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**EUROPEAN PATENT APPLICATION**

⑰ Application number: **85304017.8**

⑸ Int. Cl.<sup>4</sup>: **B 63 C 11/32**

⑱ Date of filing: **06.06.85**

⑳ Priority: **06.06.84 GB 8414476**

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㉓ Date of publication of application: **22.01.86 Bulletin 86/4**

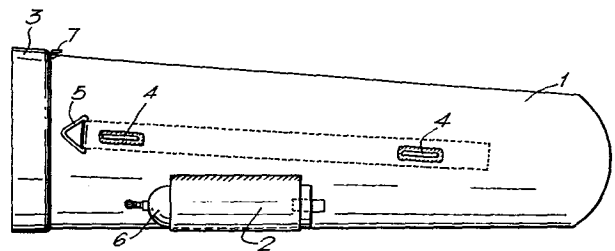
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㉔ Designated Contracting States: **AT BE CH DE FR GB IT LI LU NL SE**

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㉕ **Portable unit, e.g. for the recovery of divers.**

㉖ There is described a portable unit in which a desired pressure may be maintained and which is capable of transporting therein a person, the unit comprising a flexible body for housing the person, the body having an entrance forming a hatchway, and a rigid hatchway cover for sealing the hatchway, the unit being provided with an inlet for compressed gas and a valve whereby the pressure in the unit may be regulated. The unit may be used in the rescue of a diver.



**EP 0 168 941 A1**

A PORTABLE UNIT

This invention relates to a portable unit in which a desired pressure may be maintained, for example for the recovery of divers suffering from the bends.

5 When resurfacing rapidly, a diver is at risk of suffering from the bends, caused by the rapid decrease in pressure to which his body is subjected as he rises to the surface of the water. The diver who suffers from the bends under water is at a great  
10 risk of his condition deteriorating as he continues to rise to the surface of the water to be transferred for treatment.

Presently, many underwater operations are conducted using rigid diving bells which must be lifted up from,  
15 or lowered to, the sea bed with a crane or similar lifting device. Such bells are heavy and inflexible, which makes them difficult to manoeuvre and awkward to handle both on land and underwater.

According to the present invention there is  
20 provided a portable unit in which a desired pressure may be maintained and which is capable of transporting therein a person, the unit comprising a flexible body for housing the person, the body having an entrance forming a hatchway, and a rigid hatch cover for sealing  
25 the hatchway, the unit being provided with an inlet for compressed gas and a valve whereby the pressure in the unit may be regulated.

The unit of the invention may be submerged to the depth of the diver, who is placed inside the unit.  
30 The unit is then sealed and air is drawn from a demand valve to be discharged into the unit. The required pressure, according to the depth at which the unit is submerged, may then be set in the unit by means of an adjustable release valve. The air discharged  
35 from the demand valve into the unit then causes water

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in the unit to leave via the release valve. As a result of the buoyancy of the air, the unit ascends to the surface of the water maintaining the preset pressure. When the unit has surfaced, air may be discharged from the demand valve to expel any water from within the unit so that the unit may be transferred with the diver inside.

The unit may also be used to transfer a suffering diver for treatment on land.

For a better understanding of the present invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figures 1 and 2 are an end view and side view of the assembled unit, respectively;

Figures 3, 4 and 5 are a front, reverse and side view respectively of a hatch cover used to seal the entrance of the diving unit;

Figures 6 to 10 illustrate the entrance of the diving unit at various stages during its construction;

Figure 11 is a cross-section of the hatch cover of Figures 3 to 5, also showing, in cross-section, part of the entrance of the unit;

Figure 12 is a partial cross-section of the entrance of the diving unit; and

Figure 13 is a cross-section of the hatch cover in place in the entrance.

Figures 1 and 2 show an assembled unit in accordance with one embodiment of the present invention. The unit comprises a flexible body 1, for example formed of canvas, having two canvas side pockets 2 and an outer rubber flange 3 at the entrance to the unit. The body 1 is further provided with four handles 4, two along each side of the body 1, and two lifting eyes 5. The pockets 2 each carry a gas cylinder, preferably containing air at 3000 lb psi (207 bar). The gas cylinders 6 each have a content gauge and a demand valve, which are not shown

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in detail in the drawings as these items are standard equipment on air cylinders used for diving purposes. Air may be supplied to the unit by way of an air supply point 7, which is connected to the demand valve of the cylinders 6.

