

May 22, 1962

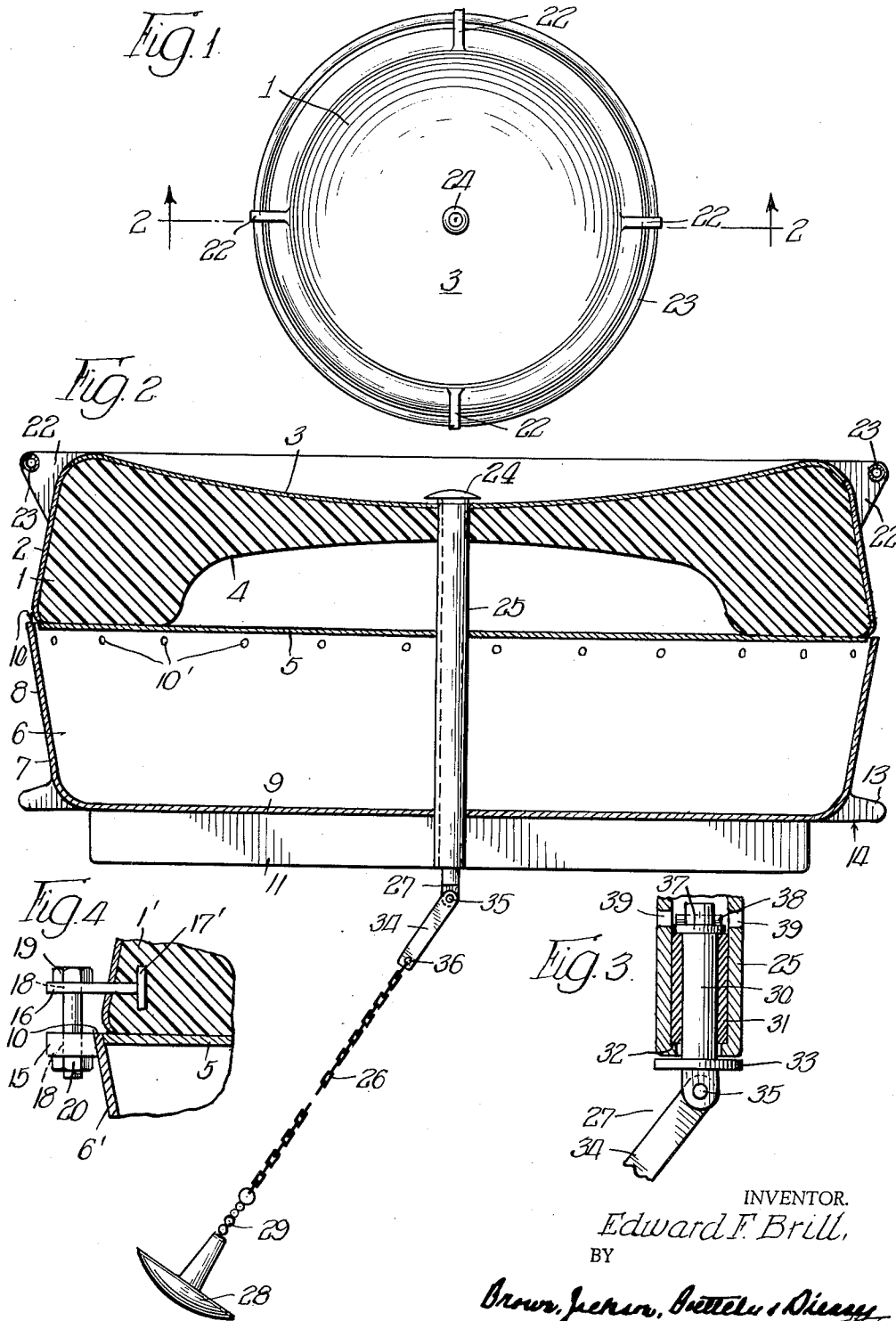
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3,035,286

