

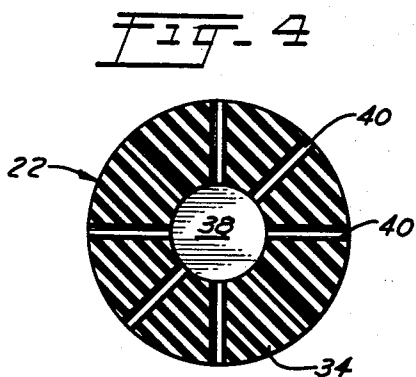
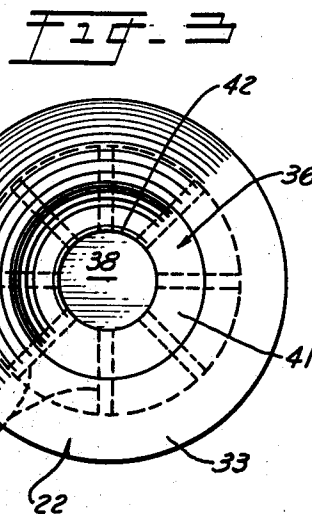
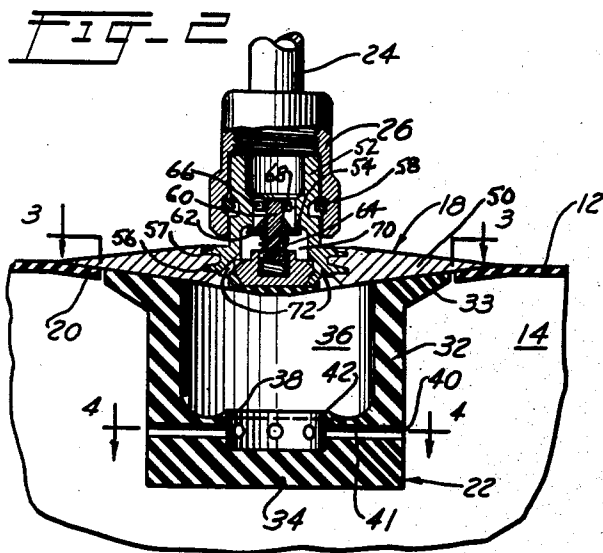
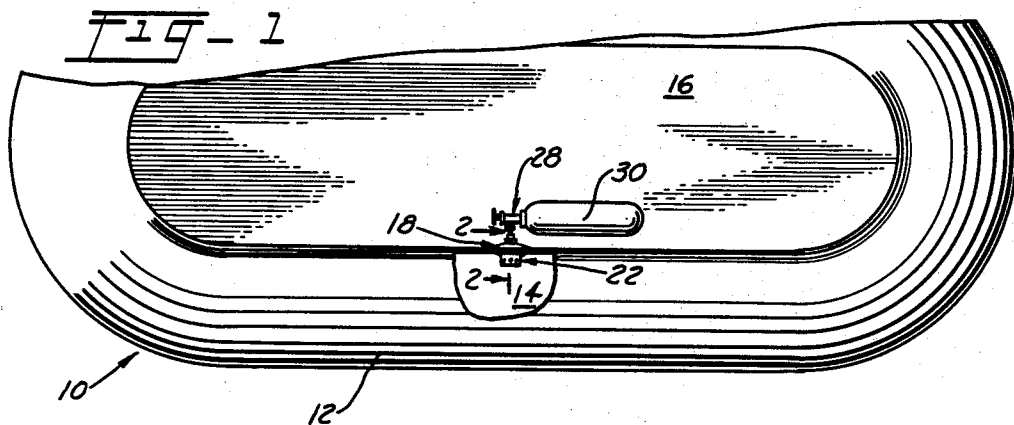
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INFLATOR FOR CO₂ INFLATION DEVICE

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INFLATOR FOR CO₂ INFLATION DEVICE

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This invention relates to an inflation device such as a life raft, a life vest and the like, and more particularly, to a flotation device having apparatus for inflating such device by utilization of the usual container of pressurized fluid, for example, carbon dioxide.