5       The entrance of the body 1 is closed by a hatch cover 8 to be described in more detail hereinafter. Briefly, the hatch cover 8 is provided with two handles 9, an adjustable release valve 10 and a 4 inch laminated glass port hole 11.

10       The body 1 of the unit is provided with a hatchway 20 for receiving the hatch cover 8. The construction of the hatchway will now be described in detail with reference to Figures 6 to 10. Figure 6 shows the hatchway 20 (which may be aluminium cast and machined for a good fit) fitted into the entrance  
15       of the unit. The outer rubber flange 3 fits over the hatchway 20, exposing an interrupted thread 13 for attachment purposes.

As shown in Figure 9, the body 1 has a steel  
20       ring 12 laminated to a flange 1a of the entrance of the body 1. The hatchway 20 consists of an annular member 14, shown in Figure 7, and, in cross-section, at the lower part of Figure 11. This annular member 14 is provided in a front face 14a thereof  
25       with an annular recess 15 for locating the steel ring 12 in a manner to be described hereinafter. The annular member 14 is further provided with a plurality of screw holes 16 around the circumference of the front face 14a, and carries the interrupted  
30       thread 13.

To construct the hatchway for use of the unit, the annular member 14 of the hatchway 20 is inserted into the entrance of the body 1 so that the steel ring 12 is located in the annular recess 15. This  
35       is shown in Figure 10, and, in more detail, in the cross-section of Figure 12. An inner rubber flange 17 locates the annular member 14 with respect to the steel ring 12, the annular member being secured

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in place by way of an annular plate 18 (also shown in Figure 8) which is screwed onto the annular member 14 using screws 19 in corresponding holes 16. In Figure 8, the unit is shown from the front, with the hatchway 20 thus constructed. As shown in Figure 6, it is protected from the outside by the outer rubber flange 3.

The hatchway 20 is now ready to receive the hatch cover 8, shown from the front in Figure 3, from the rear in Figure 4 and from the side in Figure 5. Figure 11 shows a partial cross-section through the hatch cover 8 before it is positioned in the hatchway 20 and Figure 13 shows a cross-section through the hatch cover 8 and hatchway 20, with the hatch cover 8 in position.

As has been described with reference to Figure 1, and as shown more clearly in Figures 3 and 4, the hatch cover 8 has two handles 9 and a laminated glass port hole 11 and is provided with an adjustable release valve 10. The circumference of the hatch cover 8 has an interrupted thread 21 to cooperate with the interrupted thread 13 on the hatchway 20. The adjustable release valve has an outlet 22 provided with a filter 23 (Figure 13). A rubber seal 24 is provided between the port hole 11 and main body of the hatch cover 8.

The illustrated embodiment has the following dimensions:

Internal diameter of plate 18,  $a = 22\frac{1}{4}"$  (56.5cm)  
 Maximum and minimum internal diameters of the annular member 14,  $b = 21\frac{1}{2}"$  (54.6cm)  
 $c = 21"$  (53.3cm)  
 Diameter of port hole 11,  $d = 5"$  (12.7cm)  
 Diameter of port hole 11 including the rubber seal 24,  $e = 4\frac{1}{4}"$  (13.3cm)  
 Diameter of a centre portion of the hatch cover 20,  $f, = 4"$  (10.2cm)

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Diameter of the hatch cover 20,  $g = 21''$  (53.3cm)  
 $h = 21\frac{1}{2}''$  (54.6cm)  
 $i = 22''$  (55.9cm)

Width of the annular member 14 of the hatchway

5  $8, j = 2\frac{3}{8}''$  (6cm)

External width of the annular member 14 of the hatchway 8,  $k = 2\frac{1}{8}''$  (5.4cm)

Length of the annular member 14,  $q, = 2\frac{3}{4}''$  (7cm)

