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2,514,409

PONTOON FLOTATION APPARATUS

Filed March 28, 1945

2 Sheets-Sheet 1

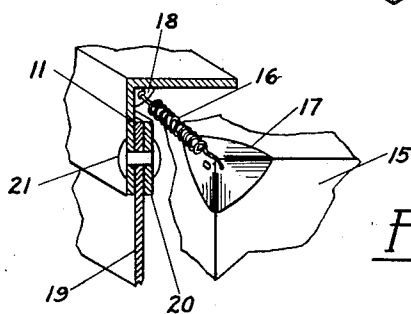
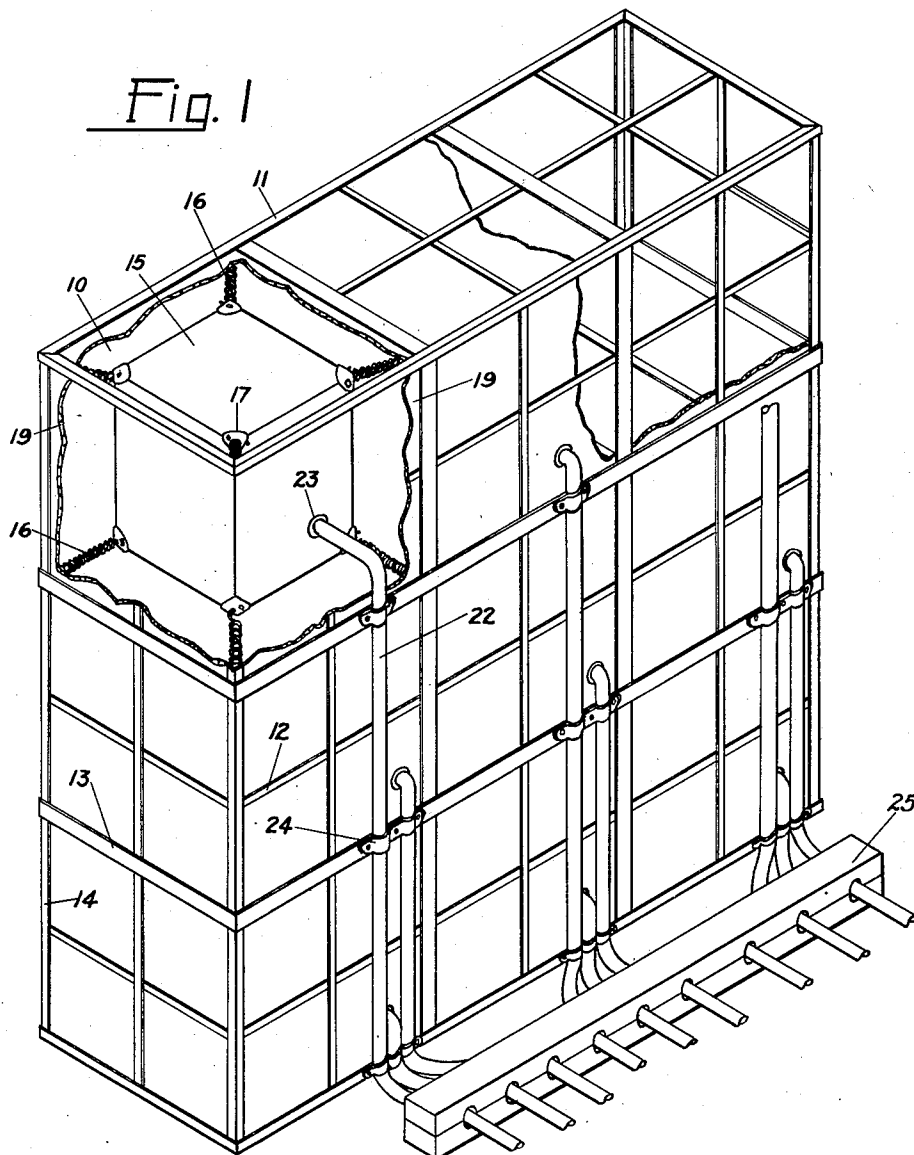


