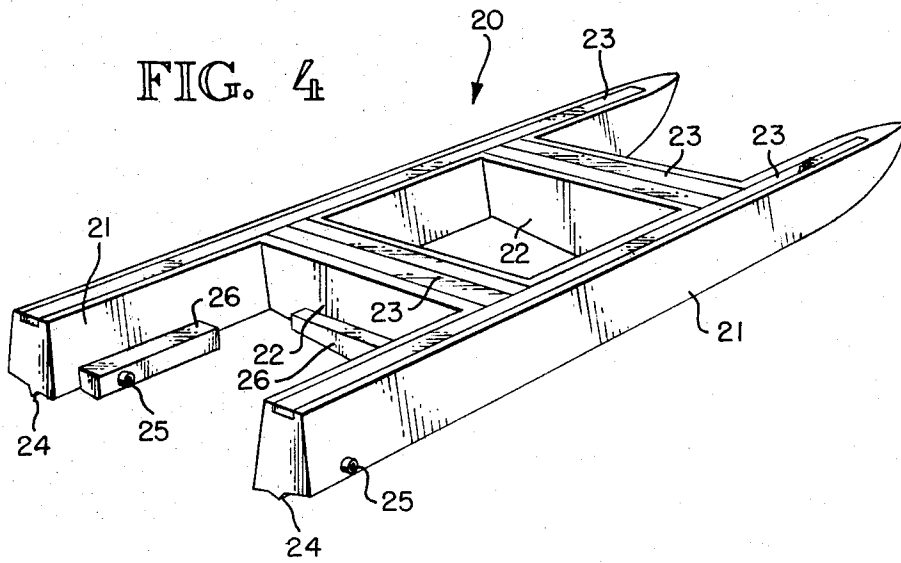


FIG. 5

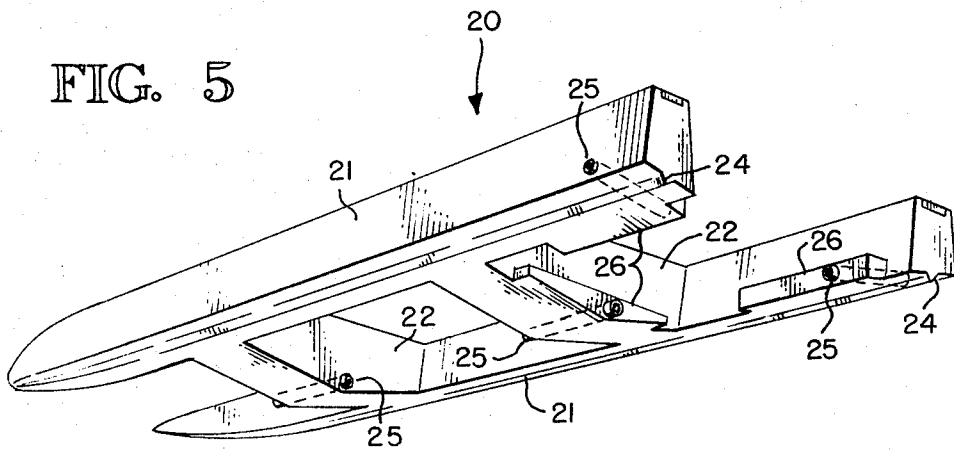
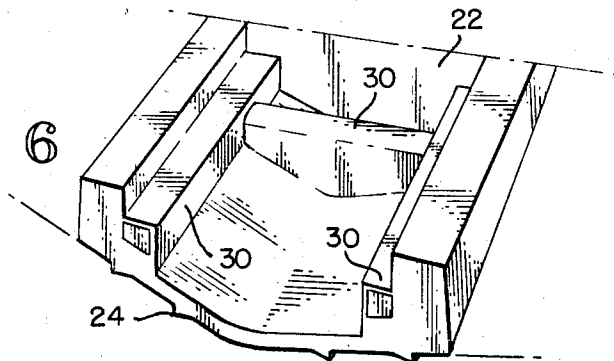


FIG. 6



STRINGER SYSTEM FOR GLASS FIBER-REINFORCED BOAT HULLS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a system for providing floor support and stiffening for boat hulls of glass fiber-reinforced resin construction, to boats incorporating such a system and to the method of installing the stringer system in a boat hull.

2. Prior Art Relating to the Disclosure

Boat hulls of glass fiber-reinforced resin construction are in common use today. A conventional method used by boat manufacturers for both stiffening the molded hull of the boat and providing support for the floor of the boat has been to individually construct structural framing of wood or plywood for each individual hull, using jigs where possible. Such a procedure is time consuming, wasteful of raw material and expensive because of the labor cost and materials involved.

SUMMARY OF THE INVENTION

This invention is directed to a stringer system providing support for a floor of a boat and stiffening for the hull and transom of the boat. The system eliminates the structural framing conventionally used, reduces the time of installation and reduces labor costs significantly.

It is an object of this invention to provide a custom-molded stringer member of rigid synthetic foam useful in conjunction with a molded, glass fiber-reinforced resin hull of a boat.