10 Length of the screw 19,  $\ell = 1\frac{1}{8}''$  (2.9cm) and  
 for the plate 18,  $m = \frac{1}{2}''$  (1.27cm),  $n = \frac{1}{2}''$   
 (1.27cm),  $o = 1\frac{3}{16}''$  (3cm) and  $p = 1\frac{3}{4}''$   
 (4.4cm)

In use, the length of the unit is 7' ( $\sim 2$  m)

The body 1 and hatchway 8, once constructed,  
 15 may be stored in a conveniently sized container (for  
 the embodiment illustrated above having the dimen-  
 sions 26" (66cm) x 26" (66cm) x 18" (45.7cm), and  
 weighing only 65lbs (29.5kg)). The hatch cover 20  
 may be attached to the hatchway 8 by arranging for  
 20 one part of the interrupted screw thread 21 on the  
 hatch cover 20 to face a space between the parts of  
 the interrupted screw thread 13 of the hatchway 8,  
 inserting the hatch cover 20 into the hatchway 8  
 and twisting it so that the screw threads engage.  
 25 To remove the cover 20 the reverse procedure is  
 carried out. With two air bottles 6 in position  
 in the canvas pockets 2 of the body 1, a diver may  
 draw air from the demand air valve (not shown), exhaling  
 the air into the unit to inflate it to the required  
 30 pressure. The adjustable release valve 10 is set, from  
 outside the unit using a gauge 10a, at the required  
 pressure so that excess air or water, as the case may be,  
 is discharged via the valve 10. The bottles 6 may be  
 easily replaced if necessary. The air bottles 6, in  
 35 addition to providing air via the demand valve, act  
 as a ballast to ensure that the unit is held the  
 correct way up in the water when a diver is being  
 carried by the unit, thus ensuring removal of all

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the water from the unit. They also stabilise the unit in transit.

5 To store the unit, the two air bottles 6 are removed and the body 1 is rolled up to be placed in a storage container with the air bottles 6.

The described embodiment can operate at pressures between 14.7 lbs psi (1 bar) and 30 lbs psi (2 bar), and may be quickly assembled ( in about 3 minutes) for use.

10 Accordingly, divers need no longer be submerged unconscious, to a required depth of water but may be placed in the unit and moved for treatment without further risk. The diver's equipment may be removed when the diver is in the unit.

15 The unit described above may be carried by hand without difficulty and assembled quickly for a recovery operation.

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CLAIMS:

1. A portable unit in which a desired pressure may be maintained and which is capable of transporting therein a person, the unit comprising a flexible body for housing the person, the body having an entrance forming a hatchway, and a rigid hatch cover for sealing the hatchway, the unit being provided with an inlet for compressed gas and a valve whereby the pressure in the unit may be regulated.

2. A unit according to Claim 1, wherein the hatchway comprises an annular member adapted to be located at the entrance of the flexible body by an inwardly directed flange of the flexible body.

3. A unit according to Claim 2, wherein a rigid ring is provided on the inner surface of the flange extending around the flange, the ring being disposed to cooperate, in use of the device, with a corresponding groove in the annular member.

4. A unit according to Claim 2 or 3, wherein the annular member is secured at the entrance of the flexible body by an annular plate by which the annular member is clamped to the flange.

5. A unit according to any preceding claim, wherein the circumference of the hatchway has an interrupted thread to cooperate, in use of the device, with an interrupted thread on the hatchway.

6. A unit according to any preceding claim wherein the pressure in the unit is regulated by an adjustable release valve provided in the hatch cover.

7. A unit according to any preceding claim, wherein the hatch cover is provided with a glass port hole.

8. A unit according to any preceding claim, wherein the hatch cover has at least one handle.

9. A unit according to any preceding claim, wherein the flexible body is formed of canvas.



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10. A unit according to any preceding claim,  
wherein the hatch cover is formed of aluminium.

