

**[54] INFLATABLE BODY-ATTACHMENTS  
FOR MARINE LIFE-SAVING**

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[22] Filed: Oct. 6, 1970

[21] Appl. No.: 78,514

[52] U.S. Cl. .... 244/122 AE, 9/342

[51] Int. Cl. .... B64d 25/18

[58] **Field of Search** .....244/122 R, 122 AH, 122 AE,  
244/122 A: 9/338, 342, 316

[56] **References Cited**

## UNITED STATES PATENTS

|           |        |               |            |
|-----------|--------|---------------|------------|
| 3,180,593 | 4/1965 | Martin.....   | 244/122 AE |
| 3,362,034 | 1/1968 | Oldham .....  | 9/316      |
| 3,449,777 | 6/1969 | Hattori ..... | 9/316      |

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[57] **ABSTRACT**

This invention concerns a life-saving appliance comprising an inflatable portion which when the appliance is unactivated is stowed compactly in a pouch, means for securing the pouch closely to the body of the wearer, and a fastening for the pouch adapted for release or disablement only through the medium of a flexible traction member to permit deployment of the appliance on inflation thereof, characterized in that the release or disabling means for the pouch fastening is adapted for direct or indirect connection to an aircraft ejection seat or the lift webbing of an associated parachute so that on separation of the wearer from the seat or deployment of the parachute, the pouch will be free to open on inflation of the appliance, and by a water-responsive mechanism adapted to initiate self-inflation of the appliance on immersion.

