

Aug. 31, 1954

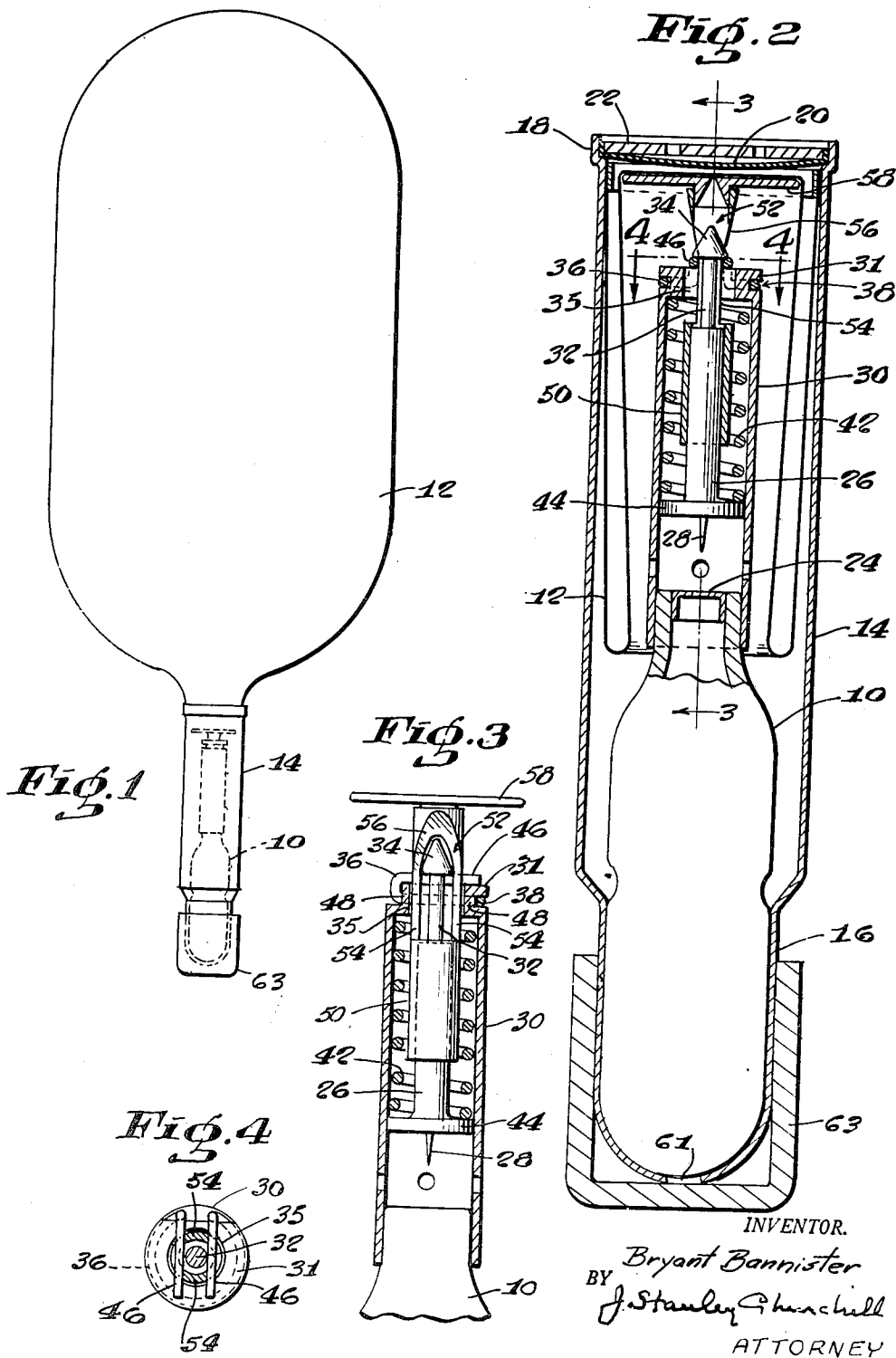
B. BANNISTER

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APPARATUS FOR REFLOATING SUBMERGED OBJECTS

Filed March 31, 1950

2 Sheets-Sheet 1



Aug. 31, 1954

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2 Sheets-Sheet 2

Fig. 5

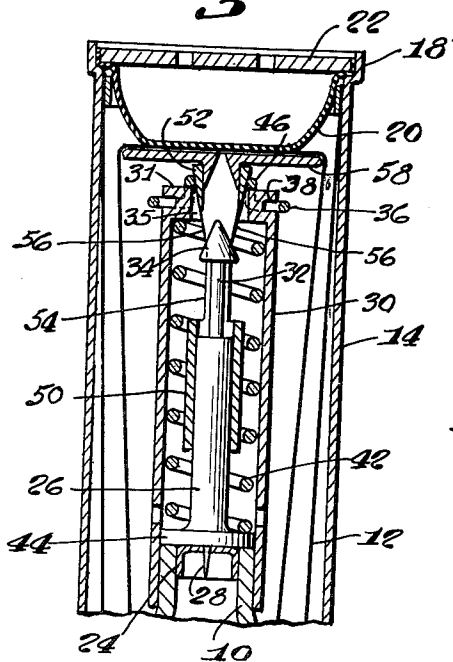


Fig. 10

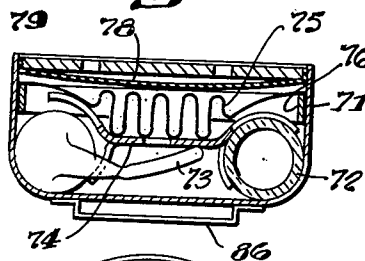


Fig. 11

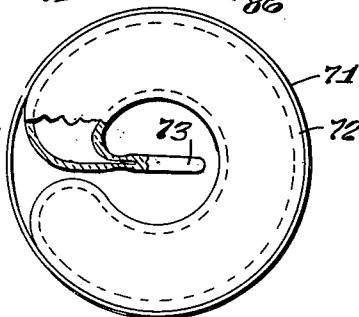


