Title: DE-BLISTERING APPARATUS AND METHOD

Abstract: An apparatus (10) for removing an item (58) from a blister pack (50), the blister pack (50) comprising a first web (52) having a deformable blister (56) formation thereon for retaining an item (58), the item (58) being enclosed inside the blister (56) by a flangible web (54) affixed to the first web (52), the apparatus comprising means for tensioning (104) the blister pack between first (102) and second (109) spaced-apart support means and a bearing surface (110) arranged to move relative to the blister pack, wherein moving the bearing surface (110) relative to the blister pack causes the bearing surface (110) to apply a force (R) to the blister (56) sufficient to deform it and to cause the item (58) enclosed therein to rupture the flangible web (54). A method of removing one or more items (58) from a blister pack (50) is also disclosed. The apparatus and/or method are preferably automated.
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.
Title: De-blistering apparatus and method

Description:

The present invention relates to an apparatus and method for removing items from blister packaging, and in particular, but not exclusively to an apparatus and method for removing medication tablets from blister packs.

Blister packs are available in a variety of forms and can be used in numerous applications. Blister packs are used extensively in the pharmaceuticals industry for packaging medication, but are also used in other types of packaging, e.g. in the toy, tool and DIY industries for packaging for example, play figurines, knives and screws respectively. Blister packaging offers a relatively simple and low-cost means of individually packaging items. The pharmaceuticals industry has been particularly keen to use blister packaging as it offers the possibility of packaging medication doses in an easy-to-use and hygienic manner.

A blister pack generally consists of a first sheet material being formed so as to have one or more cavities or blisters therein. The items to be packaged are placed in the cavity or cavities and the items are closed into the cavity by a second sheet material that is normally glued or welded onto the first sheet to close the cavities. Each blister can be opened by application of finger pressure to the blister, which forces the item to rupture the second sheet and be ejected therethrough. The item can be caught in a second hand or by a suitably positioned surface or receptacle.
If this operation is to be performed a number of times, it can be labour-intensive, tiring and time-consuming, and hence costly.

An example where a large number of items may need to be removed from blister packages is in the pharmaceuticals industry where medication doses are incorrectly packaged. Since medication cannot, by law, be sold in incorrect packaging, the medication doses must be removed and re-packaged before they can leave the manufacturing facility. Furthermore, pharmacies sometimes make-up their own "weekly" blister packs containing different medication / doses for different times of each day of the week. If the doses are incorrectly decanted, then the task of removing them for repackaging can be time consuming.

Obviously, if large numbers of medication doses have been incorrectly packaged, it can be quite expensive to remove and repackage the medication dosages. In such circumstances, it is common to destroy the entire batch of wrongly packaged medication doses, which is also costly and wasteful.

Machines are available for removing items from blister packs that mimic the action of the fingers by providing a pin that is brought down on top of successive blisters to punch the medication doses out. However, these devices require support from below in the form of a grid. Each grid has to be made to match the specific blister pack being de-blistered. Since a different support grid is required for each specific blister pack, this adds to the cost of production of the device in addition to adding complication and this, cost and time to the actual use of such machines.
It is therefore an object of the present invention to provide an improved method and apparatus for removing items from blister packaging.

Accordingly, a first aspect of the invention provides an apparatus for removing an item from a blister pack, the blister pack comprising a first web having a deformable blister formation thereon for retaining an item, the item being enclosed inside the blister by a frangible web affixed to the first web, the apparatus comprising means for tensioning the blister pack between first and second spaced-apart support means and a bearing surface arranged to move relative to the blister pack, wherein moving the bearing surface relative to the blister pack causes the bearing surface to apply a force to the blister sufficient to deform it and to cause the item enclosed therein to rupture the frangible web.

A second aspect of the invention provides a method of removing an item from a blister pack, the blister pack comprising a web having a deformable blister formation thereon for retaining an item, the item being enclosed inside the blister by a frangible web affixed to the first sheet, the method comprising the steps of tensioning the blister pack between first and second spaced-apart support means and moving a bearing surface relative to the blister pack, such that the bearing surface applies a force to the blister sufficient to deform it and to cause the item enclosed therein to rupture the frangible web.

The first and second spaced apart support means, may comprise engagement means for engaging opposite ends or edges of the blister pack. The engagement means, where provided, may be jaws that clamp onto the
blister pack, or means (e.g. a pin or spike) that pierce or engage with formations (e.g. an aperture) of the blister pack.

