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SCREW-TYPE SEALING CAP WITH IMPROVED GAS-TIGHTNESS
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- (56) Prior Art Documents  
FR 1197200  
AU 21785/88 B65D 53/04  
AU 593459 11981/88 B65D 41/04

(57) The present invention is directed towards a leaktight cap of the type having two fitted shells which, whilst being of simple manufacture and of low cost, ensures both good sealing with respect to liquids and good gas-impermeability and can be used without problems for products of the greatest diversity.

In the leaktight cap in accordance with the invention, the gas impermeability is ensured solely or principally by a disk having a gas-barrier effect which is inserted between the bottom of the outer shell and the bottom of the inner shell.

Thus, this disk becomes imprisoned between the inner shell and the outer shell by being, because of this, isolated and protected both in relation to the product contained in the container, by virtue of the inner shell, and in relation to the outside by the outer shell.

#### CLAIM

1. A leaktight and gas-impervious screw cap for a container, comprising: two cup-shaped shells rendered integral by fitting one into the other, each shell

being provided with an end wall portion and a side wall portion, the inner shell being one-piece moulded from a flexible plastic with, on its end wall portion, sealing means capable of interacting with the inner surface of the container neck and, on its side wall portion, a female thread capable of interacting with a male thread of the container neck and the outer shell being one-piece moulded from a hard plastic; and a disk made from a material having a gas-barrier effect located between the end wall portion of the outer shell and the end wall portion of the inner shell.

LEAKTIGHT SCREW CAP HAVING IMPROVED GAS-IMPERMEABILITY

The present invention relates to a leaktight screw cap comprising a cup-shaped body comprising, on its lateral wall, a female thread interacting with a male thread of the neck of the container and on its bottom sealing means interacting with the neck of the container.

Known leaktight caps of this type are generally one-part caps made from plastic. The plastics used most are polyethylene, that is to say a relatively flexible material and the more rigid polypropylene. In the case of beverages, polyethylene is generally used for non-carbonated or slightly carbonated beverages, whereas polypropylene is used for highly carbonated beverages on account of its better gas impermeability.

However, there exist numerous cases of packaging where the gas impermeability provided by caps made from polypropylene is still insufficient. This is the case during the packaging of products sensitive to the action of oxidation from oxygen in the air (fats, sauces, fruit juices), responsible for an organoleptic alteration which may rapidly render the product unsuitable for eating. This also applies to the preservation of the CO<sub>2</sub> content of highly carbonated beverages. Another problem consists in the losses of aromas and of volatile substances from spices and essential oils. Finally, gas-impermeability defects lead to risks of picking up undesirable odours by a product such as the water in plastic bottles during storage or transport in a confined space.

In order to attempt to solve these problems, a leaktight cap has already been proposed, for example according to European Patent Application No 0,280,068, produced from an oxygen-permeable thermoplastic material, for example polypropylene, the bottom of which is internally covered with an oxygen-impermeable complex sheet (paper, chlorinated rubber, PVC), a plastisol seal being cast onto the said complex sheet. However, this cap is



not always satisfactory, especially in the case of beverages, the complex sheet being in contact with the contents of the container which is made leaktight by the cap.

5           Moreover, it has already been proposed, for example by French Patent No. 1,197,200, to produce a leaktight screw cap from two cup-shaped shells fitted one into the other, the inner shell consisting of a flexible plastic and comprising, on its lateral wall, a female thread  
10           capable of interacting with a male thread of the neck of the container and, on its bottom sealing means which are capable of interacting with the neck of the container and the outer shell consisting of a hard plastic.

          Both shells may therefore be produced in an optimal  
15           material taking into account the function which they have to fulfil in the cap. Thus, in order to obtain good sealing with respect to liquids, the use of polyethylene, that is to say a flexible and low-hardness material, is perfectly suitable for the inner shell which is in  
20           contact with the packaged product and with the neck of the container and which, on account of its flexibility, adapts well to defects which the container may also have. By contrast, the outer shell may be produced from a hard and rigid material exhibiting, moreover, good properties  
25           in terms of resistance to mechanical stresses which could jeopardise the sealing if they were exerted on a single-part cap made from a flexible plastic. However, the lower gas-impermeability of these caps formed from two shells is often not satisfactory.

