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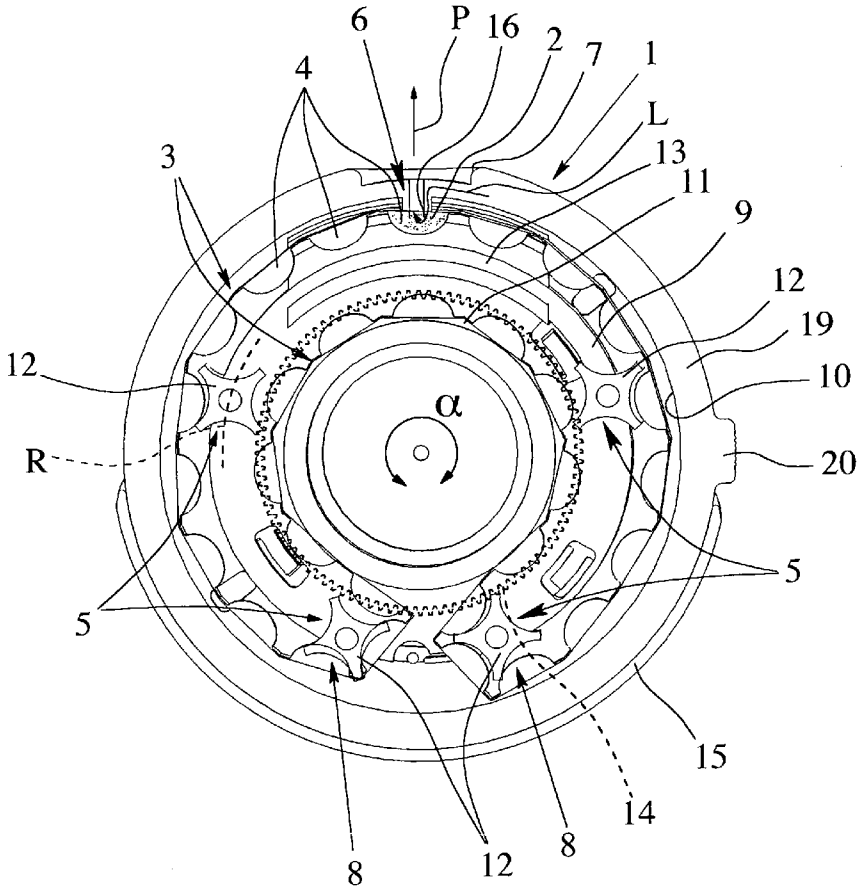

(57) Abstract: An inhaler is proposed, for delivering a preferably powdered formulation from a blister strip (3) having a plurality of blister pouches (4). In order to achieve a compact simple construction for the inhaler and an easy action for the blister strip, the carrier extends over a circumferential angle of the inhaler of less than 360-. In particular, the carrier is guided between two deflectors (8) with an at least substantially constant curvature and preferably exclusively along an outer wall of the inhaler. A conveying device (5) of the inhaler comprises four drive wheels (12) of the same diameter which are arranged on a common radius and are driven by common drive means in the same direction of rotation.

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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.

Inhaler

The present invention relates to an inhaler.

The present invention relates to the delivery and atomisation of a formulation particularly for inhalation or for other medical or therapeutic purposes. Particularly preferably the present invention relates to the delivery of medical, pharmaceutical and/or therapeutic formulations which in particular contain or consist of at least one active substance. During atomisation an aerosol or a spray cloud is produced having, particularly for inhalation, very fine, solid and/or liquid particles, preferably in the range from 1 to 10 µm.

The formulation is preferably a powder. Particularly preferably, the invention therefore relates to a powder inhaler. The term "formulation" according to the invention preferably also includes liquids, however, while the term "liquid" is to be understood in the broad sense as including *inter alia* solutions, suspension, suslutions (mixture of solution and suspension), dispersions, mixtures thereof or the like.

The present invention relates to an inhaler or other atomiser for delivering a preferably powdered formulation from a reservoir such as a blister strip or other preferably disc-shaped or band-shaped carrier, having a plurality of receptacles or blister pouches, each of which contains one dose of the formulation. The term "inhaler" is therefore preferably to be understood generally as including other atomisers or dispensers for delivering a pre-metered formulation.

DE 41 06 379 A1 discloses an inhaler having a coiled blister strip. Blister pouches of the blister strip are each filled with a dose of a powdered medicament and are opened one after another for inhalation by peeling or pulling off a cover.

Object of the present invention is to provide an improved inhaler which while being simple in construction accommodates a preferably endless band-shaped carrier or blister strip which is optimum particularly in terms of its compactness and/or ease of operation, and methods of delivering a preferably powdered for-

mulation, in particular permitting simple and/or reliable operation and/or delivery while using a simple, inexpensive construction.

The above object is achieved by means of an inhaler according to claims 1, 6, 8, 17 and 20 or by a method according to claim 25, 26 or 27. Advantageous further features are recited in the subsidiary claims.

According to a first aspect of the present invention it is envisaged that the carrier extends over a circumferential angle of the inhaler of less than 360°, is guided between two deflectors each of substantially constant curvature, extends solely in an annular segment of the inhaler and/or extends with one of two portions connecting the deflectors exclusively along a circumferential or outer wall of the inhaler. These measures enable the carrier to extend as a simple loop which has the minimum possible curvature and is accordingly relatively easy to move or convey. This results in a simple but nevertheless compact construction.

Particularly preferably, the carrier is constructed as a band and/or blister strip. The receptacles are preferably formed by blister pouches. This allows simple and inexpensive manufacture.

According to a second aspect of the present invention which can also be implemented independently, the inhaler has a planet gear and/or a conveyor device having a plurality of wheels, particularly planet wheels, for stepwise advancing and/or deflecting of the carrier. The wheels are of the same diameter, are arranged on a common radius, can be driven directly or indirectly by common drive means, particularly a sun wheel or the like, and/or have the same direction of rotation. This contributes to the desired easy action of the carrier while retaining a simple and compact construction for the inhaler.

According to another aspect of the present invention which can also be implemented independently, the inhaler 1 has a conveyor device with a gear, wherein free mobility is provided in one direction of rotation. Particularly preferably, the free rotation is integrated in the sun wheel of a planet gear. This allows a simple compact construction.

According to another aspect of the present invention which can also be implemented independently, the carrier or blister strip is movable transversely of the direction of advance in order to be able to bring the receptacles containing a dose of the formulation individually up to a preferably fixed removal device and/or open said receptacles. This allows a compact simple construction and/or optimum arrangement of the removal device in the region of a mouthpiece preferably provided in the inhaler.

In another aspect of the present invention, the preferably substantially round housing of the inhaler is flattened or indented on one side, the side being formed in particular by a housing section and a section of an openable mouthpiece cover. This allows simple, intuitive operation.

In another aspect of the present invention, the carrier is moved counter to the direction of conveying, towards a travel limiter formed in particular by a non-return device, for the purpose of accurately positioning its receptacles or blister pouches. Thus very precise positioning can be achieved in a very simple manner. In particular, the travel limiter is formed by a non-return device of a gear that moves the carrier along. However, the non-return device may theoretically also act directly on the carrier or blister strip.

According to another aspect of the present invention, during opening of a cover of a mouthpiece of the inhaler, only the carrier or the respective receptacle for dispensing the next dose is opened and the carrier is only moved on when the cover is closed. In this way malfunctions particularly when only partly opening the cover are at least substantially ruled out in a simple manner.

Further aspects, features, properties and advantages of the present invention will become apparent from the claims and following description of preferred embodiments with reference to the drawings. In the drawings:

Fig. 1 is a schematic view of an inhaler according to a first embodiment in the open state;

Fig. 2 is a perspective view of a guide portion of the inhaler;

Fig. 3 is a section through a part of the inhaler in the region of a mouthpiece;

Fig. 4 is an external view of the inhaler; and

Fig. 5 is a schematic view of an inhaler according to a second embodiment in the open position and in schematic section.

In the Figures, the same reference numerals have been used for identical or similar parts and components; in particular, similar or corresponding advantages and/or properties are obtained even if the associated description is not repeated.

Fig. 1 shows in a highly schematic representation a proposed inhaler 1 according to a first embodiment, in a cut-away or open state without a lid or cover.

The inhaler 1 serves to deliver a preferably powdered formulation 2 in the sense described hereinbefore from a preferably strip-shaped carrier, particularly a blister strip 3, having a plurality of receptacles, especially blister pouches 4, each of which directly contains a dose of the, in particular, loose formulation 2. The carrier forms in particular a closed loop, i.e. it is of circular or endless construction. For inhalation and particularly during inhalation, preferably one dose of the formulation 2 is taken from a receptacle or blister pouch 4.

The inhaler 1 has a conveyor device 5 for advancing or conveying the carrier stepwise.

The inhaler 1 also has a removing device 6 for individually opening the receptacles and/or removing the doses of formulation 2. In particular the removal device 6 is constructed so that the receptacles can be opened individually and successively from the outside and/or by breathing in while inhaling an air current L of ambient air can be sucked in, in order to deliver the respective dose with the ambient air through an associated mouthpiece 7 of the inhaler 1, as indicated by the arrow P in Fig. 1.

The mouthpiece 7 of the inhaler 1 is preferably of rigid construction and/or is formed on or formed by a housing of the inhaler 1.

Instead of the mouthpiece 7 the inhaler 1 may also have another endpiece, for example for nasal or other routes of administration for delivering the formulation 2. In particular, the inhaler 1 may also be used as a nebuliser for other purposes, e.g. for the eyes. The term "inhaler" should therefore preferably be understood in a correspondingly general sense.

The conveying device 5 preferably has two deflectors 8 for the carrier. In particular, the carrier extends only between the deflectors 8, particularly preferably in such a manner that the maximum possible length of carrier can be accommodated in the inhaler 1 whilst subjecting the carrier to the least possible and/or most uniform possible curvature, and/or so as to achieve easy action with a simple and compact construction of the inhaler 1. These individual aspects are discussed in more detail hereinafter.

The carrier is preferably guided exclusively in an annular segment 9 of the inhaler 1, as shown in Fig. 1. In particular, the inhaler 1 or the annular segment 9 forms a channel for the carrier between an in particular peripheral outer wall 10 and an intermediate or inner wall 11 of the inhaler 1.

The outer wall 10 extends in particular substantially along a circle in the particularly preferred, substantially disc-shaped construction of the inhaler 1. The inner wall 11 is preferably in the form of an outer surface of a cylinder. However, other shapes are also possible.

The deflectors 8 are preferably arranged relatively close together. The carrier preferably extends away from the deflectors 8 in opposite directions.

The carrier preferably extends over a circumferential angle α of the inhaler 1 of at least 270° and/or less than 360°. Thus a spiral or helical configuration and hence a difficult action of the carrier can be avoided.

The carrier is guided between the two deflectors 8 with an at least substantially constant curvature. This contributes in particular to the desired easy action for moving or conveying the carrier.

Portions of the carrier extend between the two deflectors 8. One of these portions - in the embodiment shown, the radially outer portion - preferably extends exclusively along the outer wall 10. This makes optimum use of the space available while in particular achieving an at least substantially constant and/or minimal curvature of the carrier along this portion.

