Sept. 22, 1959 A. H. SUMNER 2,905,579

SHELL CONSTRUCTION AND METHOD OF MAKING THE SAME

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Fig. 1.

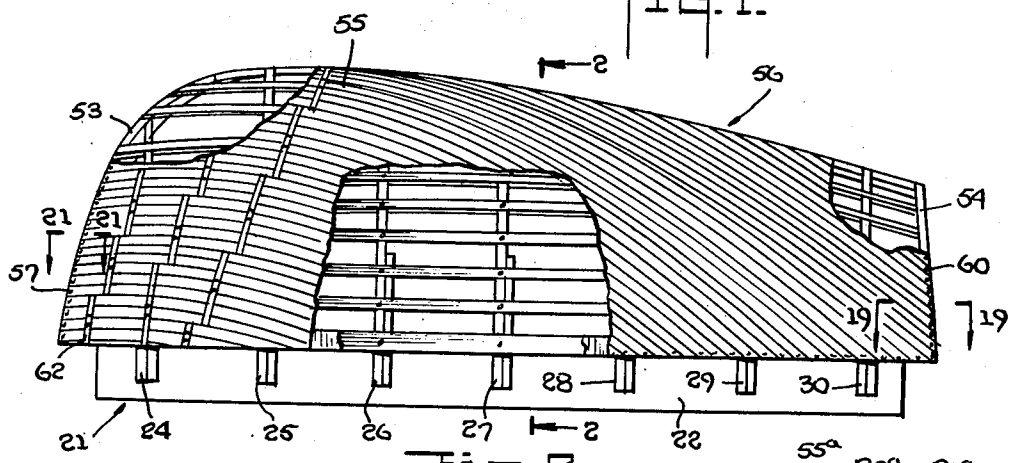


Fig. 2.

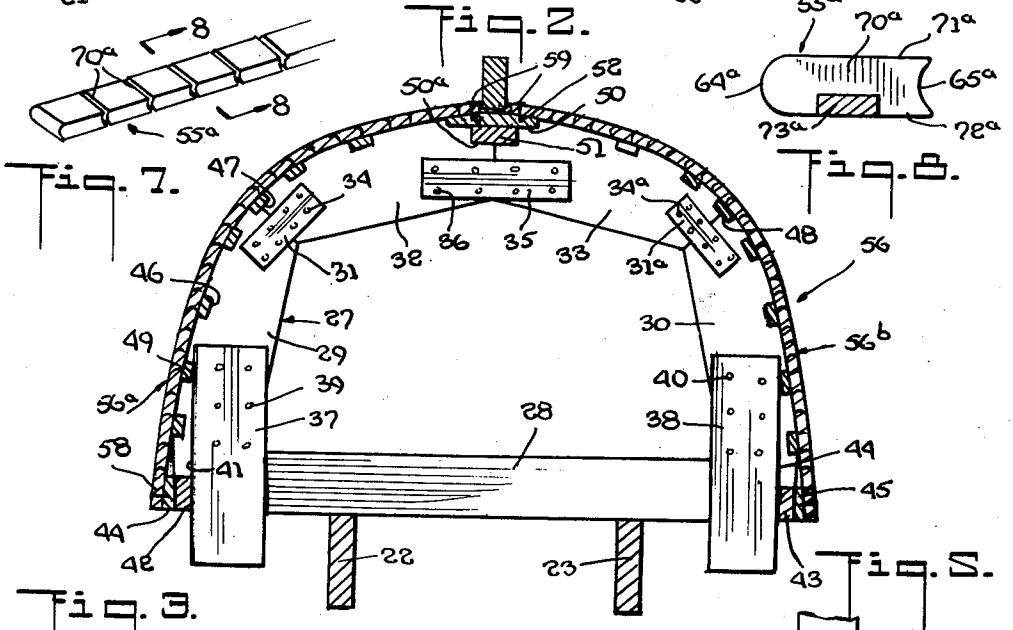


Fig. 7.

Fig. 8.

Fig. 3.

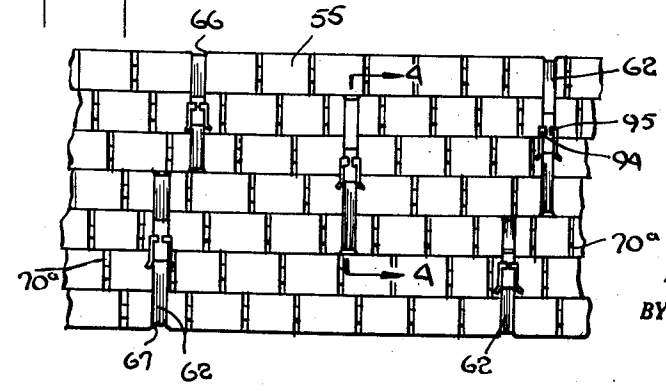
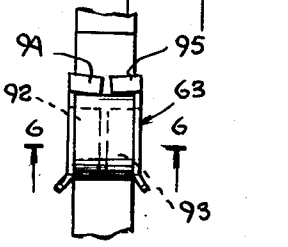


Fig. 5.



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Fig. 4.

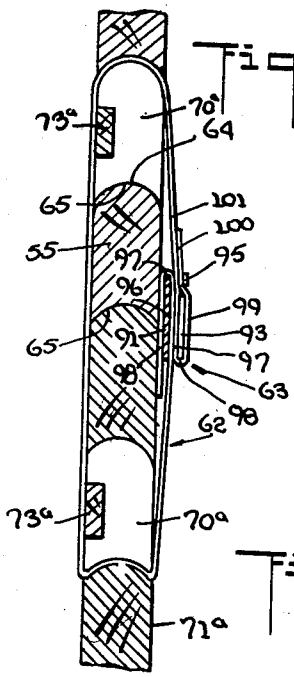


Fig. 10.

