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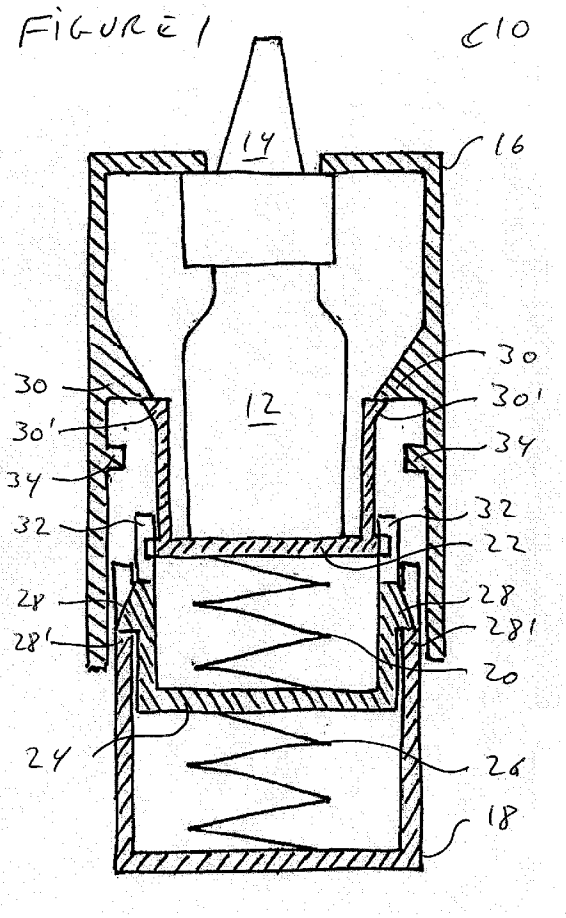

(57) Abstract: A dispenser (10) for dispensing a substance, the dispenser comprising a compressible container (12) comprising the substance, the container being adapted to eject or dispense a dose of the substance when compressed by a first force exerted on the container in a first predetermined direction or along a first axis. An intermediate element (26) being adapted to take up the expansion of the container (12) after dispensing in order to ensure full expansion of the container. A user operable element (18) adapted to move between a first and second position for providing a force to the container. The force equating or exceeding the first force at a third position between the first and second positions, and the intermediate element (26) being in the expanded state between the first and third positions and to take up expansion of the container when the operable element is between the third and second positions. The operable element (18) being prevented from moving toward the first position when positioned at or between the second and third positions.

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A DISPENSER

The present invention relates to improvements in dispensers comprising compressible containers and in particular to dispensers and dispensing where the user is not able to interact with or prevent the de-compression of the container subsequent to dispensing a dose.

WO 2005/004960 describes an inhaler comprising a handle which may only be moved in one direction between an initiating position and a fully compressed position at which it may be assumed that a full dose has been dispensed.

Other dispensers may be seen in US6860262, 5347998, 6553988, 5060643 and 6170713.

In a first aspect, the invention relates to a dispenser for dispensing a substance, the dispenser comprising:

- a compressible container comprising the substance, the container being adapted to eject or dispense a dose of the substance when compressed by a first force exerted on the container in a first predetermined direction or along a first axis,

- an intermediate element having a first state, in which it is compressed in the first direction, and a second state in which it is expanded in the first direction,

- a user operable element movable in a direction from a first to a second position, a third position being provided between the first and second positions,

the operable element being adapted to compress the container when the operable element is in the third position, and

the operable element being adapted to, in the second position, bring the intermediate element from the expanded state to the compressed state.

In the present context, several different types of container may be used, as long as they are operable by compression or deformation. One type of container comprises an internal dosing chamber which, subsequent to a compression of the container, is filled at the decompression of the container. Typically, this type of container comprises a substance with a propellant, which when exposed to ambient pressure, boils and expels the substance from the dosing chamber. In this type of container it is desirable both that the dispensing is complete, i.e. that the compression of the container takes place to a satisfactory degree, and that the decompression thereof also takes place in a satisfactory manner, in that this step defines the next dose to be dispensed.

