US00RE36965E

United States Patent [19]

Salvemini

[11] E **Patent Number: Re. 36,965**

[45] **Reissued Date of Patent: Nov. 21, 2000**

[54] **SELF-PROPELLED RESCUE APPARATUS**

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[21] Appl. No.: **09/213,631**

[22] Filed: **Dec. 17, 1998**

Related U.S. Patent Documents

Reissue of:

[64] Patent No.: **5,584,736**
Issued: **Dec. 17, 1996**
Appl. No.: **08/523,949**
Filed: **Sep. 6, 1995**

[51] **Int. Cl.**[7] **B63C 9/26**

[52] **U.S. Cl.** **441/85**

[58] **Field of Search** 441/1, 6, 13, 17, 441/81, 84, 85, 88, 95, 97, 100, 101, 108, 113; 42/1.14, 1.15, 71.01, 72, 74, 90, 94; 89/36.06, 36.05, 1.34, 37.04; 102/504

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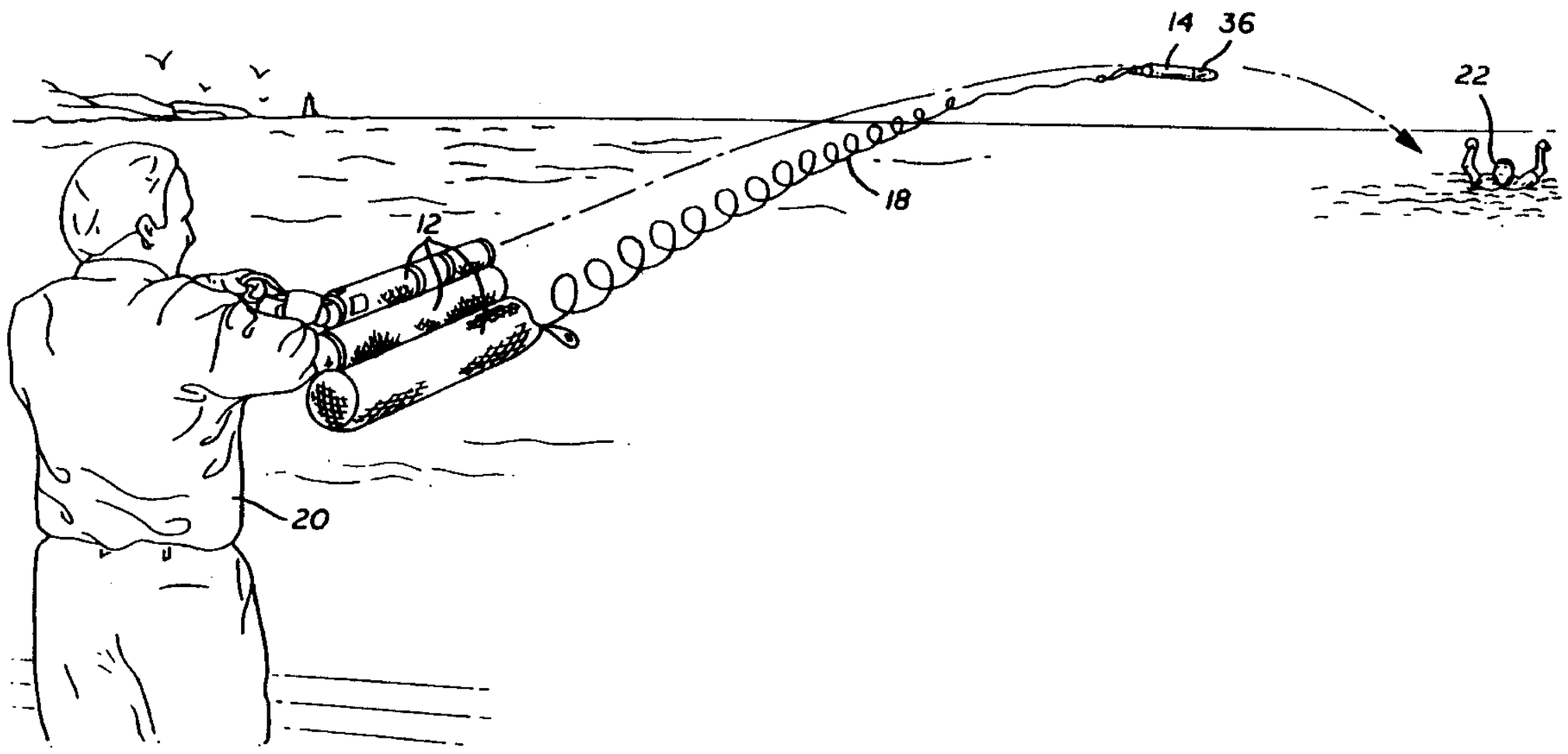
[57] **ABSTRACT**

Rescue apparatus comprising a self-propelled missile mounted on a hand-held launcher and arranged to carry a flotation device in a collapsed condition from the launcher to a distressed target, the launcher and flotation device being connected by a flexible line, so that when the missile is aimed and launched toward the target, the flotation device is carried to the target and then deployed automatically to provide flotation support and establish a "life-line" from the launcher.

