

[54] **LIGHT-WEIGHT, INFLATED-STRUCTURE BOAT**

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[51] **Int. Cl.**..... **B63b 3/00**
[58] **Field of Search**..... 9/6, 2 R, 2 A, 3, 4, 12; 114/69, 68; 244/123-126, 128, 118, 117, 5; 156/245

References Cited

UNITED STATES PATENTS

3,237,218	3/1966	Moore	9/2 A
2,797,201	6/1957	Veatch et al.	114/69 X
1,704,612	3/1929	Johnson	114/69 X
2,004,411	6/1935	Krug	244/125
3,490,085	1/1970	Lewis	9/2 A
3,450,374	6/1969	Moore	244/5
3,443,776	5/1969	Moore	244/5

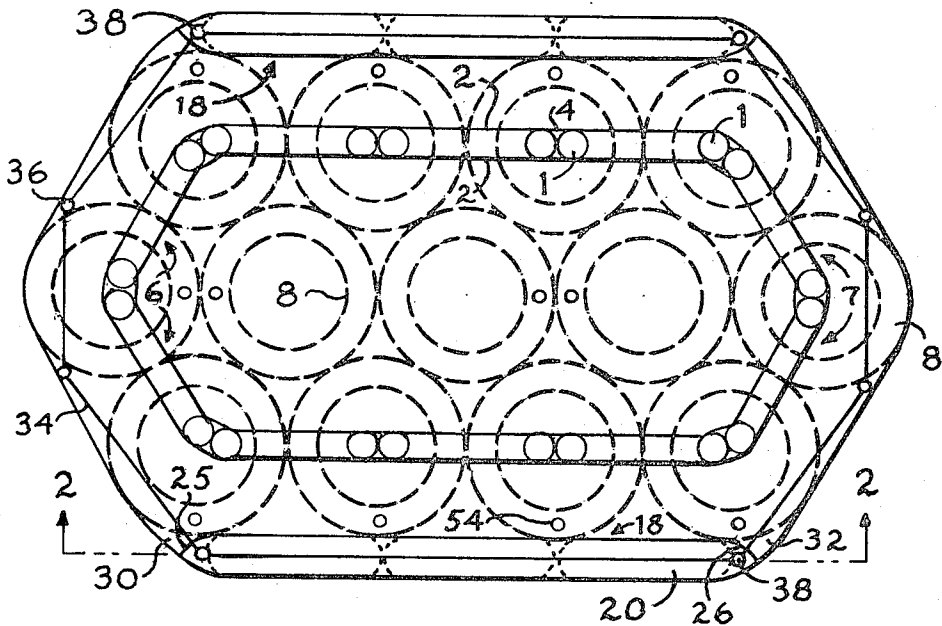