BUOYANT STRUCTURES

Filed Aug. 4, 1958

3 Sheets-Sheet 1



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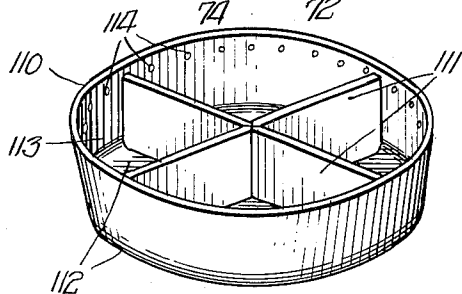
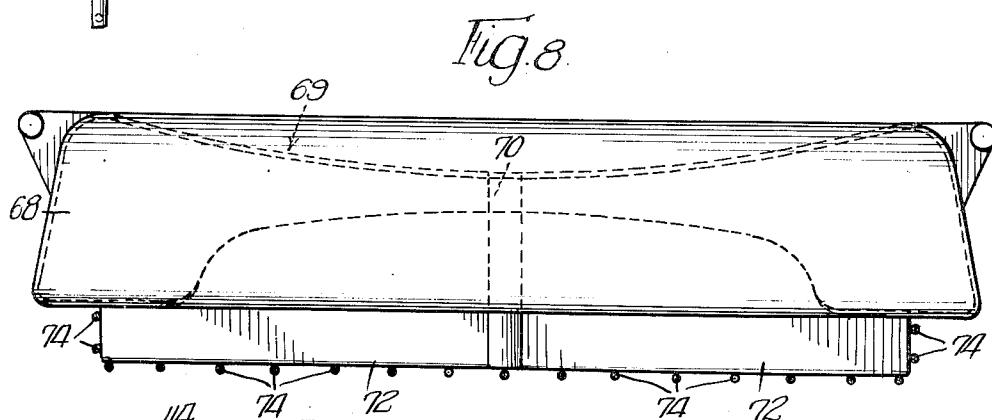
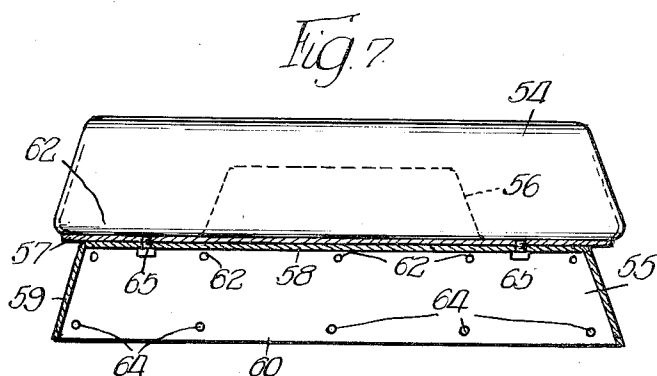
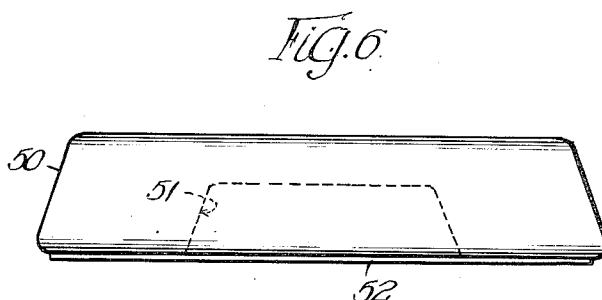
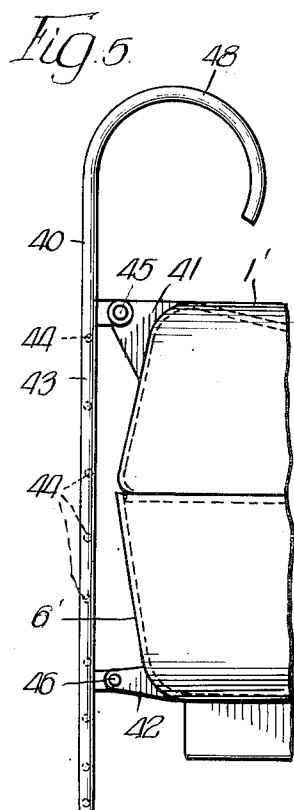
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BUOYANT STRUCTURES