30           The present invention is directed towards a leaktight cap of the type having two fitted shells which, whilst being of simple manufacture and of low cost, ensures both good sealing with respect to liquids and good gas-impermeability and can be used without problems  
35           for products of the greatest diversity.

          In the leaktight cap in accordance with the invention, the gas impermeability is ensured solely or principally by a disk having a gas-barrier effect which is



inserted between the bottom of the outer shell and the bottom of the inner shell.

Thus, this disk becomes imprisoned between the inner shell and the outer shell by being, because of this, isolated and protected both in relation to the product  
5 contained in the container, by virtue of the inner shell, and in relation to the outside by the outer shell.

This disk, instead of simply being placed between the bottoms of the two shells, could also be fixed  
10 internally to the bottom of the outer shell, for example by adhesive bonding or by welding, preferably by ultrasound. Likewise, this disk could be fixed by adhesive bonding or by welding, preferably by ultrasound, externally to the bottom of the inner shell.

Another possibility consists in arranging for the  
15 said disk to be overmoulded using the material of the outer shell, or of the inner shell, which eliminates any subsequent fixing.

The disk in question may advantageously be formed  
20 from a complex sheet, for example a sheet of metallised plastic. When this complex sheet has to be connected by moulding or by welding to the outer shell and/or to the inner shell, it should comprise, on the side of the shell to which it is to be connected, a material lending itself  
25 to a connection by melting or by welding with the material of the shell in question.

Referring to the attached drawings, there will be described hereinbelow in more detail several illustrative non-limiting embodiments of a screw cap in accordance  
30 with the invention; in the drawings:

Figure 1 is a side view, in partial cross-section, of a first embodiment of a cap in accordance with the invention;

Figure 2 is an axial cross-section of a second  
35 embodiment of a cap in accordance with the invention, in a leaktight position on a bottle neck;

Figure 3 is an axial cross-section of a third embodiment.



The leaktight screw cap 1, such as illustrated by Figure 1, is composed of a cup-shaped outer shell 2 and of an inner shell 3 which is also generally cup-shaped, the two shells 2 and 3 being fitted one into the other.

5       The outer shell 2 is produced by injection moulding from a relatively hard plastic such as polypropylene. It comprises, on its lateral wall 4, an outer knurling 5 and an inner knurling 6 consisting of grooves and ribs which are parallel to the axis of the cap.

10       A disk 7 constituted by a complex of plastic and metal, preferably a sheet of metallised polypropylene, internally covers the bottom 8 of the outer shell 2. The disk 7 may preferably be overmoulded using the plastic of the outer shell 2.

15       The inner shell 3 produced by moulding, preferably by injection moulding, from a flexible plastic such as polyethylene, comprises, on its bottom 9, an annular inner depression 10, known per se, the outer flank 11 of which is intended to interact with the inner face of the  
20       neck of a container to be made leaktight. The lateral wall 12 of the inner shell 3 externally comprises axial knurling 13 which interacts with the inner axial knurling 6 of the outer shell 2, during the fitting of the two shells 2, 3 one into the other, and internally comprises  
25       a female thread 14 intended to interact with the male thread of the neck, not shown, of the container to be made leaktight.

      The inner diameter of the outer shell 2 and the outer diameter of the inner shell, on the lower cylindrical portions of the lateral walls 4, 12 of these  
30       shells, are chosen so that the two shells 2, 3 can be rendered integral axially, one with the other, by simple force-fitting, the two shells 2, 3 moreover being integral rotationally, one with the other, by virtue of  
35       the interpenetration of their knurlings 6, 13.

      At its lower end, the lateral wall 4 of the inner shell 3 comprises a tamper-proof ring 15 of type known per se connected via frangible bridges 16 to the shell 3.



