United States Patent

[11] **3,632,066**

[72] Inventors **George M. Brown**
St. Petersburg;
Phyllis L. Newman, Miami, both of Fla.

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[45] Patented **Jan. 4, 1972**
[73] Assignee **Sauna International Inc.**
Miami, Fla.

[54] **AUTOMATIC PARACHUTE HARNESS RELEASE ASSEMBLY**
30 Claims, 15 Drawing Figs.

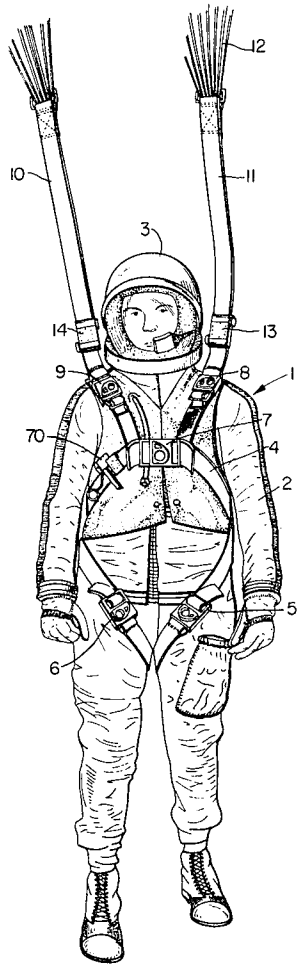
[52] **U.S. Cl.** **244/151, 24/73**
[51] **Int. Cl.** **B64d 17/30**
[50] **Field of Search** ..... 244/151; 24/73, 73 PH, 201; 9/325, 324, 311

[56] **References Cited**
UNITED STATES PATENTS

3,023,498	3/1962	Temple et al.	244/151 X
3,246,801	4/1966	DeBoer	9/325 X
3,404,439	10/1968	Jones et al.	244/151 X

Primary Examiner—Milton Buchler
Assistant Examiner—Carl A. Rutledge
Attorney—Fidelman, Wolffe & Leitner

ABSTRACT: An automatic releasing mechanism for parachute harnesses which employs water-actuatable cells to provide thermal energy to burn through harness control straps and to operate a pneumatic release mechanism to automatically open the harness buckles to free a wearer therefrom upon a water landing. A manual release is also provided to activate the pneumatic release mechanism to open the harness buckles after a landing on firm terrain.