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3 Sheets-Sheet 2



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BUOYANT STRUCTURES

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Fig. 9

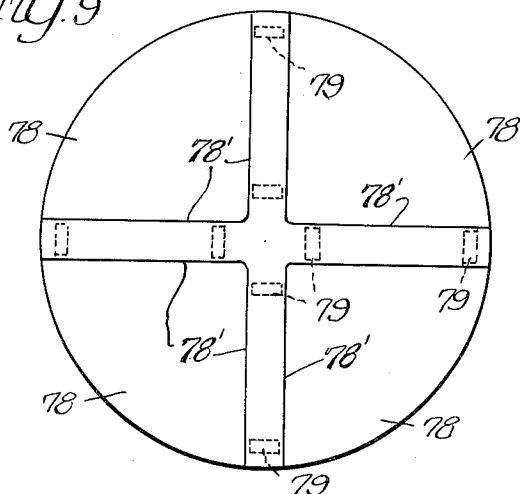


Fig. 10

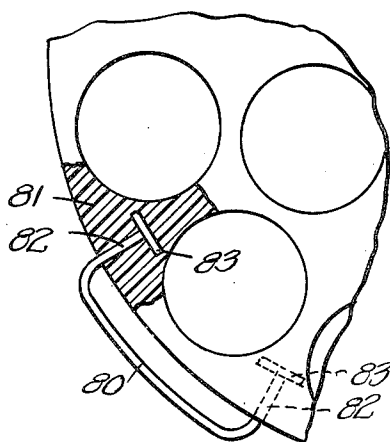


Fig. 12

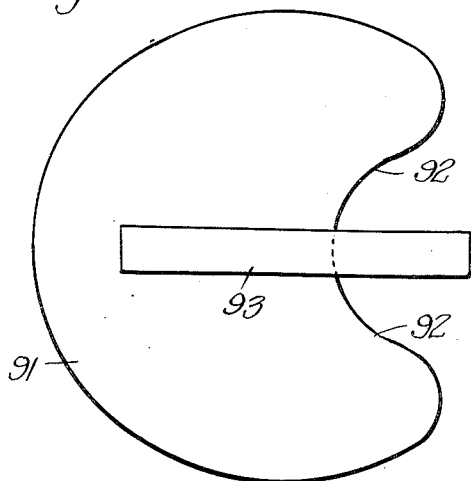


Fig. 11

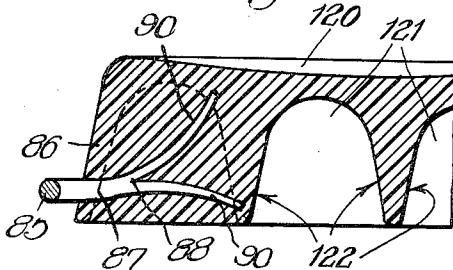
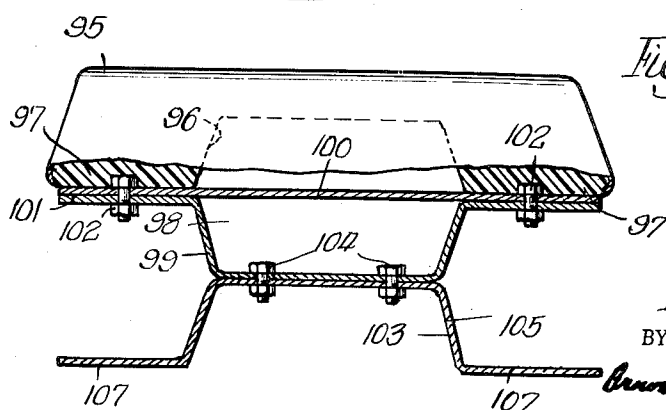


Fig. 13



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BUOYANT STRUCTURES

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5 Claims. (Cl. 9-11)

This invention relates to buoyant structures.

While the particular structures which I shall describe hereinafter in connection with the drawings are floats or rafts for use in water, it is to be understood that the invention is not limited to such use, but, may be employed for all similar purposes. For example, the present invention includes features that may be employed with the structures of my copending application, Serial No. 747,221, filed July 8, 1958.

One feature of the present invention resides in the provision of a buoyant part of low density material formed of particles that are expanded by heat to the desired shape and configuration and to knit the particles together into a low density material, and more particularly a buoyant structure of this character having a chamber in the bottom thereof for trapped or free air and a web or water containment cover which acts as a seal for said chamber and cemented or otherwise secured to the bottom of the buoyant part.

Another feature resides in the provision with such upper buoyant part of a rigid walled stabilizing chamber which is normally below water level in use and which has an opening or openings that permit complete filling of the chamber with water to stabilize the structure against generally horizontal and vertical movements and to provide distributed support of the upper buoyant part on the water over substantially the entire bottom area of the upper part, when the structure is positioned for use in water and permitting complete drainage of the water from the vessel when the structure is withdrawn from the water.

Another feature resides in the provision of a novel form of attachment of a metal or other insert, or member, to the buoyant part, and, more particularly, an attachment in which the insert or member (i.e. a handle, or a member for supporting a hand or bumper rail, or a ladder, or for joining a plurality of buoyant parts, or upper and lower parts of the structure together) is held securely and effectively in place in the low density buoyant material by compression loading of such material.