The deflectors 8 deflect the carrier through at least 160°, particularly at least substantially 180°. This contributes to the desired compact structure of the inhaler 1.

The portions of the carrier between the two deflectors 8 are preferably guided at an at least substantially constant spacing from one another. In particular, the radial width of the annual segment 9 or the radial spacing of the outer wall 10 from the inner wall 11 over the preferably arcuate extent of the carrier or the circumferential angle α is constant.

Preferably, the carrier runs exclusively between the two deflectors 8. In particular, the portions between the two deflectors 8 are guided at least substantially along an outer and inner arc, particularly an arc of a circle, as can be seen from Fig. 1.

In particular, the carrier 1 is guided on the inside by means of the preferably circular or cylindrical inner wall 11. On the outside or along the outer wall 10, the carrier is preferably guided by means of the deflectors 8, wheels 12 and/or a guide element 13.

The wheels 12 are preferably all of uniform construction but may if necessary also be of different construction.

At least one wheel 12 is preferably constructed so that the carrier can be conveyed or moved along by interlocking engagement, so that the carrier can be advanced or conveyed onwards step by step to the next receptacle by corresponding stepwise rotation of the wheel 12. This enables the formulation 2 to be removed from the individual receptacles one after another and individually taken for delivery through the removal device 6. Preferably all the wheels 12 are constructed for movement or conveying of the carrier by interlocking engagement.

Particularly preferably, the wheels 12 are constructed accordingly as drive wheels or gears or pinions. Thus, in particular, the receptacles can engage in corresponding recesses in the wheels 12. Alternatively or additionally, the wheels 12 may also engage with teeth, projections or the like into corresponding recesses, openings, interstices or the like in the carrier in order to allow the desired conveying of the carrier by interlocking engagement or in defined manner.

Alternatively or additionally, the wheels 12 or at least some of the wheels 12 may also be formed as rollers or the like and/or may not enter into interlocking engagement with the carrier. Rather, the carrier may if necessary be guided only by frictional engagement or possibly by slipping or sliding. The wheels 12 are then constructed in particular as loose, non-driven rollers or the like.

The deflectors 8 or wheels 12 may theoretically also be formed by sliding elements or other guide means. However, it is particularly preferred that the deflectors 8 should be formed by wheels 12.

In the embodiment shown, two wheels 12 form the deflectors 8. In addition, at least two other wheels 12 are preferably provided for guiding the carrier, particularly the outer portion of the carrier, on or along the outer wall 10. However, these additional wheels 12 may also be omitted entirely. In this case, in particular, corresponding guides, channels or wall portions are provided for adequately guiding the portions of the carrier between the deflectors 8.

The two deflectors 8 are preferably arranged on the side of the inhaler 1 opposite the removal device 6 or mouthpiece 7. Particularly preferably, the carrier is arranged symmetrically with respect to the removal device 6 and/or mouthpiece 7. Alternatively or additionally, this is preferably also true of the arrangement of the wheels 12.

A particular advantage of the proposed guiding of the carrier in the inhaler 1 is that the carrier is only relatively highly curved in the region of the deflectors 8 and, in particular, is only curved in the same direction. In particular, there is no sharp curve in the opposite direction. This contributes to the desired easy action during the conveying or movement of the carrier.

The wheels 12 preferably have the same diameter and in particular are identical in construction. This makes manufacture simple and inexpensive. Particularly preferably, the diameter of the wheels 12 substantially corresponds to the spacing of the portions of the carrier.

The wheels 12 are preferably arranged on a common radius R. In particular, this permits simple driving. Preferably, in fact, the wheels 12 can be driven by common drive means, especially a sun wheel 14, which is only partly shown in Fig. 1. In this case a kind of planet gear is formed, in particular, with the wheels 12. The wheels 12 preferably have teeth in the manner of a gear, to allow a defined movement or conveying of the carrier. Alternatively, the wheels 12 may also be driveable, for example, by means of an encircling belt or the like as a common drive means.

Particularly preferably, the wheels 12 rotate in the same direction in order to move or convey the carrier.

Thus, during the actuation of the conveying device 5 the carrier continues to be advanced or conveyed onwards in a rotary manner, and indeed is advanced stepwise to the next receptacle for the next delivery or inhalation.

The conveying device 5 preferably forms the only drive for moving the carrier.

The mouthpiece 7 or other endpiece preferably has an associated cover 15 which is movable, in particular pivotable, in order to open and/or close the mouthpiece 7. The conveying device 5 and/or removal device 6 is preferably actuated by the opening and/or closing movement of the cover 15. This provides a very simple and, in particular, intuitive method of actuating and using the inhaler 1.

The removal device 6 preferably has a removal element 16 which is constructed in particular as a piercing element, is of fixed design and/or attached to the mouthpiece 7. The removal element 16 is movable relative to the respective receptacle or to the carrier in order to open the respective receptacle, in particular to pierce it, and thereby establish a fluidic connection with the receptacle in question.

Preferably the relative movement is carried out by the carrier being moved by the guide element 13 or in some other way, in particular pushed transversely with respect to its direction of movement or conveying. For this purpose the guide element 13 is correspondingly guided to be movable, particularly slideable, most preferably in the manner of a sled. This direction of movement or sliding is in particular in the radial direction, in the embodiment shown, or in or counter to the direction of delivery or the arrow P.

Fig. 2 shows in perspective view a preferred construction of the guide element 13. The guide element 13 guides the carrier preferably by interlocking engagement, e.g. in opposing longitudinal grooves 17 open towards one another. However, other constructional solutions are also possible.

Moreover, Fig. 2 shows a preferably exterior sliding surface, control groove or control curve 18 on the guide element 13. The cover 15 may engage directly or indirectly in this control groove or may engage on this control curve 18, so that the guide element 13 and hence the carrier are moved or displaced in the desired manner relative to the removal element 16 for selectively opening or making contact with the respective receptacle. In particular, a sliding or forcible guide is formed for moving the guide element 13 or the carrier in defined manner as desired. However, other geared solutions or actuations are also possible.

For use, the cover 15 of the inhaler 1 is opened, for example by pivoting or rotating about a central axis of the inhaler 1. This exposes the mouthpiece 7. Before this, at the same time or subsequently, the conveying device 5 is actuated or the carrier is advanced to the next receptacle and/or the next receptacle is opened. This is achieved in particular by means of a suitable geared coupling of the cover 15 with the conveying device 5, particularly preferably with the sun wheel 14.

After the carrier has been advanced in the desired manner, and preferably as the opening or pivoting movement of the cover 15 continues, the receptacle intended for the next inhalation, and in particular already positioned relative to or underneath the removal element 16, is opened. To open it, the guide element 13 or the carrier is moved relative to the removal element 16 such that the latter opens the receptacle, particularly engages in a foil cover or covering of the blister pouch 3

and cuts it open, pierces it or tears it open. This state is illustrated in Fig. 1 and in Fig. 3 in a cut away schematic section through part of the mouthpiece 7. In this states the cover 15 is fully open and the inhaler 1 is ready for delivery or inhalation.

According to a particularly preferred alternative feature the carrier is not conveyed further during the opening of the cover 15 but is opened only in the course of the opening movement (in particular, only at the end of the opening movement). In particular, the respective receptacle of the carrier is pierced by the removal element 16. Particularly preferably the opening is carried out by moving the carrier or the corresponding receptacle up to the preferably stationary removal element 16. In this way the opening movement is at an end and the cover 15 in particular is fully open. Now the delivery or inhalation of the dose contained in the open receptacle can take place. Once the delivery or inhalation of the dose has ended the cover 15 is closed again. During the closing movement, first of all in a first phase the removal element 16 and the carrier are moved away from one another, and in particular the carrier is moved away from the removal element 16 again, so that the carrier can be moved onwards. Then in a second phase of the closing movement of the cover 15 the carrier is moved on, so that the next receptacle is already in position or at least substantially correctly positioned. This procedure has the advantage that partial opening of the inhaler 1 or cover 15 starting from the closed position does not lead to any further movement of the carrier.

In the alternative feature described above a freewheeling clutch 22 or a non-return device 28 in particular ensures, as explained hereinafter with reference to a second embodiment, that the carrier does not move back during the opening of the cover 15 or is only moved back slightly for accurate positioning.

Fig. 4 shows the inhaler 1 in exterior view with the cover 15 open. The cover 15 surrounds the preferably disk-shaped housing 19 of the inhaler 1, in particular in the shape of a sector on both sides and along a circumferential angle or circumferential portion of for example about 120 to 180°. Preferably at least one stop, in this case a radial stop 20, is provided for limiting the pivoting movement, particular both the opening movement and the closing movement.

When a user or patient (not shown) breathes or sucks in air through the mouthpiece 10, the air current L of ambient air is sucked in and conducted through the opened or pierced receptacle in such a way that the formulation 2 contained in the receptacle is delivered by the air current L through the removal element 16 and the adjoining mouthpiece 7 in nebulised form, i.e. as an aerosol cloud or spray missed.

After the receptacle has been emptied and the formulation 2 delivered, the inhaler 1 or the cover 15 can be closed again. To do this, the cover 15 is preferably rotated or pivoted counter to the direction of opening. A corresponding freedom of movement or locking mechanism ensures that the carrier or blister strip 3 is not moved or conveyed in the opposite direction in undesirable manner.

According to the alternative embodiment already described, in addition to or in particular as an alternative to the opening movement, the closing movement may also be used to actuate the conveying device 5 or to advance or further convey the carrier on to the next receptacle.

The inhaler 1 is preferably portable in construction. Particularly preferably, it operates purely mechanically.

The inhaler 1 preferably comprises a counter (not shown) for counting and particularly displaying the receptacles which have already been used or those which have not yet been used.

A second embodiment of the proposed inhaler 1 will now be described in more detail with reference to Figure 5. Only major differences from the first embodiment will be described here, in particular, which means that the other remarks and explanations still apply accordingly or in supplementary manner.

In the second embodiment or in the section according to Figure 5, a gear is shown, particularly a gearwheel or planetary gear 21, of the inhaler 1 or of the conveying device 5 for advancing or further conveying the carrier. However, theoretically, any other suitable gear may be used, although the planet gear 21 is particularly preferred.

Preferably, the inhaler 1 or the conveying device 5 is free running 22 in one direction of driving or rotation of the drive train or gear.

Particularly preferably, the free running 22 is associated with a drive wheel or gearwheel, particularly the sun wheel 14, or is arranged or integrated therein. In the embodiment shown, the free running 22 comprises a drive element 23 with at least one preferably tangentially and/or radially projecting finger 24 (most preferably two fingers 24). The drive element 23 engages in one direction of rotation (the anticlockwise direction in the embodiment shown) in interlocking engagement by means of the finger 24 or fingers 24 on the associated drive or gearwheel or sun wheel 14 in order to drive the latter in this direction. In the other direction or rotation the fingers 24 can glide or slip through. In particular, inner teeth 25 are formed on the associated drive or gearwheel or sun wheel 14 on which the fingers 24 can engage. However, other constructional solutions are also possible.