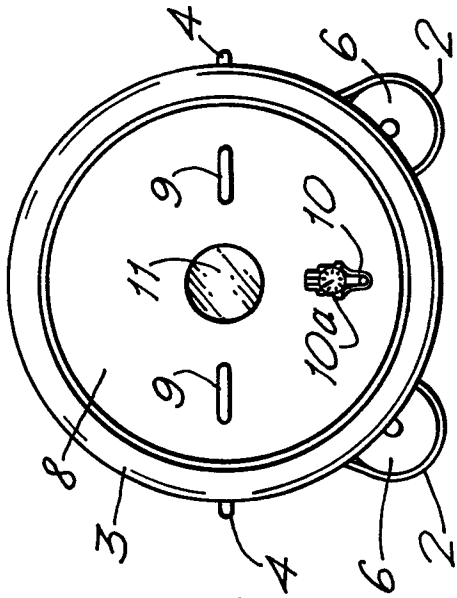


FIG. 1.

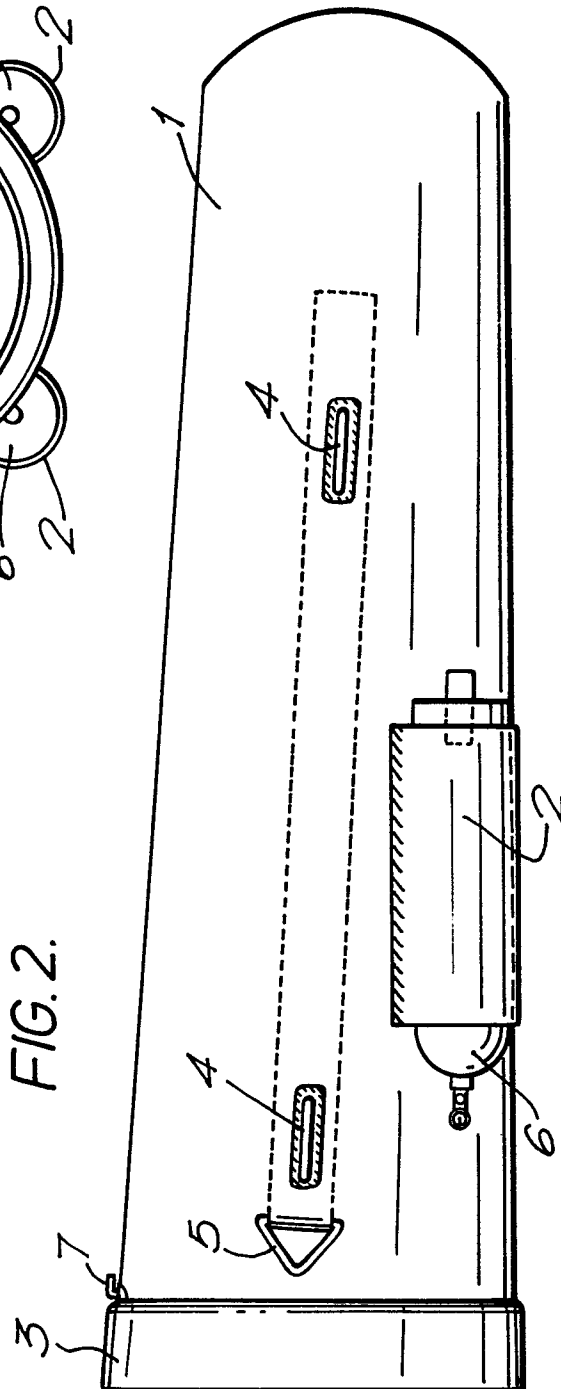


FIG. 2.

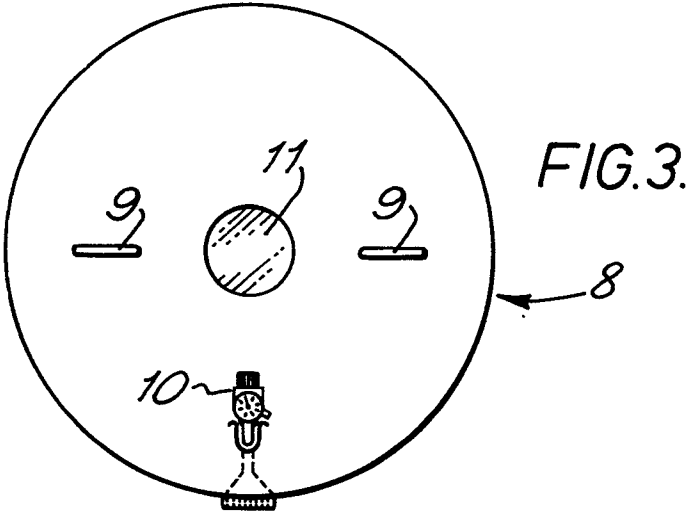


FIG. 4.

