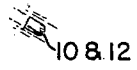
Feb. 12, 1963 A. J. ROSSI ETAL 3,076,982

RETRIEVABLE APPARATUS

Filed July 13, 1961



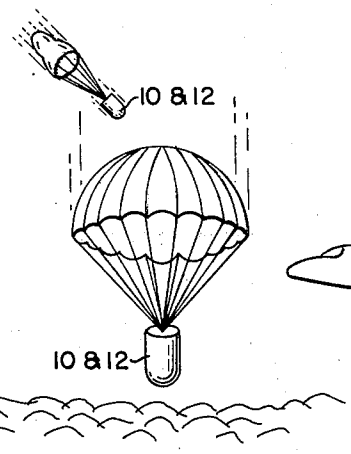


Fig. 1

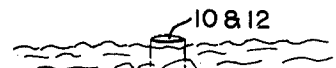


Fig. 2

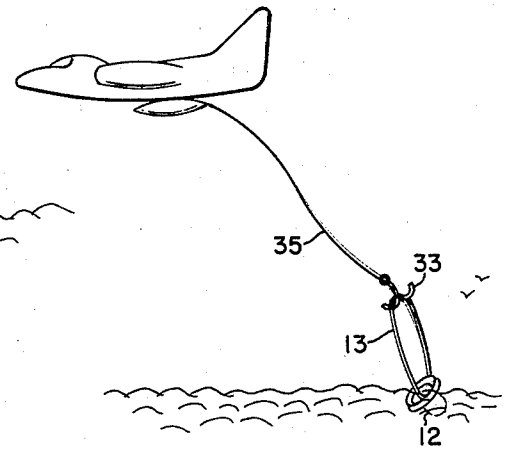


Fig. 4

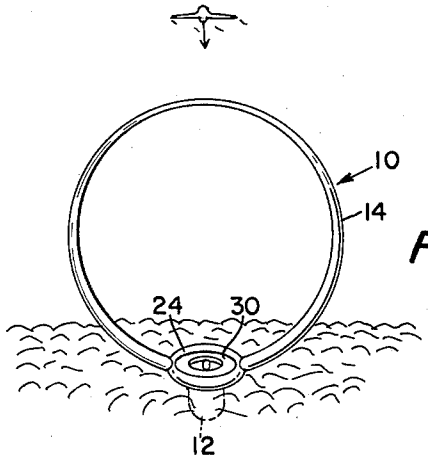


Fig. 3

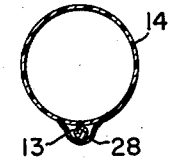


Fig. 6

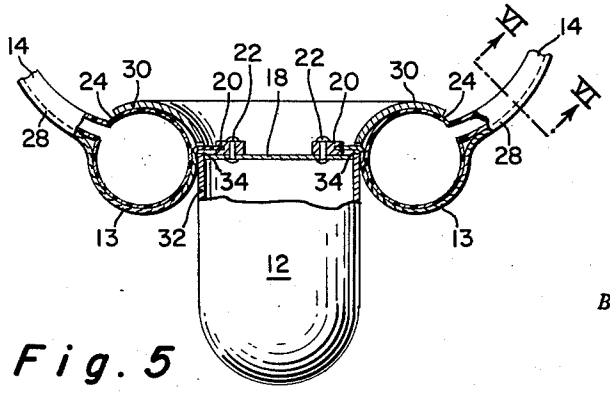


Fig. 5

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RETRIEVABLE APPARATUS

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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.

The present invention relates to a retrievable apparatus and more particularly to a target attached to a payload, the target presenting an easily connectable opening for a hook trailing from an airborne vehicle.

In the past devices used for retrieving a payload have been inefficient in their operation, bulky and inept to package within a small space. One device which has been used as a retrievable target for recovery of a payload has been a helium-filled balloon which is connected to the payload by a recovery cable, the recovery cable having at its upper end a plurality of hooks. This sort of a device is retrieved by a trapeze bar trailing from an aircraft, the trapeze bar engaging the recovery cable and breaking so as to slip a line from the aircraft into the hooks. This method of recovery presents a problem in that the trailing trapeze bar is not aerodynamically stable, thus making it difficult to guide it directly toward the retrievable target. Further, the helium balloon must be of such a size so as to support the recovery cable and hooks thus requiring a gas tank of considerable volume and weight to inflate the balloon upon reaching the earth's surface. The present invention overcomes these problems by providing a retrievable target which requires a relatively small pressurized air container for inflation and at the same time, after inflation, presents an easily connectable target, thus enabling a hook type of retrieving device to be employed from a retrieving aircraft.