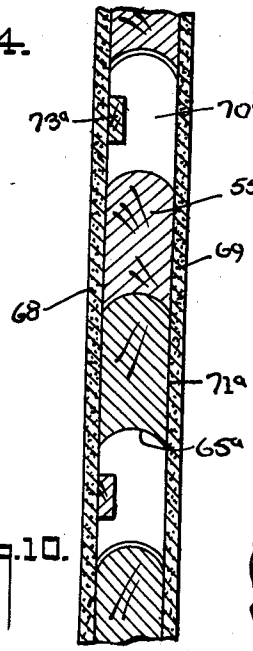


Fig. 6.

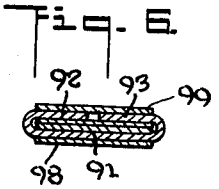


Fig. 9.

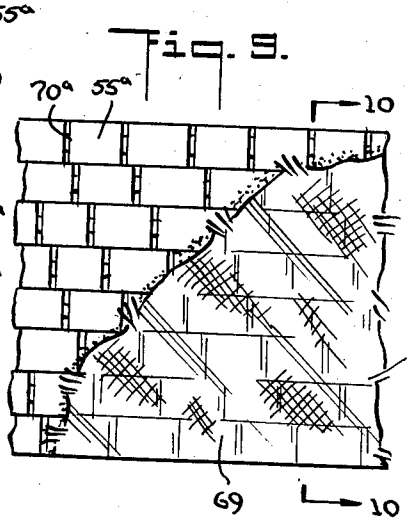


Fig. 11.

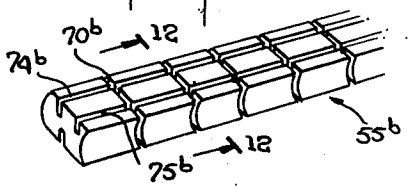


Fig. 15.

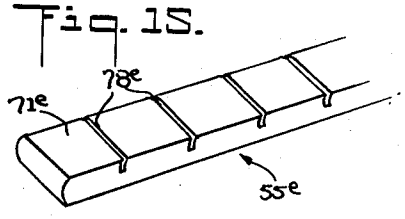


Fig. 13.

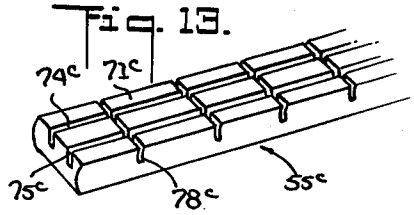


Fig. 16.

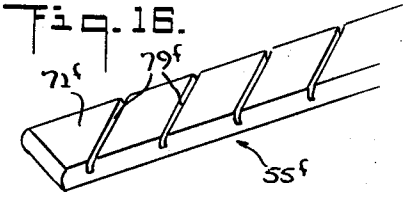
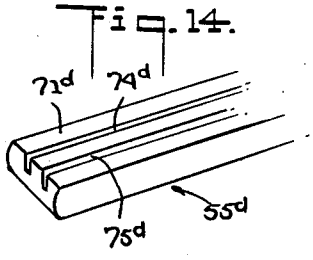


Fig. 14.



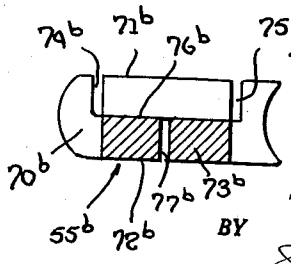


Fig. 12.

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Fig. 17.

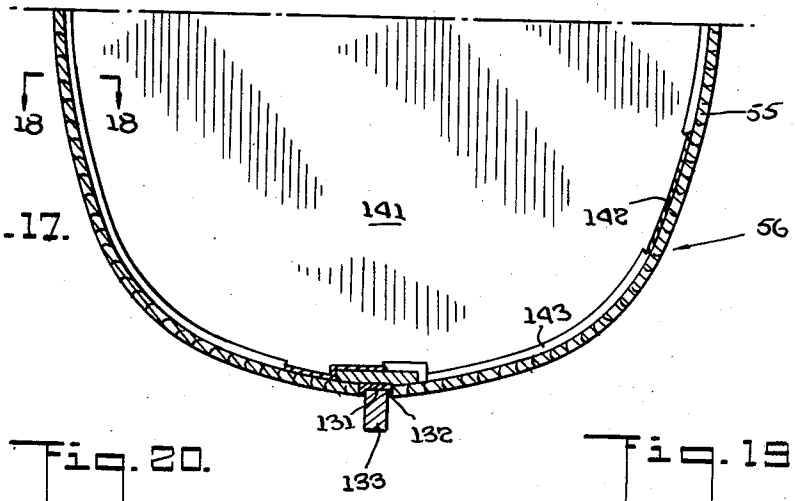


Fig. 20.

