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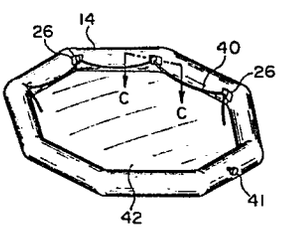
(54) Inflatable raft having continuous gas cell formed from single sheet.

(57) A flexible, rectangular, impermeable sheet of rubberized cloth is formed into an elongated, continuous, linear tube, which is then joined end to end to produce a continuous circular gas cell (14) for a raft. The cell is bent at several corners into a polygonal configuration, and angulation members (26) are attached to the corners to retain the bends and preserve the desired cell shape upon inflation. A bottom sheet (42) is attached to the polygonal cell (14) to complete the raft.

FIG. 12



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Inflatable raft having continuous gas cell formed from single sheet

Field of the Invention

This invention relates to an inflatable raft made of rubberized cloth or the like, and which may be stored on ships or airplanes for rescue use in an emergency, or which may be used for recreational purposes.

Description of the Prior Art

Conventional inflatable rafts are polygonal, circular and elliptical in shape. An example of a polygonal raft is illustrated in Figs. 1 through 3, wherein Fig. 1 shows a perspective view of a continuous gas cell of the raft, Fig. 2 shows a horizontal section taken on line A-A of Fig. 1, and Fig. 3 shows a flat blank from which a single gas cell is made. The polygonal gas cell 1 is made of impermeable sheets of rubberized cloth which are formed into tubular units and adhesively connected to each other.

In manufacturing the gas cell, sheets 1a, 1b, 1c, etc. with S-curved edges at both ends are cut out on a floor surface such that each sheet is offset by a certain length from an adjacent sheet, and has an overlapping edge margin for adhesion. The sheets are then coated with adhesive at the margins, and formed into tubular units. A predetermined number of such units, two for example, are connected together at their ends as shown in Fig. 2, and the connected units are then similarly joined

with other connected units to eventually arrive at the final gas cell configuration shown in Fig. 1.

The manufacture of this conventional raft thus necessitates connecting a plurality of gas cell units together, an operation which inevitably requires specialized manual skills; the sequence is very difficult and the reliability of the completed is generally poor. The complex shapes of the various gas cell blanks make the work very tedious, and since it is carried out on the floor level the workers must be constantly bent over. Finally, the large quantity of adhesives involved contain dangerous and harmful substances, which have harmful effects on the operators' health.

SUMMARY OF THE INVENTION

This invention provides an inflatable raft which can be constructed in a short time and which eliminates the troublesome operation of adhering together a plurality of separate sections. A single, elongated continuous tubular gas cell is formed from a rectangular sheet, and is then bent into a polygonal shape and secured by simple angulation members at the corners.

The efficiency of the angulation assembly operation is increased in one embodiment by using a pair of patches fixed to the walls of the gas cell and a joining member connected at its ends between the patches; the joining member can also be used as a handle.

The rafts can be made easily without requiring special assembly skills by simply connecting one end of the tubular gas

cell to the other end to form a continuous circular cell, and then, in another embodiment, inserting angulation members with projecting tabs into predetermined corner portions of the cell to bend it into a polygonal shape.

In another embodiment a projection on the angulation members supports a grab or safety rope extending around the inside of the raft.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a continuous gas cell of a conventional raft;

Fig. 2 is a horizontal sectional view taken on line A-A of Fig. 1;

Fig. 3 is an unfolded view of a single gas cell sheet of a conventional raft;

Fig. 4 is a perspective view of a continuous gas cell of a raft according to this invention;

Fig. 5 is a horizontal sectional view taken on line B-B of Fig. 4;

Fig. 6A is a perspective view of an angulation member with a connected joining member;

Fig. 6B is a perspective view of an angulation member with a cord joining member;

Fig. 7A is a fragmentary sectional view of an angulated corner having a patch type angulation member;

Fig. 7B is an enlarged fragmentary perspective view of the embodiment of Fig. 7A;

Fig. 8 is a fragmentary sectional view of an embodiment having a T-shaped angulation member;

Figs. 9 through 11B are enlarged perspective views of various T-shaped angulation members;

Fig. 12 is a perspective view of a raft according to another embodiment of this invention; and

Fig. 13 is an enlarged horizontal sectional view taken on line C-C of Fig. 12.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In Figs. 4 and 5 a continuous gas cell 1 is in the form of a hollow polygonal tube made of a nonpermeable sheet material. Flexible patches 2 are fixed to the outer wall of the gas cell on the inner side of the tube. A joining member 3 is connected between adjacent patches 2 to draw them towards each other to thereby angulate the gas cell 1. A pair of patches 2 and a joining member 3 constitute an angulation member.