Another feature resides in the provision of a buoyant structure in which the lower stabilizing chamber has detachable connection with the upper buoyant part and is of form and size to permit one part to telescope or be positioned within the other part for compactness in shipment and handling.

Another feature resides in making the structure of round or generally circular form to permit it to be rolled, similar to a wheel, to and from the place of use; also to permit boats or other objects to glance off the sides of the structure upon contact therewith, although structures of kidney-shape or other forms are contemplated within the scope of the broader aspects of the present invention.

Another feature resides in the provision of anti-side slip dampening vanes or baffle plates on the bottom of the structure and more particularly anti-side slip or rotation preventing vanes or baffle plates in combination with the lower stabilizing chamber.

Another feature resides in the provision of guard or grill means for preventing children, or others, from getting caught under the anti-side slip or rotation preventing vanes or baffles, or otherwise from being injured thereby.

Another feature resides in the provision of anti-dip surfaces for preventing undue dipping of the float or raft when one or more persons stand at or near the edge thereof.

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Another feature resides in the provision of a float or raft which has a depressed top surface for preventing a person from unintentionally slipping into the water when standing on the edge of the structure, and, more particularly, a top surface which is depressed to a substantially centrally disposed drain opening for permitting water to drain down through the buoyant structure from the upper surface thereof.

Another feature resides in the provision of an anchor carried by a chain, or other flexible element, secured in the lower end of the drain tube.

Another feature resides in the provision of a float or raft of the character described having a phosphorescent or light reflecting material on the surface thereof so that it may be seen in the dark by boats or others, or from the shore.

Further features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings, it being understood that the invention is limited only within the scope of the appended claims and not to the particular embodiments selected for illustration.

In the drawings:

FIGURE 1 is a top plan view of a float or raft embodying the present invention;

FIGURE 2 is a vertical section taken on the line 2-2 of FIGURE 1;

FIGURE 3 is a fragmentary vertical section showing the manner in which the chain or flexible element which carries the anchor may be secured in the lower end of the drain tube;

FIGURE 4 is a fragmentary vertical section showing one suitable means for detachably securing the lower stabilizing chamber to the bottom of the upper buoyant part;

FIGURE 5 is a fragmentary view showing a ladder secured to the buoyant structure;

FIGURES 6, 7 and 8 are side views with FIGURE 7 partially in section showing other embodiments of the invention;

FIGURE 9 is a top plan view showing a further embodiment of the invention;

FIGURE 10 is a fragmentary sectional view showing the attachment with which an insert member is secured in place in the low density buoyant material by compression loading of such material;

FIGURE 11 is a fragmentary section showing another form of attachment for an insert member;

FIGURE 12 is a top plan view of another form of float or raft embodying the present invention;

FIGURE 13 is a vertical section partially in elevation showing another embodiment of the invention; and

FIGURE 14 is a perspective view on considerably reduced scale showing another form of stabilizing vessel embodying the present invention in which the one or more anti-side slip or rotation preventing vanes are disposed on the inside of such vessel.

Referring to the drawings, the float shown in FIGURES 1 to 3, inclusive, may be a float or raft adapted for supporting one or more persons on water. It comprises an upper buoyant part 1 of low density material formed of particles that are expanded by heat and molded to the shape of the part 1 to knit the particles together.

One suitable form of float or raft embodying the present invention is of generally round or circular form, as shown in FIGURE 1 and, for example, may be of a diameter of about 6½ feet. The round or circular form of the float permits it to be rolled, similar to a wheel, to and from the place of use; also to permit boats and other objects to glance off the sides of the structure upon contact therewith.

One suitable form of buoyant upper part 1 according to the present invention is formed by placing within a

mold (not shown) polystyrene beads that can be expanded to about 40 times their volume to fill the mold and further expanding and knitting the beads together by heat. The beads may, for example, be "Styrofoam" plastic beads as marketed by the Dow Chemical Company of Midland, Michigan.

It is contemplated within the scope of the broader aspects of the present invention to use other foam forming materials, for example, a urethane foam material, such as Selectrofoam 6004, a polyester resin, or Selectrofoam 6005, a prepolymer. These materials are marketed by Pittsburgh Plate Glass Company of Pittsburgh, Pennsylvania. Such materials will bond, for example, directly to a Fiberglas shell without additional adhesive.