It is a further object of this invention to provide custom-molded stringer member of rigid foam for stiffening the molded hull of a glass fiber-reinforced resin construction and providing support for the floor of the boat.

It is a further object of this invention to provide a method of stiffening the hull of a boat and of providing structural support for the floor of the boat by utilizing a custom-molded rigid foam stringer member.

The stringer member includes molded, rigid, synthetic beam members extending essentially parallel to the hull of the boat having an essentially planar upper surface and a lower surface adapted to fit the contour of the interior of the hull of the boat, the parallel beams connected by cross braces of integrally molded foam or other suitable material. The stringer member is positioned in the boat and secured therein with a layer or layers of glass fiber-reinforced resin applied over the beams and cross braces of the stringer and the intersection between the hull and the stringer member to secure the stringer member in place. A floor member is then adhered to the upper surface of the stringer member and an additional layer or layers of glass fiber-reinforced resin applied over the entire surface of the floor member and the seam between the floor member and the boat hull to provide a continuous, uninterrupted surface. The stringer member serves (1) as an index to locate the floor and interior components of the boat, (2) support the floor, (3) enclose fuel tank, (4) incorporate bilge drains, (5) provide storage space, (6) provide additional flotation and (7) provide stiffening for the hull and transom. Additional flotation is added to the boat by injecting an expanding foam into the hollow chambers defined by the boat hull, the parallel beams and cross braces of the stringer member

and the floor member. Integral motor mounts may be provided as a part of the stringer member near the rear of the boat for mounting of a motor.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of a molded boat hull of glass fiber-reinforced resin construction illustrating the stringer member in position in the boat hull;

FIG. 2 is a vertical cross-section along line 2—2 of FIG. 1;

FIG. 3 is a vertical cross-sectional view along section line 3—3 of FIG. 2;

FIG. 4 is a perspective view of the stringer member illustrating the top side thereof;

FIG. 5 is a perspective view of the stringer member of FIG. 4 illustrating the underside thereof; and

FIG. 6 is a perspective view of a stringer member modified to include a motor mount for an inboard engine.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. 1—illustrate a molded boat hull 10 of conventional glass fiber-reinforced resin construction with the stringer system installed therein. The system described herein is useful with any configuration of boat hull, although it will be described for purposes of the application with respect to the boat hull illustrated. To provide stiffening for the boat hull and support for the floor member and transom of the boat, a custom-made, stringer member 20 of rigid, expanded foam construction is positioned in the hull of the boat and secured therein. The stringer member 20 is illustrated by FIGS. 4 and 5. The stringer member consists of two parallel beams of expanded foam 21 connected at spaced intervals by integral cross braces 22, which may be of expanded foam or other suitable material. The parallel beams and cross braces have an essentially planar upper surface for receiving the floor member for the boat. The lower surface of the beams and cross braces is contoured to fit the particular boat hull in which the stringer member is to be used. Wood strips 23 are molded in the upper surface of the beams and cross braces as illustrated by FIG. 4 to provide stiffening for the stringer member as well as to provide means for attachment of the floor member to the stringer member by staples, nails, adhesive or other suitable means.

The lower or undersurface of the parallel beams includes projections 24 which are designed to index with the strakes 11 of the molded hull as illustrated by FIG. 3. Plastic bilge drain tubes 25 are molded in place at the rear of the beams and in each one of the cross braces as illustrated to provide drainage to the rear of the boat hull in the event of any leakage. Molded-in-place ledges may be provided to support the motor as illustrated in FIG. 4 for using an inboard-outboard engine.

The stringer member is made by initially fabricating a mold of the stringer member so that the stringer produced will fit the contour and design of the particular boat hull in which it is to be utilized. Once the mold is made, the interior thereof is coated with a suitable release agent and strips of plywood or other suitable material are laid in the portion of the mold corresponding to the upper surface of the stringer member. Plastic bilge drain pipes 25 are inserted in the mold where necessary and an expanding foam, such as a polyurethane foam, is injected into the mold to fill it. After a suitable

curing time, the mold is opened and the stringer member removed. The particular foaming resin does not form a part of this invention — any suitable resin system may be used. A preferred resin system is a polyurethane foam made by mixing a resin component with a catalyst and blowing agent and injecting the mixed foaming resin immediately into the mold wherein the foam expands to fill the mold. The curing time of the resin generally ranges from 30 to 60 minutes.

Once the stringer member has been made, it is positioned in place in the hull of the boat and secured therein. The member may be secured to the hull by first applying a layer 26 of glass fiber-reinforced resin over those areas of the hull where the beams and cross braces of the stringer member will rest and, while the resin is still uncured, positioning the stringer member in place. After the stringer member is positioned in place, one or more layers of glass fiber-reinforced resin are applied over the beams and cross braces of the stringer member and the seams between the stringer member and the boat hull to effectively bond the stringer member in place in the hull. If desired, a combination of chopped glass and woven glass, woven glass alone, or chopped glass alone admixed with resin may be employed, depending on the desires of the building and the boat design.