In the production of the raft a flexible and impermeable sheet, such as rubber or resin coated cloth, is cut into an elongated belt-like strip of sufficient length to form the polygonal gas cell 1 and sufficient width to allow an overlapping margin for an adhesive tube joint at the edge of the rectangular strip. One longitudinal edge of the strip is joined to the other longitudinal edge to form an elongated linear tube, and subsequently one end of the tube is joined to the other end to form a continuous circular tube.

A joining member 3 made of a synthetic cloth, a belt or the like is connected to a pair of adjacent patches 2 by sewing

at both ends to form an angulation member. The patches are made of rubber cloth or the like, and may be round, elliptical or quadrilateral in shape.

The angulation members are adhered to the inside wall 1A of the raft such that they traverse the angles of the bent portions of the gas cell 1, and thus tension the cell to form corners and thereby define a polygonal gas cell. A bottom sheet 4 and other additional devices may be attached to the cell to make up a complete raft. The raft is usually folded for storage in a suitable place, and is inflated by gas in cases of emergency or as desired when the raft is to be used recreationally.

The angulation members are not restricted to those described above, with various other configurations being adoptable. In Fig. 6A a joining member 31 made of a synthetic cloth, a belt or the like, has one end sewn to a patch 21. The complete angulation member is thus composed of two sets of joining members 31 and patches 21, and is applied by adhering each half at a predetermined position on the gas cell 11 and then drawing together and connecting the free ends of the joining members by sewing, gluing or tying to form a suitable angle in the gas cell 11.

In Fig. 6B the patches 22, 22 are each provided with a plurality of holes with eyelets. A cord or cords 32 are stretched across the gap between the patches 22 and drawn tight to give the gas cell a suitable angle.

The patches may be fixed to the gas cell either manually or automatically, using a pressure fixing machine, in accordance

with the wishes and requirements of the manufacturer.

In the embodiments shown in Figs. 4 through 6B the joining members of the angulation members are spaced from the wall of the gas cell. This is very convenient as, accordingly, they can be utilized as handles for carrying the raft, or when actually riding in it.

In Figs. 7A and 7B the gas cell 12 is tucked inwardly at the angled corner portions 12a. The patch-like angulation member 23 shown in Fig. 7A is adhered to the bent corner portion with its interior surface directly affixed to and covering the portion 12a to angulate the gas cell 12 at a number of positions 12b to form a polygonal shape.

The gas cell 12 in Fig. 7B has two vertically arranged chambers. There is no substantial difference in the angulation members of the two independent chambers, although obviously the corner bends must be vertically aligned to prevent distortions in the inflated raft.

It is preferable that the tucked portions 12a be smeared with adhesive to stick the folded layers together in order to reliably maintain the connection and angulation.

The tucks shown in Figs. 7A and 7B prevent the outside wall of the gas cell from being excessively stretched when inflated. Accordingly, the tensions in the inside and outside wall of the gas cell when inflated are substantially uniform, enabling the raft to withstand long-term use.

In the embodiment shown in Fig. 8 the angulation member 24 has a projecting portion 24a which is inserted into the folded

tuck portion 13a and adhesively adhered thereto to provide a rigid and inseparable connection.

In Figs. 9 through 11B, various other modifications of the angulation member are shown, each of them being employed in the insertion manner shown in Fig. 8.

In Fig. 9 the angulation member is made of a flexible material which is folded into a T-shape having a planar portion 241a and a projecting insertion tab 241. The contacting surfaces proximate the central fold line are sewn together at 242.

In Fig. 10 the flexible angulation member is folded into a T-shape in the same manner as shown in Fig. 9 to define an insertion tab 243, and a flexible patch 244 is adhered to the planar portion thereof.

In Fig. 11A the angulation member 245 is molded of plastic as a single, integral, flexible unit, which is ideally suited for mass production.

In Fig. 11B the planar portion 25 is given a curvature to provide an untensioned, snug fit against the wall of the inflated gas cell, and to enable its easy adhesive attachment.