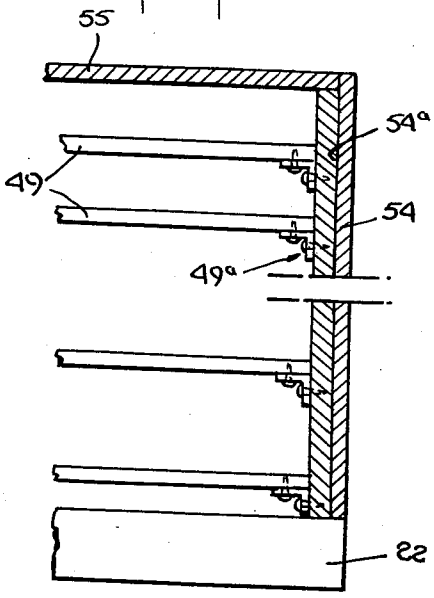


Fig. 19.

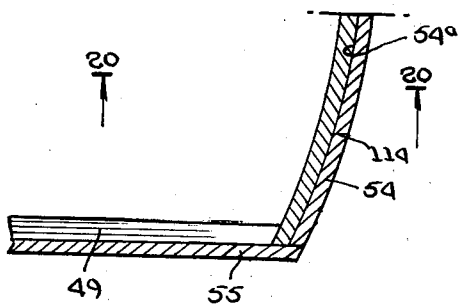


Fig. 21.

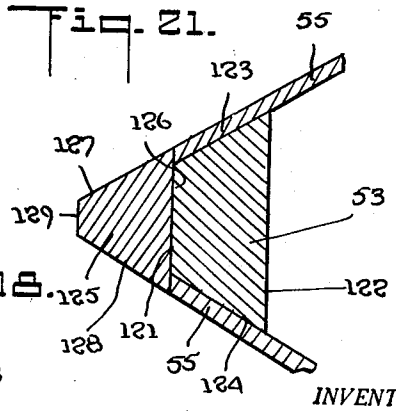
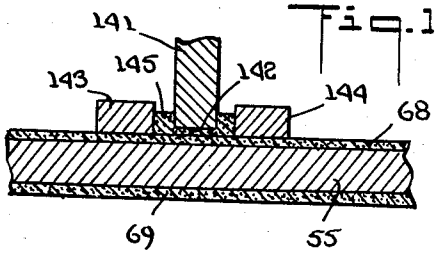


Fig. 18.



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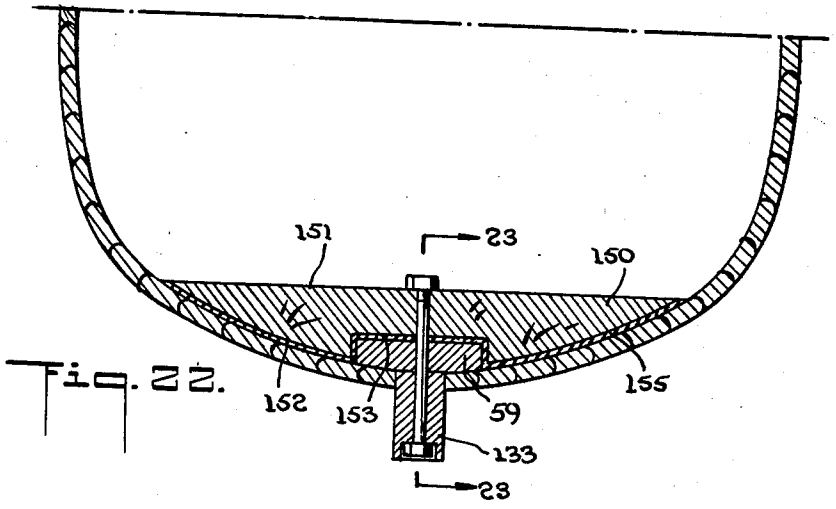


Fig. 22.

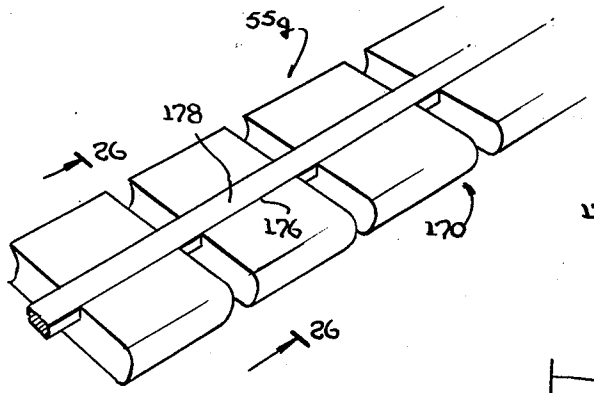


Fig. 25.

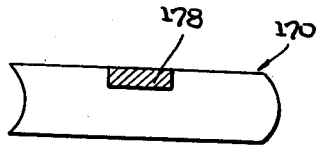
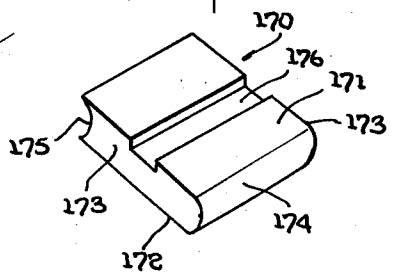


Fig. 26.

Fig. 24.



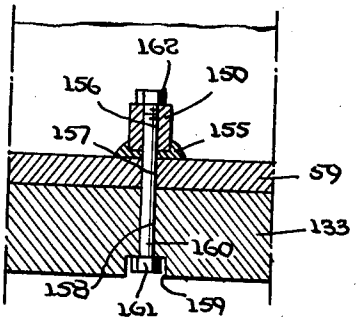


Fig. 23.

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2,905,579

SHELL CONSTRUCTION AND METHOD OF MAKING THE SAME

Arthur H. Sumner, Brightwaters, N.Y.