After the beads are placed in the mold, the formation of the part 1 may be accomplished, for example, by injecting steam through apertures in the mold further to expand and knit the plastic beads together and into the form of the part 1. Heat may be otherwise applied, as, for example, by immersing a closed mold containing the plastic beads in a hot fluid, such as steam, water or other suitable fluid, to heat the material sufficiently further to expand and knit the beads together to the desired form. The expanded plastic material is then cooled to obtain the buoyant part 1 shaped as desired.

A phosphorescent coating 2, or strips, or pieces, such as tape or the like, with surfaces of phosphorescent material may be molded to the outer periphery of the part 1, or otherwise applied thereto as suitable or desired. In this way the float may be seen in the dark, as, for example, by persons on boats or other craft, or from the shore.

The buoyant part 1 may be of natural color, or otherwise colored as desired. The upper surface 3 may, if desired, have a resinous or plastic coating, as shown, which may be painted or otherwise applied thereto, or the upper surface may have a coating or outer shell of resin material reinforced with fibrous glass, such, for example, as "Fiberglas" marketed by Owens-Corning Fiberglas Corporation of New York, New York. The feature of an outer shell of "Fiberglas" is more fully shown and described in my copending application, Serial No. 747,221, filed July 8, 1958.

The buoyant part 1 has at least one chamber 4 molded in the bottom thereof for trapped or free air. A water containment cover 5 formed, for example, of polystyrene plastic material, may be applied over the bottom of the part 1 and secured thereto, for example, by a suitable adhesive. The cover 5 acts as a seal for the chamber 4. An adhesive, such as EC-524, EC-880, EC-24, EC-260 or epoxide adhesive Bondmaster M664, mentioned by the aforementioned Dow Chemical Company in its literature; also by Minneapolis Mining and Mfg. Co. in its literature is suitable for securing the cover to the part 1.

A lower rigid walled vessel or shell 7 forming a stabilizing chamber 6 is secured to the bottom of the upper buoyant part 1. The vessel 6 is open at the top and has side and bottom walls 8 and 9. It may be formed of Fiberglas, or it may be formed of metal, such as aluminum, or of stainless steel, brass, bronze or other suitable metal which will not rust or corrode.

The stabilizing chamber 7 has one or more permanently open spaces or openings at the top thereof, for example, as shown at 10, with or without additional ports 10' along the upper portions of the side walls, to permit complete filling of the chamber 7 with water to stabilize the float against generally horizontal and vertical movements and to provide distributed support of the upper buoyant part 1 on the water over substantially the entire bottom area of the upper part when the structure is positioned for use in water. The opening or openings at 10 also permit complete drainage of the water from the chamber 7 when the structure is withdrawn from the water.

With the opening or openings 10 and/or 10' at the top only of the vessel 6, tilting of the vessel may be required completely to fill the same with water and to drain the

water from the vessel. Permanently open restricted water inlet ports in the bottom 9 of the vessel with permanently open restricted air vent openings along the top of the side wall 8, as will be described in connection with FIGURE 7, and as shown and described in the copending application identified herein, are however, contemplated within the scope of the present invention.

The bottom of the vessel 6 has generally radially disposed anti-side slip and rotation preventing or dampening vanes 11 for preventing undue side slip or rotation of the float when in use in the water. Guard means, as will be described in connection with FIGURE 8, may be provided for preventing children and others from getting caught or injured by the vanes 11.

The side wall 8 of the vessel 6 near the bottom 9 thereof has a lateral projection 13 formed integral with the wall 8 or secured thereto. The projection 13 may be of annular or intermittent form and presents anti-dip surfaces 14 for resisting dipping of the float in the water, for example, under the action of a person or persons on the top of the float or diving therefrom. The projection 13 also constitutes a bump guard for the float.

The stabilizing vessel 6 may be non-detachably secured to the bottom of the upper part 1 or it may be detachably secured to the upper part by connecting means, such, for example, as shown in FIGURE 4.

In FIGURE 4 the vessel 6' has a lug 15 integral therewith or suitably secured thereto and a metal or other member 16 is secured in or attached to the upper part 1. The member 16 has its inner end embedded in the low density material forming the part 1'. For the purpose of securing and effectively holding the member 16 in the part 1, this member 16 has one or more portions 17 which project laterally in the low density material 1', whereby the member 16 is held in place, particularly against outward forces, by compression loading of the low density material. This feature may be employed for holding inserts or members for other purposes securely and effectively in the low density material forming the upper float part 1.