Fig. 6

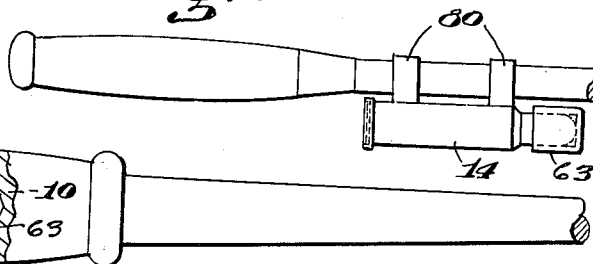


Fig. 7

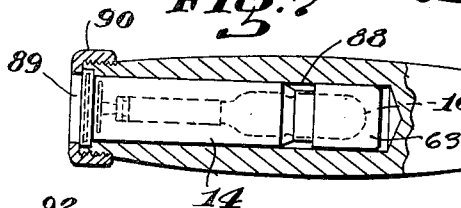


Fig. 8

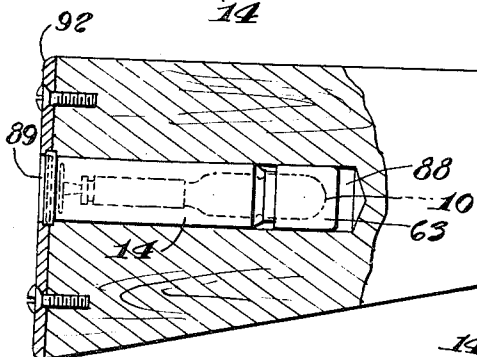
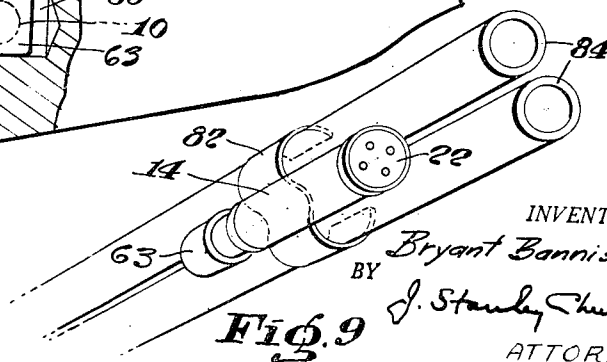


Fig. 9



INVENTOR.

Bryant Bannister

BY

J. Stanley Churchill

ATTORNEY

UNITED STATES PATENT OFFICE

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APPARATUS FOR REFLOATING SUBMERGED OBJECTS

Bryant Bannister, Pittsburgh, Pa.