Original application June 24, 1954, Serial No. 438,977. Divided and this application March 12, 1956, Serial No. 571,036

3 Claims. (Cl. 154—116)

This invention relates to a shell construction and method of making same. This is a division of application Serial No. 438,977, filed June 24, 1954, and now abandoned, for "Shell Construction for Boat Hulls and the Like Hollow Bodies and Methods for Making the Same."

It is an object of the present invention to provide a novel shell construction adapted to be employed in the manufacture of boat hulls, storage tanks, and other hollow wood structures, and comprising a series of longitudinal wood strips or planks assembled together in edge-to-edge relation on a mold to form a hollow shell, the planks being secured to each other by glue instead of nails.

Another object of the present invention is to provide a novel method of making the shell construction, said method comprising the step of temporarily holding the planks in assembled relation to each other by means of a plurality of steel straps each extending transversely around a group of planks and holding the latter in assembled relation until the glue has set.

Another object is to provide a shell construction comprising planks having a novel configuration, each plank being formed with grooves to provide several novel advantages. As a result of the grooves, the planks may be easily bent into the proper curved shape so as to conform to the shape of the mold without requiring a preliminary steaming operation or other softening process as heretofore practiced in the prior art. In addition, the grooves serve to increase the ease of bending. In addition, the increased ease of bending provided by the grooves allows the use of much wider and thicker planks than hitherto employed, thereby reducing the number of planks to be assembled in a particular shell construction, and permitting greater strength due to increased width and thickness.

The fact that the planks are glued rather than nailed to each other permits the planks to be grooved longitudinally, transversely or diagonally since the use of nails would cause the splitting of grooved planks.

A further object is to provide a shell construction of the character described having one or more sheets of fiberglass impregnated with a resin and adhered to the plank surfaces forming the side walls of the shell, thereby rendering the latter waterproof and also reinforcing the wood planks by providing a strong rigid monocoque construction.

Another object is to provide a novel boat hull of the character described and having a resin impregnated fiberglass mat for seating the joint between the keel, keelson and planking.

Still another object is to provide a novel method of making a boat hull or other shell construction of the character described above.

Other objects and advantages of the present invention are inherent in the structure and method steps as claimed and disclosed or will become apparent to those skilled in the art as the detailed description proceeds in connection with the accompanying drawings wherein:

Fig. 1 is a side elevational view, partially broken away, of a boat hull shell construction in accordance with the present invention;

Fig. 2 is a transverse vertical sectional view on line 2—2 of Fig. 1;

Fig. 3 is a side elevational view of a portion of the hull showing the straps for securing the planks together during fabrication of the shell construction on the mold;

Fig. 4 is a vertical sectional view on line 4—4 of Fig. 3;

Fig. 5 is an enlarged detail view showing the opposite ends of a strap joined by a clasp in the conventional manner;

Fig. 6 is a horizontal sectional view on line 6—6 of Fig. 5;

Fig. 7 is a perspective view showing one form of plank having transverse grooves;

Fig. 8 is a sectional view on line 8—8 of Fig. 7;

Fig. 9 is a side elevational view similar to Fig. 3 but showing a subsequent stage in the manufacture of the boat hull;

Fig. 10 is a vertical section view on line 10—10 of Fig. 9;

Fig. 11 is a perspective view of another form of plank having both transverse and longitudinal grooves formed therein;

Fig. 12 is a section view on line 12—12 of Fig. 11;

Fig. 13 shows another form of plank in which the transverse grooves do not extend entirely through the plank to the opposite side thereof as in Fig. 11;

Fig. 14 is a perspective view of still another form of plank having only longitudinal grooves;

Fig. 15 is a perspective view of another plank modification having only transverse grooves which do not extend entirely therethrough as do the grooves of the form shown in Fig. 7;

Fig. 16 is a perspective view of still another modified form of plank in which the grooves extend diagonally rather than parallel to or transverse to the longitudinal axis of the plank;

Fig. 17 is a transverse vertical sectional view partially broken away, of the boat hull removed from the mold and a bulkhead assembled therein;

Fig. 18 is a horizontal sectional view on line 18—18 of Fig. 17;

Fig. 19 is a horizontal sectional view partially broken away, on line 19—19 of Fig. 1 and shows the transom construction, but showing a curved transom instead of a straight transom as in Fig. 1;

Fig. 20 is a vertical sectional view on line 20—20 of Fig. 19;

Fig. 21 is a horizontal sectional view on line 21—21 of Fig. 1 and shows the stem construction;

Fig. 22 is a transverse cross-sectional view of the boat hull illustrating the floor timber;

Fig. 23 is a cross-sectional view taken on the line 23—23 of Fig. 22;

Fig. 24 is a perspective view of a wood block used to make the wood strips to be used as planking in making the boat hull;

Fig. 25 is a perspective partial view of a wood strip or plank employing the block shown in Fig. 24; and

Fig. 26 is a cross-sectional view taken on line 26—26 of Fig. 25.

Referring now to the drawings in more detail, the present invention will be described with reference to a boat hull, it being understood that the shell construction embodying the invention may be employed for other types of hollow wood structures such as storage tanks and bins.

As shown in Figs. 1 and 2, the reference number 21

indicates generally a conventional boat building mold comprising a pair of longitudinal horizontal base members 22, 23 adapted to rest upon the floor surface to support mold 21. The latter is merely a frame fixture on which the boat hull is fabricated and forms no part of the finished hull. Mounted on base members 22, 23 at spaced intervals therealong are a series of mold members indicated generally by the reference numerals 24 to 30 inclusive.

