PAPCB13B 1.5 PCT APPLICATION DETAILS

Application ID: 37737 / 89 PCT Number : PCT/AU89/00256
Applicant-Name
Condox No. 36 Pty. Limited
1 Lincoln Road
George's Hall New South Wales
2198 Australia

Title : Linerless closure for carbonated beverage container
Priority Country Priority Date Priority App. No.
AU 17 JUN 88 PI8846
Address-for Service :
F B RICE & CO
28A Montague Street
BALMAIN NSW 2041
Date of Lodgement : 15 JUN 89

627746

AUSTRALIA
Patents Act 1990

P/OO/OO8
Section 29 (1)
Regulation 3.1(2)

NOTICE OF ENTITLEMENT

(To be filed before acceptance)
(PCT with Convention Claim)

I/We DAVID NEIL ROWE
*authorised by PRECISION VALVE AUSTRALIA PTY LTD
of CNR WILLIAMSON & MACDONALD ROADS, INGLEBURN 2565, NEW SOUTH WALES.

the applicant in respect of an application for a patent for an invention entitled LINERLESS CLOSURE FOR CARBONATED BEVERAGE CONTAINER

filed under Australian Application No. 37737/89, state the following:-

PRECISION VALVE AUSTRALIA PTY LTD,
the person(s) nominated for the grant of the patent,

[ ] ~~*is/*are the actual inventor(s)~~
or
[X] has, for the following reasons, gained entitlement from the actual inventors(s):
PRECISION VALVE AUSTRALIA PTY LTD IS THE ASSIGNEE OF A PART INTEREST IN THE INVENTION FROM M K PLASTICS PTY LTD, PREVIOUSLY NAMED CONDOX NO. 36, BEING THE ASSIGNEE OF THE INVENTION FROM THE INVENTOR, RODNEY MALCOLM DRUITT.

The person(s) nominated for the grant of the patent *is/*are:

[ ] ~~the applicant(s) of the application(s) listed in the declaration under Article 8 of the PCT~~
or
[X] entitled to rely on the application(s) listed in the declaration under Article 8 of the PCT by reason of the following:-
PRECISION VALVE AUSTRALIA PTY LTD IS THE ASSIGNEE OF A PART INTEREST IN THE PCT APPLICATION FROM M K PLASTICS PTY LIMITED, PREVIOUSLY NAMES CONDOX NO. 36, BEING THE ORIGINAL PCT APPLICANT AND THE BASIC
And APPLICANT.

The basic application(s) referred to in the declaration under Article 8 of the PCT *is/*are the application(s) first made in a Convention country in respect of the invention.

Signed: David Rowe Date: 15th January 1992

Status: COMMERCIAL DIRECTOR

F B RICE & CO PATENT ATTORNEYS
PCT with Convention

AUSTRALIA
Patents Act 1990

P/00/008
Section 29 (1)
Regulation 3.1(2)

NOTICE OF ENTITLEMENT

(To be filed before acceptance)
(PCT with Convention Claim)

I/We RODNEY MALCOLM DRUITT
*authorised by M K PLASTICS PTY LIMITED,
of 1 LINCOLN ROAD, GEORGES HALL 2198, NEW SOUTH WALES.

the applicant in respect of an application for a patent for an invention entitled LINERLESS CLOSURE FOR CARBONATED BEVERAGE CONTAINER

filed under Australian Application No. 37737/89, state the following:-

M K PLASTICS PTY LIMITED,
the person(s) nominated for the grant of the patent,

[ ] ~~*is/*are the actual inventor(s)~~
or
[X] has, for the following reasons, gained entitlement from the actual inventors(s):
M K PLASTICS PTY LIMITED, ORIGINALLY, PREVIOUSLY NAMED CONDOX NO. 36 IS THE ASSIGNEE OF THE INVENTION FROM THE INVENTOR, RODNEY MALCOLM DRUITT.

The person(s) nominated for the grant of the patent *is/*are:

[ ] ~~the applicant(s) of the application(s) listed in the declaration under Article 8 of the PCT~~
or
[X] entitled to rely on the application(s) listed in the declaration under Article 8 of the PCT by reason of the following:-
M K PLASTICS PTY LIMITED, WAS PREVIOUSLY NAMED CONDOX No. 36 AND WAS THE BASIC APPLICANT.

And

The basic application(s) referred to in the declaration under Article 8 of the PCT *is/*are the application(s) first made in a Convention country in respect of the invention.

