Nov. 11, 1958 C. E. MANHART 2,859,457

LIFE RAFTS

Filed July 5, 1955 3 Sheets-Sheet 1

FIG. 1.

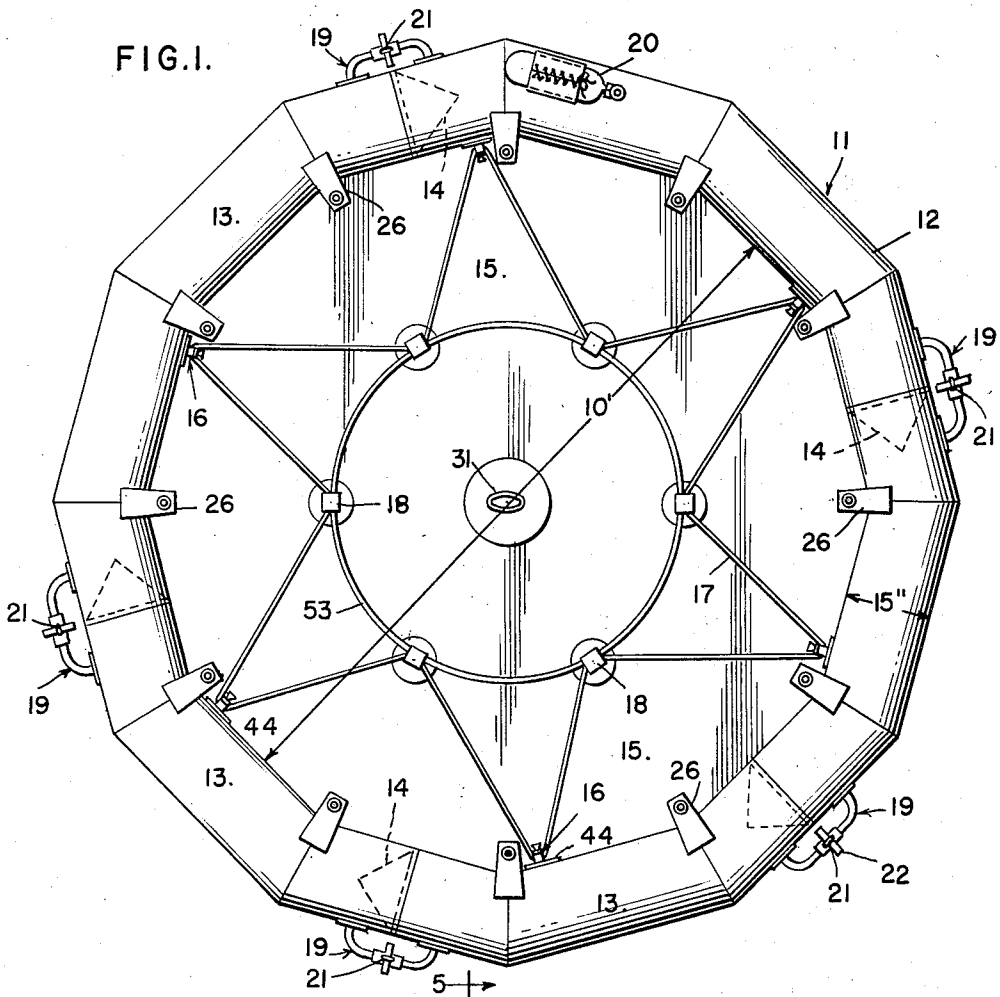


FIG. 4.

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Nov. 11, 1958 C. E. MANHART 2,859,457

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Filed July 5, 1955 3 Sheets-Sheet 2

FIG.2.

