March 10, 1970 R. S. DAUGHENBAUGH 3,500,408

EXPENDABLE SEA TARGET

Filed April 29, 1968 2 Sheets-Sheet 1

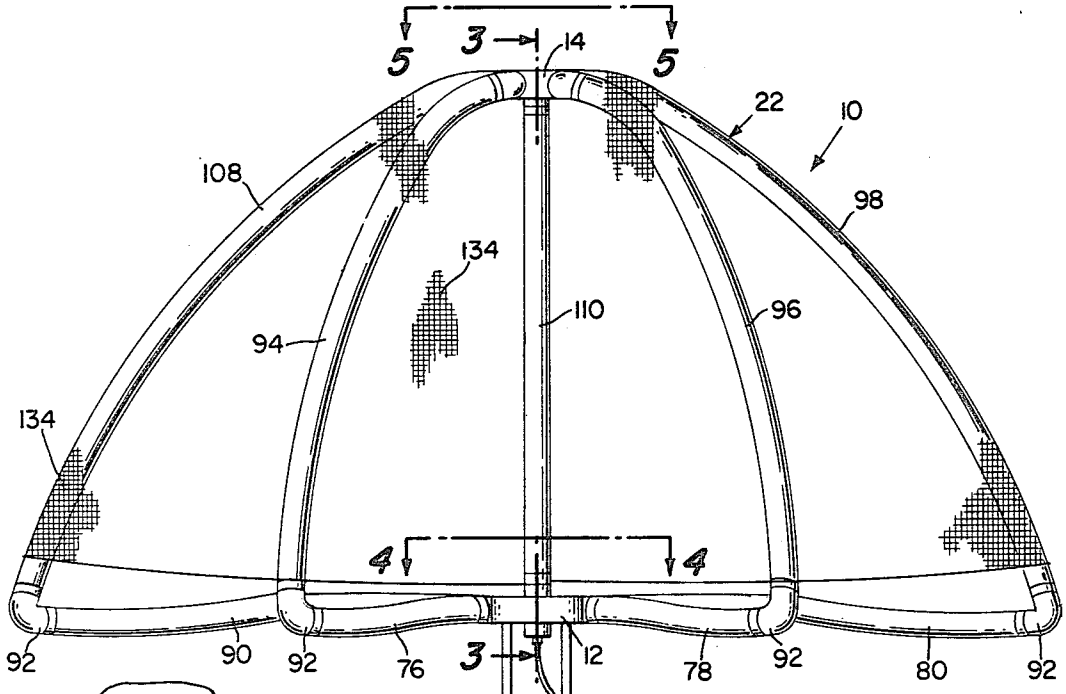


Fig. 2

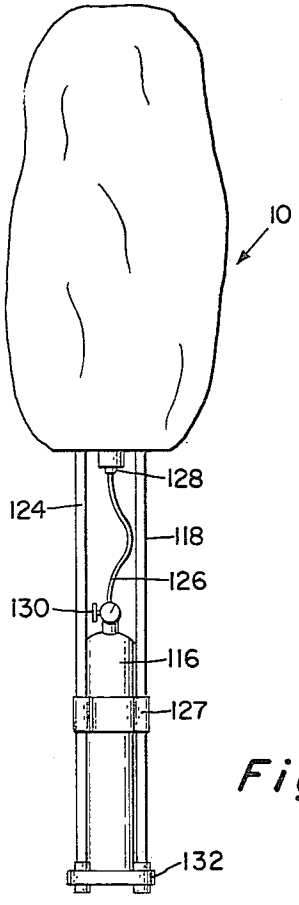


Fig. 1

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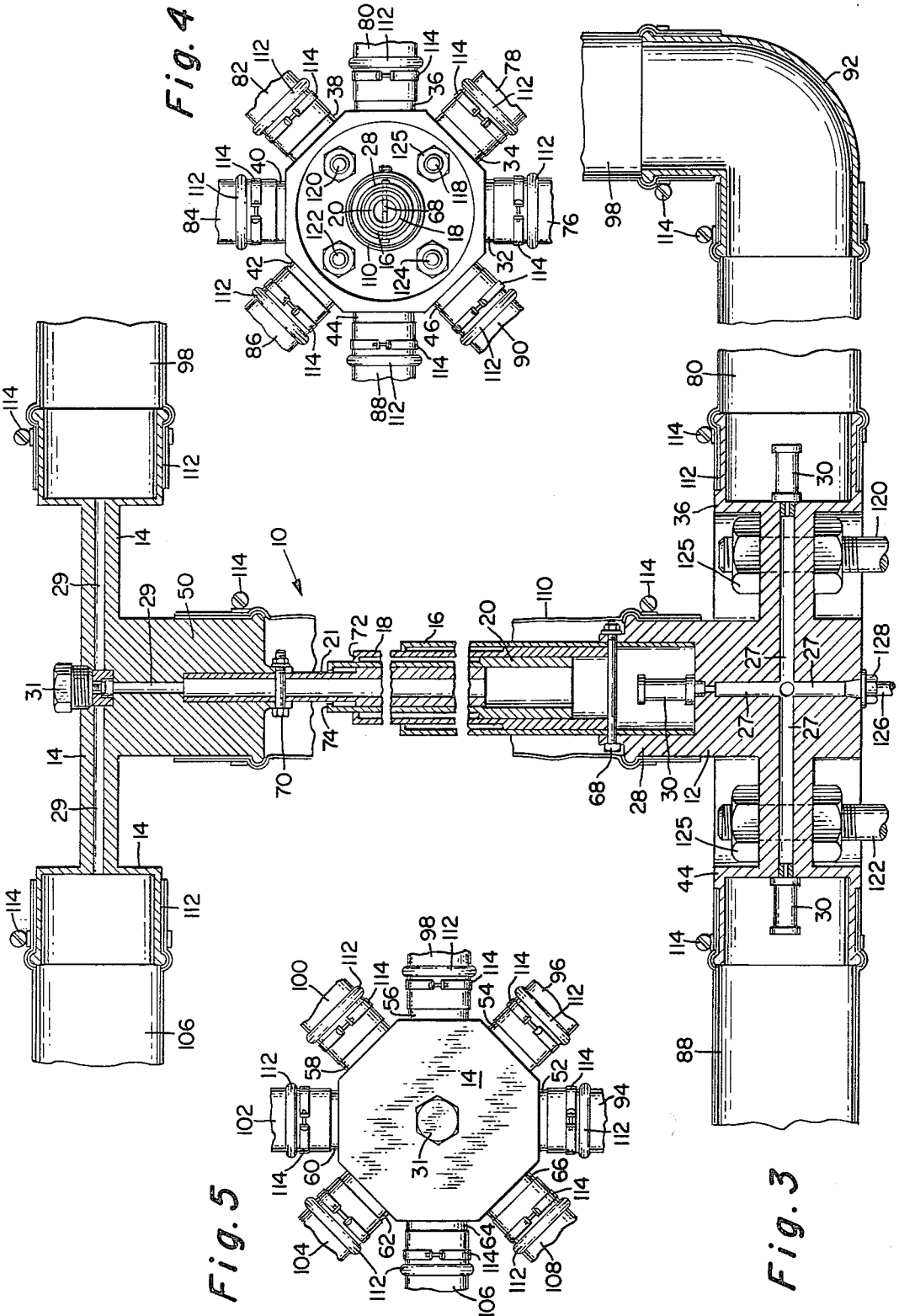


Fig. 3

Fig. 4

Fig. 5

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EXPENDABLE SEA TARGET

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ABSTRACT OF THE DISCLOSURE

A number of flexible tubes when inflated form a dome-shaped target which may be covered with a coarse radar reflective net. The target can be stored as a relatively small package in deflated or collapsed condition. When cast from a ship or plane into the sea an air flask inflates the tubes and the inflated assembly floats on the surface of the sea. The weight of the flask and its support structure provides stability to the inflated target. A check valve system prevents total loss of buoyancy due to failure of one of the tubes.

