

[54] **LIGHT-WEIGHT, WRECK-RESISTANT,
WATER-TRAVERSING VEHICLE**

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9/6, 52/DIG. 9**

[51] Int. Cl. **B63b 3/06**

[58] Field of Search **114/68, 69, .5 R, .5 F,
114/66.5, 65 R, 81; 244/5, 119; 9/6; 52/DIG.
9**

[56] **References Cited**

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[57] **ABSTRACT**

A boat, adapted for travel over water, comprising floats, and walls that comprise curved, joined-together rows of parallel-axes, thin-metal, cylindrical or corrugated cans, fastened by bonding material and optional screws between strips of mesh or pipe strap, and optionally sheathed in V-shaped strips or masses of foam

plastic or other insulation, between the cans and vehicle skin means. Four such rows, extending longitudinally of the vehicle, may be end-joined at four corners by overlapping ends of the mesh or pipe strap in each of a plurality of elongated loops, forming the framework of the upright walls. These are surmounted by a top that may be substantially flat or airfoil-shaped, comprising curved can-rows that may extend longitudinally of the vehicle, oppositely curved in opposite halves of the top. The sidewall rows are fixed at the bottom of the vehicle's sidewalls to curved deck rows that are similar to the roof rows. And to the deck of these rows (comprising a sheet of tough rubber, other plastic or plywood over the deck cans) a lower, vehicle-driving and main-float part is strongly attached along a central portion of the vehicle. This part preferably comprises upright pairs of curved, parallel-axes, fore-and-aft-arranged can rows, each pair joined at their lower ends by a straight, transversely extending row. Within this inclined, narrowly-flat-bottomed part, which provides headroom for walking along most of the boat's length, ladders and motive means for driving the rear propeller are mounted. Vertical rows of parallel-axes, shock-absorbing, buffer cans preferably extend below the main deck, forming roll-limiting, outrigger floats. The boat is preferably somewhat stabilized by balloons at its top; and if the balloons are large enough (with airfoil-shaped top and with or without small wings jutting thru the sidewalls) the vehicle may be a flying boat. The balloons are preferably in fore-and-aft-extending rows, with a gap in at least one row for a hatchway from the top.