Fig. 2

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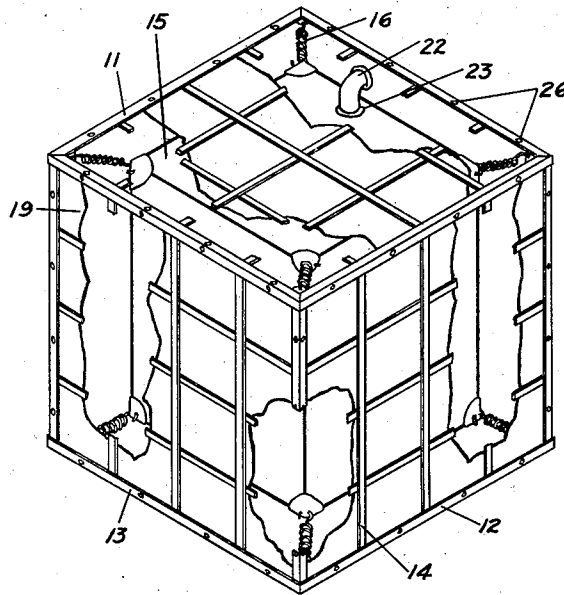


Fig. 3

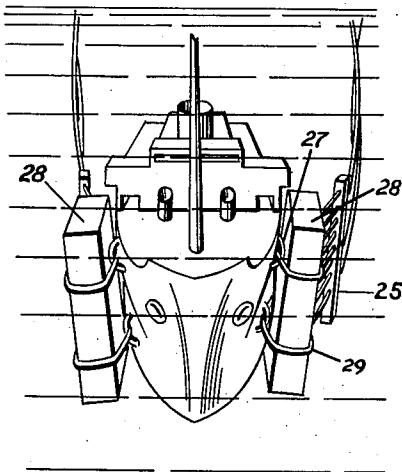


Fig. 4

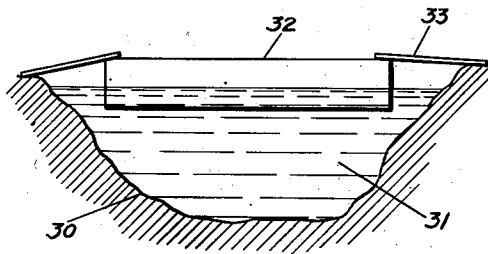


Fig. 5

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UNITED STATES PATENT OFFICE

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PONTOON FLOTATION APPARATUS

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This invention relates to pontoon flotation apparatus suitable for raising sunken objects such as ships and further suitable for constructing pontoon bridges or other devices designed to float upon the surface of the water.

Naval construction battalions, army engineer corps, and marine salvage organizations have a need for pontoon flotation apparatus that is rigid, strong, light and formed of multiple cells and that can be individually filled with gas, such as air, or emptied. Strength and rigidity are essential to withstand the severe stresses encountered in both military and civilian operations as well as to provide the desired shape to the apparatus. Because of the need for rapidly and frequently being transported from place to place it is essential that a minimum of weight and bulk be embodied and that the apparatus be adapted for complete disassembly. Multiple cells are necessary to insure that a leak occurring in any cell causes only local failure and will not result in complete failure as would be the case with a single cell. A further advantage in multiple cells is that by proper selection of the individual cells that are filled with air and those that are emptied it is possible to orient the apparatus relative to other objects when floating or submerged in the water.

An object of the invention therefore is to provide pontoon flotation apparatus having an open framework of steel members that give a maximum of strength and rigidity and a minimum of weight and bulk and the desired shape to the construction.

It is also an object to provide an apparatus having multiple cells that can be individually filled or emptied of air.

A further object is to provide a novel cell construction for pontoon flotation apparatus having an internal bladder of rubber or similar expansible material that can be inflated to fill the cell or collapsed to occupy only a part of the space within the cell together with a spring or other resilient suspension means for supporting the bladder within the cell whereby the bladder is protected from shock or injury caused by jarring of the cell frame and whereby proper orientation of the bladder within the cell is insured regardless of whether the bladder is in collapsed or inflated condition.