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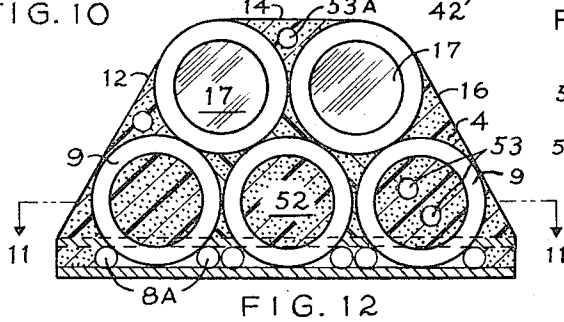
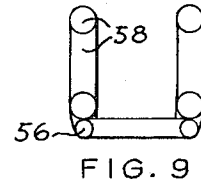
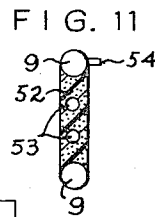
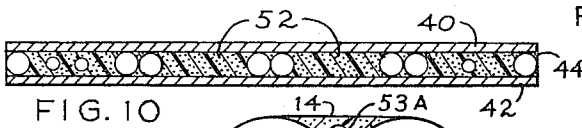
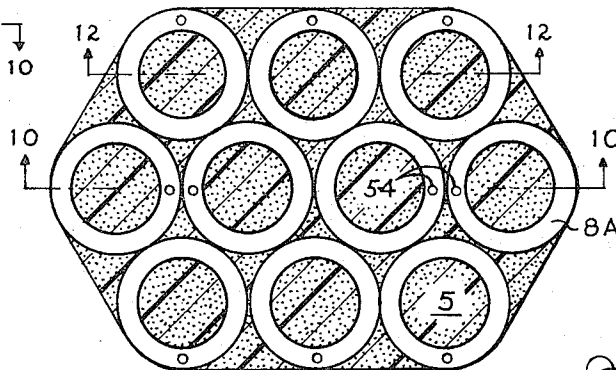
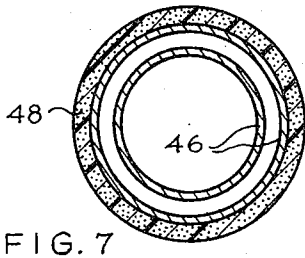
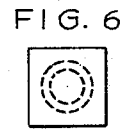
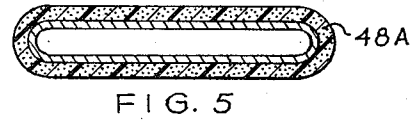
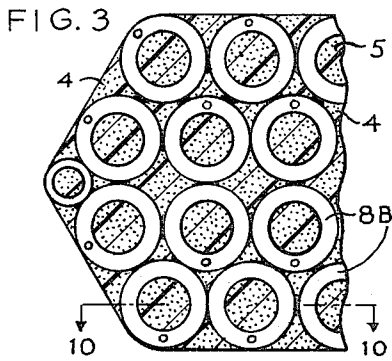
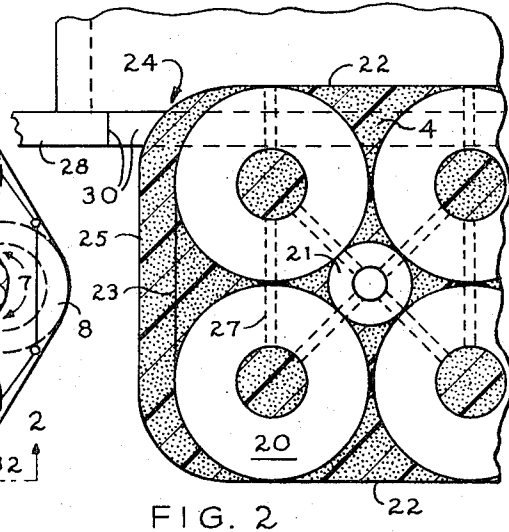
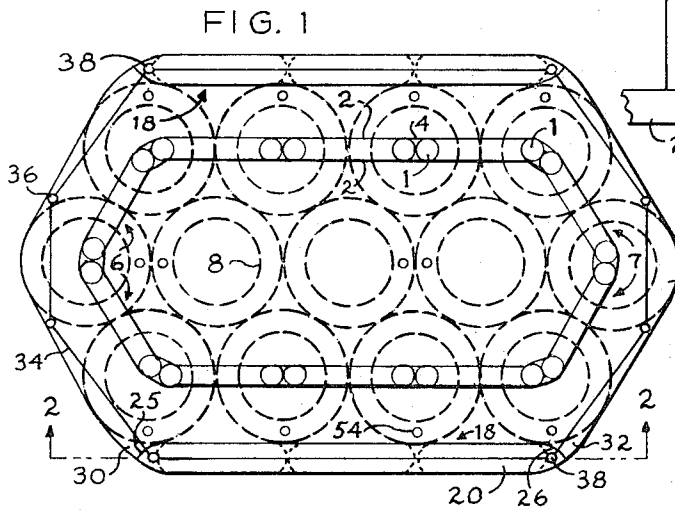
ABSTRACT