Signed: R M Druitt Date: 15th January 1992

Status: Inventor
Manager, M.K. PLASTICS PTY. LTD.

F B RICE & CO PATENT ATTORNEYS
PCT with Convention

(12) PATENT ABRIDGMENT (11) Document No. AU-B-37737/89
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 627746

(54) Title
LINERLESS CLOSURE FOR CARBONATED BEVERAGE CONTAINER

International Patent Classification(s)
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PI8846	**17.06.88**	**AU AUSTRALIA**

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(71) Applicant(s)
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RODNEY MALCOLM DRUITT

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(57) Claim

1. A closure for a container having an externally screw threaded neck, said closure being moulded in one piece from a resilient plastics material and comprising a top and a depending skirt which has on its internal surface a complementary screw thread, characterised in that an annular sealing rib projects downwardly from the top, the rib includes a first substantially cylindrical portion contiguous with the top and lying adjacent to or abutting with the skirt and a second, frusto-conical, portion contiguous with the end of the first portion distal to the top and extending radially inwardly to terminate in a circular free edge, the internal diameter of the first portion being equal to or only slightly larger than the external diameter of the neck of the container to which the closure is to be attached such that, during threaded engagement of the closure with the neck, the second, frusto-conical, portion will be engaged by a free end of the neck and folded back against the first, substantially cylindrical portion of the rib and to form a gas-tight seal between the neck of the container and the closure.

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(71) Applicants *(for all designated States except US)*: M.K. PLASTICS PTY. LIMITED [AU/AU]; 1 Lincoln Road, George's Hall, NSW 2198 (AU). PRECISION VALVE AUSTRALIA PTY. LIMITED [AU/AU]; CNR. Williamson & Garner Road, Ingleburn, NSW 2565 (AU).

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(75) Inventor/Applicant *(for US only)* : DRUITT, Rodney, Malcolm [AU/AU]; 1 Lincoln Road, George's Hall, NSW 2198 (AU).

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(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.

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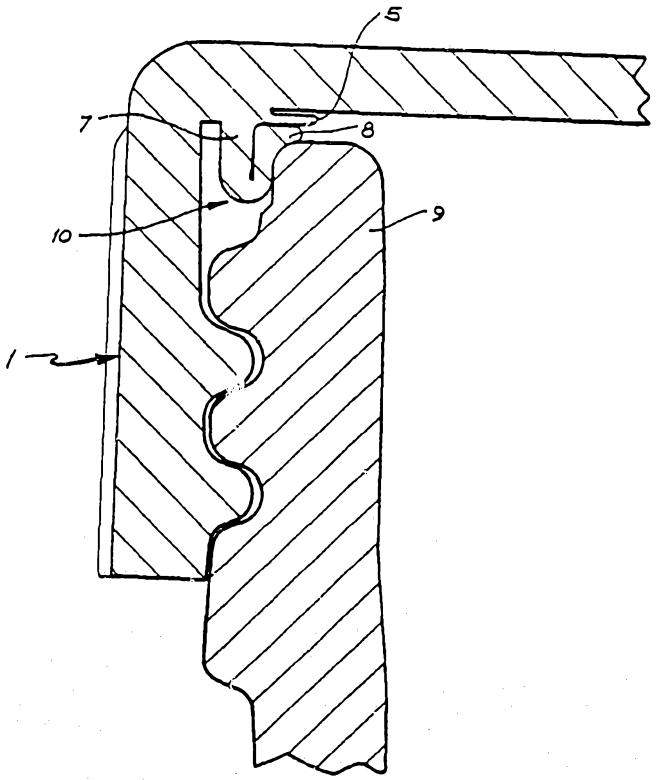
(54) Title: LINERLESS CLOSURE FOR CARBONATED BEVERAGE CONTAINER

(57) Abstract

A closure (1) for a container having an externally screw threaded neck (9), said closure (1) being moulded in one piece from a resilient plastics material and comprising a top (4) and a dependingskirt (2) which has on its internal surface a complementary screw thread (3), characterised in that an annular sealing rib (6) projects downwardly from the top (4), the rib (6) includes a first substantially cylindrical portion (7) contiguous with the top (4) and lying adjacent to or abutting with the skirt (2) and a second, frusto-conical, portion (8) contiguous with the end of the first portion (7) distal to the top (4) and extending radially inwardly to terminate in a circular free edge, the internal diameter of the first portion (7) being equal to or only slightly larger than the external diameter of the neck (9) of the container to which the closure is to be attached such that, during threaded engagement of the closure (1) with the neck (9), the second, frusto-conical, portion (8) will be engaged by a free end of the neck (9) and folded back against the first, substantially cylindrical portion (7) of the rib (6) and to form a gas-tight seal between the neck (9) of the container and the closure (1).