A further object is to provide a lining of net-like material inside the cell walls to form an envelope into which the bladder expands when inflated, such lining protecting the bladder from abrasion against the cell walls and from injury

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by agencies exterior to the cell, strengthening the bladder when inflated, and serving as the cell wall in the interstices within the lattice work of the frame and thus eliminating the need for solid steel cell walls and thereby greatly reducing the weight and bulk of the apparatus.

In the accompanying drawings:

Fig. 1 illustrates a preferred form of this invention comprising a pontoon having, for example, nine individual cells and is partly broken away for clarity of illustration.

Fig. 2 is a detailed view illustrating the manner in which the net lining for each cell is attached to the metal framework and further illustrating the method by which the bladder is suspended within each cell.

Fig. 3 illustrates a form of the invention in which the pontoon comprises a single cell.

Fig. 4 illustrates the use of a pontoon embodying this invention in raising a sunken ship.

Fig. 5 illustrates the use of a pontoon embodying this invention in forming a floating bridge.

Fig. 1 shows a preferred form of pontoon as embodying a lattice framework 11 having horizontal strips 12, interconnecting end strips 13 and vertical strips 14. These strips are made of steel or other suitable material and formed from angles, flat strips or any desired cross sectional shapes. The framework defines multiple cells, for example, nine individual cells 10, each of which is generally cubic in shape, though other shapes may be used. The strips forming the framework are fastened together by bolts or any other securing means suitable for allowing rapid and complete disassembly for packing and shipment. The framework strips are spaced relatively widely apart to form a lattice having large interstices.

The lattice framework is thus rigid, strong, and of whatever shape is desired and because of the large interstices in the lattice it is light in weight and of minimum bulk when dismantled.

At the top left of Fig. 1 is a breakaway revealing the construction of a single cell 10 in the pontoon and at the top right of this view is a breakaway showing the lattice framework 11 of a single cell 10. Inside each cell is a bladder 15, which can be made of rubber or other material impervious to air and which is adapted upon inflation to fill the cell completely while only partly filling the cell when deflated. The shape of the bladder can be adapted to fit best the shape of the cell and with a cubic cell a bladder of cubic shape is suitable.

The bladder is resiliently supported within the

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cell by shock springs 16, each of which is attached at one end to the bladder and at the other end to a suitable point on the frame. Other resilient means can be used in place of the springs if desired. In using a cubic bladder and cell it is desirable to provide a shock spring at each corner of the bladder for attachment to the adjacent corner of the cell frame. In Fig. 2 is shown an enlargement of one shock spring mounting. An anchor pad 17 is provided at the corner of the bladder and one end of the spring is secured to it, the other end being secured to a bracket 18 at the corner of cell frame 11. These shock spring mounts protect the bladder against damage when pontoon frame 11 is subjected to severe jarring or shock. The spring mounts also insure proper positioning of the bladder, within the cell, regardless of whether it is inflated or collapsed.

A lining 19 is within each cell to cover the cell walls. This lining 19 is of net-like or woven fabrication and any suitable material can be used. In Fig. 2 is shown an enlargement of the manner in which the lining can be fastened to each cell wall 11. Along its edge the lining 19 can be clamped between frame 11 and clamping strip 20 and secured in place by suitable fasteners 21. Lining 19 forms a resilient envelope, into which bladder 15 expands when inflated, and serves to protect bladder 15 from abrasion against the metal strips of the frame 11 and from damage by external agencies. Lining 19 further serves as the cell wall in the large openings of the frame latticework 11, thus eliminating the need for a solid steel wall with consequent reduction in weight to a minimum, but without sacrificing strength and rigidity.

The combination of widely spaced frame members 11 in cell 10 and lining 19 within cell 10 produces several advantages not found in other constructions. It is the frame members 11 and lining 19 together that form the cell wall and this affords a construction that incorporates the rigidity, strength and shape-giving characteristics of a steel construction with the lightness in weight resulting from use of a net-like lining and elimination of need for solid steel walls. Further, there is a minimum of bulk when the pontoon is dismantled and packed for shipment because the steel strips of frame 11 can be compactly packed for shipment in contrast to the bulk of solid steel plates. These features make the pontoon ideal for use where a strong, rigid, light construction is desired and further make the pontoon ideal for work where frequent and rapid dismantling and shipment from place to place is required.