A vehicle, preferably a raft or other boat (e.g., a life raft, outboard-motor boat, cabin-cruiser vessel or fly-

ing boat) having a light-weight, very buoyant frame that comprises strongly inflated, doughnut-shaped tubes arranged flatwise within boat skin means and foam plastic between the skins and tubes. The tubes have walls that are thin and light in weight, optionally non-extensible (preferably stiffly resilient) or expansible (preferably resilient) optionally of material non-permeable to gas (e.g., aluminum, dense plastic, very thin iron, very thin steel (preferably resilient), or glass). The preferably resilient skin means may comprise: molded, optionally fiber-reinforced plastic; or pieces of thin sheeting (of very thin iron such as common-can material, very thin resilient steel or resilient phosphor bronze; pieces of plastic sheeting; marine plywood; fabric - textile or metallic sheeting or other, more closely woven fabric (cloth), these pieces of sheeting, plywood or fabric being joined together (thus inclosing at least most of the tubes) by epoxy, silicone sealant or other bonding material and/or by rivets, bolts or thread. Stucco comprising cement and aggregate (filler) optionally may be applied in situ, the cement being optionally Portland-and-lime cement but preferably comprising plastic-when-applied rubber (e.g., pliobond) or epoxy or silicone sealant. In the central spaces of the doughnut-shaped tubes there is preferably located a tube-and-skin-bracing element (optionally a core of substantially rigid or stiffly resilient foam plastic), or a plate-glass or plexiglass window. The tubes are preferably connected at their contacting peripheries by material that is preferably resilient (optionally bonding material which for example may be silicone sealant, other plastic-when-applied rubber, or epoxy).

27 Claims, 12 Drawing Figures





LIGHT-WEIGHT, INFLATED-STRUCTURE BOAT

This patent application is a continuation in part of Application Ser. No. 23,789, filed on Mar. 30, 1970 (U.S. Pat. No. 3,670,349 entitled "Light Weight Article"), which was a continuation in part of Application Ser. No. 531,564, filed on Mar. 3, 1966 (U.S. Pat. No. 3,503,825 of Mar. 31, 1970, entitled "Method of Making Light-Weight Article"). FIGS. 4 to 12 are copies of FIGS. 7 to 12 of Application Ser. No. 23,789; and FIGS. 4 to 9 are copies of FIGS. 4 to 9 of Application Ser. No. 531,564. These continuation-in-part features of the present invention pertain to inventions required to be divided from the said prior applications.

Some objects of the present invention are to provide: (1) a very strong, very light-weight vehicle having a preferably stiffly resilient frame, comprising doughnut-shaped tubes, filled with gaseous material; (2) a nearly crashproof boat or raft having stiffly resilient, doughnut-tube-framed floats, capable of yielding under major-storm shock and returning to their former shape, but stiff enough to resist minor water shocks without deflection; (3) a raft or other boat having side walls comprising doughnut-shaped tubes with their major diameters in substantially upright positions, and a bottom, connected to the side walls, having doughnut-shaped tubes with major diameters that are substantially or nearly normal to upright diameters of side-wall tubes; (4) a boat as in (3) above, in which the doughnut-shaped tubes are between boat-strength-providing skins, with foam plastic around the tubes and between the skins; (5) a boat as in (3) above, having an inclosable cabin of low height, with a collapsible top portion that provides access to the interior and upright standing room in good weather; (6) a boat having an inclosed cabin with a top, deck and side walls, each of which comprises inflated doughnut-shaped tubes arranged flatwise within skin means; (7) a boat as in (6) above, in which at least some of the doughnut-shaped tubes are in staggered, inter-bracing juxtaposition. Other objects will be apparent in considering the following specification and the attached drawings.

In these drawings:

FIG. 1 is a downward sectional view of one form of the invention from a horizontal plane thru the middle of the bottom rows of doughnut-shaped frame tubes in the upright walls;

FIG. 2 is an enlarged-scale view in vertical section from the plane 2—2 of FIG. 1, partly broken away;

FIG. 3 is a plan view of a lower deck (or of a boat top or top deck), in section from a median plane containing the major diameters of the tubes;

FIG. 4 is a sectional view from a median plane thru a construction unit that may be either in the form of a ball or a cylinder;

FIG. 5 is a sectional view of another type of construction unit, utilizable either as a central element of the doughnut-shaped tube of this invention or as a frame-streamlining frame unit at the bow or stern of the boat or raft;

FIG. 6 is an end view of one of the optional end-view forms of the unit of FIG. 5 (which in cross section is optionally round or polygonal);

FIG. 7 is a sectional view from a median plane thru one form of the tubular doughnut-shaped rings;

