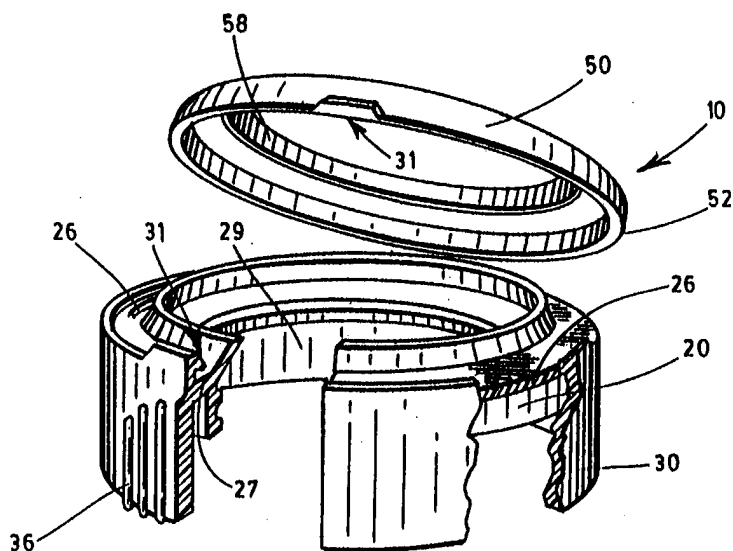


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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| <b>(51) International Patent Classification <sup>6</sup> :</b><br><br><b>B65D 50/06</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>A1</b> | <b>(11) International Publication Number:</b> <b>WO 98/21113</b><br><br><b>(43) International Publication Date:</b> 22 May 1998 (22.05.98)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>(21) International Application Number:</b> PCT/CA97/00773<br><br><b>(22) International Filing Date:</b> 17 October 1997 (17.10.97)<br><br><b>(30) Priority Data:</b><br>2,190,172                      12 November 1996 (12.11.96)      CA<br><br><b>(71) Applicant:</b> BOUCHONS MAC INC. [CA/CA]; 33 Taylor,<br>Waterloo, Quebec J0E 2N0 (CA).<br><br><b>(72) Inventor:</b> DECELLES, Gilles; 11 Deschamps, Waterloo,<br>Quebec J0E 2N0 (CA).<br><br><b>(74) Agent:</b> ORLHAC, Thierry; Robic, 55 St-Jacques, Montreal,<br>Quebec H2Y 3X2 (CA). |           | <b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR,<br>BY, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH,<br>HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT,<br>LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT,<br>RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA,<br>UG, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW,<br>SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ,<br>MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK,<br>ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI<br>patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE,<br>SN, TD, TG).<br><br><b>Published</b><br><i>With international search report.</i> |

**(54) Title:** CLOSURE CAP**(57) Abstract**

The closure cap (10) for sealing a container has an inner skirt (20) shaped and sized to fit externally and to be secured onto the neck of the container. The cap also has an outer skirt (30) projecting from the inner skirt. This outer skirt extends over the inner skirt at a given distance from same, thereby defining a gap (24) therebetween. The outer skirt (30) is made of a material that is resiliently flexible and can be deformed when an external pressure is applied onto its external surface. The cap further has a foldable cover (50) shaped and sized to close the neck of the container. This cover has a peripheral edge (52) attached to the outer skirt by a hinge. A snap (31) having one part integral to the upper portion of the outer skirt and another part integral to the cover is provided for releasably locking the cover in a closed position when it is folded down over the neck of the container. The one part of the snap that is integral to the upper portion of the outer skirt is positioned and devised to move and disengage the other part of the snap means and thus release the cover, when external pressure is applied at a suitable location (36) onto the external surface of the outer skirt.

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## CLOSURE CAP

### FIELD OF THE INVENTION

5                   The invention relates to a closure cap for sealing a container. More particularly the invention relates to a closure cap which is very easy to open by an adult.

### BACKGROUND OF THE INVENTION

10                   Closure caps are known, which are child resistant and comprise a skirt that must be manually squeezed in a given radial direction to permit unscrewing of it and removal from the container. An example of such a closure which can only be used on a container whose neck has especially been adapted for this purpose, is described in U.S. patent No. 3,941,268. It is worth  
15                   noting that such closure caps can only be opened with two hands (one holding the container, the other one squeezing and turning the cap).

                  Also known are closure caps which comprise a foldable top cover that can be snapped down in a closed position. To release the cover and open the container, one has to apply pressure on top of it to deform its edges and  
20                   cause it to unsnap. Closures of this type are described, by way of examples, in U.S. patents Nos. 3,612,322 (see Figs. 18 to 20 of it); 3,934,745 (see Figs. 3 and 4 of it); 3,845,872 and 4,535,905.

                  In spite of those existing closure caps, there is still a need for a closure cap which is efficient and easy to use with any kind of container, with  
25                   no special adaptation thereof. The expression "efficient and easy to use" as used herein means that the cap must be easy to open for adults and elderly persons.

                  There is also a need for a closure cap which is not removable from the container when same is open (as is the cap of U.S. patent No.  
30                   3,941,268), and which, therefore, does not risk getting lost once the container is open.

                  There is further a need for a child resistant closure cap which is very reliable and easy to open with one hand only.

There is further a need for a cap which is easy to open in the dark or by people who have vision problems.

### **SUMMARY OF THE INVENTION**

5                   The object of the present invention is to provide a closure cap which satisfies the above mentioned needs.

                  More particularly, the invention provides a closure cap for sealing a container having an opening surrounded by a neck. This cap comprises an inner skirt shaped and sized to fit externally onto the neck. This inner skirt has  
10 an upper portion and a lower portion.

                  Attachment means are provided, which are integral to the inner skirt and devised in such a way as to cooperate with corresponding attachment means provided onto the neck for securing the inner skirt onto it , preferably in a non-removable manner.

15                   The cap also comprises an outer skirt projecting from the inner skirt. This outer skirt which is preferably, but not necessarily connected to the upper portion of the inner neck, has an upper portion, a lower portion and an external surface. It is made of a material that is resiliently flexible and can be deformed when an external pressure is applied onto its external surface. It  
20 extends over the inner skirt at a given distance from the same, thereby defining a gap there between.

                  The cap further comprises a cover shaped and sized to close the opening of the container. This cover has a peripheral edge attached to the outer skirt by a hinge and being foldable up and down about the hinge.