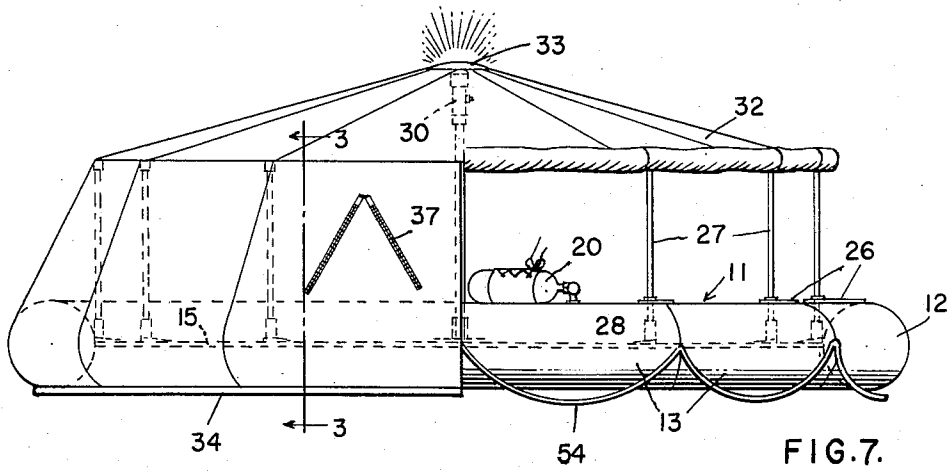


FIG.3.

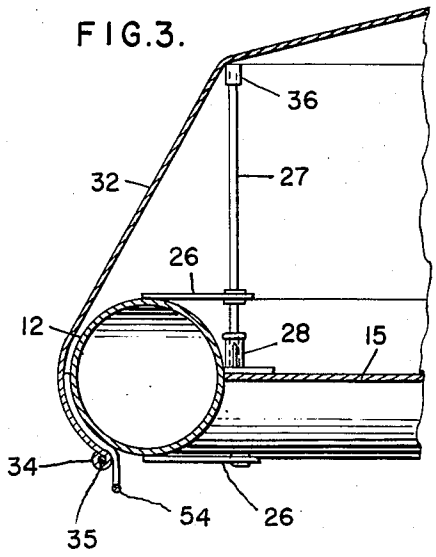


FIG.6.

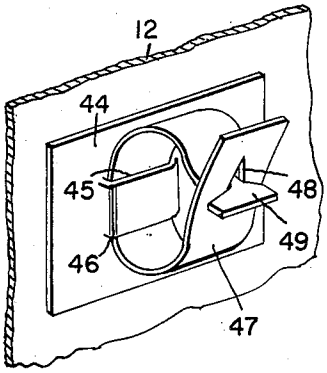


FIG.7.

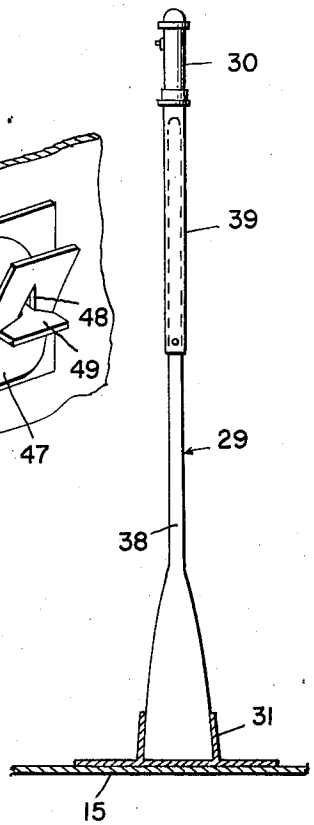
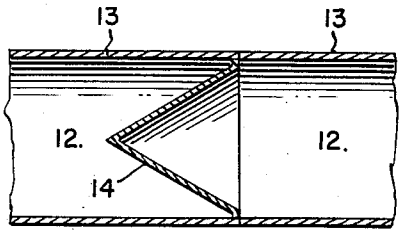


FIG.8.



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Nov. 11, 1958 C. E. MANHART 2,859,457

LIFE RAFTS

Filed July 5, 1955 3 Sheets-Sheet 3

FIG.9.

