Feb. 4, 1969 L. P. FRIEDER ET AL 3,425,071

HEAT REFLECTIVE INFLATABLE BUOYANT BODY

Filed Oct. 20, 1965 Sheet 1 of 2

Fig 1

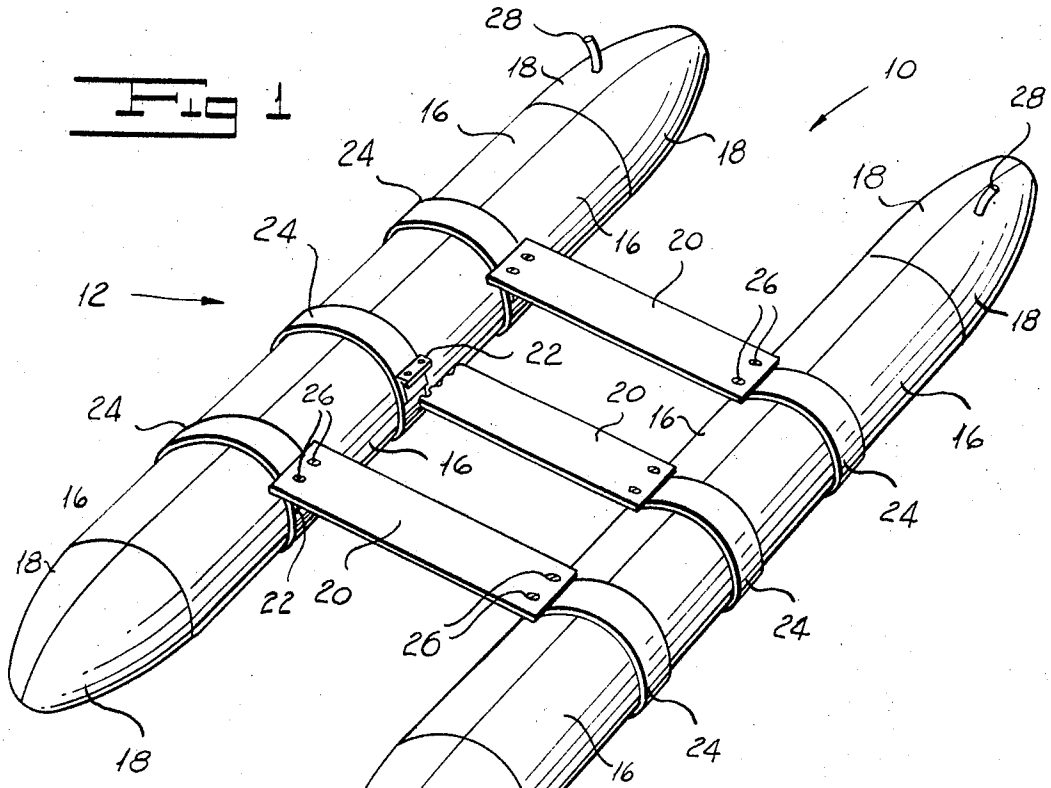
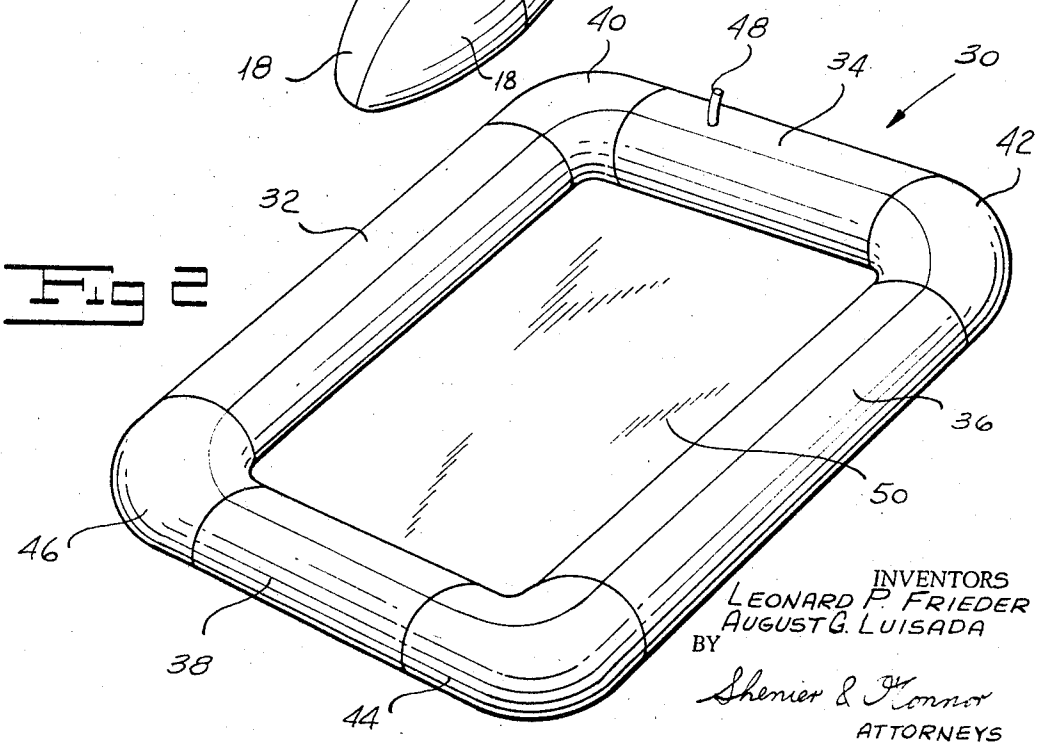