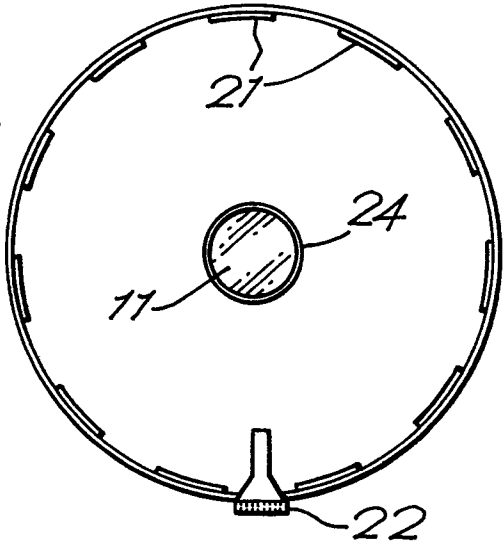


FIG. 5.

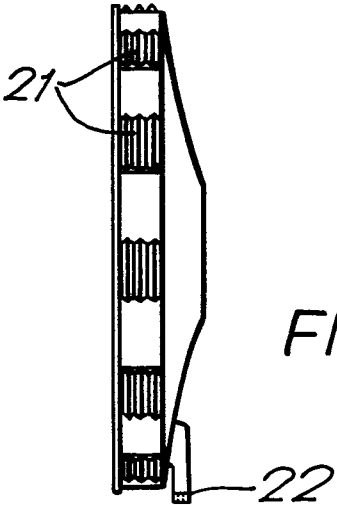


FIG. 6.