**10 Claims, 4 Drawing Figures**

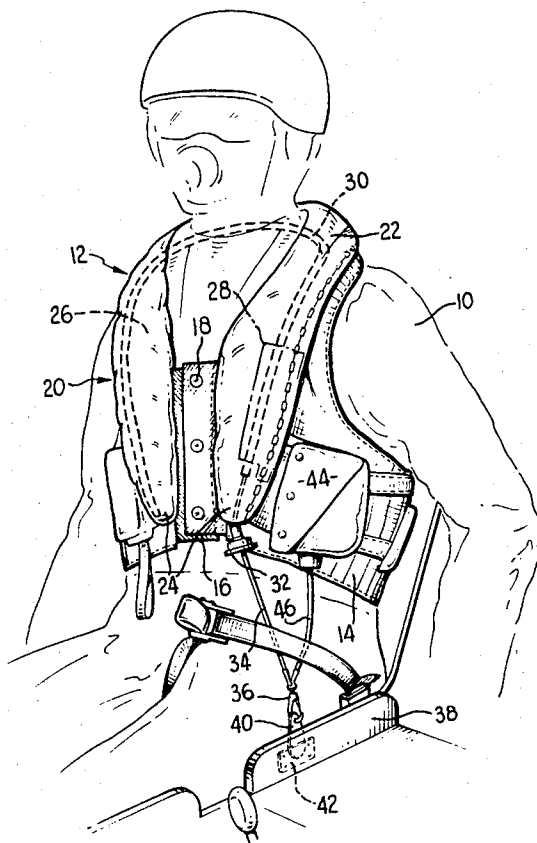
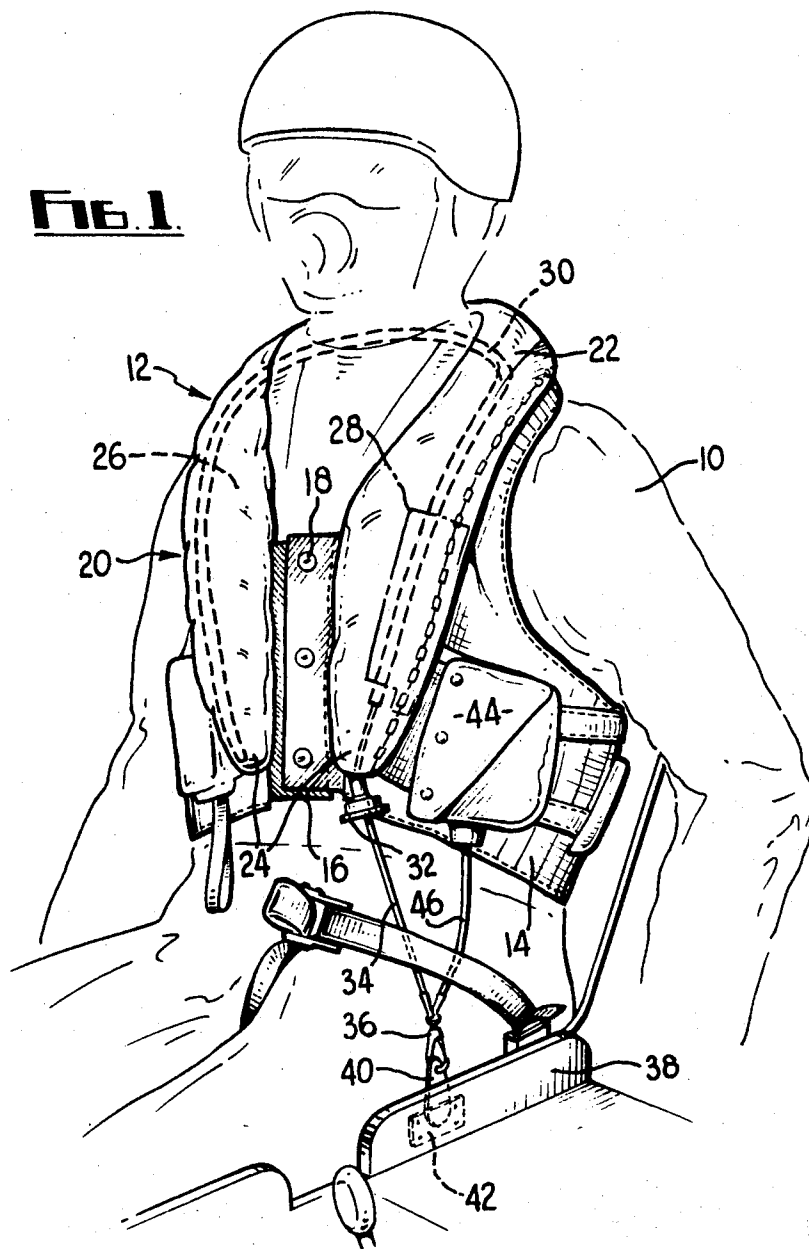


**FIG. 1.**



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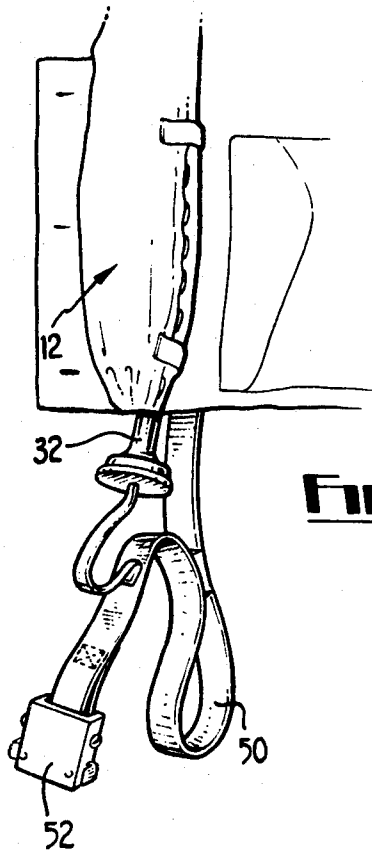