In the example shown, the ring 15 comprises a circumferential row of flexible tabs 17 intended to interact, by being turned back towards the bottom of the cap 1, with a flange, not shown, provided on the end of the container, beneath the thread, so that after installing the entire cap 1 on the neck of the container, the first unscrewing of the cap 1 causes the bridges 16 to break, and therefore a detachment, at least in part, of the ring 15, which indicates in a clearly visible and irreversible manner that the container has undergone a first opening or attempted opening.

The cap 101 according to the embodiment illustrated by Figure 2 is also composed of an outer shell 102 and of an inner shell 103.

The outer shell 102 comprises, in a manner similar to the outer shell 2 of Figure 1, a lateral wall 104 with an outer knurling 105 and an inner knurling 106, together with a disk 107 having a gas-barrier effect on the inner face of its bottom 108.

The inner shell 103 differs from the inner shell 3 of the cap 1 according to Figure 1 solely by the presence of a sealing skirt 110 projecting over the bottom 109 of the shell 103 in order to interact with the inner face of the neck 111 of a container. Apart from that, encountered again on the inner shell 103, a lateral wall 112 equipped with an outer knurling 113 and a female thread 114 interacting with the male thread 119 provided on the neck of the container. At its lower end, the lateral wall 112 of the inner shell 103 carries a tamper-proof ring 115 which here is shown in the position in which its tabs 117 interact with the flange 118 of the neck of the container to be made leaktight.

In the two embodiments shown, in Figures 1 and 2, the disk 7, 107 having a barrier effect inserted between the bottoms 8, 9 and 108, 109 of the two shells 102 and 103 may be fixed, for example by welding using ultrasound, to one and/or to the other of the two shells 2, 3 and 102, 103. It is also possible to overmould the disk



7, 107 using the material of the outer shell 2, 102, during the injection moulding of the latter. In order to permit a connection to be made by melting of the disk 7, 107 with the outer shell 2, 102, it is necessary to provide, on this disk 7, 107 whose barrier effect may preferably be obtained by a metallic layer, a layer of a plastic lending itself to a connection by melting with material of the said shell. The same also applies when the disk 7, 107 is to be connected to the inner shell 3, 103.

The cap 201 of Figure 3 comprises an outer shell 202 and an inner shell 203 which, fitted one into the other, are integral axially, one with the other, by a circumferential groove 206 internally provided in the lateral wall 204 of the outer shell, externally provided with a knurling 205, and by a flange 213 externally provided on the lateral wall 212 of the inner shell 203, the flange 213 being snap-fastened into the groove 206 when finally fitting the two shells one into the other. The two shells 202 and 203 are rendered integral one with the other in the circumferential direction by teeth 218 provided on the groove 206 and on the flange 213.

In addition, in the embodiment of Figure 3, the sealing means 210 of the inner shell 203 which comprises a female thread 214 on its lateral wall 212 extended by a tamper-proofing 215 here comprise a skirt 211 to the lower end of which the bottom 209, having a flat-plate shape, is joined. The disc 207 linked to the inner face of the bottom 209 of the outer shell 202 thus becomes some distance away from the bottom 209 of the inner shell.

It goes without saying that the embodiments shown and described have been given only by way of illustrative and non-limiting examples and that numerous modifications and alternative forms are possible within the scope of the invention.

Thus, sealing means other than the annular depression 10 according to Figure 1, the skirt 110 according



to Figure 2 or the plate skirt 210 according to Figure 3 may be provided on the inner shell 3, 103, 203 in order to ensure sealing with the neck of the container to be made leaktight.

5       It should, moreover, be pointed out that the manufacture of the inner shell 2, 102, 202 is extremely simple and may be carried out at a very high rate, on account of the absence of inner thread. Now, it is precisely on account of the female thread that the demoulding of the  
10 one-part caps made from relatively rigid plastic leads to a great reduction in the rate of manufacture.

      In addition, in the cap in accordance with the invention, the two shells may be produced from materials of different colours, which not only gives a pleasing  
15 appearance to the cap (tamper-proof ring of a colour different from the visible remaining portion, namely the outer shell), but renders even more apparent any attempt at opening the container.

