A method of producing a laminated article i.e. a catamaran float comprises a plurality of pre-fabricated panels 14and15, at least one of which is a foamed plastics material, are laid within a mould (10 figure 1) and are bonded to each other by intervening adhesive material including the step of introducing resin 20 into the mould to surround at least one of the panels therein. The layers 14 and 15 and a graphics sheet 13 may be placed in a press (12 figure 1) until the layers are firmly secured. The resin may include powdered metals such as aluminium or additives such as silica or talc to serve as thickeners.
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PRODUCTION OF LAMINATED ARTICLES

This invention relates to production of laminated articles, including component parts for assembly with other parts. It is more particularly, but not exclusively, concerned with a method of production of hulls for a catamaran.

The term ‘hull’ is used in this specification interchangeably with the term ‘float’.

Typically when floats are designed and fabricated for catamarans, they require three-dimensional modelling and skilled construction methods.

According to the invention a method of production of a laminated article is provided wherein a plurality of pre-fabricated panels, at least one of which is of foamed plastics material, are laid within a mould and are bonded to each by intervening adhesive material, including a step of introducing resin into the mould to surround at least one of the panels therein.

More specifically, the present invention provides a method of producing catamaran floats that are thin and elongated like blades, with substantially parallel sides. The prefabricated panels are laminated, optionally with sheet material, within the confines of a cast or mould (the terms ‘cast’ and ‘mould’ being used interchangeably).

The advantage is that different designs of such blade-like floats are more easily conceived, requiring only two-dimensional design skills. For the same reason, each
design of float is more easily made than hitherto and more portable for operation or storage. Above all, the use of off-the-shelf materials in the form of rolls, sheets or panels, along with readily mixed resin compounds, makes the process of manufacture available to do-it-yourself methods.

An example of the method of the invention will now be described with reference to the accompanying illustrations in which:

Fig 1 is a perspective view of a shallow mould and press plate as used in the exemplary method;

Fig 2 is an exploded perspective view of the pre-formed layers which are placed within the mould of Fig. 1 in the exemplary method;

Fig 3 is a similar perspective view illustrating assembly of the layers within the mould and the casting step of the exemplary process; and

Fig 4 is a similar perspective view of the completed blade-like float.

As shown in Fig 1, a mould 10 is produced that has an outline which is substantially the same as that required for the intended float. The mould 10 is sufficiently deep to accommodate the eventual thickness of the float, and is accompanied by an upper section or press 12 that fits the outline almost exactly so as to compress the contents within.

The float is produced from a sequence of laminar components, as shown in Fig. 2, which have been previously cut to size from stock materials in the form of panels, rolls or sheets. The first of these is a plastics sheet 13 which provides a means of
sealing the outside of the float, while at the same time allowing for the presentation of
pre-printed graphics.

The second of these is an outer panel 14 which may be either of plywood or of high
density plastics foam, such as polyvinylchloride (PVC) or styrene acrylnitride (SAN).
In this respect a high density SAN foam commercially available under the trade name
“Core-cell” has been found suitable. This panel is typically between 3 and 6mm in
thickness and is cut to approximately the same outline shape as the mould 10.

The third laminar component is a core panel 15 which is of foamed plastics material,
typically of lower density and less expensive than the outer panel 14, if the latter is of
foamed plastics. A suitable material is low density cellular PVC. A typical core
panel thickness is about 8 cm.

Its purpose is to space out the two sides of the float. Although the core panel 15 is cut
to approximately the same outline shape as the mould it is preferably of slightly
reduced dimensions, and may also include cut-out sections within its outline. The
illustrated example of core panel 15 has two strips 17 cut away and is therefore
provided as three separate parts. In this event, in order to keep the various parts of
foam together in the right place before location in the mould, a backing sheet 16 is
used to which the parts are attached.

The fourth and fifth layers 14’ and 13’ form the other side of the float and correspond
to the second and first components 14, 13 respectively, as already described.
In the exemplary method a suitable commercially available resin is used to adhere the various layers 13, 14, 15, 14' and 13' to each other within the mould 10. Such resin can be used in various different forms. In one form it can be applied to a glass fibre fabric which is drawn off a roll. In another form it can be poured into the mould.

In the exemplary method, the first plastics sheet 13 is placed in the mould 10 and resin is applied to its upper surface by roller. The first outer panel 14 is then positioned in the mould and is adhered to the resin. A further resin layer is then applied, but this may be applied at the same time to glass fibre fabric drawn from a roll. Such a fabric does not present a smooth surface and this is why it is preferred not to use it between the outer panels 14, 14' and the respective outer sheets 13, 13'. However, it is preferred between the outer and core panels 14, 14' and 15 because it provides a better reinforcement and overlap, particularly when any of the panels 14, 14', 15 are provided in sections (separate parts shown here only for core panel 15, but also possible for the side panels 14, 14').

Fig. 3 illustrates the next steps in the process. The foam core 15 and its backing sheet 16 are adhered to the first side panel 14 of the float within the mould 10. This leaves an arrangement of shallow channels in the gaps defined by the cut away strips 17 and also surrounding the outline of the core panel 15 which is slightly smaller than the mould. A suitable resin mixture 20 is then poured into these channels until level with the top of the foam core 15.
Thus a cold cast resin compound frame is formed around the core panel and is defined by using the foam core as an insert which is also integrated into the resulting structure.

A suitable resin mixture may incorporate powdered metal, such as powdered aluminium. Other possible additives, which may serve as thickeners, include silica or talc.