31 Claims, 3 Drawing Sheets



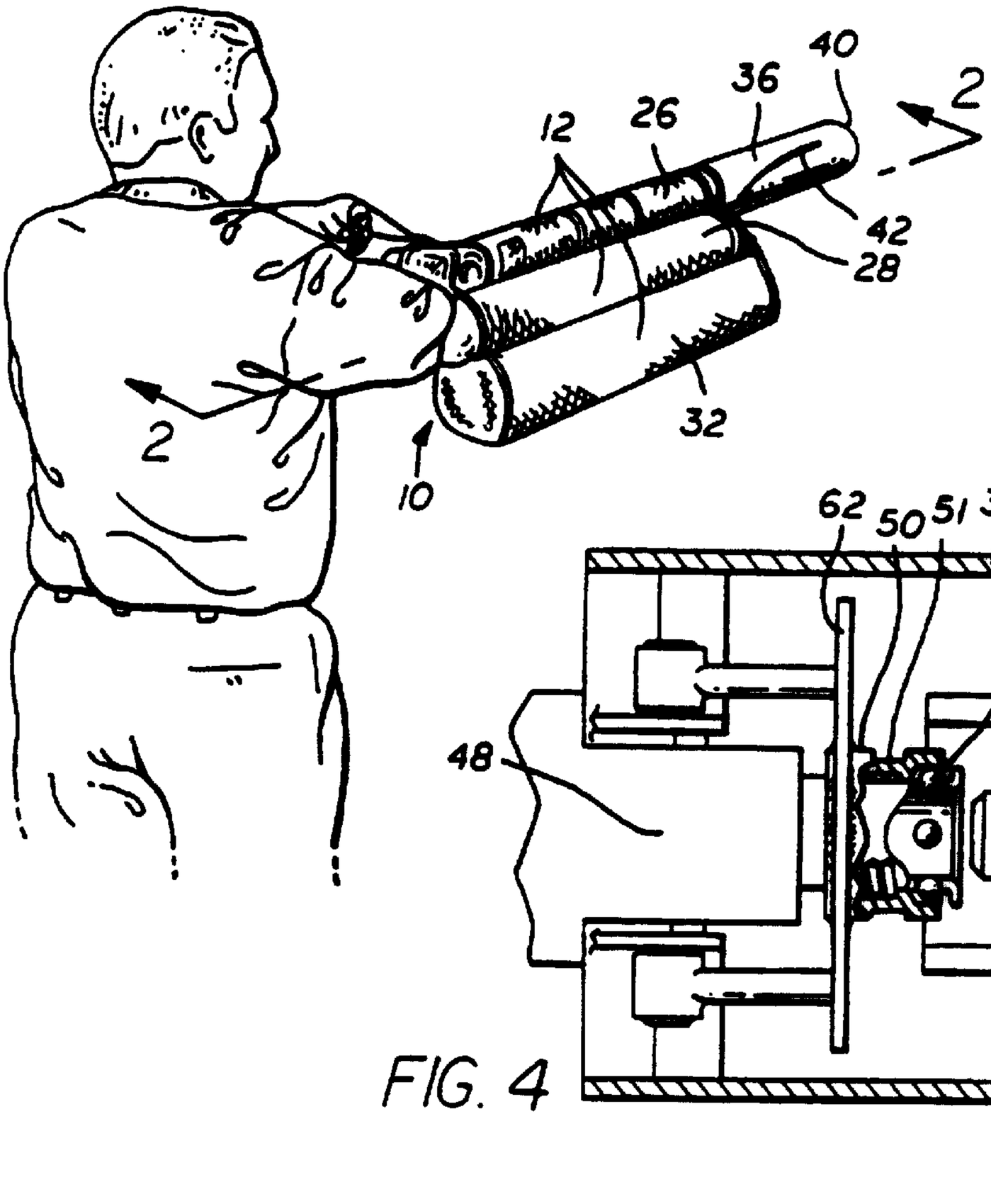


FIG. 1

FIG. 4