Conventional inflation devices are generally constructed from a rubberized fabric which defines a space-enclosing envelope to which is attached a manifold. The manifold is sealed in place in an opening of the envelope so as to prevent the egress of fluid from the inflation device. The manifold is adapted to communicate with a bulb, or container, of carbon dioxide by means of a discharge connection, and a valve on the container. Upon opening of the valve, carbon dioxide under high pressure passes through the manifold into the envelope to inflate the latter. It has been found that the rapid expansion of carbon dioxide as it enters the envelope sharply reduces the temperature within the envelope to such a degree as to cause localized minute cracks in the rubberized fabric of the envelope. Through such cracks carbon dioxide gas from within the envelope may leak, causing destruction of the utility of the inflation device.

Thus, one object of the present invention is to provide an inflatable device with apparatus for inflating the same wherein the disadvantages and deficiencies of prior constructions are obviated.

Another object of this invention is to provide an inflation device for receiving therein expanding CO₂ gas, and including means for receiving the CO₂ gas from a storage container therefor into an intermediate pre-expansion compartment, so that the means defining said compartment serves both as a manifold and as a dissipater of the cold so as to prevent cracking of the material of the envelope which receives the fully expanded CO₂ gas.

A further object of this invention is to provide a novel apparatus for inflating an inflatable device, such apparatus comprising a manifold adapted to be connected to the inflatable device and a cup-like rubber, cold dissipater secured to the manifold in isolation from said inflatable device, the manifold and cold dissipater together defining a preliminary expansion chamber wherein the temperature of expanding gas may be raised sufficiently prior to discharge into said inflatable device, so as to prevent cracking the fabric forming the wall of the inflatable device.

These and other objects of the present invention will become more apparent hereinafter.

This invention relates to an inflatable device, such as a life raft, comprising an inflatable envelope defining at least one compartment of relatively large volume, and inlet means for admitting pressurized gas into the compartment, the inlet means comprising a manifold affixed to the envelope and a body of substantial mass serving as a cold dissipater affixed to the manifold in isolation from the envelope, the cold dissipater defining a small volume expansion chamber relative to said compartment, but within which initial expansion of the gas may take place, and the dissipater having a plurality of discharge openings therein through which expanded gas may pass from the preliminary expansion chamber into the compartment defined by the envelope.

The following description of a preferred embodiment of the present invention will best be understood when read in conjunction with accompanying drawings in which:

FIG. 1 is a partial plan view of a flotation device embodying the apparatus of the present invention;

FIG. 2 is an enlarged fragmentary view, partly in section, taken generally on the line 2—2 of FIG. 1;

FIG. 3 is a view taken substantially along line 3—3 of FIG. 2; and

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 2.

Referring to FIG. 1, there is shown a plan view of an inflatable-envelope-type flotation device embodying the present invention. The flotation device is shown as a life raft, as is indicated generally by the numeral 10. The life raft comprises a generally annular, elliptically-shaped inflatable tube 12 forming the outer periphery of the life raft, the wall of such tube 12 defining a relatively large compartment or space 14 within the inflatable tube 12. A flat bottom 16 is connected to the inflatable tube 12. If desired, one or more flexible partitions or bulkheads (not shown) may be provided within the inflatable tube to divide the compartment 14 into a plurality of relatively large compartments, and the usual one-way check valves may be provided in each partition between adjacent compartments.

The inflatable envelope, or tube, 12 and the bottom 16 may be constructed of silk or cotton fabric impregnated with rubber, neoprene or like material in a usual and well-known manner. Appurtenances such as oar locks, ropes, etc. are normally attached to the life raft, but inasmuch as they have no pertinence to the present invention they have been omitted for the sake of clarity.

The improved means herein for admitting pressurized gas, commonly CO₂ gas, into the compartment 14 for inflating the envelope 12 comprises an annular inlet manifold 18 and a cold dissipater generally indicated at 22. The inlet manifold 18 is adapted to be secured in opening 20 in envelope 12 in the usual fashion, for example, the flange of the manifold 18 may be vulcanized to the rubberized fabric defining the opening 20 in the inflatable envelope 12.