The sun wheel 14 preferably drives associated planet wheels 27 of the planet gear 21 via intermediate gears 26. The intermediate gears 26 are preferably uniformly distributed about the sun wheel 14 in order to achieve a particularly compact structure. Alternatively, the sun wheel 14 may also drive the planet wheels 27 directly.

The planet wheels 27 are preferably arranged coaxially with the wheels 12 for guiding and/or conveying the carrier. Particularly preferably, the planet wheels 27 are mounted about wheels 12, in pairs on a common axle and/or are of integral construction. For example, the planet wheels 27 may be formed on the wheels 12 or vice versa.

The inhaler 1 or the conveying device 5 preferably has a non-return mechanism 28 to safely prevent undesirable reversing of the carrier and/or to form a defined end stop to the movement of the carrier. The non-return mechanism 28 preferably works on the conveying device 5 or its gear, i.e. in the embodiment shown on a planet wheel 27. For example, the non-return mechanism 28 may be formed by an, in particular, elastically biased locking latch or the like which prevents the unwanted backwards rotation and reversing. Alternatively or additionally, the non-return mechanism 28 may also act on the carrier itself.

In the embodiment shown the drive element 23 is preferably coupled in a driving relationship with the cover 15, so that the drive element 23 is rotated at the same time during opening and closing. In one direction of rotation the free wheel clutch 22 locks in place and rotates the sun wheel 14 in order to drive the planet wheels 27 and according convey the carrier onwards by means of the wheels 12. In the other direction of rotation the free wheel clutch 22 comes into effect or rotates or slips through, at least under the effect of the non-return mechanism 28, so that the carrier is no longer moved backwards or at most is moved as far as the stop or the barrier of the non-return mechanism 28. This reversing as far as a defined stop by means of the non-return mechanism 28 can be achieved by corresponding frictional or forceful engagement of the free wheel clutch 22 in the reverse direction and/or it can be used for highly accurate positioning of the carrier.

Preferably, the inhaler 1 is constructed such that the carrier is initially always advanced somewhat too far as it moves on to the next receptacle. Before the receptacle is opened, the carrier is then moved back to the travel limiter or until the non-return mechanism 28 comes into effect. Thus, the receptacle which is to be opened is initially positioned very precisely in the removal position in which opening takes place, particularly by moving it up to the removal element 16.

Particularly preferably, the reversing of the carrier or of the receptacle in the carrier which is to be opened, up to a defined end stop (formed by the non-return mechanism 28), is used in the alternative embodiment already described above (advancing of the carrier only when the cover 15 is shut) so that during the initial opening of the inhaler 1 or of the cover 15 the carrier is moved back to the stop and the receptacle which is to be opened is accurately positioned relative to the removal element 16. The actual opening of the receptacle then takes place in the course of the further opening movement of the cover 15, as already explained.

Generally speaking it should be pointed out that the free wheel clutch 22 may also be produced in some other way. The non-return mechanism 28 can also be formed in some other way. In particular the non-return mechanism 28 may if necessary also act directly on the carrier 2, optionally even directly on the receptacles or blister pouches 4.

It should be noted that the opened covered 15 in turn preferably exposes the mouthpiece 7, although this is not shown in Figure 5.

Figure 5 shows the preferred sled-like guiding of the guide element 13, preferably by means of the housing of the inhaler 1, in purely schematic form.

The inhaler 1 or its housing 19 has in particular a substantially round shape and/or a flattened or indented (concave) side. In the embodiment by way of example, this flattened or indented side is particularly preferably formed by a portion 29 of the housing 19 of the inhaler 1 and/or by a portion 30 of the cover 15. The portion 29 serves in particular for holding or gripping the inhaler 1 or as an abutment surface for a finger, especially a thumb, of the user (not shown). The portion 30 serves in particular as an actuating surface, preferably for a finger or thumb of the user (not shown), during opening or for the purpose of opening the cover 15. When the inhaler 1 is closed, the two portions 29 and 30 are preferably located side by side and form, in particular, an at least substantially continuous outer surface of the inhaler 1. To open the cover 15 the two portions 29 and 30 can preferably be pushed apart. This allows very simple and/or intuitive operation.

Generally it should be pointed out regarding the two embodiments that the carrier 3 is preferably moved or displaced at right angles or perpendicular to the direction of conveying or in the radial direction, in order to fluidically connect the respective receptacle or blister pouch 4 to the removal device 6 or the removal element 16 thereof, and/or to open said receptacle or pouch 4. The removal device 6 or its removal element 16 is correspondingly preferably fixed in construction. After the removal or inhalation of the formulation 2 from the respective blister pouch 4, the carrier is preferably moved back again in the opposite direction to allow the carrier to be conveyed onwards.

The lateral movement of the carrier for the purpose of opening it is preferably carried out by the opening or closing movement of the cover 15, particularly separately from the gear, particularly preferably by means of a sliding guide or other forced guide, which correspondingly moves or displaces the guide element 13 and hence the carrier or the receptacle located in the removal position, with

the desired dependency on the movement of the cover 15 (in this case towards or away from the removal element 16)

Individual features and aspects of the two embodiments may also be combined with one another as desired and/or used in other inhalers 1.

Some preferred ingredients and/or compositions of the preferably medicinal formulation 2 are listed below. As already mentioned, they are in particular powders or liquids in the broadest sense. Particularly preferably the formulation 2 contains the following:

The compounds listed below may be used in the device according to the invention on their own or in combination. In the compounds mentioned below, **W** is a pharmacologically active substance and is selected (for example) from among the betamimetics, anticholinergics, corticosteroids, PDE4-inhibitors, LTD4-antagonists, EGFR-inhibitors, dopamine agonists, H1-antihistamines, PAF-antagonists and PI3-kinase inhibitors. Moreover, double or triple combinations of **W** may be combined and used in the device according to the invention. Combinations of **W** might be, for example:

- **W** denotes a betamimetic, combined with an anticholinergic, corticosteroid, PDE4-inhibitor, EGFR-inhibitor or LTD4-antagonist,
- **W** denotes an anticholinergic, combined with a betamimetic, corticosteroid, PDE4-inhibitor, EGFR-inhibitor or LTD4-antagonist,
- **W** denotes a corticosteroid, combined with a PDE4-inhibitor, EGFR-inhibitor or LTD4-antagonist
- **W** denotes a PDE4-inhibitor, combined with an EGFR-inhibitor or LTD4-antagonist
- **W** denotes an EGFR-inhibitor, combined with an LTD4-antagonist.

The compounds used as betamimetics are preferably compounds selected from among albuterol, arformoterol, bambuterol, bitolterol, broxaterol, carbuterol, clenbuterol, fenoterol, formoterol, hexoprenaline, ibuterol, isoetharine, isoprenaline, levosalbutamol, mabuterol, meluadrine, metaproterenol, orciprenaline, pirbuterol, procaterol, reproterol, rimiterol, ritodrine, salmefamol, salmeterol, soterenol, sulphonterol, terbutaline, tiaramide, tolubuterol, zinterol, CHF-1035, HOKU-81, KUL-1248 and

- 3-(4-{6-[2-hydroxy-2-(4-hydroxy-3-hydroxymethyl-phenyl)-ethylamino]-hexyloxy}-butyl)-benzyl-sulphonamide
- 5-[2-(5.6-diethyl-indan-2-ylamino)-1-hydroxy-ethyl]-8-hydroxy-1H-quinolin-2-one
- 4-hydroxy-7-[2-{[2-{[3-(2-phenylethoxy)propyl]sulphonyl}ethyl]-amino}ethyl]-2(3H)-benzothiazolone
- 1-(2-fluoro-4-hydroxyphenyl)-2-[4-(1-benzimidazolyl)-2-methyl-2-butylamino]ethanol
- 1-[3-(4-methoxybenzyl-amino)-4-hydroxyphenyl]-2-[4-(1-benzimidazolyl)-2-methyl-2-butylamino]ethanol
- 1-[2H-5-hydroxy-3-oxo-4H-1,4-benzoxazin-8-yl]-2-[3-(4-N,N-dimethylaminophenyl)-2-methyl-2-propylamino]ethanol
- 1-[2H-5-hydroxy-3-oxo-4H-1,4-benzoxazin-8-yl]-2-[3-(4-methoxyphenyl)-2-methyl-2-propylamino]ethanol
- 1-[2H-5-hydroxy-3-oxo-4H-1,4-benzoxazin-8-yl]-2-[3-(4-n-butyloxyphenyl)-2-methyl-2-propylamino]ethanol
- 1-[2H-5-hydroxy-3-oxo-4H-1,4-benzoxazin-8-yl]-2-{4-[3-(4-methoxyphenyl)-1,2,4-triazol-3-yl]-2-methyl-2-butylamino}ethanol
- 5-hydroxy-8-(1-hydroxy-2-isopropylaminobutyl)-2H-1,4-benzoxazin-3-(4H)-one
- 1-(4-amino-3-chloro-5-trifluoromethylphenyl)-2-tert.-butylamino)ethanol
- 6-hydroxy-8-{1-hydroxy-2-[2-(4-methoxy-phenyl)-1,1-dimethyl-ethylamino]-ethyl}-4H-benzo[1,4]oxazin-3-one
- 6-hydroxy-8-{1-hydroxy-2-[2-(ethyl 4-phenoxy-acetate)-1,1-dimethyl-ethylamino]-ethyl}-4H-benzo[1,4]oxazin-3-one
- 6-hydroxy-8-{1-hydroxy-2-[2-(4-phenoxy-acetic acid)-1,1-dimethyl-ethylamino]-ethyl}-4H-benzo[1,4]oxazin-3-one
- 8-{2-[1,1-dimethyl-2-(2.4.6-trimethylphenyl)-ethylamino]-1-hydroxy-ethyl}-6-hydroxy-4H-benzo[1,4]oxazin-3-one
- 6-hydroxy-8-{1-hydroxy-2-[2-(4-hydroxy-phenyl)-1,1-dimethyl-ethylamino]-ethyl}-4H-benzo[1,4]oxazin-3-one
- 6-hydroxy-8-{1-hydroxy-2-[2-(4-isopropyl-phenyl)-1.1dimethyl-ethylamino]-ethyl}-4H-benzo[1,4]oxazin-3-one
- 8-{2-[2-(4-ethyl-phenyl)-1,1-dimethyl-ethylamino]-1-hydroxy-ethyl}-6-hydroxy-4H-benzo[1,4]oxazin-3-one