As shown in detail with respect to the mold member 27 in Fig. 2, each of the mold members comprises a horizontal lower base element 28*a* mounted on the upper edges of base members 22, 23 and extending transversely thereto. The opposite ends of each base element 28 are secured to the respective lower ends of a pair of upwardly and inwardly extending side elements 29*a*, 30*a*. The upper ends of the latter are secured by plates 31, 31*a* to the respective outer ends of a pair of upper elements 32*a*, 33*a*. The plates 31, 31*a* are apertured to receive screws 34, 34*a* extending therethrough and engaging elements 29*a*, 30*a* and 32, 33.

The inner ends of said elements 32, 33 are secured to each other by a plate 35 having apertures therethrough for receiving screws 36. Secured to each of the elements 29*a*, 30*a* and extending vertically downwardly therefrom is a member indicated at 37, 38, respectively. Said members 37, 38 are secured to the respective elements 29*a*, 30*a* by screws 39, 40. It will thus be seen that the ten mold members 24 through 30 are provided with seven vertical members 37 along one side of mold 21 and also seven vertical members 38 along the other side of mold 21.

Secured to the outer vertical edges 41 of the series of members 37 and extending longitudinally of mold 21 along one side thereof is a sheer stringer 42. Another sheer stringer 43 is secured to the outer vertical edges 41 of the members 38 and extends longitudinally along the opposite side of mold 21. The elements 29, 30, 32, 33 of each of the mold members 24 to 30 are provided around their outer edges with a plurality of spaced rectangular recesses or notches 46. The adjoining edges of elements 29, 32 are recessed to provide a similar rectangular notch 47 and another notch 48 is likewise formed at the adjoining edges of mold elements 33. Extending longitudinally of mold 21 and fitted within the notches 46, 47, 48 are a series of stringers 49.

The adjoining edges of mold elements 32, 33 are formed with a larger rectangular notch 50 having a smaller rectangular notch 50*a* extending downwardly therefrom. A longitudinal keelson stringer 51 extends through the aligned series of smaller notches 50*a* and contacts the bottom surfaces of the latter. It will thus be seen that mold 21 is of a conventional construction commonly employed in the fabrication of boat hulls and it will be understood that other types of molds may be employed practicing the method of the present invention.

In building the boat hull construction of the present invention in accordance with the novel method of making the latter, a keelson 52 is mounted within the aligned series of larger notches 50 and is temporarily secured to keelson stringer 51. The forward end of keelson 52 is attached to a stem 53 mounted at the forward end of mold 21 and the rear end of keelson 52 is secured to a transom 54 mounted at the rear end of mold 21. As thus far described, the construction is conventional and well-known in the art.

Referring to Figs. 19 and 20, transom 54 extends straight or arcuately around the rear of the boat hull 56 and may be fabricated from a sheet of veneer or plywood or may be built up with a series of vertical planks. Secured to the interior surface 54*a* of transom 54 is an inner piece of solid wood frame 114 to the outer edges of which are attached the planks 55 by nails or other fasteners. Permanently attached to the rear ends of stringer 49 are angle brackets 49*a* temporarily secured to the piece 114.

The transom can be flat or curved transversely as desired and of double planked construction, or of plywood with a frame 114 to which the planking strips 55 can be fastened. The bottom edge of the transom rests on members 22, 23 of Fig. 1. During assembly of the hull, transverse transom members 54, 114 are temporarily secured to stringers 49 by brackets 49*a* and are removed with the completed hull 56 from mold 21.

As shown in Fig. 21 the stem 53 is of trapezium shape in cross-section and comprises transverse parallel forward and rear surfaces 121, 122 and forwardly converging sides 123, 124. A stem cap 125 is also of trapezium shape and comprises a rear surface 126 abutting the forward surface 121 of stem 53 and secured thereto in any suitable manner. The sides 127, 128 of stem cap 125 converge forwardly toward the forward end surface 129 and extend parallel to the sides 123, 124, respectively, of stem 53. It will be noted that the sides 127, 128 are located outwardly of sides 123, 124 by a distance equal to the thickness of the hull planking now to be described.

Referring again to Fig. 2, a pair of longitudinal sheer clamp members 44, 45 are temporarily secured to sheer clamp stringers 42, 43, respectively, and extend therealong. The rear ends of sheer clamp members 44, 45 are secured to transom 54 and the forward ends to stem 53 in the usual manner.

A plurality of longitudinal planks 55 are secured either from stem 53 to sheer clamp 44 or from keelson 52 to sheer clamp 44, or from keelson 52 to transom 54 and extend over stringers 49 in superimposed relation on the latter to form the boat hull 56.

As shown in Fig. 1, a first group of said planks 55 are secured to stem 53 at their forward ends by nails 57. The rear ends of said first group are secured by nails 58 to the sheer clamp members 44, 45. A second group of planks 55 are secured at their forward ends to keelson 52 by nails 59 and extend rearwardly and downwardly therefrom. The rear ends of the second group of planks 55 are secured to sheer clamp members 44, 45 by said nails 58. A third group of planks 55 have their forward ends secured to keelson 52 and their rear ends are secured by nails 60 to the peripheral edge of transom 54. It will thus be seen that there are three groups of planks 55, one group extending rearwardly and downwardly from stem 53 to sheer clamps 44, 45, another group extending rearwardly and downwardly from keelson 52 to shear clamps 44, 45, and a third group of planks 55 extending rearwardly and downwardly from the rear portion of keelson 52 to transom 54.