FIG. 8 is a sectional view from a median plane containing the major diameters of another form of the boat

deck (or top) that comprises doughnut-shaped tubes in staggered, inter-bracing juxtaposition - shown with the optional and preferable foam plastic around the tubes;

FIG. 9 is an elevational sectional view of a simple life-saving raft or other boat, optionally usable also as a swim sled or the like;

FIG. 10 is a sectional view from a plane comparable to that indicated at 10—10 of FIG. 3 or FIG. 8, illustrating one of the optional types of the skin means and one of the optional arrangements of the foam-plastic filler between skins;

FIG. 11 is a sectional view of one of the doughnut-tubed units from a plane comparable to that indicated at 11—11 in FIG. 12 - from a median plane thru an optional form of the tubular rings; and

FIG. 12 is a vertical, sectional view of a life-raft or other boat from a fore-and-aft plane comparable to that indicated at 12—12 in FIG. 8.

Three forms of the boat incorporating the invention are shown in FIGS. 1 and 2, FIG. 9, and FIG. 12. In each of these forms the structure comprises: a deck includes flatwise-assembled, doughnut-shaped tubes, filled with gaseous material (optionally gas or gas-cell-containing foam plastic), within skin means; and side walls also comprising skin means and tubes of this type that have exterior surfaces in contact. Preferably, each adjacent pair of contiguous peripheries of the tubes are connected by bonding material, for example by epoxy, silicone sealant, or other plastic-when-applied rubber. In each of the disclosed boat forms: the deck and side walls optionally are fixed to front and rear walls; and the side walls optionally support and are fixed to a top wall.

In FIG. 1 the side walls are exemplified as comprising the doughnut-shaped rings 1 within side-wall skin means 2, and preferably foam plastic is formed at least around the outer peripheries of the tubes as indicated in FIG. 1 at 4, or (as shown in FIGS. 3, 8 and 12) both around the tubes (at 4) and also within these rings (at 5 or 52). This foam plastic is preferably of the closed-gas-cell type, and at least the filler 5 is preferably stiffly resilient.

The side walls may be indented inside the outer edges of the deck as shown in FIG. 1 (thus providing walking or standing space around the upright walls); or the outer periphery of these walls may be vertically above the peripheral edges of the deck. In the form of the invention shown in FIG. 1 an angled pair of upright front walls, 6, and a similar angled pair of after walls, 7, are fixed to the side walls by the cabin-enveloping skin means that incloses these four walls; and they are fixed to the deck by pipe strap or angle irons or strong adhesive tape and bonding material (epoxy putty or welding, brazing or solder).

THE LOWER DECK

The deck optionally may be substantially rectangular; but in plan view it, like the upright walls, is preferably hexagonal. It comprises doughnut-shaped tubes (8, 8A, 8B) that are similar to the rings 1, and are preferably and similarly in contact with foam plastic (or optionally cement, Portland cement, lime, or dense plastic, containing light-weight aggregate - for example pumice, cinders or plastic particles). Preferably this filler is stiffly resilient foam plastic. The deck skin

means is similar to the skin 2 around the upright walls and to the skin means of the top.

All the deck tubes, 8, 8A, of FIG. 1 and FIG. 8 are staggered in assembly and thus are strongly interbraced in the manner of bricks in a masonry wall. In the alternative arrangement shown in FIG. 3, comprising an even number of fore-and-aft rows, the tubes 8B on each side of the middle fore-and-aft line are thus staggered and interbraced; but the two middle fore-and-aft rows are not staggered relatively to each other. This optional tube arrangement in the lower deck or the boat top of either FIG. 1 or FIG. 12 permits each of the bottom tubes of the upright walls to be in contact with an adjacent upright-wall tube and also nested within a portion of a deck tube, somewhat as indicated in FIG. 12, where the lower portions of the bottom side-wall rings 9 are nested in the doughnut-shaped spaces of the deck tubes 8A.