25                   Snap means are provided for releasable locking the cover in a closed position when it is folded down over the neck of the container. These snap means have one part integral to the upper portion of the outer skirt and another part integral to the cover. The one part of the snap means that is integral to the upper portion of the outer skirt is positioned and devised to  
30 move and disengage the other part of the snap means, thus releasing the cover, when external pressure is applied at a suitable location onto the external surface of the lower portion of the outer skirt.

In use, the closure cap is attached to the neck of the container and the cover maintained by the snap means in a closed position to close the container opening. To release the cover, one has only to exert sufficient pressure onto a suitable location of the outer surface of the outer skirt.

5           A non-restrictive description of a plurality of preferred embodiments will now be given with reference to the appended drawings.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 is a partial perspective view of a closure cap according to  
10 a first embodiment of the invention;

Fig. 2 is a side elevational, partial cross-sectional view of the cap of Fig. 1, showing the same installed onto the neck of a container;

Fig. 3 is a view similar to Fig. 1, showing the cap in a closed position;

15           Fig. 4 is a fragmentary, cross-sectional view taken along line IV-IV of Fig. 3;

Fig. 5 is a schematic view of the cap of Fig. 1, emphasizing the radial deformation of the outer skirt when pressure is exerted thereon;

20           Fig. 6 is a schematic view of the cap of Fig. 1, emphasizing the vertical deformation of the outer skirt when pressure is exerted thereon;

Fig. 7 is a perspective view of a closure cap according to a second embodiment of the invention;

Fig. 8 is a cross-sectional view of a closure cap according to a third embodiment of the invention;

25           Fig. 9 is a cross-sectional view of a closure cap according to a fourth embodiment of the invention;

Fig. 10 is a perspective view of a closure cap according to a fifth embodiment of the invention; and

30           Fig. 11 is a cross-sectional view of a closure cap according to a sixth embodiment of the invention.

#### **DESCRIPTION OF SEVERAL PREFERRED EMBODIMENTS**

The cap 10 according to the first embodiment of the invention as

shown in Figs.1 to 6 is intended to be used for closing the opening of the container 60.

The container 60 which is shown on Figs. 2 and 3 is of a conventional shape and comprises an opening surrounded by a neck portion 62.

The cap 10 comprises an inner skirt 20 and an outer skirt 30. The inner skirt 20 has an upper portion and a lower portion and is shaped and sized to fit externally onto the neck 62. To secure the cap 10 to the container 60 in a removable or a non-removable manner, the inner skirt 20 is provided with attachment means which are integral to the inner skirt 20. These attachment means cooperate with corresponding attachment means provided onto the neck 62. As shown in Fig. 2, non-removable attachment means may consist of one or more peripheral beads 22 or of a succession of small bumps, provided on the internal face of the inner skirt 20 and on the external face of the neck portion 62 in such a manner as to shape within each other. However, any other kind of attachment means known *per se* in this art could alternatively be used. Removable attachment means may consist of a screwing device.

As shown in Figs. 1 to 6, the outer skirt 30 is preferably tubular in shape. However, the outer skirt 30 could be of another shape. Thus, for example, the outer skirt 30 could comprise two flat surfaces on which pressure would be applied.

This outer skirt 30 is connected to and projects from the upper portion of the inner skirt 20. The outer skirt 30 extends over the inner skirt 20 at a given distance from the same, thereby defining a gap 24 between the same and the neck portion 62 of the container 60.

As is better shown on Fig. 1 the outer skirt 30 is advantageously connected to the upper portion of the inner skirt 20 by a peripheral transversal wall 27. This wall 27 propagates the force induced by a pressure which may be applied on the outer skirt 30. Some portions 26 of the wall 27 may advantageously be slotted. Such slotted portions 26 being located respectively at substantially the same distance from both the hinge 54 and the snap means 31 as will be better described hereinafter.

The cap 10 also comprises a cover 50 shaped and sized to close

the opening of the container 60. The cover 50 has a peripheral edge 52 that is attached to the outer skirt 30 by a hinge 54 (shown in Fig.4). The cover 50 is foldable up and down about this hinge 54.

As illustrated in Figs. 1, 2 and 4, the inner skirt 20 is provided with a partition element 28 which projects inwardly and partly obturates the container opening. The partition element 28 may extend the peripheral transversal wall 27 and comprises an orifice 29 which is advantageously sized and shaped according to the texture of the product (i.e. solid, liquid, colloidal, etc..) with which the container 60 is filled up, in order to permit good outflow of this product when one uses the container 60. In such a case, it is preferred that the cover 50 has its inner surface provided with a sealing ring 58 shaped and sized to seal the periphery of the orifice 29 of the opening of the partition element 28 when the cover is in a closed position. To seal the orifice 29, the cover 50 and/or the partition element 28 may also be provided with any sealing devices, such as a sealing ring. This is well known in the art and need not be further described.

When the cover 50 is folded down over the neck portion 62 of the container 60, it is releasably locked in a closed position (shown in Figs. 2, 3 or 4) by snap means 31 of a conventional structure. In this embodiment shown in Figs. 1 to 6, the snap means 31 and the hinge 54 are located in radially opposite positions. As is it better shown in Fig. 4, the snap means 31 has one part 32 integral to the upper portion of the outer skirt 30 and another part 56 integral to the cover 50, respectively.

The outer skirt 30 is made of a material, preferably a plastic material, that is resiliently flexible and can be deformed when an external pressure is applied onto its external surface.

The part 32 of the snap means 31 that is integral to the upper portion of the outer skirt 30 is positioned and devised to move and disengage the other part 56 of the snap means 31, thus releasing the cover 50, when external pressure is applied at a suitable location onto the external surface of the lower portion of the outer skirt 30.

Marking means may be provided onto the external surface of the outer skirt 30 underneath the snap means 31 in order to mark the position of

the suitable location where the external pressure must be applied to release the cover 50. These marking means may consist of grooves 36 made into the outer surface of the outer skirt 30. They may also consist of a change in the texture of the outer surface of the outer skirt 30 which would be noticeable when one would touch the latter, even in the dark. Alternatively they may consist of a depression or a simple coloured spot.