Fig 2



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Sheet 2 of 2

Fig 3

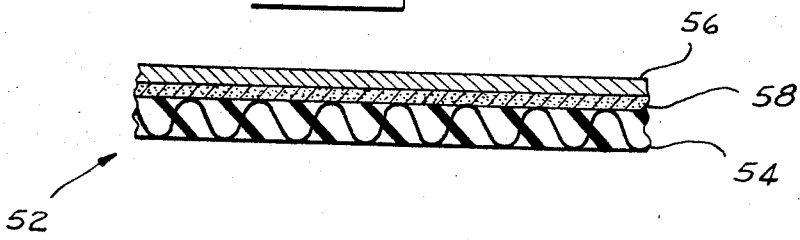


Fig 4

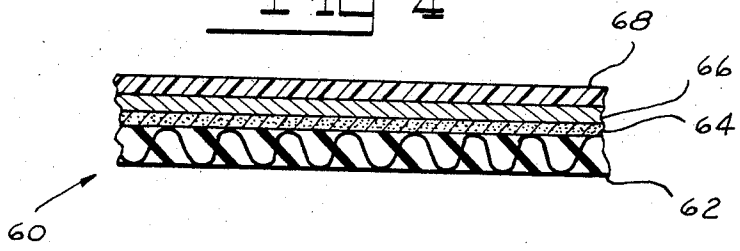


Fig 5

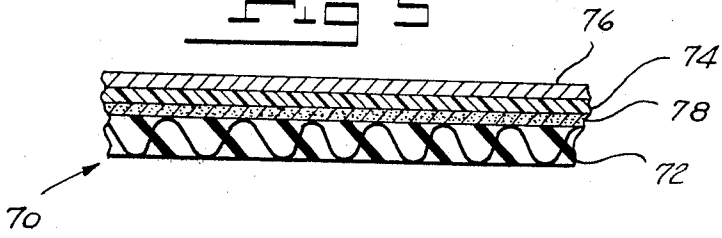


Fig 6

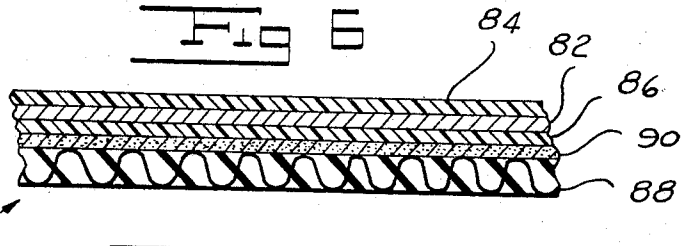


Fig 7

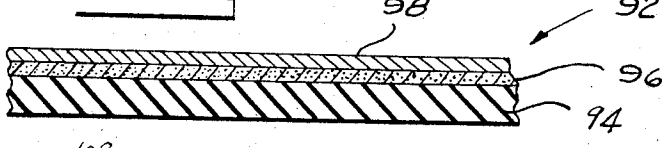
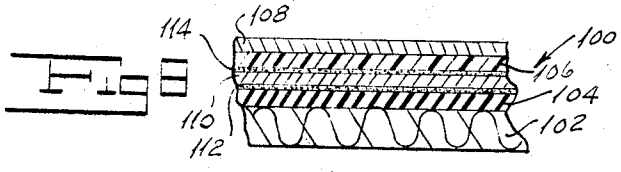