In Figs. 12 and 13 the gas cell 14 has angulation members 26 each having a first projection 26a which is inserted into a corner tuck and an apertured, outwardly extending projection 26b through which a grab rope 40 is threaded. A plug 41 prevents the inflation gas, such as CO_2, from leaking out of the gas chamber, and a bottom sheet 42 is adhesively attached to the bottom of the gas cell 14. Since the angulation members are also used to support the grab rope, separate attachments therefor

are not needed. This reduces the number of parts needed to assemble a complete raft, and thereby lowers the production time and cost.

The rafts of this invention are usually folded for storage when not in use, and it is therefore important that the angulation members be flexible. If they are rigid they will obstruct the folding of the rafts, and cause unwanted frictional wear and rubbing of the raft tube material.

A synthetic rubber adhesive which hardens at normal room temperatures may be used to form the gas cells, and to fix the angulation and other members thereto. Alternatively, an epoxy or a phenolic adhesive which is hardened by heating may be used, as well as a hot-melt type adhesive such as an ethylene-vinyl acetate copolymer.

Claims:

1. An inflatable, polygonal shaped raft, characterized by a continuous tubular gas cell (12; 13; 14) having at least one chamber and made of a single sheet of flexible impermeable material,

a plurality of flexible angulation members (23; 24; 26) individually attached at a plurality of predetermined positions to said gas cell to form and retain a plurality of angled corners (12a; 12b) upon inflation and thereby establish said polygonal shape, and

a bottom sheet (42) attached to a bottom surface of said gas cell to form a bottom of said raft.

2. A raft as claimed in claim 1, characterized in that said angulation members (23; 24; 26) are attached to an interior wall of said gas cell and span the angled corners (12a; 12b) thereof.

3. A raft as claimed in claim 2, characterized in that said gas cell is formed by sealingly connecting one end of a continuous, linear, tubular body to the other end to form a closed circular tube.

4. A raft as claimed in claim 3, characterized in that said tubular body is formed by joining an elongated longitudinal edge of said single sheet to an opposite longitudinal edge thereof, and wherein said sheet is rectangular.

5. A raft as claimed in claim 2, characterized

in that each angulation member comprises a pair of flexible patches (21; 22) attached to spaced opposite sides of said gas cell wall at an angled corner, and a joining member (31; 32) connected to said patches at its two opposite ends to draw said patches towards each other and maintain a bend at said corner.

6. A raft as claimed in claim 5, characterized in that said joining member (31; 32) is spaced from the wall of said gas cell, and may also serve as a handle.

7. A raft as claimed in claim 6, characterized in that said joining member comprises a pair of belt members (31), one being connected to each patch (21) at one end, and the other, free ends of said belts (31) being mutually joined midway between said patches.

8. A raft as claimed in claim 6, characterized in that said joining member comprises a cord (32) drawn between a pair of said patches (22).

9. A raft as claimed in claim 2, characterized in that each angled corner is formed by an inward fold (12a) of said gas cell wall.

10. A raft as claimed in claim 9, characterized in that each angulation member comprises a patch (23; 24) attached to said gas cell wall to cover a central portion of an inward fold (12a, 13a).

11. A raft as claimed in claim 10, characterized in that each fold is internally coated with adhesive.

12. A raft as claimed in claim 11, characterized in that said gas cell comprises a plurality of vertically arranged chambers.

13. A raft as claimed in claim 10, characterized in that each patch (24) has a Y-shape defined by a first projecting tab portion (24a) inserted into and adhesively attached to said inward fold (13a).

14. A raft as claimed in claim 13, characterized in that each angulation member (24) is made of a flexible material centrally folded to form said Y-shape.

15. A raft as claimed in claim 14, characterized in that said flexible material is sewn together at mutually contacting surfaces thereof proximate the central fold (Fig. 9).

16. A raft as claimed in claim 13, characterized in that each angulation member (24) is made of flexible plastic (Fig. 11A).

17. A raft as claimed in claim 13, characterized in that an adhesion portion (25) of each angulation member (24) has a curvature which conforms to the curvature of the inflated gas cell wall.

18. A raft as claimed in claim 13, characterized in that each patch (26) has a second projecting tab portion (26b) extending oppositely from said first tab portion (26a), and a grab rope (40) supported by and drawn between said sencond tab portions.