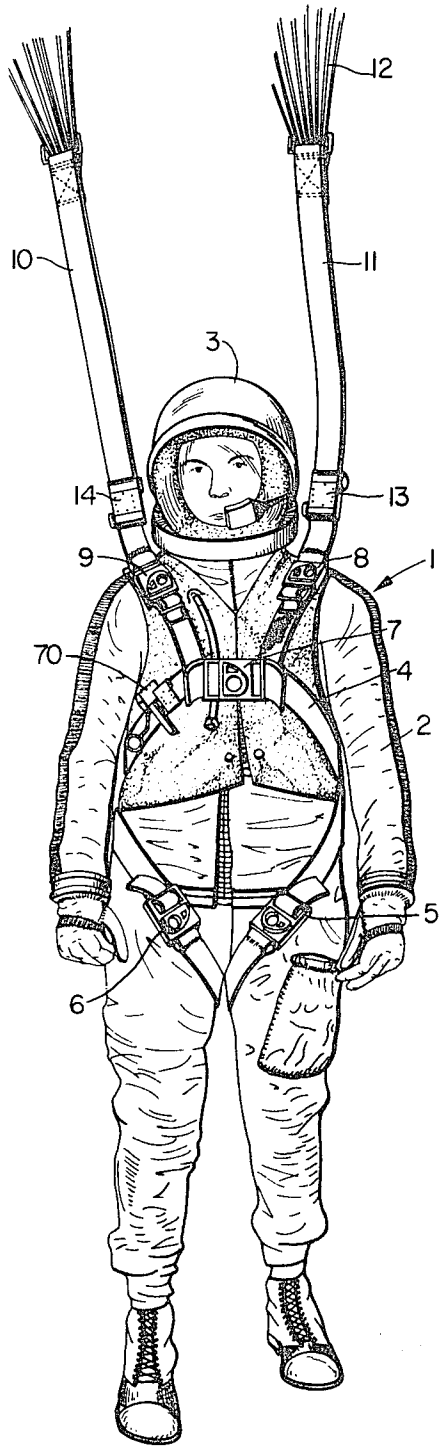


FIG. 1

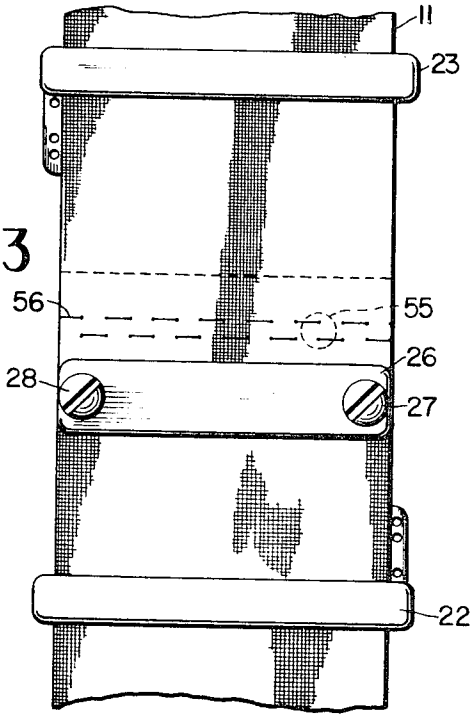
INVENTOR

GEORGE M. BROWN
PHYLLIS L. NEWMAN

BY Fidelman, Wolffe & Leitner

ATTORNEYS

FIG. 3



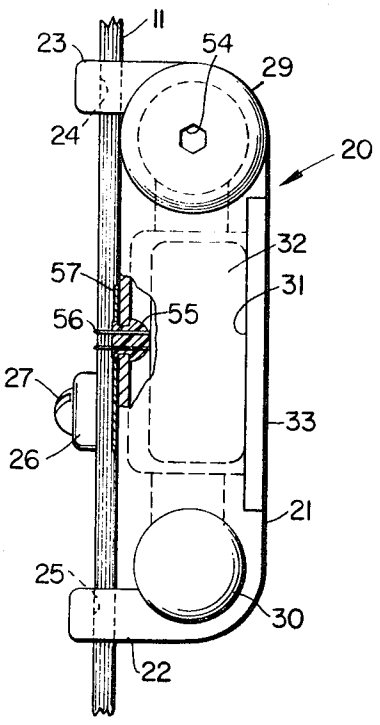


FIG. 2

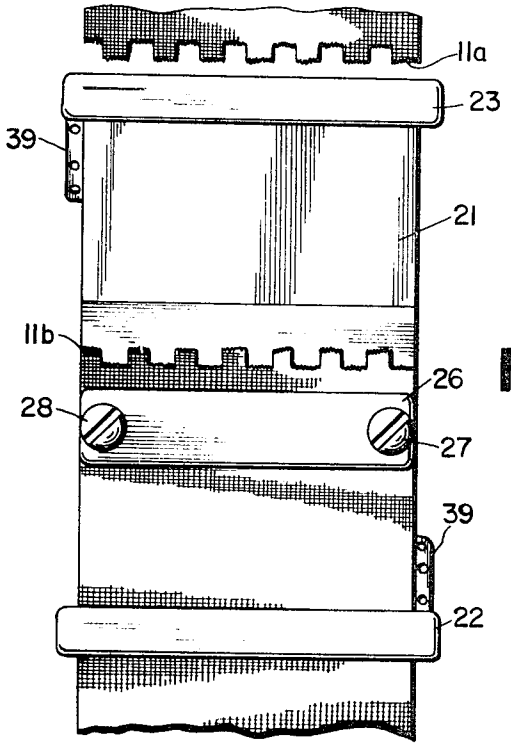


FIG. 4

INVENTOR
GEORGE M. BROWN