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.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to targets, and more particularly to inflatable targets, for use in target practice at sea.

Description of the prior art

Prior sea targets have been expensive to construct, cumbersome to transport to the target site and, throughout their life, constitute a substantial menace to navigation. Such prior target constructions have ordinarily been in the form of a raft or buoyant platform made of heavy timbers or of steel pontoons which are interconnected by rigid angle irons or other supports. Above this floating platform has been erected a lattice-work superstructure of wood or metal slats and this superstructure constitutes the visible portion of the target.

Such prior art devices are very expensive to manufacture and require the use of a tug or other sea-going vessel to tow them to the target site. When cast adrift they may be lost or broken up in inclement weather and thereafter constitute a serious hazard to navigation. Even when broken up during target practice they leave large chunks of flotsam which can be a substantial peril to navigation in the area for a long time.

Heretofore it has been proposed to provide small radar reflective units which are water-borne and can be employed for target practice. Some of these constructions are inflatable. However such constructions frequently lack ease of portability and the capacity to sustain one or more projectile hits without deflation and loss. Furthermore such prior inflatable devices are ordinarily complex in nature, are unreliable in operation and are restricted to relatively small size hence are not visible from the substantial distances required for target use with the current longer range missiles and projectiles

SUMMARY

The present invention is directed to an inflatable sea target comprising a network of flexible plastic tubing which is inflated by an attached air flask after the target is cast from a ship or aircraft. A coarse radar reflecting net covers the tubing and gives a dome-shaped appearance to the inflated device. When the target is erected and floating on the surface of the sea a degree of stability is provided by the depending air flask and its support cradle.

Appropriate valving prevents total loss of buoyancy in the event of failure of some of the plastic tubes.

It is an object of the present invention to provide an improved sea target, inflatable in design and non-hazardous to navigation.

Another object of the present invention is to provide a relatively stable target which is not readily capsized by strong winds or high sea states.

A further object is to provide a lightweight, inexpensive target which is compact in storage, economical to construct and is readily expendable after use.

Another object of the present invention is to insure a durable target by providing means for maintaining buoyancy should some of the individual plastic tube elements fail.

Other objects, advantages, and novel features of the invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevatioal view of one embodiment of the present invention shown in its compact, deflated condition prior to launch.

FIG. 2 is a view similar to FIG. 1 but showing the target fully inflated as it appears when resting upon the surface of the sea.

FIG. 3 is an enlarged detailed vertical cross-section of the embodiment of FIGS. 1 and 2 taken along a line substantially corresponding to line **3—3** of FIG. 2.

FIG. 4 is a slightly enlarged transverse plan view taken along a line substantially corresponding to line **4—4** of FIG. 2.

FIG. 5 is a detail top plan view taken along a line substantially corresponding to line **5—5** of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing where like reference numerals refer to similar parts throughout, there is shown a target **10** comprising generally bottom and top manifold assemblies **12** and **14** respectively positioned one above the other and connected together by a hollow shaft formed of a series of hollow contiguous telescoping sections **16**, **18**, **20** and **21** (FIG. 3). A flexible and inflatable tubing system **22** operatively interconnects the two manifolds and a reflectorized net **24** is positioned over and supported by the tubing system **22**. Suspended from the bottom manifold **12** is a pressurized gas flask or cylinder **116** for supplying a suitable inert gas to the manifold **12** for distribution to the flexible tubing system **22**. The reflectorized net **24** upon inflation of the tubing system renders a hemiglobal or dome-shaped appearance to the entire target **10** and provides a basis for radar detection.

The bottom manifold **12** has passages **27** drilled therein which extend from a central gas inlet passage **128** to a plurality of tube connections positioned in advantageous areas of the manifold. These include a central upwardly extending tube connection **28** and a multiplicity of radially disposed tube connections **32–46** extending in equidistantly spaced relationship located horizontally about the periphery of the manifold **12**. Each tube connection **28** and **32–46** may be provided with a check valve **30** to prevent backward flow of air or gas into the manifold **12**.