**FIG. 2.**

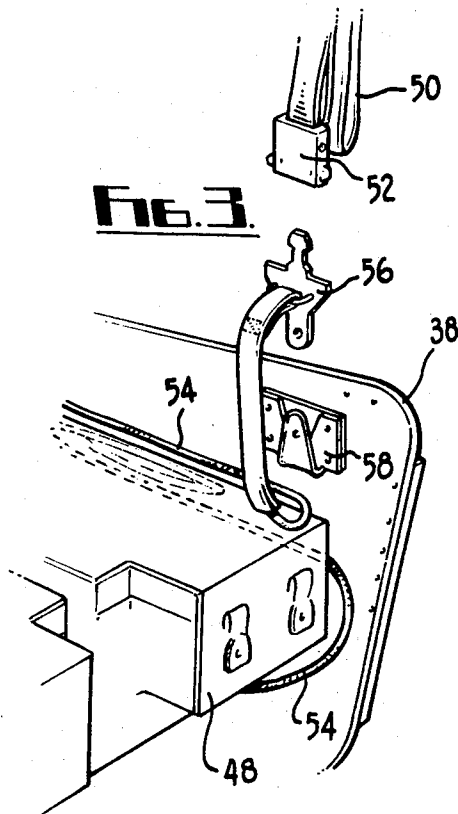
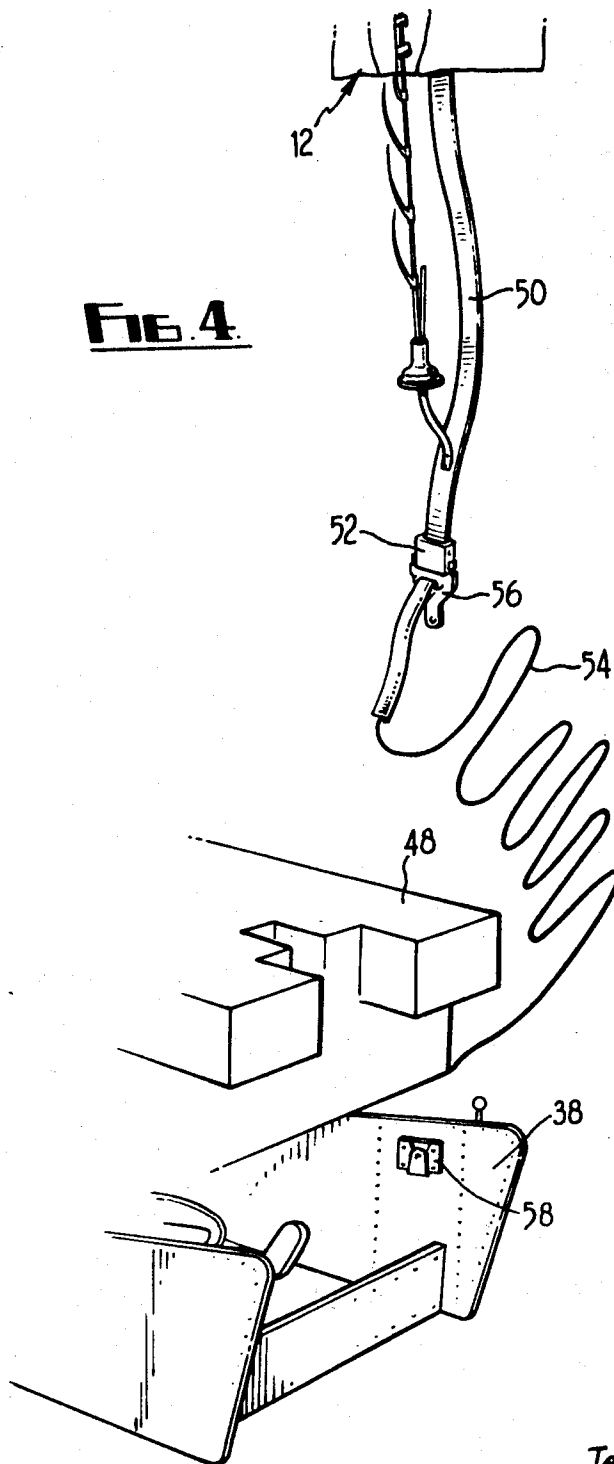


**FIG. 3.**

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**FIG. 4.**



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## INFLATABLE BODY-ATTACHMENTS FOR MARINE LIFE-SAVING

THIS INVENTION CONCERNS MARINE LIFE-SAVING APPLIANCES IN THE FORM OF INFLATABLE BODY ATTACHMENTS FOR MARINE LIFE-SAVING.