Usually the blister pack will comprise a plurality of blister formations disposed in at least one row or column. More usually there will be a plurality of rows and columns.

The means for tensioning may be provided with a resiliently deformable means, (e.g. a spring) for biasing the support means away from each other. Additionally or alternatively, the support means may be movable relative to one another.

In a preferred embodiment of the invention, the first support means comprises a fixed clamp and the second support means is movable relative to the first support means.

In a most preferred embodiment of the invention, the second support means is integrally formed with the bearing surface.

The bearing surface may be any surface capable of applying a force to the blister of the blister pack. In a preferred embodiment of the invention, the bearing surface is a roller, however it is to be appreciated that a skid, knife-edge or any other suitable means may achieve the same function.

In a preferred embodiment, the second support means is advantageously incorporated into a roller, which acts as the bearing surface. Thus, the blister pack can be supported at one end by the first support means and the second end can be affixed to the roller. Rotation of the roller to wind the blister pack onto the roller would therefore tension the blister pack whilst bringing the blister pack into contact with the roller.
Where the second support means is incorporated into the bearing surface, it may be a slot that receives one end of the blister pack and retains it using friction.

Where the bearing surface is a roller, it may be a cylindrical roller or a polygonal prism. Where a polygonal prism is used, the circumferential distance between the edges thereof may be designed to coincide with the position or periodicity of the blister or blisters of the blister pack. The roller may additionally have formations to assist in exerting a reaction force F to the blisters of the blister pack. In a preferred embodiment, the roller comprises one or more longitudinal ribs to increase the pressure exerted on the blisters of the blister pack in use.

Where a roller is used, it is preferably arranged to move relative to the first support means to accommodate the shortening of blister pack as it is wrapped therearound.

Handles may be provided for actuating the first and second support means and/or the bearing surface.

The apparatus of the invention may comprise one or more motors and/or actuators for automation purposes. Where the apparatus is automated, it may be computer or electronically controlled.

A preferred embodiment of the invention shall now be described, by way of example only, with reference to the accompanying drawings, in which;

Figure 1 shows a side perspective view of an apparatus according to the invention;
Figure 2 shows an end perspective view of an apparatus according to the invention;

Figure 3 shows a schematic representation of the method of the invention;

Figures 4, 5 and 6 show alternative mechanical arrangements of the method and apparatus of the invention;

Figures 7 and 8 show another embodiment of the apparatus of the invention;

Figure 9 shows a perspective view of a type of separator means for the invention;

Figure 10 shows a perspective view of another type of separator means for the invention; and

Figure 11 shows a detailed view of the roller.

Referring to Figures 1 and 2 of the drawings, an apparatus 10 is shown comprising a body 12, a first support means 14 and a bearing surface 16 in the form of a cylindrical roller and carrying a second support means 18.

The body 12 is formed of a bent sheet of metal, defining flat, perpendicular base 20 and side 22 faces. The side face 22 has an elongate slot 24 therein for slidably receiving an axle (hidden) connecting the bearing surface 16 to an actuation handle 26.

The first support means 14 comprises a fixed lower jaw 28 and a slidably movable upper jaw 30, which slides within a guide slot 32. The first support means 14 further comprises a grip handle 34 that pivots about a fulcrum 36. The grip handle 34 is arranged to bear against an abutment 38.
Thus, an end of a blister pack (not shown) can be gripped between the lower jaw 28 and upper jaws 30 by pressing the grip handle 34 downwards in the direction indicated by arrow A. There is a formation (not shown) on the underside of the grip handle 34 that engages with the abutment 38 to releasably lock the grip handle 34 down using either friction or an over-square or over-centre cam arrangement for locking the grip handle 34 down.

The first support means 14 is supported by a back plate 40, which is formed of sheet metal.

The bearing surface 16 is in the form of a cylinder and has a slot 42 therein. The slot 42 comprised the second support means and is angled away from the central axis of the cylinder such that it is not radial. An end of a blister pack (not shown) can be inserted into the slot 42 and retained thereby.

The bearing surface 16 is mounted on an axle (hidden) that passes through the elongate slot 24, a bearing 43 and the actuation handle 26. The bearing 43 and handle 26 are retained on the axle using a lock nut 44. Thus, the bearing surface 16 can rotate about the axle as indicated by arrow B and can slide within the elongate slot 24 as indicated by arrow C.