The top wall or top deck has side edges that preferably are located vertically above the outer surfaces of the upright walls. In the boat of FIG. 1 this top preferably comprises doughnut-shaped tubes, skin means and foam plastic that are like these features of the lower deck and the upright walls. This tube-braced top and a similar front wall also are optional in the boat of FIG. 12; but as illustrated these walls in FIG. 12 are exemplified of thinner material. Here each of the bow, top and stern walls, shown respectively at 12, 14 and 16, may comprise one or more plies of: strong canvas, nylon netting or other textile or metallic fabric, impregnated and coated with waterproof rubber or other plastic; waterproofed marine plywood or sheet metal (aluminum alloy, very thin copper or steel (optionally resilient), or the like. The forward and after walls have plate-glass or plexiglass windows, securely fastened and sealable in them. Either of these windows optionally may be within a frame, and optionally may be part of a door. Plate-glass or plexiglass windows are also shown in FIG. 12 at 17, optionally having frames, fixed by bonding material inside the tubes.

A MEANS OF ACCESS to the interior of the boat of FIG. 1, as well as in FIG. 12, optionally may be at the bow or stern — thru one of the upright wall tubes. But here there is preferably a glass-windowed hatch, fitting inside a doughnut-shaped tube of the top, this top serving both as cover and an upper deck. In the boat of FIG. 1 the top deck (of smaller horizontal area than the lower deck) preferably has only two fore-and-aft rows of the tubes, so that the doughnut-shaped tube spaces are sufficiently large in major diameter to provide an entrance hatchway.

THE FLOAT MEANS

In each of the boat forms the bottom of the craft may be entirely flat, optionally horizontal or for better planing at an angle to the horizontal, median plane of the boat. Such a flat bottom is exemplified in FIGS. 9 and 12. But unless the vessel is a life raft or the like, each boat form preferably comprises floats. Two such floats, 18, forming a catamaran, are exemplified in FIG. 1 and the enlarged-scale FIG. 2. Each of these floats comprises: the doughnut-shaped tubes (20, 21) which preferably are larger in minor diameter than the wall and deck tubes 1 and 8; waterproof skin means (22, 23), optionally of any of the below-described skin materials, preferably comprising resilient, substantially non-extensible material, for example resilient plastic (such

as polypropylene), or fabric (preferably netting of thin-gage aluminum or copper wire mesh), impregnated and coated with resilient rubber or other resilient plastic; an optional forward fairing, 24, illustrated as comprising a portion of the foam plastic, poured inside the forward, resilient skin 25 in situ, passing thru holes in the forward main-float-skin portion 23, but optionally being a separate, molded and waterproofed element, epoxy-glued to the skin portion 23; and after fairing that comprises the fairing skin 26 and is made like the optional forward fairing 24; the filler of these fairings (preferably stiffly resilient) may comprise rather dense foam plastic or epoxy, Portland, or other cement with fine, very light-weight aggregate.

The doughnut-shaped tubes 20 are exemplified as in orthogonal arrangement, but optionally they may be staggered and have an assembly pattern that is similar to the lower half of FIG. 8, this figure then being considered as elevational. In either event the float doughnut-shaped tubes 20 and the optional filler tubes 21 (two of these tubes 21 being coaxial and side-by-side) are all tied together by metallic or fabric ties 27 (bands, wires or cords). The looped tie means between each adjacent pair of the tubes (optionally in both the float and the other boat walls) may be: pipe straps, snugly enveloping the pair of rings and bolted at its ends into a loop; or fabric-reinforced self-adhesive tape, for example commercially obtainable fiberglass-reinforced tape. After each float is sub-assembled it is epoxy-bonded to the deck edge 28, and preferably also attached by means of a stiffly resilient, elongated, apertured angle piece (e.g., of fiberglass-reinforced plastic), fixed to 28 and to an upper portion of the float skin 22. The float is further secured at its joint with the deck by the bow and stern fairings 30, 32, which preferably comprise epoxy, reinforced by fibers of fiberglass or the like.

The optional lifeline 34 completes the main assembly of the boat. Before the upper skin of the lower deck is glued to the top surfaces of the tubes 8 the rods or pipes 36, optionally pieces of rigid or stiffly resilient plastic extrusions (for example of commercially obtainable plastic water pipe), are epoxy glued in angles between the deck-edge skin and selected ones of the tubes and to the bottom skin of the deck. And during the sub-assembly of the floats the similar pipes 38 are glued in the bow and stern float fairings. The lifeline 34 is held in eyes or shallow slots in the tops of the elements 36 and 38, and these tops are watertightly covered, e.g., by caps screwed down on the upper ends of the pipes.