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4 Claims. (Cl. 9—8)

1

This invention relates to apparatus for refloating a submerged object to which it is attached.

One object of the invention is to provide novel apparatus for refloating a submerged object to which it is attached, as for example, a fishing rod, gun, outboard motor, or other article or object which has been inadvertently dropped overboard.

The further object of the invention is to provide apparatus for refloating a submerged object to which it is attached, which is controlled in its operation by hydrostatic pressure of a predetermined depth of water, and which may be economically manufactured and which is adapted when attached to the article or object to interfere to a minimum degree with the normal and intended use of the object.

With these general objects in view and such other as may hereinafter appear, the invention consists in the apparatus for refloating a submerged object, and more particularly to apparatus of this character whose operation is responsive to predetermined hydrostatic pressure and in the various structures and arrangements and combinations of parts hereinafter described and particularly defined in claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention, Fig. 1 is a view of the present apparatus shown in its inflated condition; Fig. 2 is an enlarged cross-sectional view of the apparatus prior to inflation; Fig. 3 is a detailed view, partly in cross section, of the gas-releasing mechanism, the section being taken on line 3—3 of Fig. 2; Fig. 4 is a cross-sectional plan view taken on line 4—4 of Fig. 2; Fig. 5 is a view similar to Fig. 2 showing the parts in the position assumed immediately after the release of the gas pressure and prior to inflation of the apparatus; Fig. 6 is a view in side elevation illustrating the attachment of the present apparatus to a fishing rod; Fig. 7 is a side elevation of the parts in section illustrating the embodiment of the present apparatus within the handle of a fishing rod; Fig. 8 is a side elevation of parts in section illustrating the embodiment of the present apparatus in a gun stock; Fig. 9 is a perspective illustrating the attachment of the present apparatus to the underside of a double-barreled shotgun; Fig. 10 is a cross-sectional view of a modified form of the present refloating apparatus; Fig. 11 is a plan view with portions broken away and partly in section of the apparatus shown in Fig. 10.

In general the present invention contemplates novel and efficient apparatus for refloating sub-

2

merged objects, and particularly those which have been inadvertently dropped overboard to which the present apparatus is attached, and which in addition may be useful when embodied in life-saving apparatus and the like. The present apparatus embodies a reservoir or container of gas or volatile fluid which is capable of yielding a gas under pressure when released and provision is made for releasing the compressed gas when the apparatus has submerged to develop a predetermined amount of hydrostatic pressure. The apparatus embodies an inflatable member which is arranged to be inflated by the released gas to effect the refloating of the object to which present apparatus is attached.

Referring now to the drawings and particularly to Figs. 1 to 5, the invention is therein illustrated as embodying a sealed container 10 of a compressed gas or a volatile fluid, such as liquid carbon dioxide, and an inflatable member, such as a balloon 12 assembled in its deflated condition. Preferably, the container 10 and the deflated balloon are confined within an outer casing 14. The container 10 may comprise a commercially available carbon dioxide cartridge and, as herein shown, may be tightly fitted into a lower reduced diameter portion 16 of the outer casing, the upper end of the casing being provided with a shouldered portion 18 forming a seat for a thin elastic or flexible membrane seal 20 and an outer perforated closure disk 22 frictionally retained in the seat 18. The thin membrane is designed to be depressed when the object to which the present apparatus is attached has submerged to a predetermined depth to thereby develop a predetermined hydrostatic pressure. This movement of the membrane enables the hydrostatic pressure to be utilized in operating mechanism for effecting the release of the gas to inflate the balloon 12, as will be described.

The sealed mouth portion of the gas-producing cartridge 10 may comprise a relatively thin-walled member 24 adapted to be fractured or punctured by a spring-pressed punch or plunger 26 having a sharp pin 28 at its lower end, the plunger 26 being normally retained in its upwardly raised or spring-loaded position, as illustrated in Fig. 2 and being adapted when unlatched and released to cause the pin to pierce the cartridge and thus release the gas. When the apparatus has submerged to a predetermined depth, the parts are moved into a position to unlatch the plunger whereupon the heavy compressed spring 42 becomes operative to rapidly move the pin and associated parts into the position shown in Fig. 5.