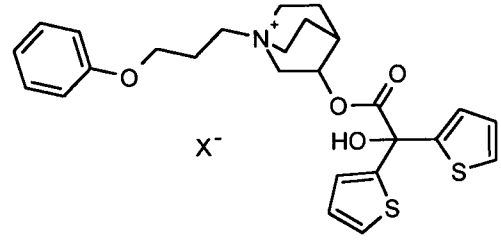
- 8-{2-[2-(4-ethoxy-phenyl)-1,1-dimethyl-ethylamino]-1-hydroxy-ethyl}-6-hydroxy-4H-benzo[1,4]oxazin-3-one
- 4-(4-{2-[2-hydroxy-2-(6-hydroxy-3-oxo-3.4-dihydro-2H-benzo[1,4]oxazin-8-yl)-ethylamino]-2-methyl-propyl}-phenoxy)-butyric acid
- 8-{2-[2-(3.4-difluoro-phenyl)-1,1-dimethyl-ethylamino]-1-hydroxy-ethyl}-6-hydroxy-4H-benzo[1,4]oxazin-3-one
- 1-(4-ethoxy-carbonylamino-3-cyano-5-fluorophenyl)-2-(tert-butylamino)ethanol
- 2-hydroxy-5-(1-hydroxy-2-{2-[4-(2-hydroxy-2-phenyl-ethylamino)-phenyl]-ethylamino}-ethyl)-benzaldehyde
- N-[2-hydroxy-5-(1-hydroxy-2-{2-[4-(2-hydroxy-2-phenyl-ethylamino)-phenyl]-ethylamino}-ethyl)-phenyl]-formamide
- 8-hydroxy-5-(1-hydroxy-2-{2-[4-(6-methoxy-biphenyl-3-ylamino)-phenyl]-ethylamino}-ethyl)-1H-quinolin-2-one
- 8-hydroxy-5-[1-hydroxy-2-(6-phenethylamino-hexylamino)-ethyl]-1H-quinolin-2-one
- 5-[2-(2-{4-[4-(2-amino-2-methyl-propoxy)-phenylamino]-phenyl}-ethylamino)-1-hydroxy-ethyl]-8-hydroxy-1H-quinolin-2-one
- [3-(4-{6-[2-hydroxy-2-(4-hydroxy-3-hydroxymethyl-phenyl)-ethylamino]-hexyloxy}-butyl)-5-methyl-phenyl]-urea
- 4-(2-{6-[2-(2.6-dichloro-benzyloxy)-ethoxy]-hexylamino}-1-hydroxy-ethyl)-2-hydroxymethyl-phenol
- 3-(4-{6-[2-hydroxy-2-(4-hydroxy-3-hydroxymethyl-phenyl)-ethylamino]-hexyloxy}-butyl)-benzylsulphonamide
- 3-(3-{7-[2-hydroxy-2-(4-hydroxy-3-hydroxymethyl-phenyl)-ethylamino]-heptyloxy}-propyl)-benzylsulphonamide
- 4-(2-{6-[4-(3-cyclopentanesulphonyl-phenyl)-butoxy]-hexylamino}-1-hydroxy-ethyl)-2-hydroxymethyl-phenol
- N-Adamantan-2-yl-2-(3-{2-[2-hydroxy-2-(4-hydroxy-3-hydroxymethyl-phenyl)-ethylamino]-propyl}-phenyl)-acetamide

optionally in the form of the racemates, enantiomers, diastereomers thereof and optionally in the form of the pharmacologically acceptable acid addition salts, solvates or hydrates thereof. According to the invention the acid addition salts of the betamimetics are preferably selected from among the hydrochloride, hydrobromide, hydriodide, hydrosulphate, hydrophosphate, hydromethanesulphonate,

hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydroxalate, hydrosuccinate, hydrobenzoate and hydro-p-toluenesulphonate.

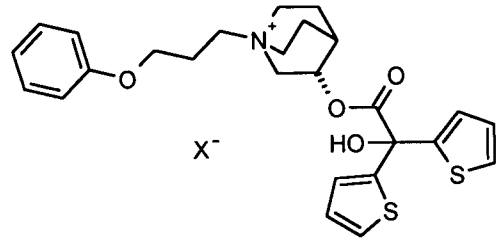
The anticholinergics used are preferably compounds selected from among the tiotropium salts, preferably the bromide salt, oxitropium salts, preferably the bromide salt, flutropium salts, preferably the bromide salt, ipratropium salts, preferably the bromide salt, glycopyrronium salts, preferably the bromide salt, trospium salts, preferably the chloride salt, tolterodine. In the above-mentioned salts the cations are the pharmacologically active constituents. As anions the above-mentioned salts may preferably contain the chloride, bromide, iodide, sulphate, phosphate, methanesulphonate, nitrate, maleate, acetate, citrate, fumarate, tartrate, oxalate, succinate, benzoate or p-toluenesulphonate, while chloride, bromide, iodide, sulphate, methanesulphonate or p-toluenesulphonate are preferred as counter-ions. Of all the salts the chlorides, bromides, iodides and methanesulphonates are particularly preferred.

Other preferred anticholinergics are selected from among the salts of formula **AC-1**



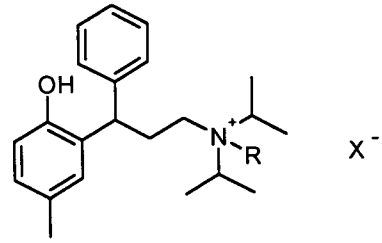
AC-1

wherein X $^-$ denotes an anion with a single negative charge, preferably an anion selected from among the fluoride, chloride, bromide, iodide, sulphate, phosphate, methanesulphonate, nitrate, maleate, acetate, citrate, fumarate, tartrate, oxalate, succinate, benzoate and p-toluenesulphonate, preferably an anion with a single negative charge, particularly preferably an anion selected from among the fluoride, chloride, bromide, methanesulphonate and p-toluenesulphonate, particularly preferably bromide, optionally in the form of the racemates, enantiomers or hydrates thereof. Of particular importance are those pharmaceutical combinations which contain the enantiomers of formula **AC-1-en**



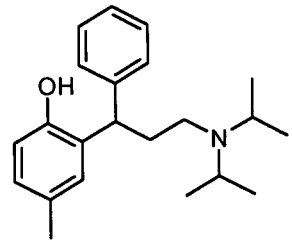
AC-1-en

wherein X $^-$ may have the above-mentioned meanings. Other preferred anticholinergics are selected from the salts of formula **AC-2**



AC-2

wherein R denotes either methyl or ethyl and wherein X $^-$ may have the above-mentioned meanings. In an alternativen embodiment the compound of formula **AC-2** may also be present in the form of the free base **AC-2-base**.



AC-2-base

Other specified compounds are:

- tropenol 2,2-diphenylpropionate methobromide,
- scopine 2,2-diphenylpropionate methobromide,
- scopine 2-fluoro-2,2-diphenylacetate methobromide,
- tropenol 2-fluoro-2,2-diphenylacetate methobromide;
- tropenol 3,3',4,4'-tetrafluorobenzilate methobromide,
- scopine 3,3',4,4'-tetrafluorobenzilate methobromide,
- tropenol 4,4'-difluorobenzilate methobromide,
- scopine 4,4'-difluorobenzilate methobromide,
- tropenol 3,3'-difluorobenzilate methobromide,
- scopine 3,3'- difluorobenzilate methobromide;

- tropenol 9-hydroxy-fluorene-9-carboxylate methobromide;
- tropenol 9-fluoro-fluorene-9-carboxylate methobromide;
- scopine 9-hydroxy-fluorene-9- carboxylate methobromide;
- scopine 9-fluoro-fluorene-9- carboxylate methobromide;
- tropenol 9-methyl-fluorene-9- carboxylate methobromide;
- scopine 9-methyl-fluorene-9- carboxylate methobromide;
- cyclopropyltropine benzilate methobromide;
- cyclopropyltropine 2,2-diphenylpropionate methobromide;
- cyclopropyltropine 9-hydroxy-xanthene-9-carboxylate methobromide;
- cyclopropyltropine 9-methyl-fluorene-9-carboxylate methobromide;
- cyclopropyltropine 9-methyl-xanthene-9-carboxylate methobromide;
- cyclopropyltropine 9-hydroxy-fluorene-9-carboxylate methobromide;
- cyclopropyltropine methyl 4,4'-difluorobenzilate methobromide.
- tropenol 9-hydroxy-xanthene-9-carboxylate methobromide;
- scopine 9-hydroxy-xanthene-9-carboxylate methobromide;
- tropenol 9-methyl-xanthene-9-carboxylate -methobromide;
- scopine 9-methyl-xanthene-9-carboxylate -methobromide;
- tropenol 9-ethyl-xanthene-9-carboxylate methobromide;
- tropenol 9-difluoromethyl-xanthene-9-carboxylate methobromide;
- scopine 9-hydroxymethyl-xanthene-9-carboxylate methobromide,

The above-mentioned compounds may also be used as salts within the scope of the present invention, wherein instead of the methobromide the salts metho-X are used, wherein X may have the meanings given hereinbefore for X^-.

As corticosteroids it is preferable to use compounds selected from among beclomethasone, betamethasone, budesonide, butixocort, ciclesonide, deflazacort, dexamethasone, etiprednol, flunisolide, fluticasone, loteprednol, mometasone, prednisolone, prednisone, rofleponide, triamcinolone, RPR-106541, NS-126, ST-26 and

- (S)-fluoromethyl 6,9-difluoro-17-[(2-furanylcarbonyl)oxy]-11-hydroxy-16-methyl-3-oxo-androsta-1,4-diene-17-carbothionate
- (S)-(2-oxo-tetrahydro-furan-3S-yl)6,9-difluoro-11-hydroxy-16-methyl-3-oxo-17-propionyloxy-androsta-1,4-diene-17-carbothionate,

- cyanomethyl 6α,9α-difluoro-11β-hydroxy-16α-methyl-3-oxo-17α-(2,2,3,3-tertamethylcyclopropylcarbonyl)oxy-androsta-1,4-diene-17β-carboxylate

optionally in the form of the racemates, enantiomers or diastereomers thereof and optionally in the form of the salts and derivatives thereof, the solvates and/or hydrates thereof. Any reference to steroids includes a reference to any salts or derivatives, hydrates or solvates thereof which may exist. Examples of possible salts and derivatives of the steroids may be: alkali metal salts, such as for example sodium or potassium salts, sulphobenzoates, phosphates, isonicotinates, acetates, dichloroacetates, propionates, dihydrogen phosphates, palmitates, pivalates or furoates.

