Abstract: This invention relates to a powder container for an inhaler, and to inhalers configured to use the container, and to methods of delivering a powder in a dry powder inhaler. More generally aspects of the invention relate to a container for any type of powder or liquid, in particular a medicament, chemical or biological reagent, or foodstuff. We therefore describe a dry powder container for an inhaler, the container comprising a moulded plastic base (1) defining a plurality of cavities (2) for holding powder, said base having a first, upper surface (4) abutting a second sloping surface (10) defining a lateral side of said base, wherein an angle between said sloping surface and a plane defined by said upper surface is less than 90 degrees, and wherein a said cavity extends between said first, upper surface and said second, sloping surface, the container further comprising a film or foil seal (3) comprising a single piece of film or foil over both said upper surface and said sloping surface to seal dry powder within a said cavity.
Apparatus and Methods

FIELD OF THE INVENTION

This invention relates to a powder container for an inhaler, and to inhalers configured to use the container, and to methods of delivering a powder in a dry powder inhaler. More generally aspects of the invention relate to a container for any type of solid, powder or liquid, in particular a medicament, chemical or biological reagent, or foodstuff.

BACKGROUND TO THE INVENTION

There is a need for improved container technology, in particular for pharmaceuticals, more particularly for dry powder inhalers (DPIs). It is known to fabricate a container by applying aluminium foil to a flat surface, applying heat and pressure so that the foil adheres to the surface. Such an arrangement can be employed, for example, to provide a bandolier of blister pouches.

Background prior art can be found in: US5042472; GB2461544A; and EP0547730A.

We will describe an improved container which is particularly suitable for, inter alia, dry powder inhalers.

SUMMARY OF THE INVENTION

In a first aspect the invention provides a (dry) powder container for an inhaler, the container comprising a moulded plastic base defining a plurality of cavities for holding powder, said base having a first, upper surface abutting a second sloping surface defining a lateral side of said base, wherein an angle between said sloping surface and a plane defined by said upper surface is less than 90 degrees, and wherein a said cavity extends between said first, upper surface and said second, sloping surface, the container further comprising a film or foil seal comprising a single piece of film or foil over both said upper surface and said sloping surface to seal dry powder within a said cavity.
Embodiments of the container facilitate an improved air flow in a dry powder inhaler. The upper surface of the base may be substantially planar or dished; the sloping lateral side surface may be planar or curved or rounded. In embodiments a lateral side (or a plane defined by the lateral side) defines an angle in the range 35 to 60 degrees with a plane defined by (extending) said upper surface. In preferred embodiments the upper surface and sloping surface define a curved (rather than sharp) edge, with a fillet radius, to facilitate the process of applying the film or foil. Embodiments of the container have an approximately frusto-conical shape (the height of the base tapers towards a circumferential edge). Thus the skilled person will appreciate that when fabricated the surfaces will generally abut via a rounded edge or fillet, for example when fabricated in plastic having a radius of between 0.5mm and 2mm (although a "radius" down to substantially 0mm is possible), to facilitate flow within a mould.

The film or foil may comprise, for example, plastic film, optionally metallized, or a metal or similar foil, or some other suitable laminate or thin membrane. The film or foil acts as a lid for a cavity. In aspects of the invention it is contemplated that the film or foil could be replaced by a lid which is, say, crimped over a cavity without sealing.

In embodiments of the container the base has a further, third sloping surface also abutting the upper surface, the film or foil extending over this third surface. In this way a cavity is defined such that air may enter the cavity through the top or one lateral side and proceed through the cavity exiting via a sloping surface lateral side of the base. In embodiments a cavity has a generally longitudinal shape, for example an aspect ratio (in plan view) of greater than 1:1, 1.5:1, 2:1 or 3:1. Optionally additional sloping surfaces may be provided.

In some preferred embodiments of the container the base is disc-shaped and the one or both sloping surfaces define outer and inner circumferential lateral sides of the base, the cavities extending generally radially. However in other embodiments the container/base has the form of a longitudinally extending strip and the one or both sloping surfaces define longitudinal lateral sides of the strip.

In preferred embodiments the plastic base has one or more grooves (or ribs or projections) in the or each sloping surface between an adjacent pair of cavities. This
enables the film or foil to gather in the grooves as it is folded around the circumferential lateral side of the base, stretching the film or foil across the cavities and reducing the risk of wrinkles. Alternatively the foil may be stretched over the cavities without the use of grooves, ribs or the like, for example by stretching a planar foil/film around the sloping edge(s) of the base.