Fig 8



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HEAT REFLECTIVE INFLATABLE BUOYANT BODY

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U.S. Cl. 9—11 4 Claims
Int. Cl. B63c 9/04; B32b 15/08

ABSTRACT OF THE DISCLOSURE

A craft for use by survivors at sea comprising an inflatable body having a wall made up of an impervious base and a film of heat reflective material carried by said base for reducing variations in temperature of the inflating gas within the body in response to changes in ambient temperature.

Our invention relates to an improved inflatable buoyant body and more particularly to an inflatable body so constructed that the pressure of the inflating gas within the body remains substantially constant with changes in temperature.

Various inflatable buoyant bodies are known in the art for supporting one or more persons in the water. For example, there are buoyant floats which may comprise a part of a boat of the type known as a catamaran. Other buoyant bodies are made in the shape of a raft and form a most important if not essential piece of equipment for survival at sea. Most of the devices of this type are made inflatable rather than being formed of solid buoyant material in order to permit them to be stowed in a relatively small space. This is particularly true of life rafts stored on ships, in which space is at a premium.

In use of inflatable bodies of the type described above, in order to prepare the boat or raft for use it is filled with air or a suitable gas, possibly by blowing through a suitable valve or more probably inflating the body from a tank of compressed air or gas such as carbon dioxide. Once the boat has been inflated, it is ready for use in buoyantly supporting one or more passengers. When the boat is on the open water, it is exposed to the direct rays of the sun and consequently the temperature of the gas within the body increases and a corresponding increase in gas pressure results. If the body is to be prevented from bursting when the pressure increases, some means must be provided for permitting the escape of gas to hold the pressure within a safe range. After such release of gas when the sun is obscured by clouds or when darkness falls, the temperature of the gas drops and its pressure falls. If a dangerous condition of too little buoyancy or even of sinking is to be avoided in this circumstance, additional gas or air must be pumped into the raft. The situation may occur, however, particularly in the case of a survival raft, either that the supply of compressed gas available is exhausted or that pumping equipment is not available. Moreover, the inlet valve structure may be such that it is impossible for an individual to blow into the valve to refill the raft. The danger of this condition will readily be appreciated.

It is further desirable that a craft, such as a survival raft or a boat, be radar reflective. That is, radar is often employed in an effort to locate a lost boat or to locate a survival raft. If that effort is to be successful, the craft must respond to the radar beam.

We have invented an improved inflatable buoyant body which overcomes the defects of inflatable buoyant bodies of the prior art. Our device is so constructed that the pressure of the inflating gas remains substantially constant, or within a safe range, under most conditions which

will be encountered in use. It is simple and inexpensive in construction for the result achieved thereby. It is so constructed further as to be radar reflective to permit the raft or boat to be located by radar.

One object of our invention is to provide an improved inflatable buoyant body which overcomes the defects of inflatable buoyant bodies of the prior art.

Another object of our invention is to provide an inflatable buoyant body, the inflating gas pressure of which remains within a safe range under most conditions of its use.

A further object of our invention is to provide an inflatable buoyant body which is simple and relatively inexpensive for the result achieved thereby.

A still further object of our invention is to provide an inflatable buoyant body which reflects a radar beam.

Other and further objects of our invention will appear from the following description.

In general our invention contemplates the provision of an inflatable buoyant body, the wall of which is formed of an air-impervious base material carrying a heat-reflective metallic film and which may be provided with a layer of abrasion-resistant material.

In the accompanying drawings which form part of the instant specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views:

FIGURE 1 is a perspective view of one type of inflatable boat incorporating our invention.

FIGURE 2 is a perspective view of an inflatable life raft embodying our invention.

FIGURE 3 is a sectional view of one form of material from which a craft embodying our invention may be formed.

FIGURE 4 is a sectional view of another form of material of which a craft embodying our invention may be formed.

FIGURE 5 is a sectional view of a further form of material of which the inflatable body of a craft embodying our invention may be made.

FIGURE 6 is a sectional view of yet another material of which the inflatable portion of a craft embodying our invention may be formed.

FIGURE 7 is a sectional view of a still further form of material of which a craft embodying our invention may be made.