The releasable plunger 26, as herein shown, is slidably mounted in a cylindrical sleeve 30 having an upper end wall 31, the lower end of the sleeve being open and tightly fitted over and frictionally retained or otherwise secured on the reduced diameter mouth portion of the cartridge 10. The upper end of the plunger 26 is provided with a reduced diameter portion 32 terminating in a conically shaped head 34 arranged to extend through an opening 35 in the end wall 31 and to cooperate with a spring wire catch 36 supported in a grooved portion 38 of the end wall to normally retain the plunger in its elevated position. A coil spring 42 supported within the sleeve 30 is interposed between the end wall 31 thereof and a collared portion 44 of the plunger, the spring 42 being arranged to force the plunger downwardly upon being released from the catch 36.

As herein illustrated, the spring wire catch 36 is generally circular in form and is provided with two parallel inwardly extended legs 45, the catch being arranged to be slipped into the grooved portion 38 with the legs 45 embracing the reduced diameter portion 32 under the head 34 of the plunger 26, and with the legs 46 also embracing opposed connecting portions 48 extending between the upper and lower faces of the groove 38 for retaining the catch in operative position in the end wall 31, as best shown in Fig. 4.

Provision is made for expanding the catch 36 by spreading the legs 46 to release the plunger head 34 and permit the plunger 26 to be urged downwardly by the coil spring 42 when the water pressure reaches a predetermined point sufficient to press the membrane 20 inwardly and to force the member 50 to spread the spring legs 46 apart. As herein shown, the tubular member 50 is slidably fitted into the opening 35 in the end wall 31 and over the head 34 and body portion of the plunger 26, so that the plunger or punch member is slidably supported within the tubular member 50. The tubular member is provided with opposed slots or cut-outs 52 forming opposed relatively narrow and substantially vertical connecting portions 54 and also forming angularly extended wedging surfaces 56 coextensive with the vertical portions 54. The connecting portions 54 are also embraced by the legs 46 of the catch, as indicated in Fig. 4, so that in operation, when the tubular member 50 is pressed downwardly by hydrostatic pressure the wedging surfaces 56 engage and spread the legs 46 apart to release the head 34. The upper end of the tubular member 50 is provided with a flanged disk 58 loosely fitted therein and over which the upper end of the deflated balloon 12 is supported, as illustrated.

In assembling the spring-pressed punch and releasing structure above described, the coil spring 42 and the plunger 26 may be first inserted into the lower open end of the sleeve 30 and the tubular wedge member 50 may be inserted through the top of the opening 35 and about the plunger 26. The spring 42 may then be compressed to extend the head 34 of the punch above the grooved portion 38 whereupon the catch 36 may be inserted into the groove to embrace the portions 32, 48, and 54 and to retain the parts in their normally locked position. The lower end of the sleeve 30 may then be frictionally or otherwise secured to the mouth of the cartridge 10, and the flanged member 58 fitted into the top of the tubular member. The balloon 12 arranged as shown in Fig. 2 is supported on the disk 58 and the free end of the balloon is secured to the

casing by the retaining ring driven within the mouth of the casing. The closure members 20, 22 are then fitted into position within the mouth of the casing to complete the assembly.

From the description thus far, it will be seen that when the article or object to which the present apparatus is attached has been inadvertently dropped overboard and that when the device has submerged in water to a predetermined depth, the hydrostatic pressure developed, acting through apertures in the closure member 22, causes the thin membrane 20 to exert pressure at the rate of one pound per square inch per 2.3 feet of submergence, this pressure being exerted upon the disk 58 at the upper extremity of the wedge. This pressure forces the disk and wedge to which it is loosely connected, downwardly spreading the two arms 46 of the latching spring. When the downwardly movement has spread the arms of the latching spring sufficiently, the conical head of the plunger is released, allowing the plunger to travel downwardly, puncturing the gas bomb as the helical spring forces the plunger downwardly. The helical spring assumes its free length about the full travel of the plunger, and the gas which, in the case of the usual carbon dioxide bomb, is released at about 1,000 pounds per square inch forces the puncturing needle away from the puncture and allowing the gas to flow out through the gas release opening. Pressure almost instantly fills up both inside the collapsed balloon and in the annular space around the balloon. The pressure being confined within the casing quickly builds up sufficiently to force out of the casing the upper closure member 22, the balloon and the top disk. The thin rubber-like membrane, which prevents water from entering the casing, is also ruptured allowing free escape of the balloon, which at atmospheric pressure, assumes a volume of about 277 cubic inches and has surface buoyancy of about 10 pounds. These figures are based upon the gas content of the usual bombs which are now employed to produce carbonated water in home dispensers and which are sufficient for most of the purposes for which the present apparatus is intended for use. It will be understood, however, that more buoyancy may be obtained utilizing larger balloons and gas bombs of greater gas content.