In a further alternative approach, a planar foil/film may be cut or controllability torn along a radial direction at a plurality of positions around an inner and/or outer circumferential edge of the foil/film. To facilitate folding of the foil/film over the sloping edge(s) without stretching the film may be given a daisy wheel type shape.

Preferred embodiments of both the strip and disc configurations of the container also comprise a flash trap at an edge opening of a cavity, in particular at an edge of a cavity opening onto the or each sloping surface. In embodiments such a flash trap comprises an indentation or step in a floor and/or side of the cavity adjacent the edge to receive excess plastic during application of the film or foil to the base. Due to manufacturing tolerances the precise dimensions of the moulded plastic base can vary and if the base is slightly too large for the tool applying heat and pressure to fix the film or foil, melted plastic can be displaced and obscure a side opening of the cavity. Providing an indentation or step at a side edge of the cavity, in particular in the or each sloping face, provides a space into which excess plastic can be displaced in a situation where the base is slightly too large for the tool. The skilled person will appreciate that flash traps may be provided at other locations around the edge of a cavity should practical tests indicate a need for these.

In a variant the invention provides a powder container for an inhaler, the container comprising a generally circular moulded plastic base defining a plurality of cavities for holding powder, said base having a domed upper surface, and wherein a said cavity extends between an top portion of said domed surface and a lateral side portion of said domed surface, the container further comprising a film or foil seal comprising a single piece of film or foil over said domed surface to seal dry powder within a said cavity.

In embodiments the powder container has a central aperture such that said container defines a ring or loop, and a cavity extends to an inner lateral portion of the domed
Features embodiments of the first aspect of the invention, as previously described, can also be applied to this variant.

The invention also provides a dry powder container as described above in which the cavities hold a pharmaceutical powder or powder-containing capsule. For example, powder may be provided in a capsule and this capsule incorporated into a cavity.

The invention further provides an inhaler including a dry powder container as described above. In embodiments the inhaler comprises one or more punches or peeling means to punch or peel one or preferably at least two holes through the film or foil into a cavity, at least one of these holes being in a sloping surface of the container/cavity. Although a punch may be preferred, in other arrangements the inhaler may be arranged to peel the film/foil open, to reduce the risk of creating foil/film fragments. The inhaler is configured such that an air (or fluid) flow in the inhaler, in use, defines a path through the cavity in which the air exits through a hole in a sloping wall of the container, for example in a substantially linear path through the device.

In embodiments the container has two sloping surfaces and a hole is punched in each. Then the inhaler may be configured such that the air flow is in through a first hole in a sloping surface wall of a cavity, longitudinally through the cavity, and out through a second hole in a sloping surface wall of the cavity. A single punch may be employed to punch both holes. The inhaler may be configured to mount a disc-shaped container embodiment so that the disc is rotated each time the powder in a cavity is used. The disc may be mounted, for example, so that the plane of the upper surface is generally along a longitudinal path between an air inlet for the device and an exit port from which air is provided towards a mouthpiece.

The invention also provides a method of delivering a powder in a dry powder inhaler including a dry powder container, the method comprising: punching or peeling one or a pair of holes (at least two) in a film or foil covering a cavity containing said powder, wherein at least one of said holes is in a lateral side of said container; and flowing air or gas in through one of said holes and out of a second of said holes, in embodiments out of said lateral side of said container, towards a delivery part of said inhaler, to entrain said powder in said air or gas to deliver said powder to a user.
The invention further provides an inhaler for delivering a powder in a dry powder inhaler including a dry powder container, in particular as described above, the inhaler comprising: means for punching or peeling one or a pair of holes in a film or foil covering a cavity containing said powder, wherein at least one of said holes is in a lateral side of said container; and means for flowing air or gas through said holes and out of said container, in embodiments out of a lateral side of said container, towards a delivery part of said inhaler, to entrain said powder in said air or gas towards a delivery part of said inhaler to deliver said powder to a user.

The invention further provides a container, comprising a lid and a base, said lid being a flexible film or foil less than 2mm thick, said base being more rigid than the lid and incorporating one or more cavities each for containing one or more pharmaceutical ingredients, wherein the lid is joined to the base to form a hermetic seal around each cavity, and wherein the joining surface defines two or more substantially planar (or low-curvature) surfaces adjacent to an edge.