LINERLESS CLOSURE FOR CARBONATED BEVERAGE CONTAINER

FIELD OF THE INVENTION

This invention relates to caps for sealing the opening of screw top containers. In particular, the invention provides a screw top cap which seals bottles of carbonated liquid such as softdrinks but is well adapted to seal other containers such as glass or PET containers with contents at above or below atmospheric pressure or having gaseous components or requiring a hermatic seal.

Screw top caps have been used for some time to seal various containers. Although many screw tops include a separate sealing wad within the cap, there is substantial advantage to be had in producing a one-piece cap which still effectively seals the container.

PRIOR ART

Such a one piece cap is shown in the British patent 788148 (3 August 1956) which includes a continuous lip within the top portion of the cap positioned to engage against the annular end face of the opening and provide a seal between the lip and the free end edge of the container with the lip curling over at its free edge. However, this cap provides a seal only against the free end edge of the container.

Australian application 15456/76 (30 June 1976) discloses an alternative one-piece cap in which a annular lip extends from the inside top of the cap and engages the inner bore of a container opening so as to curl the free end of the lip in against the bore or inside surface of the opening. However, with this cap, effective sealing requires that the inside bore of the opening be of accurate and consistent dimensions. Furthermore, if aerated or other gaseous liquid is to be contained, gas pressure will tend to distort the lip and cause a seal

failure.

Australian patent application 14180/83 (5 May 1983) describes a cap with two internal sealing structures. One of the structures is an annular shaped outer portion shaped to accept the outer peripheral edge of the free end of the container relying upon the pressure generated during the closing of the cap to seal against this outer edge. Further provided is an inner cylindrical lip to engage the inner bore of the container opening.

SUMMARY OF THE PRESENT INVENTION

According to the present invention there is provided a closure for a container having an externally screw threaded neck, said closure being moulded in one piece from a resilient plastics material and comprising a top and a depending skirt which has on its internal surface a complementary screw thread, characterised in that an annular sealing rib projects downwardly from the top, the rib includes a first substantially cylindrical portion contiguous with the top and lying adjacent to or abutting with the skirt and a second, frusto-conical, portion contiguous with the end of the first portion distal to the top and extending radially inwardly to terminate in a circular free edge, the internal diameter of the first portion being equal to or only slightly larger than the external diameter of the neck of the container to which the closure is to be attached such that, during threaded engagement of the cap with the neck, the second, frusto-conical, portion will be engaged by a free end of the neck and folded back against the first, substantially cylindrical portion of the rib and to form a gas-tight seal between the neck of the container and the closure.

Preferably the plastics material is high density polyethylene, low density polyethylene, or polypropylene. Where the container is to be used for gaseous liquids, the

plastics material must have a very low porosity to the gas. Preferably the rib is shaped and sized so that, during the threaded engagement of the closure with the container, the free edge of the rib contacts an inner surface of the top, or the surface of structure contiguous with the top, before the closure is fully engaged and such that the rib in the region proximal the free edge is pinched between the free end of the neck of the container and the top of the closure, or the structure contiguous with the top of the closure, when the closure is fully engaged with the container.

Preferably the first substantially cylindrical and second frusto-conical portions of the lip join at an included angle of at least 90°. It is also preferred that the rib is of a thickness tapering from a maximum thickness proximal the top to a minimum thickness at its annular free edge.

It is also preferred that the first substantially cylindrical and second frusto-conical portions of the lip smoothly join with an internal radius of from 0.1mm to 0.5mm, most preferably 0.2mm. It is further preferred that the cross-sectional thickness of the rib proximate the join between the first and second portions is from 0.4m to 0.8m, most preferably approximately 0.6mm.

Where the closure is adapted to seal a container with an Alcoa step finish, the first substantially cylindrical portion of the sealing rib joins the top spaced radially inwardly from the skirt so as to define a space of annular cross-section between the rib and skirt. Where the container neck has a standard finish the rib is closely spaced from, or contiguous with, the skirt.