PDE4-inhibitors which may be used are preferably compounds selected from among enprofyllin, theophyllin, roflumilast, ariflo (cilomilast), tofimilast, pumafentrin, lirimilast, arofyllin, atizoram, D-4418, Bay-198004, BY343, CP-325.366, D-4396 (Sch-351591), AWD-12-281 (GW-842470), NCS-613, CDP-840, D-4418, PD-168787, T-440, T-2585, V-11294A, Cl-1018, CDC-801, CDC-3052, D-22888, YM-58997, Z-15370 and

- N-(3,5-dichloro-1-oxo-pyridin-4-yl)-4-difluoromethoxy-3-cyclopropylmethoxybenzamide
- (-)p-[(4*a*R*,10*b*S*)-9-ethoxy-1,2,3,4,4a,10b-hexahydro-8-methoxy-2-methylbenzo[s][1,6]naphthyridin-6-yl]-N,N-diisopropylbenzamide
- (R)-(+)-1-(4-bromobenzyl)-4-[(3-cyclopentyloxy)-4-methoxyphenyl]-2-pyrrolidone
- 3-(cyclopentyloxy-4-methoxyphenyl)-1-(4-N'-[N-2-cyano-S-methyl-isothioureido]benzyl)-2-pyrrolidone
- cis[4-cyano-4-(3-cyclopentyloxy-4-methoxyphenyl)cyclohexane-1-carboxylic acid]
- 2-carbomethoxy-4-cyano-4-(3-cyclopropylmethoxy-4-difluoromethoxy-phenyl)cyclohexan-1-one
- cis[4-cyano-4-(3-cyclopropylmethoxy-4-difluoromethoxyphenyl)cyclohexan-1-ol]
- (R)-(+)-ethyl[4-(3-cyclopentyloxy-4-methoxyphenyl)pyrrolidin-2-ylidene]acetate
- (S)-(-)-ethyl[4-(3-cyclopentyloxy-4-methoxyphenyl)pyrrolidin-2-ylidene]acetate

- 9-cyclopentyl-5,6-dihydro-7-ethyl-3-(2-thienyl)-9*H*-pyrazolo[3.4-c]-1,2,4-triazolo[4.3-a]pyridine
- 9-cyclopentyl-5,6-dihydro-7-ethyl-3-(*tert*-butyl)-9*H*-pyrazolo[3.4-c]-1,2,4-triazolo[4.3-a]pyridine

optionally in the form of the racemates, enantiomers or diastereomers thereof and optionally in the form of the pharmacologically acceptable acid addition salts thereof, the solvates and/or hydrates thereof. According to the invention the acid addition salts of the betamimetics are preferably selected from among the hydrochloride, hydrobromide, hydriodide, hydrosulphate, hydrophosphate, hydromethanesulphonate, hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydroxalate, hydrosuccinate, hydrobenzoate and hydro-p-toluenesulphonate.

The LTD4-antagonists used are preferably compounds selected from among montelukast, pranlukast, zafirlukast, MCC-847 (ZD-3523), MN-001, MEN-91507 (LM-1507), VUF-5078, VUF-K-8707, L-733321 and

- 1-(((R)-(3-(2-(6,7-difluoro-2-quinolinyl)ethenyl)phenyl)-3-(2-(2- hydroxy-2-propyl)phenyl)thio)methylcyclopropane-acetic acid,
- 1-(((1(R)-3(3-(2-(2,3-dichlorothieno[3,2-b]pyridin-5-yl)-(E)-ethenyl)phenyl)-3-(2-(1-hydroxy-1-methylethyl)phenyl)propyl)thio)methyl)cyclopropane-acetic acid
- [2-[[2-(4-tert-butyl-2-thiazolyl)-5-benzofuranyl]oxymethyl]phenyl]acetic acid

optionally in the form of the racemates, enantiomers or diastereomers thereof and optionally in the form of the pharmacologically acceptable acid addition salts, solvates and/or hydrates thereof. According to the invention the acid addition salts of the betamimetics are preferably selected from among the hydrochloride, hydrobromide, hydroiodide, hydrosulphate, hydrophosphate, hydromethanesulphonate, hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydroxalate, hydrosuccinate, hydrobenzoate and hydro-p-toluenesulphonate. By salts or derivatives which the LTD4-antagonists may optionally be capable of forming are meant, for example: alkali metal salts, such as for example sodium or potassium salts, alkaline earth metal salts, sulphobenzoates, phosphates, isonicotinates, acetates, propionates, dihydrogen phosphates, palmitates, pivalates or furoates.

EGFR-inhibitors which may be used are preferably compounds selected from among cetuximab, trastuzumab, ABX-EGF, Mab ICR-62 and

- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(morpholin-4-yl)-1-oxo-2-buten-1-yl]amino}-7-cyclopropylmethoxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-diethylamino)-1-oxo-2-buten-1-yl]amino}-7-cyclopropylmethoxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-cyclopropylmethoxy-quinazoline
- 4-[(R)-(1-phenyl-ethyl)amino]-6-{[4-(morpholin-4-yl)-1-oxo-2-buten-1-yl]-amino}-7-cyclopentyloxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{[4-((R)-6-methyl-2-oxo-morpholin-4-yl)-1-oxo-2-buten-1-yl]amino}-7-cyclopropylmethoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{[4-((R)-6-methyl-2-oxo-morpholin-4-yl)-1-oxo-2-buten-1-yl]amino}-7-[(S)-(tetrahydrofuran-3-yl)oxy]-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{[4-((R)-2-methoxymethyl-6-oxo-morpholin-4-yl)-1-oxo-2-buten-1-yl]amino}-7-cyclopropylmethoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[2-((S)-6-methyl-2-oxo-morpholin-4-yl)-ethoxy]-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-({4-[N-(2-methoxy-ethyl)-N-methyl-amino]-1-oxo-2-buten-1-yl}amino)-7-cyclopropylmethoxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-cyclopentyloxy-quinazoline
- 4-[(R)-(1-phenyl-ethyl)amino]-6-{[4-(N,N-to-(2-methoxy-ethyl)-amino)-1-oxo-2-buten-1-yl]amino}-7-cyclopropylmethoxy-quinazoline
- 4-[(R)-(1-phenyl-ethyl)amino]-6-({4-[N-(2-methoxy-ethyl)-N-ethyl-amino]-1-oxo-2-buten-1-yl}amino)-7-cyclopropylmethoxy-quinazoline
- 4-[(R)-(1-phenyl-ethyl)amino]-6-({4-[N-(2-methoxy-ethyl)-N-methyl-amino]-1-oxo-2-buten-1-yl}amino)-7-cyclopropylmethoxy-quinazoline
- 4-[(R)-(1-phenyl-ethyl)amino]-6-({4-[N-(tetrahydropyran-4-yl)-N-methyl-amino]-1-oxo-2-buten-1-yl}amino)-7-cyclopropylmethoxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-((R)-tetrahydrofuran-3-yloxy)-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-((S)-tetrahydrofuran-3-yloxy)-quinazoline

- 4-[(3-chloro-4-fluorophenyl)amino]-6-({4-[N-(2-methoxy-ethyl)-N-methyl-amino]-1-oxo-2-buten-1-yl}amino)-7-cyclopentyloxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N-cyclopropyl-N-methyl-amino)-1-oxo-2-buten-1-yl]amino}-7-cyclopentyloxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-[(R)-(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-[(S)-(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6.7-to-(2-methoxy-ethoxy)-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-7-[3-(morpholin-4-yl)-propyloxy]-6-[(vinylcarbonyl)amino]-quinazoline
- 4-[(R)-(1-phenyl-ethyl)amino]-6-(4-hydroxy-phenyl)-7H-pyrrolo[2,3-d]pyrimidine
- 3-cyano-4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(N,N-dimethylamino)-1-oxo-2-buten-1-yl]amino}-7-ethoxy-quinoline
- 4-{[3-chloro-4-(3-fluoro-benzyloxy)-phenyl]amino}-6-(5-{[(2-methanesulphonyl-ethyl)amino]methyl}-furan-2-yl)quinazoline
- 4-[(R)-(1-phenyl-ethyl)amino]-6-{[4-((R)-6-methyl-2-oxo-morpholin-4-yl)-1-oxo-2-buten-1-yl]amino}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-{[4-(morpholin-4-yl)-1-oxo-2-buten-1-yl]amino}-7-[(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-chloro-4-fluorophenyl)amino]-6-({4-[N,N-to-(2-methoxy-ethyl)-amino]-1-oxo-2-buten-1-yl}amino)-7-[(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-{[4-(5.5-dimethyl-2-oxo-morpholin-4-yl)-1-oxo-2-buten-1-yl]amino}-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[2-(2,2-dimethyl-6-oxo-morpholin-4-yl)-ethoxy]-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[2-(2,2-dimethyl-6-oxo-morpholin-4-yl)-ethoxy]-7-[(R)-(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-7-[2-(2,2-dimethyl-6-oxo-morpholin-4-yl)-ethoxy]-6-[(S)-(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{2-[4-(2-oxo-morpholin-4-yl)-piperidin-1-yl]-ethoxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[1-(tert.-butyloxycarbonyl)-piperidin-4-yloxy]-7-methoxy-quinazoline

- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-amino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-methanesulphonylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(tetrahydropyran-3-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-methyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(morpholin-4-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(methoxymethyl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(piperidin-3-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[1-(2-acetylamino-ethyl)-piperidin-4-yloxy]-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(tetrahydropyran-4-yloxy)-7-ethoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-((S)-tetrahydrofuran-3-yloxy)-7-hydroxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(tetrahydropyran-4-yloxy)-7-(2-methoxy-ethoxy)-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{trans-4-[(dimethylamino)sulphonylamino]-cyclohexan-1-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{trans-4-[(morpholin-4-yl)carbonylamino]-cyclohexan-1-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{trans-4-[(morpholin-4-yl)sulphonylamino]-cyclohexan-1-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(tetrahydropyran-4-yloxy)-7-(2-acetylamino-ethoxy)-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(tetrahydropyran-4-yloxy)-7-(2-methanesulphonylamino-ethoxy)-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(piperidin-1-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline

- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-aminocarbonylmethyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-{N-[(tetrahydropyran-4-yl)carbonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-{N-[(morpholin-4-yl)carbonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-{N-[(morpholin-4-yl)sulphonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy- quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-ethanesulphonylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-methanesulphonyl-piperidin-4-yloxy)-7-ethoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-methanesulphonyl-piperidin-4-yloxy)-7-(2-methoxy-ethoxy)-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[1-(2-methoxy-acetyl)-piperidin-4-yloxy]-7-(2-methoxy-ethoxy)-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-acetylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-[1-(tert.-butyloxycarbonyl)-piperidin-4-yloxy]-7-methoxy-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-(tetrahydropyran-4-yloxy]-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-{N-[(piperidin-1-yl)carbonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-{N-[(4-methyl-piperazin-1-yl)carbonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{cis-4-[(morpholin-4-yl)carbonylamino]-cyclohexan-1-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[2-(2-oxopyrrolidin-1-yl)ethyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(morpholin-4-yl)carbonyl]-piperidin-4-yloxy}-7-(2-methoxy-ethoxy)-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-(1-acetyl-piperidin-4-yloxy)-7-methoxy-quinazoline

- 4-[(3-ethynyl-phenyl)amino]-6-(1-methyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-(1-methanesulphonyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-methyl-piperidin-4-yloxy)-7(2-methoxy-ethoxy)-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-isopropyloxycarbonyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(cis-4-methylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{cis-4-[N-(2-methoxy-acetyl)-N-methyl-amino]-cyclohexan-1-yloxy}-7-methoxy-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-(piperidin-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-[1-(2-methoxy-acetyl)-piperidin-4-yloxy]-7-methoxy-quinazoline
- 4-[(3-ethynyl-phenyl)amino]-6-{1-[(morpholin-4-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(cis-2,6-dimethyl-morpholin-4-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(2-methyl-morpholin-4-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(S,S)-(2-oxa-5-aza-bicyclo[2,2,1]hept-5-yl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(N-methyl-N-2-methoxyethyl-amino)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-ethyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(2-methoxyethyl)carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-{1-[(3-methoxypropyl-amino)-carbonyl]-piperidin-4-yloxy}-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[cis-4-(N-methanesulphonyl-N-methyl-amino)-cyclohexan-1-yloxy]-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[cis-4-(N-acetyl-N-methyl-amino)-cyclohexan-1-yloxy]-7-methoxy-quinazoline

- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-methylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[trans-4-(N-methanesulphonyl-N-methyl-amino)-cyclohexan-1-yloxy]-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-dimethylamino-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(trans-4-{N-[(morpholin-4-yl)carbonyl]-N-methyl-amino}-cyclohexan-1-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-[2-(2,2-dimethyl-6-oxo-morpholin-4-yl)-ethoxy]-7-[(S)-(tetrahydrofuran-2-yl)methoxy]-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-methanesulphonyl-piperidin-4-yloxy)-7-methoxy-quinazoline
- 4-[(3-chloro-4-fluoro-phenyl)amino]-6-(1-cyano-piperidin-4-yloxy)-7-methoxy-quinazoline

optionally in the form of the racemates, enantiomers, diastereomers thereof and optionally in the form of the pharmacologically acceptable acid addition salts, solvates or hydrates thereof. According to the invention the acid addition salts of the betamimetics are preferably selected from among the hydrochloride, hydrobromide, hydriodide, hydrosulphate, hydrophosphate, hydromethanesulphonate, hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydroxalate, hydrosuccinate, hydrobenzoate and hydro-p-toluenesulphonate.