19. A raft as claimed in claim 18, characterized in that each angulation member (26) is made of a flexible plastic with said first and second projecting tab portions (26b) integrally formed.

FIG. 1 PRIOR ART

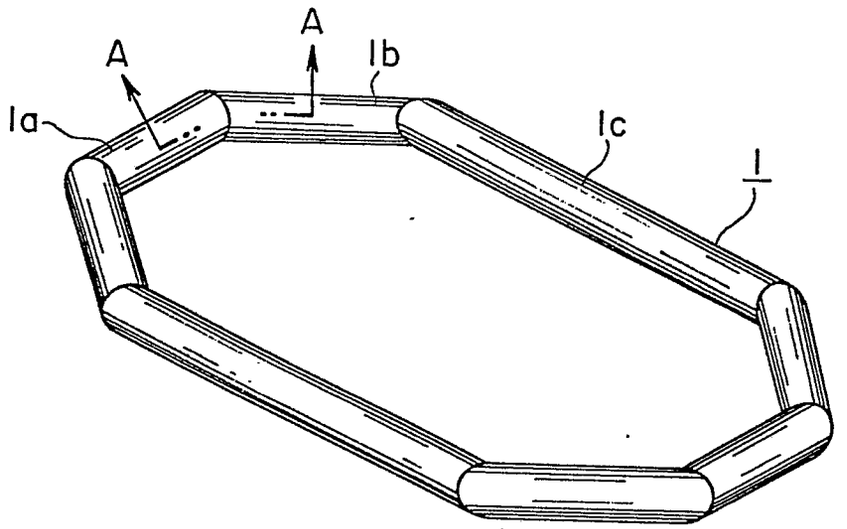

FIG. 2
PRIOR ART

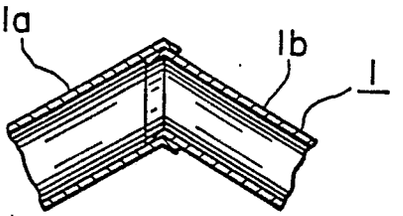

FIG. 3
PRIOR ART

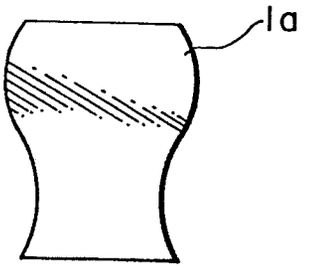

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FIG. 4

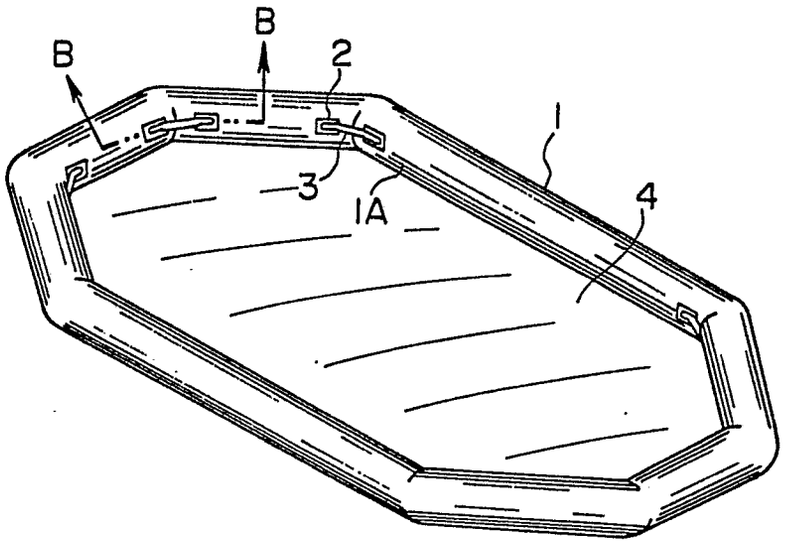


FIG. 5

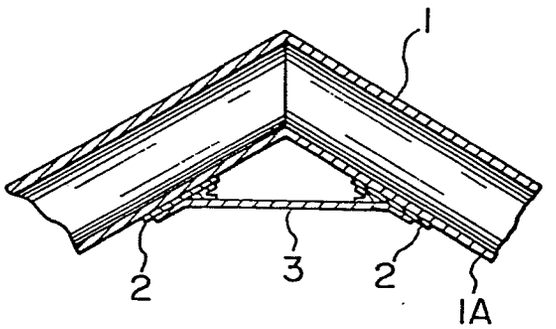


FIG. 6A

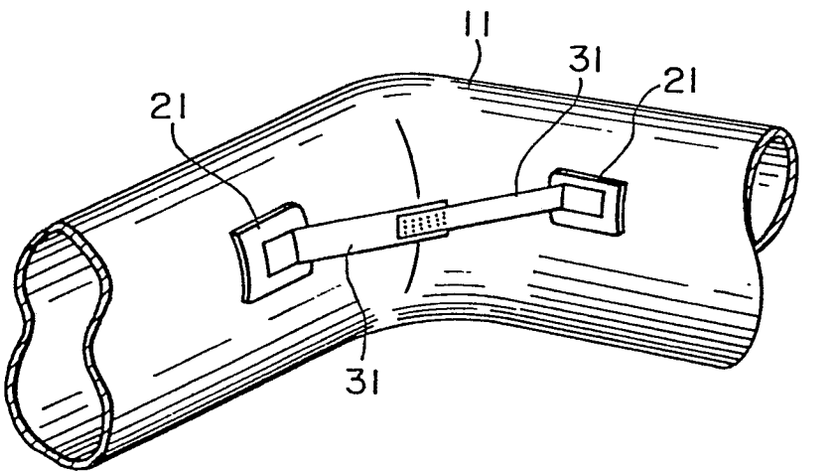


FIG. 6B

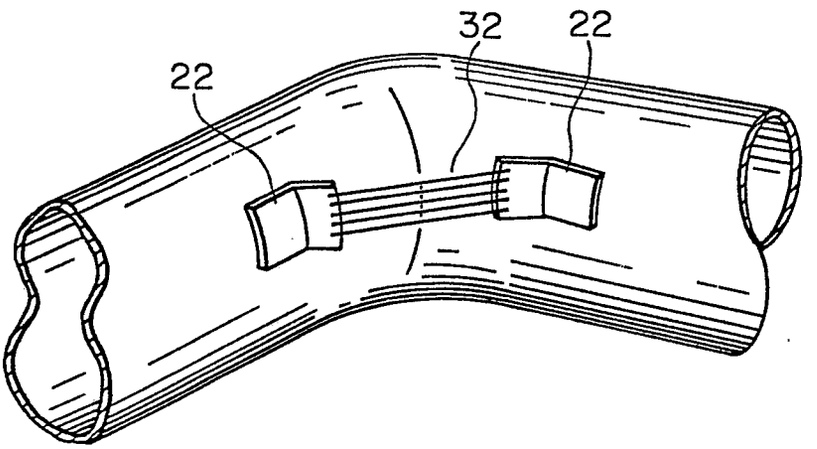


FIG. 7A

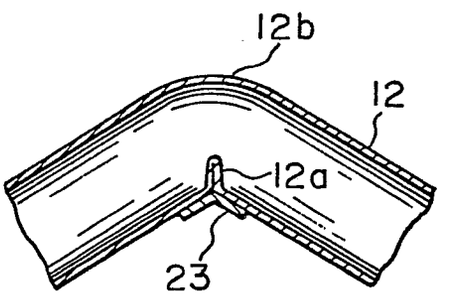


