AUTOMATICALLY INFLATABLE FLOTATION DEVICE FOR BATHING SUITS

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Fig. 10

Fig. 11

Fig. 12

Fig. 13

Fig. 15

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This invention relates generally to automatically inflatable bathing suits, and more particularly to a bathing suit having a flotation member which is automatically inflated upon reaching a pre-selected depth under water.

Buoyant clothing having flotation devices usually have one or another of the following disadvantages: The flotation device is bulky and unsightly in appearance. If the device is automatically inflatable upon immersion in water, it cannot be worn in the water in connection with a bathing suit without disabling the automatic inflation device. Inflatable flotation devices that are concealed in an article of clothing such as bathing trunks are not usually adapted to assume a position on the swimmer which will keep his head above water especially if the swimmer has been rendered unconscious. Many inflation devices must be manually operated, or, if automatically operated upon reaching a certain depth under water, this depth may not be selectively predetermined by the swimmer.

Most swimmers, especially those with some competence, do not wish to appear as if they are wearing a safety device, and yet a swimmer may desire a flotation device which will automatically inflate and keep his head above water if he meets with some accident rendering him unconscious, such as striking the head while diving.

The primary object of the present invention, accordingly, is to provide a safety device including a flotation member which may normally be concealed in abbreviated bathing attire such as swimming trunks while bathing, but which will be automatically inflated upon reaching a pre-selected depth and will maintain that position designed to keep the wearer's head above water.

Another important object is to provide a flotation device for swimmers which is automatically inflated upon reaching a predetermined depth below the surface of the water, which predetermined depth may be selectively regulated by the swimmer at any time over a range of depths which permits the swimmer activity, such as in diving, below the surface of the water.

A further object is to provide a flotation device which may normally be worn concealed in scanny bathing attire and which may be regulated to automatically inflate at any selected depth, or which at the wearer's option may be prevented from inflating at all.

Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a front perspective view of a swimmer wearing the inflated device of the present invention in connection with a pair of trunks;
FIGURE 2 is an enlarged front perspective view of the inflated flotation member of FIG. 1;
FIGURE 3 is an enlarged front elevational view of the trunks of FIG. 1;
FIGURE 4 is an enlarged fragmentary view of a portion of the trunks shown in FIG. 3;
FIGURE 5 is an enlarged plan view of the top of the trunks of FIG. 3;
FIGURE 6 is an enlarged sectional view on the line 6-6 of FIG. 3 showing schematically the flotation member in its normal folded position;
FIGURES 7 and 8 are views similar to FIG. 6 showing the flotation member slightly inflated and almost fully inflated, respectively;
FIGURE 9 is a posterior side view of the gas release housing shown in FIG. 4;
FIGURE 10 is a sectional view on the line 10-10 of FIG. 4;
FIGURES 11, 12 and 13 are sectional views on the lines 11-11, 12-12, and 13-13 respectively of FIG. 10; and
FIGURES 14 and 15 are enlarged end and front side elevational views, respectively, of the gas release housing shown in FIGS. 4 and 9.

In the drawings, the flotation device, including a flotation member 10, is shown in connection with a pair of trunks 11, in its inflated state in FIG. 1 and in its normal concealed or uninflated state in FIG. 3.

The annular flotation member 10 best seen in FIG. 2 is normally folded flat in circumferentially disposed plells 12, as shown in FIG. 6, in an upwardly opening pocket 13. Pocket 13 may be formed in a belt separate from trunks 11, it will be understood, but in the preferred form of the invention pocket 13 is formed by a layer of elastic material 14 stitched at 15 to the belt portion 16 of trunks 11. Both the layer 14 and belt portion 16 of the trunks are expandable so that they may be put on by the wearer in the usual manner.

Pocket 13 is normally closed by the snap fasteners 17-17, which open comparatively easily so that the pocket is self-opening upon inflation of the member 10. The layer 14 of the pocket extends completely around the trunks 11 as shown in FIG. 5, and is provided at the front with button holes 18 and an aperture or window 19 as best seen in FIG. 4, for reasons which will hereinafter become apparent.

For inflating the member 10, it is provided with nipples 20 to which are secured flexible tubes 21 that lead to an inflating or gas-releasing housing 25 and are normally also contained in the pocket 13.