Figure 3 shows a schematic of a preferred method of operation of the invention. A blister pack 50 is shown comprising upper 52 and lower 54 webs. The upper web 52 is a vacuum formed plastics material and has blisters 56 formed therein. Medication tablets 58 are sealed inside the blisters 56 by the lower frangible web 54, which is manufactured of a metal foil material. A first end 60 of the blister pack 50 is gripped by the upper 30 and
lower 28 jaws of the first support means 14. A second end 62 of the blister pack 50 is gripped, using friction, by the slot 42 in the curved bearing surface 16.

The blister pack 50 is arranged such that the blisters engage with the bearing surface 16 when the bearing surface 16 is rotated in the direction indicated by arrow B. As the bearing surface 16 is rotated in the direction indicated by arrow B, the blister pack 50 rolls around the bearing surface 16.

The combination of reactive force R between the bearing surface 16 and the blisters 56 and the tension T between the two support means 14 & 42 means that the tablets 58 are pushed towards and rupture 64 the lower frangible web 54 of the blister pack 50. The tablets 58 are thereby ejected from the blister pack 50.

As the bearing surface 16 is rotated, the effective shortening of the blister pack 50 is accommodated by virtue of the fact that the bearing surface is able to slide as indicated by arrow C.

The apparatus can be reset by unrolling the blister pack 50 and removing the ends 60 & 62 from the respective support means 14 and 18. The ejected tablets 58 can be collected in a suitable receptacle or hopper (not shown) and the emptied blister pack 50 recycled or discarded.

Figures 4, 5, and 6 show alternative schematics of the method of the apparatus. In these examples, the blister pack 50 is gripped between the first 14 and second 18 support means which are tensioned T using a spring or a screw threaded arrangement (not shown). The support means 14 & 18 each
comprise lower 28 & 28' and upper 30 & 30' jaws that clamp onto ends of the blister pack 50.

In Figure 4, the bearing surface 16 comprises a roller 70 that is moved over the blisters of the blister pack in the direction indicated by arrow D. The roller 70 effectively flattens the blisters 56 causing the medication tablets 58 to rupture the frangible web 54 one-by-one.

Figure 5 is an alternative embodiment of Figure 4 whereby the roller 70 is replaced by a skid 72. Equivalent features have not been numbered for clarity.

Figure 6 shows a yet further embodiment of the invention comprising a knife-edge 74 in place of the roller 70 of Figure 4 or the skid 72 of Figure 5. In this case, the knife-edge 74 is stationary and the blister pack 50 is moved relative thereto in the direction indicated by arrow D'. To this end, the support means 14 & 18 are conveniently carried by a movable platen (not shown). This arrangement conveniently enables all of the medication tablets to be ejected in substantially the same place, enabling a hopper or receptacle 76 to be positioned beneath the blister pack 50 to collect the ejected medication tablets 58.

The embodiments of Figures 4 and 5 may be modified according to the teaching of Figure 6 to have a movable platen and a fixed bearing surface, or the platen and surface may both be arranged to move, but in opposite directions. Figure 6 could, alternatively have a fixed platen and a movable bearing surface.
Figure 7 illustrates a deblistering apparatus that may be automated in
operation. This apparatus is similar in function to the apparatus illustrated in
Figures 1 to 3 of the drawings. The apparatus has a feed track 100 for a
blist er pack at the end of which is a clamp 102. The clamp includes a sensor
for detecting the blister pack and its extent of movement through the clamp.
The clamp is operated using an actuator (not shown) Opposite the clamp is a
roller 104 on a mounting 106 that is reciprocally moveable along rods 108.
The mounting includes motor 107 for moving the roller along the rods 108 and
motor 105 for rotating the roller 104.

The roller 104 includes clamp 109 provided by an outer sleeve 110 with
a longitudinal opening therein, in which a bar 113 is arranged, so that the two
are relatively movable to create a slot for an end of a blister pack and then to
clamp the blister pack end between them. The clamp of the roller is normally
closed but a solenoid 114 is provided to hold the flange to prevent it moving
whilst the sleeve 110 is rotated to open the clamp when a blister pack is to be
clamped.