BRIEF DESCRIPTION OF THE DRAWINGS

An exemplary embodiment of the invention will now be described with reference to the drawings which show:

Fig. 1 an embodiment of the present invention in sectioned elevation;

Fig. 2 the embodiment of Fig. 1 screwed onto a suitable container shown in sectional elevation;

and Fig. 3 an alternative embodiment in sectional elevation.

PREFERRED EMBODIMENTS

Fig. 1 shows a cap 1 which is in many aspects a conventional screw top cap for a bottle to be used in containing a carbonated beverage. The cap 1 includes a continuous cylindrical sidewall 2 with a thread 3 formed on its interior surface. The top end of the cap 1 is closed by a top 4 which joins the skirt 2 in a continuous circular perimeter. The top 4 and skirt 2 being formed integrally from high density polyethylene by injection moulding.

The cap differs from known caps in that it includes an annular rib 6 which extends from the interior surface of the top 4 concentrically of the cap 1, being positioned close to the skirt 2. The annular sealing rib 6 includes a first or root portion 7 which extends from the top 4 approximately parallel to the skirt 2 with a second portion 8 extending from the end of the first portion 7 tapering inwardly and away from the end wall 8.

The cap 1 can be seen in Fig. 2 screwed onto the screw top end 9 of a container not fully shown in the drawing. The end 9 of the container is finished with an "Alcoa step" 10 at the outer periphery of its open end extremity. The Alcoa step 10 allows a space between the end 9 of the container and the inner surface of the skirt 2 of the cap 1. The size of this annular space is sufficient to allow the second portion 8 of the outer rib 6 to contact the end 9 of the container as the cap 1 is being screwed onto the container, and for the second

portion 8 to fold up on itself and against the root portion 7 and structure integral with the top 4. Thus there is formed a continuous gas tight seal between the cap 1 and the container extending from the Alcoa step 10 to the end surface of the container. There is no need of a separate seal inserted into the cap 1 prior to its application to the container as is common in the art.

As the cap 1 is attached in the above described manner, the second portion 8 of the sealing rib 6 is deformed by being bent towards the top 4. The deformation continues and contact is made between the second portion 8 of the sealing rib 6 and an inner rib 5 which effectively extends the structure of the top 4. The inner rib 5 in fact is not essential to the invention and can be dispensed with if the other components are suitably modified so that the end portion 8 contacts the top 4 during this deformation.

Once the second portion 8 has contacted the inner rib 5 (or top 4) further movement attaching the cap 1 will press and grip the contacting part of the second portion 8 between the container end 9 and the top 4. As the movement attaching the cap 1 continues, it tends to pinch the free edge of rib 6 between the container and the top 4 and to "pull" the first portion 7 of the outer rib tightly in towards the container end 9 to produce a tight seal about the curved edge surface of the container end 9 extending from its extreme end annular surface 11 to the Alcoa step region 10.

In the preferred embodiment shown in the drawings, an annular gap 12 is formed between the outer rib 6 and the skirt 7, proximate the top 4. This is one means of accommodating the Alcoa step 10 and allowing the necessary movement of the outer rib 6 during application of the cap 1 to a container end 9.

The dimensions of the outer rib 6, in conjunction

with the design shape of the rib 6 and its material of construction, will clearly influence the effectiveness of the cap 1. Not only the sealing effectiveness but also the mouldability, removal torque, reusability and consistency are important. For the high density polyethelene cap shown in the drawings, the inner radius joining the first and second portions 7 and 8 of the outer rib 6 is 0.2mm, the outer radius 0.5mm and the cross-sectional thickness approximately 0.6mm (slightly tapered for mould removal).

The alternative embodiment of Fig. 3 has a very much smaller inner rib 5 but is otherwise substantially the same as the embodiment of Fig. 1 and 2.

The cap is modified (not illustrated) for containers not finished with an Alcoa step. Importantly, the inner diameter at the skirt and the thread dimensions must provide a secure engagement with the container thread. Further the inner dimension of the first portion 7 of the sealing rib 6 is preselected to be equal to, or slightly greater than, the external diameter of the container neck at the opening. Some radial flex should be provided in the sealing rib 6 so that on application of the cap to the container the second portion 8 can uniformly bend back onto the first portion 7.