PHYLLIS L. NEWMAN

BY Fidelman, Wolffe & Leitner

ATTORNEYS

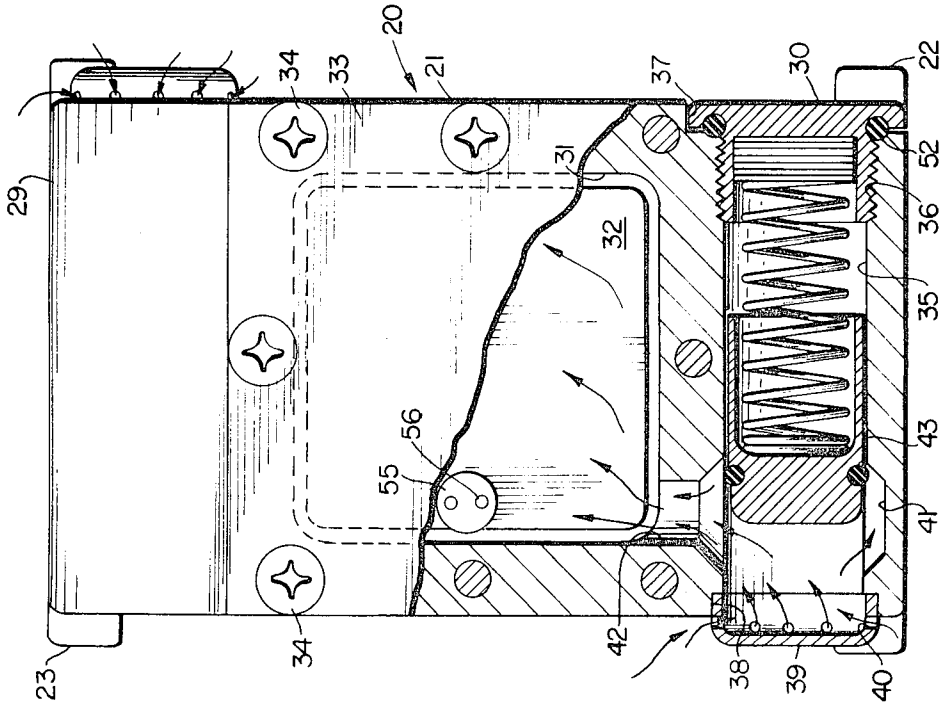


FIG. 6

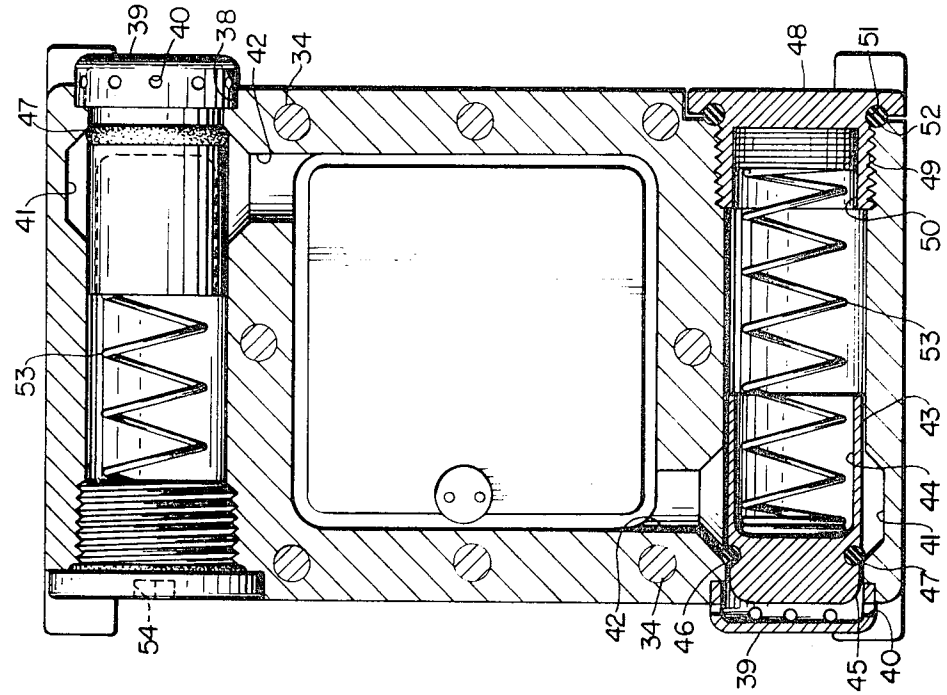


FIG. 5

INVENTOR

GEORGE M. BROWN
PHYLLIS L. NEWMAN

BY Pollman, Hoffe & Fister

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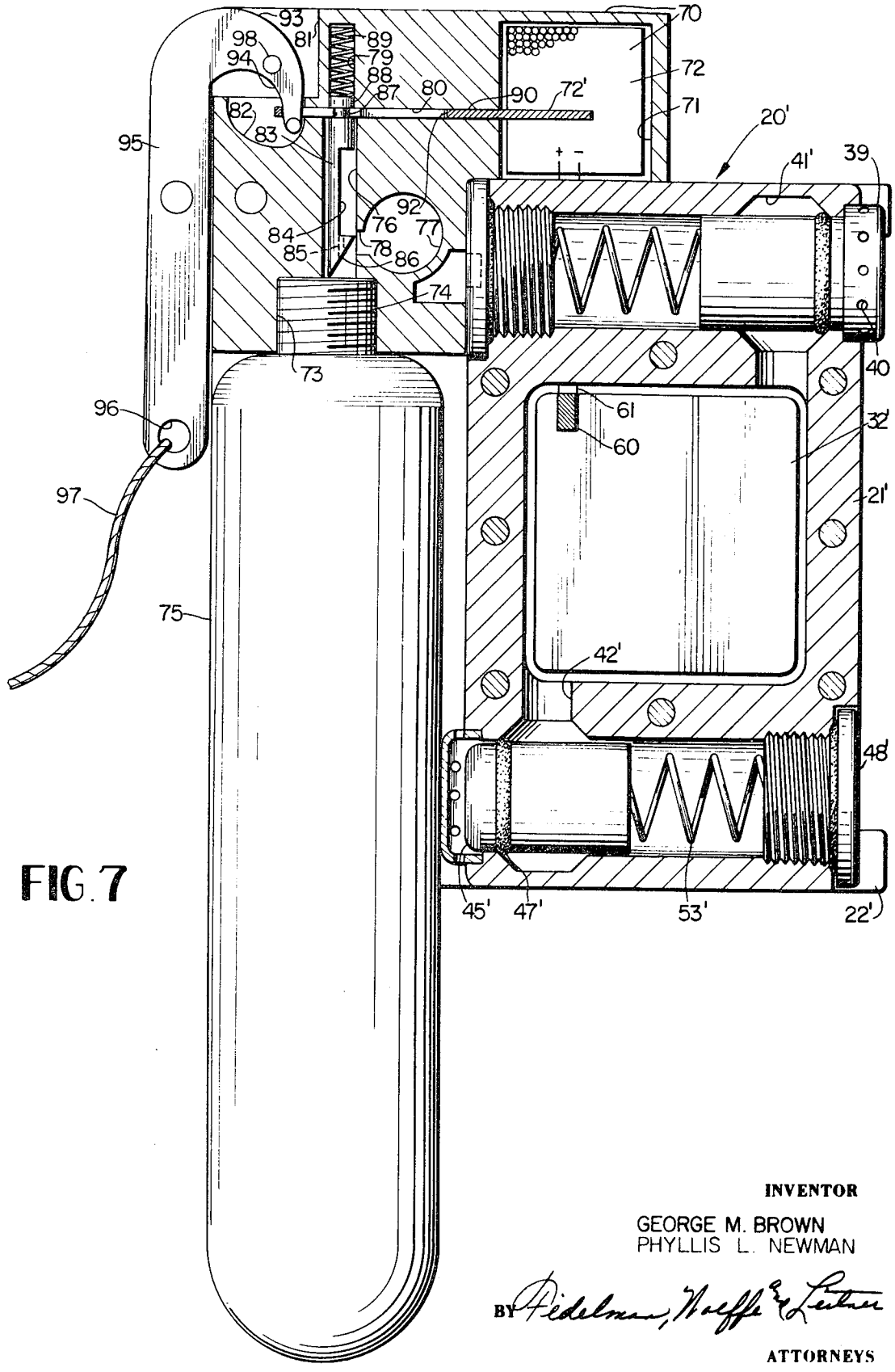