Except for the nails 57, 58, 59, 60 securing the extreme ends of planks 55 to stem 53, keelson 52 and transom 54, the intermediate portions of planks 55 are devoid of nails. Instead, planks 55 are temporarily maintained in edge-to-edge abutting relation on mold 21 by means of a plurality of conventional steel bale straps 62. As seen in Fig. 3, each strap 62 is wrapped around a group of adjacent planks 55 and the opposite ends of each strap 62 are pulled taut so as to cause strap 62 to be under tension thereby pulling the planks 55 of each bundled group together in secure abutting relation. As shown in Fig. 5, the opposite ends of each strap 62 are securely fastened together by means of a conventional clasp or buckle element 63 applied to the strap ends by any conventional strap tensioning and fastening device. It will be understood that wire and a similar flexible means may be employed instead of straps 62 to accomplish the same function.

As shown in Figs. 4 to 6 inclusive, each of the clasps 63 comprises a web portion 91 having a large pair of ears 92, 93 extending integrally from the opposite edges thereon and over the web portion 91 in spaced relation thereto. Another pair of smaller ears 94, 95 also extend integrally from opposite edges of web portion 91 and are spaced outwardly of the latter in a common plane with

the larger ears 92, 93. One end of strap 62 is provided with a portion 96 extending between web portion 91 and ears 92 to 95 of clasp 63. Strap portion 96 is then bent around the edge of web portion 91 at 97 and is provided with an extreme end portion 98 lying between the exterior surface of planks 55 and the adjacent clasp web portion 91.

The other end of strap 62 is provided with a portion 97*a* extending between strap portion 96 and ears 92, 93 and is bent around the lower edges of the latter at 98. Integral with the latter is a portion 99 extending along the outer surfaces of ears 92, 93 and then below the smaller ears 94, 95. The latter press against an extreme outer strap end portion 100 to maintain portion 100 in abutting relation to the portion 101 of strap 62. It will be seen that straps 62 are arranged in alternate staggered relation, as shown in Figs. 1 and 3, to assure that planks 55 are maintained in rigid abutting assembled relation until planks 55 have been securely glued together.

The planks 55 are formed of any type of wood suitable for boat hull construction and are chemically treated with a water-soluble anti-rot fire-retardant material such as a solution of zinc chloride. Water soluble materials are preferred for this purpose since an oil base preservative, such as creosote, would prevent adherence of the glue and resin to be described below.

As best seen in Fig. 4, each of the planks 55 is provided with a convex edge 64 and an opposite concave edge 65. The convex edge 64 of each plank 55 is adapted to fit within and abut against the concave edge 65 of the adjacent plank 55. A suitable glue or cement composition of any suitable type commonly employed in boat hull construction is applied to the plank edges 64, 65 as the planks 55 are assembled on the mold 21. The straps 62 maintain plank edges 54 in abutting relation to plank edges 65 while the glue is drying after which the straps 62 may be removed. As seen in Fig. 3, the straps 62 tend to bite into the edges 64, 65 of the outermost planks 55 of each group to form slight recesses or indentations 66, 67 in said edges 64, 65 and are filled with wood putty.

As shown in Figs. 2 and 17, the forward edges of planks 55 secured to keelson 52 are spaced from each other to form with the latter a rectangular recess 131 extending longitudinally along the bottom of boat hull 56. Within recess 131 is a longitudinal strip 132 of mat fiberglass comprising a plurality of glass fibers closely matted together. The fiberglass mat 132 is impregnated with a polyester resin in a fluid state and including the usual accelerator and catalyst compounds. Before the resin solidifies, a keel 133 is mounted within recess 131 and embedded within fiberglass mat 132. When the resin of the latter hardens, mat 132 securely retains keel 133 in assembled position and further serves to make a durable water-tight sealed joint between keel 133, keelson 52, and the forward edges of planks 55.

The boat hull 56 may now be removed from mold 21. The screws or other means securing keelson stringer 51 to keelson 52 and sheer stringers 42, 43 to sheer clamp members 44, 45 are removed. This permits sheer clamp members 44, 45 to spring outwardly away from sheer stringers 42, 43 and also causes the side walls 56*a*, 56*b* of hull 56 to spring outwardly away from stringers 49. Hull 56 is thus free to be removed upwardly off of mold 21.

After boat hull 56 has been thus removed, the interior and exterior surfaces thereof have applied thereto one or more sheets of fiberglass 68, 69 impregnated with a polyester resin or other suitable synthetic plastic material. The resin fills the pores of the fiberglass and also cements the latter to the side wall surfaces of planks 55. The polyester resin is in liquid form mixed with the usual accelerator and catalyst, as noted above with respect to fiberglass mat 132. The fiberglass sheets 68, 69 are preferably of woven fabric-like construction instead of being matted. The liquid resin mixture is brushed onto fiberglass sheets 68, 69 and hardens in five to fifty minutes depending on the proportions of accelerator and catalyst employed. The number of superimposed layers or sheets 68, 69 of fiberglass may be varied to build up any desired thickness and strength.