19 Claims, 12 Drawing Figures

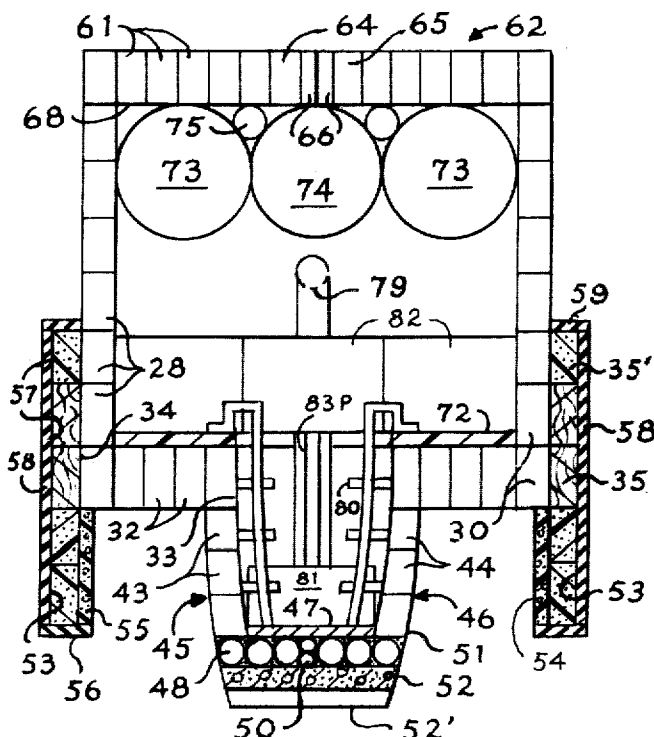




FIG. 1

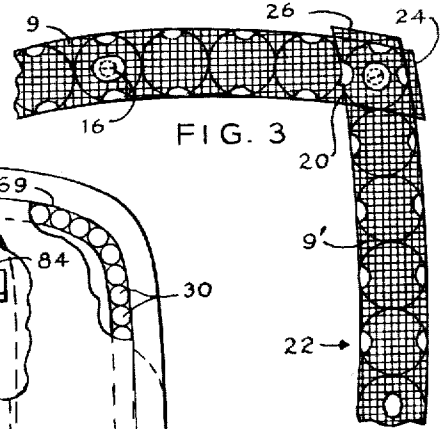


FIG. 3

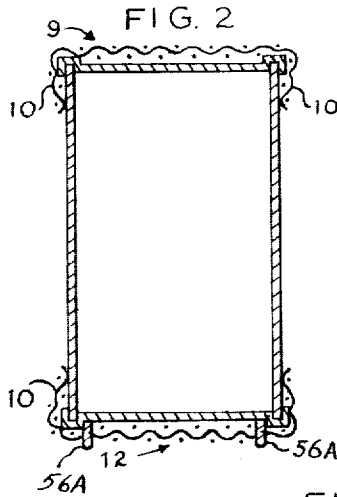


FIG. 2

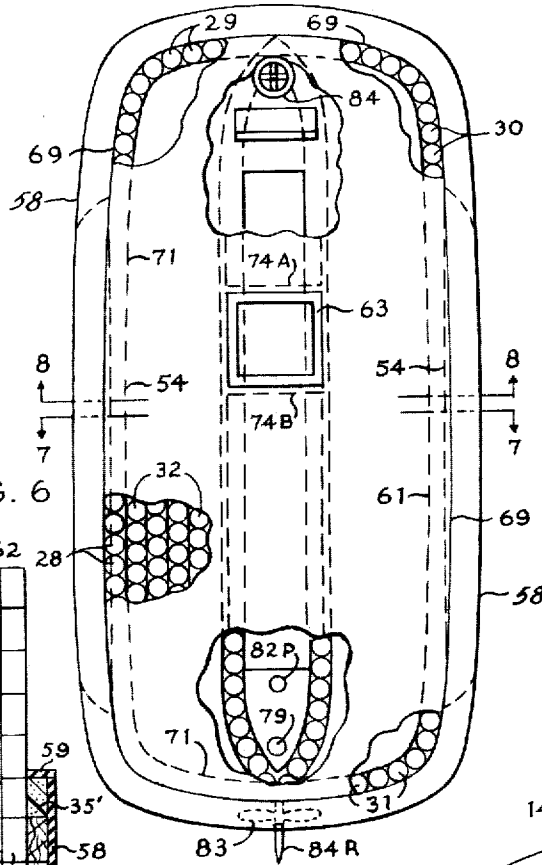


FIG. 6

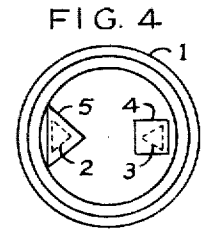


FIG. 4

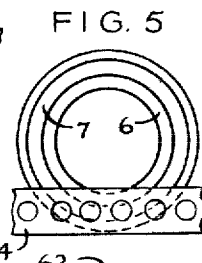


FIG. 5

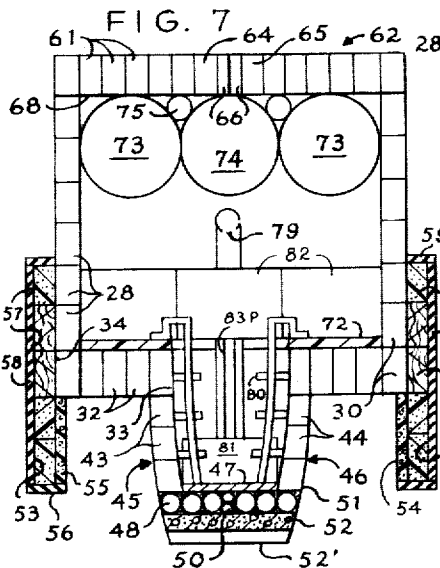


FIG. 7

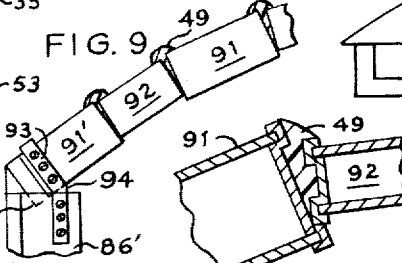


FIG. 9

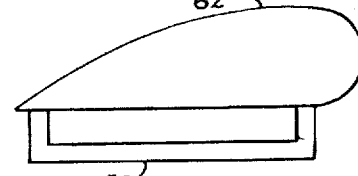


FIG. 11

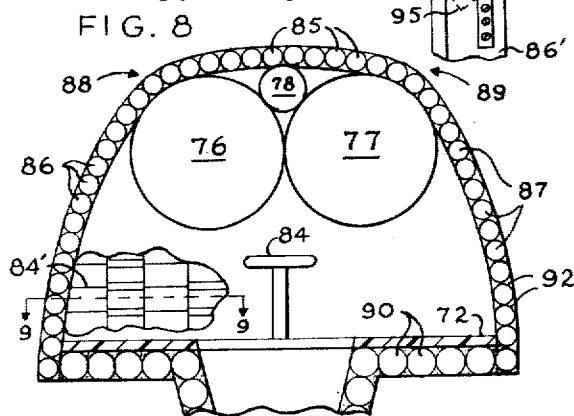


FIG. 8

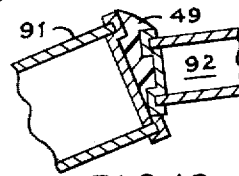


FIG. 10

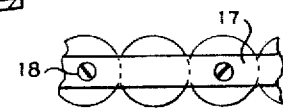


FIG. 12

LIGHT-WEIGHT, WRECK-RESISTANT, WATER-TRAVERSING VEHICLE

This invention pertains to a light-weight, strong, water-traversing vehicle, capable of lessening or eliminating damage in crashes. Either of the two exemplified inventive forms may be only for water-surface travel or may be a flying boat or the like. In some respects the present invention comprises improvements of the structure of the inventor's prior U.S. Pat. No. 3,596,622 of Aug. 3, 1971.

