(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 November 2004 (18.11.2004)

PCT

(10) International Publication Number
WO 2004/099024 A1

(51) International Patent Classification[7]: B65D 47/20

(21) International Application Number:
PCT/EP2004/004466

(22) International Filing Date: 28 April 2004 (28.04.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
03252865.5 7 May 2003 (07.05.2003) EP

(71) Applicant *(for AE, AG, AL, AM, AT, AU, AZ, BA, BB, BE, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CY, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, SZ, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW only)*: **CROWN PACKAGING TECHNOLOGY INC** [US/US]; 11535 S.Central Avenue, Alsip, IL 60803-2599 (US).

(71) Applicant *(for LS only)*: **CROWN PACKAGING UK PLC** [GB/GB]; Downsview Road, Wantage Oxfordshire OX12 9BP (GB).

(72) Inventor; and

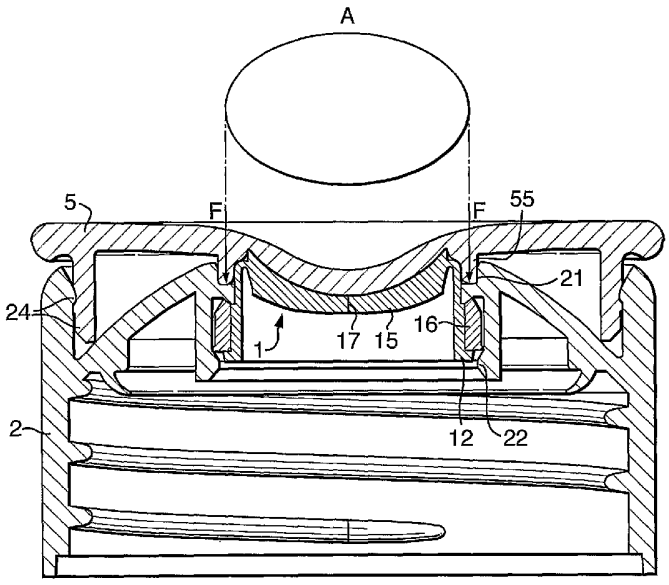
(75) Inventor/Applicant *(for US only)*: **RAMSEY, Christopher,Paul** [GB/GB]; Braeside, Manor Road, Wantage Oxfordshire OX12 8DP (GB).

(74) Agent: **SMITH, Debra, Jane, Clare**; CROWN Packaging UK PLC, Downsview Road, Wantage Oxfordshire OX12 9BP (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

[Continued on next page]

(54) Title: VALVE CLOSURE



(57) Abstract: A valve closure for a container, having a body, a valve and a lid. The valve is positioned across the opening of the container and itself has an opening through which the contents of the container may be dispensed. The lid is moveable relative to the body between open and closed positions and is shaped to block the valve opening, when the lid is in its closed position. The lid has a projection, which forms a peripheral seal around the valve opening, when the lid is in its closed position, and within the periphery of the projection, the shape of the lid substantially conforms to the shape of the valve and / or body, to minimise the volume therebetween.

WO 2004/099024 A1

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

VALVE CLOSURE

The present invention relates to a closure used to seal a container having a valve. In particular, the closure is designed to prevent leakage from the valve during transport or storage of the container.

Many liquid food products (e.g. honey and sauces such as tomato sauce) are now packaged in containers incorporating a valve, which is used to control dispensing of the product. Also, liquid toiletries, such as shower gel are packaged in such containers, because the valve allows the container to be stored in an inverted position without substantial loss of product, whilst allowing easy dispensing of the product upon activation of the valve. In many cases, a self-closing valve is preferred. A self-closing valve opens in response to increased product pressure in the container, achieved for example by a user squeezing the container. When the product pressure is relieved, the valve automatically assumes a closed configuration in which the valve opening is substantially sealed. However, such valves are known to leak a little over time and may be activated accidentally during mishandling or pressure / temperature variation during transport.

To overcome these problems, it is known to provide an overcap for the valve, which prevents the valve from opening or leaking, during prolonged storage or transport. Many different types of overcap arrangement are described in the prior art. Conventional overcap

designs are concerned with preventing leakage from the dispensing orifice in the valve.