Specifically, the sleeve 110 is affixed fixed to the bar 112. A square-
section rod 113 is connected to a flange 128 that can be used to open or
close the slot 109. In use, the rod 113 is locked using a solenoid 114 that
interacts with the flange 128 and the bar 112 rotated to move the sleeve 110
dge away from the rod 113 to open the slot. The slot 109 can then be closed
onto an edge of a blister pack by releasing the solenoid 114 and allowing the
sleeve 110 to move towards the rod 113 under the action of a spring (not
shown).
When a blister pack (not shown) with its blisters uppermost is fed through the clamp 102 a sensor detects the leading edge of the pack and sends a signal via the control circuit to the solenoid 114 and motors 105 & 107 operating the roller 104 to move it towards the clamp 102 along the rods 108 and to open the clamp 109. When the leading edge of the pack enters the clamp 109, the solenoid 114 releases the bar to trap the blister pack.

The roller 104 then moves away from the clamp 102 until the sensor detects the rear edge of the blister pack, which sends a signal to the clamp 102 to close and trap that edge of the pack. Then, the roller 104 is rotated in an anticlockwise direction and the roller itself presses the tablets out of the blister pack in a similar fashion.

The blister pack may be tensioned by moving the mounting 106 away from the first clamp 102. The amount of tension can be detected electronically by the power required by the motor 107. Alternatively, a motor 107 could be selected to stall at a predetermined blister tension. A torque or force sensor could be used to monitor the tension in the blister pack.

Once the blister pack has been emptied, the roller 104 unwinds the blister pack and moves away from the clamp 102. When the blister pack has been thus extended, the clamps 102 and 109 are released thereby dropping the emptied blister pack onto the base plate 20 or into a removable tray (not shown). The blister pack and tablets can then be removed by hand or automatically in accordance with a mechanism described with reference to Figures 8, 9 and 10.

Constructional details of the apparatus are as follows:
Motor 107 drives a worm screw 116 via a gear or belt drive assembly 118. The worm screw engages with teeth on the underside of the mounting 106 such that rotation of the worm screw 116 causes the mounting 106 to move along the rods 108.

A second motor 105 rotates the bar 112 via gear or belt drive arrangement 120. The motor 105 and the gear arrangement 120 depend from the mounting 106.

The mounting 106 is formed of a chassis in the form of a u-shaped member 122.

The solenoid 114 is connected to a push rod 126 that can engage with an aperture 124 provided in a flange 128. Thus, the flange can be held in a fixed position whilst the sleeve 110 is rotated to by the motor 105 to cause the clamp 109 to open or close. The flange is spring-loadedly biased towards a clamping position such that when the push rod 126 is retracted by the solenoid 114, it springs automatically to a clamping position.

Microswitches or optical sensors 130 are provided towards ends of the rods 108 such that the mounting 106 touches a microswitch 130 at its full extent of movement along the rods 108. Thus, a signal can be sent to a control circuit (not shown) to tell the motor 107 to stop turning when the mounting 106 reaches its fullest extent of movement. One advantage of providing microswitches 130 or optical sensors at the fullest intended extent of movement of the mounting 106 is that errors, such as blister pack breakages or unintentional disengagement of the blister pack can be detected.
Figure 8 shows a different view of the invention depicted in Figure 7. As can be seen, the mounting 106 is mounted on the rods using bushes 132.

A further feature of Figure 8 is the addition of a separator. An aperture 140 is provided in the base plate 20. A grating 142 overlies the aperture 140 such that tablets can fall through it, but not an empty blister pack. The fallen tablets are collected and guided by a hopper 144 for collection in a receptacle (not shown). A ram 146 is also provided to push the empty blister pack off the base plate 20 such that it is cleared for another cycle.

Figure 9 shows a different separator means 150 located about the roller sleeve 110. A push plate 152 is provided that enables a blister pack to be pushed off the roller 110 in the direction indicated by arrow E. In use, after the blister pack has been emptied, the first support means 102 is un-clamped. The blister pack will tend to remain coiled around the roller as long as the second support means, i.e. the slot 109 remains clamped onto the edge of the blister pack. The second support means can therefore be un-clamped and the push plate 152 moved in the direction of arrow E to remove the blister pack from the roller 110. Thus, the items are dropped onto the base plate or into a receptacle (not shown) and the empty blister pack separated and dropped into a separate receptacle (not shown).

The push plate 152 is moved by means a ram mechanism, i.e. a motor 154 arranged to drive a worm screw 156 via a gear or belt drive arrangement 158 (hidden). The worm screw 156 engages with a screw-threaded formation 157 of a block 160 connected to a push rod 162 that acts against the push plate 152. Thus, rotation of the motor causes the push plate 152 to move
over the roller 110 in the direction indicated by arrow E (or in reverse by reversing the motor).