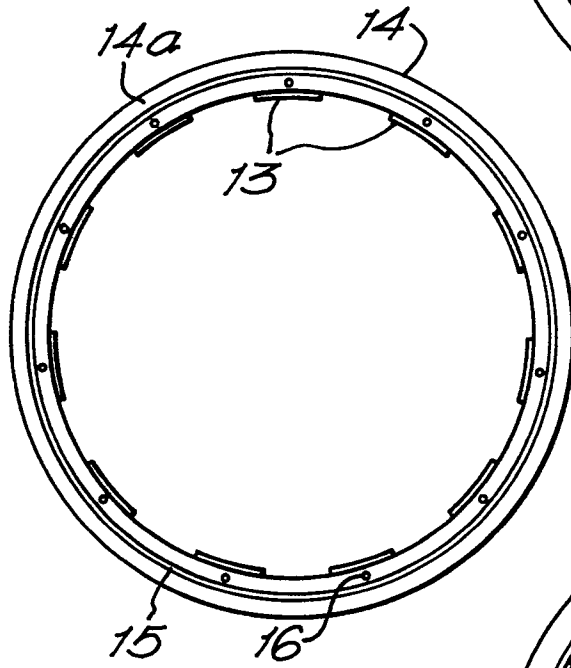
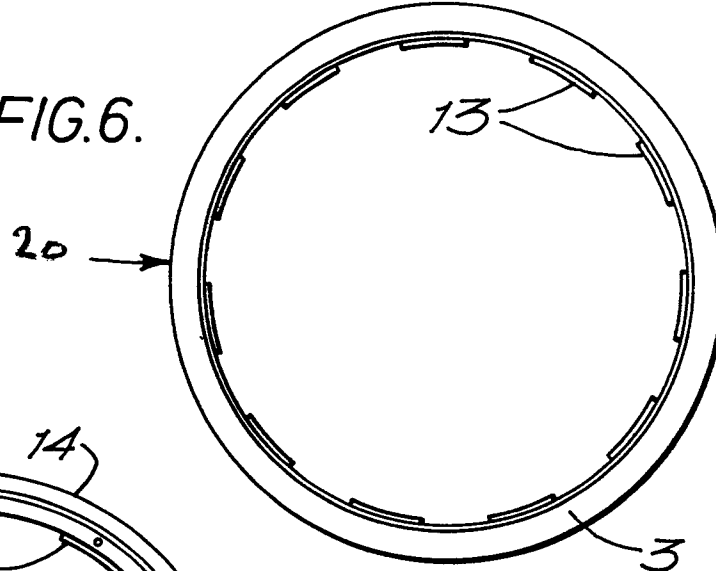
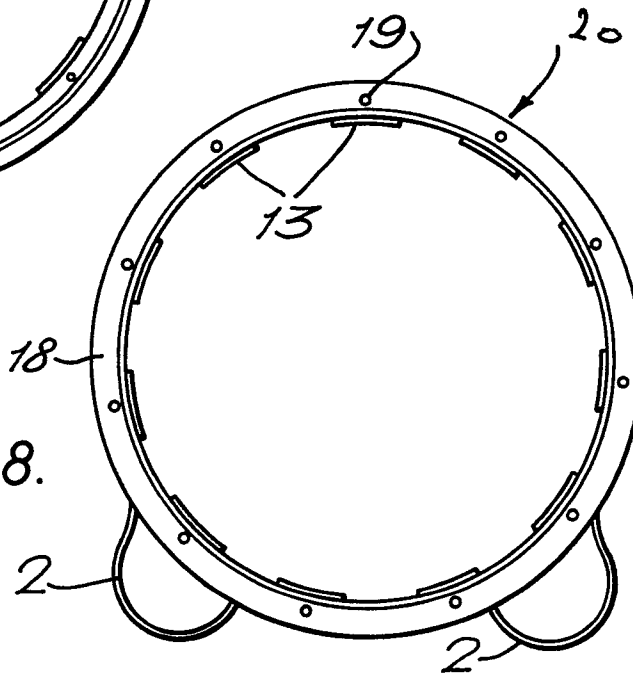
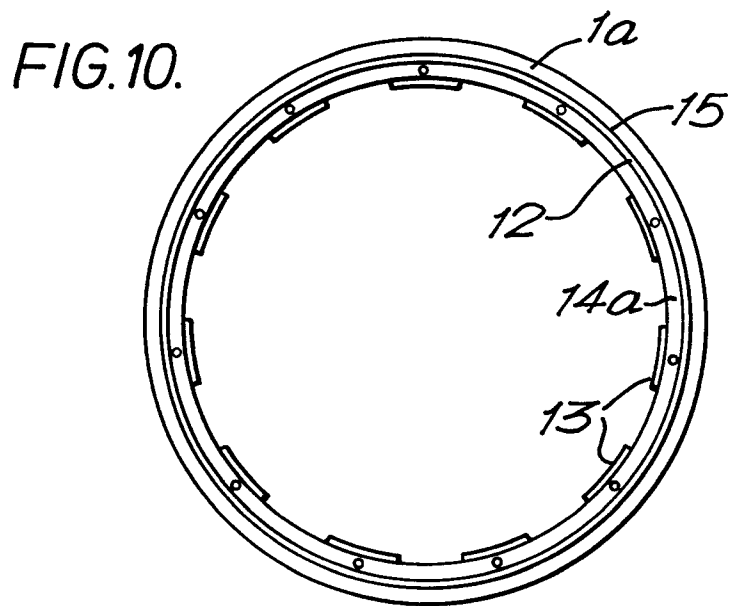
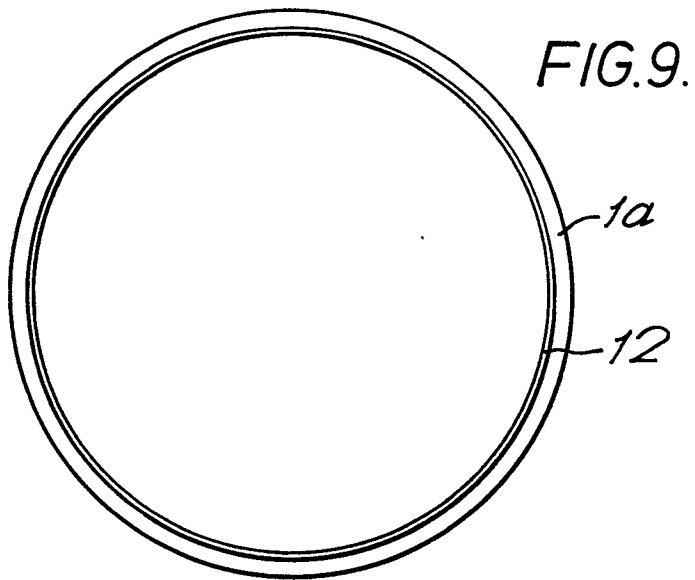