In contrast, the present invention is based upon the acceptance that all valves will leak to some degree, but the level of leakage may be controlled to acceptable levels by reducing the volume of the cavity into which leakage can occur.

Accordingly, the present invention provides a closure for a container, having a body, a valve with an opening through which the contents of the container may be dispensed and a lid, moveable between open and closed positions relative to the body and shaped to block the opening in the valve when the lid is in its closed position, characterised in that the lid has a projection designed to form a peripheral seal around the valve opening, when the lid is in its closed position and the shape of the lid, within the periphery of the projection substantially conforms to the shape of the body and/or valve within the peripheral seal, to minimise the volume therebetween.

Therefore, the closure according to the invention has an open position, in which the contents of the container may be dispensed and a closed position (for transport or storage), where the closure lid defines a peripheral, fluid tight seal around the valve opening. The shape of the lid within the boundary of this peripheral seal is closely matched to the shape of the valve and surrounding closure parts lying within the

periphery of the seal. In this way, the volume into which the valve may leak is minimised and any leakage that occurs is limited to an acceptable level in the eyes of the user.

In a preferred embodiment of the invention, the closure comprises a body, which carries the valve and is designed to engage the container neck, either removeably (using a screw thread arrangement, for example) or permanently (using a snap-fit arrangement, for example). The closure also has a lid, which is capable of moving relative to the body between open and closed positions. When the lid is in its open position, the contents of the container may be dispensed through the opening in the valve. However, when the lid is in its closed position, it blocks the valve opening, preventing substantial leakage from the valve.

Unlike the sealing systems described in the prior art, the lid is not intended to prevent leakage entirely, instead the aim of the invention is to minimise the volume into which leakage may occur, thus controlling the leakage to acceptable levels. If the volume is sufficiently small, then the leakage will form a thin film and surface tension prevents a drip forming. Thus, the surface appears clean.

Accordingly, in the present invention, the lid is provided with a projection, which is adapted to form a fluid-tight, peripheral seal around the valve opening. The fluid-tight seal may be formed by the lid projection

applying pressure directly to the valve around the valve opening. However, in some cases this is not desirable, particularly where the valve is made from a material which is prone to creep when subjected to an applied load. Such creep may reduce the effectiveness of the peripheral seal over time or may affect the normal dispensing operation of the valve.

An advantage of the present invention is that the peripheral seal may be provided by interaction between the two most suitable surfaces. Therefore, if the valve is prone to creep, the projection may be arranged to co-operate with the closure body, rather than the valve and thereby create an effective fluid tight seal. Advantageously, the lid projection and the closure body are designed to form a bore seal therebetween, when the lid is in its closed position.

In order to minimise the volume into which leakage may occur, the shape of the lid, within the periphery of the projection must closely match the shape of the valve and/or body of the closure within the peripheral seal, when the lid is in its closed position. In addition, if the valve is prone to creep and the peripheral seal is therefore formed between the lid projection and the closure body, the shape of the valve protruding from the closure body must be relatively simple, to enable close matching of the portion of the lid within the projection and the portion of the closure body and valve within the peripheral seal.

The present invention will now be described, by way of example only, with reference to the accompanying drawings, in which

FIGURE 1 shows a valve sealing arrangement according to a first embodiment of the invention, comprising a conventional self-closing valve not prone to excessive creep and a lid, shown in its closed position.

FIGURE 2 shows a valve sealing arrangement according to a second embodiment of the invention, comprising a conventional self-closing valve not prone to excessive creep and a lid, shown in its closed position

FIGURE 3 shows a closure according to a third embodiment of the invention, having a self-closing valve prone to creep and lid, shown in its closed position.

Wherever possible, like components have been referenced using the same reference numerals.

According to figures 1 and 2, a valve sealing arrangement comprises a conventional self-closing valve 1 held in a body 2 by a clip 3 and a lid 5, moveable relative to the body 2 between open and closed positions. The body 2 may either form part of a container or a closure. In figures 1 and 2, the clip is shown attached to the internal surface of the body 2, although it will be appreciated that the relative positions of the body 2 and the clip 3 may be reversed and the clip 3 may be attached to the external surface of the body 2. The clip

3 clamps the valve 1 in the body 2, by means of a snap fit connection 23 between the body 2 and the clip 3.