The dopamine agonists used are preferably compounds selected from among bromocriptin, cabergoline, alpha-dihydroergocryptine, lisuride, pergolide, pramipexol, roxindol, ropinirol, talipexol, tergurid and viozan, optionally in the form of the racemates, enantiomers, diastereomers thereof and optionally in the form of the pharmacologically acceptable acid addition salts, solvates or hydrates thereof. According to the invention the acid addition salts of the betamimetics are preferably selected from among the hydrochloride, hydrobromide, hydriodide, hydrosulphate, hydrophosphate, hydromethanesulphonate, hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydrooxalate, hydrosuccinate, hydrobenzoate and hydro-p-toluenesulphonate.

H1-Antihistamines which may be used are preferably compounds selected from among epinastine, cetirizine, azelastine, fexofenadine, levocabastine, loratadine,

mizolastine, ketotifen, emedastine, dimetindene, clemastine, bamipine, cexchlorpheniramine, pheniramine, doxylamine, chlorophenoxamine, dimenhydrinate, diphenhydramine, promethazine, ebastine, desloratidine and meclozine, optionally in the form of the racemates, enantiomers, diastereomers thereof and optionally in the form of the pharmacologically acceptable acid addition salts, solvates or hydrates thereof. According to the invention the acid addition salts of the betamimetics are preferably selected from among the hydrochloride, hydrobromide, hydriodide, hydrosulphate, hydrophosphate, hydromethanesulphonate, hydronitrate, hydromaleate, hydroacetate, hydrocitrate, hydrofumarate, hydrotartrate, hydroxalate, hydrosuccinate, hydrobenzoate and hydro-p-toluenesulphonate.

It is also possible to use inhalable macromolecules, as disclosed in EP 1 003 478 A1 or CA 2297174 A1.

In addition, the compounds may come from the groups of ergot alkaloid derivatives, the triptans, the CGRP-inhibitors, the phosphodiesterase-V inhibitors, optionally in the form of the racemates, enantiomers or diastereomers thereof, optionally in the form of the pharmacologically acceptable acid addition salts, the solvates and/or hydrates thereof.

Examples of ergot alkaloid derivatives are dihydroergotamine and ergotamine.

Claims:

1. Inhaler (1) for delivering a preferably powdered formulation (2) from a carrier which is preferably band-shaped, flexible and/or forming a closed loop, with a plurality of receptacles, each of which contains one dose of the formulation (2),

with a conveying device (5) for stepwise advancing of the carrier, which comprises in particular two deflectors (8) between which the carrier extends,

wherein the carrier extends over a circumferential angle (α) of the inhaler (1) of less than 360°, and/or

wherein the carrier is guided between the two deflectors (8) in each case with an at least substantially constant curvature, and/or

wherein the carrier extends exclusively in an annular segment (9) of the inhaler (1) and/or with one of two portions connecting the deflectors (8), exclusively along an outer wall (10) of the inhaler (1).

2. Inhaler according to claim 1, characterised in that the carrier extends exclusively between the two deflectors (8).

3. Inhaler according to claim 1 or 2, characterised in that the carrier is guided between the two deflectors (8), at least substantially along an outer and inner arc, particularly an arc of a circle.

4. Inhaler according to one of the preceding claims, characterised in that the deflectors (8) deflect the carrier through at least 160° each, particularly at least substantially 180° or more each.

5. Inhaler according to one of the preceding claims, characterised in that the portions of the carrier between the two deflectors (8) are guided at an at least substantially constant spacing from one another.

6. Inhaler (1) for delivering a preferably powdered formulation (2) from a carrier which is preferably band-shaped, flexible and/or forming a closed loop, with a plurality of receptacles, each of which contains one dose of the formulation (2), in particular according to one of the preceding claims,

with a conveying device (5) which comprises a plurality of wheels (12) for stepwise advancing and/or for guiding the carrier,

wherein the wheels (12) have the same diameter, are arranged on a common radius, can be driven by common drive means, particularly a sun wheel (14), and/or have the same direction of rotation.

7. Inhaler according to claims 5 and 6, characterised in that the diameter of the wheels (12) essentially corresponds to the spacing of the portions.

8. Inhaler (1) for delivering a preferably powdered formulation (2) from a carrier which is preferably band-shaped, flexible and/or forming a closed loop, with a plurality of receptacles, each of which contains one dose of the formulation (2), in particular according to one of the preceding claims,

with a conveying device (5) having a gear, particularly a planet gear (21), for advancing the carrier, the conveying device (5) having a free wheel clutch (22).

9. Inhaler according to claim 8, characterised in that the free wheel clutch (22) is arranged in a drive wheel and/or gear wheel, particularly in a sun wheel (14).

10. Inhaler according to one of the preceding claims, characterised in that the conveying device (5) has in particular only two or four wheels (12) which act on the carrier, and/or that all the wheels (12) acting on the carrier are driven.

11. Inhaler according to one of claims 8 to 10, characterised in that the conveying device (5) has a non-return mechanism (28) which forms a travel limiter for the reverse movement of the carrier, particularly in order to be able to position the respective receptacle in a defined position for the next delivery.

12. Inhaler according to one of the preceding claims, characterised in that the conveying device (5) forms the sole drive for moving the carrier.

13. Inhaler according to one of the preceding claims, characterised in that the inhaler (1) has a mouthpiece (7) or other endpiece for delivering the preferably nebulised or atomised formulation (2) and an associated cover (15) which is movable or pivotable for opening and/or closing the mouthpiece (7).

14. Inhaler according to claim 13, characterised in that the inhaler (1) is constructed such that the conveyor device (5) and/or a removal device (6) can be actuated or driven in order to open the individual recesses and/or remove the doses of formulation (2) by means of the opening and/or closing movement of the cover (15).

15. Inhaler according to one of the preceding claims, characterised in that the inhaler (1) comprises a removal device (6) for separately opening the recesses and/or removing the doses of formulation (2), and in particular wherein the removal device (6) comprises a removal element (16) which is movable relative to the respective receptacle or to the carrier, in order to open the respective receptacle.

16. Inhaler according to claim 15, characterised in that the removal element (16) is constructed as a piercing element, fixedly formed and/or attached to a mouthpiece (7) of the inhaler (1).

17. Inhaler (1) for delivering a preferably powdered formulation (2) from a carrier which is preferably strip-shaped, flexible and/or forms a closed loop, with a plurality of receptacles each of which contains a dose of the formulation (2), in particular according to one of the preceding claims,

with a conveyor device (5) for advancing the carrier stepwise,

with a removal device (6) for opening the receptacles individually and/or removing the doses of formulation (2), the removal device (6) having an at least substantially stationary removal element (16),

the carrier being movable at right angles to the direction of advance towards the removal element (16) in order to open the carrier or a receptacle of the carrier or to connect to the removal element (16).

18. Inhaler according to one of claims 15 to 17, characterised in that the removal device (6) comprises a guide element (13) which is movable in particular in the manner of a sled and/or at right angles to the direction of conveying or advancing of the carrier for individually opening the receptacles by moving the respective receptacle or the carrier relative to the removing element (16).

19. Inhaler according to one of claims 15 to 18, characterised in that the removal device (6) is constructed such that the receptacles can be individually opened from the outside one after another and/or by breathing while inhaling an air current (L) of ambient air can be sucked in for delivering the respective dose with the ambient air as an aerosol cloud (17).

20. Inhaler (1) for delivering a preferably powdered formulation (2) from a carrier which is preferably strip-shaped, flexible and/or forms a closed loop, particularly according to one of the preceding claims,

with a substantially round housing (19) which is flattened or indented on one side.

21. Inhaler according to claim 20, characterised in that the flattened or indented side is formed by a portion (29) of the housing (19) and by a portion (30) of a cover (15) of the inhaler (1) which is adjacent to said portion (29) when the inhaler (1) is closed.

22. Inhaler according to one of the preceding claims, characterised in that the carrier is constructed in the form of a band and/or a blister strip (3).

23. Inhaler according to one of the preceding claims, characterised in that the receptacles are formed by blister pouches (4) of the carrier.

24. Inhaler according to one of the preceding claims, characterised in that the inhaler (1) is portable in construction.

25. Method of delivering a preferably powdered formulation (2) from a carrier which is preferably band-shaped, flexible and/or forming a closed loop, particularly a blister strip (3), having a plurality of receptacles each of which contains a dose of the formulation (2),

wherein the carrier is advanced stepwise, so that the receptacles are brought into a removal position one after another, and

wherein the carrier is moved at right angles, more particularly perpendicularly, to the direction of conveying or advancing, in order to bring the particular recepta-

cle which is in the removal position up to a preferably fixed removal device (6) and/or to open said receptacle.

26. Method of delivering a preferably powdered formulation (2) from a carrier which is preferably band-shaped, flexible and/or forming a closed loop, particularly a blister strip (3), having a plurality of receptacles each of which contains a dose of the formulation (2), particularly according to claim 25,

wherein the carrier is advanced stepwise and the receptacles are brought into a removal position one after another,

wherein the carrier is moved backwards, counter to the direction of advance, towards a travel limiter or a non-return mechanism (28) for correctly positioning the respective receptacle in the removal position of the carrier.

27. Method of delivering a preferably powdered formulation (2) from a carrier which is preferably band-shaped, flexible and/or forming a closed loop, particularly a blister strip (3), having a plurality of receptacles each of which contains a dose of the formulation (2), particularly according to claim 25 or 26,

wherein the carrier is advanced stepwise and the receptacles are opened one after another to deliver the respective dose,

wherein the respective receptacle is opened by opening a cover (15) of a mouthpiece (7) in order to deliver the formulation (2) and the carrier is only moved further on by closing the cover (15).