FIG. 7

INVENTOR

GEORGE M. BROWN
PHYLLIS L. NEWMAN

BY Fidelman, Wolffe & Leitner

ATTORNEYS

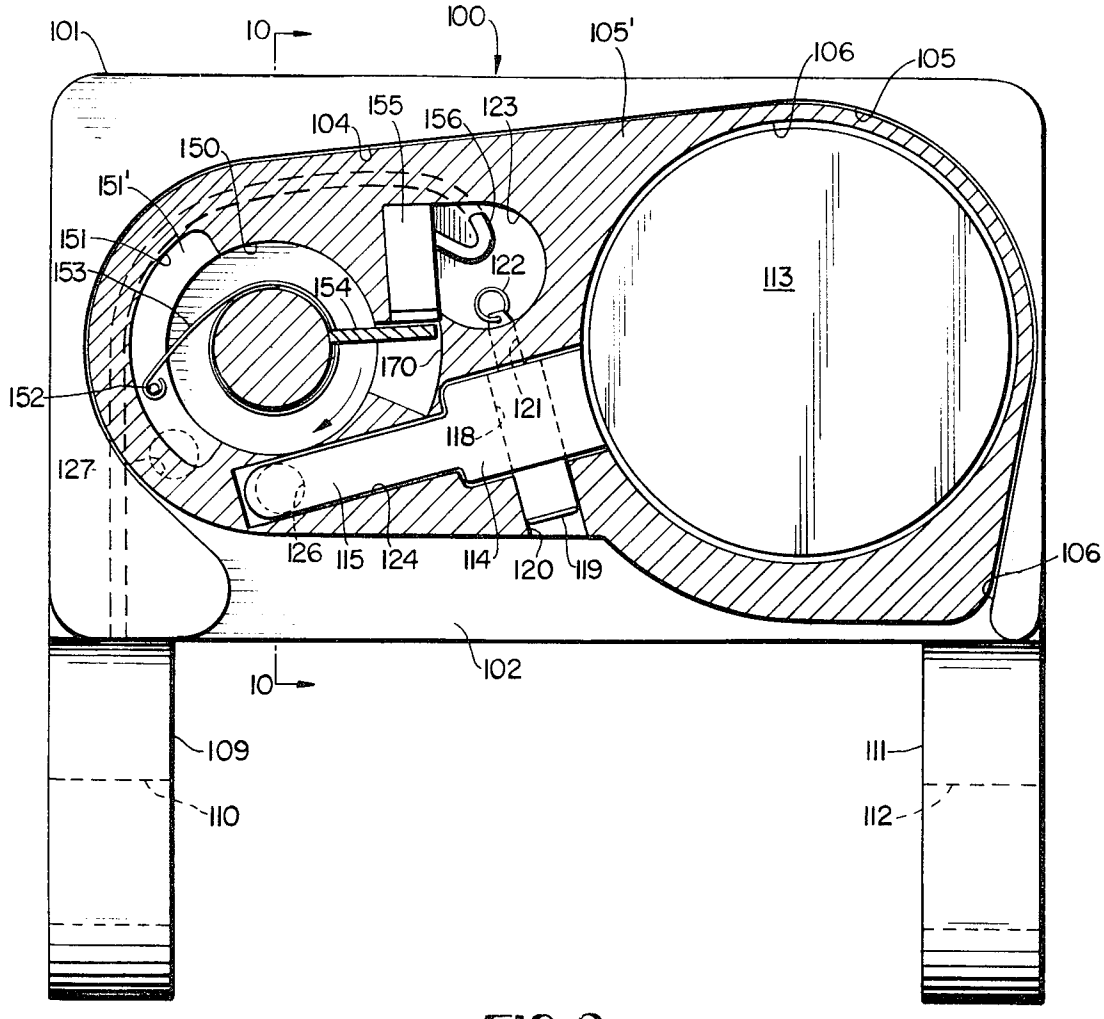


FIG. 9

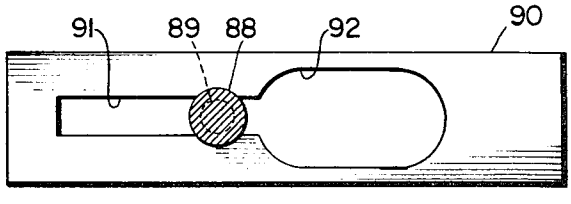


FIG. 8

INVENTOR
GEORGE M. BROWN
PHYLLIS L. NEWMAN

BY Friedman, Wolffe & Leitner

ATTORNEYS

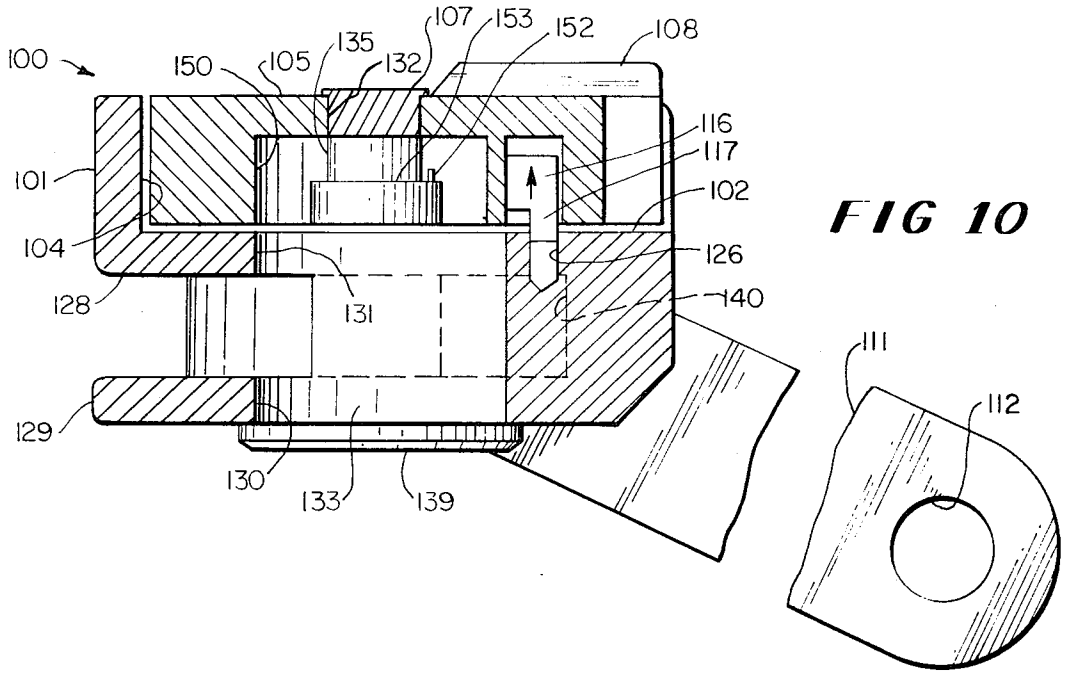


FIG 10

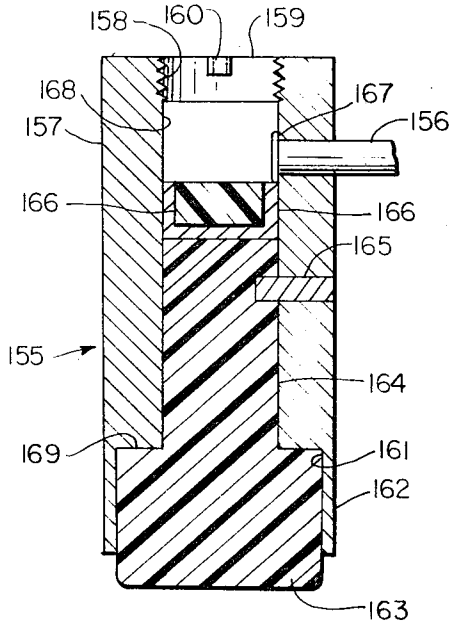


FIG 11

INVENTOR.
GEORGE M. BROWN
PHYLLIS L. NEWMAN

BY
Friedman, Wolffe & Leitner
ATTORNEY

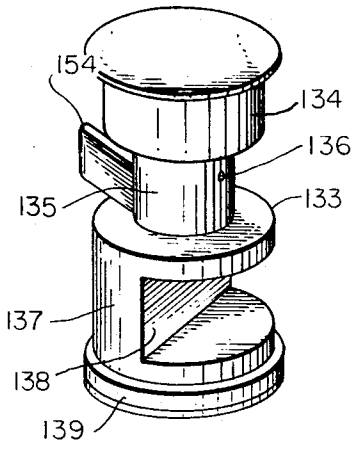


FIG 12

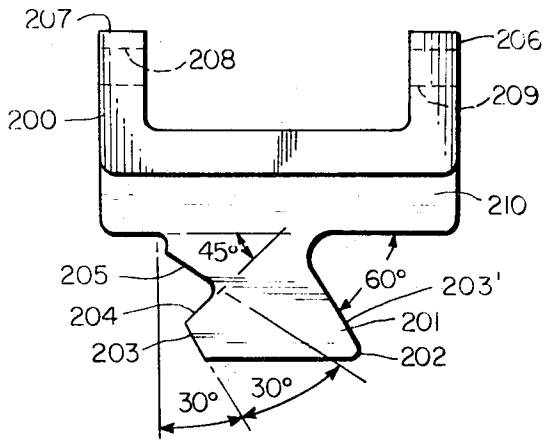
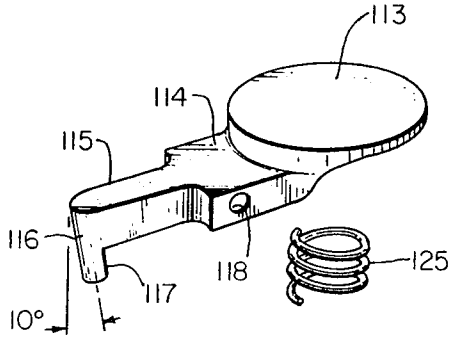


FIG 13



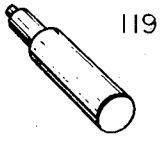


FIG 14

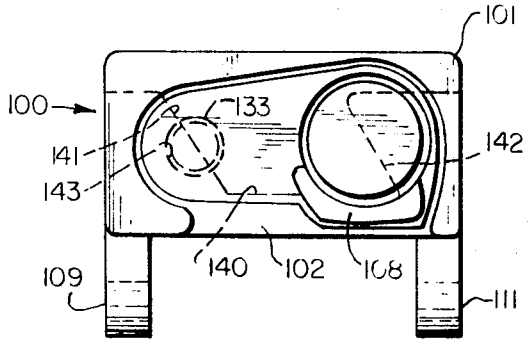


FIG 15

INVENTOR.
GEORGE M. BROWN
PHYLLIS L. NEWMAN
BY
Friedman, Wolff & Leitner
ATTORNEY

AUTOMATIC PARACHUTE HARNESS RELEASE ASSEMBLY

This invention relates to parachutes and like structures and particularly to automatic release mechanisms for the harness portions thereof. Specifically this invention relates to water-actuatable releases which, when submerged, provide severing action for harness belts whereby a parachutist is automatically released from his harness structure upon a water landing.