This invention has, among other purposes, the following objectives: (1) a relatively light-weight but extremely strong vehicle, adapted to traverse water at least part of the time of its travel; (2) such a vehicle having firm, strong, inner load-carrying structure and outer impact-cushioning structure that protects its walls against fracture and collapse in collisions or severe storms; (3) a water-traversing vehicle having walls comprising rows of cans of substantially parallel axes, flanked and braced by strips of wire mesh or pipe strap; (4) boat structure comprising such rows of corrugated, sealed, light-weight, tubular receptacles containing gaseous, strong, light-weight, material under pressure above that of the atmosphere; and (5) a boat having roll-limiting outrigger floats having in its top part balloons that also aid in stabilizing it against rolls and pitching.

Other objects and the specific structure of the invention will become apparent from the following specification, and from the accompanying drawings, in which:

FIG. 1 is a plan view, partly broken away, of one of the rows of parallel-axes cans, used as construction elements of the boat's sidewalls, top deck and bumper means;

FIG. 2 is a cross-sectional view of one of the construction-element can-rows from a plane containing the axis of one of the cans, comprising cans and apertured can-holding strips;

FIG. 3 is a detail plan (or side-elevational) view, partly broken away, illustrating an assembly of two of the rows at a corner of the boat;

FIG. 4 is a plan view of a common type of used can, with its apertures sealed over;

FIG. 5 is a fragmentary plan view of an optional type of new or used can, also illustrating an optional type of apertured strip for holding the cans in a strong row;

FIG. 6 is a plan view of one form of the completed vehicle, comprising rows of can, partly broken away in its forward and rear portions (along a horizontal plane above the buffers) to illustrate forward wall cans in cross section, a steering wheel and pilot's seat in plan view, and rear main-float cans, and partly broken away in a middle portion along a horizontal plane to indicate cans of the deck (or top) in cross-sectional view;

FIG. 7 is a sectional view from the vertical plane 7—7 of FIG. 6;

FIG. 8 is a sectional view from the vertical plane comparable to that indicated at 8—8 of FIG. 6, showing an alternative form of the boat body;

FIG. 9 is a fragmentary sectional view from a horizontal plane comparable to that indicated at 9—9 in FIG. 8, on a scale enlarged from that of FIG. 8, illustrating corner structure of the invention form of FIG. 8, comprising curved front-end rows of cans and upright sidewall can-rows;

FIG. 10 is a fragmentary sectional view from a horizontal plane containing the axes of end-joined front-end (or rear-end-wall) cans, on a scale enlarged from that of FIG. 9;

FIG. 11 is a side elevational view on a reduced scale, indicating an optional airfoil shape of the top of the boat cabin of FIG. 7 or FIG. 8; and

FIG. 12 is a fragmentary plan view of a row of parallel-axes cans that is straight.

Each of the forms of the invention shown in FIGS. 6 and 8 comprises juxtaposed rows of parallel-axes cans which may be of the type shown in FIGS. 1 to 4 or the kind illustrated in FIG. 5, these cans being optionally new or used, and securely and bracingly fastened together between parallel strips of strong, apertured material of metal (or optionally of fabric-reinforced plastic). The can shown in FIGS. 2 and 4 may be of the currently common, liquid-containing or coffee-containing type — for example, a beer can, or the corrugated type of used tomato-juice or fruit-juice can shown at 1 in FIG. 4. This can has been opened as indicated at 2 and 3 and then resealed by a piece of adhesive tape 4 (or 5). The adhesive tape may be mastic tape, or of fiberglass and adhesive, or of aluminum and adhesive. The sealing piece may be rectangular as at 4 or triangular as at 5, and preferably is hand-torn from a tape roll that is perforated to permit easy removal of each piece. Preferably it is in the form of a right, isosceles triangle (having two sides equal), which is repetitively indicated on the roll of tape by a continuous series of punctures, and involves no loss of material in removing the pieces. Optionally, the pieces 4 and 5 may be sheathed over with epoxy or other strong glue — for example: liquid epoxy cement poured in a layer over the end closures of the cans, or bits of epoxy putty placed over pieces 4 and 5 by a putty knife.

The new or used can of FIG. 5 is of the common paint-can type, and optionally may be a used paint can. It comprises a flanged snap-lid 6, which is sealingly forced down into tight contact with the bottom of the groove 7 and with the downwardly and inwardly extending annular flange that is integral with this bottom and is covered by the lid in FIG. 5.

The cans may be assembled in straight rows or, as illustrated in FIGS. 1 and 3, in curved rows. They may be placed in fixtures or forms having low, straight or curved side walls, and while in the fixture one of the strips of apertured material stretched over them, and while thus stretched epoxy-glued (or soldered, or brazed), as at 8, to the can end closures. In the assembly of FIGS. 1 and 3 the apertured strip 9, optionally of metal-wire mesh or nylon or other strong plastic network, covers the entire surface of the can-end closures. When, as is preferable, the strip is of metal-wire mesh (for instance, of hardware cloth) this mesh is stamped or otherwise forced and cut into the form indicated in FIG. 2, having approximately parallel flanges 10; and then, with or without use of the above-described fixture, the flanged strip is snugly placed over the can ends and bonded in place. After the strip is thus bonded in can-bracing position the incomplete can row is inverted and the second strip 12 is similarly bonded to the can ends 14. Optionally, the strips 9 and 12 may be narrower than the diameter of the cans; and also optionally, as indicated in FIG. 5 at 14, the strips may be of apertured, solid, strength-providing material — for example of commercially obtainable steel pipe strap.