As better shown in Fig. 1, a part of the outer skirt 30 can project upwardly and thus overlay at least partially the peripheral edge 52 of the cover 50 so that the joint between the cover 50 and the outer skirt 30 is not accessible. Such a design is desirable as it may prevent grasping of the cover 50 by a child to force the container to open. The line defining the joint between the cover 50 and the outer skirt 30 may be of any design.

In use, the closure cap 10 is snapped or otherwise secured onto the neck of the container 60 and the cover 50 is maintained by the snap means 31 in a close position. To release the cover 50, one has only to exert sufficient pressure onto the suitable location that is marked on the outer surface of the outer skirt 30 and below the hinge. As illustrated in Fig. 3 this suitable location underneath the snap means 32. Deformation of the inner skirt 30 as a result of the pressure exerted by the user is made possible thanks to the gap 24 between the outer skirt 30 and the inner skirt 20 and/or the external surface of the neck portion 62 of the container 60. To close the cover 50, one needs only to fold it down over the neck 62 of the container 60 and engage the two part 32 and 56 of the snap means by applying sufficient pressure on top of the cover 50. The slotted portions 26 in the transversal wall 27, if any, facilitate the deformation of the outer skirt 30.

If desired, a short description or logo explaining how to use the cap can be printed or stamped on it at a suitable location.

Figs. 5 and 6 emphasize in a schematic manner the radial and vertical deformations of the outer skirt 30 when the same is pressed. Such deformations causes the snap part 32 to swivel outwardly and to disengage from the corresponding snap part 56 of the cover 50. In the meantime, the cover 50 is pushed up to open and pivot about its hinge 54 by the vertical deformation of the cap shown in Fig. 6.

To further facilitate the deformation of the outer skirt 30, the latter could have portions of reduced thickness. Such portions should be provided peripherally and substantially at the same distance from both the hinge 54 and the snap means 31.

5 It should be noted that such embodiment renders the cap 10 very difficult for young children to open and thus is of improved safety.

The cap 110 according to the second embodiment of the invention as shown in Fig. 7 is similar to the one shown in Figs. 1 to 6, except that, in order to facilitate deformation of its outer skirt 130, the latter has,  
10 instead of portions of a reduced thickness, slotted portions 136 provided peripherally and substantially at the same distance from both the hinge 154 and the snap means 131.

According to this second embodiment, the peripheral edge 152 of the cover 150 and the upper portion of the outer skirt 130 are also  
15 preferably shaped so as to define together a smooth external surface when the cover is locked in a closed position, thereby improving the safety of the cap 110 by preventing grasping of the cover 150 by a child to force the container to open.

In this second embodiment, the cap further comprises a pin 151  
20 provided on the internal surface of the cover 150 to seal the orifice 151, This pin 129 is shaped and sized to fit within the orifice 129 provided on the partition element 128 of the cap 110. This is particularly efficient to seal the orifice 129 when this orifice is of a small diameter, like the one illustrated in Fig.7.

25 The cap 310 according to the third embodiment of the invention as shown in Fig. 8 is also similar to the caps shown in Figs. 1 to 7, except that the lower portion of its outer skirt 330 is connected to and projects upwardly from the lower portion of its inner skirt 320. Once again, provided that there is a sufficient gap 324 between the inner skirt 220 and the outer skirt 330,  
30 disengagement of the snap means 331 and thus release of the cover 350 is achieved if sufficient pressure (shown in dotted lines) is applied onto the outer skirt 330.

The cap 310 according to the fourth embodiment of the invention

as shown in Fig. 9 is similar to the caps shown in Figs. 1 to 8 except that it further comprises radial reinforcement ribs 340 between the inner skirt 320 and the other skirt 330. These ribs 340 are advantageously located along straight lines extending at an optimal angle of about  $45^\circ$  with respect to an axis AA extending between the hinge 354 and the snap means (not shown).

The cap 410 according to the fifth embodiment of the invention as shown in Fig. 10 is similar to the caps shown in Figs. 1 to 9 except that the snap means comprises at least two distinct sets of elements. Each set has one part 432' or 432" integral to the upper portion of the outer skirt 430 and another part 456' or 456" integral to the cover 450. These two distinct sets are peripherally spaced apart from each other. These two distinct sets and the hinge 454 are located in substantially opposite positions. A depression 436 is provided into the external surface of the outer skirt 430 to mark the position of the suitable location where the external pressure must be applied to release the cover 450. As is shown, this depression 436 is positioned between the two distinct sets of elements.

The closure cap 510 according to the sixth embodiment of the invention as shown in Fig. 11 is similar to the caps shown in Figs. 1 to 10 except that it is made integral to the container 560 itself. As shown in Fig. 11, the container 560 is provided with a tubular wall 564, whose upper portion is integral to the inner skirt 520. As the cap 510 is secured to the container 560 by the upper portion of the wall 564, the container 560 requires no more to be provided with any neck portion or attachment means to secure the closure cap 510 on it. This embodiment provides a one-piece container 560 having an efficient and easy-to-open closure system. The cap 510 may be advantageously provided with one or more of the previously described embodiments relating to the inner skirt 520, the outer skirt 530, the cap 550, the partition wall 528, the snaps means 531, etc. Of course, at least the upper portion of the container 560 defining the inner skirt 520, has to be made of the resilient material which has been described hereinabove for the manufacture of the closure caps shown in Figs. 1 to 10.

All the closure caps described above, may be moulded in one piece with any kind of plastic material. This is well known in the art and need

not be further described.

Although preferred embodiments of the invention have been described in detail hereinabove, and illustrated in the accompanying drawings, it is to be understood that the invention is not limited to these embodiments  
5 and that various changes and modifications may be made therein without departing from the scope and spirit of the invention.