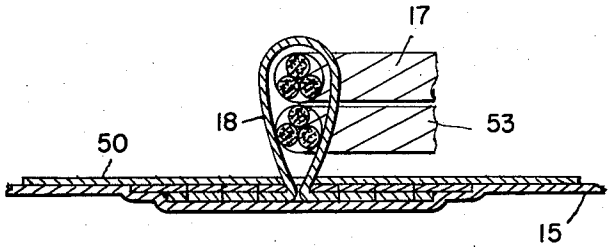


FIG.10.

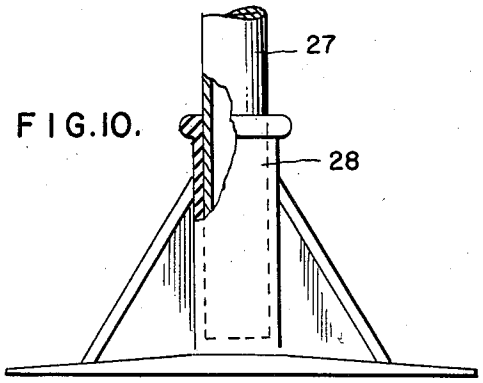


FIG.5.

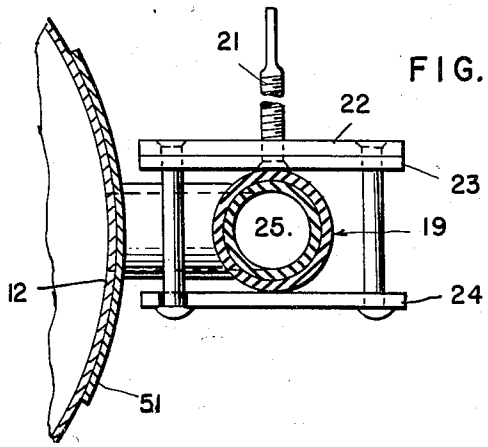
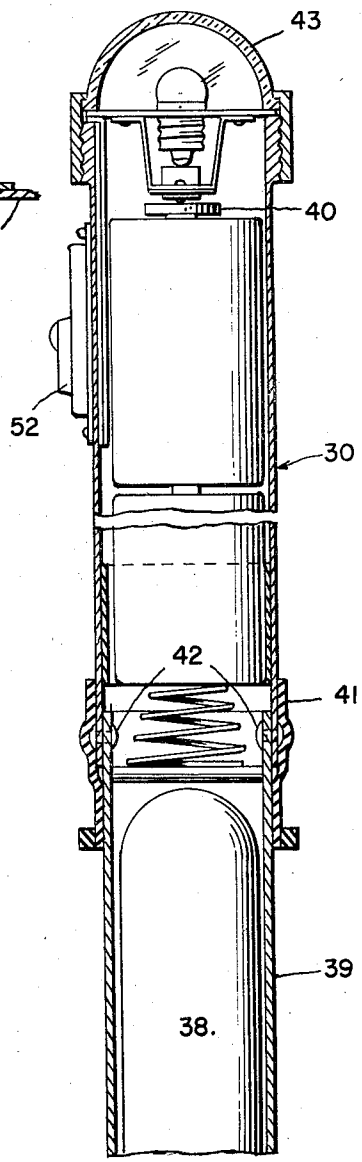


FIG.11.



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LIFE RAFTS

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Application July 5, 1955, Serial No. 519,780

2 Claims. (Cl. 9—11)

This invention relates to life-rafts, and more particularly to inflatable life-rafts of the type carried in aircraft, or the like, for use for survival-at-sea, in the event of a crash or forced landing.

It is an object of the invention to devise a relatively light-weight inflatable raft capable of carrying a maximum number of passengers.

Rafts of this general type frequently have a plurality of inflatable tubes, so that in the event one becomes punctured, the remaining tube or tubes will keep the raft afloat. These rafts suffer the disadvantage, however, that should two or more of the tubes become punctured, the raft will fail in its purpose. In order to overcome this objection, it is an object of this invention to devise a single tube raft that is so compartmented or bulkheaded that in the event one or more of the compartments should become ruptured, the raft will still remain afloat.