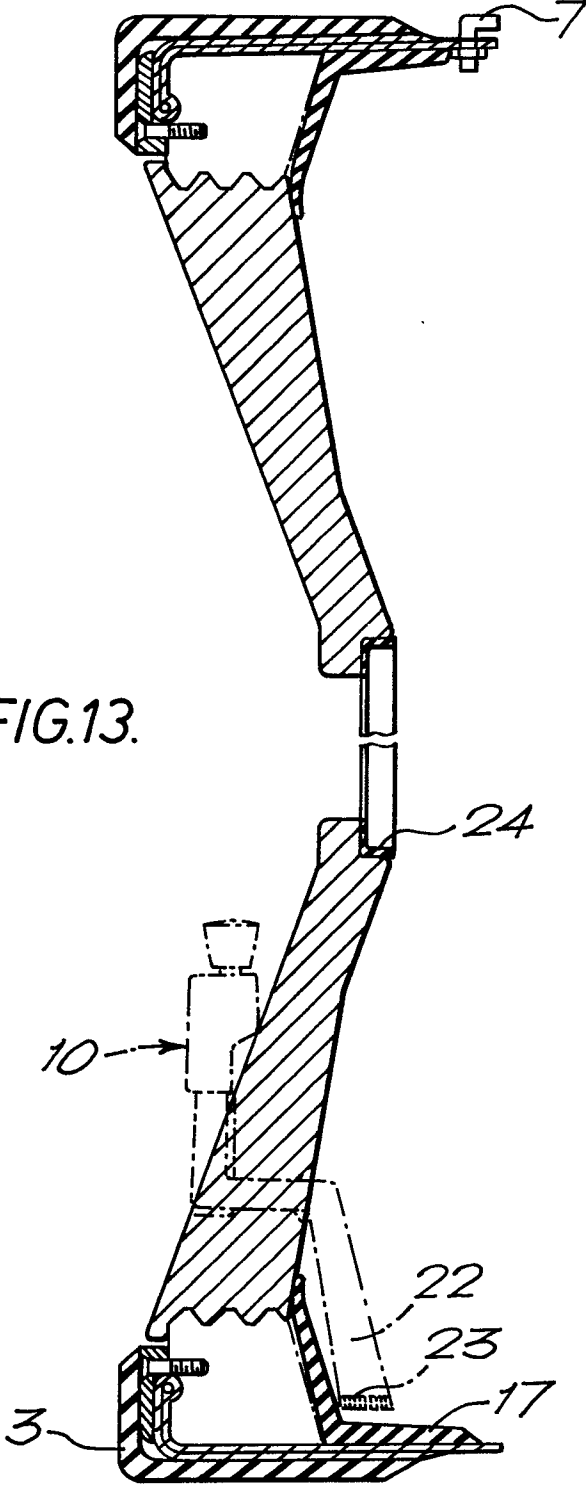
FIG. 7.

FIG. 8.





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European Patent  
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**EUROPEAN SEARCH REPORT**

Application number

EP 85 30 4017

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	FR-A-1 406 060 (AMANJEAN)  * The whole document *	1, 2, 3, 4, 5, 6, 9	B 63 C 11/32
X	FR-A-1 460 707 (TISSEUR)	1, 7, 8	
A	US-A-3 729 002 (MILLER)		
A	GB-A- 7 228 (DRÄGERWERK)(A.D. 1915)		
A	MECHANICAL ENGINEERING, vol. 102, no. 3, March 1980, page 56, Published by the American Society of Mechanical Engineers, New York, US; "Underwater parachute for scuba divers"		TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 63 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 24-09-1985	Examiner DE SCHEPPER H.P.H.
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