Most commercially obtainable pipe strap is slightly bowed at its edges. This curve may be that of the curvature of the can row; but when this row curvature is on a smaller radius than that of the pipe strap it contacts the can ends at dissimilar end areas. Epoxy putty or other bonding material is placed thru the pipe-strap apertures that are over the can ends, thus strongly fastening the cans together and within the parallel pair of row-bracing strips. If desired, sheet-metal screws (with or without washers) may first be screwed thru the mesh or pipe strap, forcing the apertured strips tightly against the can ends and then epoxy or other bonding material is sealingly placed over the screw heads. Such a screw-and-bonding-material assembly is indicated at 16 in FIGS. 1 and 3. Optionally, the apertured strip 14 (or the alternative solid-material strip 17 of FIG. 12) may be placed across the middle portion of the can and there bonded and sealed in place by the screws and bonding material 16; and optionally the strip 14 may be wider than it is exemplified in FIG. 5.

In FIG. 12, the pair of optional can-holding strips 17 may be of sheet metal (for example, of aluminum) or of adhesive tape (for example, comprising fiberglass or aluminum, coated with adhesive). These strips are on opposite can ends of the row; When they are of adhesive tape and the cans are of the used type the tape optionally may also be utilized to cover the holes in the ends of the cans. In any event, either the adhesive tape or the sheet-metal strip preferably is strongly bonded by epoxy putty or other strong glue between portions of the strips and can ends; and if desired extra strength of the attachment may be obtained by drilling small holes thru each strip and adjacent can ends, inserting sheet-metal screws 18 tightly in the drilled holes (these screws being of larger diameter than the holes) and, preferably, sealing over the screw heads and adjacent strip portions with epoxy putty or other bonding material. The type of parallel-axes can-row indicated in FIG. 12 optionally may be straight as shown, or curved as in FIG. 1.

The above-described rows of cans may be assembled in vehicular-body corners as indicated in FIGS. 3, 6, and 8. As indicated in FIGS. 1 and 3, two extended end portions 19 of an adjacent pair of the apertured strips (from which portions of the lateral flanges 10 have been cut away) are slightly forced apart and straddled over the end row-terminating can 20 and over an end portion of the mesh 9' of the row 22; and then the end 24 of the portion 19 is hammered or otherwise forced downward into a flange that engages the sidewall of the can 20. The flange 26 at the end of row 22 has been similarly formed before the above-described assembly.

Assembly of the vehicle of FIGS. 6 and 7 preferably comprises the following steps:

1. The four outer deck rows of cans (the lowest ones of the rows 28, 29, 30 and 31) are connected at four corners as illustrated in FIG. 3. At each corner, bolts are threaded thru the contiguous plies of mesh (or pipe strap), and their nuts and adjacent mesh portions are covered with epoxy putty (or solder). This step involves inversion of the connected four rows, for bolting and gluing or otherwise bonding both the tops and bottoms of the overlapped end pieces of the apertured strips at the corners.
2. While the four rows are on the plant floor (or up on a table or bench), the interior deck rows are successively assembled, each extending

longitudinally nearly the full distance between the rows 29 and 31. Because of the slight outward bowing (cabin-strengthening outward arches) of these rows there are gaps of varying distances between cans of the inner rows 32 and those of 29 and/or 31, but each of these gaps is bridged over by end portions 19 that are relatively longer than those illustrated in FIGS. 1 and 3, these portions being straddled over and bolted and bonded to the top and bottom apertured strips 9'. Preferably, before this bolting and bonding the top strip 9 is temporarily bent upward, and into each gap short, vertically-arranged tubular elements (small-diameter pieces of bamboo or plastic pipe of the water-conveying type) are placed and epoxy-bonded together. Optionally, the gap related to one of the rows 32 is adjacent to the row 29, and in assembly of the next row 32 its forward can is in contact with a can of 29 and the gap is then between a can of 31 and the rear-most can of 32. In joining the side flanges 10 of the rows 28 and 32 together, curved short pieces of wire are threaded thru adjacent apertures of the juxtaposed pieces of mesh, and the upper ends of the wires are twisted together, bent, and covered with bonding material, thus making a strong joint between row sides. The rows 32 are successively assembled inward from a row 28 on each side of the deck, and at its middle there is a large gap (later to be filled by the liner 33) between adjacent, oppositely curved rows.

3. The eight deck-level can rows 34 of the shock-absorbing means are assembled, joined at rounded corners, and twist-wired and bonded at their inner sides to the rows 28 in the manner of step (2). Each of the cans of 34 (as well as the other buffer cans) preferably contains shock-absorbing insulation 35 — optionally foam plastic, as indicated at 35', or fibers or particles of fiberglass, shredded foam plastic, shredded bark or the like, coated and adhesively bound together (for example: by dipping the fibers into liquid-state rubber cement of the Pliobond or silicone-rubber type before placing them into the cans; or by pouring liquid-state rubber or epoxy cement over the fibers while in the cans and then draining off most of the poured liquid).