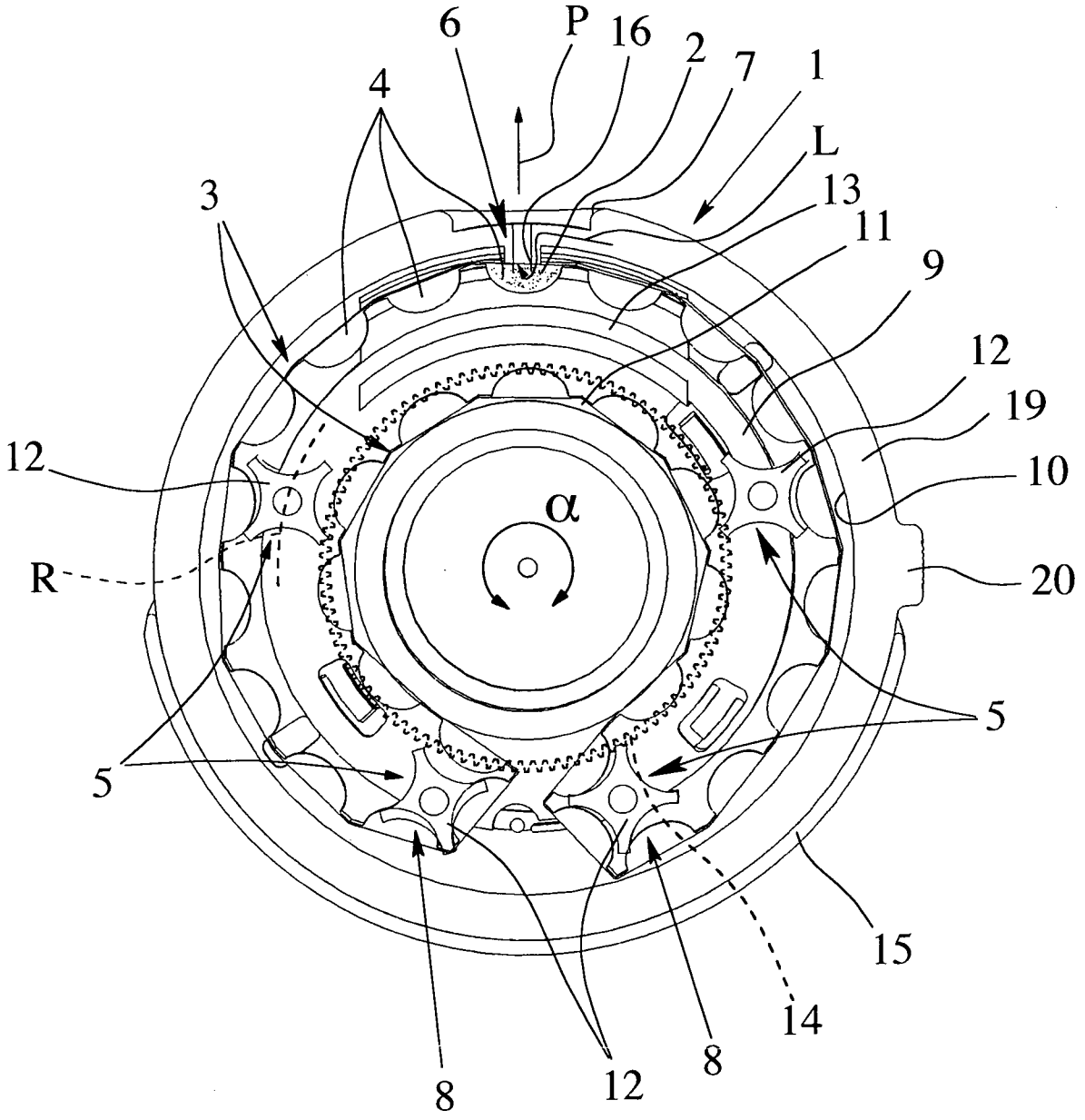


Fig. 1

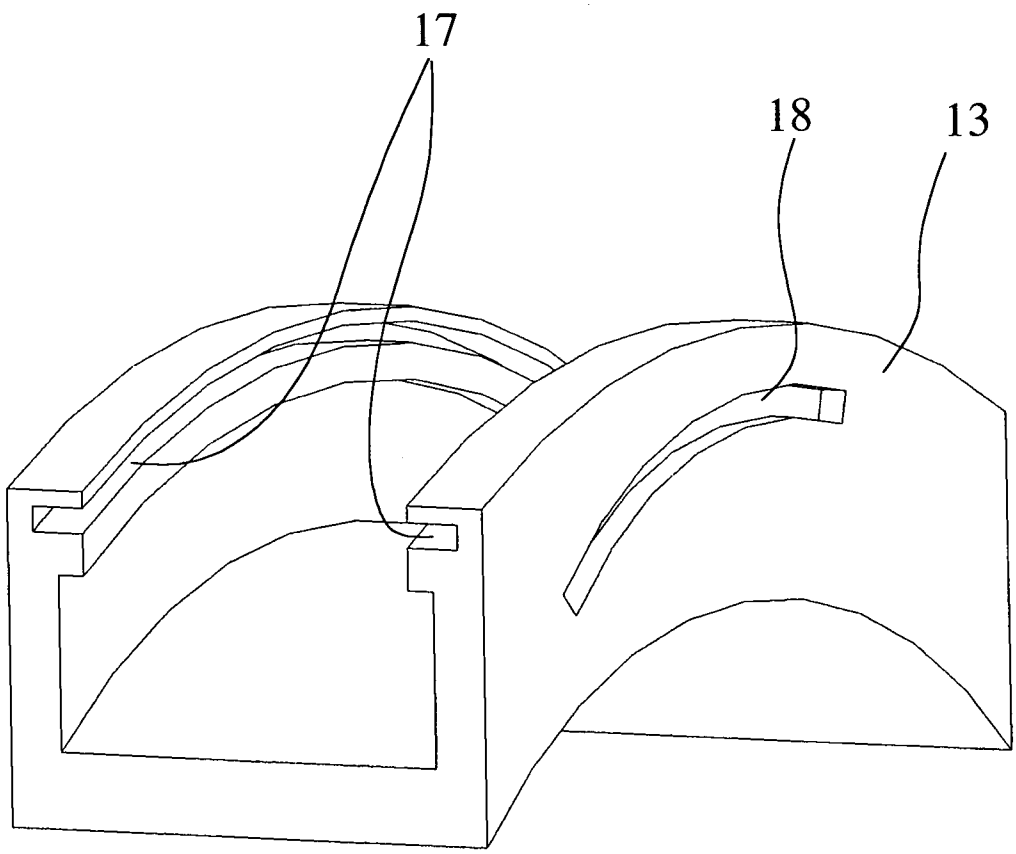


Fig. 2

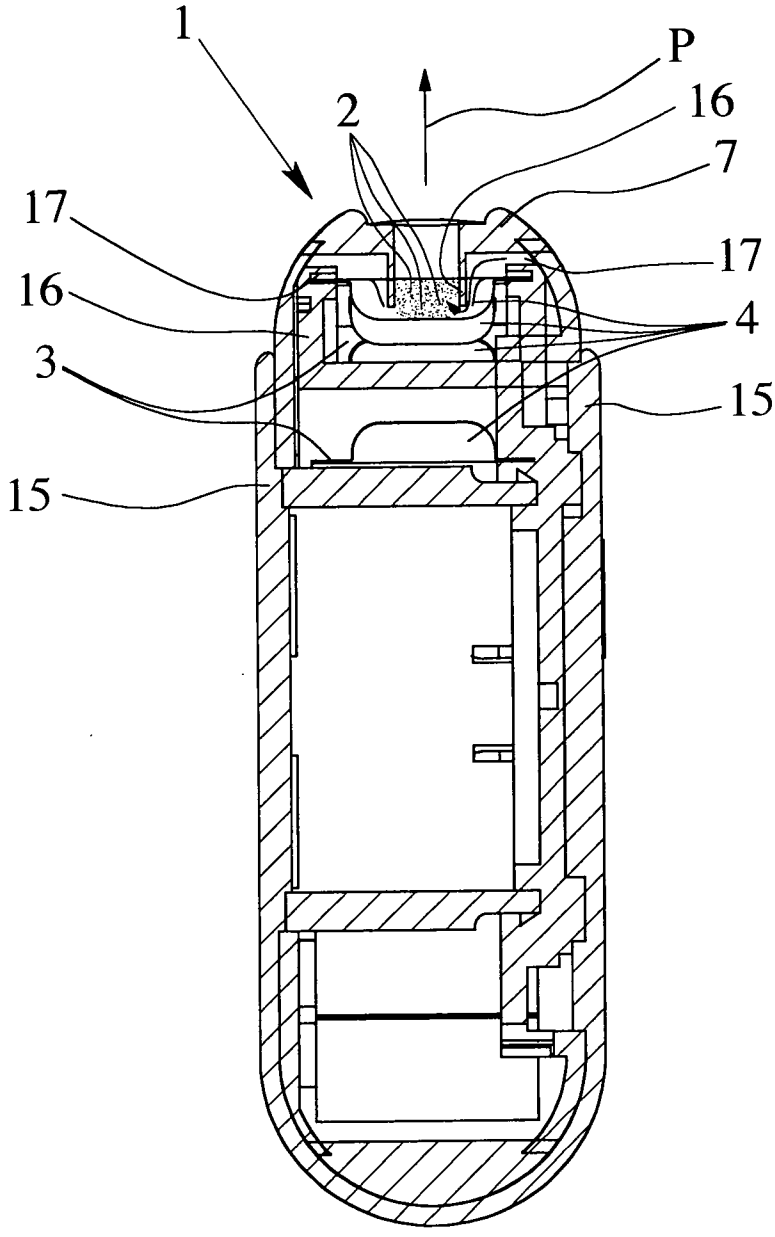


Fig. 3

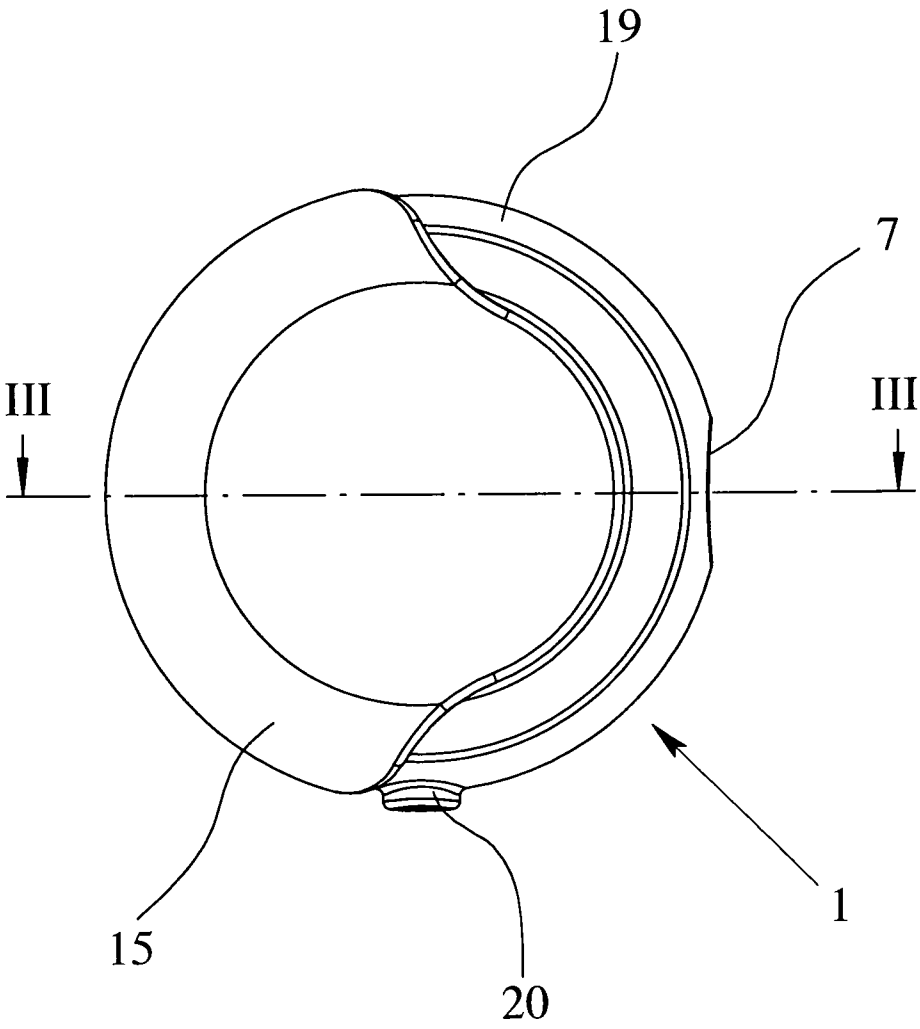


Fig. 4

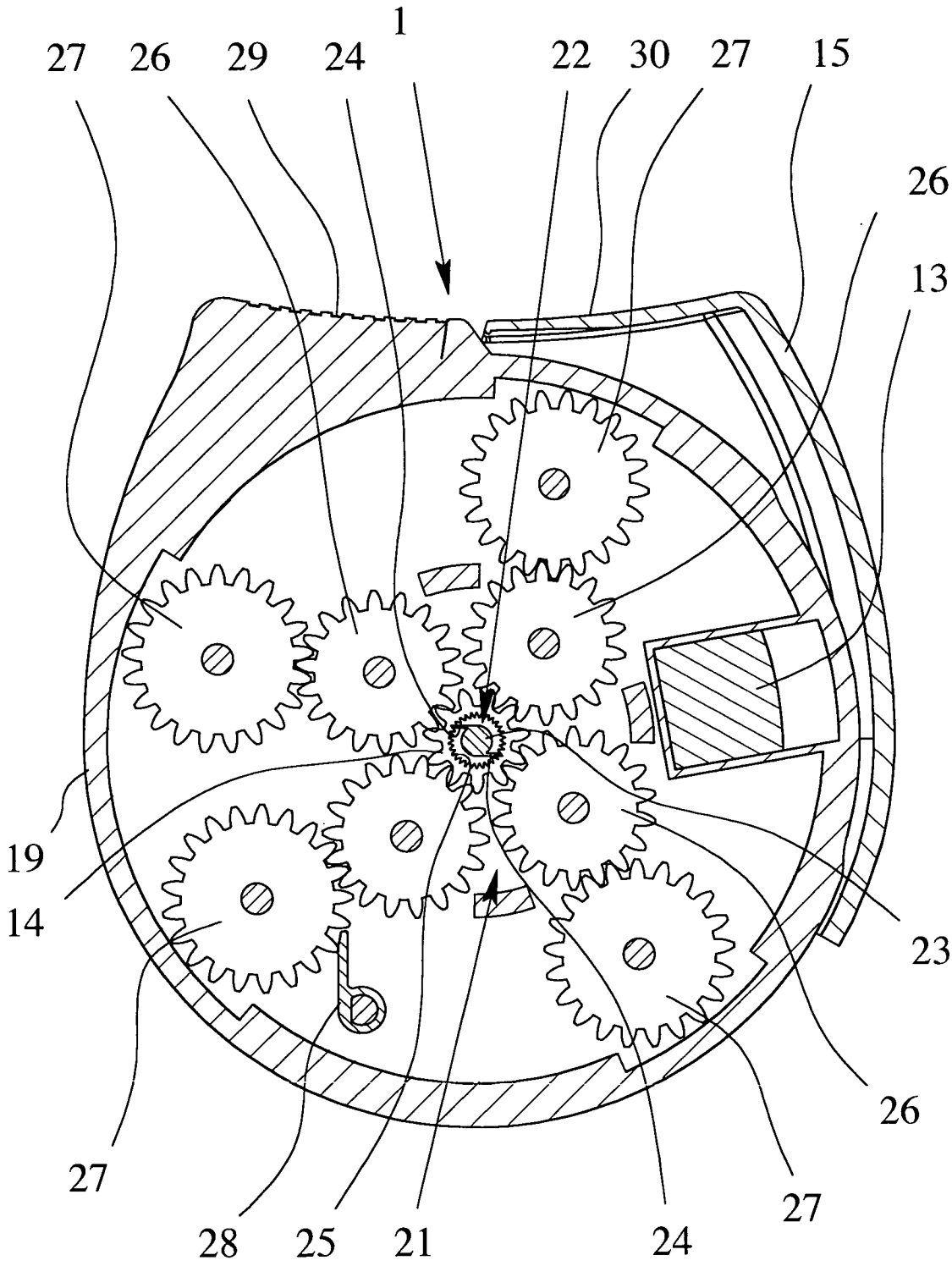


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/004416

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61M15/00

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

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.
X	WO 03/061743 A (GLAXO GROUP LTD [GB]; ANDERSON GREGOR JOHN MCLENNAN [GB]; BONNEY STANL) 31 July 2003 (2003-07-31) page 59 - page 62; figures 19,20	1,20-24
X	WO 2005/049121 A (GLAXO GROUP LTD [GB]; RAND PAUL KENNETH [GB]) 2 June 2005 (2005-06-02)	1-10,12, 14,15, 20,22,24
Y	page 10, line 1 - page 10, line 10; figures 5,7-14 page 12, line 15 - line 28	11,13
X	WO 2005/014089 A (GLAXO GROUP LTD [GB]; AUGUSTYN STEPHEN [GB]; CROSBY GARY THOMAS [GB];) 17 February 2005 (2005-02-17) abstract; figures	1,20-24

-/--

[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
21 August 2007	30/08/2007

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	Valfort, Cyril

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/004416

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 41 06 379 A1 (GLAXO GROUP LTD [GB]) 5 September 1991 (1991-09-05) cited in the application	1-24
Y	the whole document	13
P,X	WO 2006/079746 A (VALOIS SAS [FR]; POCOCK ANDREW GORDON [GB]; KAY STUART BRIAN WILLIAM [) 3 August 2006 (2006-08-03) claim 1; figures 26,27	1,16-19
Y	WO 03/035508 A (GLAXO GROUP LTD [GB]; HARVEY STEPHEN JAMES [GB]) 1 May 2003 (2003-05-01) page 37, line 21 - line 27; figure 1	11
A	WO 01/26720 A (SHL MEDICAL AB [SE]; BRUNNBERG LENNART [SE]; OLSSON THOMAS [SE]) 19 April 2001 (2001-04-19) abstract; figures	16-19

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2007/004416

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. [X] Claims Nos.: 25-27
because they relate to subject matter not required to be searched by this Authority, namely:

Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy

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

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

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

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

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

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

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