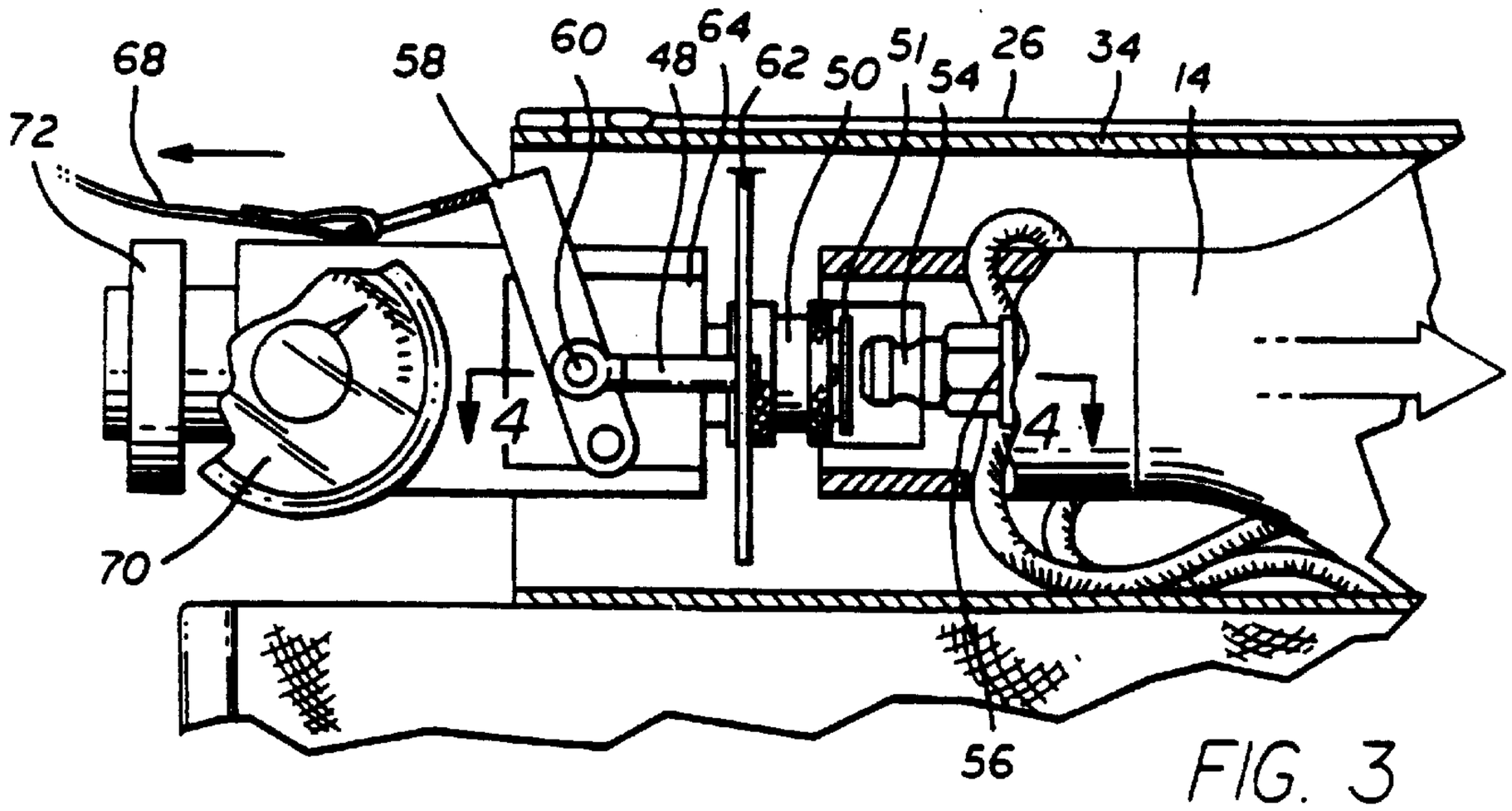
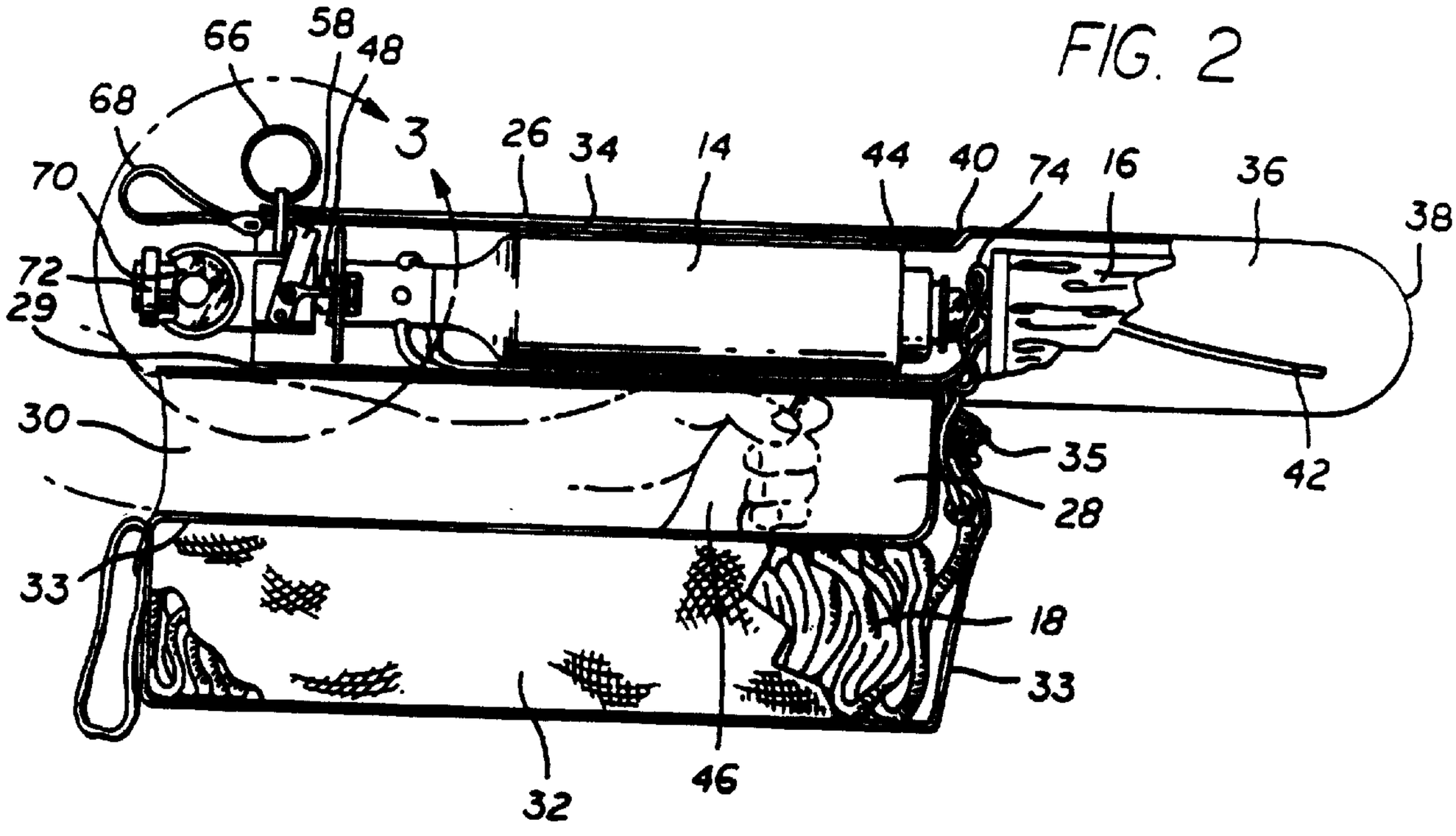