## CLAIMS

1. A closure cap (10, 110, 310, 410) for sealing a container (60) having an opening surrounded by a neck, said cap comprising:
- 5 a) an inner skirt (20, 320) shaped and sized to fit externally onto the neck, said inner skirt having an upper portion (22), a lower portion and an external surface;
- b) attachment means integral to the inner skirt, said attachment means cooperating with corresponding attachment means provided
- 10 onto the neck for securing the inner skirt onto said neck;
- c) an outer skirt (30, 130, 330, 430) projecting from the inner skirt, said outer skirt having an upper portion, a lower portion, and an external surface and extending over the inner skirt at a given distance from same, thereby defining a gap (24, 324) therebetween, said outer skirt having
- 15 a thickness;
- d) a cover (50, 150, 350, 450) shaped and sized to close the opening of the container, said cover having a peripheral edge (52) attached to the outer skirt by a hinge (54, 354) and being foldable up and down about said hinge; and
- 20 e) snap means (31, 131, 331) having one part (32) integral to the upper portion of the outer skirt and another part (56) integral to the cover, respectively, for releasably locking the cover in a closed position when it is folded down over the neck of the container,
- said cap (10, 110, 310, 410) being characterized in that:
- 25 said outer skirt (30, 130, 330, 430) is made of a material that is resiliently flexible and can be deformed when external pressure is applied onto its external surface; and
- the one part (32) of the snap means (31) that is integral to the upper portion of the outer skirt (30) is positioned and devised to move and
- 30 disengage the other part (56) of the snap means, thereby releasing the cover, when the external pressure is applied at a suitable location onto the external surface of the lower portion of the outer skirt.

2. The closure cap according to claim 1, characterized in that the lower portion of the outer skirt (30, 130, 430) is connected to and projects from the upper portion of the inner skirt.

5 3. The closure cap according to claim 1, characterized in that the lower portion of the outer skirt (330) is connected to and projects upwardly from the lower portion of the inner skirt (320).

4. The closure cap according to claim 2 or 3, characterized  
10 in that the outer skirt is tubular in shape.

5. The closure cap according to claim 4, characterized in that the snap means (31) and the hinge (54) are located in radially opposite positions.

15 6. The closure cap according to claim 5, characterized in that it further comprises means (36) provided onto the external surface of the outer skirt (30) underneath the snap means (31) and the hinge (54) in order to mark the position of the suitable location where the external pressure must be  
20 applied to release the cover (50).

7. The closure cap according to claim 4, characterized in that the snap means comprises at least two distinct sets of elements (432', 432") that are peripherally spaced apart, said two distinct sets of elements and the  
25 hinge being located in substantially opposite positions and wherein said cap (410) further comprises means (436) provided onto the external surface of the outer skirt and between said two distinct sets of elements in order to mark the position of the suitable location where the external pressure to release the cover (450) is to be applied.

30 8. The closure cap according to any one of claims 1 to 7, characterized in that the peripheral edge (52) of the cover (50) and the upper portion of the outer skirt (30) are shaped to define together a smooth external

surface when the cover (50) is locked in a closed position, thereby preventing holding or gasping of the cover to force the same open.

9. The closure cap according to any one of claims 1 to 7,  
5 characterized in that the peripheral edge (52) of the cover (50) in its closed position and the outer skirt (30) define together a joint and wherein the upper portion of the outer skirt (30) extends upwardly to overlay said joint.

10. The closure cap according to any one of claims 1 to 9,  
10 characterized in that the outer skirt (30) is connected to the upper portion of the inner skirt (20) by a peripheral transversal wall (27) and wherein portions (26) of this wall (27) are cut, said portions (26) being provided substantially at the same distance from both the hinge and the snap means.

15 11. The closure cap according to any one of claims 1 to 9, characterized in that the outer skirt (30) has slotted portions (136) to facilitate the deformation of said outer skirt, said slotted portions being provided peripherally and substantially at the same distance from both the hinge 154 and the snap means (131).

20

12. The closure cap according to any one of claims 1 to 9, characterized in that further comprises radial reinforcement ribs (340) between the inner and the outer skirts (320, 330) said ribs being provided along straight lines extending at an angle of about 45° with respect to an axis extending  
25 between the hinge and the snap means.

13. The closure cap according to any one of claims 1 to 12, characterized in that means (22) integral to the inner skirt (20, 320) consist of a snap.

30

14. The closure cap according to any one of claims 1 to 13, characterized in that said cap is made of molded plastic.

15. The closure cap according to any one of claims 1 to 14, characterized in that the cover (50) has an inner surface provided with a guiding and sealing ring (58) sized to fit within the opening of the container (60) when the cover (50) is in a closed position.

5

16. The closure cap according to claim 15, characterized in that the inner skirt is provided with a partition element (128) which projects inwardly and partly obturates the opening of the container, said element comprising an orifice (129), and wherein the cover (150) has an inner surface  
10 provided with a sealing device (151) shaped and sized to seal the orifice of the partition element when the cover is in a closed position.

17. A closure cap (510) for sealing a container having an opening, characterized in that it comprises:

15 a) an inner skirt (520) which is made integral to the container in an area surrounding the opening, said inner skirt having an upper portion and a lower portion;

b) an outer skirt (530) projecting from the inner skirt, said outer skirt having an upper portion, a lower portion and an external surface and  
20 extending over the inner skirt at a given distance from same, thereby defining a gap therebetween, said outer skirt having a thickness;

c) a cover (550) shaped and sized to close the opening of the container, said cover having a peripheral edge attached to the outer skirt by a hinge and being foldable up and down about said hinge; and

25 d) snap means (531) having one part integral to the upper portion of the outer skirt and another part integral to the cover, respectively, for releasably locking the cover (550) in a closed position when it is folded down over the neck of the container,

wherein said outer skirt (530) is made of a material that is  
30 resiliently flexible and can be deformed when external pressure is applied onto the external surface of said outer skirt; and

wherein the one part of the snap means (531) that is integral to the upper portion of the outer skirt is positioned and devised to move and

disengage the other part of the snap means, thereby releasing the cover (550), when the external pressure is applied at a suitable location onto the external surface of the lower portion of the outer skirt.