The parachute has brought with it obvious advantages and a number of problems to the wearer among which the difficulty of extraction therefrom after landing is paramount. This liability is increased when the landing is in water, the canopy tending at times to either completely encase the exposed portions of the chutist or alternatively act to drag him by wind still caught in the canopy. If the chutist has been injured or is unconscious, these problems are compounded to the point where an otherwise safe landing may terminate in the drowning of the chutist.

Automatically inflating life jackets, of course, substantially decrease the incidence of accidental drowning but still do not solve the problem of drag or envelopment by the chute. Obviously these latter situations could be rectified by automatic release mechanisms for the harness support but to date no satisfactory device has been designed therefor. The failure of such development appears to be based on the theory that automatic harness release should be accomplished at the buckles, and other standard release mechanism. This has resulted in cumbersome devices which have not performed satisfactorily for both the release and buckling requirements. Here we have a situation where the requirements of the buckle are incompatible with the criteria of the automatic escape mechanism, the former having high-strength, weathering, and locking characteristics, the latter only requiring automatic web severing.

This invention provides water actuatable cells for (1) automatically severing the control webs from the harness and (2) automatically operating a pneumatically control system to open the harness buckles to separate the parachutist from his harness. The water actuatable cells may be set up to perform either of the above two functions only. Using them to both sever the control webs from the harness and to activate the pneumatic assembly to open the harness buckles provides an additional margin of safety. The system also employs a manually operated plunger system to activate the pneumatic system to open the harness buckles. The latter feature is used when the parachutist finds himself on land.

Therefore, it is a principal object of the instant invention to provide a release mechanism that automatically severs a control web or harness web upon water immersion.

It is a further object to provide an automatic release mechanism which is self contained and is separate from conventional canopy and harness release.

It is still a further object to provide a release mechanism which is water actuated, but can withstand all environmental conditions without accidentally operating.

It is a further object to provide an automatic release mechanism which can sever the control webs upon immersion of the chutist in the water and also automatically cause release of the body harness buckles.

It is a further object to provide a self contained pneumatic release assembly for releasing harness buckles which is either automatically operable upon water immersion or which can be manually activated by the chutist.

FIG. 1 shows a chutist wearing a parachute harness illustrating the locations of the embodiments of the present invention.

FIG. 2 shows the automatic harness release mechanism in place on a main harness strap.

FIG. 3 shows a bottom view of the mechanism and harness strap of FIG. 2.

FIG. 4 is a similar view to FIG. 3 showing the harness strap in separated condition.

FIG. 5 is a front view of the automatic harness release mechanism showing portions in section.

FIG. 6 is a front view of the automatic harness release mechanism similar to FIG. 5 showing the device being actuated.

FIG. 7 shows the automatic harness strap release mechanism connected to a manual pneumatic release mechanism.

FIG. 8 shows a large top view of the firing pin slide.

FIG. 9 shows a top sectional view of the female harness buckle having a manual release and provisions for the single point automatic release mechanism to actuate the buckle.

FIG. 10 is a view taken along line 10—10 of FIG. 9.

FIG. 11 is a sectional view of the actuating piston for automatic release of the female buckle latching pivot.

FIG. 12 is a perspective view of the latching pivot.

FIG. 13 is a view showing the male portion of the harness buckle.

FIG. 14 is an exploded view of the manual buckle release mechanism with its biasing spring and pivot pin.

FIG. 15 is a view showing the female portion of the harness buckle.

Referencing now to FIG. 1 there is shown a parachutist 1 wearing an aviation suit 2 and an oxygen and communications helmet 3. The chutist is wearing a harness 4 of conventional configuration with shoulder, leg and chest straps. Mounted on the harness are release buckles 4, 5, 6, 7 and 8. Attached through buckles 8 and 13 to the harness are main chute control straps 10 and 11 which are, in turn, connected to shroud lines as at 12.

Mounted on control straps are automatic strap release mechanisms 13 and 14. FIG. 2 shows such a mechanism designated generally as 20. It consists of a substantially rectangular case 21 having strap engaging portions 22 and 23 which have slots 24 and 25 through which passes the strap 11.

An attachment plate 26 is mounted on the strap on the side opposite the case 21 by screws 27, 28 which pass through plate 26 and the control strap 11.

On opposite ends of the case 21 are water pressure activated chambers 29 and 30. Between the chambers is a activation cell chamber 31 containing a magnesium-silver chloride cell 32. A cover plate 33 maintains the cell within the chamber and is secured on case 21 by screws 34.

Within each end portion is a cylindrical chamber 35. One end of the chamber is internally threaded as at 36 to receive a threaded plug 37. The opposite end of chamber 35 is counterbored as at 38 to receive a ventilated valve cover 39 with a series of small holes 40 to allow water to enter the chamber. Chamber 35 is annularly relieved as at 41 and 41 is in communication with a passage 42 which, in turn, is in communication with chamber 31 and cell 32.

A cylindrical valve member 43 is mounted for sliding movement within chamber 35. Both valve 43 and plug 37 are internally bored as at 44 and 50 and receive a compression spring 53 therebetween. Valve member 43 is annularly relieved as at 46 and accommodates an annular O-ring seal 47. Seal 47 engages the flared part of relieved portion 41 and is kept there by the action of the spring 53. Plug 37 is similarly relieved as at 51 to receive a second sealing O-ring 52. The face of plug 37 has a hexagonal hole by which the plug can be engaged by a wrench to turn it to either adjust the tension of spring 53 as to disassemble the device.

Cell 32 has an insulating plug 55 and wires 56 leading therefrom. As shown in FIG. 2 the wires 56 are shown in contact with the cell 32. An insulating plate 57 is secured between case 21 and control strap 11. The wires 56 are sewn across the strap in a fashion as shown in FIG. 3. While the design shown is preferred other designs, most of the conventional in sewing or stitching, can be employed such as series, parallel, etc. The only limitation on the design would be the wires themselves. The preferred wire is made of Microchromate. It is like Nichrome wire which gets red hot upon a current passing through it.