FIG. 3

FIG. 2



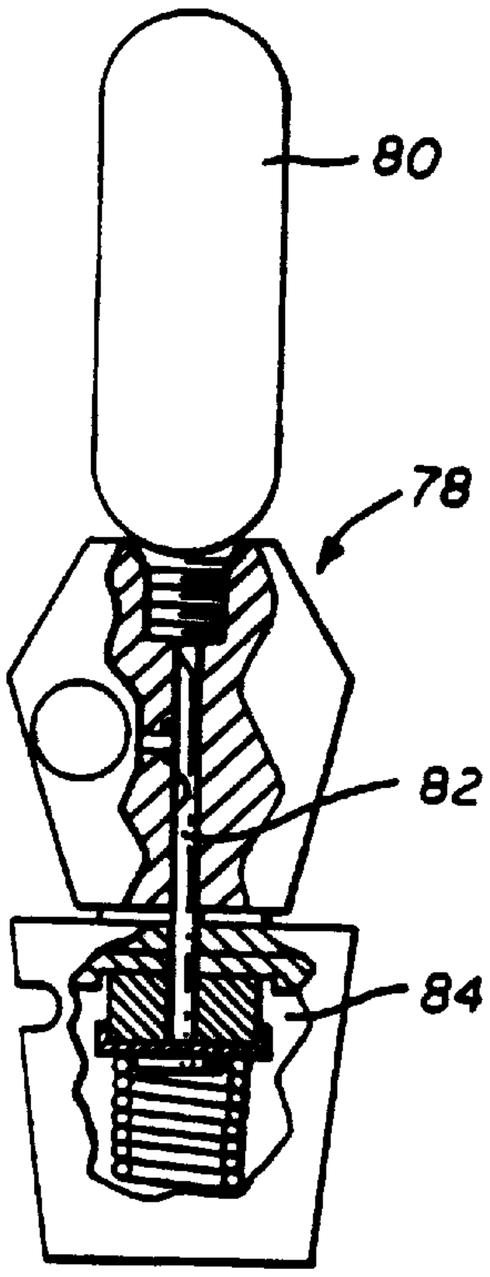


FIG. 6

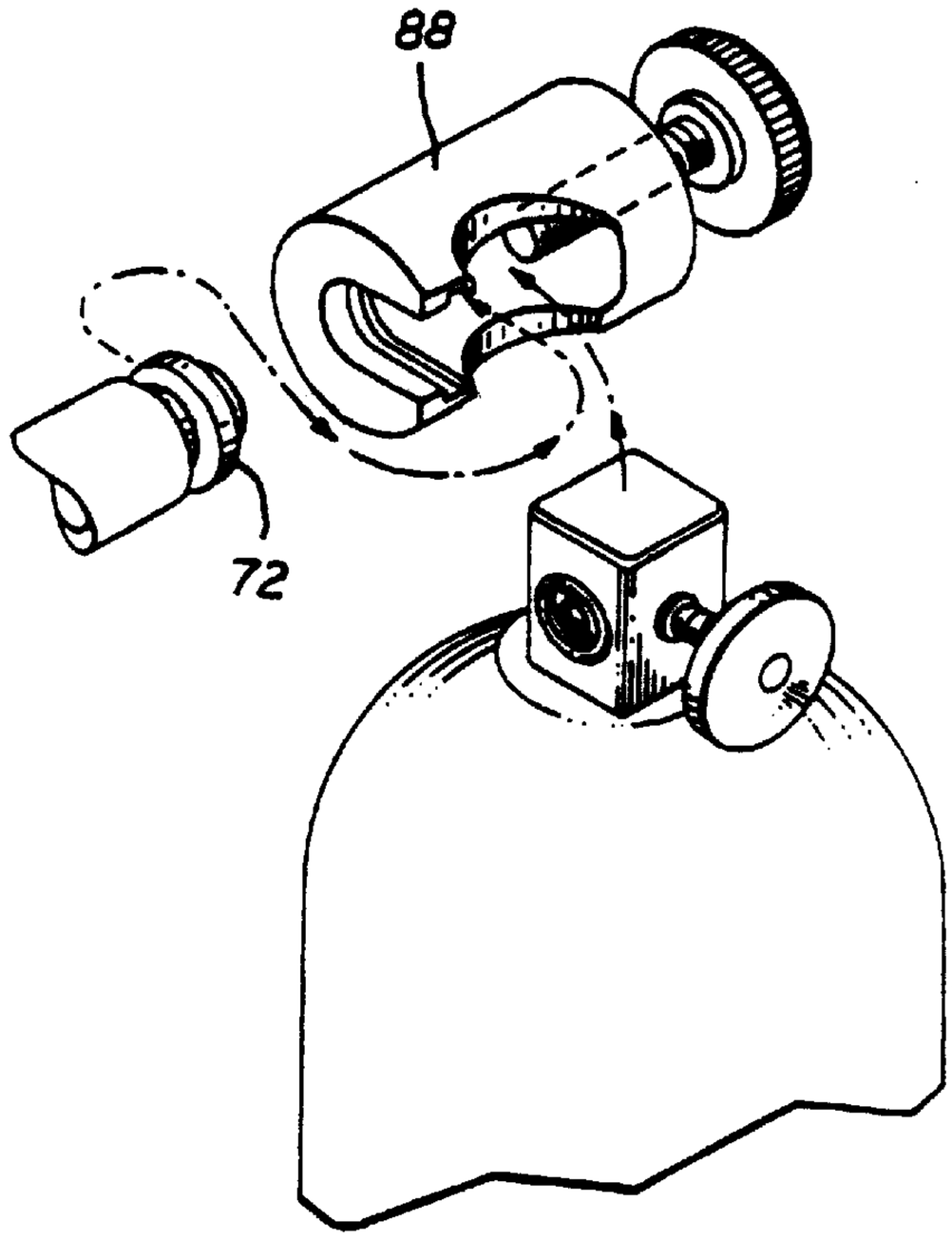


FIG. 8

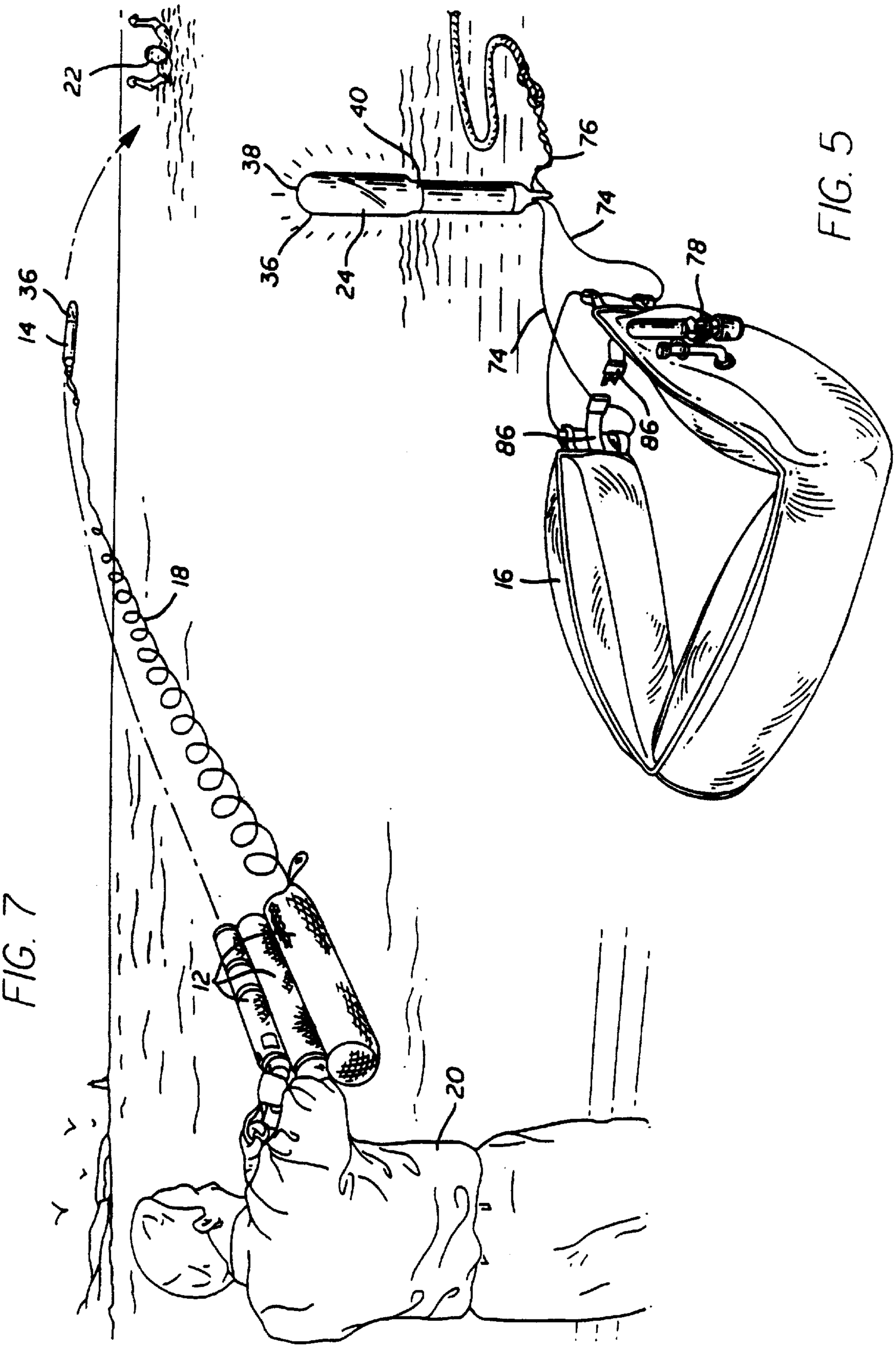


FIG. 5

FIG. 7

SELF-PROPELLED RESCUE APPARATUS

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to rescue apparatus and, more particularly, to a self-propelled rescue apparatus for deploying a "life-line" and life-support item to a distressed target located a substantial distance from the launching site.

2. Description of Prior Art

It has long been a problem when attempting to rescue people, especially a person who has fallen overboard from a boat, to be able to launch a line from the rescuer to the person in distress. This problem has been especially evident when the rescue apparatus, in its simplest form, involved hand throwing a life line or other rescue device to the person in distress. Clearly, such apparatus inherently depends on the strength and skill of the rescuer and, at best, suffers from a severe distance limitation. Even more advanced apparatus which rely upon firing a projectile comprising life saving devices have had their limitations as to the distances the rescue device can be projected and because of safety factors involved with the launching platforms used for firing the projectiles.

In the field of mechanized rescue apparatus, it has been the general practice to employ projectiles, with attached life-lines which are fired in the direction of the distressed person. The projectiles historically have relied upon launching devices, such as modified rifles, grenade launchers and harpoon launchers. Although such devices have been useful, they have not proven to be entirely satisfactory under all conditions, generally having been designed for large commercial or military vessels (as evidenced by one system that uses a fuel driven propulsion rocket motor as a thrust source). Additionally, they do not lend themselves to general public use due to the inherently dangerous environment associated with the launching devices which employ gun powder, volatile fuel, or similar charges to propel the life saving projectile. They are also limited in terms of the distance that a projectile can be fired from a launcher.