CLAIMS:

1. A closure for a container having an externally screw threaded neck, said closure being moulded in one piece from a resilient plastics material and comprising a top and a depending skirt which has on its internal surface a complementary screw thread, characterised in that an annular sealing rib projects downwardly from the top, the rib includes a first substantially cylindrical portion contiguous with the top and lying adjacent to or abutting with the skirt and a second, frusto-conical, portion contiguous with the end of the first portion distal to the top and extending radially inwardly to terminate in a circular free edge, the internal diameter of the first portion being equal to or only slightly larger than the external diameter of the neck of the container to which the closure is to be attached such that, during threaded engagement of the closure with the neck, the second, frusto-conical, portion will be engaged by a free end of the neck and folded back against the first, substantially cylindrical portion of the rib and to form a gas-tight seal between the neck of the container and the closure.

2. A closure as defined in claim 1 wherein during said threaded engagement interaction between the rib and the neck of the container will cause said rib, while folding back, to contact an inner surface portion of the top or of structure contiguous with the top to provide a gas-tight seal with the container.

3. A closure as defined in claim 1 wherein the shape, size and material of construction of said rib is selected such that, during attachment of said closure to a container, said rib is frictionally engaged between said free end of the container neck and a surface portion of the top once mutual contact is made so that final movement of said closure draws a portion of the rib adjacent an outer top surface of the container tightly against said

top surface of the container so as to form a continuous seal from said top surface to a cylindrical side surface of the container neck.

4. A closure as defined in claim 2 wherein said surface portion is defined by part of a second continuous annular rib being contiguous with the end wall.

5. A closure as defined in claim 4 wherein the second rib extends radially inwardly and away from said top and is tapered in cross-section.

6. A closure as defined in claim 5 wherein, upon attachment of said closure to a said container, said second rib is deformed by being bent towards said top subsequent said contact with said sealing rib.

7. A closure as defined in claim 6 wherein said cylindrical portion joins said top radially displaced from said skirt so as to define a generally annular gap between said cylindrical portion and said top.

8. A closure as defined in claim 1 wherein said rib is tapered in cross-section so as to allow ejection of the closure from an injection mould.

9. A closure as defined in claim 2 wherein the shape, size and material of construction of said rib is selected such that, during attachment of said closure to a container, said rib is frictionally engaged between said free end of the container neck and a surface portion of the top once mutual contact is made so that final movement of said closure draws a portion of the rib adjacent an outer top surface of the container tightly against said top surface of the container so as to form a continuous seal from said top surface to a cylindrical side surface of the container neck.

10. A closure as defined in claim 3 wherein said surface portion is defined by part of a second continuous annular rib being contiguous with the end wall.

11. A closure as defined in claim 9 wherein said surface

portion is defined by part of a second continuous annular rib being contiguous with the end wall.

12. A closure as defined in claim 11 wherein said cylindrical portion joins said top radially displaced from said skirt so as to define a generally annular gap between said cylindrical portion and said top.