Figures 10a and 10b show a yet further alternative separator means in the form of a flap 166 located beneath the first support means 102. In Figure 10a, the flap 166 is closed, whereas in Figure 10b, the flap 166 is open. The flap 166 is opened and closed using an actuator (not shown).

In use, the blister pack is emptied as described above, causing the items contained therein to drop onto the base plate 20 or into a removable receptacle. The mounting 106 is then moved away from the first support means 102 and the second support means 109 disengaged. The blister pack will tend to coil up into a spiral near to the first support means 102. The flap 166 can then be opened and the first support means 102 disengaged from the blister pack to cause it to drop onto the flap 166 and through aperture 168 into a receptacle (not shown).

Finally, Figure 11 shows a detailed view of the roller. The sleeve 110 is affixed to a bar 112. The sleeve 110 has a cutout 168 for accommodating a square-sectioned rod 170. The rod 170 can be offered up to the cutout 168 to close the slot 109 thereby creating a clamping action. The rod 170 is affixed at opposite ends to a washer 172 and a flange 128 both having axial apertures 174 for receiving the bar 112.

A pair of springs 176 are provided aligned on cords of the washer 172 and flange 128 to provide a clockwise biasing force, i.e. a biasing force to cause the rod 170 to engage the cut out 168.
Thus, if the bar 112 and sleeve 110 are rotated anti clockwise, the rod 170 engages the cutout 168 and rotates with therewith. However, if a push rod is engaged with aperture 124 to hold the flange 128 in-situ and the sleeve 110 rotated clockwise, the cutout 168 moves away from the rod 170 thereby opening the clamp. The clamp can be closed by releasing the push rod from the aperture 124 thereby causing the rod 170 to re-engage with the cut out 168 under the influence of the springs 176.

It is to be appreciated that the apparatus and method of the invention could be used in conjunction with a variety of blister pack types, not just medication blister packs as illustrated in the accompanying drawings.
Claims:

1. An apparatus for removing an item from a blister pack, the blister pack comprising a first web having a deformable blister formation thereon for retaining an item, the item being enclosed inside the blister by a frangible web affixed to the first web, the apparatus comprising means for tensioning the blister pack between first and second spaced-apart support means and a bearing surface arranged to move relative to the blister pack, wherein moving the bearing surface relative to the blister pack causes the bearing surface to apply a force to the blister sufficient to deform it and to cause the item enclosed therein to rupture the frangible web.

2. An apparatus as claimed in claim 1, wherein the first and second spaced apart support means comprise engagement means for engaging opposite ends or edges of the blister pack.

3. An apparatus as claimed in claim 2, wherein the engagement means comprises jaws that clamp onto the blister pack.

4. An apparatus as claimed in claim 2, wherein the engagement means comprises means that pierce or engage with formations of the blister pack.

5. An apparatus as claimed in claim 4, wherein the engagement means comprises a pin or spike and the formation of the blister pack comprises an aperture.

6. An apparatus as claimed in any of claims 1 to 5, wherein the means for tensioning is a resiliently deformable means for biasing the support means away from each other.
7. An apparatus as claimed in claim 6, wherein the resiliently deformable means is a spring.

8. An apparatus as claimed in any of claims 1 to 5, wherein the support means are movable relative to one another.

9. An apparatus as claimed in claim 1, wherein the first support means comprises a fixed clamp and the second support means is movable relative to the first support means.

10. An apparatus as claimed in claim 9, wherein the second support means is integrally formed with the bearing surface.

11. An apparatus as claimed in claim 9, wherein the bearing surface is any surface capable of applying a force to the blister of the blister pack.

12. An apparatus as claimed in claim 11, wherein the bearing surface is a roller.

13. An apparatus as claimed in claim 11, wherein the bearing surface is a skid, knife-edge or any other suitable means.

14. An apparatus as claimed in claim 12, wherein the second support means is incorporated into a roller which acts as the bearing surface.

15. An apparatus as claimed in claim 14, wherein second support means is a slot that receives one end of the blister pack and retains it using friction.

16. An apparatus as claimed in any of claims 12 to 15, wherein the roller is a cylindrical roller or a polygonal prism.

17. An apparatus as claimed in claim 16, wherein the polygonal prism has a circumferential distance between the edges thereof to coincide with the position or periodicity of the blister or blisters of the blister pack.
18. An apparatus as claimed in any of claims 12 to 17, wherein the roller is arranged to move relative to the first support means to accommodate the shortening of blister pack as it is wrapped therearound.