The housing 25 is rectangular and is provided with nipples 20 at either end to which tubes 21 are secured. The posterior side of housing 25 is provided with a recess 28 (FIG. 9) having an end piece 29 slidably removable in one end wall of the housing as best seen in FIGURES 9, 10 and 12. Piece 29 retains a compressed gas container or cartridge 30 in recess 28 in the housing, the neck 31 of the container being engaged in a resilient gasket 32, in conventional manner, and having at its end a puncturable solder or soft metal seal 33.

The sealed end of container 30 is in communication with one portion 34 of a central sealed chamber 35 in the housing 25, which chamber is made up of several communicating portions. In portion 34 of the chamber, a sharp punch or needle element 36 for piercing seal 33 and releasing the gas in the container, is carried on one end of an arm 37 which, in turn, is secured to the end of a plunger rod 38. The other end of arm 37 is guided in a slot 39 in the wall of chamber 35.

The other end of rod 38 has a plunger 40 secured thereto adapted to slide in a bore 41 which comprises another communicating portion of chamber 35. A coil spring 42 biases plunger 40 and its associated parts in a direction designed to carry punch 36 from a spring loaded position as shown, to a position in which it punctures seal 33 and releases gas from the container.

Plunger 40 is normally held in the spring-loaded or cocked position by a detent or trigger member 45, as best seen in FIGURE 13. The detent member 45 is a lever pivotally secured at its center by an appropriate pin 46 to ears 45', formed on the portion 47 of the housing body between bore 41 and a rectangular recess 48 at the front side of housing 25.

The recess 49 forms part of central chamber 35 and communicates with bore 41 through the slot 49 in the housing portion 47 in which the lever 45 lies. The detent end 50 of lever 45 is hooked over the plunger 40,
3 as shown, and the other or trigger end 51 of the lever normally projects into recess 48.

A movable pressure plate element 52 lies in recess 48 and is hinged by secured at 53 to one end wall of housing 25. Between pressure plate 52 and the front outer wall 54 of housing 25 a flexible diaphragm 55, indicated in the drawings by a thickened line, is peripherally clamped and sealed to the walls of the housing by the outer wall 54 which is secured by appropriate fasteners 56 and adhesive.

The front outer wall 54 has a perforate portion 57 at its center but the recess 48 is sealed by diaphragm 55 from communication with the outside of the housing. The perforate portion allows the diaphragm to flex in response to depth-induced pressure when housing 25 is submerged in water. The perforations in wall 54, on the other hand, are small so that diaphragm 55 is protected from sudden surges in the water caused by movement in the water.

The pressure plate 52 is normally biased and held in contact with diaphragm 55 and against the wall 54 by a water pressure resisting coil spring 58. Spring 58, best seen in FIGURE 11, is carried on the reduced end 59 of a screw 60 which is axially slideable in a hole 61 through a portion of the housing. A slot 62 extending from one edge of housing 25 contains a regulator dial wheel 63 which is threaded on the screw 60. The end of screw 60 opposite the reduced end 59 and the cooperating portion 64 of hole 61 are square to prevent screw 60 from turning when dial 63 is turned. A suitable resilient sealing washer carried on screw 60, but not shown in FIG. 11 in the interest of clarity, prevents the admission of water through the hole 61 into the recess 48 of the housing.

The peripheral edge of dial 63 has a scale 65 thereon calibrated with respect to the resilience of spring 58 to enable the wearer of the device to regulate the setting of dial 63 in terms of depth under water at which gas will be automatically released.

It will also be noted that, by turning dial 63, the screw 60 may be advanced so that the reduced end 59 bears against plate 52 and locks it in place.

In operation, the flotation member 10 and the inflation device housing 25 together with the connecting tubes 21 are all normally carried in pocket 13 as described. Housing 25 may be provided with button-like projections 66 which engage button holes 18 (FIG. 4) in the pocket and the window 19 in belt portion 14 provides immediate contact of the water with the housing 25 when the swimmer enters the water. A separate pocket 67 (FIG. 5) may be provided in the belt portion 14 so that the slight bulge occasioned by the housing 25 may take on the appearance of a belt buckle.

When the swimmer enters the water he inserts a finger into pocket 13 and turns dial 63 to back the screw 60 away from plate 52. If diving or other underwater activity is contemplated he may regulate the gas release point in terms of depth by referring to the scale 65 on the dial.