In crashes of aircraft at sea, it often happens that some appreciable time passes before rescue can be effected. During such time survivors are exposed to the ravages of the elements, and may suffer even more serious hurts than those incurred in the original crash. It is, therefore, another object of this invention to devise sheltering means to be used with the raft for the safety and convenience of the survivors.

Still another object of the invention is the provision of an attention-attracting light, visible through the sheltering means.

Another object of the invention is to devise a raft that is reversible; namely, a raft that is equally readily usable irrespective of which side thereof may be in contact with the water.

In rough weather to which survivors at sea are often subjected, it sometimes happens that one or more of the survivors may be thrown about on the raft and possibly cast into the sea and lost. It is known to provide life-lines around the periphery of conventional life-rafts for the safety and convenience of survivors. It is an object of this invention, however, to provide, in addition to the conventional life-lines around the periphery of the raft, life-lines disposed on the survivor-supporting deck of the raft, such life-lines being attached in a manner which will permit them to be readily releasable from their moorings in order to better secure the safety of the survivors.

Such objects and others that appear hereinafter can be realized by an embodiment of the invention that has an endless inflatable and deflatable tube forming the outline or periphery of the life-raft with a diaphragmatic deck or floor supported more or less diametrically from the tube for supporting survivors thereon. The tube is compartmentized by means of a plurality of transversely extending flexible coned-shaped divisions or bulkheads having closable and openable equalizer means bridging the divisions, and tube-inflating means are provided. Such a raft is reversible, namely it can be used either side up. Additional advantage can be derived by using a shelter means forming a canopy secured at the periphery of the raft, held in extended or survivor-covering position by a mast that can be oar-supported means rising from the deck for upholding the peak of the canopy. If desired, the peak can be made of substantially transparent material so that flashing means on the mast can be seen through the transparent peak. The canopy can be made more commodious by being formed with a shoulder portion supported from stanchions, that may be telescopic, secured to the tube. Additionally, there may be a life-line on the deck slidably held in place by breakable fastenings. Other features of advantage appear hereinafter.

In the drawings:

Fig. 1 is a plan view of the raft of the invention;

Fig. 2 is a view in side elevation of the raft, with the canopy attached;

Fig. 3 is a partial vertical cross-sectional view, taken along the line 3—3 of Fig. 2, showing the detail of the canopy supporting means and the canopy-retaining means;

Fig. 4 is a view of the equalizer tube, with certain parts in cross-section;

Fig. 5 is a view taken along line 5—5 of Fig. 4, looking in the direction of the arrows;

Fig. 6 is a view, in perspective, of the novel life-line securing means;

Fig. 7 is a view in side elevation of the mast;

Fig. 8 is a fragmentary cross-sectional view of the flexible bulkhead divider;

Fig. 9 is a view of the deck-top life-line securing means;

Fig. 10 is a view in front elevation of the canopy rod supporting means, with certain portions broken away; and

Fig. 11 is a detailed cross-sectional fragmentary view of the mast and flashlight combination.

As will be seen in Fig. 1, the raft **11** as constructed has a tube **12**, which tube or tubular peripheral member is divided into compartments **13** by means of flexible cone-shaped divisions or bulkheads **14** cemented or otherwise secured in place therein. Deck **15** is attached diametrically of the tube **12**, so as to lie midway between the upper and lower edges of the tube **12**. Deck **15** is provided with life-line moorings **16**, through which slidably passes life-line **17**. Tube **12** is provided with the novel life-line moorings **18** around its inner periphery. Equalizer tubes **19** are spaced on the outer periphery of tube **12**, connecting compartments **13** at points bridging the bulkheads **14**. Mounted on the tube is a cylinder **20** of compressed CO_2 gas for inflation of the tube.

It is readily apparent that when the CO_2 gas is released from the cylinder, it passes into that compartment **13** of tube **12** at which cylinder **20** is mounted, then passes through on equalizer tube **19** into the next compartment, and so on until the entire tube is inflated.