The skin means comprises the skins 2, 22, 28, the top and bottom skins of the bottom deck, the forward and after and edge skins of the walls 6 and 7, and the top, bottom and edge skins of the boat top or top deck. Each preferably resilient waterproof skin means of each of the walls, decks and construction elements of FIGS. 1 to 12 optionally may comprise: pieces of plastic or metal or marine plywood sheets, epoxy-bonded together; pieces of fabric (textile or metallic netting or other fabric), coated and waterproofed with plastic; or (especially in the articles of FIGS. 4 to 7, 9 and 11), integral three-sided receptacles of molded plastic and a fourth side that is bonded to the integral portions after insertion of the tubular means in these portions. When the skin means is formed of portions of sheets it preferably comprises: individual upper and lower skins (40,

42); and an endlessly curved band (44, optionally flexible, optionally stiffly resilient), between and fixed to the edges of 40 and 42, preferably with bonding material (epoxy glue or putty, welding, brazing or solder).

TUBULAR MEANS

The tubular means (containing air, helium, other gas, or gas-cell-containing plastic) in each of the figures preferably comprises tubular walls that are thin and light in weight, optionally either non-extensible or expandable. Optionally in each case their material may be: molded, resilient or non-resilient plastic — preferably substantially impermeable to gas (e.g., fiber-reinforced plastic, polyethylene, or resilient rubber that is slowly permeable to gas; die-pressed sheets of metal or of plastic of the type referred to above, hermetically joined by bonding material; thin molded or die-formed aluminum, aluminum alloy, very thin iron, steel or copper; blown glass; balloon cloth (nylon or the like), coated and impregnated with rubber or other plastic).

When it is metal or dense plastic that is practically impermeable to gas it may be permanently inflated with air or lighter-than-air gas such as helium, preferably at a pressure that is well above that of the atmosphere — for example, of ten to thirty pounds per square inch; and then the inflation hole, tube or valve is permanently sealed. This sealing may be by application of epoxy glue or by welding, brazing, soldering, or by fusing if a type of plastic is used that is meltable by heat. If the tube is integrally made, for instance by the molding method of the present inventor's U.S. Pat. No. 3,503,825, it is hermetically sealed in a step of this method.

Another example of a method of making the doughnut-shaped tubes comprises the following steps: (1) die-stamping or molding two equal, half-tube parts, each having an annular flange around its radially outer edge and another concentric annular flange around its radially inner edge; (2) placing the flanges one above the other to form the doughnut-shaped ring; (3) hermetically uniting the contacting faces of the flanges, except at an inflation hole or little pipe or valve tube, by welding, brazing, soldering, fusing or plastic, or epoxy cement; (4) inflating the tube with the selected gas (or with gas-cell-containing foam plastic); and (5) sealing the inflation inlet by bonding material or fused plastic.

Other optional types of tubular, gas-containing units of the vehicular frame are illustrated in FIGS. 4 to 7 and 11. In FIG. 7 the tube 46 comprises non-extensible wall material (e.g., metal, dense plastic or glass), optionally surrounded by a matrix of molded, substantially rigid, preferably rather dense foam plastic, 48. This matrix is shown as annular, but it may be polygonal (e.g., rectangular as in FIG. 6), adapted to be glued or mortared as a construction unit to other units of a deck, wall or float.

FIGS. 4 and 5 illustrate an optional type of frame-construction unit that may be glued within the central space of a doughnut-shaped tube, or may replace middle tubes of the type of 21. The unit of FIG. 4 optionally comprises either a gas-containing ball 50 (of one of the above-named tube-wall materials) or a cylinder as indicated in FIG. 5 — each optionally sheathed in a foam-plastic matrix 48A of the above-described type.

When the tube 46 or the ball or cylinder 50 is of glass the plastic matrix is resilient.