      Finally, although the disk 7, 107, 207 is defined  
20 as being made from a material having a gas-barrier effect, this barrier effect is also applicable to vapours, aromas, odours and other volatile substances.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A leaktight and gas-impervious screw cap for a container, comprising: two cup-shaped shells rendered integral by fitting one into the other, each shell being provided with an end wall portion and a side wall portion, the inner shell being one-piece moulded from a flexible plastic with, on its end wall portion, sealing means capable of interacting with the inner surface of the container neck and, on its side wall portion, a female thread capable of interacting with a male thread of the container neck and the outer shell being one-piece moulded from a hard plastic; and a disk made from a material having a gas-barrier effect located between the end wall portion of the outer shell and the end wall portion of the inner shell.
2. A cap according to Claim 1, characterised in that the said disc is fixed to the bottom of the outer shell and/or to the bottom of the inner shell.
3. Cap according to Claim 2, characterised in that the said disc is fixed by welding, for example by ultrasound, to the outer shell and/or to the inner shell.
4. A cap according to Claim 1 characterised in that the disc forms an insert to the mould used for forming either of the outer shell or the inner shell; said disc being inserted prior to the ingress of plastic material used for forming either of said shells.
5. A cap according to any one of Claims 1 to 4, characterised in that the said disc is formed from a complex sheet comprising, on the outer shell side, a material lending itself to a connection by melting or by welding with the material of the outer shell.



6. A cap according to any one of Claims 1 to 5, characterised in that the said disc is formed from a complex sheet comprising, on the inner shell side, a material lending itself to a connection by melting or by welding with the material of the inner shell.

7. A cap according to any one of the preceding Claims, characterised in that the two shells. are constituted by materials of different colours and in that a tamper-proof ring is produced as a single part with the inner shell in such a manner that this ring extends beyond the outer shell when the two shells are fitted one into the other.

8. A cap according to any one of the preceding claims, characterised in that the two shells are rendered integral axially by a circumferential groove and by an annular flange interacting by snap-fastening when finally fitting the two shells one into the other.

9. A cap according to Claim 8, characterised in that the two shells are rendered integral in the circumferential direction by teeth provided on the said groove and on the said flange.

DATED this 25th day of May 1995

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Vax Doc 015

AU1883392.WPC



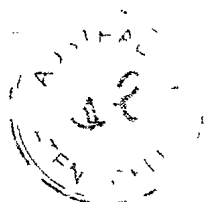
# ABSTRACT

## Leaktight screw cap having improved gas-impermeability.

Leaktight screw cap composed of two cup-shaped shells (2,  
5 3) rendered integral by fitting one into the other, the  
lower shell (3) being made from a flexible plastic and  
comprising a female thread (14) and sealing means (10)  
and the outer shell (2) being made from a hard plastic.  
A disk (7) made from a material having a gas-barrier  
10 effect is inserted between the bottoms (8, 9) of the  
outer shell and of the inner shell.

Application: especially to beverages and other products  
sensitive to gas exchanges with the outside.