4. Over the whole of the rows 28 to 34 a sheet of wire mesh is stretched and epoxy-bonded and (optionally sheet-metal-screwed) to the can ends and pieces 9 (or 14 or 17) of can-reinforcing strips. This wire-mesh sheet has a curved hole cut out of its middle portion, conforming to the large gap referred to in step (2).

5. The resultant incomplete deck is turned over; and another sheet of wire mesh (having a curved hole for the liner 33) is fastened in the manner of step (4) to other ends of the cans 28 and 32 and to adjacent strips 9 (or 14 or 17).

6. The liner 33 (of curvingly bent and epoxy-joined sheets of mesh-reinforced plastic or waterproofed plywood) is fitted into the large gap referred to in step (2), and the liner-contacting edges of the wire-mesh sheets of steps (4) and (5) (preferably slightly bent into low flanges) are epoxy-bonded to the liner; and simultaneously the liner is epoxy-bonded to contiguous can portions.

7. The cans 43 and 44, fastened together in rows between pairs of the can-joining strips (9, 14 or 17) are contiguously assembled in rows around the sides and pointed ends of the liner 33, and are fastened by epoxy and/or bolts to the wire mesh of step (5). These rows are exemplified in FIG. 6 as straight in their midship por-

tions, but optionally they may be here bowed outward, in the manner of the rows 28 and 30. The cans 43 and 44 may be assembled in six hours, having junctions fastened together in the manner of FIG. 3 — two rows at each pointed end of the liner 33 and one juxtaposed to each of its elongated sides. But currently only two rows in each tier are preferred, each row having curved ends that fit against curved sides of the liner's pointed ends, these two rows being fastened together in a common-level tier of cans, in the manner of FIG. 3, at the forward and rearward portions of these pointed ends. When, as is preferred and exemplified in FIG. 7, the main float curvingly narrows from its deck-attachment level down to its bottom its sidewall curvature necessitates slight wedge-shaped spaces (at 45, 46) between the outer edge portions of each contiguous pair of the can-joining strips (9, 14 or 17). These spaces are filled with epoxy putty, light-weight concrete, or the like. This step (7) comprises fastening together each contiguous pair of the strips along their contacting edge portions which are nearest to the longitudinal axis of the cabin. When these strips are of the narrow type of FIG. 5 or FIG. 7, they are located at these contacting edge portions (as indicated in FIG. 5), and bolts and epoxy putty, solder or other bonding material there strongly fasten these edge portions together, extending thru adjacent pairs of the can-row strips.

8. The float-strength-providing bottom sheet 47 (of mesh-reinforced plastic, metal or waterproofed plywood) is epoxy-bonded or otherwise fastened between (or optionally on bottom ends of) the cans 43 and 44.

9. On the outside of 43, 44 and 47 a horizontal tier of cans 48 is epoxy-putty-bonded or otherwise fastened. These cans may be in curved deck rows of the type shown at 32 in FIG. 6; but as exemplified in FIG. 7, they are in rows of end-joined cans that at least in part are curved and of the type indicated in FIGS. 9 and 10. In FIG. 10 the wedge-shaped spaces between pairs of can ends that are necessitated by this curvature are shown as filled with epoxy putty or other bonding material, 49. When the midship portions of the main-float sidewalls are longitudinally straight each adjacent pair of the different-diameter cans have the can-end cap of the smaller can closely nested and bonded with epoxy or solder in the indented end cap of the larger can, and the curved ends of each can row have the filled wedge-shaped spaces; but when the float sidewalls are curved from end to end these wedge-shaped portions are between each pair of the cans. In any event, there is a gap at the middle of the float-deck tier of cans; and this is preferably filled with short pieces of bamboo 50 and/or epoxy putty or light-weight concrete.

10. A sheet of wire mesh is epoxy-bonded or otherwise fastened on the cans 48.

11. A sheet 51 of metallic or dense-plastic mesh (or a solid metal or reinforced-plastic sheet) is stretched in a loop around and epoxy-bonded to the can sidewalls of the rows 43 and 44. This looped sheet also extends around the cans 48 and has the edge portions jutting above the inverted float cans (on the fixture), these edge portions being cut to conform to the inclined, planing, lift-providing layer of concrete, 52.

12. The concrete 52, in its plastic state, is poured within the upstanding edge portions of 51 and troweled to form a smoothly inclined hydroplaning surface, the rear portion of which is indicated at 52' in FIG. 7. This concrete preferably comprises cement (epoxy or

Portland cement) and light-weight aggregate (for example, cinders, expanded clay or shale, cedar or cypress sawdust or short fibers of fiberglass or shredded cypress or cedar bark, and is topped with one or two coats of epoxy putty. When the sheets 51 are of mesh this concrete is also stuccoed and smooth-troweled on them.

13. The lower, curved, buffer and outrigger-float can rows 53 (comprising can-joining strips 9, 14 or 17) are bolted and bonded to the rows 34; and inside their concave curvatures the straight sheets 54 of solid metal, reinforced plastic or wire mesh are stretched and bolted and bonded or otherwise fastened to the forward and after ends of the curved rows.