After complete inflation of the tube **12**, equalizer tubes **19** are closed off, as by turning thumb screws **21** of pinch clamps **22**, forcing opposed faces **23**, **24** together, thus closing off air passage **25** of tube **19** between compartments. It will be seen, therefore, that when this is done, there is no intercommunication between any of the compartments of the tube, so that in the event one of the compartments becomes ruptured, thereby losing its inflating air, the remaining compartments will continue to be inflated, and not lose their inflating air through such rupture. Should two or even three of the compartments **13** become ruptured, the raft will still function to support the survivors.

Flexible bulkheads **14** are non-planar in cross-section and preferably are cone-shaped, as best seen in Fig. 8, in order better to withstand pressure, and to equalize the volumes and pressures in adjacent compartments. Also, if an adjacent compartment becomes punctured and collapses, I have found that this non-planar, coned,

curved, or bowed bulkhead satisfactorily withstands breaking even when much greater pressure is applied to one side and relatively little to the other.

Another feature of the invention is the provision of a canopy, and canopy-supporting means. As best seen in Figs. 1 and 3, canopy-support rods or stanchions 27 are received through canopy-support rod holders 26 cemented or otherwise secured to tube 12, which are spaced at intervals on tube 12. Disposed below holders 26 on the face of deck 15 are sockets 28, adapted to securely receive therein the lower ends of rods 27 (Fig. 10).

Additional canopy-supporting means are provided in the oarmast 29, with attached signalling means 30. Mast 29 is received in envelope or socket 31, that is preferably flexible, and attached to the center of deck 15.

It will be understood that, as shown for example in Fig. 3, the attachments 16, 18, 26, 28, 31, and 44 may be, and preferably are, provided at appropriate positions on both sides of deck 15 and tube 12, so as to permit immediate use of the raft for its intended purpose, irrespective of which side of the raft rests in the water.

As illustrated in Fig. 2, a canopy 32 is supported on stanchion or rods 27 and mast 29, for weather-protection of survivors on the raft. Canopy 32 is made of a relatively light-weight opaque rubberized nylon fabric, and is provided at its apex with a transparent portion 33, preferably made from a polyester film such as that known as Mylar. The color of the fabric used is yellow for greater visibility.

Disposed in hem 34 of canopy 32 is a length of elastic cord 35, adapted to hold the lower edge of canopy 32 securely against the tube 12. Canopy 32 is also provided at suitable positions with sockets 36 which fit over the upper ends of canopy-supporting stanchions 27, whereby to hold and give a shouldered shape to the canopy at the upper ends of the stanchions. As seen in Fig. 2, the canopy is provided with an inverted V-shaped zipper construction 37, providing access to and egress from the interior of canopy 32, and in addition may be utilized with a similar structure (not shown) diametrically disposed in the canopy, for ventilation purposes. Also as shown at the right in Fig. 2, portions of canopy 32 may be rolled up for admission of additional light, or air, and secured in rolled-up position by any conventional method, means for which may be provided in the construction of the canopy.

Referring now particularly to Figs. 2, 7 and 11, it will be seen that there has been provide a mast 29 for supporting canopy 32, while at the same time providing signalling means for attracting rescuers. Mast 29 may be composed of oar 38, extension 39 and signalling member 30. Member 30 may be a two-cell flashlight provided with flasher 40, and switch 52, which may be manually operated by occupants of the raft upon proper occasion. As best seen in Fig. 11, flashlight 30 is connected to extension 39, as by sleeve 41 which may be of rubber, the sleeve 41 serving to cover and protect rivet connections 42. Rivets 42 secure the signalling means 30 to extension 39.

When canopy 32 is in place and supported, at least in part, by mast 29, the transparent portion 33 of the canopy rests on transparent lens 43 of flashlight 30. As flasher 40 operates, the signal thereby produced will be transmitted through the portion 33, and thereby be readily observable by searchers and rescuers.