Reference: Figure 1



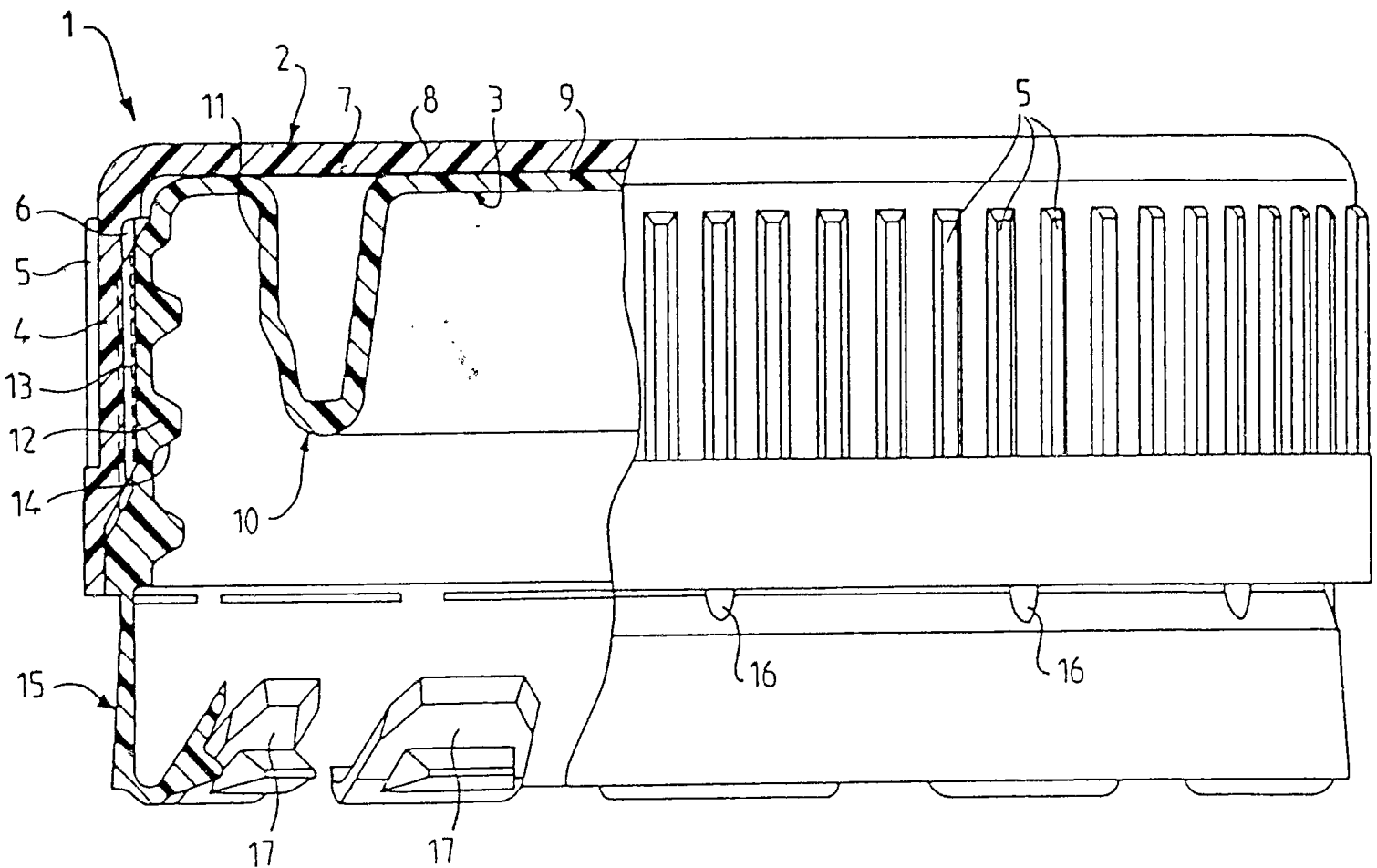


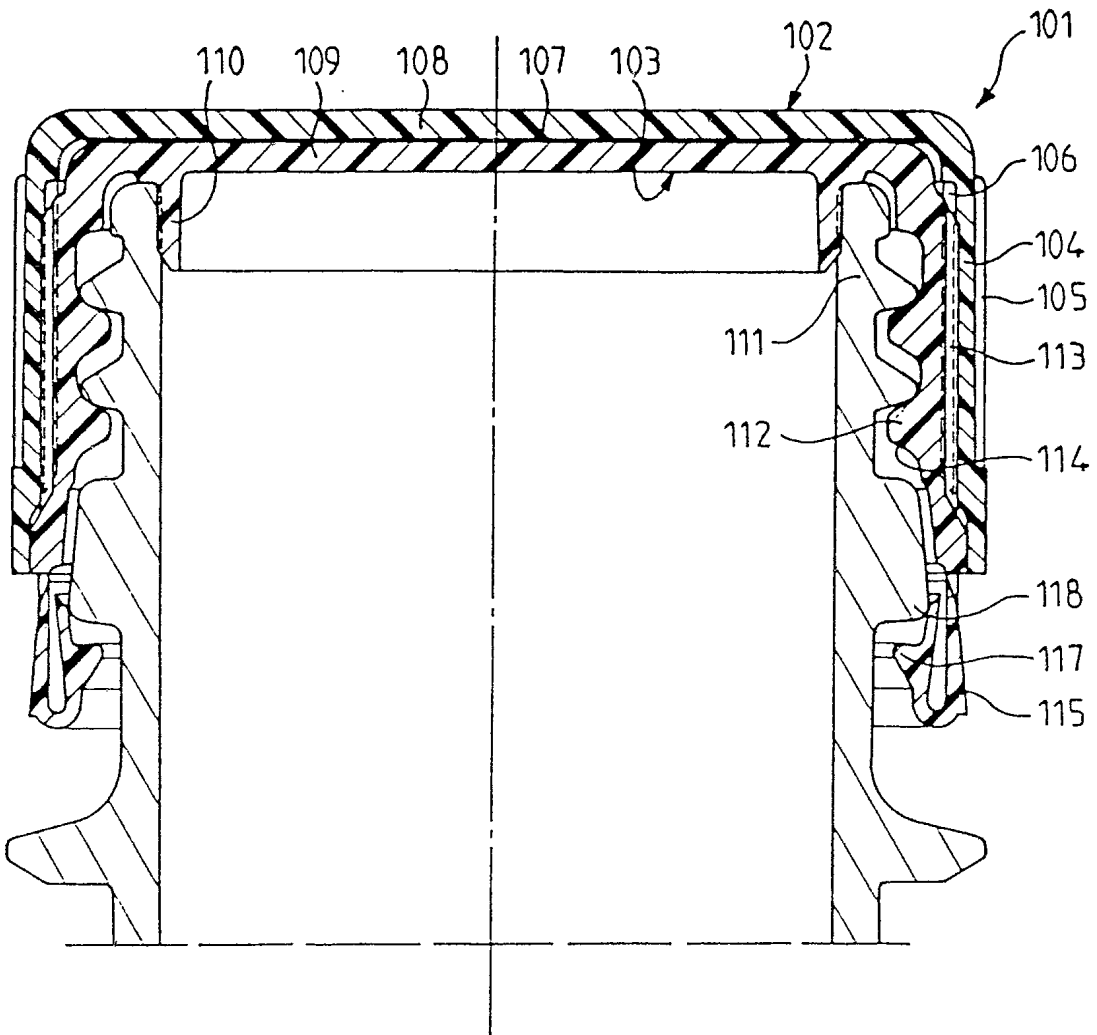
FIG. 1

FEUILLE DE REMPLACEMENT

2/3

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FIG. 2



FEUILLE DE REMPLACEMENT

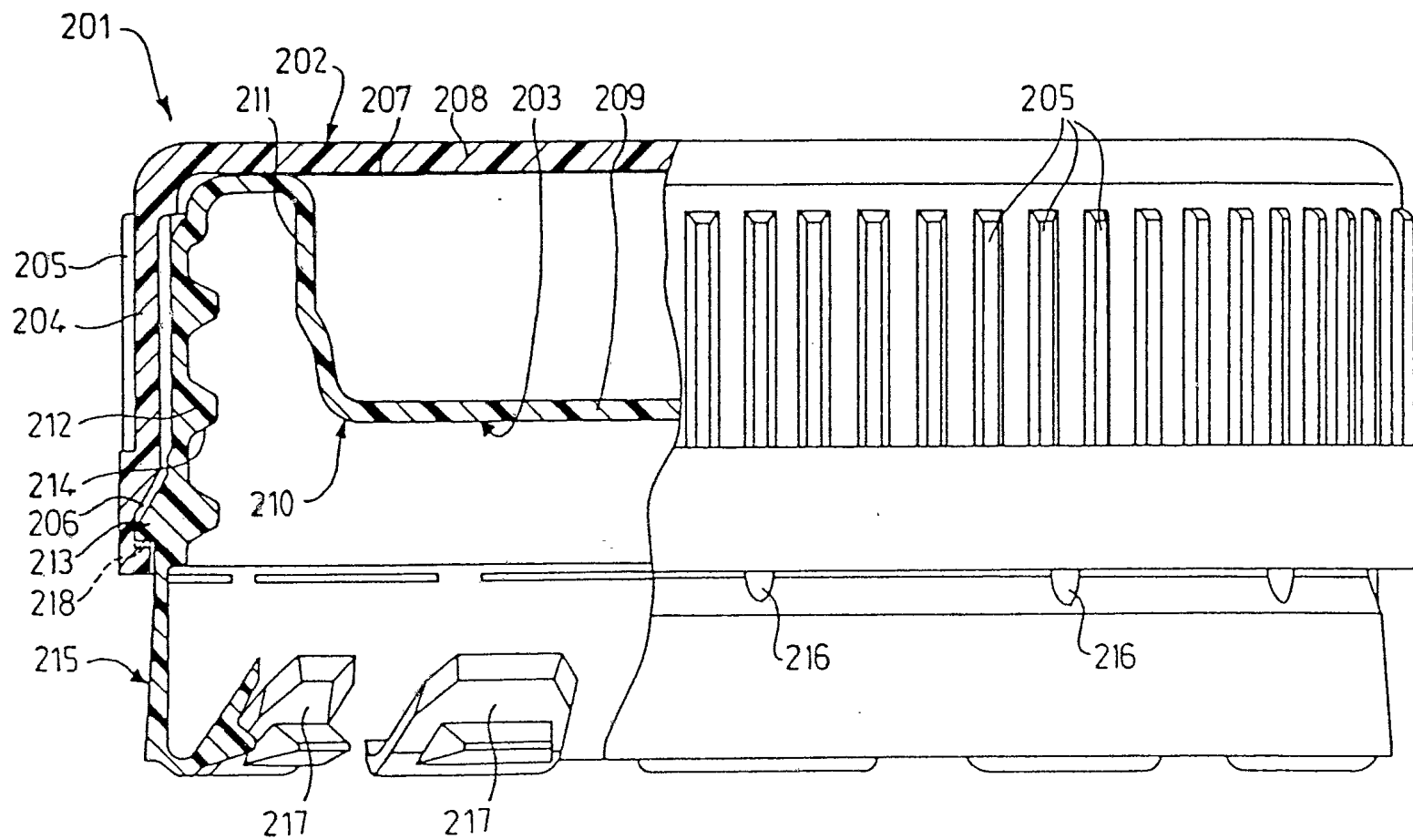


FIG.3

FEUILLE DE REMPLACEMENT

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FR92/00443

## A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.<sup>5</sup> : B65D 41/04; B65D 51/18

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)

Int. Cl.<sup>5</sup> : 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 practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR, A, 1 173 217 (GRUSSEN) 23 February 1959, see the whole document ----	1,8
A	FR, A, 1 197 200 (RICAL) 27 November 1959, cited in the application see the whole document ----	1
A	FR, A, 2 439 721 (SEPROSY) 23 May 1980, see page 3, line 24 - page 4, line 4; figure 3 ----	1,7
A	FR, A, 1 101 829 (GIRARDEAU) 11 October 1955 -----	

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

## \* Special categories of cited documents:

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

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"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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

31 August 1992 (31.08.92)

Date of mailing of the international search report

27 October 1992 (27.10.92)

Name and mailing address of the ISA/

European Patent Office

Facsimile No.

Authorized officer

Telephone No.