The projecting portions of the lug 15 and member 16 have, for example, openings 18 which register when the upper and lower parts of the float are assembled. Bolts 19 are inserted with their shanks extending through the registering openings 18 and nuts 20 are screwed on the ends of the bolts and detachably connect the upper and lower parts 1 and 6 together.

The lower stabilizing vessel 6 may be of a form and size to permit the upper buoyant part 1 to telescope or be positioned within the lower part 6 when the parts are separated. This provides for compactness in shipment and handling.

Metal or other inserts or members 22 may be secured to the upper buoyant part 1, for example, by attachment, as shown and described in connection with FIGURE 4. These members 22 are disposed at or near the top of the float and project outwardly from the periphery of the part 1. A hand or bumper rail 23 is carried by the members 22. The rail 23 is shown of continuous annular form in FIGURE 1, but it is to be understood that the hand or bumper rail 23 may be of intermittent form.

The top surface 3 of the upper buoyant part 1 is preferably depressed generally centrally to a drain opening 24 formed by the upper end of an upright drain tube 25. The tube 25 extends downwardly through the buoyant part 1, stabilizing chamber 6 and inner ends of the vanes 11 and is suitably secured to the respective parts of the float structure. The depressed character of the top surface 3 prevents a person from unintentionally slipping into the water when standing at the edge of the top surface of the float and the water drains from the top surface to the opening 24 and through the buoyant part by way of the tube 25.

A chain or other flexible element 26 is attached at one

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end at 27 to the lower end of the tube 25. An anchor 28 is attached to the outer end of the chain 26.

As shown in detail in FIGURE 3, the attachment 27 of the chain 26 to the tube 25 comprises, for example, a short stud or post 30 disposed within a sleeve or bushing 31, which may be formed of suitable yielding material and is positioned within the lower end of the tube 25 and held against downward displacement by an in-turned flange 32 at the lower end of the tube 25. Below the lower end of the tube 25 the stud 30 has a radial flange 33 and a link 34 is pivoted at 35 to the stud 30 below the flange 33. The opposite end of the link 34 is pivoted at 36 to the adjacent end of the chain 26. The anchor 28 is attached at 29 to the other end of the chain.

A washer 37 fits over the reduced upper end of the stud 30 and against the upper end of the sleeve or bushing 31. A pin 38 inserted through a diametrical opening in the reduced upper end of the stud 30 retains the stud against downward displacement from the sleeve or bushing 31. Aligned openings 39 in the tube 25 permit insertion and removal of the pin 38 and the water which drains downwardly through the tube 25 discharges outwardly through these openings.

As shown more or less schematically and fragmentarily in FIGURE 5, a ladder 40 may be secured to inserts or members 41 and 42 secured or fastened to the upper buoyant part 1' and lower stabilizing chamber 6'. The inserts 41 may be attached to the low density material forming the upper part 1' similar to the manner in which the previously described inserts 22 are attached to the part 1.

The ladder has upright members 43 and rungs 44 enabling a person to hold onto or climb upon the float or raft. The upright members 43 are fastened to the members 41 and 42 at 45 and 46 respectively. The upper ends of the upright side members 43 are arched to arcuate form at 48.

In FIGURE 6 the float comprises a buoyant part 50 similar to the buoyant part 1 of FIGURES 1 and 2 with at least one chamber 51 molded in the bottom thereof for trapped or free air. A water containment cover 52 is applied over the bottom of the part 50 and secured thereto. The cover 52 acts as a seal for the chamber 51.

In FIGURE 7 the float comprises an upper buoyant part 54 and a lower stabilizing chamber or vessel 55 secured to the bottom thereof. The buoyant part 54 is similar to the buoyant part 1 of FIGURES 1 and 2 with at least one chamber 56 molded in the bottom thereof for trapped or free air. A water containment cover 57 is applied over the bottom of the part 54 and secured thereto. The cover 57 acts as a seal for the chamber 56.

The lower stabilizing chamber or vessel 55 of FIGURE 7 is closed at the top by a top wall 58 and has a depending side wall 59 and is open at the bottom at 60. The side wall 59 along the top thereof has a plurality of permanently open and relatively restricted air vent openings 62 to permit complete filling of the chamber 55 with water when the float is placed therein. Thus, as in the other embodiments of the invention the float is stabilized against movement and distributed support of the upper buoyant part on the water over substantially the entire bottom area of the upper part is provided.