Fig. 6 illustrates a preferred form of readily releasable lifeline 17, to be attached to the inner periphery of tube 12. As there shown, mooring 16 is constructed of a patch 44 in which there are parallel slots 45, 46. Passing through slots 45, 46 is a loop 47, adapted to slidably receive therethrough life-line 17. As will be noted, loop 47 is constructed adjacent one end thereof with a cut 48, which receives therein the opposite co-operatively shaped end 49 of loop 47. During rough weather, the occupants of the deck grip line 17 in order to steady their positions. Maintaining their position is also facilitated if the occupant puts his feet on the second lifeline 53. If, perchance, one of them should be thrown about while grasping line 17, the force transmitted thereto will break cut 48 completely open, thereby permitting the occupant to retain a connection with the raft until he is returned to his position by the other survivors.

Fig. 9 illustrates the method by which deck life-line 17 is secured to the deck 15 at points inboard of the tube 12. Loop 18 is secured, as by cementing, to deck 15, and a chafing patch 50 is secured thereover to protect the deck at the point of strain. In this loop may also be secured a second deck life-line 53 that is more or less circularly arranged as shown in Fig. 1. Life-line 54 extends around the periphery of the tube of the life-raft but is looped as shown at the right of Fig. 2 to provide immersed stirrups to be used by survivors in boarding the raft.

Chafing patches 51 are employed for like purposes at the points of emergence from tube 12 of equalizer tubes 19, and intermediate the length of tubes 19 where equalizer clamps 22 are situated.

Fig. 10 illustrates the manner in which canopy-support stanchions 27 are inserted and held in canopy-support rod sockets 28. Sockets 28 are formed of the same material as tube 12 and deck 15, and are cemented in place. Stanchions 27 may be one-piece, or they may be of telescopic construction, allowing for permanent attachment to deck 15, while at the same time permitting adjustment in the shape of the canopy.

Sockets 36, attached to canopy 32 for reception of the upper ends of stanchions 27 are of the same material as the canopy. The various sleeves, grommets and the like which are attached to the deck 15 and tube 12 are of the same material as the deck and tube.

In operation, the folded and deflated raft is thrown overboard. Survivors swim to it; inflate it; climb aboard using the stirruped life-line 54; and hold themselves in place on the deck by the life-lines 17 and 53. Then they put up the canopy, as needed.

The raft of the invention, although primarily intended for use at sea, is not restricted thereto. Inasmuch as aircraft sometimes crash in other areas, as for example arctic or desert lands, it is contemplated to use the raft and canopy as shelter in such areas. Where a crash occurs in an arctic area, the survivors may pack snow or ice around the raft, while using the canopy as a protective device against exposure. In a similar way, if a crash occurs in a desert or on the plains, sand or the like may be packed around the raft, as may be branches of trees, moss, dirt or the like, in the event of a crash in jungle or mountainous areas.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, since the scope of the invention is defined by the appended claims rather than by the description preceding them, and all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly co-operative equivalents, are therefore intended to be embraced by those claims.

I claim:

1. A life-raft having an inflatable endless tube, a diaphragmatic deck extending inwardly of the tube at an elevation substantially at the midheight of the tube, an endless life-line extending annularly around the center of the deck and inboard of the tube, an inner ring of looped means for slidably securing the life-line to the deck at a plurality of points, an outer ring of breakable looped strap means disposed at a plurality of points around the periphery of the raft, and a second endless life-line extending alternately and slidably through a looped strap of the outer ring thereof and a loop of the inner ring thereof to present in plan view a circle formed

by the inner life-line from which radiates a plurality of angles formed by the outer life-line with the outer looped straps, whereby when an occupant of the life-raft puts an abnormal strain on the second life-line a looped strap of the outer ring thereof will break instead of a loop of the inner ring thereof.

2. A life-raft having an inflatable endless tube, a diaphragmatic deck extending inwardly from the tube, compartmentizing flexible divisions extending generally transversely of the tube, equalizer means bridging around each division, means for closing off the equalizer means, life-lines on the deck, and breakable means for securing the life-lines slidably in place, wherein the breakable means comprise a slotted patch secured to the tube, a life-line engaging loop of rubberized fabric passing through slots of the patch, and one end of said loop being slotted for reception in firm but easily breakable engagement of the opposite co-operatively formed end of said loop.

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