It will also be observed that the hydrostatic pressure required to release the puncturing plunger can be varied at will by varying the wedge angle of the wedge member, by varying the stiffness of the latching spring, and also by varying the amount of pressure required to compress the plunger-energizing spring. For instance, assume that only the wedge angle is altered from 45° included angle to 15° included angle, all other values remaining the same; then one pound downward thrust on the wedge would produce a spreading force of about 2.6 pounds for the 45° angle and 7.7 for the 15° angle. Friction will reduce these figures somewhat but proportionally and to no great extent with proper selection and treatment of materials employed in the construction of the device. It follows from the above figures that the submergence necessary to trip the device will be about three times as great for the 45° wedge angle as for the 15° angle. The actual tripping depth measured in feet can also be controlled by varying the area of the top disk which is subjected to the hydrostatic pressure; thus, if this area be one square inch, there would be a thrust of one pound for each 2.3 feet of submergence, and if the disk area was two square

5

inches, the thrust would be two pounds for each 2.3 feet of submergence. The device as described would be particularly applicable to insertion in a fishing rod butt section or clipped to the rod, or a tackle box, or into the butt of a gun, and would have ample buoyancy to refloat such articles of considerable weight.

In order to permit replacement of the gas cartridge, I prefer to provide a finger hole 61 in the bottom of the casing 14 and to provide the casing with the frictionally held cap 63 for closing the hole 61. In this manner the cartridge may be dislodged by the finger when the cap is removed.

Other applications requiring greater buoyancy or possibly a modified shape are readily within the scope of this invention. For instance, greater buoyancy for refloating a dropped outboard motor can be obtained by increasing the gas capacity of the bomb and related parts. For life saving, where the device might be attached to a person's belt, the shape of the device might preferably be more disk-like than tubular.

Referring now to Figs. 10 and 11, a modified form of the present refloating apparatus is shown therein. Such modification includes a cup-shaped metal container 71 enclosing an annular sealed glass container 72. The glass container 72 is provided with a sealed tip 73 at one end thereof by which a gas under pressure or a volatile liquid may be sealed with the glass container. Either compressed air or hydrogen or a volatile liquid, such as methyl chloride, may be used, although if desired other sources of gas pressure may be used. The glass tip 73 is arranged to extend into a position such that the end of the glass tip is engaged by a circular disk 74, which is perforate and held in the position shown in Fig. 10 by being supported at one end on one portion of the glass container 72 and with the central portion thereof engaging the end of the glass tip 73. A balloon 75 is secured between the casing 71 and a retaining ring 76, as shown, and the usual flexible membrane 78 and perforated retaining disk 79 are provided to form a closure for the open upper end of the metal container 71. When the device is submerged to a predetermined depth the hydrostatic pressure developed will force the membrane 78 inwardly, exert pressure on the disk 74 to force it downwardly, thus breaking off the seal 73 and permitting the gas to emerge under high pressure from the glass container and thus inflate the balloon. This action displaces the membrane and retaining disk 79 permitting the balloon to inflate substantially as shown in Fig. 1.

In order to permit the present refloating apparatus to be conveniently attached to various articles that it is desired to effect the refloating thereof in the event that the articles are dropped overboard, I preferably provide suitable means for the attachment of the apparatus to the article. For example, in Fig. 6 a pair of clips 83 are illustrated as attached to the body portion of the casing 14 by welding or otherwise and by which the apparatus may be conveniently clipped to the fishing rod in the manner illustrated in Fig. 6. As shown in Fig. 9 a single clip 82 may be provided on the body portion of the casing 14 designed to enable the apparatus to be clipped under the two barrels 84 of a double-barreled shotgun. As illustrated in Fig. 10 I may provide the casing with a loop member 86 through which a strap may be passed to secure the casing to the object. As illustrated in Figs. 7 and 8 the present apparatus may be made in a size suitable to be fitted into a preformed hole 88, bored or other-

6

wise formed in the handle of a fishing rod, as shown in Fig. 7 or in the butt of a gun stock, as shown in Fig. 8. A suitable opening 89 will be provided in the ferrule 90 and shoulder plate 92 to permit the inflation of the balloon when the fishing rod or gun has been submerged to a predetermined depth.