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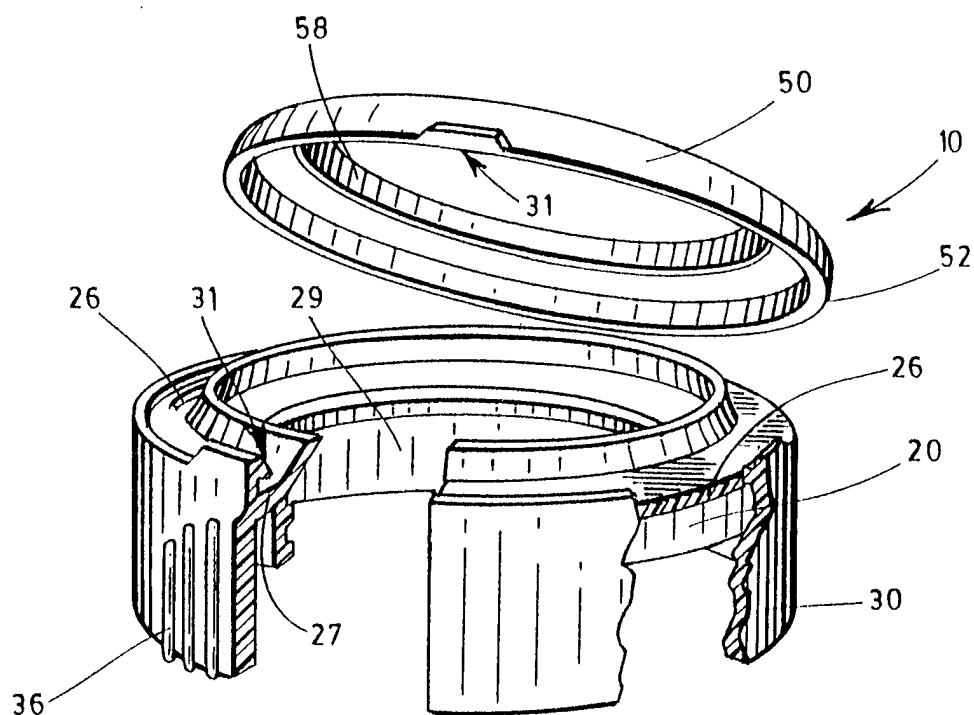


FIG. 1

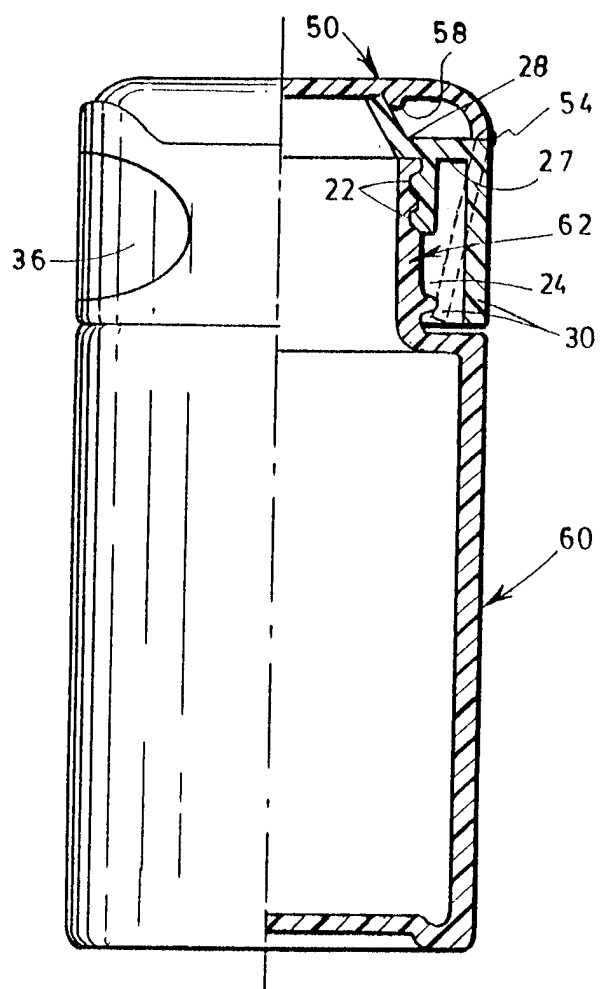
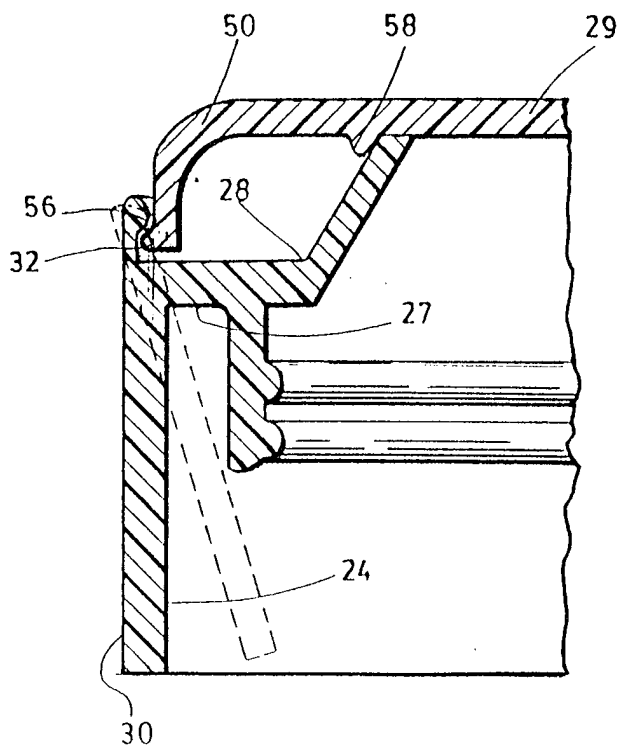
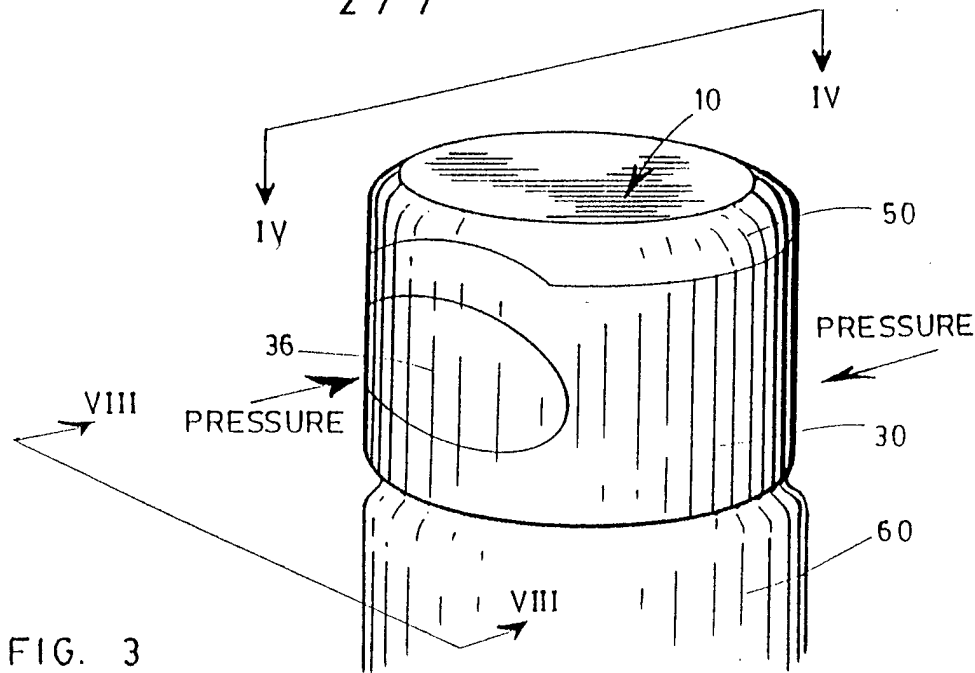