The valve 1 comprises a securement flange 11, connected to a valve head 15 by a connecting wall 12. The valve head takes the form of an inwardly concave dish, with an opening 17 provided in the centre thereof. In figures 1 and 2, the connecting wall 12 of the valve 1 takes the form of a V-shaped elbow, although many different connecting wall configurations are known from the prior art. For example, the connecting wall may have a loose folded configuration, which functions like a rolling diaphragm upon opening of the valve or a simple linear configuration, which simply stretches slightly, as the valve opens.

Referring now to figure 1, the lid 5 is provided with an annular projection 51, which encircles the valve opening 17. The annular projection 51 is designed to apply an axial sealing force F to the valve head 15, which is braced by the opposing support 31 provided by the clip 3. The interaction between the annular projection 51, the valve head 15 and the support 31, produces the sealing force F, which creates a fluid-tight seal A around the periphery of the valve opening 17. The shape of the lid within the periphery of the projection 51, closely matches the shape of the valve head 15 within the periphery of the annular seal A. Thus, the volume defined between the lid 5 and the valve head 15 within the periphery of the annular seal A is reduced to a

minimum, thereby minimising the volume of leakage that can occur from the valve opening 17.

Figure 2 shows an alternative valve sealing arrangement, in which no force is applied to the valve head 15. This may be an important consideration where the design of the valve head is critical and therefore the application of forces to the valve head for a prolonged period is undesirable. In this arrangement, the body 2 is designed to apply a radial sealing force F to the connecting wall 12. The dimensions of the aperture in the body 2, through which the valve head 15 protrudes, are chosen to provide the necessary radial sealing force F to form a fluid-tight annular seal A. In this arrangement, the lid 5 has an annular flange 55, which is arranged to form a bore seal with an annular collar 25 provided in the body 2. The tip 56 of the annular flange 55 may also be designed to form a face seal within the recess 21 formed in the body 2 adjacent to the collar 25.

The fluid-tight seal A extends around the periphery of the valve head 15 and thereby encompasses the valve opening 17. The shape of the lid 5 within the periphery of the annular flange 55, closely matches the shape of the valve 1 within the periphery of the annular seal A. Thus, the volume defined between the lid 5, the valve head 15 and valve connecting wall 12 within the periphery of the annular seal A is reduced to a minimum. Thereby minimising the volume of leakage that can occur from the valve opening 17.

Referring now to figure 3, which shows a closure according to the present invention having a valve, which is made from a material that is prone to creep or distortion when subjected to an applied load for prolonged periods, for example TPE. The advantage of TPE is that it can be used to produce valves at low cost and is suitable for sequential moulding with other materials such as rigid polypropylene (PP).

In the embodiment shown in figure 3, a TPE valve 1 is sequentially moulded to a rigid polypropylene ring 16. The polypropylene ring 16 is clipped into a closure body 2 and is held in place by a bead 22. The valve has a dish-shaped, inwardly concave valve head 15, which is connected to the polypropylene ring 16 by a connecting wall 12. The closure also includes a removable lid 5, which is closed on the body 2 and secured in position by means of a snap fit arrangement 24. The lid 5 does not apply any forces to the valve 1, because this could cause distortion. Instead, the lid 5 has an annular flange 55, which is designed to co-operate with the closure body 2 to form a peripheral fluid-tight seal around the valve opening 17. The annular flange 55 is arranged to form a bore seal within an annular channel 21 provided in the body 2. The tip of the annular flange 55 may also be designed to form a face seal within the annular channel 21 as previously described with reference to the embodiment shown in figure 2. Thus, the annular flange 55, may be adapted to form a fluid-tight peripheral seal

A in the form of a bore seal, a face seal or a combination of the two.

The fluid-tight seal A extends around the periphery of the valve head 15 and thereby encompasses the valve opening 17. The shape of the lid 5 within the periphery of the annular flange 55, closely matches the shape of the valve 1 within the periphery of the annular seal A. Thus, the volume defined between the lid 5, the valve head 15 and valve connecting wall 12 within the periphery of the annular seal A is reduced to a minimum. Thereby minimising the volume of leakage that can occur from the valve opening 17.