It will be appreciated then, that there exists a need for a simple means of launching rescue devices to distressed people in life threatening situations at great distances from the rescuer, while at the same time providing a safe launching platform, free from dangerous fuels, explosives, or other firing mechanisms. Moreover, it is desirable to do so with relatively low cost apparatus that comprises all reusable parts which dramatically reduces on going operational costs.

SUMMARY OF THE INVENTION

Briefly, and in general terms, the present invention provides a safe, reliable rescue apparatus for deploying a life-line with a life-support item at one end to a distressed target at a substantial distance from a rescuer. This is accomplished by apparatus that incorporates a self-propelled missile which is releasably mounted on a launcher connected to the other end of the life-line and which, upon activation, carries the life-support item and life-line from the launcher to the location of the distressed target.

In a more detailed aspect of the invention, the launcher is adapted to be hand-held and the missile includes a cartridge

of pressurized gas that serves as the missile propellant. Mounted on the missile is a container that releasably contains the life-support item adapted to be released automatically at the location of the target. For economic and convenience reasons, the gas cartridge preferably is rechargeable.

In a preferred embodiment of the invention, the rescue apparatus is especially adapted for rescue of a person in distress in the water. The life-support item then constitutes a flotation device that is carried initially within the container on the missile in a collapsed condition. Upon water contact, the flotation device is deployed from the container and expanded for supporting the distressed person and enabling rescue by retrieval of the life-line. To aid in the rescue process, a beacon is also carried by the missile and arranged to be illuminated upon contact with the water.

These and other features and advantages of the invention will appear in the following detailed description of the preferred embodiment, read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of rescue apparatus embodying the invention in a condition in which it is ready to be utilized;

FIG. **2** is a cross-sectional view taken on line **2—2** of FIG. **1**;

FIG. **3** is an enlarged, partial view taken within circle **3** of FIG. **2**, depicting the apparatus of the invention immediately after initiation of a launch;

FIG. **4** is a cross-sectional view taken on line **4—4** of FIG. **3**;

FIG. **5** is a perspective view of a flotation device which is part of the disclosed embodiment, in a deployed condition, the flotation device being shown in collapsed condition in FIG. **1** and FIG. **2**;

FIG. **6** is a partial cut-away view of the flotation device inflation mechanism;

FIG. **7** is a pictorial rendition of the rescue apparatus of FIG. **1** being deployed; and

FIG. **8** is a partial cut-away perspective view of a missile recharging adapter depicting how it is affixed to the rescue apparatus and a standard compressed air tank for recharging purposes.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, and particularly to FIG. **1**, there is shown a self-propelled rescue apparatus **10** of the present invention. The rescue apparatus **10** includes a hand-held launcher **12** for a self-propelled missile **14** that carries a life-support item, such as an inflatable harness **16**, with a flexible life-line **18** attached thereto, to a distressed target, such as a person who has fallen overboard from a boat. A typical rescue scenario is depicted in FIG. **7**, where the missile **14** has been aimed and launched by a rescuer **20** to a person **22** in distress in the water a substantial distance away from the rescuer. The missile **14** delivers to the person **20** the flexible life-line **18**, the inflatable harness **16**, and a beacon **24**. The apparatus of the invention is adapted so that the harness **16** is inflated and the beacon **24** illuminated automatically in response to water contact. A beacon that has been found to be satisfactory is model number L87 light weight beacon manufactured by ACR.

Referring now to FIGS. **1** and **2**, the launcher **12** includes a cylindrical missile compartment **26** for housing the self-

propelled missile **14**, a body-engaging portion **28** attached longitudinally along the underside **29** of the missile compartment and **26** shaped to provide a sleeve for receiving an arm **30** of the rescuer **20**. Another compartment **32** oriented longitudinally along an underside **33** of the body-engaging portion **28** contains the flexible line **18** in a coiled or spiral-wound configuration. For reasons of durability and light weight, as well as ease of manufacture, the launcher **12**, including the portions forming the missile compartment, the **26** body-engaging portion **28**, and the flexible line compartment **32**, is made of canvas-like material.

The line **18** preferably is made from nylon or a similar material that is substantially unaffected by sea water, as well as strong enough to pull the weight of a large person. Further, compartment **32** includes a distal flap **33** releasably connected to the flexible line **18** via a half-ring pin and light line assembly **25**, through which the flexible line **18** may exit without substantial resistance. Contained within the missile compartment **26** is a cylindrical tube **34**, made of aluminum or another high strength lightweight material which is configured to protect and guide the self-propelled missile **14**.

The launcher **12** also embodies a generally tube-shaped life-support container **36** having an enclosed end **38** with a hemispherical configuration and an open end **40** with a reduced diameter. The container **36** has a slit **42** running longitudinally in a curved pattern from the open end **40** toward the distal end **38**. The open end **40** of the container **36** is configured to be inserted and held within a distal opening **44** in the cylindrical aluminum insert **34**, so that the end of the container **36** points away from the rescuer **20**. As shown in FIG. **2**, the container **36** is configured to receive a collapsed inflatable harness **16**.

Attached to the rescuer's end of the cylindrical tube **34** is a trigger mechanism **38** for launching the self-propelled missile **14**. The trigger mechanism **48** includes a quick release valve assembly **50**, which comprises a cylindrical housing with a valve split ring **51** having ball bearings **52** positioned in captured relation about its circumference. The assembly is biased toward the missile **14** and receives a nipple **54** on the proximal end **56** of a cartridge portion of the missile **14**. An L-shaped trigger arm assembly **58** is attached at about a midpoint of one of its legs to a member **60** extending proximally from a plate **62** which engages a circumference of the quick-release valve assembly **50**. Once end of the trigger arm assembly **58** is pivotally attached to a nozzle assembly **64** and another end is configured to receive the pin portion of a safety ring and end pin **66** as well as a trigger strap **68**.