FIG. 2

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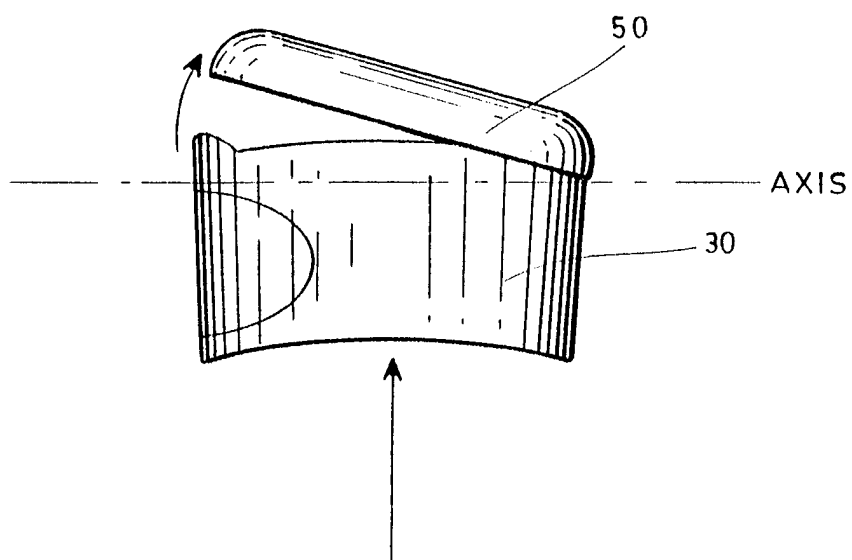
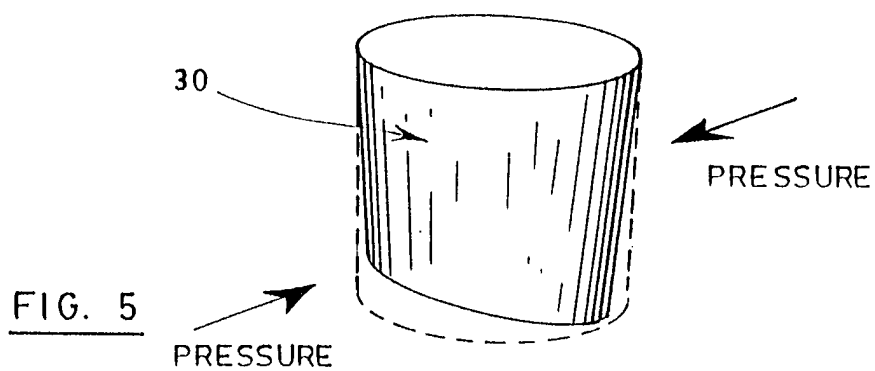
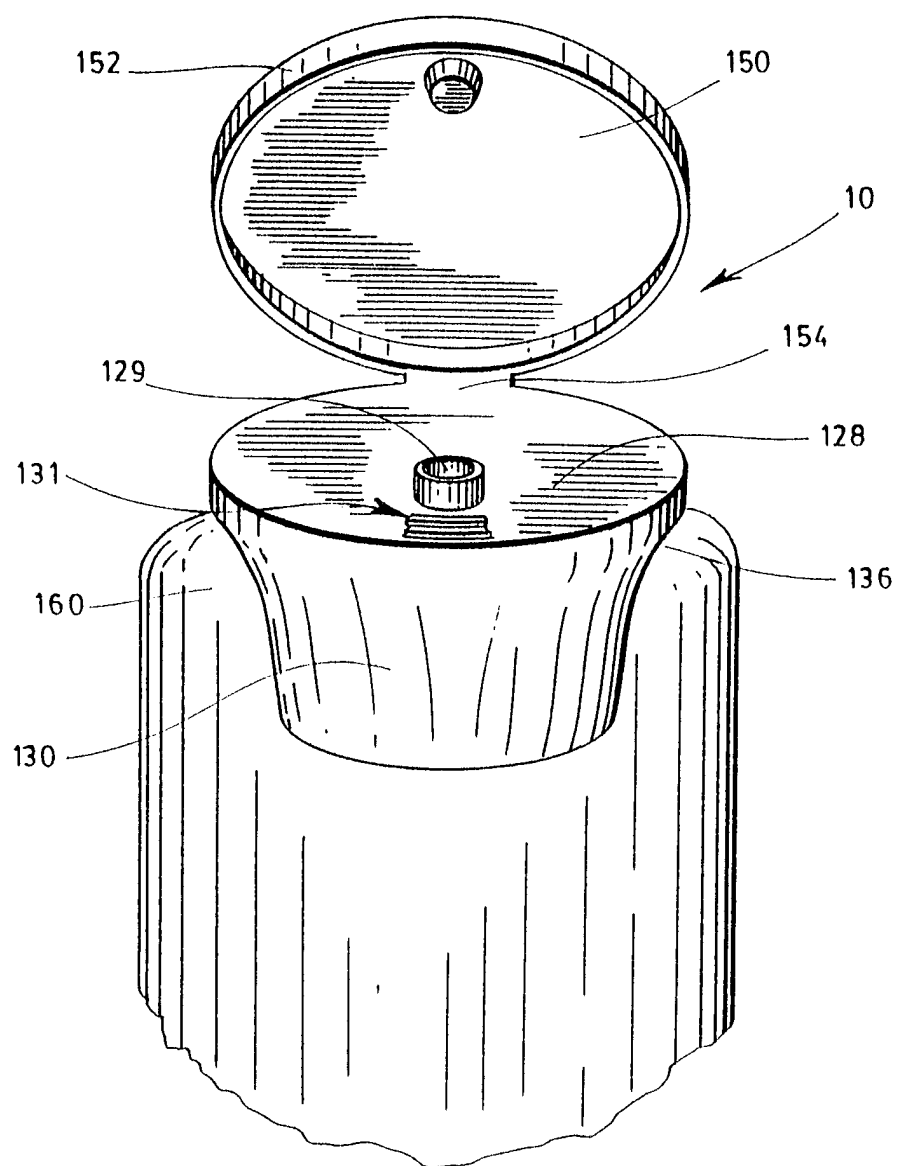