Positioned outwardly of manifold 18 is an inlet nipple, or tube, 24 having a quick coupling nut 26 adapted for attaching the nipple 24 to the manifold so that nipple 24 communicates through annular manifold 18 with the cold dissipater 22. The nipple 24 connects to a valved discharger 28 that receives pressurized CO₂ gas from cylinder 30, as is well known in the art.

The CO₂ gas is maintained in the cylinder 30 under a very high pressure so that when the valve discharger 28 is opened, the gas is to be discharged into compartment 14 within the inflatable envelope through inlet manifold 18 and cold dissipater 22.

Referring now to FIG. 2, there is shown a sectional view of the inlet manifold 18 and the cold dissipater 22 taken generally along line 2—2 of FIG. 1. Cold dissipater 22 is preferably formed from rubber or neoprene and is cup-shaped, having generally right cylindrical side walls 32 and a base 34. The upper periphery of cup 22 is flared and radially enlarged outwardly at 33 to provide substantial area of contact, at least twice the cross-section area of side walls 32, between cup 22 and manifold 18. The wall thickness of the cold dissipater is several times the wall thickness of the envelope 12. The cold dissipater is vulcanized through its enlarged periphery 33 to the manifold 18 and is thereby made integral with the manifold 18.

It will be seen that a preliminary expansion chamber 36 of predetermined size and location is thus defined between the cold dissipater 22 and manifold 18. Within the base 34 of the cold dissipater, there is provided a central, circular, recess 38 that is depressed relative to the other portions of base 34 that define chamber 36. Communicating with the cylindrical wall of recess 38 are a

plurality of radially extending passageways 40 through which the preliminarily expanded gas within chamber 36 may discharge into compartment 14. The shape of the chamber 36 is such as to define a concave portion 41 surrounding central recess 38 and merging with an annular raised lip 42 at the border or edge of recess 38. The entire arrangement produces a turbulence in the gas as it expands within chamber 36 and before it discharges through passageways 40 into compartment 14.

Normally, cold dissipater 22 would first be suitably affixed to the inlet manifold 18 as, for example, by means of vulcanization. Then the components would be tested to assure that the union between the members meets minimum design requirements. The subassembly comprising the inlet manifold 18 and cold dissipater 22 is then inserted into an opening 20 in the inflatable envelope 12 and the subassembly is united with the fabric surrounding opening 20. Thus, it is readily apparent that the cold dissipater 22, which is made from rubber or neoprene having a wall thickness several times that of the fabric from which the inflatable envelope is formed, is isolated from direct connection to the fabric of the envelope 12.

In a simplified construction of this invention, the gas is merely discharged from manifold 18 into a portion of expansion chamber 36 of the cold dissipater 22. However, as a further improvement, the discharge from manifold 18 to chamber 36 is controlled and directed laterally outwardly against the lateral walls 32 of the cup-shaped member 22. Thus, the manifold 18 comprises the annular patch member 50, to which cold dissipater 22 is vulcanized, and the outermost annulus of patch 50 is vulcanized to tube 12. The patch 50 carries an elongated annular insert 52 upon which is defined a valve seat 54. The insert has ribs 56 and 57 embedded in patch 50. The insert 52 is secured to the coupling nut 26 by means of a locking spring 53 which extends into annular registering recesses formed on the insert 52 and nut 26.

Within the insert 52 is a poppet stem 60 with a molded rubber valve disc 62 thereon biased by spring 64 toward seating engagement with valve seat 54. The stem 60 carries a centering star 66 which cooperates with bore 68 in insert 52. The insert 52 defines a chamber 70 downstream of valve seat 54, and the chamber 70 communicates with a plurality of discharge ducts or passageways 72. In the specific construction shown, four equally spaced ducts 72 are provided and are inclined at 45° to the longitudinal axis of insert 52 with the ducts directed outwardly in the downstream direction.

The arrangement of ducts 72 is such that their discharge ends are positioned inwardly of the walls 32 of member 22, so that the gas issuing from ducts 72 is directed within chamber 36 against the walls 32 and this tends to localize the formation of frozen particles of gas, known as "snow," along the side walls 32 and in the trough 41, thereby preventing clogging of passageways 40.