The embodiments described above are provided as an illustration of the invention only and many other configurations of valve and arrangements of the closure will be apparent to the person skilled in the art. The invention is ideally suited to liquid seals, where the reduction in leakage volume allows positive surface tension effects to occur. However, the invention is also suitable for gas seals (for example for processed and / or aseptically filled foods) where a hermetic quality seal is required. The valve closure according to the invention can meet this requirement and thus a separate foil seal is not required (e.g. closures for sauce bottles often need a barrier foil under the closure).

CLAIMS

1. A closure for a container, the closure having
   - a body
   - a valve, having an opening through which the contents of the container may be dispensed, and
   - a lid, moveable between open and closed positions relative to the body, and shaped to block the opening in the valve, when the lid is in its closed position, characterised in that
   - the lid has an annular projection and when the lid is in it's closed position, the projection forms an annular peripheral seal around the valve opening, and
   - the shape of the lid within the periphery of the projection substantially conforms to the shape of the body and/or valve within the peripheral seal, such that when the lid is in its closed position it contacts the body and/or valve over substantially the whole of the area thereof within the peripheral seal to minimise the volume therebetween.

2. A closure according to claim 1, wherein the body has a sealing face and the projection on the lid engages with the sealing face of the body to form a peripheral seal around the valve opening.

3. A closure according to claim 2, wherein the projection and the sealing face of the body are adapted to form a bore seal therebetween.

4. A closure according to any one of the preceding claims, wherein the valve is formed integrally with the body.

5. A closure according to any one of the preceding claims, wherein the valve is a self-closing valve having a flange adapted to be constrained by the closure body, a valve head defining the valve opening and a connecting wall therebetween.

6. A closure according to claim 4, wherein the valve connecting wall has a substantially linear configuration to allow the shape of the lid within the projection to substantially conform to the shape of the body and/or valve within the peripheral seal.

7. A closure according to any one of the preceding claims, wherein the lid has a plug inside the periphery of the projection and the plug is shaped to substantially confirm to the shape of the body/valve within the peripheral seal.

8. A closure according to any one of the preceding claims, wherein the valve is independent from the body and retained therein by a clip.

9. A closure / container combination comprising
- a container,
- a valve, having an opening through which the contents of the container may be dispensed, and
- a closure, moveable between open and closed positions relative to the container, and shaped to

block the opening in the valve, when the closure is in its closed position,
characterised in that
when the closure is in it's closed position,
- it has a projection which forms a peripheral seal around the valve opening, and
- the shape of the closure within the periphery of the projection substantially conforms to the shape of the container and/or valve within the peripheral seal, to minimise the volume therebetween.

Fig.1.

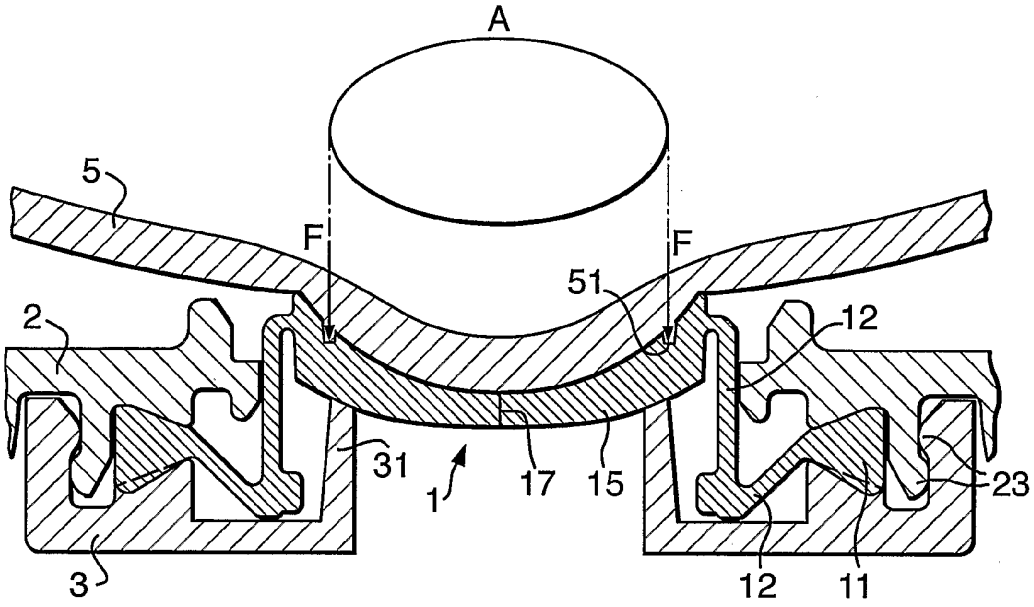


Fig.2.