The optionally pressurized gaseous material in the central spaces of the hollow rings may be helium, air or other gas; or as indicated in FIGS. 10 to 12, it may be gas-cell-containing foam plastic, 52. When the liquid foam-plastic materials are poured after the tubes of the deck, wall or float are within the skin means the tubes are glued only to the bottom skin (42), and a clearance is provided between them and the upper skin 40 (temporarily apertured for pouring the plastic liquids) for passage of the foaming plastic to the central tube spaces. But as indicated in FIG. 11 the foam plastic materials may be poured into a central tube space while the ring is in a mold. Balloons or other helium-filled units, 53, may be placed in the central tube space before the foam-plastic liquids are poured. In addition to being in the central space foam material 52 such balloons (53A) may be in the foam plastic 4 that is exterior of the tubes.

When the tube-wall material is substantially or nearly impermeable to gas the valves or other gas-inlet tubes 54 may be placed anywhere on the tube; but when the tube-wall materials are permeable to gas (e.g., of resilient rubber), the valve 54, usable repeatedly, is preferably located on the side wall of the tube and projects thru a skin inward toward the center of the cabin.

FIG. 9 illustrates a simple, economical form of swim sled, lifesaving raft or other boat. The lower, inflated, deck tubes 56 have outer peripheries that are fastened together (by epoxy and/or ties 27) in an aligned fore-and-aft row, somewhat similar to the middle row of four tubes in FIG. 8. These tubes 56, as well as the upper tubes 58, may comprise any of the above-described tube-wall materials and gaseous materials. The tubes 58 are band-tied and glue-bonded to the tubes 56, are preferably inflated with lighter-than-air gas and preferably extend in a fore-and-aft direction over all or nearly all the fore-and-aft length of the row of deck tubes 56; but they are of larger diameters and volume than the deck tubes. This boat, as well as the other forms of the invented craft, thus preferably has more volume of buoyant tubes above the upper surface of the lower deck than below that surface, and has a center of buoyancy that is considerably above its center of gravity. Either when the device is thrown from a larger craft or when a user is lying or sitting on the deck row the large-volume, very light-weight tubes 58 prevent capsizing. When the user is swimming or rowing with light-weight oars, his hands (or oars) project thru opposite openings in the tubes 58.

In the following claims, unless otherwise qualified: the word "boat" means any vessel capable of floating in and traversing water; "upright" means at an angle to the horizontal greater than forty-four degrees; the term "gaseous material" signifies gas or gas-cell-containing plastic or similar material comprising gas; "gas" means any pure gas or mixture of gases; "plastic": rubber or any other natural or synthetic plastic, dense or foamed; "float means" signifies one or a plurality of floats; and "skin means" signifies a skin or plurality of connected skins.

I claim:

1. A vehicle, including:
 - a load-supporting deck comprising: a plurality of inflated doughnut-shaped tubes, arranged flatwise with their major diameters substantially in the same

normally horizontal plane and having pairs of contiguous peripheries, each pair of the said peripheries comprising contiguous, radially outer surfaces of two adjacent tubes; gaseous material within the walls of each of said tubes; connecting means holding said peripheries together; and deck-skin means on upper and lower surfaces of said tubes;

a plurality of upright walls, each of which comprises: a plurality of inflated doughnut-shaped tubes, arranged flatwise, each of which has a major diameter that is in a normally upright plane, the said tubes having pairs of contiguous peripheries, each of said pairs comprising contiguous, radially outer surfaces of two adjacent tubes; gaseous material within the walls of each of said tubes; and connecting means holding said peripheries together; and vehicle-strength-providing means connecting said deck and upright walls together.

2. A vehicle as set forth in claim 1, in which said connecting means comprises bonding material.

3. A vehicle as set forth in claim 1, adapted to float in water, in which the said tubes of the upright walls have more volume than the tubes of said deck and the vehicle has a center of buoyancy above its center of gravity.

4. A vehicle as set forth in claim 1, in which the central spaces in at least some of the doughnut-shaped tubes of said upright walls are open from an area above said deck to the exterior of the vehicle, adapted to permit extension of a bather's arms thru the tube openings.

