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(71) Applicant *(for all designated States except US)*: **GLAXO GROUP LIMITED** [GB/GB]; Glaxo Wellcome House, Berkeley Avenue, Greenford Middlesex UB6 0NN (GB).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **PEARSON, Allen, John** [GB/GB]; Origin Product Design Limited, Unit 1, Broughton Craft Centre, Causeway Road, Broughton, Huntingdon Cambridgeshire PE28 3AS (GB). **RAND, Paul, Kenneth** [GB/GB]; GlaxoSmithKline, Park Road, Ware Hertfordshire SG12 0DP (GB).

(74) Agent: **RICE, Jason, Neale**; GlaxoSmithKline, Corporate Intellectual Property (cn925.1), 980 Great West Road, Brentford Middlesex TW8 9GS (GB).

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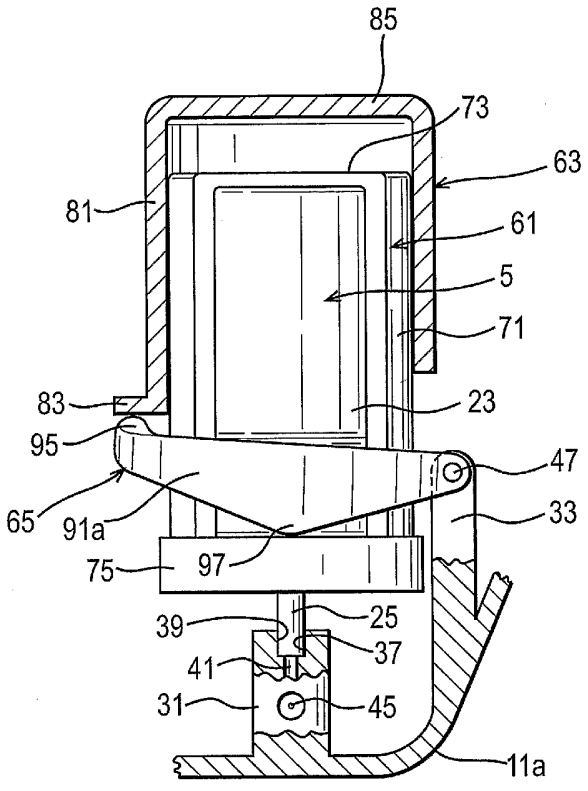
(54) Title: INHALATION DEVICES



(57) Abstract: An inhaler for delivering medicament by inhalation comprises (i) a canister (5) which comprises a body (23) which defines a chamber containing medicament and a valve stem (25) which extends from the body (23) and from which medicament is in use delivered on actuation of the canister (5), and (ii) an actuator. The actuator comprises a housing (11) in which the canister (5) is received, and an actuating mechanism (9) for actuating the canister (5). The actuating mechanism (9) comprises a loading member (61) which is fitted to or comprised in the body (23) of the canister (5), an actuating member (63) which is operable by a user to actuate the canister (5) to deliver medicament, and a drive member (65) which operably couples the loading member (61) and the actuating member (63) and is pivotally mounted, such as to be pivoted on operation of the actuating member (63) to engage and drive the loading member (61) from a first, rest position to a second, actuated position in which the canister (5) is actuated.

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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.

INHALATION DEVICES

Field Of The Invention

The present invention relates to an actuator for an inhaler for administering medicament by inhalation and to an inhaler including the same. The invention is particularly, but not exclusively, concerned with an actuator for a pressurised metered dose inhaler (pMDI).

Background Of The Invention

pMDIs are well known in the art of inhalation devices. It is therefore not necessary to describe the construction and operation of a pMDI other than in bare essentials.

A pMDI comprises a canister and an actuator housing. The housing is generally tubular, although this is not essential, and generally formed of a plastics material, for instance by moulding. The canister comprises an open-ended canister, typically made from a metal such as aluminium. The open end of the canister is sealingly capped by a metering valve assembly. The valve assembly typically includes a hollow dispensing member or valve stem which projects from the outlet or business end of the canister. The dispensing member is mounted for sliding movement relative to the canister between an extended position, to which the dispensing member is biased by a biasing mechanism in the valve assembly, typically a return spring, and a depressed position.

In use, the sealed canister contains a pressurised medicinal aerosol formulation. The formulation comprises the medicament and a fluid propellant, and optionally one or more excipients and/or adjuvants. The medicament is typically in solution or suspension in the formulation. The propellant is typically a CFC-free propellant, suitably a liquid propellant, and may for example be HFA-134a or HFA-227.

Movement of the dispensing member from the extended position to the depressed position results in a metered dose of the aerosol formulation being dispensed from the canister through the dispensing member. Typically, the metering valve assembly is provided with a metering chamber of defined volume. In the extended position of the dispensing member, the content of the canister is placed in fluid communication with the metering chamber through the dispensing member so that the metering chamber is filled with the aerosol formulation. When the dispensing member is depressed, the metering chamber is isolated from the canister inner volume and placed in fluid communication with the external environment through the dispensing member. Thus, the defined volume of the aerosol formulation in the metering chamber is discharged to the external environment via the dispensing member.

Such metering valve assemblies are well known in the art and can be obtained from *inter alia* Bespak Plc (King's Lynn, Norfolk, United Kingdom) and Valois S.A.S. (Le Neubourg, France).

The housing typically comprises an internal passageway having an open end. The canister is slidable into the internal passageway through the open end with the canister being inserted valve assembly first into the internal passageway. A stem block, which receives the dispensing member of the canister when the canister is received in the housing in a "rest position", has a passageway with an inlet end for receiving the dispensing member and an outlet end, which faces a dispensing outlet of the housing, typically a mouthpiece or a nasal nozzle. The stem block holds the dispensing member stationary whereby depression of the canister to its rest position further into the housing to an "actuated position" causes the dispensing member to be displaced from the extended position to the depressed position relative to the canister. A metered dose of the aerosol formulation will thereby be dispensed out of the dispensing outlet of the housing via the internal passageway of the stem block.

In use, a patient in need of a metered dose of the medicinal aerosol formulation concurrently inhales on the dispensing outlet and depresses the canister from the rest position to the actuated position. The inspiratory airflow produced by the patient entrains the metered dose of the medicinal aerosol formulation into the patient's respiratory tract. So, a pMDI of the type described above is a breath-coordinated inhaler.

Inhalers are commonly provided with a dust cap that covers the dispensing outlet when the inhaler is not in use. The dust cap, when applied, prevents foreign material from entering the housing. This prevents the user from inhaling dust or lint, for example, that might otherwise accumulate in the housing. This is of particular importance where the user suffers from asthma or other respiratory conditions, in which the inhalation of foreign material may cause severe irritation.

Developments to pMDIs have included the provision of actuation indicators or dose counters therefor. Such a dose counter is described in PCT Patent Application Nos. WO-A-9856444 and WO-A-2004/001664 to Glaxo Group Limited. The dose counter is fixably secured on the valve assembly end of the canister and includes a display which denotes the number of metered doses of the medicament formulation dispensed from, or remaining in, the canister. The display of the dose counter is visible to the patient through a window provided in the housing. The display may be presented by a plurality of indicator wheels rotatably mounted on a common axle, each wheel having numerals displayed in series around the circumference.

Many actuators have been developed with a view to facilitating the delivery of medicament, examples of which are disclosed in US-A-3272391, US-A-3272392, US-A-4678106, US-A-5899365, US-A-6237812 and WO-A-99/49917.

It is an aim of the present invention to provide an improved actuator for an inhaler for administering medicament by inhalation and an inhaler including the same.

Summary Of The Invention

In one aspect the present invention provides an inhaler for delivering medicament by inhalation according to claim 1.

Preferably, the body of the canister includes a base and a head, and the loading member is located over the base of the body of the canister and includes a loading section which is engaged by the drive member.

In one embodiment the loading section of the loading member comprises a substantially annular section.

Preferably, the loading member comprises a sleeve which fits about an outer peripheral surface of the body of the canister, an end section at one end of the sleeve which engages the base of the body of the canister, and the loading section at the other end of the sleeve.

Preferably, the sleeve of the loading member extends substantially to the head of the body of the canister.

Preferably, the drive member extends between opposite sides of the canister and is pivotally mounted at one of the opposite sides of the canister, and the actuating member includes an actuating element which is located at the other of the opposite sides of the canister and, on operation of the actuating member, acts to engage the drive member such as to effect pivoting of the same.

In one embodiment the actuating element of the actuating member comprises a flange element.

Preferably, the actuating member is located over the base of the body of the canister, and comprises a sleeve which fits about an outer peripheral surface of the sleeve of the loading member, the actuating element disposed to one,

distal end of the sleeve, and an end section at the other end of the sleeve which is acted upon by the user in operating the actuating member.

Preferably, the drive member comprises at least one drive arm which is coupled at one end to a pivot and engages the loading section of the loading member.

More preferably, the drive member comprises first and second drive arms which extend from the pivot about opposed sides of the canister, such as to engage the loading section of the loading member at the opposed sides of the canister, and a connecting element which interconnects the other, distal ends of the drive arms and is engaged by the actuating element of the actuating member.

Yet more preferably, the drive arms each include a drive point which engages the loading section of the loading member substantially in a plane which intersects a longitudinal axis of the housing.

Preferably, the housing includes a nozzle block which receives the valve stem of the canister.

Preferably, the housing includes an outlet through which the user in use inhales.

More preferably, the outlet is a mouthpiece.

In another aspect of the present invention there is provided the actuator of the inhaler of the invention.

Other aspects and features of the invention are set forth in the appended claims and the exemplary embodiments which will now be described with reference to the accompanying Figures of drawings.

Brief Description Of The Drawings

Figure 1 illustrates a perspective view of an inhaler in accordance with a first embodiment of the present invention;

Figure 2 illustrates an exploded perspective view of the inhaler of Figure 1;

Figure 3 illustrates a fragmentary, part-sectional view of the inhaler of Figure 1, where illustrated in the inoperative, rest configuration;

Figure 4 illustrates a fragmentary, part-sectional view of the inhaler of Figure 1, where illustrated in the actuated configuration;

Figure 5 illustrates a part-exploded perspective view of an inhaler in accordance with a second embodiment of the present invention;

Figure 6 illustrates a part-sectional view of an inhaler in accordance with a third embodiment of the present invention, where illustrated in the inoperative, rest configuration; and

Figure 7 illustrates a part-sectional view of the inhaler of Figure 6, where illustrated in the actuated configuration.

Detailed Description Of Preferred Embodiments

Figures 1 to 4 illustrate a hand-held, hand-operable inhaler of the pMDI type in accordance with a first embodiment of the present invention.

The inhaler comprises an actuator which comprises a main body 3, an aerosol canister 5 which is fitted in the main body 3 and contains medicament to be delivered on actuation of the inhaler, and an actuating mechanism 9 which is operable by a user to actuate the inhaler.

The main body 3 comprises a housing 11 in which the canister 5 is in use fitted, and a mouthpiece 13, in this embodiment a tubular element, which is

in fluid communication with a lower end of the housing 11 and in use is gripped in the lips of the user. The mouthpiece 13 could instead be configured as a nasal nozzle.

The canister 5 in this embodiment is of standard type, as outlined *supra,* and comprises a body 23 which defines a chamber containing a medicament in a CFC-free propellant under pressure, for example an HFA propellant, a valve stem 25 which extends from one end, the head, of the body 23 and an internal metering valve (not illustrated) which is normally biased by an internal valve spring (not illustrated) to a closed position and opened to deliver a metered dose of medicament from the canister 5 when the valve stem 25 is depressed into the canister body 23.

In this embodiment the housing 11 comprises first and second housing parts 11a, b which are attached together, here by clips.

The first, lower housing part 11a is in fluid communication with the mouthpiece 13, and includes a nozzle block 31, in this embodiment disposed to a base surface of the first housing part 11a, for receiving the valve stem 25 of the canister 5, and a support member 33 to which a drive member 65 of the actuating mechanism 9 is pivotally coupled, as will be described in more detail hereinbelow. In this embodiment the lower housing part 11a is formed, here by moulding, as a single, integral unit.

Referring particularly to Figures 3 and 4, the nozzle block 31 includes a tubular bore 37 for receiving the valve stem 25 of the canister 5, which in this embodiment is co-axial with the longitudinal axis of the housing 11. The tubular bore 37 is open at one, the upper, end thereof and includes an upper section 39 which has an internal dimension which is substantially the same as the outer dimension of the valve stem 25 and a lower section 41 which has a smaller dimension, which sections 39, 41 together define an annular seat for the distal end of the valve stem 25. The tubular bore 37 further includes a laterally-directed spray orifice 45 in the lower section 41

thereof which is configured to direct a spray into and through the mouthpiece 13.

Referring again particularly to Figures 3 and 4, in this embodiment the support member 33 is an upstanding member which includes a pivot 47 about which the drive member 65 of the actuating mechanism 9 is pivotally supported.

The inhaler further comprises a mouthpiece cap 49 which provides for closure of the mouthpiece 13.

The second, upper housing part 11a includes an aperture 51 at the upper end thereof, which allows for operation of the actuating mechanism 9, as will be described in more detail hereinbelow.

The actuating mechanism 9 comprises a loading member 61 which is fitted over the base of the body 23 of the canister 5, an actuating member 63 which is disposed at the aperture 51 in the second housing part 11b, and a drive member 65 which operably couples the loading member 61 and the actuating member 63, such as to provide for the loading member 61, and hence the body 23 of the canister 5, to be driven downwardly on depression of the actuating member 63.

In this embodiment the loading member 61 comprises a sleeve 71, here a part-tubular, substantially U-shaped sleeve, which is a close fit with the outer peripheral wall of the body 23 of the canister 5 and extends over substantially the entire length of the body 23 of the canister 5 from the base to the head of the body 23 of the canister 5, an end section 73 at one, the upper, end of the sleeve 71, here which spans the sleeve 71, which engages the base of the body 23 of the canister 5, and a loading section 75, here an annular flange, at the other, lower end of the sleeve 71, which is engaged by the drive member 65 to load the canister 5, as will be described in more detail hereinbelow.

In this embodiment the actuating member 63 is a cap element, here generally in the form of a button, which comprises a sleeve 81, here a tubular sleeve, which is a close fit with the outer peripheral wall of the sleeve 71 of the loading member 61 and includes an actuating element 83, here a flange element, at one, the lower, distal end of the sleeve 81 and to a side of the canister 5 opposite the support member 33, and an end section 85 at the other, upper end of the sleeve 81 which encloses the other end of the sleeve 81.

In this embodiment the drive member 65 comprises first and second drive arms 91a, b which are pivotally coupled at one end to the pivot 47 on the supporting member 33 and extend about opposed sides of the sleeve 71 of the loading member 61, such as to engage the loading section 75 of the loading member 61 at the opposed sides of the sleeve 71 of the loading member 61, and a connecting element 95 which interconnects the other, distal ends of the drive arms 91a, b at the side of the canister 5 opposite the support member 33 and is disposed such as to be engaged by the actuating element 83 of the actuating member 63, whereby, on depression of the actuating member 63, the drive arms 91a, b are driven in unison, here by pivoting about the pivot 47 on the support member 33, such as to drive the loading member 61, and hence the canister 5 downwardly to actuate the same.

In this embodiment the drive arms 91a, b each include a drive point 97, here defined by the junction of two inclined surfaces, which is located substantially in a plane which intersects the longitudinal axis of the housing 11, such that the canister 5 is loaded substantially uniformly along the longitudinal axis thereof and through the valve stem 25 of the canister 5.

Operation of the actuator will now be described hereinbelow.

The user first takes the actuator, as illustrated in Figure 1, in one hand, and removes the mouthpiece cap 49.

The user then takes the mouthpiece 13 in his/her lips, and, in co-ordination with an inhalation breath, actuates the inhaler by depressing the actuating member 63 of the actuating mechanism 9 with one or more digits of the hand holding the actuator.

As illustrated in Figure 4, depression of the actuating member 63 causes the actuating element 83 of the actuating member 63 to engage the connecting element 95 of the drive member 65, which in turn causes the drive member 65 to be pivoted about the pivot 47 on the support member 33 and drive the loading member 61, through engagement of the pivot points 97 of the respective drive arms 91a, b with the loading section 75 of the loading member 61.

This downward movement of the loading member 61 drives the body 23 of the canister 5 downwardly in relation to the stationary valve stem 25 of the canister 5, thus actuating the canister 5 to deliver a spray of the medicament formulation dispensed from the valve stem into and through the mouthpiece 13.

On releasing the actuating member 63, the inhaler is returned by the valve return spring to the rest configuration illustrated in Figure 3, ready for subsequent actuation.

Following actuation, the inhaler is removed from the mouth, and the mouthpiece cap 49 is fitted to the mouthpiece, as illustrated in Figure 1, ready for subsequent actuation.

Figure 5 illustrates a hand-held, hand-operable inhaler of the pMDI type in accordance with a second embodiment of the present invention.

The inhaler of this embodiment is very similar to the inhaler of the above-described embodiment, and thus, in order to avoid unnecessary duplication of description, only the differences will be described in detail, with like parts being designated by like reference signs.

The inhaler of this embodiment differs from that of the first-described embodiment in that the housing parts 11a, 11b are threadedly coupled, and the support member 33 is disposed to the upper housing part 11b. This configuration is advantageous in providing for ready replacement of the canister 5.

Operation of the inhaler of this embodiment is the same as for the above-described embodiment.

Figures 6 and 7 illustrate a hand-held, hand-operable inhaler of the pMDI type in accordance with a third embodiment of the present invention. The inhaler of this embodiment is very similar to the inhaler of the above-described first embodiment, and thus, in order to avoid unnecessary duplication of description, only the differences will be described in detail, with like parts being designated by like reference signs.

The inhaler of this embodiment differs from that of the first embodiment in the following noteworthy respects.

Firstly, the actuating mechanism 9 is provided with a pair of pivoting drive members 65 on opposing inner sides of the housing 11. Each drive member 65 has a pair of drive arms 91a, 91b (only one of which is shown), as in the first embodiment, although the distal ends of the drive arms 91a, 91b are not connected together in this embodiment. In fact, the drive members 65 are configured in a wishbone shape, with the drive arms 91a, 91b forming the limbs of the wishbone shape.

Secondly, the actuating member 63, again in the form of a cap, has a centrally disposed actuating element 83 on each opposing side thereof (only one shown), here in the form of a tongue at the distal end of the actuating member 63. Each actuating element 83 engages a pair of drive arms 91a, 91b, one from each drive member 65.

Operation of the inhaler of this embodiment is the same as for the above-described embodiment. More particularly, as shown in Figure 7, depression of the actuating member 63 causes the actuating members 83 thereof to pivot the drive members 65 about the pivots 47 in a downward direction. The loading member 61 is then driven downwardly through engagement of the pivot points 97 of the respective drive arms 91a, b with the loading section 75 of the loading member 61. This downward movement of the loading member 61 drives the body 23 of the canister 5 downwardly in relation to the stationary valve stem 25 of the canister 5, through engagement of the end section 73 with the base of the canister body 23, thus actuating the canister 5 to deliver a spray of the medicament formulation dispensed from the valve stem into and through the mouthpiece 13.

It will be appreciated that the actuating mechanisms in the illustrated embodiments of the invention provide a mechanical advantage. That is to say, the manual force required to be applied by the user to operate the inhaler (by overcoming the return force of the valve return spring) is less than would otherwise be the case, such as in operation of a standard pMDI where the user has to push down on the base of the canister 5 against the return force of the valve return spring. In the third embodiment, the use of two oppositely located drive members 65, compared to the single drive member 65 in the first embodiment, better balances and distributes the loading forces applied to the loading section 75.

Preferably, all of the parts of the actuator of the exemplary embodiments are made from a plastics material, for example by a moulding process.

The canister 5 in the illustrated embodiments may be furnished with a dose counter as described in WO-A-9856444 and WO-A-2004/001664, the entire contents of which are hereby incorporated herein by reference.

In a modification of the illustrated embodiments, not shown, the loading member 61 takes the form of an accessory which is fixedly connected to the

head end of the canister 5 and which provides the loading section 75 for the drive member 65 to act on to move the canister 5 downwardly. As an example, the accessory may take the form of a dose counter as described in WO-A-9856444 and WO-A-2004/001664. The housing of such a dose counter may be adapted to present the loading section.

In an alternative modification of the illustrated embodiments, not shown, the loading section for the drive member 65 may be presented by a surface of the canister 5.

Finally, it will be understood that the present invention has been described in its exemplary embodiments and can be modified in many different ways without departing from the scope of the invention as defined by the appended claims.

Also, as regards the provision of reference signs in the appended claims, it is to be understood that reference signs are provided only for illustrative purposes and are not intended to confer any limitation to the claimed invention.

CLAIMS

1. An inhaler for delivering medicament by inhalation, comprising:
a canister (5) which comprises a body (23) which defines a chamber containing medicament and a valve stem (25) which extends from the body (23) and from which medicament is in use delivered on actuation of the canister (5); and
an actuator comprising:-
a housing (11) in which the canister (5) is received, and
an actuating mechanism (9) for actuating the canister (5);
wherein the actuating mechanism (9) comprises a loading member (61) which is fitted to or comprised in the body (23) of the canister (5), an actuating member (63) which is operable by a user to actuate the canister (5) to deliver medicament, and a drive member (65) which operably couples the loading member (61) and the actuating member (63) and is pivotally mounted, such as to be pivoted on operation of the actuating member (63) to engage and drive the loading member (61) from a first, rest position to a second, actuated position in which the canister (5) is actuated.

2. The inhaler of claim 1, wherein the body (23) of the canister (5) includes a base and a head, and the loading member (61) is located over the base of the body (23) of the canister (5) and includes a loading section (75) which is engaged by the drive member (65).

3. The inhaler of claim 2, wherein the loading section (75) of the loading member (61) comprises a substantially annular section.

4. The inhaler of claim 2 or 3, wherein the loading member (61) comprises a sleeve (71) which fits about an outer peripheral surface of the body (23) of the canister (5), an end section (73) at one end of the sleeve (71) which engages the base of the body (23) of the canister (5), and the loading section (75) at the other end of the sleeve (71).

5. The inhaler of claim 4, wherein the sleeve (71) of the loading member (61) extends substantially to the head of the body (23) of the canister (5).

6. The inhaler of any of claims 1 to 5, wherein the drive member (65) extends between opposite sides of the canister (5) and is pivotally mounted at one of the opposite sides of the canister (5), and the actuating member (63) includes an actuating element (83) which is located at the other of the opposite sides of the canister (5) and, on operation of the actuating member (63), acts to engage the drive member (65) such as to effect pivoting of the same.

7. The inhaler of claim 6, wherein the actuating element (83) of the actuating member (63) comprises a flange element.

8. The inhaler of claim 6 or 7 when appendant upon claim 4 or 5, wherein the actuating member (63) is located over the base of the body (23) of the canister (5), and comprises a sleeve (81) which fits about an outer peripheral surface of the sleeve (71) of the loading member (61), the actuating element (83) disposed to one, distal end of the sleeve (81), and an end section (85) at the other end of the sleeve (81) which is acted upon by the user in operating the actuating member (63).

9. The inhaler of any of claims 6 to 8, wherein the drive member (65) comprises at least one drive arm (91a, b) which is coupled at one end to a pivot (47) and engages the loading section (75) of the loading member (61).

10. The inhaler of claim 9, wherein the drive member (65) comprises first and second drive arms (91a, b) which extend from the pivot (47) about opposed sides of the canister (5), such as to engage the loading section (75) of the loading member (61) at the opposed sides of the

canister (5), and a connecting element (95) which interconnects the other, distal ends of the drive arms (91a, b) and is engaged by the actuating element (83) of the actuating member (63).

11. The inhaler of claim 10, wherein the drive arms (91a, b) each include a drive point (97) which engages the loading section (75) of the loading member (61) substantially in a plane which intersects a longitudinal axis of the housing (11).

12. The inhaler of any of claims 1 to 11, wherein the housing (11) includes a nozzle block (31) which receives the valve stem (25) of the canister (5).

13. The inhaler of any of claims 1 to 12, wherein the housing (11) includes an outlet (13) through which the user in use inhales.

14. The inhaler of claim 13, wherein the outlet (13) is a mouthpiece.

15. The actuator of the inhaler of any of claims 1 to 14.

16. An actuator for an inhaler for delivering medicament by inhalation substantially as hereinbefore described with reference to Figures 1 to 4 or Figure 5 of the accompanying drawings.

17. An inhaler for delivering medicament by inhalation substantially as hereinbefore described with reference to Figures 1 to 4 or Figure 5 of the accompanying drawings.

FIG. 1

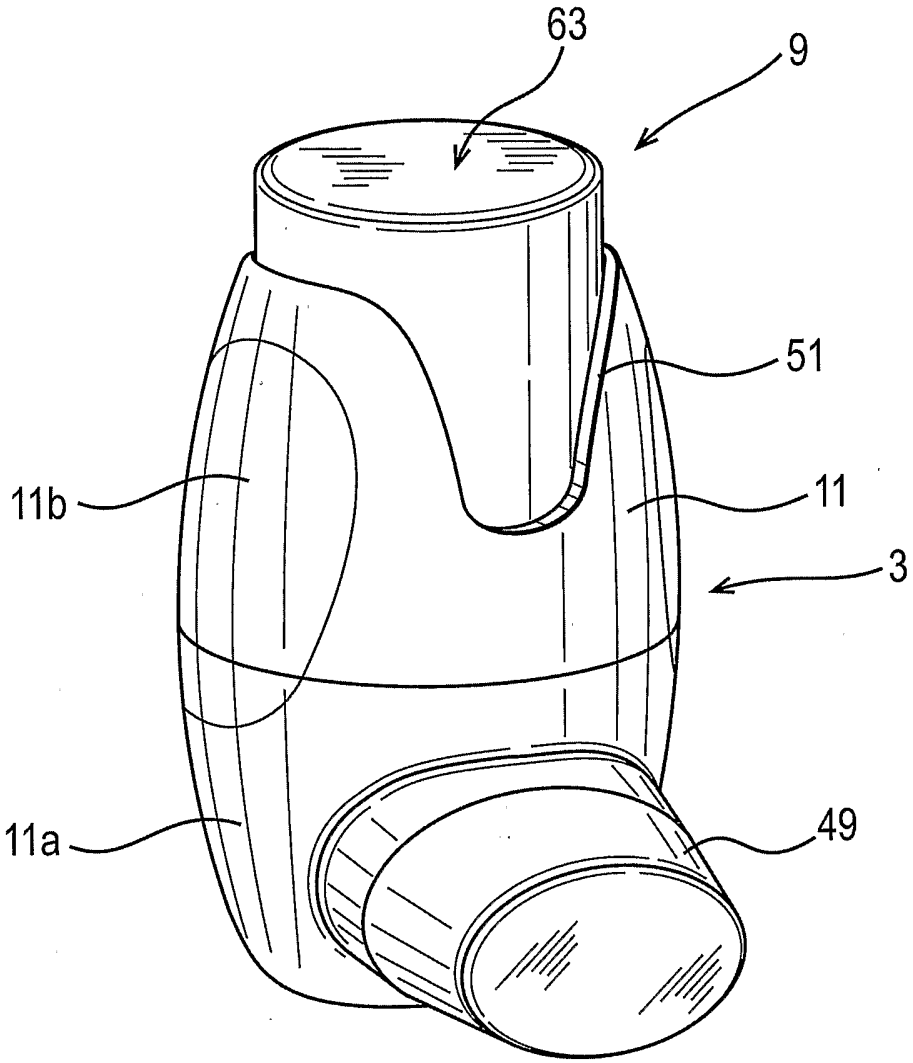


FIG. 2

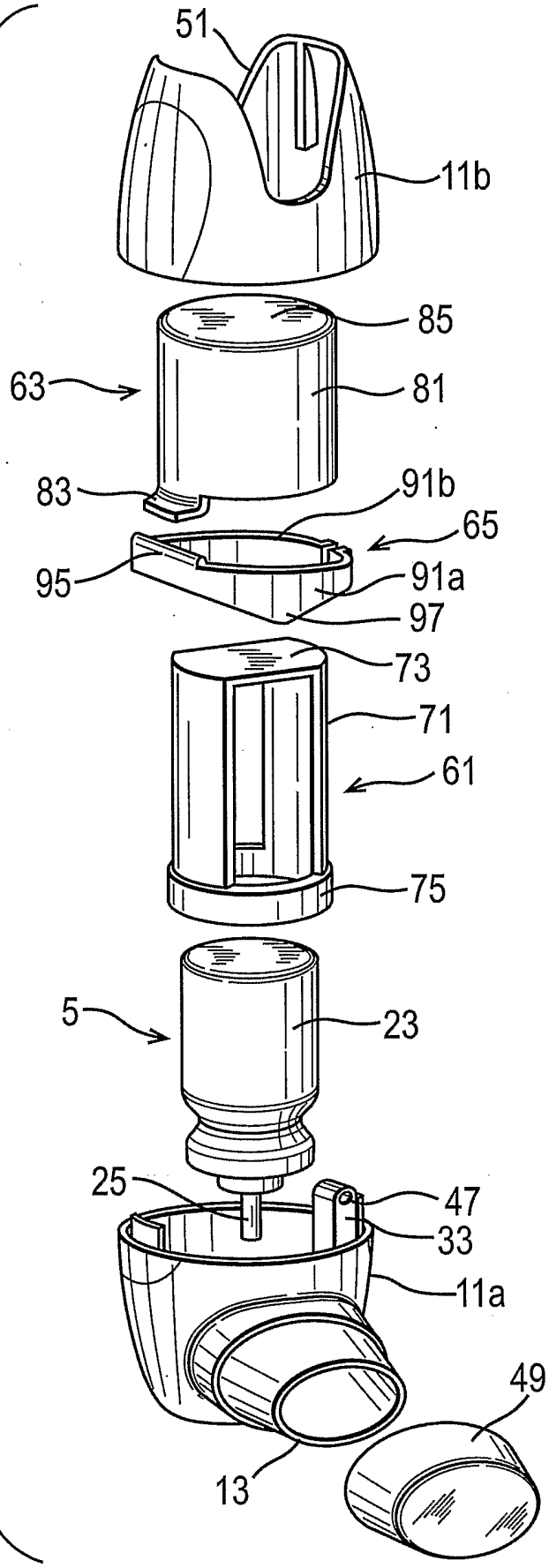


FIG. 3

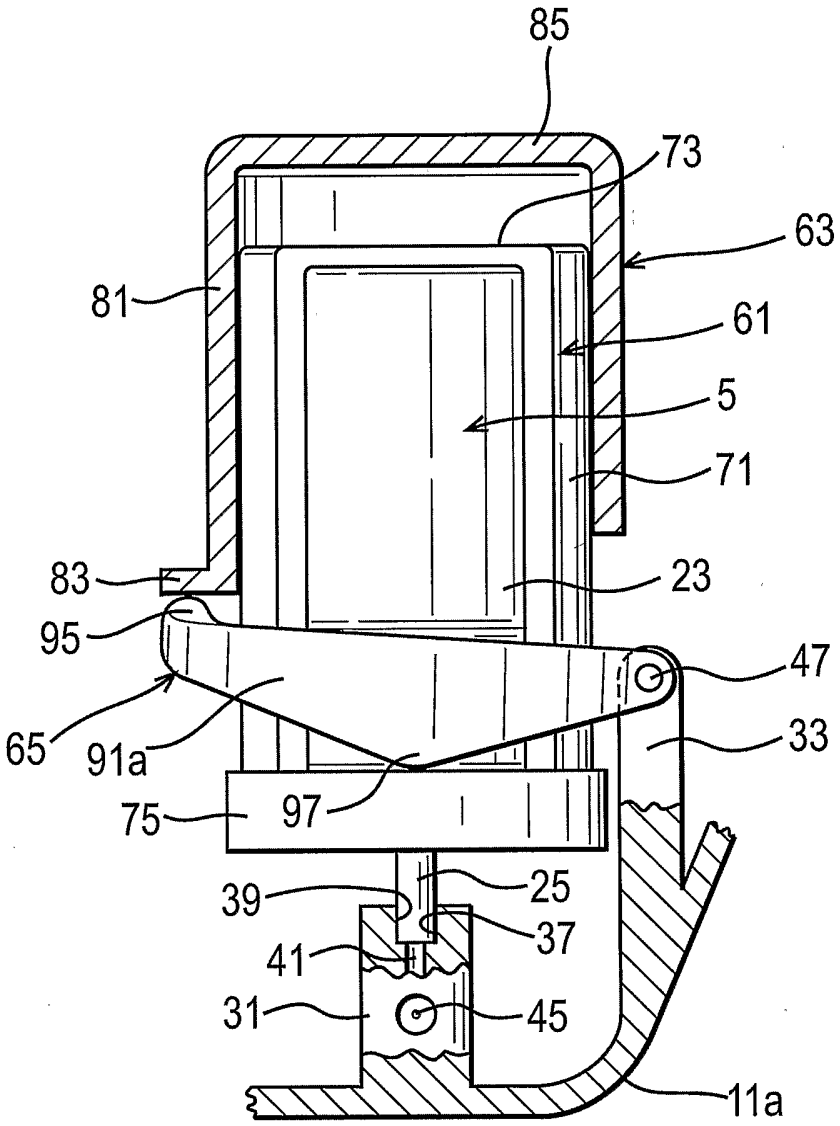


FIG. 4

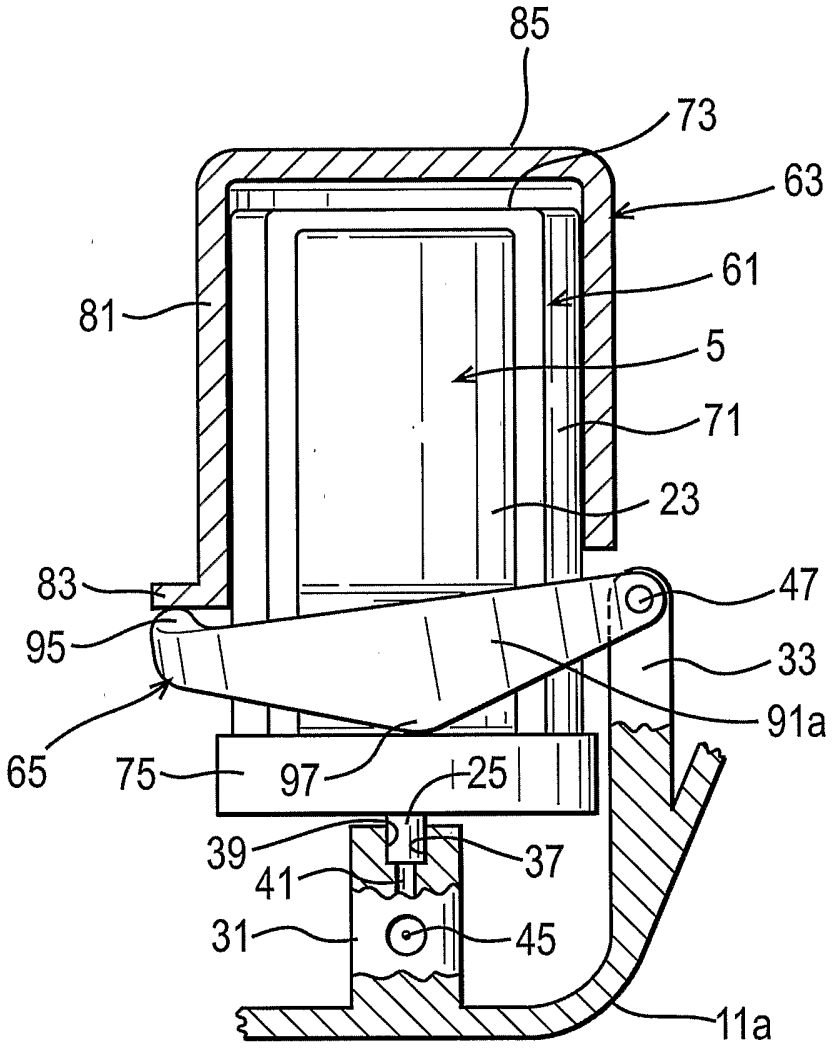


FIG. 5

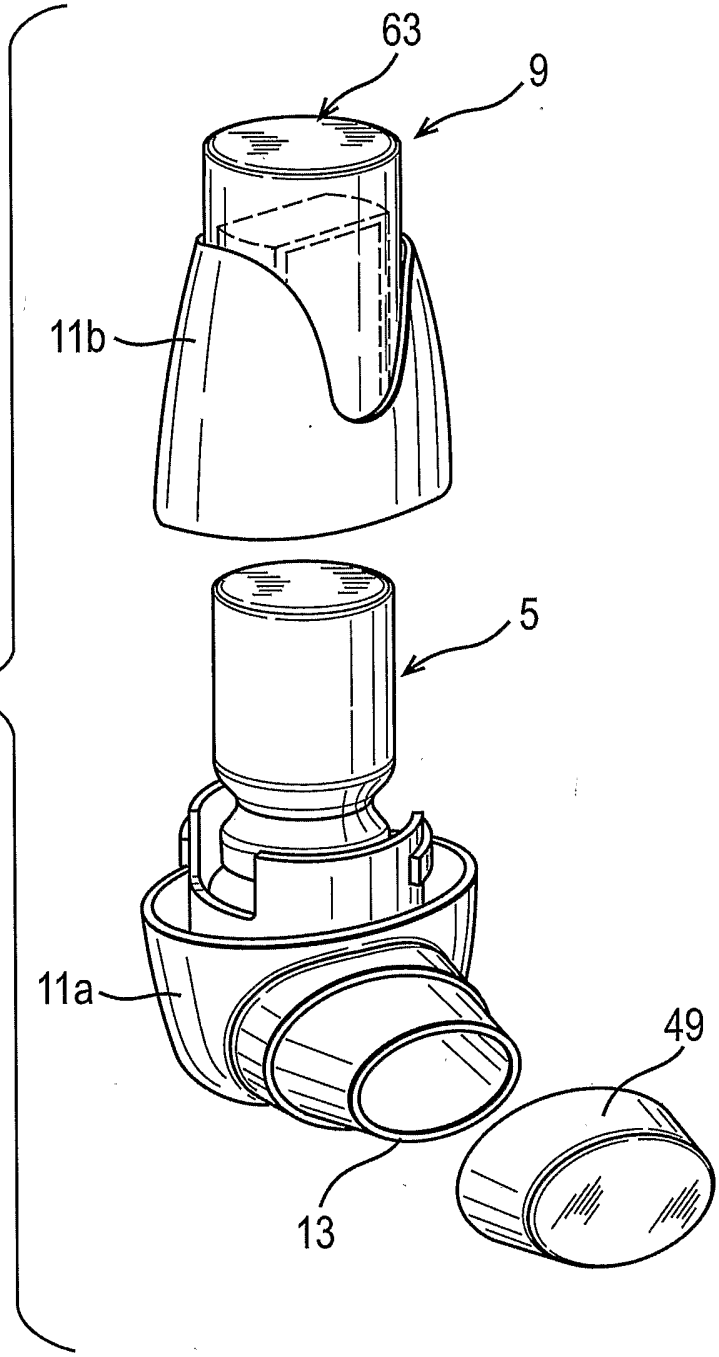
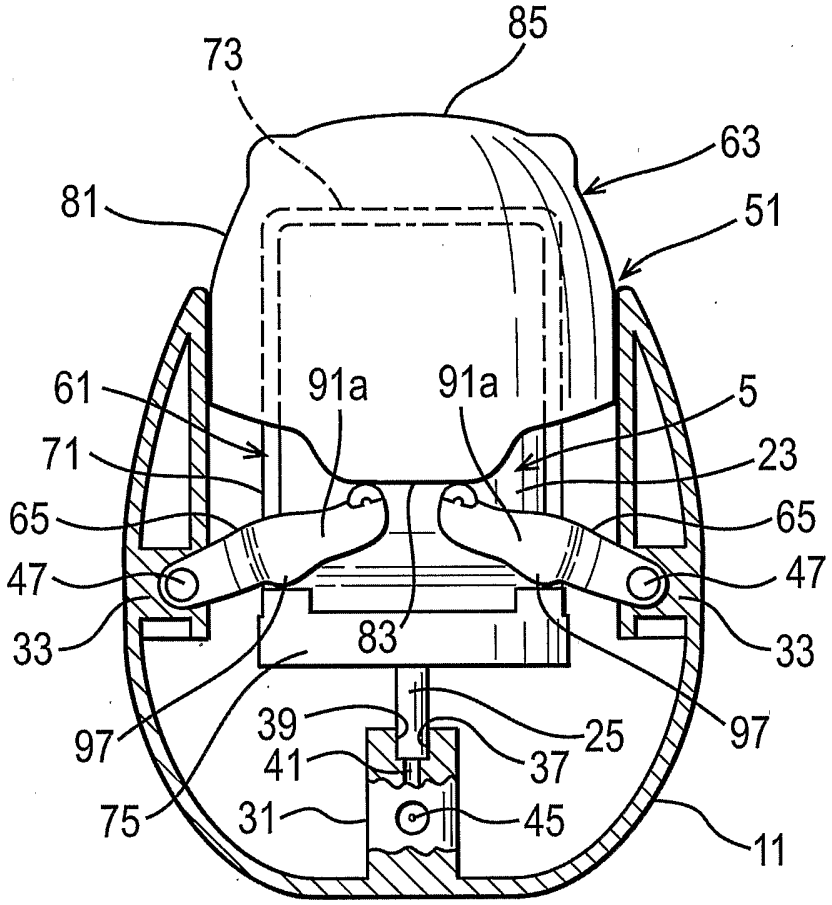


FIG. 6


85
73
63
81
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91a
91a
5
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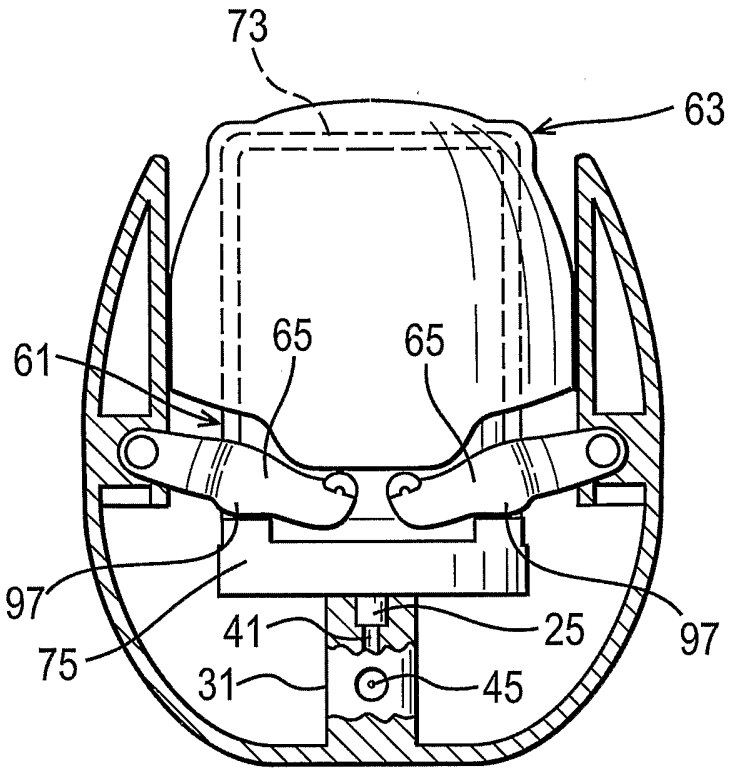
FIG. 7



INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2006/000975

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61M15/00 A61M15/08 B65D83/14 B05B11/00

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)
A61M B65D B05B

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

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/170928 A1 (GRYCHOWSKI JERRY ET AL) 21 November 2002 (2002-11-21) the whole document	1-15
X	WO 2004/012799 A (GLAXO GROUP LIMITED; DAVIES, MICHAEL, BIRSHA) 12 February 2004 (2004-02-12) the whole document	1-15
X	DE 196 10 456 A1 (ING. ERICH PFEIFFER GMBH, 78315 RADOLFZELL, DE) 18 September 1997 (1997-09-18) the whole document	1-15
X	FR 2 812 826 A (VALOIS SA) 15 February 2002 (2002-02-15) the whole document	1-5, 12-15

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 May 2006	24/05/2006

Name and mailing address of the ISA/	Authorized officer
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	Borowski, A

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2006/000975

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 477 233 A (PFEIFFER ERICH GMBH & CO KG [DE]) 17 November 2004 (2004-11-17) paragraphs [0042] - [0049]; figures 4a-4d,6	1-9, 12-15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2006/000975

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.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 16, 17
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:
see FURTHER INFORMATION sheet PCT/ISA/210

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.

Continuation of Box II.2

Claims Nos.: 16,17

Claims 16 and 17 contain references to the description and the drawings and are unclear (Article 6 PCT) to such an extent that a meaningful search is not possible.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2006/000975

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002170928 A1	21-11-2002	WO 02096490 A2	05-12-2002
WO 2004012799 A	12-02-2004	AU 2003253367 A1	23-02-2004
		BR 0312230 A	12-04-2005
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		CN 1671434 A	21-09-2005
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		JP 2005534392 T	17-11-2005
		MX PA05000821 A	19-04-2005
		US 2005258191 A1	24-11-2005
DE 19610456 A1	18-09-1997	NONE	
FR 2812826 A	15-02-2002	NONE	
EP 1477233 A	17-11-2004	DE 20122164 U1	24-06-2004