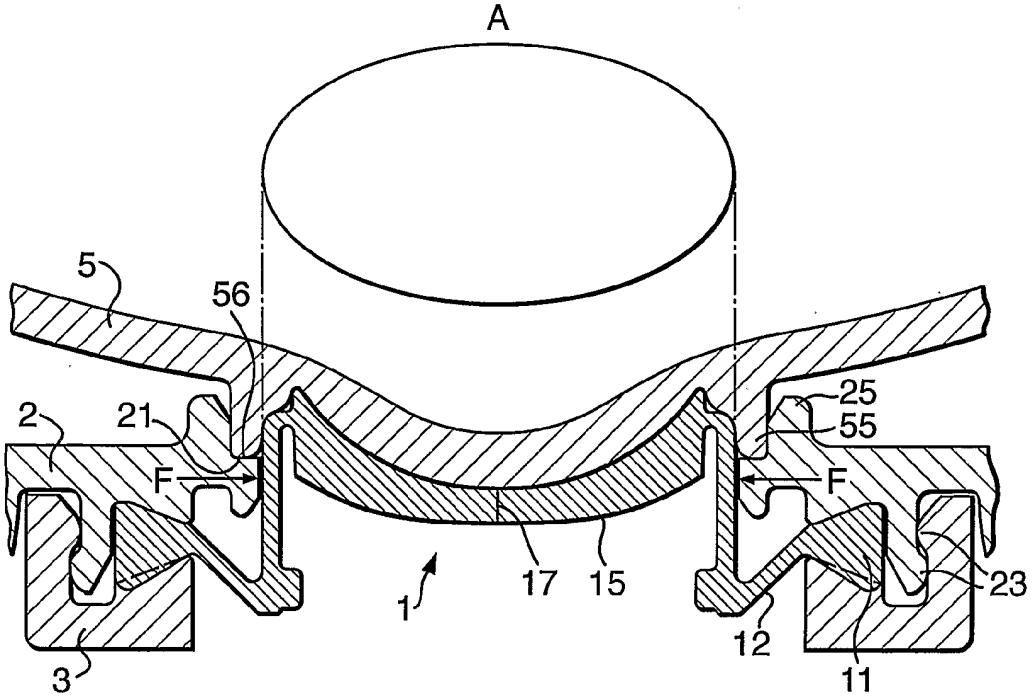
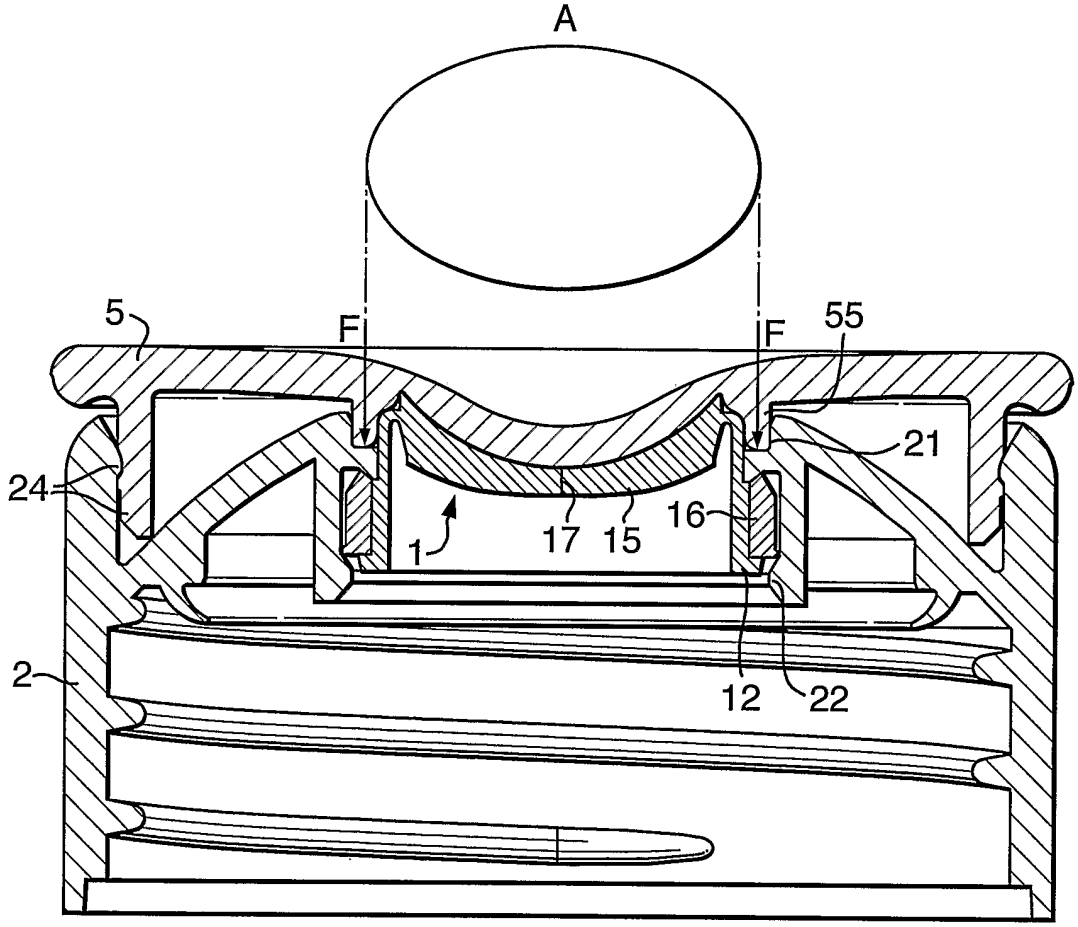