FIG. 7 shows a water pressure activated harness release mechanism 20' employed in conjunction with a gas operated

buckle release mechanism **70**. Mechanism **20'** operates in the same manner and is of the same construction as mechanism **20**. The essential difference is in the use of the wires to connect the cell through two Joule condenser **1** capacitors (**60**) to an electric solenoid **72**.

Mechanism **70** comprises a housing having a chamber **71** in which the electric solenoid **72** (not shown in detail) is housed. The solenoid **72** is adapted to thrust a rod **72'**.

The lower part of housing **70** has a threaded bore **73** which receives a CO_2 cartridge **75** having a threaded neck **74**. Above neck **74** is an elongated passageway **76** which connects with a gas escape passage **77** by a port **78**. Coaxial with passageway **76** is a smaller diameter passage **79**.

A slot **80** connects chamber **71** with a cut out area **81** on the corner of housing **70**.

Mounted for sliding movement within passageway **76** is a firing pin **83** having a notched portion **84**, a pointed piercing portion **86** and a hole **85** connecting portions **84** and **86**. Hole **85** allows the gas to enter portion **84** and then chamber **77** after the cartridge is punctured. Pin **83** has a reduced neck portion **87** and a head portion **88**. A compression spring **89** biases the pin downwardly.

Positioned within slot **80** is firing pin actuating slide **90**. FIG. **8** shows the slide and its position relative to portion **87** and head **88** of pin **83** when the mechanism is ready to be used but before firing. Slide **90** has a large cutout **92** in communication with a narrow slot **91**. When the slide is shoved to the left, as viewed in FIG. **8**, allows spring **89** to thrust pin **83** into cartridge **75**.

Mounted in cutout area **81** is a manual operating lever **95** with a pull lanyard **97** attached thereto through a hole **96**. Lever **95** is pivoted about pin **98** and has a tapered slide engaging lip **94** which passes through the end of slide slot **91** and into a curved cutout area **82**. When the lever **95** is pulled outwardly and pivots around **98** and pulls slide **90** to allow pin to puncture cartridge **75**. The gas escapes through passage **77** to nylon tubing (sewn into the webbing of the harness straps, not shown) and to a female buckle portion **100**.

Buckle portion **100** is similar to the buckles shown and described in a copending application, Ser. No. 763,249, filed Sept. 27, 1968, by this applicant entitled RELEASEABLE COUPLING. The contents of the patent application, Ser. No. 763,249, are hereby incorporated into this application by reference.

Portion **100**, shown in FIGS. **9** and **10**, consists of a housing **101**, generally rectangular in shape. It has a lower surface **102** which is surrounded by raised housing **101** having curved wall portion **103**, straight wall portion **104**, curved wall portion **105** of a larger radius than portion **103** and ending in straight wall portion **106**. A latch **105** is surrounded by these walls and is adapted to pivot in the direction shown by the arrow in FIG. **9** about a pivot cam **133**. Latch **105'** has a cylindrical aperture **106** which has a raised portion **108**.

Extending from housing **101** are two arms **109**, **111** which have holes **110**, **112** which are adapted to receive a coupling strap fastener bar.

A pushbutton release **113** is located within aperture **106**. Latch **105** has a cylindrical bore **120** which communicates with an open area **124**. Area **124** has a large width section and a narrow width section. At the end of the narrow section in the surface **102** is a bore **126**. A second bore **127** is located in surface **102**. There is a cylindrical bore **150** in latch **105** and an arcuate area **151** is cut out adjacent bore **150**. Area **105**, however, has a ledge **151'** which is above the surface **102**.

Pushbutton release **113** (see FIG. **14**) has a widened portion **114** extending therefrom which has an aperture **118** therethrough. A narrow section **115** is an extension of portion **114** and has a generally cylindrically shaped portion **116** extending downwardly therefrom at an angle of approximately 10°. The lower cylindrical projection **117** is adapted to engage bores **126** and **127**. Pin **119** secures release **113** to latch **105** by its reduced portion passing through small-diameter bore **121** into cutout area **123**. A ring **122** passes through a small hole in the end of pin **119**. Located within area **123** is a piston assembly **155**. Tubing **156** connects with piston assembly and is adapted to carry gas from the cartridge in mechanism **70**.

Housing **101** has a slotted area **140** adapted to receive the male buckling portion. The slotted area defines a lip **129**. Both lip **129** and the housing **101** have bores **130**, **131** and latch **105** has a square hole **132**. A pivot cam **133** (FIG. **12**) is received within hole **132** and bores **130** and **131**. Pivot **133** has a cylindrical portion **134** which received within hole **132**, a cylindrical reduced portion **135**, a larger diameter portion **137**, and a slightly larger flange portion **139**. Portion **137** has a slot **138** which forms a semicircle. A cam-actuating arm **154** extends out from section **135** and is adapted to be actuated to swing approximately 20° through cut out area **170** (FIG. **9**) to turn the cam pivot to allow the male buckle portion and female buckle portion to unlock.

FIG. **13** shows the general relationship of female buckle section **100** and male buckle section **200**. Like section **100**, section **200** has two arms **206**, **207** extending therefrom which have aligned holes **208**, **209** therein. The main body section **210** has a projection **201** extending therefrom and is of a general parallelogram configuration with the exception of a notch in one side thereof. The sides **203** and **203'** are approximately at 30° to the direction of coupling.

The edge **205** of the notch is at an additional 30° to the coupling direction and edge **204** is at 45° to the lateral dimension of portion **200**.

Portion **100** has a similar shape in cutout slot **140**. Where portion **200** has a notch, however, portion **100** has a semicircular cut **143**.

Edges **203** and **202** are mated with portions **141** and **142**, respectively, of portion **100**. The latch is in its swing-out position. Rotating latch **105** back into position on housing **101** as shown in FIG. **13** turns pivot cam **133**. Surface **138** of **133**, which was aligned with portion **141**, now turns and the other part of cylindrical section **137** enters the notched area on **201** and locks the members **100** and **200** together. Pivoting of latch **105** unlocks the members.