A floor member 27 of plywood or other suitable material cut to fit the boat hull is laid over the stringer member and secured thereto by inserting staples, nails or other suitable fastening elements through the floor member into the strips of wood 23, which form an integral part of the beams and cross braces of the stringer member. Prior to positioning the floor member in place, a bead 28 of glass fiber-reinforced resin may be run along the portion of the hull contacting the floor member (FIG. 3) to effectively bond the floor member to the hull. After the floor member is secured in place, one or more layers 29 of glass fiber-reinforced resin may be applied over the entire floor and the seams between the floor and the hull of the boat or applied only at the seams between the hull and the floor member.

If the stringer system described is to be used with a boat hull for mounting of an inboard motor, integral motor supports 30 can be formed in the rear portions of the parallel beams as illustrated by FIG. 6.

Prior to application of the layer or layers 29 of glass fiber-reinforced resin over the floor, additional flotation may be added to the boat by cutting one or more openings in the floor member and injecting an expanding foam into one or more of the hollow chambers 30 and 31 formed by the boat hull, beams and cross braces of the stringer member, and floor member. The expanding foam fills the hollow chamber or chambers and provides additional flotation capacity for the boat hull.

One of the hollow chambers, such as the middle chamber 31, may be used to hold a gasoline tank or be used for storage space.

The stringer system described eliminates the necessity of individually building structural framing for each boat hull and provides stiffening for the hull and support for the floor member and transom of the boat. Once a particular boat hull is designed, a mold is made for the stringer system to fit that particular boat hull and the stringer members fabricated quickly and at much less cost than necessary with individual framing systems for each boat hull. All of the sequential steps

for securing the stringer to the hull can be accomplished without prior curing of the previous step, thus reducing the overall installation time.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A custom-molded stringer member for positioning in the interior of a glass fiber-reinforced resin hull of a boat to provide stiffening for the hull of the boat and support for the floor and transom of the boat, comprising:

a stringer member including (1) one or more molded, rigid, synthetic foam beams extending essentially parallel to the length of hull of the boat having an essentially planar upper surface and a lower surface adapted to fit the contour of the hull of the boat and (2) one or more rigid cross braces extending between the beams, each having a planar upper surface and a lower surface adapted to fit the contour of the hull of the boat,

one or more layers of glass fiber-reinforced resin over the stringer member and intersection of the stringer member with the hull of the boat for securing the stringer member to the boat hull and making it an integral part thereof,

a floor member adhered to the upper surface of the stringer member, and

one or more layers of glass fiber-reinforced resin laid over the floor member and intersection between the floor member and boat hull.

2. The stringer system of claim 1 including one or more layers of glass fiber-reinforced resin between the boat hull and the lower surface of the stringer member for bonding the stringer member to the boat hull at points of contact thereof.

3. The stringer member of claim 1 wherein the upper surface of the beams and cross braces includes a molded in situ exposed wood member providing stiffening to the stringer member and means of adhering the floor member thereto.

4. The stringer member of claim 1 including molded-in-place bilge drain tubes extending the width of the beams and cross braces for draining water from the interior of the hull.

5. The stringer system of claim 1 wherein the rear portion of each of the parallel beams of the stringer includes molded-in-situ structural motor mounts.

6. A glass fiber-reinforced resin boat comprising: a molded, glass fiber-reinforced resin hull, a custom-molded stringer member of rigid, synthetic foam secured in the boat hull providing stiffening for the hull and support for the floor and transom of the boat, the stringer member including (1) molded, rigid, synthetic foam beams extending essentially parallel to the the length dimension of the hull of the boat having a planar upper surface and a lower surface adapted to fit the contour of the interior of the hull of the boat and (2) integral, molded, rigid foam cross braces extending between the beams connecting the beams together,

one or more layers of glass fiber-reinforced resin applied over the beam and cross braces and the intersection between the beams, cross braces and the hull for securing the stringer member to the hull to form an integral part thereof, and

a floor member secured to the stringer member and supported thereby.

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7. The boat of claim 6 including one or more layers of glass fiber-reinforced resin over the floor member for sealing the intersection between the floor member and the hull and providing a continuous, uninterrupted upper surface.

8. The boat of claim 7 wherein one or more of the hollow spaces defined by the floor member, hull, cross braces and beams of the stringer member is filled with an expanding synthetic foam providing additional flotation for the boat.

9. A method of providing support for the floor in a boat and stiffening for the hull and transom of a boat of glass fiber-reinforced resin construction comprising:

providing a boat hull of glass fiber-reinforced resin construction,
providing a custom-molded stringer member of rigid, molded synthetic foam having molded, rigid, synthetic foam beams extending essentially parallel to the length dimension of the hull of the boat having

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a planar upper surface and a lower surface adapted to fit the contour of the inner hull of the boat connected by integral, molded, foam cross braces, positioning the one-piece stringer member in place in the hull of the boat,

securing the stringer member in place in the hull by application of one or more layers of glass fiber-reinforced resin over the stringer member and its intersection with the hull of the boat,

securing a floor member to the upper surface of the stringer member, and

sealing the joints between the hull and the floor member.

10. The method of claim 9 wherein sealing includes applying one or more layers of glass fiber-reinforced resin over the entire floor member and its intersection with the hull of the boat to provide a continuous, uninterrupted surface.

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