The invention still further provides a container for a powder or liquid, in particular a medicament, chemical or biological reagent or foodstuff, the container comprising a moulded plastic base defining a plurality of cavities for holding powder or liquid, said base having a first upper surface abutting a second, sloping surface defining a lateral side of said base, wherein an angle between said sloping surface and a plane defined by said upper surface is less than 90 degrees, and wherein a said cavity extends between said first, upper surface and said second, sloping surface, the container further comprising a film or foil seal comprising a single piece of film or foil over both said upper surface and said sloping surface to seal said powder or liquid within a said cavity.

Features of the above described embodiments of a dry power container for an inhaler by correspondingly be applied to the above described container for a solid, powder or liquid. In one preferred implementation the container is configured as a tablet dispenser.

BRIEF DESCRIPTION OF THE DRAWINGS
These and other aspects of the invention will now be further described, by way of example only, with reference to the accompanying figures in which:

Figure 1 shows a dry powder container according to an embodiment of the invention;

Figure 2 shows a tool for manufacturing the container of Figure 1;

Figure 3 shows a vertical cross-section view through the container of Figure 1, and an illustration of air flow through the container;

Figure 4 shows a cross-sectional view through an inhaler according to an embodiment of an aspect of the invention;

Figure 5 shows a view of a container according to a second embodiment of the invention; and

Figure 6 shows a configuration of a container according to a third embodiment of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

We describe a design of container such that the foil can be sealed non-flat. This uses non-flat foil sealing on a pharmaceutical container, in embodiments with excess of foil grooves and flash traps.

Thus we describe a container with one or more cavities for holding product contents such as a pharmaceutical powder, disposable medical device, or biological or chemical reagent. The container comprises a substantially rigid base with a more flexible lid joined onto the base by a forming process so that the lid closely follows the contours of the adjoining surface of the base. Additionally the lid may be sealed onto the base to form a hermetic seal, providing a sterile and/or moisture and gas barrier between outside the container and the contents. The contents may be a pharmaceutical, or a medical product, or food, or other contents which the user needs to protect until use, and then access. To access the contents, the lid may be fully or partially opened by
peeling the lid off the base, or by punching or piercing or bursting one or more apertures in the lid.

In a preferred embodiment Figure 1, the base (1) is an injection moulding made of polymer, which contains multiple cavities (2), each for containing a dose of pharmaceutical in dry powder form. The lid is a flexible foil (3) made of aluminium coated with a heat sealable polymer layer.

After assembling each dry powder dose into each cavity, the lid is formed over the upper surface of the base (4) and simultaneously joined to the upper surface of the base by a heat sealing process which takes in the initially flat and planar lid component, aligns it with the base, applies pressure and heat to the lid onto the base by a heat sealing tool Figure 2, (5), until the heat sealable polymer layer and base polymer co-melt and then fuse to form a cohesive joint after heat is removed. After this process, the result is a lid neatly joined to the base, with the foil lightly stretched over the cavities, without wrinkles, and where each cavity is reliably hermetically sealed. In transforming the lid foil from a planar surface to a 3D surface which matches the topology of the upper surface of the base, areas of excess foil are created which would otherwise create wrinkles that would then lead to sealing failures. The heat sealing tool incorporates rib features (6) to fold any excess lid foil that is created into corresponding "excess foil" grooves (7) in the base, and to maintain tension in the foil across the areas where a good seal must be made. Where the transformation of lid foil from planar to 3D requires additional lid area to be created, the rib features (8) act as forming edges (which need not be sharp), by cutting tears in the lid or locally stretching the lid at defined positions that are safely accommodated on the base.

In other products, the lid is typically formed over just one planar or low-curvature surface. However, in this embodiment the lid is simultaneously formed on the top planar or low-curvature surface and over edges onto additional low-curvature surfaces. In this embodiment the second and third surfaces are conical surfaces (10, 11), and the cavities in the base extend to these additional surfaces.

The lid can be opened by piercing the foil in one or more positions (12, 13) at these surfaces or on top of the cavity (14), to allow the powder to be drawn out by air flow (Figure 3) (15).
The use of a sloping side surface facilitates manufacture: preferably therefore the angle of a sloping surface to a plane defined by the upper surface in less than 80° (it will be appreciated that for planar upper and side surfaces the internal angle between these surfaces is greater than 90°).

In manufacture, production tolerances of the injection moulding process mean that the size of the base will vary in series production. This variation in the size will normally be much greater than the variation in the size of the mating surface of the heat sealing tool. To maintain reliable forming and sealing over the whole lid surface, these size variations are accommodated by melting of excess base polymer at the additional surfaces (10, 11). However, to avoid the excess melt obscuring the cavities at these positions, which would prevent piercing a clean hole for contents removal, the base incorporates "flash trap" features (16) which in embodiments are small recesses adjacent to any edge of each cavity that accommodate any excess melt produced without obscuring the cavity.