The nozzle assembly **64** further includes a pressure gauge **70** for monitoring and displaying pressure of the air contained within the missile **14** and a machined lip **72**. Further, the nozzle assembly **64** has a hollow interior (shown) and an opening (not shown) in communication with the hollow interior and through which air may be caused to flow to the missile nozzle nipple **54** to fill the missile **14**.

Attached to the collapsed inflatable harness **16** are a pair of lines **74** which secure the collapsed inflatable harness **16** to the missile **14**. A third line **76** attached the flexible line **16** to the missile **14**.

When so configured, the launcher **12** is ready for use. Referring to FIG. **2**, the trigger mechanism **48** operates to retain the self-propelled missile **14** in place within the cylindrical missile tube **34**, as well as to keep pressurized air within the missile **14**. The safety ring and pin **66** insures that the missile **14** is so retained by locking the trigger mechanism **48**, thereby preventing any unexpected or accidental launching of the missile **14**. Moreover, in its fully charged state, it is contemplated that the self-propelled missile **14** be pressurized with air in the range of 2500 to 3000 psi. Further, as configured, the launcher **12** is evenly balanced fore and aft, thereby minimizing a heavy nose or tail effect when aiming the apparatus.

The rescue apparatus is adapted to be hand held, as shown in FIGS. **1**, **2** and **7**, for aiming and launch. To facilitate the process, the sleeve receives the rescuers arm and a hand grip **46** is provided.

In order to deploy the self-propelled missile **14**, the rescuer **20** removes the safety ring and pin **66** from engagement with the L-shaped trigger arm assembly **58**. Referring now to FIG. **3**, the rescuer next pulls on the trigger strap **68** which in turn causes the trigger arm assembly **58**, through its connection with plate **62**, to pull the distally biased quick-release valve split ring **51** from engagement with the nozzle nipple assembly **54**. More specifically, when the trigger strap is pulled, the ball bearings **52** positioned about the circumference of the quick release assembly **50** are removed from engagement with the outer circumference of the nipple assembly **54**. Once this has occurred, the pressurized air within the self-propelled missile is permitted to escape through the nipple assembly, thereby propelling the missile **14** out of the launcher and, thereafter, for an extended period toward the target. The cylindrical tube **34**, in turn, acts as an initial launch tube and guides the missile trajectory.

Referring now to FIGS. **5** and **6**, once the missile **14** has reached its destination and contacted the water, the inflatable harness **16** automatically inflates, ejecting itself out through slit **42** formed in the life-support container **36**. That is, an automatic inflation apparatus **78** which is attached to the side of the inflatable harness **16** causes the harness to inflate. An automatic inflation mechanism that has been found to be particularly satisfactory is model V-80,000 EC-4 manufactured by Holkey-Roberts. The inflation apparatus **78** includes a standard CO_2 cartridge **80** and a spring-loaded cartridge piercing device **82** that is held in a "cocked" position by a water-soluble pellet **84** until it has been dissolved by water (two to three seconds). Once the pellet **84** dissolves, the piercing device **82** pierces the CO_2 cartridge **80**, thereby allowing it to inflate the harness **16**.

At the same time, the missile **14** and life-support container **36** with a beacon **24** (not shown) flashing inside, floats in the water near the victim **22**. The victim would then put on the harness **16** and secure it around their chest and under their arms. To aid in securing the harness **16** to the victim **22** the harness **16** can be configured with straps **86** which can be tightened about the victim. Thereafter, the flexible line **18** can be attached to the front of the harness **16** to facilitate a rescue using the flexible line **18** to pull the victim **22** to safety. Once the victim has been rescued the entire self-propelled rescue apparatus **10** will also be retrieved and be available for repackaging for subsequent use.

Recharging the missile **14** requires a specially designed adapter **88** (FIG. **8**). This adapter is slotted and half-open on one side to allow it to be slipped over the machined lip **72** formed in the nozzle assembly **64**. With this arrangement, the missile **14** is recharged while its installed in the rescue apparatus **10**.

It is contemplated that the rescue apparatus will have uses other than water rescue. For example, the life support item might be as simple as a first aid item that is transferred between ships at sea or a handle for a victim stranded on a mountain cliff.

It will be apparent from the foregoing, while a particular form of the invention has been illustrated and described and

certain modifications referenced, various other modifications can be made without departing from the spirit and scope of the invention. Accordingly, it is not intended that the invention be limited, except as by the appended claims.

I claim:

1. Rescue apparatus comprising:

a launcher with a body-engaging portion comprising an arm-receiving sleeve and a hand grip for use by a rescuer in aiming said launcher, *said hand grip adapted to be gripped by a first hand of the rescuer*;

a self-propelled missile releasably mounted on said launcher and adapted to be launched therefrom;

a life-support item carried by said missile and arranged to be deployed at a location remote from said launcher;

a flexible line having opposite ends and connected at one said end to said launcher and at the opposite said end to said life-support item; and

a trigger actuateable to launch said missile and cause said life-support item to be carried by said missile to said remote location for deployment, *said trigger being remote from the first hand of the rescuer when said hand is gripping said hand grip.*

2. The rescue apparatus of claim **1**, wherein said missile is charged with compressed air which serves as the missile propellant.

3. The rescue apparatus of claim **1**, wherein said missile is connected to said line after said life-support item is deployed to enable said missile to be retrieved by said line, and wherein said missile is capable of being recharged for subsequent use.