The planks 55 are preferably provided with grooves extending either transversely, longitudinally, diagonally, or a combination thereof. For example, in one modification shown in Figs. 7 and 8, each plank 55*a* is provided with a series of spaced transversely extending grooves 70*a* each extending throughout the width of plank 55*a* from the convex edge 64*a* thereof to the concave edge 65*a*. The outer ends of groove 70 extend entirely through the thickness of plank 55*a* from the outer surface 71*a* to the inner surface 72*a* thereof leaving only a relatively small web portion 73*a*. For purposes of illustration, the structures shown in Figs. 3, 4, 9, and 10 comprise the plank embodiment 55*a*. It will be noted that the planks 55*a* are assembled together to form the boat hull 56 in such a manner that the grooves 70*a* extend in staggered alternate relation, thereby preventing any continuous flow path for water from the grooves 70*a* in one plank 55*a* to the grooves 70*a* in the plank 55*a* adjacent thereto and thereby reducing any tendency of the boat hull 56 to leak or absorb water.

Referring now to Figs. 11 and 12, there is shown another modified form of plank indicated generally at 56*b* and which may be substituted for the plank 55*a* described above. Plank 55*b* comprises a series of longitudinally spaced transversely extending grooves 70*b* substantially identical to the grooves 70*a*.

In addition, plank 55*b* is provided with a pair of longitudinal grooves 74*b*, 75*b* spaced transversely to each other and extending downwardly from the outer surface 71*b* to a depth approximately in the plane of the outer surface 76*b* of web portion 73*b*. The latter is also provided with a longitudinal groove 77*b* extending inwardly from the inner surface 72*b* of plank 55*b* and disposed approximately intermediate the other pair of grooves 74*b*, 75*b*.

Referring now to Fig. 13, there is disclosed still another modified form of plank indicated generally at 55*c* and having a pair of parallel longitudinal grooves 74*c*, 75*c*, in the outer surface 71*c* thereof. The outer surface 71*c* is also provided with a series of transverse grooves 78*c* which extend throughout the width of plank 55*c* but are of the same depth as longitudinal grooves 74*c*, 75*c* and do not extend through the width of plank 55*c* to the interior surface of the latter as do the transverse grooves 70*a*, 70*b* described above.

Still another modified form of plank is indicated at 55*d* in Fig. 14. Plank 55*d* has an exterior surface 71*d* provided merely with a pair of longitudinal grooves 74*d*, 75*d* substantially similar to the grooves 74*b*, 75*b*, and 74*c*, 75*c* of Figs. 11 and 13. Plank 55*d* is devoid of any transverse grooves.

Another modified plank is indicated generally at 55*e* in Fig. 15. Plank 55*e* has an outer surface 71*e* formed with a series of transverse grooves 78*e*. The latter are relatively shallow and are similar to the grooves 78*c* of Fig. 13 and hence do not extend through the entire thickness of plank 55*e* as distinguished from the transverse grooves 70*a* and 70*b* of Figs. 7 and 11.

Still another modified form of plank is indicated generally at 55*f* in Fig. 16. Plank 55*f* has an outer surface 71*f* formed with a series of grooves 79*f* extending diagonally with respect to the longitudinal axis of plank 55*f*. Grooves 79*f* are relatively shallow and extend approximately halfway through the thickness of plank 55*f* and are approximately the same depth as the transverse grooves 78*c* and the longitudinal grooves 74*c*, 75*c* of Fig. 15.

It will be understood that planks 55 may be entirely devoid of grooves if so desired or may have any of the grooved configurations as exemplified by planks 55*a* to

55*f* inclusive. However, the use of transverse, longitudinal or diagonal grooves, or any combination thereof, provides several novel and highly advantageous results. The grooves enable the planks **55** (**55***a* to **55***f*) to be bent and twisted into the required curved shape when placed around stringers **49** of mold **21** without requiring that the planks **55** first be steam treated as heretofore necessary in prior art methods of boat construction. Also, the presence of the grooves increases the bending and twisting capacities to an extent that much wider planks may be employed and thus requiring the use of a lesser number of planks to form the hull **56** with considerable saving in time and expense in the operation of assembling the planks **55** on mold **21**. Furthermore, the grooves provide the planks **55** with a greater bending moment of inertia and greater strength per weight of material employed thereby providing a boat hull **56** or other shell construction of great strength and durability combined with light weight. The transverse grooves are particularly effective in increasing the bending capacity of the planks whereas the longitudinal grooves primarily improve the twisting capacity. The diagonal grooves enable the planks to be twisted more easily in a direction tending to close the grooves and the angle of the grooves should be selected in accordance with the direction of twist desired. The longitudinal grooves provide the further advantage that they allow lateral swelling of the wood planks without unduly straining the fiberglass layers thereon.

The layers of glue between the interfitting arcuate edge **64**, **65** of adjacent planks **55** serve the double function of maintaining planks **55** secured together in assembled relation and also prevent water from seeping from one plank **55** to the plank **55** adjacent thereto. The sheets of resin-impregnated fiberglass **68**, **69** on the interior and exterior surfaces of hull **56** cooperate with the planks **55** therebetween to provide a strong, rigid, leakproof, monocoque wall construction which is both simple and inexpensive to manufacture. The outer fiberglass layers or sheets **69** prevents water from contacting the planks **55** and should the outer fiberglass sheets **69** be accidently torn or punctured, the inner fiberglass sheets **68** will still prevent the boat hull **56** from leaking. The resin or other other synthetic plastic material which impregnates the fiberglass sheets **68**, **69** may contain any suitable coloring pigments to impart an attractive appearance to hull **56**.