When the swimmer for any reason reaches the critical depth, which has been selectively predetermined by setting the dial 63, the depth-induced water pressure, exerted through the perforations in the wall 54 on the diaphragm 55 and pressure plate 52 thereunder, overcomes the preset resistance of spring 58. This causes plate 52 to move inward and to the trigger end 51 of the lever 45 where the latter is locked about its pivot pin 46. The detent end 50 is thus withdrawn from engagement with plunger 40 allowing spring 42 to carry the plunger and rod 38 to the right as shown in FIGURE 13. Arm 37 (FIG. 10) is also carried to the right and the gas release punch 36 pierces seal 33 of the container.

When the seal is broken, the compressed gas in container 30 escapes into the central chamber 35, through nipples 26 and tubes 21 and inflates the flotation member 10.

10. As indicated in FIGURES 6-8, the member 10 opens the snaps 17-17 by expanding and member 10 leaves the pocket 13. Even if the swimmer is unconscious at the time, the air remaining in his lungs before drowning maintains his body in at least a partially up-right position in the water and the now dilated member 10 slides up under the arms of the swimmer. It will be noted that the flotation member 10 is smaller under the arms than at the front or rear of the swimmer so as not to impede his swimming if he is conscious but so as to keep his head and face out of the water if he is unconscious.

It will be apparent that the device is small and normally well concealed. It has been found, however, that despite the small size of the housing 25 and the consequent smallness of the gas containers 30, sufficient compressed gas, usually carbon-dioxide, is contained to completely inflate a flotation member whose average thickness diameter around and along the annulus is 7.6 inches. This gives a flotation volume of about one cubic foot and results in a buoyant force of about 60 pounds or about 1⁄4 to 1⁄2 the weight of the average heavy person. This has been found to be sufficient to keep the swimmer's head and shoulders above water.

New or partially inflated members are easily inserted after the device has been operated and the flotation member can easily be deflated and folded again for reuse.

Although a cylindrical container or cartridge 30 has been shown, it will be apparent that a considerable saving in space may be obtained by using a rectangular container. Using a flat rectangular container the housing 25 may be made of five inches long, two inches wide, and only one-quarter inch thick.

As will be apparent to those familiar with the art, the invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The embodiment disclosed is therefore to be considered in all respects as illustrative rather than restrictive, the scope of the invention being indicated by the appended claim.

What is claimed is:

1. An automatically inflatable safety device for a bathing suit having a belt which has an annular pocket therein and an annular inflatable flotation member normally folded flat in said pocket, a water pressure responsive gas release device comprising: a gas releasing housing in said pocket having a puncturable container normally containing compressed gas, a conduit means operatively connecting the housing and said flotation member, said housing having a diaphragm therein flexible in response to depth-induced water pressure, a pressure plate in the housing adjacent said diaphragm, said pressure plate being inwardly movable by the flexing of said diaphragm, gas release means for puncturing said gas container, normally spring loaded means for actuating said gas release means, detent means normally holding said spring loaded means in spring loaded position and adapted to be disengaged from the spring loaded means by the inward movement of said pressure plate, a pressure resisting spring biasing said plate outwardly of the housing, a regulator screw supporting said pressure resisting spring in the housing, and a pressure regulator wheel projecting from the housing and threadedly carried by said regulator screw, said screw being adapted to regulate the pressure exerted by said pressure resisting spring on said pressure plate when said regulator screw is turned to selectively predetermine the water depth at which said gas release means is actuated, said housing having a perforate member covering said diaphragm whereby said diaphragm and pressure plate are responsive to under water depth pressure and the perforations in said perforate member being sized to render said diaphragm unresponsive to sudden surges in the water.

(References on following page)
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<thead>
<tr>
<th>References Cited in the file of this patent</th>
<th>5</th>
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<tbody>
<tr>
<td>UNITED STATES PATENTS</td>
<td></td>
</tr>
<tr>
<td>1,704,197 Journey</td>
<td>Mar. 5, 1929</td>
</tr>
<tr>
<td>1,849,637 Peternella</td>
<td>Mar. 15, 1932</td>
</tr>
<tr>
<td>2,470,457 Bancora</td>
<td>May 17, 1949</td>
</tr>
<tr>
<td>2,625,954 Klein</td>
<td>Jan. 20, 1953</td>
</tr>
<tr>
<td></td>
<td>2,784,426</td>
</tr>
<tr>
<td></td>
<td>2,869,151</td>
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<td></td>
<td>2,903,718</td>
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<td>2,946,484</td>
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<tbody>
<tr>
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<th>FOREIGN PATENTS</th>
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<tr>
<td>France</td>
<td>Mar. 26, 1952</td>
</tr>
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