In FIGURE 8 the float comprises a buoyant part 68 similar to the buoyant part 1 of FIGURES 1 and 2 and having a top surface 69 depressed generally centrally with a drain opening 70 for permitting water to drain down through the buoyant part 68. In this case the stabilizing chamber is omitted and the generally radial anti-side slip vanes 72 are applied directly to the bottom of the buoyant part 68. Guard wires, or other guard means, grill or the like, as exemplified at 74, cover the lower and outer end edges of the vane 72 for preventing children and others from getting caught or injured by the vanes.

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In the embodiment of the invention shown in FIGURE 9 the float is of generally circular form and comprises four or a plurality of sector-shaped sections 78 secured together along adjacent planar surfaces 78' by suitable fasteners or connecting members shown more or less schematically at 79. Each section 78 may comprise a buoyant part similar to the buoyant parts heretofore described.

FIGURE 10 shows the attachment with which a different form of metal or other insert 80 is secured in place in the low density buoyant material of the character previously described and which forms the buoyant part 81. In this case the insert 80 is of generally U-shaped form having the bight of the U projecting from the periphery of the part 81 to form a handle or a rung of a ladder, or the like. The legs 82 of the insert 80 are molded into the body 81 and have laterally projecting portions 83, whereby, the insert 80 is held securely and effectively in place, particularly against outward forces, by compression loading of the low density material.

The metal insert 85 shown partially in section in FIGURE 11, is similarly inserted or embedded in the buoyant thermoplastic part 86 of low density material and generally circular form. The buoyant part 86 has an upwardly exposed surface 120 for supporting persons thereon. The buoyant part 86 also has in the body of low density material a plurality of downwardly opening and upwardly closed chambers 121 of substantial depth sufficient for trapping air therein upon placement of the float in water. The sides of the chambers 121 are defined by side surfaces 122 disposed to oppose by coaction with the water rotation of the generally circular buoyant part and movement of this part in all lateral directions.

In FIGURE 12 the float comprises a buoyant part 91 as previously described, but of generally kidney shape. Diving areas are indicated at 92 and a diving board 93 is attached to the float. This makes for even greater stability.

In FIGURE 13 the float comprises a buoyant part 95 similar to the buoyant part 1 of FIGURES 1 and 2 having at least one chamber 96 molded in the bottom thereof for trapped or free air. A water containment cover 97 is applied over the bottom of the part 95 and secured thereto. The cover 97 acts as a seal for the chamber 96.

Beneath the buoyant part 95 is a trough-shaped vessel 98 having side walls 99 and open to the water at opposite ends at 100. The upper margins of the side walls 99 have outwardly extending flanges 101 secured, preferably detachably, at 102 to the cover 97. A second trough-shaped vessel 103, inverted with respect to the vessel 98, is secured to the vessel 98, preferably detachably, at 104. The vessel 103 has side walls 105 and is open to the water at opposite ends at 106. The lower margins of the side walls 105 have outwardly extending flanges 107 which present additional anti-dip surfaces.

The structure shown in FIGURE 13 will move easily through the water in the direction of the openings 100 and 106 and has stability against movement in a sidewise direction. This structure may have a motor on it, or oar locks for oars, for propelling the structure through the water, or may be towed through the water. When the parts are disconnected the vessel 98 may be nested in the vessel 103 and the vessel 103 may be nested in the part 95 for compactness in handling and shipment.

The center drain hole or opening shown, for example, in FIGURE 2, may be used to mount a ladder, for example, by providing the ladder with a rail extension that may be removably inserted in such hole and may turn therein to enable turning the ladder to any desired position about the float.

In FIGURE 14 the vessel or shell 110 constitutes the stabilizing vessel, similar to vessel 6 of FIGURE 2, or the other stabilizing vessels shown and described, or within the scope of the present invention. In this case the anti-side slip and rotation or spinning preventing vanes

111 are shown as four in number and generally radially disposed, although one or more such vanes disposed otherwise as desired may be employed. The one or more anti-side slip and rotation or spinning preventing vanes 111 are disposed inside the vessel 110, which is closed at the bottom by a bottom wall 112 and has a side wall 113. The ports 114 along the upper portion of the side wall 113 correspond, in general, with the ports 19' shown in FIGURE 2.