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

Remark on Protest

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

[ ] No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2007/004416

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 03061743 A	31-07-2003	BR 0306799 A	07-12-2004
		CA 2473053 A1	31-07-2003
		CN 1622838 A	01-06-2005
		EP 1467789 A1	20-10-2004
		JP 2005515039 T	26-05-2005
		MX PA04007129 A	29-10-2004
		NZ 533780 A	31-03-2006
		US 2005154491 A1	14-07-2005
		ZA 200405701 A	03-10-2005
WO 2005049121 A	02-06-2005	EP 1711219 A1	18-10-2006
		JP 2007511258 T	10-05-2007
		US 2007131225 A1	14-06-2007
WO 2005014089 A	17-02-2005	AU 2004262907 A1	17-02-2005
		BR PI0411773 A	08-08-2006
		CA 2533333 A1	17-02-2005
		CN 1829547 A	06-09-2006
		EP 1651296 A1	03-05-2006
		JP 2006528500 T	21-12-2006
		MX PA06000726 A	30-03-2006
		US 2006196504 A1	07-09-2006
DE 4106379 A1	05-09-1991	AP 310 A	07-01-1994
		AT 401007 B	28-05-1996
		AT 43791 A	15-10-1995
		AU 675825 B2	20-02-1997
		AU 5926794 A	16-06-1994
		AU 645056 B2	06-01-1994
		AU 7202591 A	05-09-1991
		BE 1003798 A4	16-06-1992
		BR 9100843 A	05-11-1991
		CA 2037421 A1	03-09-1991
		CH 683319 A5	28-02-1994
		CN 1054893 A	02-10-1991
		CN 1107687 A	06-09-1995
		CZ 283168 B6	14-01-1998
		CY 2010 A	20-02-1998
		CZ 9601807 A3	16-12-1998
		DK 37991 A	03-09-1991
		ES 2031763 A6	16-12-1992
		FI 911037 A	03-09-1991
		FI 990115 A	21-01-1999
		FR 2659558 A1	20-09-1991
		FR 2660550 A1	11-10-1991
		GB 2242134 A	25-09-1991
		GR 91100096 A	30-06-1992
		HK 18895 A	17-02-1995
		HK 19195 A	17-02-1995
		IE 910698 A1	11-09-1991
		IL 97396 A	31-12-1995
		IT 1244655 B	08-08-1994
		JP 3110477 B2	20-11-2000
		JP 4220266 A	11-08-1992
		LU 87898 A1	16-11-1992
		NL 9100381 A	01-10-1991
		NO 910836 A	03-09-1991
		NO 302929 B1	11-05-1998

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE 4106379	A1	NO	980033 A	05-01-1998
		NZ	237274 A	27-02-1996
		OA	9393 A	15-09-1992
		PL	289264 A1	01-06-1992
		PT	96920 A	29-01-1993
		SE	512934 C2	05-06-2000
		SE	9100582 A	03-09-1991
		RU	2075977 C1	27-03-1997
		ZA	9101516 A	26-02-1992
WO 2006079746	A	03-08-2006	FR 2881117 A1	28-07-2006
WO 03035508	A	01-05-2003	AT 345288 T	15-12-2006
			EP 1436216 A1	14-07-2004
			JP 2005506163 T	03-03-2005
			US 2005005934 A1	13-01-2005
WO 0126720	A	19-04-2001	AT 271400 T	15-08-2004
			AU 1068401 A	23-04-2001
			DE 60012347 D1	26-08-2004
			DE 60012347 T2	28-07-2005
			EP 1220698 A1	10-07-2002
			ES 2225246 T3	16-03-2005
			US 6880555 B1	19-04-2005