4. The rescue apparatus of claim **1**, wherein said life-support item comprises an inflatable flotation device carried by said missile in a collapsed, deflated condition and arranged to be deployed and inflated at said location remote from said launcher.

5. The rescue apparatus of claim **4**, further including means responsive to contact with water for causing said flotation device to be inflated automatically.

6. The rescue apparatus of claim **1**, wherein said line is initially supported in a coiled condition on said launcher and uncoils without substantial resistance as said missile carries said life-support items to said location remote from said launcher.

7. The rescue apparatus of claim **1**, wherein compressed gas provides said self-propelled missile with sustained thrust substantially throughout its flight path.

8. Water rescue apparatus for supporting in the water and retrieving a person at a location remote from a rescuer, comprising:

a launcher at the location of the rescuer with a body-engaging portion comprising an arm-receiving sleeve and a hand grip for use by a rescuer in aiming said launcher;

a self-propelled missile releasably mounted on said launcher and adapted to be aimed toward the distressed person and launched from said launcher;

a flotation device for supporting the distressed person in the water and capable of being packaged in a collapsed condition in which it occupies a relatively small space and of being deployed to an uncollapsed condition for such supporting purpose;

a length of flexible line connected at its opposite ends to said launcher and to said flotation device;

means on said missile defining a compartment for carrying said flotation device in its collapsed condition and for releasing the same for deployment at said remote location; and

means associated with said flotation device and activated by water contact for causing said flotation device to be ejected from said compartment and deployed.

9. The rescue apparatus of claim **8**, wherein said missile includes a cartridge charged with compressed gas which serves as propellant for said missile.

10. The rescue apparatus of claim **9**, wherein said missile is capable of being recharged with compressed gas for subsequent use.

11. The rescue apparatus of claim **8**, further including a beacon carried by said missile, and water-activated means for causing said beacon to illuminate responsive to contact with water.

12. The rescue apparatus of claim **8**, wherein said flotation device is an inflatable harness which is deflated in said collapsed condition and inflated in said expanded condition.

13. The rescue apparatus of claim **9**, wherein said launcher is adapted to be hand-held for aiming and launching said missile.

14. The rescue apparatus of claim **8**, wherein compressed gas provides said self-propelled missile with sustained thrust substantially throughout its flight path.

15. The rescue apparatus of claim 8, wherein said launcher further includes a missile-receiving compartment generally parallel to said arm-receiving sleeve, wherein said missile is mounted at least partially within said missile-receiving compartment and more than one-half of a length of said missile-receiving compartment lies between a hand of the rescuer and the torso of the rescuer when the hand of the rescuer grips said hand grip.

16. The rescue apparatus of claim 8, further comprising a trigger actuateable to launch said missile, wherein said hand grip is gripped, in use, by a first hand of the rescuer, and said trigger is actuated by a second hand of the rescuer.

17. The rescue apparatus of claim 1, wherein approximately one-half of said missile lies between a hand of the rescuer and the torso of the rescuer when said missile is mounted on said launcher and the hand of the rescuer grips and said hand grip.

18. The rescue apparatus of claim 1, wherein said launcher further includes a missile-receiving compartment generally parallel to said arm-receiving sleeve, wherein said missile is mounted at least partially within said missile-receiving compartment and more than one-half of a length of said missile-receiving compartment lies between a hand of the rescuer and the torso of the rescuer when the hand of the rescuer grips said hand grip.

19. The rescue apparatus of claim 1, wherein an opposite end of said flexible line is connected to said launcher.

20. The rescue apparatus of claim 1, wherein said trigger is actuated by the second hand of the rescuer.

21. The rescue apparatus of claim 1, wherein said missile is mounted on said launcher in a generally empty state and is filled with compressed gas after being mounted.

22. Rescue apparatus comprising:

a launcher with a body-engaging portion comprising an arm-receiving sleeve and a hand grip for use by a rescuer in aiming said launcher;

a self-propelled missile releasably mounted on said launcher and launched therefrom, said missile being mounted on said launcher in a generally empty state and filled with compressed gas after being mounted; and

a trigger actuateable to launch said missile to a location remote from said launcher.

23. The rescue apparatus of claim 22, wherein approximately one-half of said missile lies between a hand of the

rescuer and the torso of the rescuer when said missile is mounted on said launcher and the hand of the rescuer grips said hand grip.

24. The rescue apparatus of claim 22, wherein said launcher further includes a missile-receiving compartment generally parallel to said arm-receiving sleeve, wherein said missile is mounted at least partially within said missile-receiving compartment and more than one-half of a length of said missile-receiving compartment lies between a hand of the rescuer and the torso of the rescuer when the hand of the rescuer grips said hand grip.

25. The rescue apparatus of claim 22, further comprising:

a flexible line having opposite ends, and one said end being carried by said missile to the location remote from said launcher.

26. The rescue apparatus of claim 22, further comprising:

a life-support item carried by said missile to the location remote from said launcher.

27. The rescue apparatus of claim 26, further comprising:

a flexible line having opposite ends and connected at one said end to said life-support item.

28. The rescue apparatus of claim 23, wherein said missile is charged with compressed air which serves as propellant for said missile.

29. The rescue apparatus of claim 22, wherein compressed gas provides said self-propelled missile with sustained thrust substantially throughout its flight path.

30. The rescue apparatus of claim 22, wherein at least a portion of said missile is adjacent to a forearm of the rescuer when said missile is mounted on said launcher and the forearm is received in said arm-receiving sleeve.

31. The rescue apparatus 22, wherein a first hand of the rescuer grasps said hand grip, and a second hand actuates said trigger.

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