The top manifold **14** may have a slightly smaller radius than the bottom manifold **12** but the two manifolds are otherwise similar. Manifold **14** has a central downwardly extending tube connection **50** and the same number of horizontal and equidistantly spaced radially disposed tube connections **52–66** corresponding to similar connections on the bottom manifold **12**. Since the flexible tubing system **22** operatively connects the two manifolds, **12** and

14 respectively, there must be the same number of hose connections on each manifold. It will be noted that check valves are not provided in the top manifold 14. However interconnected passages 29 are present since they serve as an avenue through which the gas pressure can be released from the top manifold 14 by removal of threaded plug 31 should deflation of an inflated target be desired.

Both bottom and top manifolds are structurally interconnected by the hollow telescoping metal sections 16, 18, 20 and 21. As shown the outer section 16 may be attached to the upwardly extending tube connection 28 of the bottom manifold 12 and the innermost section 21 may be attached to the downwardly extending tube connection 50 of top manifold 14 by the bolt and nut arrangements 68 and 70 respectively. Sections 18 and 20 are positioned in a sliding arrangement, one within the other and provide a telescoping effect substantially as illustrated. Each section 16, 18, 20 and 21 has a shoulder 72 which contacts an inwardly extending top portion 74 of an externally contiguous section when fully extended which thereby limits the length to which the sections can be extended. Thus when the sections 16, 18, 20 and 21 are completely telescoped, the target 10 is a relatively small package easily handled and transportable; whereas when the sections are fully extended, a fairly tall and easily seen sea target is provided. While the foregoing is the preferred means of providing a telescoping attachment between the bottom and top manifolds, other expandable arrangements may be employed if so desired.

The flexible tubing system 22 when inflated is designed to completely extend the telescoped members 16, 18, 20 and 21 and to provide a large target 10 having positive buoyancy thus enabling the target 10 to float when erected in the target area. It includes eight spreader tubes 76–90, each being positioned over one of the corresponding separate tube connections 32–46 which branch equidistantly about the periphery of the bottom manifold 12.

The spreader tubes 76–90, after extending a suitable distance outward from each tube connection much in the same manner as the spokes of a wheel radiate outward away from a central hub, bend or turn upwards and continue as support tubes 94–108 where they are positioned over the appropriate tube connection 52–66 of the top manifold 14. If desired an elbow 92 may be positioned between the outer ends 93 and 95 of each spreader and support tube which strengthens the angle area and facilitates manufacture.

A separate flexible vertical support tube 110 may be positioned so as to enclose the contiguous vertically disposed telescoping sections 16, 18, 20 and 21 and is secured over both the upwardly extending tube connection 28 of the bottom manifold 12 and the downwardly extending tube connection 50 of the top manifold 14.

At each attaching connection of both the spreader and the support tubes, a neoprene gasket 112 may be employed in combination with a hose clamp 114 to assure an adequate seal.

The radar reflective coarse netting 134 provides high visibility to the target 10 and strengthens the inflated assembly.

The flexible tubing system 22 is inflated from a compressed air or gas cylinder 116 which may be suspended a suitable distance below the bottom manifold 12 by four suspension rods 118, 120, 122 and 124, said rods being connected at 125 to the manifold 12 in an equally spaced arrangement about the periphery thereof. A cylinder clamp 127 serves to maintain the suspended position of the air cylinder 116 against the four attaching suspension rods 118–124. A hose 126 extends from the air cylinder 116 to the connection 128 placed in the bottom center of manifold 12, and a suitable pressure valve 130 controls the flow of air from the cylinder 116 to the central inlet connection 128 on the bottom manifold 12. Counterweights 132 may be positioned just below the cylinder 116 and be attached to the rods 118–124 substantially as shown. Such counterweights provide stability to the target 10 against it being overturned by wind or wave.