Referring to FIG. **11**, there is shown the piston assembly **155** for automatically pivoting cam pivot **133** to unlock the buckle. It consists of a housing **157** which has a cylindrical bore **168** one end of which is internally threaded as at **158**. A threaded plug **159** is screwed into that end of housing **157** and has a hexagonal aperture **160** in which a tool may be inserted to turn the plug. The opposite end of **157** is counterbored as at **161** to provide a thin annular wall **162**. Seated with housing **157** is a nylon no-return plug **163**. A frangible shear pin **165** maintains plug **163** in place. A piston **166** is mounted beneath the plug **163** and the space between the plug **159** and piston **166** receives the flared end **167** of tubing **156** which is used to carry the gas from chamber **77** on the mechanism **70** to activate the piston assembly. When the gas acts to force piston **166** outward, it pushes against plug **163**, breaking the shear pin and forcing the plug out. The plug cannot return since once the bottom edges **169** of the plug head clear the end of the housing, expansion of the nylon plug, which is force-fitted initially within housing **157** makes the diameter of the plug head portion larger than the internal diameter of the counterbored section.

As shown in FIG. **10**, section **117** of the release **113** is in bore **126** and is kept there by the action of a spring **125** (FIG. **14**) biasing the other end of the release upwards, thus keeping **117** in bore **126**. Pressing on **113** allows **117** to move out of the hole in the direction indicated by the arrow in FIG. **10**. While **113** is kept depressed the latch is swung to an unlocking position. The release **113** need not be depressed after this since **117** will stop the pivoting of **105** where it encounters bore **127** in surface **102**. The action of spring **125** again forces **117** into the bore and thus locks the latch against further movement.

Pin **152** mounted on shelf **151'** of area **151** anchors one end of a torsional spring **153** which extends from said pin around portion **135** of pivot cam **133** and is then anchored by a screw

(not shown) or an equivalent means to pivot cam **133** which has a hole **136** for accommodating such a screw.

The spring **153** biases **133** in a direction opposite to the arrow shown adjacent **153** in FIG. **9**, i.e., member **153** is always abutting plug **163** of piston assembly **155**. When assembly **155** is activated, plug **163** forces **153** to move, thus rotating pivot cam **133** within hole **132**. Cut out area **170** is shaped so as to allow arm **153** to swing approximately 20° which is sufficient to rotate **133** to enable surface **138** of cam **133** to become flush with surface **141**, thus unlocking the buckle.

OPERATION

To activate the system when parachuting onto land in the absence of water one merely pulls on lanyard **97** which causes portion **94** to pull slide **90** into position to allow the cartridge **75** to be punctured by firing pin **83**. The gas escapes through hole **85** in pin **83** through **78** into chamber **77** whereupon it enters a plurality of nylon tubes (not shown) which are sewn into or otherwise supported by the harness straps. The tubing carries the gas to buckles **5**, **6**, **7**, **8** and **9**. Piston assemblies such as **155** are activated and plugs such as **163** rotate pivot cams as at **133** to unlock the male and female components of the buckle to release. As the plug is held in the forward position the release is unable to reclose itself. Obviously, a safety valve may be incorporated into the system if desired.

When the foregoing occurs, all the buckles and fittings are released in unison and the harness completely divests itself from the wearer.

When landing in water, the release takes place automatically. As chutists, when landing on the water, go beneath the surface a given number of feet after impact, springs **53** are set to give under a small amount of pressure over atmospheric. As shown in FIG. **6**, water enters chambers **35** in mechanism **20** through holes **40** and forces valve member **43** rearwardly compressing the springs **53**. The water enters the cell **32**, produces a chemical reaction generating electricity and the current passes through wires **56** to burn through the straps **10**, **11** thus releasing the parachute with its shrouds from the wearer.

Simultaneously, water enters holes **40'** in mechanism **20'** (FIG. 7) and contacts cell **32'**. The chemical reaction charges capacitor **60** which then discharges and wires **61** carry the charge to solenoid **72**. Activation of solenoid **72** causes rod **72'** to move thus forcing firing pin actuator slide **90** to move. This movement, in turn, allows firing pin **83** to puncture cartridge **75** and the gas is released and buckles **5**, **6**, **7**, **8**, and **9** are released in the same manner as previously described.

This procedure automatically releases the harness with its severed control straps **10** and **11** from the wearer without him having to do anything.

Obviously, only the mechanisms **13** and **14** may be used or just mechanism **70** with its mechanism **20'**. It is preferred to use both systems, however.

In the water, when the automatica device **20** is submerged in water to a depth of from 2½ to 3 feet, (0.085 atmospheres) water enters holes **40**. When the pressure builds up to atmospheric pressure plus 0.085 atmospheres, the valves move rearwardly admitting water and exiting air from the electrolytic cell chamber. As the water comes into contact with the magnesium-silver chloride cell, it is immediately activated and begins to discharge energy into the condenser/capacitor. As soon as this is charged to 2 joules (about 4–10 ms.) the charge is released as a bulk unit to the solenoid or to wires to burn the straps.

Usually the springs **53** are made from 0.027 in stainless steel with about 1½ lb. extended pressure. They will respond to an added pressure of from 0.080 to 0.090 atmospheres.

The cells are standard-type magnesium-silver chloride water-activated cells. They will read with either salt or fresh water.

A discharge condenser may be placed in the circuit of mechanism **20** to insure full power.

The casings **21** of mechanisms **20** are either plastic or aluminum and can be made about three inches by one and three-fourth inches by three-fourth inches. The size, therefore, is small enough not to interfere with the chutists normal range of functions while pulling on his gear or when he is wearing it.

The system is sealed by the O-rings and gaskets (not shown) to prevent accidental opening in the rain.

The cartridge may contain either carbon dioxide or nitrogen.

All internal parts are electromagnetically sealed so that static electricity or stray currents will not cause accidental operation of the device.

While several preferred embodiments of the device have been shown, it is obvious that many changes and modifications within the scope of the appended claims will be apparent to those of ordinary skill in the art.

What is claimed is:

1. An automatic releasing system for parachute harnesses comprising a housing means, a water actuatable cell contained within said housing and adapted to generate an electrical current upon contact with water, an endless high-resistance wire connected at both extremities with said water actuatable cell and adapted to be sewn into a parachute harness strap, normally closed valve means adapted to admit water to said water-actuatable cell at a predetermined liquid pressure and means adapted to secure said housing means to a harness strap whereby upon contact with water, the cell generates sufficient heat in said wires to cause them to burn and sever said harness strap.

2. A system as in claim **1** wherein said wires are microchromate wires.

3. A system as in claim **1** wherein said water-actuatable cell is a magnesium-silver chloride cell.

4. A system as in claim **1** wherein said valve means includes sealing means to prevent moisture from reaching the water-actuatable cell.

5. A system as in claim **1** wherein said valve means includes a passage means communicating between said water actuatable cell and the atmosphere, a biased valving member in a portion of said passage means and normally closing said passage means from communication with the atmosphere.

6. A system as in claim **5** wherein said valving member includes a cylindrical piston with an annular groove therein, a sealing ring in said groove adapted to cooperate with the sides of said passage means to seal said passage.