FIG. 7B

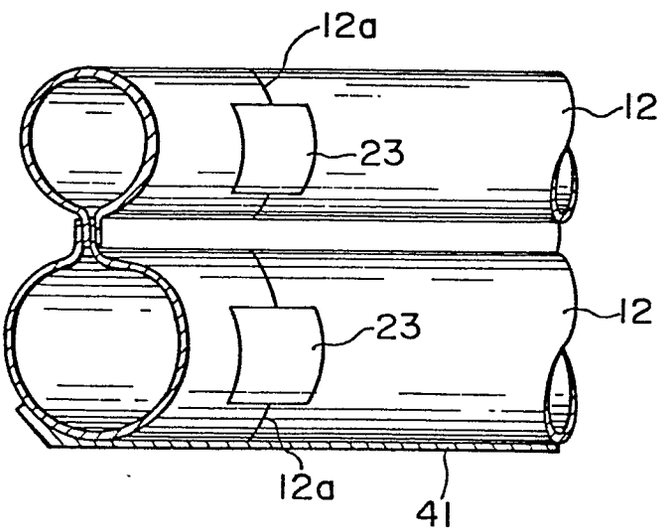


FIG. 8

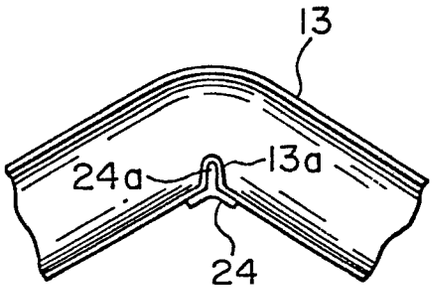


FIG. 9

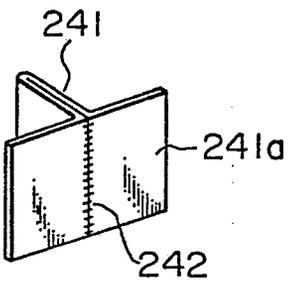


FIG. 10

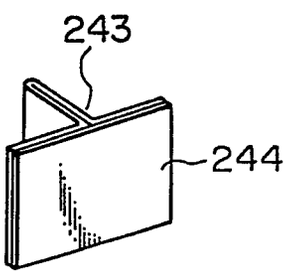


FIG. 11A

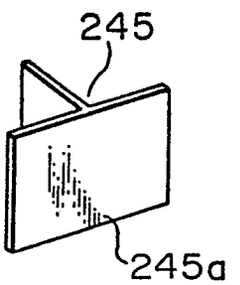


FIG. 11B

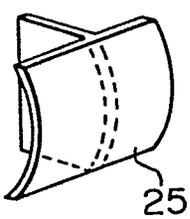


FIG. 12

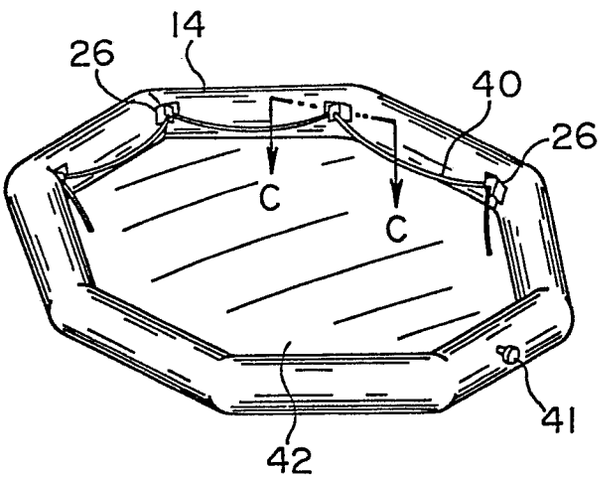
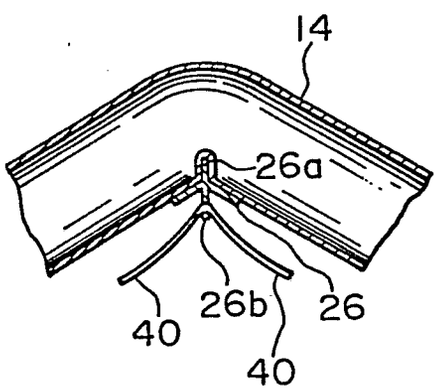


FIG. 13



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European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 81 10 4649

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US - A - 2 456 086 (C.F. SCHWALL) * column 2, lines 19-55; column 3, lines 73-75; column 4, column 5, lines 1-13; figures 1,2,4,5 and 7 to 10 *	1,2,3, 4,9, 10,11
X	NL - A - 79 08 751 (DUNLOP) * page 2, lines 1-27; page 7, lines 4-35; pages 8 to 11; figures 1 to 15 * & GB - A - 2 036 655	1,2,3, 4,9, 10,11, 12
X	GB - A - 2 006 124 (PIRELLI) * page 1, lines 94-130; page 2, lines 1-47; figures 1 to 4 *	1,2,5, 8,9, 11
	GB - A - 1 224 186 (RFD-GQ) * page 1, lines 44-55; figures 1 to 3 *	1
A	FR - A - 2 347 255 (RDF INFLATABLES) & GB - A - 1 506 819 US - A - 4 083 070	

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 63 B 7/08

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 63 B
B 63 C

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28-09-1981	PRÜSSEN