It is the object of the invention to provide such a marine life-saving appliance which is entirely automatic in use, which does not inflate unless the wearer is actually in water, and which can withstand the extremely rigorous conditions experienced on emergency exit from high-speed aircraft. So far as we are aware no existing appliance satisfactorily meets all these requirements.

According to the present invention a marine life-saving appliance comprises an inflatable portion which when the appliance is unactivated is stowed compactly in a pouch, means for securing the pouch closely to the body of the wearer, and a fastening for the pouch adapted for release or disablement only through the medium of a flexible traction member to permit deployment of the appliance on self-inflation thereof, characterized in that the release or disabling means for the pouch fastening is adapted for direct or indirect connexion to an aircraft ejection seat or to the lift webbing of an associated parachute so that on separation of the wearer from the seat or deployment of the parachute, the pouch will be free to open on inflation of the appliance, and by a water-responsive mechanism adapted to initiate self-inflation of the appliance or immersion.

The invention will now be described further, by way of example only, with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of an appliance according to the invention, and worn in one operative manner by an aircraft Pilot;

FIG. 2 is a detail view showing part of an appliance according to the invention having different means for securing same in operative manner when worn;

FIG. 3 is a detail view showing how the appliance of FIG. 2 is connected to the ejection seat of an aircraft; and

FIG. 4 is a detail view showing the sequence of events as the wearer of the appliance of FIG. 2 is ejected from the aircraft.

The appliances shown in the various figures of the drawings are all of the general type fully described and illustrated in U.S. Pat. No. 3,362,034 that is to say having an inflatable portion which when the appliance is unactivated is stowed compactly in a pouch, means for securing the pouch closely to the body of the wearer, and a normally enclosed fastening for the pouch adapted for release or disablement only through the medium of a flexible traction member to permit deployment of the appliance on self-inflation thereof. Such an appliance satisfies the requirement that it can withstand the extremely vigorous conditions experienced on emergency exit from high-speed aircraft. The inflatable portion is stowed compactly in a pouch which is of stream-line shape—that is, it presents no undesirable protruberances (not even in the fastening region, as this is enclosed) which the slip-stream could engage and result in the appliance being damaged or even torn from the wearer's body.

The fastening will not be released or disabled until the flexible traction member is operated and the design is such that the necessary movement of the traction member is small, and results in smooth disengagement of the fastening.

However, the appliance described in the patent aforesaid is designed for manual operation in that the wearer pulls the traction member which simultaneously disengages the fastening and initiates self-inflation. Therefore, if, for some reason the wearer is unconscious, it will not operate. On the other hand, once operated the appliance will inflate and in some circumstances this could be undesirable.

Referring first to FIG. 1 the pilot 10 of a high-speed aircraft is shown in position in the cockpit and wearing an appliance 12 in accordance with the invention.

The appliance 12 is of basically similar construction to that described and illustrated in U.S. Pat. No. 3,362,034. It consists essentially of a waistcoat 14 having a medial front open-

ing 16 closed by buttons 18 and provided with a hollow collar 20 comprising two superimposed stole-shaped flaps 22, whose inner peripheries are sewn around the neck-band of the garment and down the edges of its front opening 16.

This collar 20 has permanently closed rounded ends 24 which are sewn to the front of the garment, the outer peripheries of its component flaps 22 being securable together to provide a stowage pouch for an inflatable bag 26 of generally similar shape, one of the front lobes of which is connected to an assembly 28 of known type comprising a water-sensitive device including a switch element whose immersion closes an electrical circuit and allows current from a primary cell to fire a cartridge whereby a pin is driven through a closure diaphragm on a bottle of compressed gas which is thereby released into the bag 26. The bottle may be of more than adequate inflation capacity for the bag concerned, and the bag fitted with a pressure-relief valve to ensure against its bursting in the event of accidental actuation of the water-responsive mechanism or any previous failure of the means for releasing or disabling of the pouch fastening means later referred to, the bag thus remaining capable of oral inflation through a conventional valved tube.

The flaps 22 of the stowage pouch are secured together by means of loops on the one which pass through slits in the other, the loops being releasably retained in position by means of a flexible traction member 32 in the form of a stainless steel wire cable located in a stiff tube 30. The side of the tube 30 facing the loops has a longitudinal slit through which extends at intervals branches of cable spliced or crimped to the traction member, each branch passing through say four consecutive loops. By pulling the traction member by a distance corresponding to four consecutive loops the cable branches are pulled from all the loops in a smooth manner and the fastening of the flaps 22 thereby disabled or released.

The flaps 22 then present no hindrance to inflation of the bag 26. Touch fastener strips may be provided on the flaps 22 to discourage premature separation during descent but which will not hinder separation on inflation. The tube 30, the loops, the traction member and the cable branches are all enclosed by an auxiliary flap secured by a slide fastener so as to prevent undesirable protruberances or irregularities at the exposed surface of the appliance, for reasons already described. All this is described in more detail in the patent aforesaid.

One end of the traction member extends from its enclosure so as to be accessible for automatic operation as will now be described.

In the embodiment of FIG. 1 the end of the traction member 32 is provided with a static line 34 running from the traction member 32 to a snap hook 36 whereby it can be attached, when the wearer is strapping himself into his ejection seat 38, to a releasable anchorage provided on one side of the latter, such anchorage comprising an aperture plate 40 engaged with a spring clip 42 on the seat pan and adapted to separate from the latter under a pull of 25 lbs, say. Such an anchorage may already be provided on the seat to facilitate automatic energization of a radio beacon 44, incorporated in the appliance, through the medium of a second static line 46, and in such a case both static lines may conveniently be connection to the same snap hook as illustrated.

In use when the pilot, in an emergency, operates the ejection seat 38, he remains in the seat in the initial stages the seat and pilot together being stabilized by one or more drogue parachutes which are automatically operated on ejection. Then, in known manner, after a given descent or a given time delay the pilot's main parachute opens and this causes the pilot to be separated from the seat. This separation loads the static line 34 which consequently operates the traction member 32 and releases or disables the fastening of the pouch. Finally the plate 40 disengages from the spring clip 42 and the seat falls away. Should the pilot fall in water self-inflation of the bag 26 is immediately initiated and the flaps 22 of the pouch 13 readily separate to allow inflation to proceed unhindered.

In the embodiment of FIGS. 2, 3 and 4 (in which like parts are given the same reference numerals as in FIG. 1) the arrangement for disabling or releasing the pouch fastening is somewhat different. The ejection seat 38 incorporates a so-called survival pack 48, which, when the seat separates from the pilot is to remain attached to the pilot so as to be available to him on completion of his descent. An integrated line 50 is provided on the appliance. 12, having a connector 52 on its free end. The survival pack 48 has a lowering line 54 attached thereto to the free end of which is attached a two-way connector plate 56. One end of the plate 56 engages a spring clip 58 at the side of the seat 38 and the other end is engageable by the connector 52. The end of the traction member 32 is attached to the integrated line 50 at a position which causes the latter to loop above the point of attachment thus ensuring that on extension of the line 50 under load the traction member 32 will be operated to disable or release the pouch fastening.

FIG. 2 indicates the connection of the traction member 32 to the integrated line 50; and FIG. 3 the disposition of the various parts prior to securing them in operative condition.

On ejection (see FIG. 4), on separation of the pilot and seat, the line 50 is first extended and the traction member 32 thereby operated to disable or release the pouch fastening. The spring clip 58 then releases the plate 56 allowing the survival pack 48 to accompany the pilot. The pack 48 is usually ready when released to fall away to the extent of the lowering line 54. On landing in water self-inflation of the bag 26 is initiated as before.

One advantage of this embodiment is that a separate connexion operation for the pouch release means is not necessary.

In another embodiment of the invention the traction member 32 may be connected, not to the ejection seat, but to the lift webbing of the pilot's parachute, so as to be operated automatically on deployment of the latter. However, in this case with the end of the traction member 32 in the position previously described, a connecting line would have to pass round a pulley on the appliance and thence to the parachute webbing, thus to ensure that the pull on the traction member is exerted in the proper direction. Alternatively the end of the traction member could be arranged to emerge from the neck region of the appliance and then be connected directly to the parachute webbing

I claim:

1. A marine life-saving appliance intended to be worn by a person sitting in an aircraft ejection seat, said appliance comprising an inflatable portion, an initially closed but openable pouch in which said portion is stowed compactly in uninflated condition, means for securing said pouch closely to the body of the wearer, a fastening for maintaining said pouch closed, an elongated flexible traction member adapted on longitudinal movement to release said fastening to permit deployment of the appliance on inflation thereof, means for connecting said traction member to an aircraft ejection seat so that on separation of the wearer from the seat said traction member will be pulled longitudinally and said pouch rendered free to open an inflation of said inflatable portion, and a water-responsive

mechanism adapted to initiate self-inflation of the appliance on immersion.

2. An appliance as set forth in claim 1 further comprising a normally secured enclosure for said fastening.

3. An appliance as set forth in claim 1 further comprising a static line secured to said traction member and a fastener at the free end of said static line.

4. An appliance as set forth in claim 3 further comprising another device thereon, an additional static line secured to said device for operating same, said additional static line being attached to said fastener on said static line secured to said traction member.

5. An appliance as claimed in claim 1 further comprising an integrated line, a fastener on the free end thereof, and a connection between said integrated line and said traction member, the length of said connection being substantially less than the length of said integrated line between the appliance and the point of attachment of said connection to said integrated line.

6. An appliance as set forth in claim 3 in combination with an ejection seat of an aircraft, there being means on said ejection seat to which said fastener on said static line is connected and which will disengage when the loading thereon exceeds that necessary to operate said traction member.

7. An appliance as set forth in claim 5 in combination with an ejection seat of an aircraft, there being means on said ejection seat to which said fastener on said integrated line is connected and which will disengage when the loading thereon exceeds that necessary to straighten said integrated line and operate said traction member.

8. An appliance in combination with an ejection seat of an aircraft as set forth in claim 7 further comprising a two-way connector plate, to one end of which said fastener on the integrated line is secured, a spring clip on said ejection seat to which the other end of said connector plate is engaged, a survival pack, and a lowering line connecting said survival pack to said connector plate.

9. A marine life-saving appliance intended to be worn by a person also wearing a parachute, said appliance comprising an inflatable portion, an initially closed but openable pouch in which said portion is stowed compactly in uninflated condition, means for securing said pouch closely to the body of the wearer, a fastening for maintaining said pouch closed, an elongated flexible traction member adapted on longitudinal movement to release said fastening to permit deployment of the appliance on inflation thereof, means for connecting said traction member to the lift webbing of a parachute attached to the wearer so that on release of said parachute said traction member will be pulled longitudinally and said pouch rendered free to open an inflation of said inflatable portion, and a water-responsive mechanism adapted to initiate self-inflation of the appliance on immersion.

10. An appliance as set forth in claim 9 in combination with a parachute attached to the wearer there being means of the lift webbing of said parachute to which said traction member is connected.

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