While various sources of gas under pressure may be used for producing the balloon-inflating gas I prefer to employ carbon dioxide for this purpose. This gas is nontoxic, and the physical properties are very suitable in regard to pressure in the liquid state at normal temperatures. It possesses a low compressibility factor of about 0.2 at room temperature, which means that about five times as much gas can be compressed into a given volume as would be the case if Boyle's law were followed. Finally, many of the carbon dioxide bombs on the market which are at the present used domestically lend themselves for use with many applications of the present invention.

Having thus described the invention, what is claimed is:

1. Refloating apparatus particularly adapted for use in refloating inadvertently submerged objects, comprising a tubular outer casing capable of attachment to the object to be refloatated and openable at one end, an inflatable member having its free end secured to the casing and being disposed in its deflated condition inside of the casing in a position to be displaced from the casing through the openable end thereof, a gas container disposed within the casing at a distance from the open end thereof and provided with a breakable seal, mechanism mounted within the casing between the inflatable member and the gas container for automatically breaking the seal to release gas pressure to within the casing when the casing becomes submerged to a predetermined depth to thereby displace the inflatable member from the casing and inflate the same by means of the gas thus released, the open end of the casing being normally provided with displaceable means for preventing the admission of water to within the casing, said mechanism comprising a punch, a loaded compression spring for actuating the punch, a catch for holding the spring under compression until released, and catch releasing means responsive to predetermined hydrostatic pressure exerted thereon through the open end of the casing.

2. Refloating apparatus particularly adapted for use in refloating inadvertently submerged objects, comprising a tubular outer casing capable of attachment to the object to be refloatated and being openable at one end, an inflatable member having its free end secured to the casing and being disposed in its deflated condition inside of the casing in a position to be displaced from the casing through the open end thereof, a gas container disposed within the casing at a distance from the openable end thereof and provided with a breakable seal, mechanism mounted within the casing between the inflatable member and the gas container for automatically breaking the seal to release gas pressure to within the casing when the casing becomes submerged to a predetermined depth to thereby displace the inflatable member from the casing and inflate the same by means of the gas thus released, the open end of the casing being normally provided with displaceable means for preventing the admission of water to within the casing, said mechanism comprising a punch, a housing mounted on the gas container within which the punch is guided in its

movement, a compression spring within the housing and cooperating with the punch to actuate the same, a spring catch between the punch and the housing for normally holding the spring under compression, and hydrostatic pressure responsive means for releasing the catch when the casing has been submerged to a predetermined depth.

3. The refloating apparatus as defined in claim 2 wherein the hydrostatic pressure responsive means for releasing the catch comprises a wedge member.

4. Refloating apparatus for use in refloating an inadvertently submerged object comprising a tubular casing member capable of attachment to the object, a container within the casing for holding compressed gas, an inflatable member disposed within and attached to said casing member and connected to said gas container, a resilient pressure-responsive membrane member positioned within said casing member, gas-release mechanism within the casing actuated when a predetermined amount of hydrostatic pressure is exerted upon said resilient membrane, said gas-release mechanism comprising a punch for punc-

turing the gas container to release the gas to inflate the inflatable member, a housing mounted upon said container in which the punch is guided, a compression spring cooperating with the punch, a catch for retaining the spring and punch out of contact with the gas container, and a wedge cooperating with said catch and actuated by the force of the predetermined hydrostatic pressure exerted upon the membrane member thereby to release said catch, spring and punch.

References Cited in the file of this patent

UNITED STATES PATENTS

	Number	Name	Date
15	1,166,651	Beck et al.	Jan. 4, 1916
	1,476,387	Atwell	Dec. 4, 1923
	1,490,157	Cherniak	Apr. 15, 1924
	2,073,688	Freygang	Mar. 16, 1937
20	2,192,450	Miller	Mar. 5, 1940

FOREIGN PATENTS

	Number	Country	Date
	13,859	Great Britain	of 1906
	359,931	Italy	July 8, 1938
25	364,931	Italy	Nov. 19, 1938