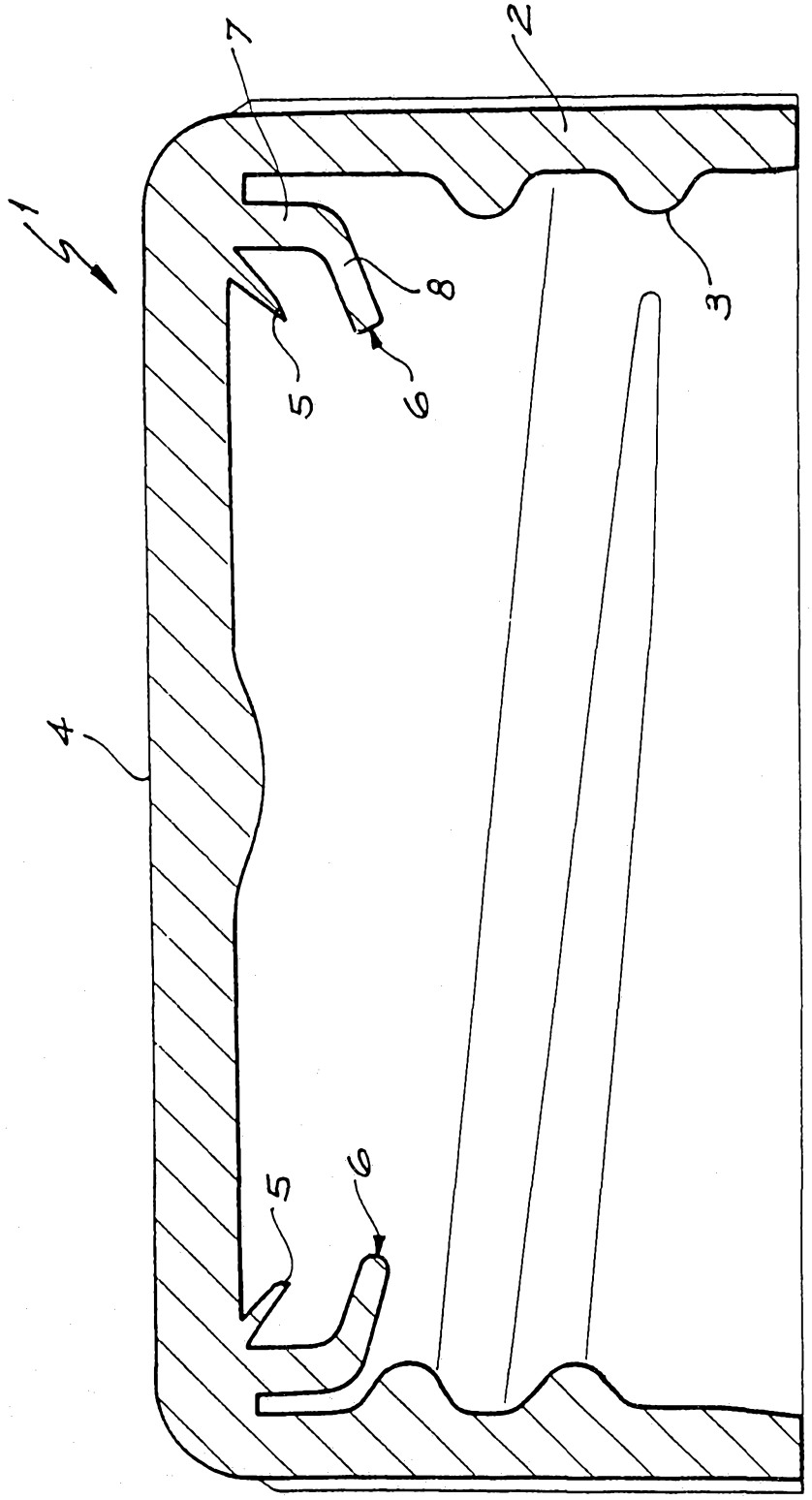


FIG. 1

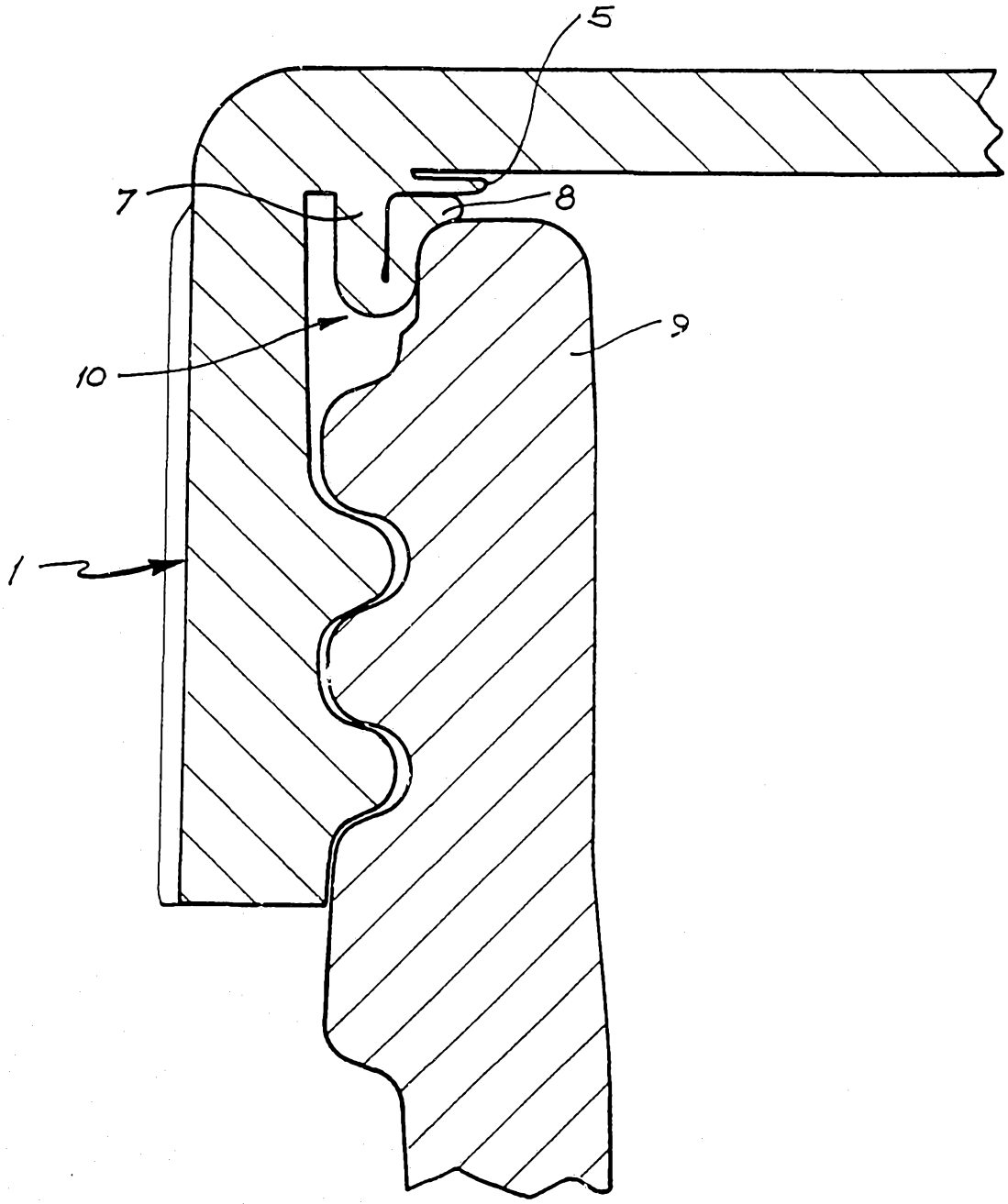


FIG. 2

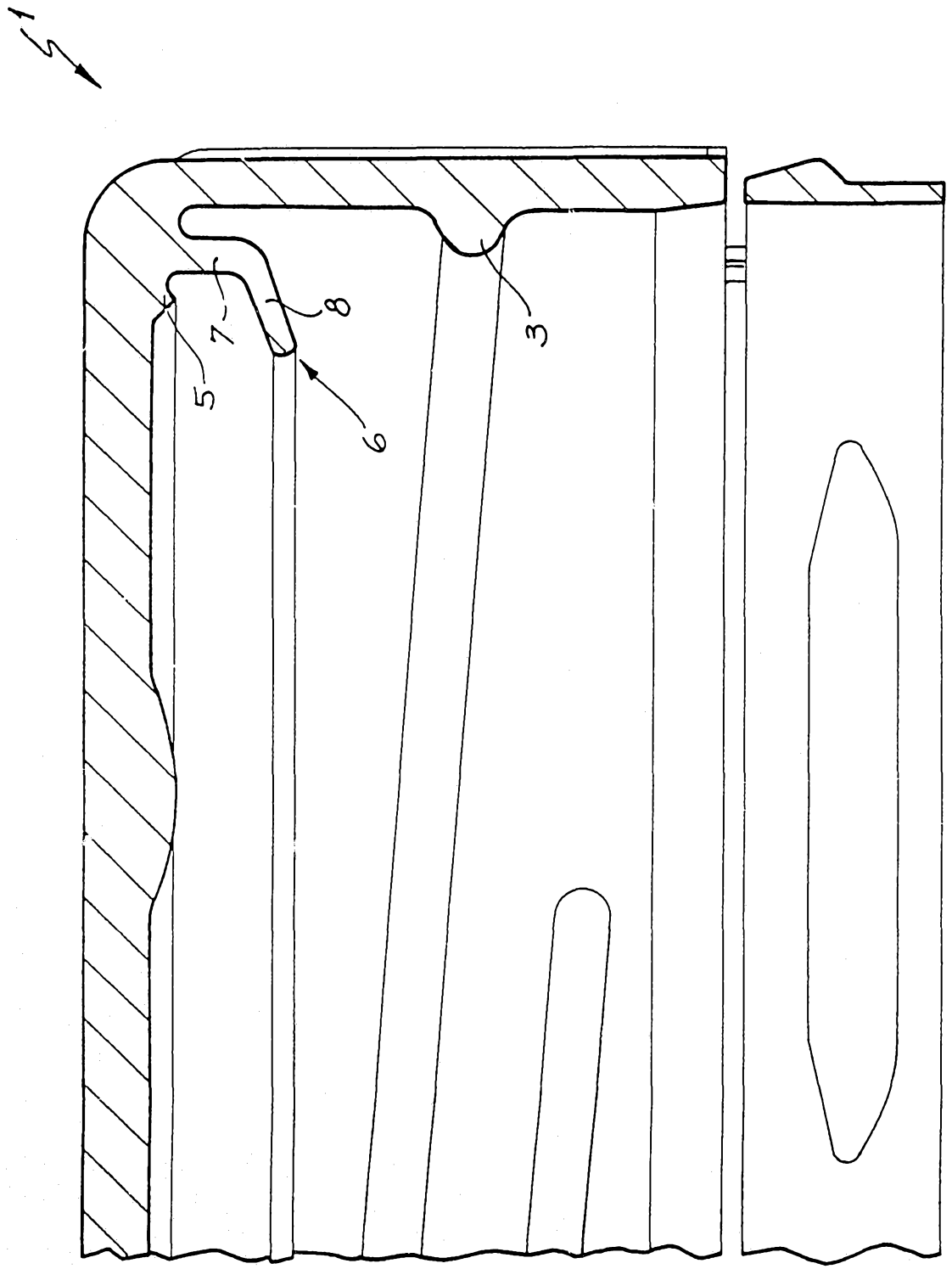


FIG. 3

INTERNATIONAL SEARCH REPORT

International Appl tion No. PCT/AU 89/00256

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) 6

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[4] B65D 41/04, 53/02

II. FIELDS SEARCHED

Minimum Documentation Searched 7

Classification System	Classification Symbols
IPC	B65D 41/04
US Cl	215/351, 215/352

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 8

AU: IPC as above; B65D 53/02

III. DOCUMENTS CONSIDERED TO BE RELEVANT 9

Category*	Citation of Document, 11 with indication, where appropriate, of the relevant passages 12	Relevant to Claim No 13
X,Y	AU,B, 9239/66 (417081) (HAYASHIDA) 8 February 1968 (08.02.68)	(1-12)
X,Y	AU,B, 15456/76 (501062) (ALBERT OBRIST A.G.) 5 January 1978 (05.01.78)	(1-12)
X,Y	CH,A, 407786 (AKTIEBOLAGET WICANDERS KORKFABRIKER) 2 October 1962 (02.10.62)	(1-12)