14. Concrete 55, of the type referred to in step (12) is poured into the gap between 54 and the cans 53, and when the sheet 54 is of mesh is stuccoed on it.

15. A strip of wire mesh is bonded to the lower ends of the cans 53 and to the concrete 55 and on this stucco 56 of an above-described type is troweled.

16. The completed lower part of the hull is turned over, the next higher tier of the sidewall rows 28 to 31 is fastened on top of the lowest tier of these rows, formed in step (1). This fastening preferably comprises placing epoxy between the two superposed, contiguous apertured strips (9 or 14 or 17) and bolts thru the two strips (for example, the bolts 56A of FIG. 2, which are placed with their heads and nuts in V-shaped spaces between cans).

17. The next higher tier of the rows 28 to 31 is fastened in place as in step (16); and the upper bumper rows of cans 57 are assembled and twist-wired and bonded to each other and to the bottom rows 34.

18. Strips of thick, tough, resilient rubber, 58, are stretched around and bonded with epoxy or silicone rubber cement to each of the sets of insulation-filled bumper and outrigger-float cans; and over each of these sets a horizontal strip or coating 59 of such rubber or of epoxy is similarly bonded, thus completing the buffer 60 and the outrigger floats.

19. The remainder of the sidewall can-rows 28 to 31 are successively twist-wired and bonded in place, up to the top of the vehicle.

20. The can rows 61 of the top 62 of the hull (reinforced by the strips (9, 14 or 17) are successively assembled in accordance with the method of step (2). But in this case the middle gap between oppositely bowed can rows is considerably different from that of step (2). At a central portion of the top this gap is transversely wide but relatively short in fore-and-aft direction, forming a hatchway, which may be sealably closed by the hatch 63. Forward and rearward of this hatch, adjacent ends of relatively short can rows are fastened (for example, by bolts and epoxy putty) to sidewalls or vertical flanges of the hatch. Then into the relatively quite narrow gaps between adjacent, short, centermost, oppositely bowed can rows (64 and 65), short, vertically extending tubular elements, 66 (small-diameter pieces of bamboo or plastic pipe of the water-conveying type), are placed and epoxy-bonded together.

21. Over the whole of the can-rows 61 and the filler tubular elements 66 and the top set of the can rows 28 to 31 a sheet of wire mesh is stretched and epoxy-bonded (and optionally sheet-metal-screwed) to the upper can ends and pieces 9 and 9' (or 14 or 17) of can-reinforcing strips. A similar sheet, 68, is similarly

fastened to under surfaces of the strips and cans of the can rows 61. And other similar sheets are screwed and epoxy-putty-bonded on the outside can-sidewall surfaces (at 69) and on the inside can-sidewall surfaces of the rows 28 to 31 (at 71).

22. Epoxy (or Portland) cement stucco of the above-described type is troweled, preferably in two coats, on the upper surfaces of the deck can-rows 32, and optionally topped with glued-in-place decking 72 of tough rubber, other plastic or plywood.

23. Epoxy (or Portland) cement stucco of the above-described type is troweled in two or more coats on the sheets of mesh that were applied in step (21). And optionally, sheets of tough, resilient rubber or other plastic may be strongly glued to the mesh on the outside can-sidewall surfaces at 69 and on the top 62.

24. Balloon means (exemplified in FIG. 7 as comprising three rows of large balloons, 73 and 74 and two rows of smaller, space-filling balloons, 75), containing helium, is placed in the top part of the cabin and optionally glued with epoxy or silicone-rubber cement to the under surface of the top 62. As indicated in FIG. 6, the central balloon row has a gap between balloon ends 74A and 74B, providing for cabin access thru the hatchway and via an adjacent ladder. These balloons 73, 74 and 75 have tire-valve-type gas inlets, for adding helium to replace any that is lost thru the thin balloon walls. Optionally, and as illustrated in FIG. 8, two rows of large balloons, 76 and 77, and filler balloons 78 may be utilized instead of the smaller balloons 73 to 75.

35. Windows, ports and the engine exhaust pipe 79 (FIG. 7) are epoxy-fastened in wall holes (openings left in wall construction that are similar to the gap for the hatch 63 — or, alternatively, holes now drilled and cut thru the walls).

26. A plurality of ladders, 80, for passage between the decks 47 and 72 and entrance into or exit from the boat via the hatchway, are fastened to the lining 33, the can rows 43 and 44 and the deck 72.

27. The motive means (exemplified as comprising the engine 81, fuel tanks 82, fuel pipe 83P, propeller 83, and steering wheel 84, steering connection and rudder 84R) is installed, thus completing the boat.