5. A vehicle as set forth in claim 1, in which: at least the majority of the tubes of said deck are in juxtaposed fore-and-aft rows; the centers of these tubes in each of the said rows are substantially in a straight fore-and-aft line; the tubes of at least some of the adjacent pairs of said rows are staggered; the outermost side rows have fewer tubes than a middle one of the rows; and the forward and after ends of the vehicle are quasi-triangular in horizontal cross section.

6. A vehicle as set forth in claim 1, in which: said deck skin means comprises parallel, planar sheets of firm stiff material; the said tubes of the deck are between said sheets; and the vehicle includes flexible, waterproofed skin means on the tubes of said upright walls.

7. Structure as set forth in claim 1, in which said vehicle is a boat.

8. A vehicle as set forth in claim 1, comprising porous-plastic filler material between adjacent external peripheries of said deck-frame tubes.

9. A vehicle as set forth in claim 8, in which said porous-plastic filler material comprises foamed plastic.

10. A vehicle as set forth in claim 8, comprising porous-plastic filler material in central spaces of said deck-frame tubes.

11. A vehicle as set forth in claim 1, comprising porous-plastic filler material between adjacent external peripheries of said deck-frame tubes and said wall-frame tubes.

12. A vehicle as set forth in claim 11, comprising porous-plastic filler material in at least some of said wall-frame tubes.

13. A vehicle as set forth in claim 1, in which: said upright walls comprise forward and after walls attached to a pair of side walls; and said vehicle comprises a top,

attached to upper portions of said forward, after and side walls.

14. Structure as set forth in claim 13, comprising a cabin boat, in which the said top is an upper deck and comprises: a top skin means; within said top skin means at least one top fore-and-aft row of aligned doughnut-shaped tubes; and gaseous material within the tubes of said top row.

15. Structure as set forth in claim 14, in which each of said forward and after walls comprises: wall-skin means; doughnut-shaped tubes arranged flatwise within said last-named skin means; and gaseous material within each of said last-named tubes.

16. A vehicle as set forth in claim 1, in which said gaseous material comprises gas under above-atmospheric pressure.

17. A vehicle as set forth in claim 1, having a center of buoyancy above its center of gravity, in which the said gaseous material in at least some of the upright-wall tubes comprises lighter-than-air gas.

18. Structure as set forth in claim 1, comprising a topless vessel, adapted to float in water and to support at least one person, in which the volume of said wall-frame tubes is greater than that of said deck-frame tubes, and said vessel has a center of buoyancy above the top surface of said deck-skin means.

19. A vehicle as set forth in claim 1, comprising a central element, lighter than water, in the central space of each doughnut-shaped deck tube.

20. A vehicle as set forth in claim 19, in which said central element comprises plastic.

21. A vehicle as set forth in claim 20, in which said plastic is foamed plastic, and said central element comprises a lighter-than-air unit in said foamed plastic.

22. A vehicle as set forth in claim 1, floatable in water comprising a pair of catamaran floats, attached to said deck, each of said floats comprising float-skin means and doughnut-shaped tubes arranged flatwise in said float-skin means.

23. A vehicle as set forth in claim 22, in which: each of said deck and float tubes comprises resilient tube-wall material; each of said deck-skin means and said float-skin means comprises resilient material; and said vehicle comprises a central tube-bracing element in the central space of each of said doughnut-shaped tubes.

24. A vehicle as set forth in claim 23, in which said central element is circular in cross section and in weight is lighter than water.

25. A vehicle as set forth in claim 23, in which: said tubes contain gas under above-atmospheric pressure; said tube-wall material is extensible; and said skin means and central element limit expansion of said tube-wall material under gaseous pressure.

26. A vehicle, comprising:

a load-supporting deck, having: deck-skin means; and at least one fore-and-aft row of aligned, doughnut-shaped deck-frame tubes, assembled flatwise in said deck-skin means;

a plurality of upright walls, each wall of at least one pair of said walls comprising: wall-skin means; a plurality of aligned, doughnut-shaped wall-frame tubes, associated flatwise in said skin means; and at least one windowed element in the central space of one of said doughnut-shaped wall-frame tubes; gaseous material inside each of said doughnut-shaped tubes; and

vehicle-strength-providing means connecting said deck and walls together.

27. A vehicle as set forth in claim 26, comprising porous filler material between adjacent external peripheries of said deck-frame tubes.

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