An object of the present invention is to provide a retrievable apparatus which is easily connectable with a retrieving device.

Another object is to provide a retrievable device which can be packaged into a relatively small space.

A further object of the invention is to provide a retrievable apparatus which will orient itself with respect to the wind when placed in a body of water.

Still another object is to provide an inflatable retrievable target connected to a payload which can be easily retrieved by a hook trailing from an aircraft.

Other objects and many of the attendant advantages of this invention may be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like parts throughout the figures thereof and wherein:

FIG. 1 is a side view of the payload including the deflated retrievable apparatus, shown first in a bullet-like dropping and then in a dropping by parachute;

FIG. 2 shows a perspective view of the payload including the retrievable apparatus after it has fallen into the water and shed the parachute rigging;

FIG. 3 is a perspective view of an aircraft and the payload with the retrievable apparatus in its inflated position;

FIG. 4 shows a side view of an aircraft retrieving the payload by passing a trailing hook through the retrievable target;

FIG. 5 shows a cross-sectional view taken through the central axis of the payload along with the supporting retrievable apparatus; and

FIG. 6 is a cross-sectional view taken along line VI—VI of FIG. 5.

Referring now to the drawings wherein like reference numerals designate like or corresponding parts throughout the several views there is shown in FIGS. 3 and 5 a target 10 which is attached to a payload 12, the target including a flexible carrying line 13 and an inflatable tapered torus 14 which forms the lines 13 into a toroid. The flexible line 13 is preferably nylon cord which has ends fixedly attached to an upper plate 18 of the payload by rotatable cylinders 20. The means of fixing each end of the line 13 into the cylinders 20 may be by any suitable means such as bonding the ends within the cylinders by an epoxy. The cylinders 20 are rotatable on the plate 18 about rivet pins 22 which pass through the cylinders and the plate 18.

The torus 14 is maintained in an upright position within a body of water by an inflatable annular tube 24 which lies flat in the water and is connected to the torus at diametric locations by any suitable means such as vulcanizing, sewing, flanging or bolting, the particular means employed depending upon the type of material used for the annular tube 24 and the torus 14. The inner spaces of the annular tube 24 and the torus 14 communicate with one another as shown in FIG. 5 so that upon inflating either one of these elements the other will be correspondingly inflated.

The line 13 is disposed within a pouch 28 which follows around the outside periphery of the torus 14 so as to form the line 13 into the shape assumed by the torus upon inflation. The pouch 28 may be integral with the torus 14 or may be attached thereto by such methods as bonding, vulcanizing or sewing.

The target 10 supports the payload 12 by an annular rim 30 which rests around the top of the annular tube 24 and which is integral with an outer casing 32 of the payload. The annular rim 30 has two openings 34 which are of a sufficient size so as to allow the flexible line 13 to pass therethrough and attach to the upper plate 18.

As shown in FIG. 4 an aircraft is trailing a 3-prong hook 33 by a cable 35, the hook being such that it can be turned in any direction and still have a prong facing in a substantially forward position with respect to the aircraft.

The volume of the annular tube 24 upon inflation is to be such as to float the entire apparatus including the payload in the water. If the payload has sufficient buoyancy of itself, then, of course, the volume of the annular tube becomes immaterial. By disposing the annular tube flat in the water as shown in FIG. 3, good stability is provided to the overall assembly when it is in its operational position in the water. This stability is increased by tapering the torus 14 toward its top end so that the weight of the torus is more concentrated at its lower end near the water and wind loading is relatively lessened toward the top end.

In the preferred embodiment the torus 14 is made of polyethylene plastic approximately .005 inch thick covered with mylar approximately .0005 inch thick. Also, in the preferred embodiment the annular tube 24 is made of a thin durable material such as that described for the torus or it can be made from a nylon impregnated with rubber. The mylar has good radar reflectivity and visibility allowing a pilot to easily locate the payload.