The form of the vehicle illustrated in FIGS. 8 to 10 is made in the general manner described in the above steps (1) to (27). But there are some differences in these two vehicular types. In the form of FIG. 8, the curved-axis rows 85, 86 and 87, comprising parallel-axes cans within curved, reinforcing, apertured strips similar to 9, 9', 14 or 17, extend transversely of the vehicle, instead of longitudinally as in FIGS. 6 and 7. Each upper end of the upright rows 86 and 87 is joined to the contiguous end of a row 85 in an overlapped-mesh (or overlapped-pipe-strap) corner, 88, (or 89) of the type shown in FIG. 3; and adjacent pairs of ends of the rows 85 and 87 are similarly joined at corners 89. The deck optionally may comprise can-rows that are similar to 32 (except that the parallel can-axes of each row of the cans and the flanges 10 are arranged along straight lines, instead of curved lines as in FIGS. 1 and 6); but as illustrated, the deck has hollow elements 90 with fore-and-aft axes. These elements optionally may be tubes (preferably having corrugated walls) that extend from the front-end wall to the rear-end wall. But preferably each of the elements 90 comprises a row of cans, each adjacent pair of which are different diameters and are end-joined by epoxy putty or other bond-

ing material, providing much bamboo-like strength per unit of weight at the bonded joints between can ends. Foam plastic in its mixed liquid state may be inserted around and between these cans and their upper and lower deck skins thru an aperture or apertures in 72.

FIG. 9 may be considered as a sectional view (from the fore-and-aft plane 9—9 of FIG. 8) of either the front-end or the rear-end body wall. Each of these walls is curved outward from the central part of the boat, as in FIG. 6, and as in FIG. 6 optionally may comprise parallel-axes cans. But as exemplified in FIGS. 8 and 9, each of the end-wall can-rows comprises cans 91 and 92 of different diameters, with end caps of the smaller cans 92 partly within end caps of the larger cans 91 and strongly bonded to 84 with epoxy putty, solder or the like, 49. Each end can (91') of these rows is fastened to an adjacent end can (86') of a sidewall row (86 or 87) by a piece of pipe strap 93, which is looped around the can 91', twisted at 94, both above and below the can 86', and screwed and epoxy-bonded to upper and lower portions of the can-wall of 86'. Optionally and preferably, an extra-strong junction between the two rows of cans is made by cutting a hole at 95 in the end cap of 86', depressing a cut portion of it, and strongly bonding part of the end of 91' within the recess thus formed (this bonding being done before fastening the tie element 93 in place). Preferably, the cans 91 and 92 are of equal lengths.

The bottom part of the vehicle of FIG. 8 is somewhat similar to that of FIG. 7. Although, as exemplified in FIG. 8, the two outrigger floats and buffers may be eliminated in the form of either FIG. 7 or FIG. 8, preferably the boat of both of these figures is relatively wider in beam than it is here illustrated and has the buffer means and outrigger floats, these floats aiding the balloons in stabilizing the boat against rolling and pitching motions.

Various changes may be made within the scope of the following claims. For instance, all of the cans may be imbedded in foam plastic, poured or injected in its mixed-liquid state thru holes in a hull skin, into spaces between the cans and the skins. Or a V-shaped mass or strip of insulation (96-FIG. 1) for example, of foam plastic or plastic and fiberglass may be glued, adhesive-taped or otherwise fastened in the outer groove between each pair of the parallel-axes cans.

In the claims, unless otherwise qualified: the word "boat" refers to a water-surface vehicle or an aircraft adapted to takeoff or land on water; the term "tubular member" means a single, elongated tube or pipe of any cross-sectional shape or a fastened-together row of cans of any cross-sectional shape; the word "can" signifies a tube of any cross-sectional shape, having end closure elements; "rod-like element" means a screw, rivet or bolt; "bonding material": epoxy putty or other glue, solder, welding or brazing material; and "gaseous material": any pure gas, mixture of gases, or gas-containing insulation or plastic (for example, gas-cell-containing foam plastic), under atmospheric or above-atmospheric pressure.

I claim:

1. A vehicle, adapted to traverse water, comprising:

body structure including: body-sidewall can-rows, comprising cans having sidewalls and having substantially parallel longitudinal can axes extending transversely to the length of the row; means fasten-

ing the cans of each row together, said means including at least one elongated strip of mesh, having a flange on each side of said can row and flanking the sidewalls of said cans, said flanges extending toward a central cross-sectional plane of the cans, and means fastening said strip to the cans; means fastening the said rows together in sidewall framework on each side of the vehicle; forward and rearward end-wall frameworks, comprising tubular members; means fastening said end-wall tubular members to said sidewall rows; top framework, comprising tubular members; means fastening said top framework to upper portions of said sidewall rows; deck framework, comprising tubular members; means fastening said deck framework to portions of said sidewall rows; skin means, sheathing the said sidewall rows and frameworks; and gaseous material within each of said cans and tubular members; and

an elongated float below said body structure, comprising: float-wall framework having tubular members arranged in side-by-side relation; and waterproof skin means on said float-wall framework.

2. A vehicle as set forth in claim 1, in which said frameworks comprise a plurality of four-part can-row structures, each of which includes: four end-joined rows of said parallel-axes cans; a pair of apertured strips of row-strength-providing material on opposite can-ends of each row, bonding material between said strips and can-ends; and means fastening together each adjacent pair of row ends in a strength-providing corner of the vehicle, comprising extended end portions of a said pair of the apertured strips which jut beyond cans to which the strips are fastened and straddle a row-end can and its associated, overlapped end portions of an adjacent pair of apertured strips, and further comprising a screw, passing thru apertures of each of said extended end portions and said associated end portions and into said end can, at each and-end side of said four-part structure.