Disposition of the one or more vanes 111 within the vessel 110 prevents children or others from getting caught or injured by the vanes and eliminates any requirement for other guard means such as shown in FIGURE 8. The vanes 111 may extend all or less than the full height of the interior of the vessel 110 and the upright drain tube may be omitted as shown.

In any case there may be one or more stabilizing chambers beneath the upper buoyant part, instead of a single stabilizing chamber, as shown, for example, in FIGURE 2.

The embodiments of the invention shown in the drawings are for illustrative purposes only and it is to be expressly understood that said drawings and the accompanying specification are not to be construed as a definition of the limits or scope of the invention, reference being had to the appended claims for that purpose.

I claim:

1. A float comprising an upper buoyant part of low density material formed of particles that are expanded by heat to the shape of such part and to knit the particles together, a lower rigid walled stabilizing chamber secured to the bottom of said upper buoyant part, said stabilizing chamber being disposed normally below water level in use and open to permit complete filling of the chamber with water to stabilize the float against movement and to provide distributed support of the upper buoyant part on the water over substantially the entire bottom area of the upper part when the float is positioned for use in water, anti-side slip and rotation preventing dampening vanes on the bottom of said stabilizing chamber, guard means for preventing persons from getting caught or injured by said vanes, a lateral projection presenting at least one anti-dip surface on said stabilizing chamber and constituting an underwater bump guard, the top surface of the upper buoyant part being depressed generally centrally to a drain opening for permitting water to drain down through the buoyant part from the upper side thereof, said drain opening being formed by an upright tube, a flexible element secured at one end to the lower end of said tube, an anchor carried on the other end of said flexible element, and a hand and bumper rail secured to said upper buoyant part and positioned outwardly of the upper portion of said part, said upper buoyant part having a phosphorescent or light reflecting material on the surface thereof so that the float may be seen by others and from the shore.

2. A float comprising an upper buoyant part of low density material formed of particles that are expanded by heat to the shape and size of such part and to knit the particles together, the top surface of said upper buoyant part being depressed generally centrally to a drain opening for permitting water to drain downwardly therethrough, and anti-side slip and rotation preventing vanes secured to said float beneath the bottom of said buoyant part.

3. A float comprising an upper buoyant thermoplastic part, said buoyant part having an upwardly exposed surface for supporting persons thereon, and a lower rigid walled stabilizing chamber secured to the bottom of said upper buoyant part, said stabilizing chamber being disposed normally below water level in use and open to permit complete filling of the chamber with water to stabilize the float against movement and to provide dis-

tributed support of the upper buoyant part on the water over substantially the entire bottom area of the upper part when the float is positioned for use in water, the upwardly exposed surface of said upper buoyant part being depressed generally centrally to a drain opening for permitting water to drain down through the upper buoyant part from the upper surface thereof, the depressed character of the upper surface of said buoyant part preventing a person from unintentionally slipping into the water when standing at the edge of said surface.

4. A float comprising an upper buoyant thermoplastic part, said buoyant part having an upwardly exposed surface for supporting persons thereon, a lower rigid walled stabilizing chamber secured to the bottom of said upper buoyant part, said stabilizing chamber being disposed normally below water level in use and open to permit complete filling of the chamber with water to stabilize the float against movement and to provide distributed support of the upper buoyant part on the water over substantially the entire bottom area of the upper part when the float is positioned for use in water, the upwardly exposed surface of said upper buoyant part being depressed generally centrally to a drain opening for permitting water to drain down through the upper buoyant part from the upper surface thereof, the depressed character of the upper surface of said buoyant part preventing a person from unintentionally slipping into the water when standing at the edge of said surface, said drain opening being formed by an upright tube, a flexible element secured at one end to the lower end of said tube, and an anchor at the other end of said flexible element.

5. A float comprising an upper buoyant thermoplastic part, said buoyant part having an upwardly exposed surface for supporting persons thereon, a lower rigid walled stabilizing chamber secured to the bottom of said upper buoyant part, said stabilizing chamber being disposed normally below water level in use and open to permit complete filling of the chamber with water to stabilize the float against movement and to provide distributed support of the upper buoyant part on the water over substantially the entire bottom area of the upper part when the float is positioned for use in water, the upwardly exposed surface of said upper buoyant part being depressed generally centrally to a drain opening for permitting water to drain down through the upper buoyant part from the upper surface thereof, the depressed character of the upper surface of said buoyant part preventing a person from unintentionally slipping into the water when standing at the edge of said surface, and a ladder having attachment to said stabilizing chamber and to said upper buoyant part.

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