19. An apparatus as claimed in any of claims 1 to 18, further comprising handles for actuating the first and second support means and/or the bearing surface.

20. An apparatus as claimed in any of claims 1 to 19, wherein the apparatus is automated.

21. An apparatus as claimed in claim 20, further comprising one or more motors and/or actuators.

22. An apparatus as claimed in claim 20 or claim 21, that is computer or electronically controlled.

23. An apparatus as claimed in any of claims 20 to 22, comprising a feed track for a blister pack at the end of which is a clamp having a sensor associated therewith for detecting the blister pack and its extent of movement through the clamp.

24. An apparatus as claimed in any of claims 20 to 23, wherein the bearing surface is a roller mounted on a mounting that is reciprocally moveable by way of a motor.

25. An apparatus as claimed in claim 24, further comprising one or more microswitches or optical sensors for detecting when the mounting is at a furthest extent of its movement.

26. An apparatus as claimed in any of claims 20 to 25, wherein the bearing surface is rotatably movable using a roller.
27. An apparatus as claimed in any of claims 20 to 26, wherein the roller comprises a clamp formed by an outer sleeve with a longitudinal opening therein in which a bar is arranged so that the sleeve and bar are relatively movable to create a slot for an end of a blister pack and then to clamp the blister pack end between them.

28. An apparatus as claimed in claim 27, wherein the clamp of the roller is normally closed.

29. An apparatus as claimed in claim 27 or claim 28, further comprising a solenoid to engage the bar to hold it whilst the roller is rotated to open the clamp.

30. An apparatus as claimed in claim 28 or claim 29, wherein the sleeve is spring-loadedly biased with respect to the bar to bias the clamp to a clamping position.

31. An apparatus as claimed in any of claims 24 to 30, wherein the blister pack is tensionable by moving the mounting away from the first clamp.

32. An apparatus as claimed in any of claims 1 to 31 further comprising a ram for pushing an empty blister pack or ejected items off the apparatus.

33. An apparatus as claimed in any of claims 1 to 32, further comprising a hopper or receptacle for collecting ejected items.

34. An apparatus as claimed in claim 23 wherein the hopper or receptacle comprises a separating means for separating different types of item.

35. An apparatus as claimed in claim 24, wherein the separating means comprises a grating.
36. An apparatus as claimed in claim 34, wherein the separator means comprises means for pushing the blister pack off the bearing surface.

37. An apparatus as claimed in claim 36, wherein the means for pushing comprises a push plate actuated by a ram mechanism.

38. An apparatus as claimed in claim 34, wherein the separating means comprises a flap movable between more than one position such that when the flap is in a desired position, the blister pack can be dropped and directed by the flap in a desired direction.

39. A method of removing an item from a blister pack, the blister pack comprising a web having a deformable blister formation thereon for retaining an item, the item being enclosed inside the blister by a frangible web affixed to the first sheet, the method comprising the steps of tensioning the blister pack between first and second spaced-apart support means and moving a bearing surface relative to the blister pack, such that the bearing surface applies a force to the blister sufficient to deform it and to cause the item enclosed therein to rupture the frangible web.

40. An apparatus substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

41. A method substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 B65B69/00

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 B65B

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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| A        | US 4 975 015 A (HARDING ET AL)  
4 December 1990 (1990-12-04)  
column 5, line 40 - column 6, line 9;  
figures 4-14 | 1-39 |
| A        | US 5 038 968 A (ALBETSKI ET AL)  
13 August 1991 (1991-08-13)  
abstract; figures 5,6 | 1,39 |
| A        | BE 1 008 594 A3 (DE COENE GUIDO JOZEF)  
4 June 1996 (1996-06-04)  
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paragraphs '0049! - '0055!; figures 2,3 | 1,39 |
| A        | US 2 957 604 A (GOLDMAN BOREL X ET AL)  
25 October 1960 (1960-10-25) | |

**Date of the actual completion of the international search**

1 April 2005

**Date of mailing of the international search report**

12/04/2005

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Form PCT/ISA/210 (second sheet) (January 2004)
**INTERNATIONAL SEARCH REPORT**

**Box II  Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.: 40, 41 because they relate to subject matter not required to be searched by this Authority, namely:
   - Rule 6.2 (a) PCT

2. ☐ Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box III  Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this International application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (January 2004)
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