7. A system as in claim **5** including a ventilated cover member between said passage means and to atmosphere adapted to prevent accidental displacement of said biased valve member.

8. A combination automatic and manual buckle opening mechanism for a parachute harness comprising, at least one buckle having male and female components, a manually operable locking means on one of said components adapted to lock and unlock said components together, pneumatically operated means on said buckle adapted to unlock said components separate from said manually operable locking means, a housing containing pneumatic activating means including conduit means connecting it with said pneumatically operated means on said buckle, a gas release means, a water-actuatable cell adapted to automatically actuate said gas release means to pneumatically unlock said buckle components and a manually operable lever adapted to manually activate said gas release means to pneumatically unlock said buckle components.

9. A mechanism as in claim **8** wherein said male buckle component has a parallelogram-shaped projection extending therefrom, said female buckle component having an opening corresponding to the shape of the projection on the male component, one wall of said opening having a rotatable member adjacent thereto, said rotatable member having a semicircular shaped portion, the flat surface of which aligns with said wall in an unlocking position to admit said male component projection, said projection having a cutout portion on one side thereof which allows said rotatable member to rotate into a locking position to lock said components together, said

manually operable locking means adapted to be swung to rotate said rotatable member and said pneumatically operated means adapted to rotate said rotatable member without moving said manually operable locking means, whereby upon immersion in water the water-activable cell operates said gas release means to automatically unlock said male and female components.

10. A mechanism as in claim 9 wherein said rotatable member has a radially extending lever thereon and said pneumatically operated means is positioned within said manually operable unlocking means adjacent said lever, whereby, upon manual operation, rotating of said rotatable locking member is accomplished by swinging of said manually operable means so that the pneumatically operated means engages said lever and rotates said rotatable member to unlock said components and, upon automatic operation, said pneumatically operated means is activated to swing said lever internally and independent of said manually operated means to rotate said rotatable member and unlock said components.

11. A mechanism as in claim 10 wherein said pneumatically activating means comprises a container of compressed gas with a frangible seal thereon and said gas release means includes a spring-biased plunger adapted to puncture said seal and allow said gas to escape through said conduit means and cause said pneumatically operated means to unlock said components.

12. A mechanism as in claim 11 wherein said gas release means further includes a slide member engagedly said manually operable lever to normally hold said plunger in retracted position, a solenoid adapted to move said slide member to release said plunger upon energization by the water-actuatable cell, and a pivot on which said manually operable lever causes said slide to move to release said plunger or said solenoid moves said slide to move also releasing said plunger.

13. A mechanism as in claim 12 wherein said housing contains a passage, said plunger positioned in said passage and having a hollow-puncturing tip, said conduit means being in open communication with said passage.

14. A mechanism as in claim 8 wherein said water-actuatable cell includes a body portion, said body portion having a normally closed valve means adapted to admit water to said cell at a predetermined liquid pressure.

15. A mechanism as in claim 14 wherein said cell is a magnesium-silver chloride cell.

16. A mechanism as in claim 14 wherein said valve means includes sealing means to prevent moisture from reaching said cell.

17. A mechanism as in claim 14 including a ventilated cover member on said body portion covering said valve means and adapted to prevent accidental opening of said valve means.

18. In combination with a parachute harness, an automatic harness-releasing system comprising at least one housing, means securing said housing to a web of said harness, a water-actuatable cell contained within said housing and adapted to generate an electrical current upon contact with water, normally closed valve means in said housing adapted to admit water to said cell at a predetermined pressure, and at least one harness-releasing means affixed to said harness and adapted, upon energization by said cell to automatically cause said harness to release when the parachutist is immersed after a water landing.

19. A system as in claim 18 wherein said harness-releasing means comprises at least one high-resistance endless wire, the ends of which are connected to said cell, said wire being sewn into a web on said harness whereby upon contact with water, said cell generates sufficient energy to cause said wires to heat and sever said web by burning therethrough.

20. A system as in claim 19 wherein said wire is a microchromate wire.

21. A system as in claim 19 wherein said valve means includes a sealing means to prevent moisture from reaching said cell.

22. A system as in claim 20 wherein said cell is a magnesium-silver chloride cell.

23. A system as in claim 18 wherein said harness releasing means comprises at least one buckle having male and female components a manually operable locking means on one of said components adapted to lock and unlock said components, pneumatically operated means on said buckle separate from said manually operated means adapted to unlock said components, said housing additionally containing pneumatic activating means including conduit means connecting it with said pneumatically operated means on said buckle, a gas release means, said water-actuatable cell adapted to automatically actuate said gas release means to pneumatically unlock said buckle components, said housing also containing a manually operable lever adapted to activate said gas release means to pneumatically unlock said components.

24. A system as in claim 23 wherein said pneumatically operated means comprises a no-return piston housed within a cylinder on said female component.

25. A system as in claim 23 wherein said male buckle component has a parallellogram-shaped projection extending therefrom, said female buckle component having an opening corresponding to the shape of the projection on the male component, one wall of said opening having a rotatable member adjacent thereto, said rotatable member having a semicircular shaped portion, the flat surface of which aligns with said wall in the unlocking position to admit said male component projection, said projection having a cutout portion on one side thereof which allows said rotatable member to rotate into a locking position to lock said components together, said manually operable locking means adapted to be swung to rotate said rotatable member and said pneumatically operated means adapted to rotate said rotatable member without moving said manually operable locking means, whereby upon immersion in water to a predetermined depth said water-actuatable cell operates said gas release means to automatically unlock said male and female components.

26. A system as in claim 25 wherein said rotatable member has a radially extending lever thereon, and said pneumatically operated means is positioned within said manually operated unlocking means adjacent said lever whereby upon manual operation, rotating of said rotatable unlocking member is accomplished by swinging of said manually operable means so that the pneumatically operated means engages said lever and rotates said rotatable member to unlock said components and, upon automatic operation, said pneumatically operated means is activated to swing said lever internally and independent of said manually operable means to rotate said rotatable member and unlock said components.

27. A system as in claim 26 wherein said pneumatic activating means comprises a container of compressed gas with a frangible seal thereon and said gas release means includes a spring biased plunger adapted to puncture said seal and allow gas to escape through said conduit means and cause said pneumatically operated means to unlock said components.

28. A system as in claim 27 wherein said gas release means further includes a slide member engaged by said manually operable lever to normally hold said plunger in retracted position, a solenoid adapted to move said slide member to release said plunger upon energization by the water-actuatable cell.

29. A system as in claim 28 wherein said housing contains a passage, said plunger positioned within said passage and having a hollow puncturing tip, said conduit means being in open communication with said passage.

30. A system as in claim 29 wherein said pneumatically operated unlocking means comprises a cylinder located within said manually operated unlocking means and a no-return piston plug situated therein.

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