If the planking **55** of hull **56** is subjected to a severe external blow, as in a collision, the planking **55** will be pushed inwardly and the inner layers **68** of fiberglass will be subjected to tensile stresses. Since the fiberglass has an extremely high tensile strength, the inner layers **68** reinforce and unify the wood planking **55** and help prevent fracture of the latter. Furthermore, punctures in either of the fiberglass sheets **68**, **69** may be easily and inexpensively repaired by placing a fiberglass patch over the ruptured area and applying liquid resin to the patch, thereby quickly and effectively sealing the puncture. The fiberglass sheets **68**, **69** serve the additional function of preventing water from entering the wood planks **55** and dissolving the water-soluble preservative, such as zinc chloride, with which said planks **55** are impregnated and coated.

Referring to Figs. 17 and 18, a plurality of bulkheads may be assembled within hull **56** after the latter has been removed from mold **21**. Each bulkhead **141** is of planar configuration and has an arcuate edge **142** conforming to the curved shape of the interior of hull **56**. A pair of retainer strips **143**, **144** of wood or other suitable material and of rectangular shape in cross-section are secured to the inner layer of fiberglass **68** and extend arcuately around the interior surface of hull **56** in parallel planes transverse to the latter to form therebetween a recess within which extends a strip of resin-impregnated mat fiberglass **145** similar to the longitudinal strip **132** described above. The arcuate edge **142** of bulkhead **141** is embedded within fiberglass mat **145** and when the resin solidifies mat **145** serves to secure the bulkhead in assembled relation within hull **56** and also provides a water-tight sealed joint between edge **142** and the inner fiberglass layer **68**.

It will be understood that the wood strips **143**, **144** of Fig. 18 terminate the fiberglass mat **145** neatly but they can be eliminated if desired.

It will further be understood that the fiberglass coverings **68** or **69** may be employed on the inside only or on the outside only or on both sides.

It will be further observed that the staggered and offset grooves such as illustrated in Fig. 9 give almost the same strength as solid wood after the glue sets because the grooves **70***a* are not in alignment with each other.

While polyester resin is mentioned herein as the impregnating substance for the fiberglass, it will be noted that other resins or other suitable plastics may be used for this purpose.

In Figs. 22 and 23 there is illustrated the hull provided with floor timber **150** which is applied to the hull after the hull has been removed from the mold and covered with fiberglass. There are a series of floor timbers **150** although only one is shown. The floor timber **150** may have a straight horizontal upper edge **151** and a curved under edge **152** which follows the shape of the hull. At the bottom of the under edge **152** is an upwardly raised notch **153** through which the keelson **59** passes. Attached to the keelson **52** is the keel **133**. A mat **155** of impregnated fiberglass is disposed between the lower edge **152** and the inside of the hull. The mat **155** is pressed by the floor timber **150** and extends to opposite sides of the floor timber. Each floor timber is formed with a central vertical through opening **156**. The keelson **59** is formed with a vertical through opening **157** aligned with each opening **156**. The keel is formed with a vertical through opening **158** aligned with each through opening **157** in the keelson. The lower opening **158** is countersunk as at **159**. Extending through each set of aligned openings **156**, **157**, **158** is a bolt **160**. Said bolt has a head **161** at its lower end received in the counterbore **159**. A nut **162** may be screwed to the upper end of the bolt **160**.

It will now be observed that after the boat hull has been removed from the mold and covered with fiberglass, a series of floor timbers **150** may be applied in the manner shown by being placed into a bed of fiberglass mat **155** and bolted through the keelson and keel. The floor timbers are placed at intervals and provide strength to the bottom of the boat. The use of fiberglass mat **155** fastens the floor timbers in perfect contact even though they are roughly shaped.

In Figs. 24, 25, 26 there is shown planking **55***g* illustrating a modified construction for such planking. Planking **55***g* may comprise a series of wood blocks **170** each having opposite faces **171**, **172** and sides **173**. Each block furthermore has an outwardly curved edge **174** at one end and a complementary inwardly curved edge **175** at its other end. In the face **171** is a shallow longitudinal groove **176**. A series of such blocks are interconnected in equally spaced condition by fiberglass roving **178** which is received within the aligned grooves **176**. The fiberglass roving **178** is, of course, impregnated with resin. The blocks **170** may be of soft wood and the strip **178** may be made of hard wood if desired. Such planking will readily bend and may be used in the same manner as planking **55***a*, **55***b*, **55***c*, **55***e*, and **55***f*.

It is to be understood that the specific embodiments of the invention shown in the drawings and described above are merely illustrative of several of the many forms which the invention may take in practice without departing from the scope thereof as delineated in the appended claims and hence the claims are to be interpreted as broadly as possible in view of the prior art without being unduly limited by the disclosure.

Having thus described the invention in some detail, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A method of making a boat hull comprising the steps of applying adhesive to edges of a plurality of wood planks, placing said planks on a hull mold in edge-to-edge abutting relation, and tying together overlapping groups of said planks with one or more planks of each group being part of another group, maintaining said groups in tied condition until the adhesive is set, and thereafter untying said groups.

2. The method of making a boat hull comprising the steps of applying adhesive to the edges of a plurality of wood planks, placing said planks in bent, twisted configuration around a hull mold in abutting, edge-to-edge relation and maintaining the planks in said abutting relation until the adhesive sets by tying together overlapping groups of said planks and untying said groups after the plank edges are adhered together.

3. A method of making a boat hull comprising the steps of applying adhesive to edges of a plurality of

wood planks, placing said planks on a hull mold in edge-to-edge abutting relation, tying together overlapping groups of said planks at longitudinally spaced positions by means of alternately staggered strap-like elements extending entirely around said groups, and maintaining said elements in strapped position until said adhesive is set, and thereafter removing said strap elements.

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