**ANNEXE AU RAPPORT DE RECHERCHE INTERNATIONALE  
RELATIF A LA DEMANDE INTERNATIONALE NO.**

FR 9200443  
SA 60095

La présente annexe indique les membres de la famille de brevets relatifs aux documents brevets cités dans le rapport de recherche internationale visé ci-dessus.  
Lesdits membres sont contenus au fichier informatique de l'Office européen des brevets à la date du  
Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office européen des brevets. 31/08/92

Document brevet cité au rapport de recherche	Date de publication	Membre(s) de la famille de brevet(s)	Date de publication
FR-A-1173217		Aucun	
FR-A-1197200		Aucun	
FR-A-2439721	23-05-80	Aucun	
FR-A-1101829		Aucun	


EPO FORM P0472

Pour tout renseignement concernant cette annexe : voir Journal Officiel de l'Office européen des brevets, No.12/82

## RAPPORT DE RECHERCHE INTERNATIONALE

PCT/FR 92/00443

Demande Internationale No

<b>I. CLASSEMENT DE L'INVENTION</b> (si plusieurs symboles de classification sont applicables, les indiquer tous) <sup>7</sup>		
Selon la classification internationale des brevets (CIB) ou à la fois selon la classification nationale et la CIB CIB 5 B65D41/04; B65D51/18		
<b>II. DOMAINES SUR LESQUELS LA RECHERCHE A PORTE</b>		
Documentation minimale consultée <sup>8</sup>		
Système de classification	Symboles de classification	
CIB 5	B65D	
Documentation consultée autre que la documentation minimale dans la mesure où de tels documents font partie des domaines sur lesquels la recherche a porté <sup>9</sup>		
<b>III. DOCUMENTS CONSIDERES COMME PERTINENTS</b> <sup>10</sup>		
Catégorie <sup>o</sup>	Identification des documents cités, avec indication, si nécessaire, <sup>12</sup> des passages pertinents <sup>13</sup>	No. des revendications visées <sup>14</sup>
A	FR,A,1 173 217 (GRUSSEN) 23 Février 1959 voir le document en entier ---	1,8
A	FR,A,1 197 200 (RICAL) 27 Novembre 1959 cité dans la demande voir le document en entier ---	1
A	FR,A,2 439 721 (SEPROSY) 23 Mai 1980 voir page 3, ligne 24 - page 4, ligne 4; figure 3 ---	1,7
A	FR,A,1 101 829 (GIRARDEAU) 11 Octobre 1955 ---	
<p><sup>o</sup> Catégories spéciales de documents cités: <sup>11</sup></p> <p>"A" document définissant l'état général de la technique, non considéré comme particulièrement pertinent</p> <p>"E" document antérieur, mais publié à la date de dépôt international ou après cette date</p> <p>"L" document pouvant jeter un doute sur une revendication de priorité ou cité pour déterminer la date de publication d'une autre citation ou pour une raison spéciale (telle qu'indiquée)</p> <p>"O" document se référant à une divulgation orale, à un usage, à une exposition ou tous autres moyens</p> <p>"P" document publié avant la date de dépôt international, mais postérieurement à la date de priorité revendiquée</p> <p>"T" document ultérieur publié postérieurement à la date de dépôt international ou à la date de priorité et n'appartenant pas à l'état de la technique pertinent, mais cité pour comprendre le principe ou la théorie constituant la base de l'invention</p> <p>"X" document particulièrement pertinent; l'invention revendiquée ne peut être considérée comme nouvelle ou comme impliquant une activité inventive</p> <p>"Y" document particulièrement pertinent; l'invention revendiquée ne peut être considérée comme impliquant une activité inventive lorsque le document est associé à un ou plusieurs autres documents de même nature, cette combinaison étant évidente pour une personne du métier.</p> <p>"&amp;" document qui fait partie de la même famille de brevets</p>		
<b>IV. CERTIFICATION</b>		
Date à laquelle la recherche internationale a été effectivement achevée	Date d'expédition du présent rapport de recherche internationale	
31 AOUT 1992	27. 10. 92	
Administration chargée de la recherche internationale	Signature du fonctionnaire autorisé	
OFFICE EUROPEEN DES BREVETS	LEONG C. Y. 	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.**

FR 9200443  
SA 60095

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A-1173217		None	
FR-A-1197200		None	
FR-A-2439721	23-05-80	None	
FR-A-1101829		None	