In the operation of the device the payload including the retrievable target are dropped from above the earth, first in a bullet-like fashion and then parachuted until it comes in contact with the surface of the earth. Upon reaching the earth's surface a pressure source (not shown) or sea water switch (not shown) is actuated to inflate the annular tube 24 and the torus 14. Upon inflation of the

torus 14 the line 13 is formed by the torus into a toroid, this toroid presenting an opening for receiving the trailing hook 33 of the aircraft. Of great importance to the retrieving operation the torus 14 will orient itself with respect to the wind. When the target 10 and the payload 12 are disposed in a body of water the torus 14 will align itself with the direction of the wind so that the wind passes directly therethrough. Should the torus be initially disposed so that it is at an angle with respect to the direction of the wind, the forces of the wind will align the loop so that the wind is blowing in a direction perpendicular to the face of the torus. This imparts a rotational stability to the target 10 which greatly enhances the efficiency of connecting the hook 33 with the payload 12. Of course, if there is no wind the torus will remain substantially in its original position after inflation. The pilot of the aircraft, during a retrieving operation, will normally fly in a low-altitude position and he will trail the hook 33 so that it is directed within the opening of the torus 14. In most instances the cable 35 will first drag a short distance along the line 13 breaking the torus after which the hook will grab the line 13 and take the payload in tow. Upon the hook 33 grabbing the line 13 the payload is lifted by the line out of the water and is then carried by the aircraft after which the aircraft can bring the payload within its confines by reeling in the cable 35 and the line 13, or as alternatives the entire apparatus including the payload can be parachuted to land or dropped with a buoyancy bag near a ship.

While in the preferred embodiment the retrievable device is employed in a body of water it is to be understood that it can be used at a land location in a similar manner. For land use, the torus 14 would assume an upright position as shown in FIG. 3 and the retrieving operation would be the same as just described.

It is now readily apparent that the retrievable apparatus provides a simple and efficient device for connection with a trailing hook from an airborne vehicle. The apparatus is simple requiring a relatively small pressurized air container for inflation and is of such a construction that it can be packaged into a relatively small space along with a payload. It has good stability in the water and is of such a shape that it will orient itself with respect to the wind so that a pilot can more easily connect the trailing hook with the sought-for payload. Further, it has good radar reflectivity and visibility so that the pilot can easily locate the payload.

Obviously many modifications and variations of the present invention are possible in 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.

We claim:

1. A device for use in recovery of an object from a body of water by an airborne vehicle wherein the combination of the object and the device are floatable in the water, said device comprising a loop capable of being inflated to present a substantial opening, means attaching the loop to the object with the object located outside the loop so that a substantial portion of the loop is left open and means for positioning the loop upright out of the water when the loop is inflated whereby upon floating the device and the object in the water with the loop inflated said loop provides an easily connectable target with a trailing hook from the airborne vehicle.

2. A device for use in recovery of a payload from a body of water by an airborne vehicle wherein the combination of the payload and the device are floatable in the water, said device comprising elongate flexible means having ends attached to the payload for carrying said payload, inflatable means substantially in juxtaposition with the carrying means for forming at least a portion of the carrying means into a loop having a substantial opening and means for positioning the carrying means and the forming means upright out of the water whereby upon floating the device and the payload in the water with the forming means inflated the looped-carrying means provides an easily conectable target with a trailing hook from the airborne vehicle.

3. A device as claimed in claim 2 wherein the forming means in its upright inflated position has a top end and a bottom end, and the cross-section of said forming means is gradually tapered toward the top end whereby additional stability is imparted to the device.

4. A device as claimed in claim 2 wherein at least a portion of the forming means upon inflation has the shape of a torus.

5. A device as claimed in claim 2 wherein the positioning means includes an annular inflatable tube, said tube being capable of floating flat in the water and the forming means having ends which join the tube at two substantially diametric locations.

6. A device as claimed in claim 5 including the payload, the annular tube upon inflation forming an opening and means for supporting said payload within the latter opening.

7. A device as claimed in claim 6 wherein the forming means and the annular tube have inflatable spaces communicating with one another whereby the forming means and the annular tube will inflate together upon introducing a fluid under pressure into either one.

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