FIGURE 8 is a fragmentary sectional view of still another form of material of which our buoyant body may be made.

Referring to FIGURE 1 of the drawings, one form of craft to which our invention is adapted to be applied is a boat of the catamaran type indicated generally by the reference character **10**. In the form of the boat **10** illustrated in FIGURE 1, we form the two hulls of the boat as two inflatable pontoons indicated generally, respectively, by the reference characters **12** and **14**. Each of the pontoons **12** and **14** is made up of a number of panels **16** of material to be described hereinafter forming the central section of the pontoon and panels **18** making up the fore and aft tapered portions of the pontoon. It will readily be appreciated by those skilled in the art that the panels **16** and **18** are so joined along the seams as to be impervious to the passage of air therethrough. This may be accomplished by stitching, adhering, heat sealing and like operations.

The boat **10** may include a plurality of seats or thwarts **20**, each of which extends between a pair of brackets **22** respectively carried by support bands or collars **24** secured to the central portions of the respective pontoons **12** and **14**. Any suitable means such, for example, as screws **26** or the like, may be employed releasably to

hold the thwarts **20** between the brackets. In order to place the boat **10** in operation, each of the pontoons **12** is filled with air or gas from a suitable source through an inlet valve **28** of any suitable type known to the art. Once the two pontoons **12** and **14** have been inflated, the thwarts **20** can be secured in place. It will further be appreciated by those skilled in the art that the boat **10** may be provided with a small continuous deck rather than merely the spaced thwarts **20** and further, a mast carrying a sail might be attached to this deck structure. Since these details of the boat do not per se form part of our invention, they have not been shown.

Referring to FIGURE 2 we have illustrated a life raft indicated generally by the reference character **30** which also may embody our invention. The raft **30** includes four generally straight side and end sections **32, 34, 36** and **38** joined by corner sections **40, 42, 44** and **46**. Each of the sections we have illustrated may be made of a number of panels of material to be described, so joined to each other as to provide seams which are impervious to the passage of gas therethrough. Moreover, the various parts of the raft may be made separately inflatable or the structure may be inflated as a unit by pumping or otherwise supplying gas or air under pressure through a valve **48**. The center of the raft **30** carries a deck **50** which may or may not be made inflatable. As is also known in the art, a raft, such as the raft **30**, may also be provided with inflatable bulkheads as well as inflatable thwarts. Since the particular configuration of the raft **30** per se forms no part of our invention, these additional features are not shown and will not be described in detail.

We form the wall of the inflatable portions of the boat **10** which are the pontoons **12** and **14** and the inflatable part, such as the gunwale, of the raft **30** from an air-impervious and radiant heat-reflective material. Referring to FIGURE 3, one form of wall material indicated generally by the reference character **52** comprises a base **54** which may be rayon, nylon or cotton canvas of a weight of from one to twelve ounces which we may impregnate with a material such as rubber, buna N or the like to make the base impervious to the passage of gas. Alternatively to impregnating the fabric of base **54**, we coat it with layers of rubber, buna N or like impervious material which also serves as an adhesive.

We apply a continuous film **56** of a radiant heat reflective material such, for example, as metal to the outer surface of the base layer **54**. This may be achieved in any suitable manner known to the art. For example, we may adhere a metallic foil or film **56** to the surface of the base **54** by means of the impervious rubbery material to which the foil is bonded by a chemical bonding agent **58** such, for example, as isocyanide. Various techniques are known in the art for applying such a metallic film to a base material. For example, the film might first be applied to a thin plastic sheet, the surface of the fabric of base **54** be covered with the adhesive which is coated with the chemical bonding agent, and then the film can be brought into contact with the bonding agent and the plastic sheet stripped away. Alternatively, the film can be sprayed on or a suitable vapor deposition process can be used. The method employed to apply the metal to the base **54** does not in itself form a part of our invention. Any appropriate metal such, for example, as aluminum may be employed.

Referring to FIGURE 4, we have shown an alternate form of material indicated generally by the reference character **60** which we may use for the wall material of the buoyant members. In this form of material we build up an assembly of a base fabric **62** similar to the fabric **54**, apply a layer of adhesive **64** like the layer **58** and then apply an assembly of a metallic film **66** and an outer plastic layer **68**. The outer layer **68** in this form of the material we employ may, for example, be polyethylene terephthalate. It serves to enhance the abrasion resistant characteristic of the material while not deleteriously affecting the heat-reflective properties of the metallic film **66**.