FIG. 6

4 / 7

FIG. 7

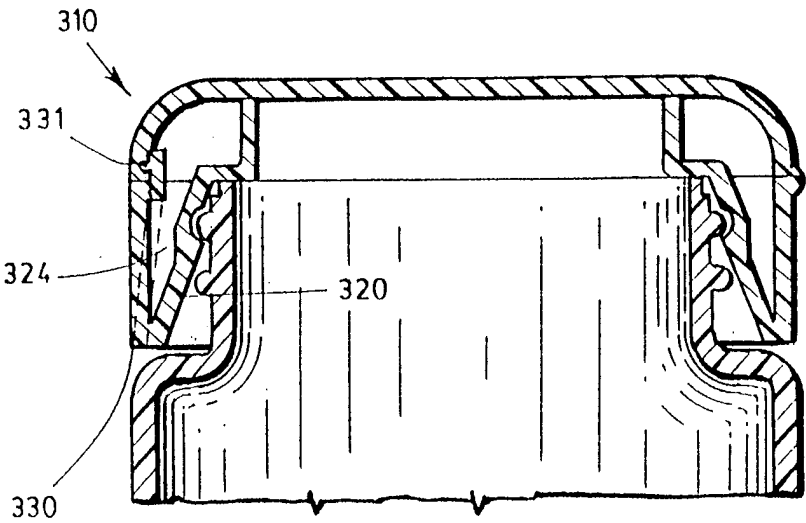


FIG. 8

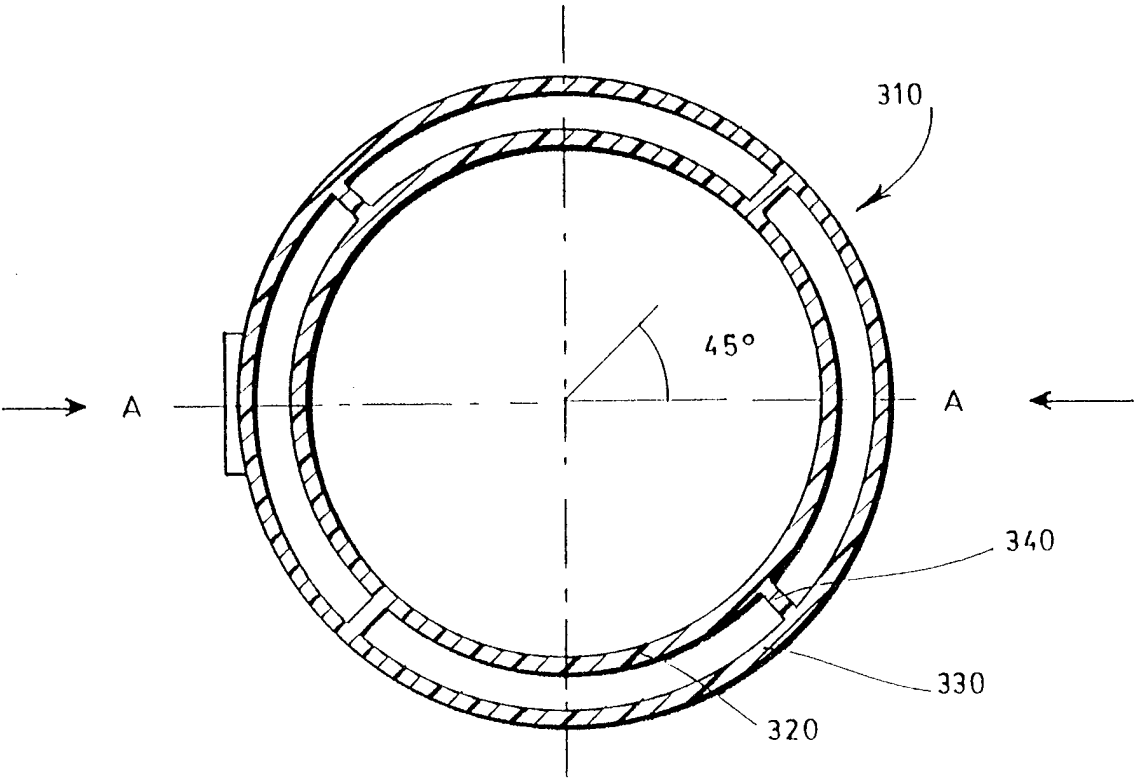


FIG. 9

6 / 7

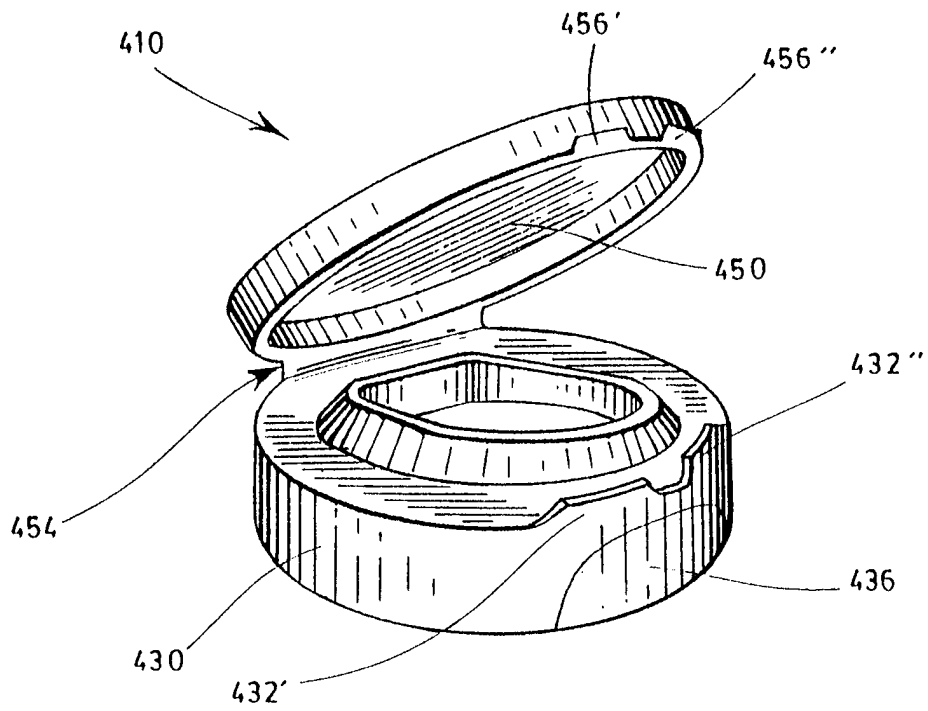
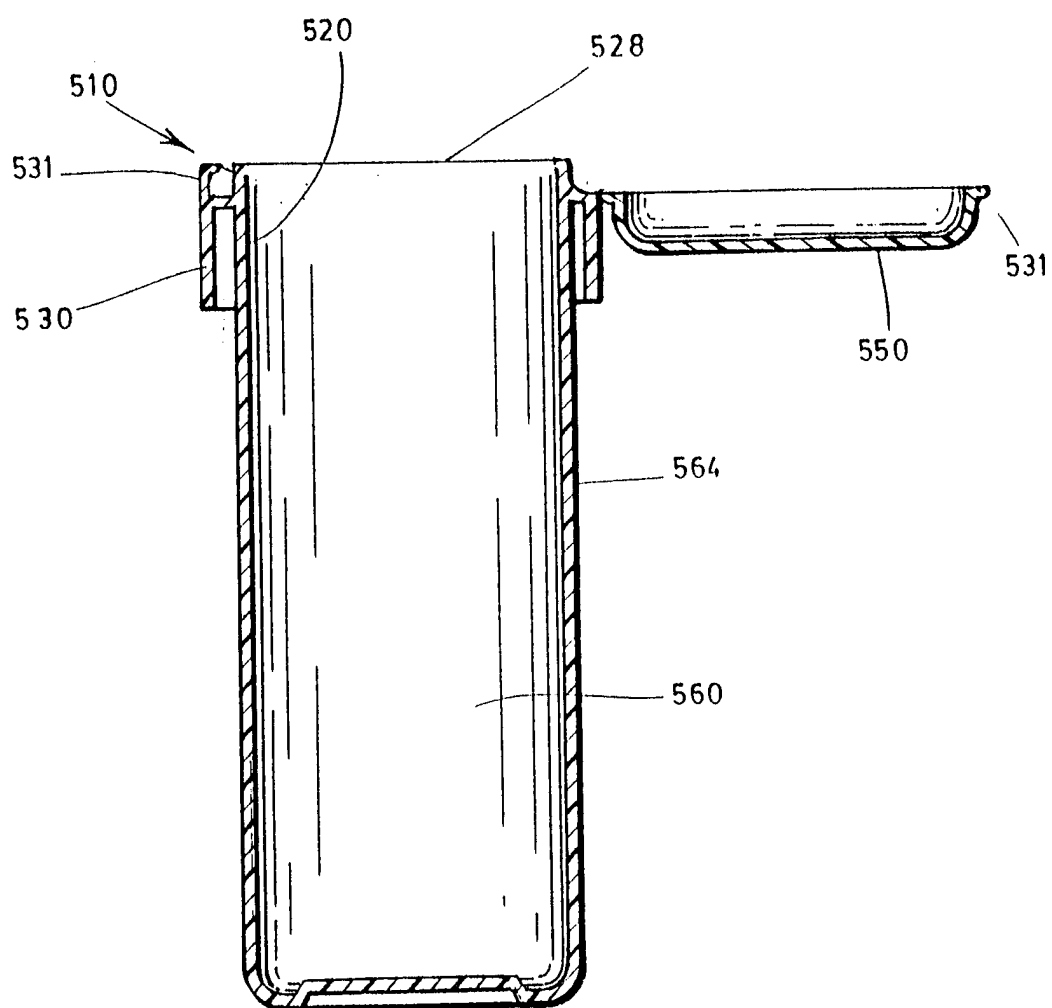


FIG. 10

7/7

FIG. 11

# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/CA 97/00773

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B65D50/06

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 6 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)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document, with indication, where appropriate, of the relevant passages                           | Relevant to claim No. |
|----------|--------------------------------------------------------------------------------------------------------------|-----------------------|
| X        | DE 36 25 477 A (FM-PLAST) 4 February 1988<br><br>see column 2, line 29 - line 58; figures 1-3                | 1,2,4,<br>14-16       |
| Y        |                                                                                                              | 3,5,6,8,<br>9,17      |
| A        |                                                                                                              | 7,10,11               |
| Y,P      | US 5 573 127 A (TAKAHASHI ET AL.) 12 November 1996<br>see column 3, line 20 - column 4, line 29; figures 2,3 | 3,5,6,8               |
| A        |                                                                                                              | 12                    |
| Y        | EP 0 603 090 A (LATORRE) 22 June 1994<br>see column 2, line 54 - column 3, line 28; figures 7-9              | 9                     |
| A        |                                                                                                              | 1,2,4-6               |
|          | -/-                                                                                                          |                       |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

12 January 1998

Date of mailing of the international search report

19/01/1998

Name and mailing address of the ISA

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

Authorized officer

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| Category | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|----------|------------------------------------------------------------------------------------|-----------------------|
| Y        | <p>US 2 852 054 A (MOTLEY) 16 September 1958<br/> see figure 2<br/> -----</p>      | 17                    |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 97/00773

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| DE 3625477 A                              | 04-02-88            | NONE                       |                     |
| US 5573127 A                              | 12-11-96            | JP 8310553 A               | 26-11-96            |
| EP 603090 A                               | 22-06-94            | FR 2699145 A               | 17-06-94            |
|                                           |                     | CA 2110746 A               | 15-06-94            |
| US 2852054 A                              | 16-09-58            | NONE                       |                     |