Injection moulding the base means that the cavities can have thin walls between them and therefore the container can have a high spatial density of cavities, making a compact container.

Sealing the lid simultaneously over additional surfaces, folding away excess foil, and accommodating excess melt has the advantage that the cavity can be opened to give a straighter more open entry and exit path for the contents, yet the lid can still be sealed reliably in one process step, lending itself to low cost mass manufacture.

During manufacture the contents, for example a powder, can be dosed via the large top area of the cavity, making loading easier. On use, the entry and exit windows can be smaller, giving better control of powder flow out of the container.

In the preferred embodiment the container is a component of an inhaler (Figure 4). The inhaler comprises a body (20) with mouthpiece (21) through which the user inhales. Prior to inhalation, the container is indexed so that an unopened cavity containing the pharmaceutical powder (22) is adjacent to the mouthpiece. Then the punch (23) is moved until it pierces the foil to create an entry (24) and exit (25) hole,
and is then retracted. When the user inhales, air (26) passes through the air vent (27), the container entry hole, entrains the powder, exits the hole with the powder, and passes through the mouthpiece to the user. In other arrangements a single long hole or opening may be employed to provide a suitable air flow.

The base referred to above could be of another solid material such as polymer or metal shaped by moulding, casting, forming or machining or made by other additive processes such as stereolithography, and contain one or several cavities. Although preferred embodiments of the container are used for dry powder, it may also be used for non-dry powders and other materials. Thus the contents of each cavity could be a solid, liquid, or gas, or powder, or suspension of solid particles in a liquid, and could be a pharmaceutical, chemical or biological reagent, or a sensor or medical product, or tablet, capsule or food. The film or foil lid could be a polymer, and coated with an adhesive, or multi-layer laminate of polymers and or metals and or adhesives. The method of joining lid to base could be simply adhesive, and could be cured by time, radiation (including electromagnetic) or by exposure to a gas.

The container could be in the shape of a circular disk (Figure 5), or a rectangular strip (Figure 6) or other shapes. In the case of the rectangular strip, excess foil grooves may not be required. The container may only require one or two planar or low-curvature surfaces to which the lid is joined. The lid could be opened by piercing foil downwards into the cavity, or by piercing then pulling the pierced foil up out of the cavity. The lid could be opened by peeling the foil off the cavity, for example by means of a hook engaging with a hole in a free edge of the foil. The lid piercing process could be used to break, split, or strip the contents. For example, the contents could be a powder capsule, which is held in the container to give enhanced moisture and gas barrier properties. Piercing the lid also pierces the powder capsule, allowing the powder to be drawn out by air flow.

Thus broadly speaking we have described powder containers comprising a base with two surfaces which are not perpendicular to one another, or with a rounded or domed upper surface, and a plurality of cavities which extend between the surfaces. Some preferred embodiments are generally ring-shaped and the cavities extend between the inner and outer edges (lateral sides) of the ring.
No doubt many other effective alternatives will occur to the skilled person. It will be understood that the invention is not limited to the described embodiments and encompasses modifications apparent to those skilled in the art lying within the spirit and scope of the claims appended hereto.
CLAIMS:

1. A powder container for an inhaler, the container comprising a moulded plastic base defining a plurality of cavities for holding powder, said base having a first, upper surface abutting a second sloping surface defining a lateral side of said base, wherein an angle between said sloping surface and a plane defined by said upper surface is less than 90 degrees, and wherein said cavity extends between said first, upper surface and said second, sloping surface, the container further comprising a film or foil seal comprising a single piece of film or foil over both said upper surface and said sloping surface to seal dry powder within a said cavity.

2. A powder container as claimed in claim 1 wherein said base has a third, sloping surface abutting said first, upper surface, wherein a said cavity extends between said first, upper surface and said third, sloping surface, and wherein said single piece of film or foil extends over said third, sloping surface to seal dry powder within said cavity.

3. A powder container as claimed in claim 1 or 2 wherein said base is generally rectangular or has the form of a strip, and wherein the or each said sloping surface defines a longitudinal lateral side of said base.

4. A powder container as claimed in claim 1 or 2 wherein said base is disc-shaped, wherein said second, sloping surface defines a circumferential lateral side of said disc-shaped base, and wherein said cavities extend generally radially.

5. A powder container as claimed in claim 4 when dependent on claim 2 wherein said base has a central opening, and wherein said third, sloping surface defines a circumferential lateral side of said opening.

6. A powder container for an inhaler, the container comprising a generally circular moulded plastic base defining a plurality of cavities for holding powder, said base having a domed upper surface, and wherein a said cavity extends between an top portion of said domed surface and a lateral side portion of said domed surface, the container further comprising a film or foil seal comprising a single piece of film or foil over said domed surface to seal dry powder within a said cavity.
7. A powder container as claimed in claim 6 wherein said container has a central aperture such that said container defines a ring or loop, and wherein a said cavity extends to an inner lateral portion of said domed surface adjacent said central aperture.

8. A powder container as claimed in claim 4, 5, 6 or 7 wherein said base has at least one groove or protrusion in said second, sloping surface or in a said lateral portion of said domed surface, between an adjacent pair of said cavities.

9. A powder container as claimed in any preceding claim wherein said base has a flash trap at an edge of an opening of a said cavity in a said sloping surface, wherein a said flash trap comprises an indentation in a floor or side of a said cavity adjacent said opening to receive excess plastic during application of said film or foil to said base.

10. A powder container as claimed in any preceding claim in which a said cavity holds a pharmaceutical powder or capsule.

11. An inhaler including the powder container of any preceding claim.

12. An inhaler as claimed in claim 11 comprising one or more punches or peeling means to punch or peel one or two holes through said film or foil into a said cavity, wherein at least one of said holes is in said second, sloping surface, and wherein an air flow in said inhaler defines a path though said cavity in through one of said holes and out through a second of said holes to entrain said powder in said cavity in said air flow for delivery to a user.

13. An inhaler as described in claim 12 when dependent on either claim 2 or claim 7, wherein a second of said holes is in said third, sloping surface or said inner lateral portion of said domed surface.

14. A method of delivering a powder in a dry powder inhaler including a dry powder container, in particular as claimed in any one of claims 1 to 10, the method comprising: punching or peeling one or a pair of holes in a film or foil covering a cavity containing said powder, wherein at least one of said holes is in a lateral side of said container; and
flowing air or gas in through one of said holes and out of a second of said holes towards a delivery part of said inhaler, to entrain said powder in said air or gas to deliver said powder to a user.

15. An inhaler for delivering a powder in a dry powder inhaler including a dry powder container, in particular as claimed in any one of claims 1 to 10, the inhaler comprising:
   means for punching or peeling one or a pair of holes in a film or foil covering a cavity containing said powder, wherein at least one of said holes is in a lateral side of said container; and
   means for flowing air or gas in through one of said holes and out of a second of said holes of said container towards a delivery part of said inhaler, to entrain said powder in said air or gas towards a delivery part of said inhaler to deliver said powder to a user.

16. A container, comprising a lid and a base, said lid being a flexible film or foil less than 2mm thick, said base being more rigid than the lid and incorporating one or more cavities each for containing one or more pharmaceutical ingredients, wherein the lid is joined to the base to form a hermetic seal around each cavity, and wherein the joining surface defines two or more substantially planar (or low-curvature) surfaces adjacent to an edge.

17. A container for a solid, powder or liquid, in particular a medicament, chemical or biological reagent or foodstuff, the container comprising a moulded plastic base defining a plurality of cavities for holding solid, powder or liquid, said base having a first upper surface abutting a second, sloping surface defining a lateral side of said base, wherein an angle between said sloping surface and a plane defined by said upper surface is less than 90 degrees, and wherein said cavity extends between said first, upper surface and said second, sloping surface, the container further comprising a film or foil seal comprising a single piece of film or foil over both said upper surface and said sloping surface to seal said powder or liquid within said cavity.

18. A tablet dispenser comprising a container as claimed in claim 17.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61M15/00 A61J1/03 B65D83/04 B65D75/32

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

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
A61M B65D A61J

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.

A  wo 2009/008832 AI (ASTRAZENECA AB [SE];
LASTOW OREST [SE]) 15 January 2009 (2009-01-15) the whole document


A the whole document

A US 2005/133029 AI (NICHOLS WALTER A [US];

Date of the actual completion of the international search 1 February 2011

Date of mailing of the international search report 08/04/2011

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Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016

Azaïzia, Mourad

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document establishing the publication date of the document cited
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another invention or other special reason (as specified)
"O" document referred to in the context of art or other means
"P" document published prior to the international filing date but later than the priority date claimed

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

*"X" document of particular relevance; the claimed invention cannot be considered to be obvious based on the disclosed content

*"Y" document of particular relevance; the claimed invention cannot be considered to be obvious based on the disclosed content when combined with one or more other such documents, such combination being obvious to a person skilled in the art

*"Z" document member of the same patent family
### DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
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<td>A</td>
<td>EP 1 844 806 A1 (BOEHRINGER INGELHEIM PHARMA [DE]) 17 October 2007 (2007-10-17) the whole document</td>
<td>1-13, 17, 18</td>
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<td>A</td>
<td>WO 2005/002654 A2 (MERIDICA LTD [GB]; HOUZEGO PETER JOHN [GB]; CONWAY JOHN KELSHAW [GB]) 13 January 2005 (2005-01-13) the whole document</td>
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<td>A</td>
<td>WO 2009/004456 A1 (PFIZER LTD [GB]; DIART VALERI E [GB]; ISAACS WARREN [GB]; MARSH STEPHEN) 8 January 2009 (2009-01-08) the whole document</td>
<td>6-13</td>
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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.: 
   because they relate to subject matter not required to be searched by this Authority, namely:

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).

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

see additional sheet

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 fees, this Authority did not invite payment of additional fees.

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.:

1-13, 17, 18

Remark on Protest

□ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

□ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

□ No protest accompanied the payment of additional search fees.
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-13, 17, 18

A powder container for an inhaler, the container comprising a moulded plastic base defining a plurality of cavities for holding powder, said base having a first, upper surface abutting a second sloping surface defining a lateral side of said base, where n an angle between said sloping surface and a plane defined by said upper surface is less than 90 degrees, and wherein a said cavity extends between said first, upper surface and said second, sloping surface, the container further comprising a film or foil seal comprising a single piece of film or foil over both said upper surface and said sloping surface to seal dry powder within a said cavity.

AND

A powder container for an inhaler, the container comprising a generally circular moulded plastic base defining a plurality of cavities for holding powder, said base having a domed upper surface, and wherein a said cavity extends between an top portion of said domed surface and a lateral side portion of said domed surface, the container further comprising a film or foil seal comprising a single piece of film or foil over said domed surface to seal dry powder within a said cavity.

AND

A container for a solid, powder or liquid, the container comprising a moulded plastic base defining a plurality of cavities for holding solid, powder or liquid, said base having a first upper surface abutting a second, sloping surface defining a lateral side of said base, where n an angle between said sloping surface and a plane defined by said upper surface is less than 90 degrees, and wherein a said cavity extends between said first, upper surface and said second, sloping surface, the container further comprising a film or foil seal comprising a single piece of film or foil over both said upper surface and said sloping surface to seal said solid, powder or liquid within a said cavity.

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2. claims: 14, 15

A method of delivering a powder in a dry powder inhaler including a dry powder container, the method comprising: punching or peeling one or a pair of holes in a film or foil covering a cavity container said powder, wherein at least one of said holes is in a lateral side of said container; and flowing air or gas through one of said holes and out of a second of said holes towards a delivery part of said inhaler, to entrain said powder in said air or gas to deliver said powder to a user.

AND
An inhaler for delivering a powder in a dry powder inhaler including a dry powder container, the inhaler comprising: means for punching or peeling one or a pair of holes in a film or foil covering a cavity containing said powder, wherein at least one of said holes is in a lateral side of said container; and means for flowing air or gas in through one of said holes and out of a second of said holes of said container towards a delivery part of said inhaler, to entrain said powder in said air or gas towards a delivery part of said inhaler to deliver said powder to a user.

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3. Claim: 16

A container, comprising a lid and a base, said lid being a flexible film or foil less than 2mm thick, said base being more rigid than the lid and incorporating one or more cavities each for containing one or more pharmaceutical ingredients, wherein the lid is joined to the base to form a hermetic seal around each cavity, and wherein the joining surface defines two or more substantially planar (or low-curvature) surfaces adjacent to an edge.

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<th>Publication date</th>
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<tr>
<td>WO 2009008832 A1</td>
<td>15-01-2009</td>
<td>NONE</td>
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<td>EP 0481666 Al</td>
<td>22-04-1992</td>
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<td>JP 1867595 C</td>
<td>26-08-1994</td>
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<td>JP 4259471 A</td>
<td>16-09-1992</td>
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<td>JP 5077432 B</td>
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<td>US 2005133029 A1</td>
<td>23-06-2005</td>
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<tr>
<td>US 5533502 A</td>
<td>09-07-1996</td>
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<td>CN 101518663 A</td>
<td>02-09-2009</td>
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