Fig.3.



INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/004466

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65D47/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 743 443 A (HINS JOHANNES) 28 April 1998 (1998-04-28)	1-5,9
A	column 4, line 16 - column 4, line 22; figure 2	6-8

X	US 5 632 420 A (LOHRMAN RICHARD D ET AL) 27 May 1997 (1997-05-27)	1-5,9
A	column 4, line 21 - column 4, line 26; figure 9	6-8

X	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 14, 31 December 1998 (1998-12-31) & JP 10 236498 A (YOSHINO KOGYOSHO CO LTD), 8 September 1998 (1998-09-08)	1-3,9
A	abstract; figures 1,7,11	4-8

	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 July 2004	06/08/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Lendfers, P

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/004466

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/096770 A (YOSHINO KOGYOSHO CO LTD ;ARAI TOSHIHIRO (JP)) 5 December 2002 (2002-12-05)	1,9
A	See Abstractfigures 2B,5B	2-8
A	US 6 089 411 A (ALBISETTI NICOLAS ET AL) 18 July 2000 (2000-07-18) page 1, paragraph 18; figures 1,2	1-9
A	US 2002/162839 A1 (AUER ROBERT T ET AL) 7 November 2002 (2002-11-07) column 5, line 49 - column 5, line 56; figures 1,3	1-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP2004/004466

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5743443 A	28-04-1998	DE 29508151 U1	17-08-1995
		CZ 9601323 A3	15-01-1997
		DE 59607916 D1	22-11-2001
		DK 743259 T3	04-02-2002
		EP 0743259 A1	20-11-1996
		ES 2165450 T3	16-03-2002
		PL 314118 A1	25-11-1996
US 5632420 A	27-05-1997	NONE	
JP 10236498 A	08-09-1998	NONE	
WO 02096770 A	05-12-2002	JP 2002347813 A	04-12-2002
		CA 2416509 A1	05-12-2002
		CN 1463240 T	24-12-2003
		WO 02096770 A1	05-12-2002
US 6089411 A	18-07-2000	FR 2745552 A1	05-09-1997
		DE 69718105 D1	06-02-2003
		EP 0824469 A1	25-02-1998
		ES 2189945 T3	16-07-2003
		WO 9731837 A1	04-09-1997
US 2002162839 A1	07-11-2002	NONE	