A hose 22 is connected with each cell by a fitting 23 whereby air or other suitable gas can be used to inflate or deflate bladder 15. Brackets 24 are for securing the hose to framework 11. Hoses from the various cells are secured together by manifold block 25.

In Fig. 3 is shown a modified form of my invention wherein the pontoon comprises a single cell 10 of construction similar to the cell 10 described in connection with Fig. 1. In this form of the invention, framework 11 is provided with fittings 26 that can be used for attaching the cell to other cells of similar construction whereby a composite pontoon of the desired size can be built up.

In Fig. 4 is shown the use of the invention in raising a sunken ship. Brackets 27 are welded or otherwise attached to the hull of the vessel

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to be raised. pontoons 28 embodying the present invention are then secured to the brackets by lashings 29 or other suitable means. When submerged in the water prior to raising the ship, bladders 15 in the pontoon are deflated to provide a minimum of displacement and buoyancy. To raise the vessel bladders 15 of the pontoon are inflated and the increased displacement and buoyancy float the ship.

Because the pontoon is formed of multiple cells 10 that can be individually inflated and deflated, a leak in any particular cell 10 results in localized failure only and results not in complete failure, as would be the case if only a single cell were used. The multiple cells have the further advantage that by controlling cells 10 individually when inflating and deflating it is possible to control the pontoon and its orientation in the water. For example, it is possible to lash the pontoon over the top of a relatively small sunken object and then in raising, by controlling cells 10 individually, to cause inversion of the pontoon and object so that when brought to the surface of the water the object is on top of the pontoon.

In Fig. 5 is shown a further use of the pontoon in forming a floating bridge. A depression in the earth is shown at 30 together with a body of water at 31. A pontoon embodying the present invention floats at 32 on the water and gangways 33 span the gap from pontoon to shore.

Various modifications and changes can be made in the above without departing from the spirit and scope of this invention as set forth in the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. Flotation apparatus having a frame formed from a lattice of relatively widely spaced metal strips and defining individual cells each provided with a lining of fabric material which serves as the cell wall in the relatively large interstices between the metal strips, a bladder within each cell adapted for inflation and deflation, means for inflating and deflating said bladder, and resilient means for retaining the bladder in proper position within each cell.

2. Flotation apparatus comprising a single cell formed from a lattice of relatively widely spaced metal strips, a lining of fabric material within the cell and serving as the cell wall in the relatively large interstices between the metal strips, an expandable bladder within the cell adapted to fill the cell when inflated and to only partially fill the cell when deflated, resilient means for attaching the bladder to the metal lattice, means for inflating and deflating the bladder, and fittings for securing the cell to other cells of similar construction whereby a composite apparatus of desired size and shape may be formed.

3. Flotation apparatus suitable for use in marine salvage and engineering operations having a frame of relatively widely spaced steel strips defining multiple cells of generally cubic shape, a rubber bladder of generally cubic shape within each cell adapted to fill the cell when inflated and to only partly fill the cell when deflated, a spring for attaching each corner of the bladder to the adjacent corner of the cell frame to retain the bladder in position within the cell regardless of whether inflated or deflated, a lining of net material within each cell adapted to form the

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cell wall in the relatively large interstices between the steel strips of the frame and adapted further to serve as a protective envelope into which the bladder expands when inflated, hose members leading into the bladders whereby inflation and deflation of the bladder may be expected, said apparatus being adapted for complete disassembly to facilitate packing and shipment.

4. Flotation apparatus comprising a substantially rigid frame, a bladder adapted to be inflated and collapsed within said frame, and resilient means for positioning said bladder in predetermined and substantially fixed position within said frame in inflated and collapsed condition.

5. Flotation apparatus comprising a rigid frame, an elastic bladder adapted to be inflated and collapsed within said rigid frame, and resilient means between said frame and said bladder for positioning said bladder in predetermined and substantially fixed position within said frame in inflated and collapsed conditions.

6. Flotation apparatus comprising a substantially rigid lattice frame defining a cell, a lining in said frame forming the cell wall in the lattice

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interstices, an elastic bladder adapted to be inflated and collapsed within the cell, and resilient means between said frame and bladder for positioning said bladder in predetermined position in the cell in inflated and collapsed condition.

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