When the target 10 is to be deployed, valve 130 is opened to admit gas through hose 126 to the inlet connection 128 from which it is ported through the radial passages 27 to pass out of the central tube connection 28, and through the eight branched tube connections 32–46 through the check valves 30 and into the flexible tubing system 22. This includes the spreader tubes 76–90, the support tubes 94–108 and the separate vertical support tube 110. By inflation of the foregoing tubular system, the telescoped sections 16, 18, 20 and 21 are extended and the target 10 is made buoyant. Since the check valves are mounted in all of the tubular connections placed on the bottom manifold 12, a failure of one or several tubes will not materially affect the buoyancy of the target.

Of course the valve 130 may be of the type actuated by water contact so as to cause inflation after immersion of the target or, if desired, it may be time operated so that it releases the compressed inflating fluid into the tubular structure after a predetermined time interval.

It will be apparent that target construction of the nature recited lends itself particularly well to simulated warfare conditions and with the provision of a timing valve arrangement as aforesaid targets may be deployed and left floating in an area for a considerable time before automatically inflating. This lends itself especially well to the mock simulation of surprise attacks by the enemy since the inflation may be caused to occur at an unpredicted time and the system serves to check upon the detection capability as well as the firing accuracy of the attacking vessel.

In view of the lightweight construction, a target made in accordance with this invention does not constitute any hazard to navigation even if lost at sea for a considerable period of time. Moreover in view of the open tubular construction and the reticulated netting, the target is not affected by prevailing winds and is not easily upset or caused to drift thereby.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A target deployable at sea from an air or marine vehicle and capable of floating for sustained periods while being subject to target practice comprising:

a plurality of inflatable, flexible tubes a portion being arranged to define a base for the target said base portion resting in the water substantially at the surface of the sea for buoyant support of the target, said tubes including a buoyant peripheral member and a plurality of similarly buoyant central members encompassed by said peripheral member;

a second portion of said inflatable, flexible tubes also forming an above-water portion supported by said base portion and extending upwardly into the air to define a visible structure having substantial external dimensions and an external contour which is readily visible when viewed from any angle;

a source of gaseous fluid for filling said inflatable tubes to cause them to expand and become form retaining;

means positioned within said inflatable tubes for preventing loss of target buoyancy in the event failure of any tubes occurs; and

counterweights centrally mounted and adapted to provide position stability to said target;

said tubes when inflated having a small cross section and being disposed relative each other and to the inflated base so as to provide an open network which appears substantially solid when viewed from a distance but which permits the free passage of wind therethrough to prevent target upsetting and minimize drifting as a result of wind resistance.

2. The device of claim 1 wherein the tubes forming said base portion are radially disposed and wherein the source of gaseous fluid is located below the floating base.

3. The device of claim 1 wherein manifolds structurally interconnected with the source of gaseous fluid distribute the gas to the base and to the visible portion of the target.

4. The device of claim 1 wherein the source of gaseous fluid is a flask of compressed gas which is interconnected with a manifold which distributes the gas to the tubes of said base and said visible portion of the target.

5. The device of claim 1 wherein upper and lower gaseous distributing manifolds are interconnected by a telescoping arrangement which permits manifold separation during tube inflation and raises the top of the target assembly a substantial distance above the surface of the sea to enhance target visibility.

6. The device of claim 1 wherein control means is provided for initiating flow of gaseous fluid to said tubes, said control means including a timing device whereby the target may be inflated at a predetermined time interval after deployment.

7. An inflatable sea target comprising:

a plurality of relatively small cross sectioned inflatable tubes radially disposed and arranged to define a base which rests in the water substantially at the surface of the sea;

a second set of relatively small cross sectioned inflatable tubes interconnected with the first set for inflation therewith from a common source and defining, when inflated, an openwork target assembly positioned above the sea level;

means for inflating both sets of tubes so as to provide buoyancy and to erect a visible superstructure;

means positioned within said tubes for preventing loss of target buoyancy; and

counterweights centrally mounted and adapted to provide position stability to said target;

said erected superstructure including relatively large open spaces therethrough and providing relatively small wind resistance whereby the influence of atmospheric conditions upon the target is maintained at a minimum.

8. The device of claim 7 wherein a coarse radar reflective net is attached to the inflatable tubes for increasing the visibility of said device and providing a suitable radar signal.

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