X	DE,A, 2703404 (GRUSSEN et al) 4 August 1977 (04.08.77)	(1)
Y	AU,B, 34451/84 (561051) (METAL BOX PLC) 2 May 1985 (02.05.85)	(2-4,8-12)
Y	GB,A, 1499895 (MACK-WAYNE PLASTICS CO.) 1 February 1978 (01.02.78)	(2,4-8)
A	AU,B, 32275/84 (570997) (METAL CLOSURES LTD) 28 February 1985 (28.02.85)	(1)
A	AU,B, 44533/68 (433268) (REFLEX CORP. OF CANADA LTD) 16 April 1970 (16.04.70)	(1)
A	EP,A, 109631 (WIEDMER) 30 May 1984 (30.05.84)	(1-4,8-11)
A	EP,A, 136088 (METAL CLOSURES LTD) 3 April 1985 (03.04.85)	(1)
A	DE,A, 2756372 (OWENS-ILLINOIS, INC) 3 August 1978 (03.08.78)	(1,2)

* Special categories of cited documents: 10

"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

"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

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
12 September 1989 (12.09.89)	22 September 1989
International Searching Authority	Signature of Authorized Officer
Australian Patent Office	G.M. COX

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 89/00256

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Members		
AU 9239/66	DE 1532419	US 3405830	
AU 15456/76	AR 211543	AT 4526/76	BE 834193
	BR 7604256	CA 1051825	CH 611850
	DE 2529340	DK 2946/76	FI 761795
	FR 23161641	FR 2378689	GB 1541702
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	JP 52064378	NL 7508901	NO 762134
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	NO 770321	SE 7701048	US 4090631
	ZA 7700574		
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	JP 60134855	NO 844272	NZ 209920
	US 4598835	ZA 8408079	
GB 1499895	ES 438278		
AU 32275/84	EP 136088	EP 293901	FI 843298
	JP 60068256	NZ 209283	PT 79135
	ZA 8406487		

CONTINUED

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 89/00256 (CONTINUED)

Patent Document Cited in Search Report	Patent Family Members		
AU 44533/68	GB 1245960	US 3478911	
EP 109631	US 4540102		
EP 136088	AU 32275/84 JP 60068256 ZA 8406487	EP 293901 NZ 209283	FI 843298 PT 79135
DE 2756372	CA 1068648	GB 1563169	US 4069937

END OF ANNEX