3. A vehicle as set forth in claim 2, in which said rows of parallel-axes cans and associated apertured strips are outwardly curved, in a direction from the interior of the vehicle.

4. A vehicle as set forth in claim 1, in which: each of said tubular members of said deck framework is a row of parallel-axes cans; and the deck of said vehicle further comprises a layer of solid material on said framework.

5. A vehicle as set forth in claim 1, in which: each of said tubular members of said top framework is a row of parallel-axes cans; and a portion of said skin means is fixed to can ends of said top rows.

6. A vehicle as set forth in claim 1, in which: each of said tubular members of said deck framework is a can-row, comprising parallel-axes cans having parallel axes extending across the length of said row and a pair of said apertured strips fastened to each can-end of said last-named can-row; and the deck further comprises a layer of solid material on said deck framework.

7. A vehicle as set forth in claim 1, further comprising: a hatch mounted at an opening in said skin means and top framework; and shock-absorbing means comprising rows of buffer cans, having in each of said last-named rows substantially parallel axes that extend across the length of the row, foam plastic in said buffer cans, means fastening said buffer cans together, and

skin means sheathing outer surfaces of said buffer cans.

8. A vehicle as set forth in claim 1, in which said can-rows comprise: cans of the used type, having holes in can ends; and closure means sealing the said holes.

9. A vehicle as set forth in claim 8, in which said closure means comprises adhesive tape.

10. A vehicle as set forth in claim 1, in which each tubular member of said forward and rearward end-wall frameworks comprises: a plurality of end-joined cans; and means fastening said end-joined cans together in an outwardly curved end-wall row, comprising bonding material between can ends.

11. A vehicle as set forth in claim 10, in which each adjacent pair of said end-joined cans are of different cross-sectional areas.

12. A vehicle as set forth in claim 1, in which said sidewall and end-wall frameworks comprise a plurality of four-part can-row structures, each of which includes: four end-joined rows of parallel-axes cans; at least one strip of mesh on can-ends of each row; bonding material between said strips and can-ends; and means fastening together each adjacent pair of row ends in a strength-providing corner portion of the vehicle, comprising: an end portion of one of said strips which is in contact with and fastened to an end of the adjacent, row-terminating can of its row; an end portion of the other of said strips at said corner portion which juts well beyond the adjacent, end can of its row and extends over said row-terminating can and overlaps said first-named strip-end portion; and means extending thru said last-named strip, fastening it to said first-named strip and to said row-terminating can.

13. A vehicle as set forth in claim 12, in which: said mesh comprises metal; each of said can-row structures further includes a second strip of metallic mesh, forming with said first-named strip an opposite pair of said strips, one of which is located on one can-end side of its associated row, and the other being located on the other can-end side of the row; each of said strips comprises a pair of integral, bent can-flanking flanges, terminating opposite a can at each of said corner portions; the said strip-end portions are in substantially planar condition, and closely overlie said row-terminating can; and said means fastening together each adjacent pair of row ends comprises a screw, passing thru apertures of the overlapped pair of said strip-end portions and into the said row-terminating can at each of said corner portions.

14. A vehicle as set forth in claim 1, in which: each of the said tubular members of said float comprises: a row of cans, having parallel axes that extend across the length of the row; at least one elongated strip of row-strength-providing material; and means fastening said strip to the said cans.

15. A vehicle as set forth in claim 14, further comprising lighter-than-air balloon means, connected to an upper part of said body structure, having a center of aerostatic lift approximately located in the vehicle's central plane, aiding in stabilizing the vehicle against rolling motion.

16. A vehicle as set forth in claim 14, further comprising outrigger floats, one at each side portion of the vehicle, each of said floats comprising tubular members and float-skin means.

17. A vehicle as set forth in claim 1, in which said mesh comprises metal, and each of said sidewall can-

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rows further includes: a second strip of metallic mesh, comprising flanges that flank can sidewalls and forming with said first-named strip a pair of such strips, one of which is located on one can-end side of said row, and the other being located on the other can-end side of the row; and bonding material between each of said strips and row-arranged cans.

18. A vehicle as set forth in claim 17, in which: each of said end-wall tubular members of each of said end-wall frameworks is a row of parallel-axes cans, at substantially the same level as a pair of said body-sidewall can-rows and has an opposite end-wall row of parallel-

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axes cans; each set of four can rows at substantially the same level being joined at four corners;

each of said corners comprising: extended end portions of a pair of the apertured strips which jut beyond the cans of a can-row, and overlap and hold between them a can and its can-end-engaging portions of apertured strips; and means fastening said extended portions to said can-end-engaging portions and to adjacent can ends.

19. A vehicle as set forth in claim 18, in which said mesh comprises metal.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,802,367 Dated March 26, 1974

Inventor(s) Alvin Edward Moore

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 50, "can" should read -- cans --. Column 5, line 3, "hours" should read -- rows --. Column 9, line 40, "and-end" should read -- can-end --. Column 11, line 12, "has" should read -- as --.

Signed and sealed this 15th day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents