SELF-INFRINGEMENT RETARDATION AND FLOATATION DEVICE

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ABSTRACT OF THE DISCLOSURE

A self-inflating retardation and floatation device for recovery of a load which is ejected at a high altitude above a body of water. The device is basically a parachute for retarding the rate of descent of the load in the air and a floatation device for maintaining the load at the water surface at the end of the flight such that the load may be recovered. A rubber or plastic bladder having an open mouth portion is enveloped by a cloth cover member having a radially extending circumferential skirt member such that the combined drag areas of the bladder, cover member and skirt portion retard the rate of descent of the load during flight, and the bladder member which is ram-air inflated maintains the load at the surface of the water.

BACKGROUND OF THE INVENTION

This invention relates generally to recovery devices, and more particularly to a self-inflating retardation and floatation recovery device.

In the process of investigating various scientific phenomena at high altitudes various types of instrumentation packages have been ejected into the atmosphere from an airplane, rocket or other delivery vehicle, and it has become increasingly necessary to provide recovery systems and devices which are capable of retrieving the instrumentation package without damage. Many devices have been proposed and utilized in the recovery of instrumentation packages from high altitude, with varying degrees of success. Some of the proposed devices provide retardation of the load during descending flight in a parachute-like manner, and floatation of the load in a body of water at the end of the flight such that the load may be recovered from the water. Such devices have not been found entirely satisfactory in that either the desirable and optimum characteristics of a retardation or floatation device have been sacrificed to enable one device to perform both functions. Furthermore, the prior art devices have experienced a serious drawback in that sufficient retardation has not been provided to prevent the device from sinking deep below the surface of the water upon impact resulting in the floatation device collapsing under the high pressures experienced at deep depths.

SUMMARY OF THE INVENTION

Accordingly, one object of this invention is to provide a new and improved self-inflating retardation and floatation device.

Another object of the invention is the provision of a new and improved self-inflating retardation and floatation device which exhibits the most desirable characteristics of both a retardation device when in the air and a floatation device when in the water.

Still another object of the present invention is to provide a new and improved self-inflating retardation and floatation device which can withstand high opening shocks in the air and provide leak integrity in the water.

A still further object of this invention is the provision of a new and improved self-inflating retardation and floatation device which is capable of providing retardation functions both in the air and the water.

Another still further object of the instant invention is the provision of a new and improved self-inflating retardation and floatation device which is so shaped as to be capable of ram-air inflation and yet maintain itself afloat with a high degree of stability and leak integrity.

One other object of this invention is the provision of a new and improved ram-air inflated retardation and floatation device which has both the optimum properties for aerodynamic flight and long floatation life, and which will provide retardation in a body of water.

Briefly, in accordance with one embodiment of this invention, these and other objects are obtained by providing a ram-air inflated retardation and floatation device having a bladder with an open mouth portion, a cover member enveloping a major portion of the bladder and having an open mouth portion secured to the open mouth portion of the bladder, a plurality of shroud lines extending from the cover member and converging to a common point, a riser line extending from the common point for supporting a load, and a circumferential ring shaped skirt member having an inner edge portion attached to the cover member and an outer edge portion extending away from the cover member with a plurality of shroud lines extending from the outer edge portion of the skirt member to the common point.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a pictorial illustration of the sequence of operation of the self-inflating retardation and floatation device of the present invention in the air, upon water entry and floating on the surface of the water;

FIG. 2 is a side elevational view, partly in section, of an embodiment of the present invention;

FIG. 3 is an enlarged view partly in section and partly broken away of the connecting members of the bladder and cover members of the present invention; and

FIG. 4 is an enlarged sectional view of the skirt member and cover member of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like reference characters designate identical or corresponding parts throughout the several views, and more particularly to FIG. 1, wherein a self-inflating retardation and floatation device 10 is illustrated in various positions, namely: position A functioning as an aerodynamic retardation device supporting a load 12 during descending flight above a body of water; position B as the load 12 enters the water; and position C wherein the device 10 functions as a floating condition on the surface of the water with the load 12 suspended therebelow. The self-inflating retardation and floatation device with the attached load 12 may be ejected from any delivery vehicle above a body of water, and the load 12 may consist of any payload in which recovery is desirable such as a package of instrumentation.

As more clearly shown in FIG. 2, the retardation and floatation device 10 of the present invention is basically constructed of a bag having an inner bladder 14 having an open mouth portion 16, a cover member 18 conforming in shape to the bladder 14 and having an open mouth

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portion 20 adjacent to and terminating short of the open mouth portion 16 of bladder 14; a circumferential ring shaped skirt member 22, and a plurality of shroud and riser lines 34, 40 and 38. The bladder 14 may be constructed of any airtight material having a high leak integrity capable of retaining inflated when in a body of water, such as rubber or plastic, and the cover member 18 may be constructed of any lightweight high strength flexible material such as canvas or silk cloth. The cover member 18 encapsulates the bladder 14, thus preventing the bladder from over-expanding and rupturing due to the effect of high air shock. A plurality of restraining bands 24 form a cage-like enclosure for the cover member 18, and a similar set of restraining bands 26 envelop the bladder 14 within cover member 18. The skirt member 22 is circumferentially secured to the cover member in such a manner as to divide the retardation and flotation device 10 into an upper hemispherically shaped section 30 and a lower frusto-conical section 32. The frusto-conical shape of the lower portion 32 in combination with the open mouth portion 16 of bladder 14 provide the optimum shape for ram-air self-inflation of the retardation and flotation device 10. Extending from the circumference of the open mouth portion 16 are a plurality of shroud lines 34 which converge to a common point 36 therebelow on the vertical longitudinal axis of the device. Extending below the common point of attachment 36 is a riser line 38 from which the load 12 may be suspended. A plurality of shroud lines 40 extend from an outer edge portion 42 of the skirt member 22, and converge to the common point of attachment 36 for limiting the upward movement of the skirt member 22 so that it presents a maximum drag surface.

Referring now to FIG. 3, the lower terminal portions of restraining bands 24 and 26 are shown as looped and joined by a ring shaped line 44 extending through the looped portions thereof. The shroud lines 34 have an upper looped portion 46 extending about the line 44 through the terminal looped portion of bands 24.

As shown in FIG. 4, skirt member 22 has a plurality of radially extending band members 48 each having a loop 50 extending beyond the outer edge 42 for providing a convenient point of attachment for shroud lines 40. The opposite ends 52 of bands 48 are sewn to cover member 18 to firmly secure the skirt 22 about the cover member.

Operationally, as the retardation and flotation device 10 is ejected into the atmosphere with load 12 attached thereto from an aerial vehicle, the bladder 14 is inflated by ram-air through open mouth portion 16 and the skirt member 22 forms the aerodynamic shape illustrated in FIG. 2. The device is thus aerodynamically retarded by the combined drag surfaces of the lower frusto-conical portion 32 of the device and the inflated skirt member 22. As the device strikes the water, the load 12 will drag the floatation device below the surface of the water due to the momentum built up during the aerodynamic descent. The skirt member 22 acts as a retardation device within the water environment as it did in the air environment, thus limiting the depth to which the retardation and flotation device will submerge. Without the skirt portion 22, the load 12 may drag the floatation device to a depth where the water pressure may collapse the bladder member 14 thereby resulting in loss of the load. Since the skirt 22 produces sufficient drag within the water to limit the depth to which the bladder is subjected, the bladder due to high leak integrity will maintain itself full of air and float to the surface of the water with the load 12 supported therebelow. On the water surface the upper portion 30, being spherically shaped, provides flotation stability to the bladder member 14 for assuring that the open mouth portion 16 will remain below the surface of the water. The device 10 may further be provided with one or more to assure early detection and recovery such as bright coloring, lights and radar reflective material.

Obviously, numerous modifications and variations of the present invention defined by the appended claims are possible in the light of the above teachings. It is therefore to be understood that the invention may be practiced otherwise than as specifically described herein.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A self-inflating retardation and flotation device comprising:
   an inflatable bag formed of an airtight flexible material and having a longitudinal axis, said bag having only one opening, said opening formed by one end of said bag tapering down to a narrow open mouth;
   a circumferential ring-shaped skirt member having an inner edge portion attached to said bag and an outer edge portion extending away from said bag; and
   a plurality of shroud lines extending from said narrow mouth and converging to said axis of said bag.

2. The device claim 1 wherein said bag has a generally spherical configuration above the line of attachment of said skirt member and a generally frusto-conical configuration below the line of attachment of said skirt member.

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