The channels in the foam core 15 may be omitted, so that only a ring of metal-resin compound forms around the foam core 15 like a tyre. Cut-outs 17, however, offer the benefit of improved structural integrity, along with the provision of ‘hard points’ for the reinforcement of attachments. These might include specific enlarged attachment points 17a for an external chassis. Additionally or alternatively there could be attachment points provided for separate skis or runners to be later fitted to the undersides of the finished blade-like floats. Even bearings, for instance, might be embedded during this phase.

If the foam core 15 is made to the same dimensions as the outer panels 14, 14; a slightly larger mould is necessary to accommodate this surrounding strip of moulded resin compound.

The method produces a durable edge around each float. The precise profile of this edge can be adapted by alterations to the mould.
Afterwards resin is applied over the resulting continuous surface above the core 15 so that the upper side panel 14' can be applied. This resin layer may be in the form of pre-impregnated fabric from a roll, or it could be applied by roller, with or without such glass fibre fabric.

One of the principal reasons for the use of a fibreglass fabric is that the side panels 14, 14' of each float may be made of materials that are typically supplied in lengths of around two and a half metres. This is generally insufficient for the eventual length of the vessel, so that fibreglass (which is drawn off the roll) can be used to conjoin separate panel sections.

In most instances it is better to restrict such reinforcement as provided by this fibreglass fabric to the insides of each outer panel 14, 14' (that surface abutting the foam core 15), so that the outsides of the panels 14, 14' retain a smooth texture for presentational material.

Afterwards a further plastics graphics bearing sheet 13' is applied in order to seal the assembly prior to pressing and curing. Graphics sheets of plastics material have the advantage that they may be heat-treated so as to seal the edges of the panels to which they are applied.

At this stage the press 12 is applied until the layers 13-15 are firmly secured. The resin may take from two hours to half a day to cure depending on the composition and
initial viscosity. Curing will usually take place at room temperature, although use of resins which require heating eg to 80°C in an oven, is also a possibility.

The resulting float is typically about 4.6m long and 0.9m wide (ie from top to bottom as seen in side elevation) with an overall thickness of about 10cm.

In use, the resulting blade-like floats, as shown in Fig. 4, would be connected in a catamaran configuration by an open chassis or by closed accommodation which would join the two floats at each side of their median line, eg one third of the way from the front and one third from the rear. Such an arrangement would involve four attachment points from which the floats may be disconnected for transport or storage, while the chassis accommodates fuel tank, seat, controls and motor. Once in the water, static buoyancy is provided by the bulk of each float, while the edges provide a running surface upon which to plane.

The foregoing is illustrative and not limitative of the scope of the invention. Many variations in detail are possible in other embodiments. In particular, the materials used (both the laminar components and the resin or adhesive) may differ, and their thicknesses may differ from those mentioned above. Also the number of panels may differ. The outside sheets may not be required and could be replaced by an outer layer of fibreglass fabric coated subsequently with a pigmented gel, to which, after hardening, graphics may be applied.
The backing sheet upon which sections of the core panel are mounted is also not essential to the production method. The sections could simply be placed in position one by one and adhered to the underlying surface of the outer panel 14. Correct positioning could be facilitated by guide lines printed onto the outer panel 14 or by use of a template which could be removable prior to the pouring in of the resin.

The mould may in another version have a removable bottom so that the cured product could be removed from either direction with assistance of pressure from the other side. A conventional two part mould, of two substantially similar parts could also be used.

The production method described may be used for manufacture of many other generally planar components, for example a deck or chassis which may be used to join the above described blade-like floats. It is simply a matter of selecting a different outline shape and producing a mould to match that outline.
CLAIMS

1. A method of production of a laminated article wherein a plurality of pre-fabricated panels, at least one of which is of foamed plastics material, are laid within a mould and are bonded to each other by intervening adhesive material, including a step of introducing resin into the mould to surround at least one of the panels therein.

2. A laminated article produced by the method of claim 1.

3. A catamaran float produced by the method of claim 1.

4. A catamaran float produced by the method substantially as hereinbefore described with reference to and illustrated by the accompanying drawings.
Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

<table>
<thead>
<tr>
<th>Category</th>
<th>Relevant to claims</th>
<th>Identity of document and passage or figure of particular relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>1, 2 &amp; 3</td>
<td>WO99/04964 A1 (SCRIMP SYSTEMS, L.L.C.) See figures and abstract.</td>
</tr>
<tr>
<td>X</td>
<td>1, 2 &amp; 3</td>
<td>US6495088 B1 (COFFIN ET AL) see figures and foam cores 14, 15 and mould surface 16.</td>
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<tr>
<td>X</td>
<td>1, 2 &amp; 3</td>
<td>US5834082 A (DAY) See figures and lines 9-13 column 22.</td>
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<tr>
<td>X</td>
<td>1, 2 &amp; 3</td>
<td>US4361613 A (BOGNER et al) See abstract and figures especially figure 3.</td>
</tr>
<tr>
<td>X</td>
<td>1, 2 &amp; 3</td>
<td>JP08294922 A (AICA KOGYO CO LTD) See abstract and figures.</td>
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Categories:

- X Document indicating lack of novelty or inventive step
- Y Document indicating lack of inventive step if combined with one or more other documents of same category.
- A Member of the same patent family
- A Document indicating technological background and/or state of the art.
- P Document published on or after the declared priority date but before the filing date of this invention.
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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC

B5A

Worldwide search of patent documents classified in the following areas of the IPC

B29C; B29D

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI