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<p>(54) Title: INHALER FOR MULTIPLE USE</p>		
<p>The drawing is a cross-sectional view of a mechanical inhaler assembly. It features a central gear mechanism with multiple gears of different sizes and teeth. A large gear (10) is on the left, and a smaller gear (12) is in the center. A vertical shaft (8) passes through the center, with a piston-like component (9) at the top. Various other components are labeled with numbers: 1, 2, 3, 4, 5, 6, 7, 11, 13, 14, 16, 17, 18, 19, 20, 21, 23, 24, 33, 36, 37, 38. The entire assembly is housed within a rectangular frame (11).</p>		

(57) Abstract

The invention relates to an inhaler for multiple use for a medicament in powdered form to be used in conjunction with an elongate carrier (2) carrying discrete doses of said medicament. Said elongate carrier comprises a carrier body (3) being provided with equidistant depressions or cavities (5) containing said doses and a peelable cover strip (4) covering and enclosing said discrete doses. The inhaler comprises a housing (1), an air inlet (6), a powder dispensing station (7) and an air outlet (8), said inlet (6), said outlet (8) and said dispensing station (7) being interconnected by an air conduit (37) for inhaling. The inhaler further comprises displacing means (15) for moving said elongate carrier (2) so as to successively locate a discrete dose in said dispensing station (7). Said displacing means (15) is arranged to act on the peelable strip (4), in this way both moving the elongate carrier (2) into and exposing each discrete dose in the dispensing station (7), a separate indexing means (20) being provided sensing or measuring and, as necessary, blocking the movement of the carrier (2) in order to ensure that each cavity (5) containing a dose is positioned and held correctly in the dispensing station (7) upon actuation of said displacing means (15).

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Inhaler for multiple use**Technical field of the invention**

The present invention relates to an inhaler for multiple use for a medicament in powdered form to be used in conjunction with an elongate carrier carrying discrete doses of said medicament, said elongated carrier comprising a carrier body and a peelable cover strip covering and enclosing said discrete doses, said inhaler comprising a housing, an air inlet, a powder dispensing station and an air outlet, said inlet, said outlet and said dispensing station being interconnected by an air conduit for inhaling, said inhaler further comprising displacing means for moving said elongate carrier so as to successively locate a discrete dose in said dispensing station and means for separating said peelable cover strip from said carrier body in connection with said dispensing station.

Background to the invention.

An inhaler of the above general kind has several advantages in comparison to standard multiple powder inhalers containing a large number of doses in a store for the powdered drug from which the powder is fed to a dispensing station.

The drug thus can be protected against moisture in a simple and efficient way since each individual dose of the drug can be tightly enclosed and sealed between the cover strip and the elongate carrier. The utilization of the drug is high since there is no store that may have to be overfilled to ensure definitely that there is drug available as long as the dose counter indicates there should be. The number of doses can be varied in a simple way by cutting different lengths from a

continuous elongate carrier. It is easy to arrange a simple counting device indicating the number of doses used or remaining. A simple indication that all doses have been used up may be obtained merely by the fact that the carrier is used up, which is easy to determine. The device may finally also be designed to be reusable several times which would make the device cheap in use, since it is easy for the patient to refill the device in a safe way without any risk for exposing the drug to for instance moisture.

A further advantage of using an elongate carrier is that the counting device may be dispensed with entirely if each dose is numbered, i. e. a numeral is assigned to each dosis, the numerals being consecutively visible through an opening in the housing. Preferably the doses are numbered backwards with the highest numeral assigned to the first dose. In this way a simple way of indicating the number of doses remaining may be obtained without any need for a counting mechanism.

An inhaler of the kind as described in the introduction above and in the preamble of the main claim is for instance disclosed in GB-A-2 242 134. This prior art device utilizes the depressions or cavities in an elongated carrier in cooperation with indexing or registering means in order to control that the depressions containing the doses are positioned correctly in the dispensing station. In one embodiment the device is provided with a spool taking up the cover strip (the indexing means are here engaging the depressions which are used to move the carrier). However, since the diameter of the spool taking up the cover strip will vary in dependence of the amount of strip wound on the spool, the winding speed of the cover strip consequently also will vary, whereas the movement of the carrier will not. To compensate for

this, the spool taking up the cover strip has been provided with a rather complicated friction coupling allowing the take-up spool to slip in relation to the movement of the elongated carrier.

5

In an alternative embodiment which is suggested, but not described in detail, the distances between the depressions in the elongate carrier have been varied in order to compensate for the above effect, which however complicates the manufacturing and filling process for the elongate carrier. Further, the number of doses can for instance not easily be varied by cutting a long prefabricated carrier part into pieces having different lengths.

15

In both cases the elongate carrier (and the depressions in particular) must be comparatively stiff to permit the use of the depressions as actuating means in conjunction with indexing or registering means. This may be undesirable in some applications. The use of the depressions in combination with the indexing means also results in limitations on the size of the depressions since the depressions, apart from the stiffness mentioned above, also have to have a minimum size in order not to slip through the indexing or registering means. This means that the doses also have to have a minimum size.

Some other related prior art devices are disclosed in for instance WO 90/13327, WO 90/13328, and EP-A1-0 469 814.

30

Brief description of the inventive concept.

35 The object of the invention is to obtain an inhaler of the kind described introductorily which also allows the use of carriers having small cavities or depressions

containing small doses of highly potent drugs and which, if necessary, may be made of a material which is sufficiently flexible to be deformed to some extent in the dispensing station in order to facilitate the
5 ejection of the powdered drug from the depression before or during inhalation. A further object of the invention is to provide an inhaler for multiple doses which has a simple construction and which is cheap to produce.

10

This is achieved in that said discrete dosers are located equidistantly along the carrier, in that displacing means is arranged to act on the peelable cover strip or alternatively on the carrier body, in
15 this way both moving the elongated carrier into and exposing each discrete dose in the dispensing station, a separate indexing means being provided sensing or measuring and, as necessary, blocking the movement of the carrier in order to ensure that each depression
20 containing a dose is positioned and held correctly in the dispensing station upon actuation of said displacing means *as described in the characterising portion of claim 1.*

25

Further preferred embodiments of the invention are described in the dependent claims.

Short description of the appended drawings.

30

Fig 1 is a schematic drawing of a preferred embodiment showing the basic principles of the inhaler,

35

Figs 2 - 5 are schematic drawings of a preferred embodiment showing the basic principles of the means for determining the length of the movement of the carrier and holding for blocking the carrier in a correct position in the dispensing station upon

actuation.

Detailed description of a preferred embodiment of the invention

5

It should be noted that all terms used below relating to the exact orientation in the appended drawings, such as "upper", "lower", "clockwise" etc only relate to the drawings as such and are not to be construed as
10 limiting the scope of the invention.

As can be seen in Fig 1, the inhaler in a preferred embodiment comprises a housing 1 with a mouth-piece 9. An air inlet 6 is connected to an air outlet 8 via a
15 dispensing station 7 by means of an air conduit 37. An elongated carrier 2 carrying the doses of the drug comprises a lower tape 3 provided with depressions or cavities 5 containing the drug and a continuous peelable cover strip 4 sealing the cavities. The
20 peelable strip 4 is separated from the lower tape 3 at the dispensing station 7, thus exposing the drug in any cavity located in the dispensing station. The dispensing station 7 is formed as a constriction in the air conduit 37, the lower tape 3 forming one of the
25 walls of the constriction. In the drawing can be seen how a cavity 5 is located centrally in the dispensing station 7.

The cover strip 4 is guided away from the lower tape 3
30 by means of a guide roller 18 located just before the dispensing station 7 and is wound onto a first take-up spool 15 fixedly attached to an actuating wheel 12 partly extending outside the housing 1. The spool 15 and the actuating wheel are rotatably supported on a
35 common axis 17 supported in the housing 1. The periphery of the actuating wheel 12 is provided with teeth 13, which may serve a double function, namely to

enhance the grip when the wheel is actuated manually
(in an embodiment in which the periphery of the wheel
extends outside the housing) and to cooperate with a
double pawl 22 in a manner to be described more in
5 detail below in connection with Figs 2 - 5.

The lower tape 3 is guided onto a second take-up spool
11 by means of a second guide roller 19 located after
the dispensing station 7. The second take-up spool 11
10 is driven by the first take-up spool 15 by means of a
belt 36 which for instance may be made of rubber. This
belt will serve as a cheap and simple friction coupling
compensating for any differences in the respective
winding speeds of the lower tape 3 and the cover strip
15 4. Normally there should not be any great differences
in the winding speeds provided that the thickness of
the lower tape and the thickness of the cover strip are
more or less equal and that the two take-up spools have
the same diameter and provided that any influence from
20 the cavities in the carrier can be disregarded.

The two guide rollers 18, 19 also serve to orient and
align the lower tape 3 correctly in the dispensing
station 7. Since the dispensing station 7 is designed
25 as a constriction in the air conduit 37, the air
respired through the air conduit will move rapidly and
turbulently across the mouth of the cavity in the lower
tape, thus lifting the dose of powdered drug out from
the cavity.

30 The airstream will move the powdered dose up along the
air conduit 37 to the mouth-piece 9. The air conduit 37
and/or the mouth-piece 9 is provided with deaggregation
means 38 to break up any aggregates that could have
35 been created in the powder formed dose. Upon impact
the medicament with powder aggregates will break up
into a finely divided medicament having a high amount

of particles having a size within the respiratory range, that is smaller than 10 μm , preferably smaller than 5 μm .

5 The construction form and size of the deaggregation means can be varied but preferably they can have a form of deflector devices as described in EP-B-237 507, or
comprise planar impaction surfaces as described in WO
92/04069 or any other suitable form which provides a
10 deaggregating effect. The deaggregation means could be provided in the air conduit 37 and/or in the mouth-piece 9 as shown in fig. 1.

If a fresh tape is to be mounted in the inhaler, the
15 free end of the cover strip 4 is firmly attached to the take-up spool 17 and the free end of the lower tape 3 is attached to the take-up spool 11.

The carrier 2 is stored on and unwound from a third
20 spool 10 which may be replaceable.

The carrier 2 further is provided with equidistant perforations (not shown) which preferably are located along the longitudinal edges of the carrier. These
25 perforations are intended to engage sprockets 21 on a sprocket wheel 20 which is rotatably journaled in the housing 1 such that the sprocket wheel 20 rotates with the carrier 2 when the carrier 2 is displaced longitudinally. A ratchet wheel 23 provided with
30 recesses 25 and a cog wheel 24 provided with recesses 26 further are attached coaxially and rigidly with the sprocket wheel 20 so as to co-rotate therewith. The cog wheel 24 serves to actuate a counting device in the shape of a cog wheel 16 provided with a scale visible
35 through an aperture in the housing (not shown) and serves additionally as a cam for a purpose which will be described more in detail below.

Figs 2 - 5 illustrate the functional details of the indexing means and particularly some details not shown in Fig 1.

5 These drawings thus show the carrier 2 with the lower tape 3, the depressions 5 and the cover strip 4, the sprocket wheel 20 with the sprockets 21, the ratchet wheel 23, the cog wheel 24, the guide roller 18, the double pawl 22, the actuating wheel 12 with the teeth
10 13 and the take-up spool 13, and the trigger 14.

The drawings further show how the double pawl 22 is provided with a first pawl 27 cooperating with the ratchet wheel 23 and a second pawl 28 cooperating with
15 the teeth 13 of the actuating wheel 12. The first and the second pawl are fixedly attached relative to each other. The double pawl 22 is carried swingably on an axle 30 and is provided with a eccentric shoulder 29 cooperating with the trigger 14.

20 The indexing means further is provided with a detent 32 cooperating with a shoulder 34 on the second pawl 28. The shoulder 34 has an upper and a lower surface for engagement with the detent 32. The upper surface is
25 oriented generally in parallel with the longitudinal extent of the detent 32. The lower surface, however, is oriented generally perpendicularly to the upper surface.

30 A cam follower 31 cooperating with the cog wheel 24 is fixedly attached relative to the detent 32. The detent and the follower are rotatably carried on an axle 35. The detent and follower are spring-biased in a counter-clockwise direction whereas the double pawl is spring-
35 biased in a clockwise direction. The trigger 14 is spring-loaded by a spring 33 biasing the trigger outwardly from the housing 1.

Fig 2 illustrates the initial position of the indexing means, before a cavity containing a new dose is moved into the dispensing station. In this position the trigger 14 rests on the shoulder 29. The pawl 28 is in engagement with the teeth 13 by which means the actuating wheel 12 is blocked. The pawl 27 is further in engagement with the ratchet wheel 23 by which means the sprocket wheel 20 is blocked. Consequently the carrier 2 is blocked. The detent 32 finally rests upon the upper surface of the shoulder 34, thus keeping the cam follower out of engagement with the cog wheel or cam 24.

When the inhaler is to be used, a cavity containing a new dose of the powdered drug normally is moved into the dispensing station. In order to free the wheels 13 and 20 and to allow this movement of the carrier, the trigger 14 is depressed against the action of the spring 33 as shown in Fig 3. The trigger acts on and displaces the shoulder 29 causing the double pawl 22 to swing counter-clockwise against the spring bias. By this means the second pawl 28 is disengaged from the teeth 13 of the actuating wheel 12 and the first pawl 27 is disengaged from the recesses 25 on the ratchet wheel 23. The detent 32 slides off the upper surface of the shoulder 34 under the influence of the spring bias and swings slightly counterclockwise such that its end rests against the lower surface of the shoulder 34, thus preventing the double pawl 22 from swinging clockwise, thereby keeping both pawls 27 and 28 disengaged from their respective wheels. As a result of the above movement of the detent 32, the cam follower 31 will swing into one of the recesses 26 of the cog or cam wheel 24.

35

It should be noted that the recesses 26 on the wheel 24 are oriented such relative to the recesses 25 on the

ratchet wheel 23 that the cam follower 31 can swing into a recess 26 when the pawl 27 can engage a recess 25. Both the actuating wheel 12 and the sprocket wheel 20 now are free to rotate.

5

Fig 4 illustrates what happens when the actuating wheel is rotated in order to move a new dose of the drug into the dispensing station.

10

Since the cover strip 4 is firmly attached to the spool 15, a rotation of the actuating wheel 12 will result in that the cover strip is wound onto the spool 15, thus pulling the carrier 2 and the lower tape 3 forward through the inhaler. This forward movement is however only possible as long as the sprocket wheel 23 and the take-up spool 15 remain free to rotate. The lower tape 3 will be wound onto the spool 11 since the spool 11 is driven by the actuating wheel 12 via the spool 15 and the belt 36.

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The cam follower 31 will swing clockwise under the influence of the teeth on the cog wheel 24 which in this instance serve as cams. This will force the detent 32 out of engagement with the lower surface of the shoulder 34 to slide on to the upper surface of the shoulder, thus freeing the double pawl 22. When the detent 32 rests on the upper surface of the shoulder 34, the cam follower 31 will return to its original position, out of engagement with the cog or cam wheel 24.

25

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The double pawl 22 can however not swing back and block the respective wheels 12 and 23 since the pawl 27 now slides upon the outer periphery of the ratchet wheel between two adjacent recesses 25. The actuating wheel thus can be rotated until the pawl 27 engages the next recess 25 on the periphery of the ratchet wheel 23.

When the pawl 27 again engages a recess 25 on the ratchet wheel 23, the component parts of the indexing means have returned to its original state before the actuation of the trigger, as can be seen in Fig 5.

5

The angular distance between the recesses 25 is chosen such that this rotation of the ratchet wheel 23 corresponds to an angular movement of the sprocket wheel 20 corresponding exactly to the distance between two adjacent depressions or cavities. In this way it is ensured that a cavity containing a fresh, exposed dose of the powdered drug replaces the cavity previously being located in the dispensing station, irrespective of whether the dose contained in that cavity has been used or not (if a dose has been left exposed in the dispensing station for some time, a new dose preferably should be used), and the inhaler is ready for inhalation.

20

A clear indication that all doses of drug are used up and that the inhaler is empty is obtained by the fact that the actuating wheel will rotate freely as soon as the end of the carrier 2 has left the sprocket wheel 20. This is due to the fact that the sprocket wheel 20 together with the ratchet wheel 23 will not rotate with the actuating wheel when the carrier has left the sprocket wheel. This results in that the indexing means will remain in the state shown in Fig 3 after the depression of the trigger 14, in which state the actuating wheel is freely rotatable, since the cam follower 35 will not disengage the detent 32 from the lower surface of the shoulder 34 and the pawl 28 will remain disengaged from the actuating wheel.

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Since the cover strip 4 is used to pull the carrier 2 through the inhaler and the lower tape 3 serves no other purpose than to form sealable containers or

cavities for each individual dose of the drug, the design of, the dimensions of and the choice of materials in the lower tape 3 and the cavities can be varied so as to optimize the release of the powdered drug from the cavities into the air stream.

The cavities thus for instance may be designed to be relatively shallow which may facilitate the release of the drug. The thickness or the material of the tape can be chosen such that the walls, particularly the bottom in the cavities is flexible enough to allow the cavities to be deformed or flexed as a consequence of the subpressure obtained at the mouths of the cavities when the accelerated airstream in the constriction sweeps past the mouths. This flexing may aid in breaking up the powder in the cavities, thus facilitating the release of the powder into the airstream. The movement of the bottom may even be strong enough to literally eject the powder from the cavities.

It would also be possible to deform the cavities mechanically by placing the lower tape under tension over an even surface or shoulder in the area of the constriction, the surface pushing the bottom of the cavities upwardly in the dispensing station when the tape is pulled over the surface. By these means the power would be more or less pushed into the airstream.

30 Possible modifications of the inhaler

The inhaler of course can be modified in many ways within the scope of the attached claims.

35 Thus the indexing means in the embodiment illustrated comprise a sprocket wheel for engagement with perforations in the tape. This sprocket wheel is

illustrated as being located before the place of separation of the lower tape and the cover strip. The sprocket wheel may however be located after the place of separation and after the dispensing station, engaging the lower tape only or the cover strip only. This may for instance have advantages in regard of the design of the inhaler. However, in some embodiments the carrier might have to be relatively strong in order not to be deformed against the sprocket wheel under the influence of the pulling action when the sprocket wheel is blocked after a forward movement of the carrier, since such deformation may result in an incorrect positioning of a cavity in the dispensing station. Depending on the respective materials used, it may normally be preferable to locate the sprocket wheel before the place of separation as illustrated in the preferred embodiment, in this way utilizing the combined strength of the lower tape and the cover strip.

In this context it should however be noted that the carrier does not risk being deformed in the preferred embodiment illustrated above, since the sprocket wheel and the take-up spool for the cover strip are locked simultaneously at the end of an intermittent movement of the carrier.

However, if the sprocket wheel is not locked at the end of each intermittent movement, it may be advisable to provide a friction brake or an equivalent thereof acting on the sprocket wheel or on the carrier before the dispensing station in order to counteract any forces transmitted from the take-up spool to the elongate carrier, thus preventing the carrier to move after the end of the intermittent movement under the action of these forces, in order to ensure that the cavity always is located correctly in the dispensing

station.

5 It is of course not necessary that indexing wheel, as for instance the sprocket wheel, is locked at the end of each movement of the carrier. It would in principle be sufficient if the indexing wheel merely activated the mechanism for locking the take-up spool in a distinct and secure manner.

10 It may also be possible to use a friction roller or wheel, which for instance may be knurled, engaging the carrier as an indexing means. This roller should cooperate with a second roller also preferably having a frictional surface, the carrier being held between the
15 two rollers. Depending on the circumstances, one or both of the two rollers may be locked after a predetermined angle of rotation in order to aid in blocking the movement of the carrier when a new or fresh dose of the medicament has been introduced into
20 the dispensing station.

The elongate carrier may also be mounted on a storage roll in an exchangeable cassette, the free end of the carrier being attached to a take up spool, also located
25 in the cassette.

CLAIMS:

1. Inhaler for multiple use for a medicament in powdered form to be used in conjunction with an elongate carrier (2) carrying discrete doses of said medicament said elongate carrier comprising a carrier body (3) and a peelable cover strip (4) covering and enclosing said discrete doses, said inhaler comprising a housing (1), an air inlet (6), a powder dispensing station (7) and an air outlet (8), said inlet (6), said outlet (8) and said dispensing station (7) being interconnected by an air conduit (37) for inhaling, said inhaler further comprising displacing means (15) for moving said elongate carrier (2) so as to successively locate a discrete dose in said dispensing station (7) and means for separating said peelable cover strip from said carrier body in connection with the dispensing station, characterized in that said discrete doses are located equidistantly along the carrier, that displacing means (15) is arranged to act on the peelable strip (4) or alternatively on the carrier body (3), in this way both moving the elongate carrier (2) into and exposing each discrete dose in the dispensing station (7), a separate indexing means (20) being provided which senses or measures and, as necessary, blocks the movement of the carrier (2) in order to ensure that each cavity (5) containing a dose is positioned and held correctly in the dispensing station (7) upon actuation of said displacing means (15).

2. Inhaler according to claim 1, characterized in that said carrier body is provided with equidistant depressions or cavities (5) containing said doses.

3. Inhaler according to claim 1 or 2,
c h a r a c t e r i z e d in that said indexing means
comprises a wheel (20) engaging the carrier (2), said
wheel being locked against rotation after a
5 predetermined angle of rotation.

4. Inhaler according to claim 1 or 2,
c h a r a c t e r i z e d in that said indexing means
comprises a wheel (20) engaging the carrier (2), said
10 wheel actuating a locking mechanism (22, 28, 29)
locking said displacing means (15) after a
predetermined angle of rotation of said wheel.

5. Inhaler according to claim 3,
15 c h a r a c t e r i z e d in that said wheel (20) is a
sprocket wheel provided with sprockets (21) engaging
perforations in said carrier (2).

6. Inhaler according to claim 3,
20 c h a r a c t e r i z e d in that said wheel (20) is a
roller or wheel having a surface with a high friction
which engages the carrier (2).

7. Inhaler according to any one of the preceding
25 claims, c h a r a c t e r i z e d in that the
displacing means is in the form of a take-up spool (15)
which can be rotated by means of an actuating wheel
(12).

30 8. Inhaler according to claim 6,
c h a r a c t e r i z e d in that the take-up spool
(15) can be locked by means of a first ratchet
mechanism (13, 28), preferably engaging the actuating
wheel (12), which is activated by the wheel (20) after
35 a predetermined angle of rotation of the wheel (20) and
which can be disengaged by means of a trigger means

(14, 33) and which again will engage said actuating wheel after said predetermined angle of rotation.

9. Inhaler according to claim 7,

5 c h a r a c t e r i z e d in that said wheel (20) comprises a cam-and-follower mechanism (25, 31) activating said first ratchet mechanism.

10. Inhaler according to any one of the preceding

10 c l a i m s , c h a r a c t e r i z e d in that the angle of rotation of the wheel (20) is determined by a second ratchet mechanism (23, 24, 27) engaging the wheel, which also can be disengaged by said trigger means (14, 33) and which then again engages the wheel after said
15 p r e d e t e r m i n e d angle of rotation.

11. Inhaler according to any one of claims 3 - 10,

20 c h a r a c t e r i z e d in that said indexing wheel (20) is associated with a cog wheel (24) engaging teeth on a counting disc (16) carrying a consecutive series of numerals, each numeral corresponding to one or a predetermined group of the doses on the carrier, the counting disc thus being intermittently rotated
25 s y n c h r o n o u s l y with each intermittent movement of said carrier, said housing being provided with an opening or window through which the numerals can be seen consecutively.

12. Inhaler according to any one of claims 1 - 10,

30 c h a r a c t e r i z e d in that a series of numerals are consecutively assigned to the doses, one numeral for each dose cavity or a predetermined group of cavities, said numerals being located on said carrier and being consecutively visible through a window or
35 o p e n i n g in the housing concurrently with the displacements of the carrier.

13. Inhaler according to claim 9,
c h a r a c t e r i z e d in that the doses are
numbered backwards, i. e. that the highest numeral is
assigned to the first dose cavity.

5

14. Inhaler according to claim 1,
c h a r a c t e r i z e d in that there is provided a
mouth-piece 9 through which the airstream is inhaled
during inhalation.

10

15. Inhaler according to claim 1 and 14,
c h a r a c t e r i z e d in that deaggregation means
38 are provided in the air conduit and/or the mouth-
piece 9.

15

16. Use of an inhaler according to claim 1 for
inhalation of a finely divided powdered medicament.

20

17. Method of dispensing a finely divided powdered
medicament using an inhaler according to claim 1.

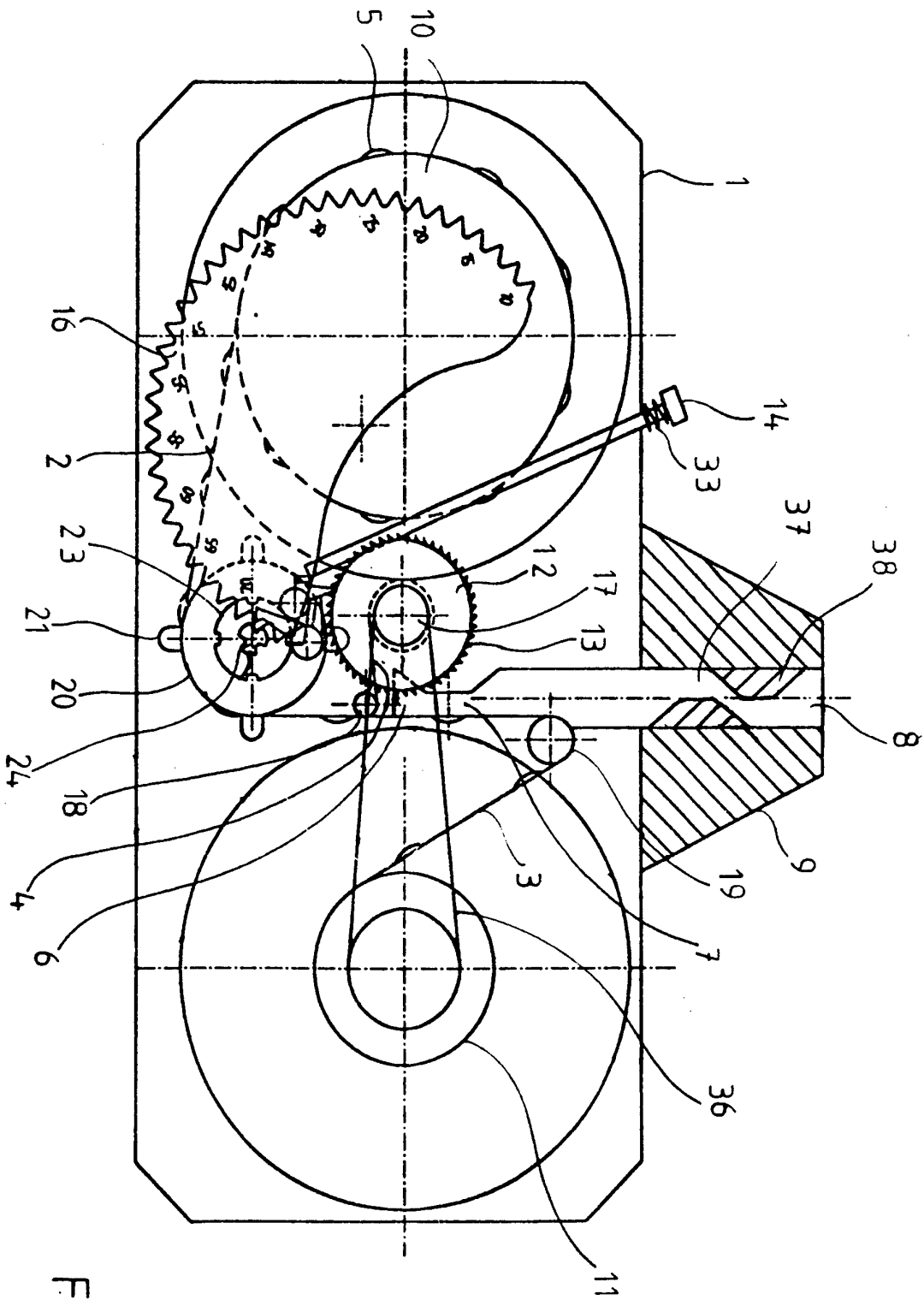


FIG. 1

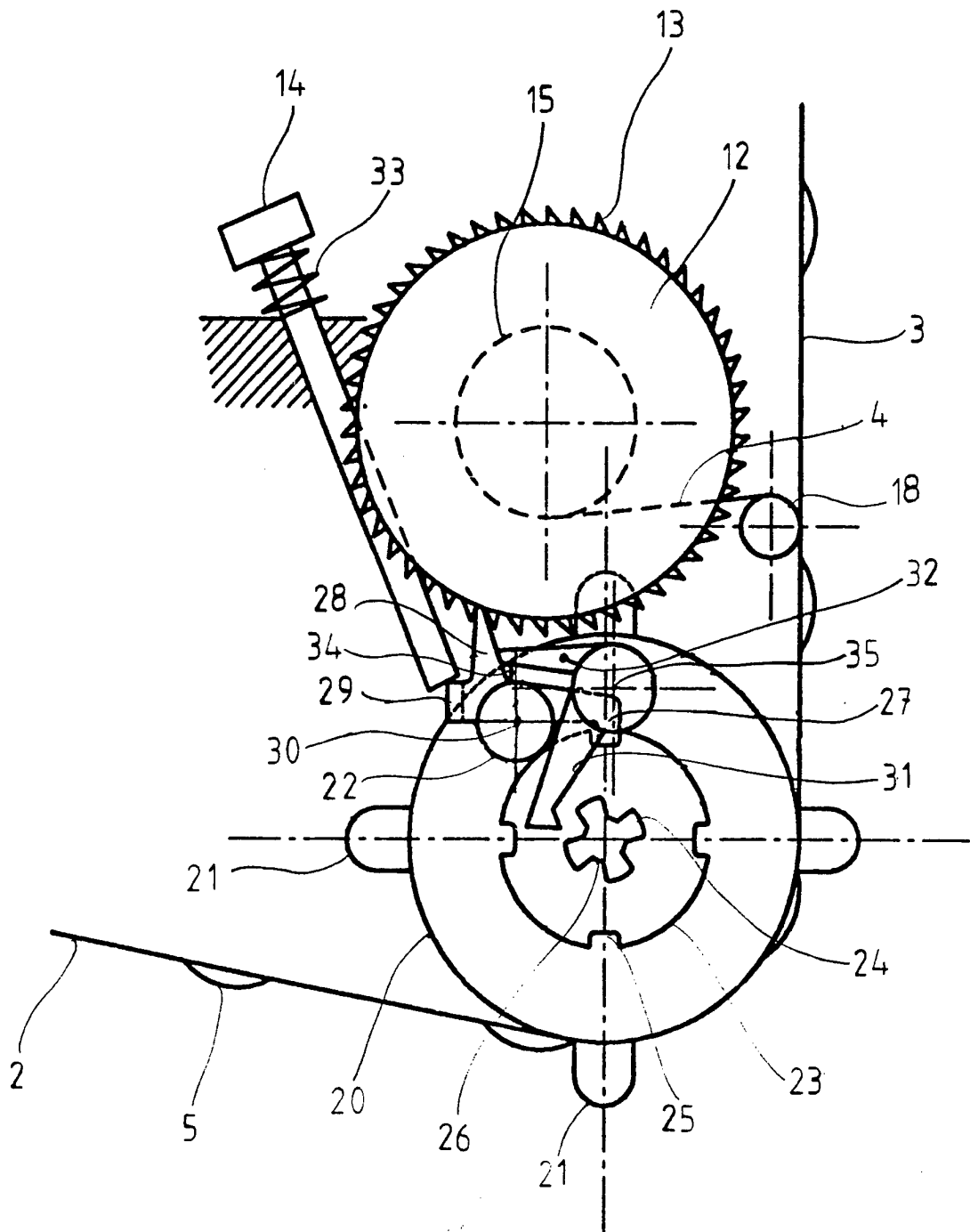


FIG. 2

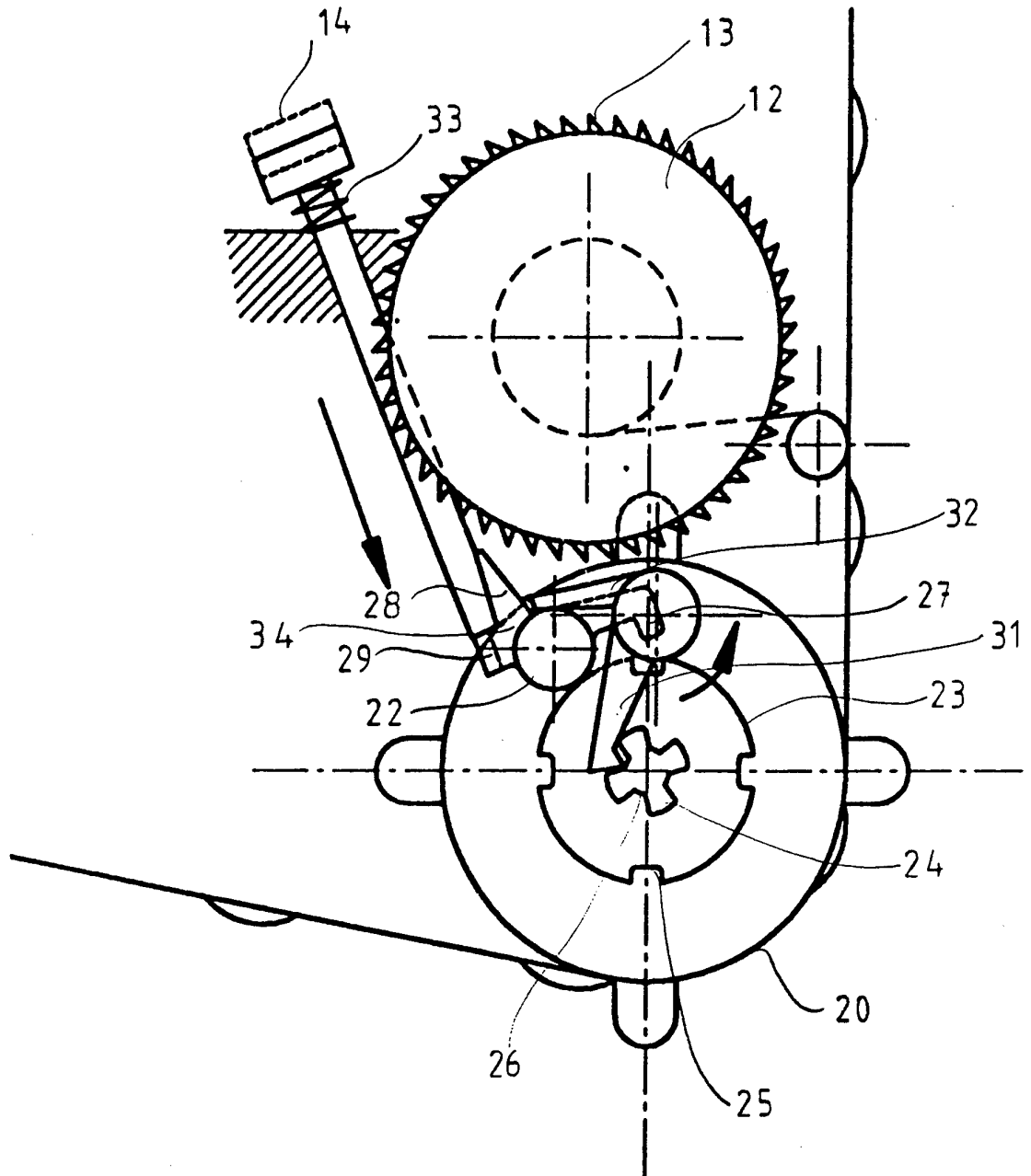


FIG. 3

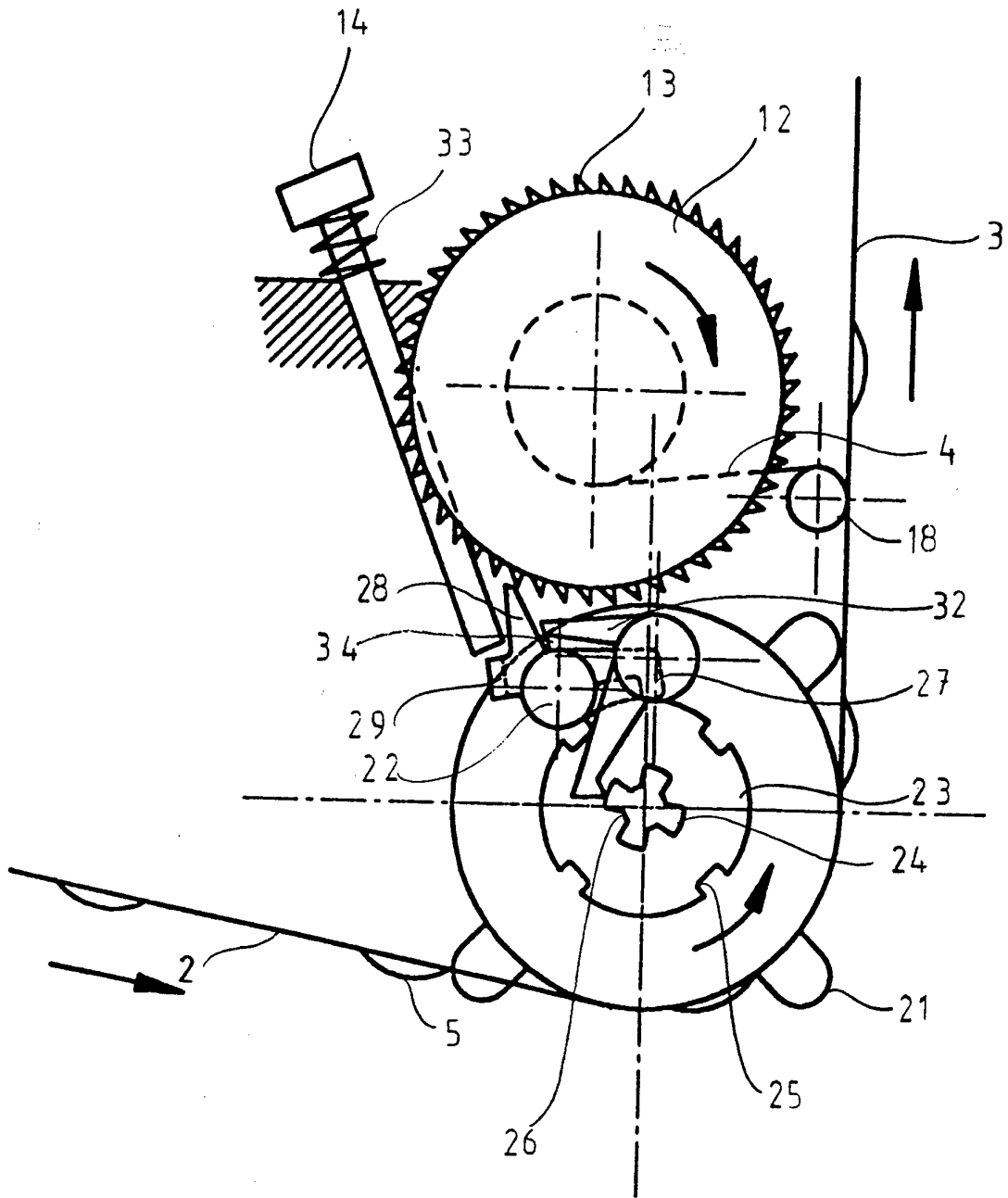


FIG. 4

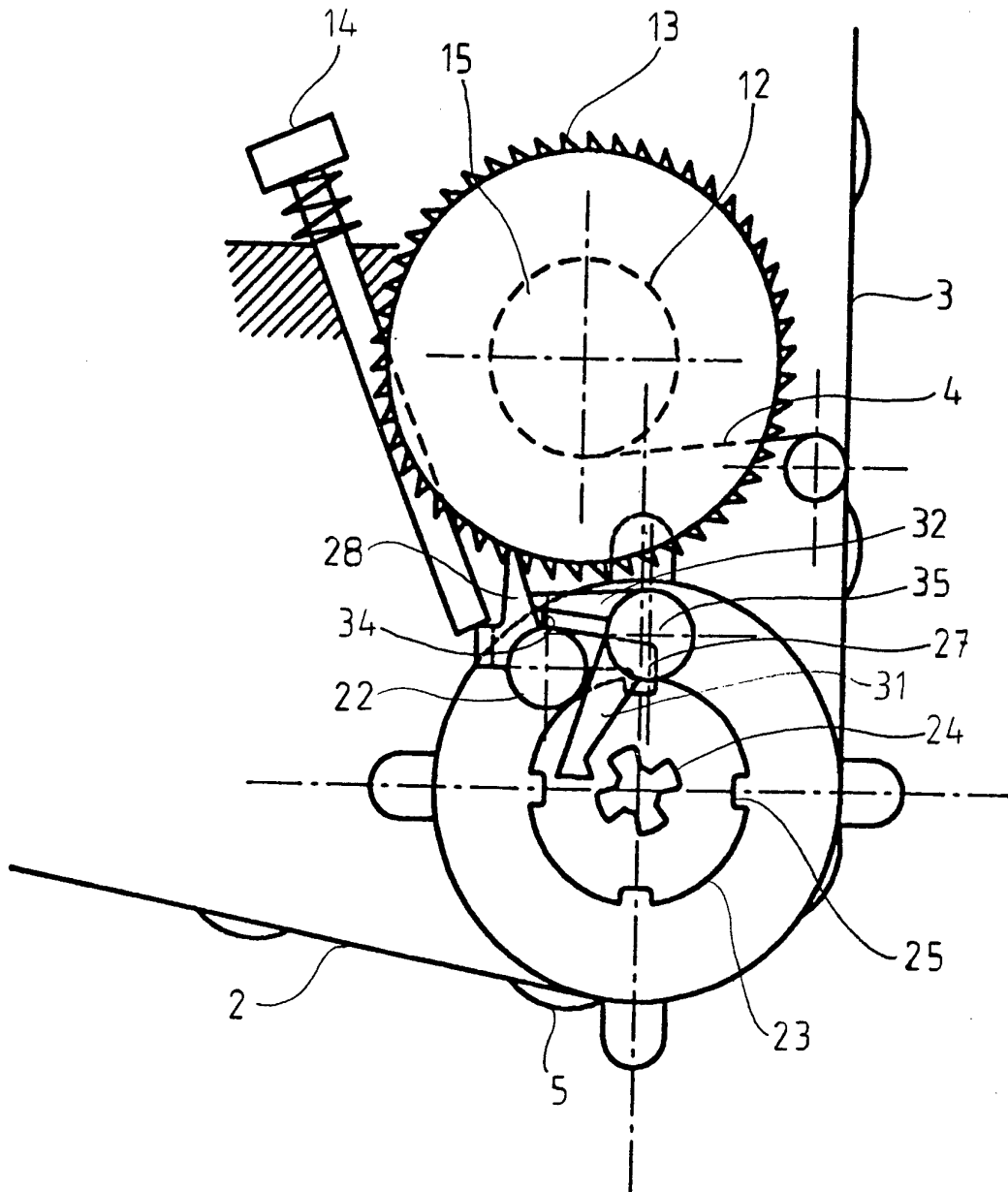


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/01007

A. CLASSIFICATION OF SUBJECT MATTER		
IPC5: A61M 15/00 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)		
IPC5: A61M		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
WPI, CLAIMS		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB, A, 2242134 (GLAXO GROUP LIMITED), 25 Sept 1991 (25.09.91), figure 16, abstract --	1-14
A	EP, A1, 0469814 (LILLY INDUSTRIES LIMITED), 5 February 1992 (05.02.92), figure 1 --	1-14
A	WO, A1, 9013327 (RIKER LABORATORIES, INC.), 15 November 1990 (15.11.90), figure 5 --	1-14
A	WO, A1, 9013328 (RIKER LABORATORIES, INC.), 15 November 1990 (15.11.90), figure 9 --	1-14
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>		
Date of the actual completion of the international search		Date of mailing of the international search report
11 March 1994		16 -03- 1994
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86		Authorized officer Leif Brander Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/01007

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO, A1, 9205823 (VALOIS), 16 April 1992 (16.04.92), figures 3,6a --	1-14
A	WO, A1, 9208509 (MINNESOTA MINING AND MANUFACTURING COMPANY), 29 May 1992 (29.05.92), figure 8 -- -----	1-14

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/01007

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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.: 16-17
because they relate to subject matter not required to be searched by this Authority, namely:
Treatment of humans by therapy (PCT, Rule 39.1(iv))
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 II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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

Claim 1-13: An inhaler

Claim 14: A mouthpiece

Claim 15: Deaggregation means

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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/01/94

International application No.

PCT/SE 93/01007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2242134	25/09/91	AU-B- 645056 AU-A- 7202591 BE-A- 1003798 CN-A- 1054893 DE-A- 4106379 FR-A- 2659558 FR-A- 2660550 JP-A- 4220266 LU-A- 87898 NL-A- 9100381	06/01/94 05/09/91 16/06/92 02/10/91 05/09/91 20/09/91 11/10/91 11/08/92 16/11/92 01/10/91
EP-A1- 0469814	05/02/92	JP-A- 5123399	21/05/93
WO-A1- 9013327	15/11/90	AU-B- 643435 AU-B- 644790 AU-A- 5539590 AU-A- 5558890 EP-A- 0470154 JP-T- 5501505	18/11/93 23/12/93 29/11/90 29/11/90 12/02/92 25/03/93
WO-A1- 9013328	15/11/90	NONE	
WO-A1- 9205823	16/04/92	FR-A- 2667509 FR-A- 2667790 WO-A- 9205824	10/04/92 17/04/92 16/04/92
WO-A1- 9208509	29/05/92	AU-A- 8873391 CA-A- 2095923 EP-A- 0557333	11/06/92 15/05/92 01/09/93