Referring now to FIGURE 5, in still a further form of material indicated generally by the reference character **70** which we may employ, we make up an assembly of the base material **72** like the material **62** and **54**. We make up an assembly of a plastic film **74** and a metallic film **76** which may, for example, be vapor-deposited on one side of the sheet **74**. We adhere the other side of the sheet **74** to the outer surface of the base material **72** by a suitable rubbery adhesive and a chemical bonding agent such as isocyanide. We have discovered that this assembly is similar to that of FIGURE 4 in that it provides increased abrasion resistance over the form of material **52** wherein no layer such as the layer **74** is employed. Layer **74** may be polyethylene terephthalate.

In a still further form of material indicated generaly by the reference character **80** which we may employ we sandwich the metallic film **82** between two films **84** and **86** such as polyethylene terephthalate. Having formed that subassembly we adhere it to the outer surface of a base **88** similar to the material **72** by a suitable chemical bonding agent **90**.

Referring to FIGURE 7, we have shown another material indicated generally by the reference character **92** which is similar to the material **52** but which differs therefrom in that the base material **94** does not incorporate any fabric but is a solid sheet of an air-impervious material such as rubber, buna N or other suitable material. An adhesive film **96** adheres the metallic film **98** to the base material **94**. In all forms of the wall forming material we employ, we make the heat reflective film substantially continuous so that it also reflects radar beams.

Referring to FIGURE 8 a still further form of material, indicated generally by the reference character **100** includes a base fabric **102** carrying an impervious coating **104** of rubbery material which also serves as an adhesive. In this form of material we adhere a sandwich of a layer **106** of polyethylene terephthalate between two metal films **108** and **110** to the rubbery layer **104**. An almost imperceptibly thin film **112** of a chemical bonding agent such as isocyanide or the like bonds the metal film **110** to the impervious rubbery adhesive layer **104**. We may also employ a chemical bonding agent film **114** to bond metal layer **110** to layer **106**. We have discovered that this arrangement is a highly efficient reflector while also being resistant to abrasion.

In use of a boat **10** or a raft **30** incorporating one of the materials shown, respectively, in FIGURES 3 to 7, the inflatable members, such as pontoons **12** and **14**, of the boat **10** or the gunwale of the raft **30**, are inflated through the valves provided therefor by pumping them with gas or air or, for example, filling them from a flask of compressed gas. After the inflatable members have been blown up in that manner, any necessary subsequent assembly operations, such as attaching thwarts **20** in the case of the boat **10**, are performed. That having been done, the craft is placed in the water and is ready for use.

In operation of the craft when it is exposed to the direct rays of the sun, the reflective metal prevents excessive heating of the interior gas or air to avoid buildup of excessive pressures. When the sun is obscured or at night, substantially the same pressure exists and the inflatable elements will not collapse to any appreciable extent. Thus, the buoyancy of thet craft remains in a safe range so that on the one hand sufficient buoyancy is provided to keep the craft afloat and on the other hand dangerous buildup of internal pressure is avoided.

In operation of a further feature of the device, we make the metallic film and the wall material substantially continuous or at least continuous over appreciable areas so that it is a good radar reflector. Thus, a craft em-

bodying our invention is relatively easily spotted by radar.

It will be seen that we have accomplished the objects of our invention. We have provided an inflatable buoyant body which overcomes the defects of buoyant bodies of the prior art. Our inflatable bouyant body has an internal pressure which remains within a safe range under substantially all of the conditions which the craft incorporating the body encounters in use. Our buoyant body is a good radar target.

Having thus described our invention, what we claim is:

1. A craft for use by survivors at sea comprising an inflatable body including an inflatable wall comprising layers of material including a gas-impervious base material, and a continuous radiant heat reflective film of metal forming the outermost layer of said wall secured to and covering a substantial portion of said wall, said film exposed to radiant heat to reduce variations in temperature of the gas within said body in response to exposure to radiant heat.

2. A craft as in claim 1, said layers including an adhesive for securing said film to said surface.

3. A craft as in claim 1, said layers including a film of polyethylene terephthalate for supporting said metal film.

4. A craft as in claim 1, said layers including a film of polyethylene terephthalate for supporting said metal film and an adhesive for securing said terephthalate film to said base.

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U.S. Cl. X.R.

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