In the operation of inflating a flotation device utilizing the present invention, with the supply 30 of liquid CO₂ under high pressure connected to the uninflated envelope, it is only necessary to actuate the discharger 28 by appropriate means, well known in the art, to effect inflating. The high pressure carbon dioxide gas unseats the valve disc 62 and discharges through the insert 52 into chamber 70 and through ducts 72 into the limited volume preliminary expansion chamber 36 and then through relatively restricted passageways 40 in the cold dissipater 22 into compartment 14 defined within the inflatable envelope 12. The carbon dioxide, which may be partly in vapor form and partly in liquid form, vaporizes and expands to a limited extent as it enters expansion chamber 36. The expansion of the carbon dioxide results in a sharp but limited temperature drop. The chamber 36 defined within the cold dissipater 22 is constructed and arranged so as to create a turbulence of the gas, which is believed to result in friction and a warming of the gas before the

gas is emitted through the relatively restricted discharge openings 40 in base 34 of the cold dissipater, at which time the gas completes its expansion. The fully expanded gases that discharge through the outlet openings 40 into compartment 14 operate to inflate envelope 12. It has been found that by virtue of the present construction the temperature of the gas is increased sufficiently to materially reduce and substantially minimize any cold cracking of the fabric comprising the inflatable envelope. Tests have shown that when utilizing only a manifold, such as 18, for an inlet means, local temperatures as low as -120° F. have been developed, while when using the construction of this invention, the local temperature drops only to about -40° F.

Thus, by the present invention, the local temperature drop effected by carbon dioxide and other like gases used for inflating a flotation member may be materially reduced after release of the gas from the pressurized container into the inflatable flotation device, so that the problem of cold cracking the fabric of the flotation device is essentially obviated. The present invention may readily be applied to all forms of flotation devices and is relatively simple to construct and relatively inexpensive to manufacture.

While I have described and shown a preferred embodiment of the present invention, it will be understood that various changes and modifications in details of construction may be made without departing from the scope of the following claims.

What I claim is:

1. An inflator for an inflatable device comprising, in combination, a manifold adapted to be sealingly confined within an opening in a wall of said inflatable device, and said manifold adapted to be connected to a source of pressurized fluid for inflating the inflatable device; a cold dissipater positioned within the inflatable device and affixed to said manifold in substantial isolation from direct engagement with said inflatable device, said cold dissipater being cup-shaped and defining together with said manifold a preliminary expansion chamber of relatively small volume relative to the volume of the compartment defined within said inflatable device, means within said cup-shaped member for creating turbulence within the preliminary expansion chamber to raise the temperature of the expanding pressurized fluid sufficiently to thereafter avoid cracking the walls of said inflatable device, said cold dissipater having therein a plurality of openings constricted in cross-section relative to the size of said preliminary expansion chamber for communicating the preliminary expansion chamber with the compartment defined within the inflatable device.

2. An inflator as in claim 1, wherein said manifold has an annular attachment flange adapted for securement to an annular wall portion of said inflatable device and said cold dissipater is secured to said manifold inwardly of said attachment flange and adapted for entry into said inflatable device through the opening in said annular wall portion.

3. An inflator for introducing pressurized gas into the confined space of an inflatable device having walls which may crack when subjected to intense cold; said inflator comprising, in combination: manifold means through which the pressurized gas is passed, means affixed to said manifold means in substantial isolation from direct engagement with said inflatable device and defining a preliminary expansion chamber bounded by a lateral wall and in which expansion chamber the pressurized gas is permitted only a limited degree of expansion, said expansion chamber defining means being relatively thick walled as compared to the walls of said inflatable device, means for discharging the pressurized gas from the manifold means at one end of said elongated expansion chamber in a direction generally axially of and laterally outwardly relative to the axis of said expansion chamber and

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toward said lateral wall of said expansion chamber, means within said expansion chamber adjacent the other end thereof for deflecting said pressurized gases for creating increased turbulence within the expansion chamber to raise the temperature of the pressurized gas to a degree sufficient to thereafter avoid cracking the walls of said inflatable device, and restricted discharge means communicating with a portion of said expansion chamber through said lateral wall for discharging the partially expanded gas into the inflatable device.

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