Another type of container is one not comprising a propellant but which, when being compressed, acts to pump the substance out of the container. In this situation, again, it is highly desirable that the compression is satisfactory in that this defines the dose output.

In general, another reason for wishing to ensure that the compression of the container is sufficient is that especially for inhalers, the droplet formation caused by the expelling of the substance is important. This formation may be affected by the time of or degree of compression of the container. Thus, to ensure that the droplet formation is as intended by the supplier of the container, the compression should be as intended by the supplier.

In this context, the expanded state of the intermediate element will be one in which it is not compressed. Compression of this element may be any manner of reducing this elements extent in the direction, such as the first direction. This compression may be a deformation only in that direction, such as may be obtained using a helical spring, a foam, or a hydraulic cylinder, or by moving two elements in relation to each other (moving one into the other), or may be a reduction along that direction and an increase in extent in another direction, as would be the case when deforming a rubber element or a balloon. Naturally, any

number of states may exist between an extreme, expanded, state and an extreme, compressed, state.

Also, the user operable element may be operated directly by the user, such as would be the case with a handle or a button/knob, or may be operated via one or more other elements operable by the user. This operation may be a rotation, a translation or any combination thereof.

In addition, the first, second and third positions may be those of the element operated by the user or an element operated via one or more other elements operated by the user.

Naturally, the first, second and third positions may be positions of any type of movement performed by the operatable element, such a translation, rotation, or any combination thereof.

When the operatable element moves from the first to the second positions via the third position, it is ensured that the container is firstly compressed and that the intermediate element is subsequently transitioned from the expanded state to the compressed state. In fact, it is preferred that a difference in extent along the first direction between the compressed and expanded states of the intermediate element is at least a distance which the container is to be compressed. In that manner, the compression of the intermediate element may take up the expansion or de-compression of the container ensuring that the container is reverted to its non-compressed state.

In this respect, it is preferred that the force exerted on the container, and provided by the operable element, is exerted via the intermediate element in its second state. Thus, the intermediate element in its second state preferably is adapted to withstand at least the first force along the first axis. Also, it is preferred that the intermediate element when in its second position or state is adapted to be prevented from moving from the second to first position by a force being lower than the first force and exerted along the first axis. Thus,

when released from its first position, the container will be able to expand by exerting a force being lower than the first force on the intermediate element.

Therefore, it is preferable that the container, intermediate element and operable element engage or abut along the first axis at least during operation of the operable element.

In one embodiment, the dispenser further has means for preventing the operable element, when positioned between the third and second positions, from moving toward the third position. Thus, it is ensured that once the container has been compressed to output the dose, the user is not able to prevent the container from de-compressing, as the operable element must move to the second position before being able to move to the third position for a next dose dispensing.

A large number of manners exist for providing a preventing means of this type, one type being a ratchet arrangement acting on the user operable element.

An alternative to the preventing means is to have the transition from the third to the second position take place automatically, preferably without the user having any possibility of affecting or preventing it.

In a preferred embodiment, the dispenser has a housing, the container (or at least a part thereof being adapted to be compressed), the intermediate element, and the user operable element being positioned sequentially engaging along the first direction in the housing so as to abut or engage. In this manner, the housing acts to direct the forces from the operable element to the container and from the container to the intermediate element. Naturally, the order of the elements along the sequence is not important.

In one embodiment, the user operable element comprises a resilient element adapted to be compressed/biased by operation of the user and which is adapted to compress the container when de-compressing/expanding. Naturally, the compression of the container may be a direct consequence of the de-

compressing or expanding of the resilient element, such as when an engagement (acting to compress the resilient element) of the user ends, or the dispenser may further have first means for preventing compression of the container, even though the resilient element exerts a force. This may be a loading operation in which the user compresses the resilient element and thereby makes the dispenser ready for dispensing at any time. The first preventing means are then brought out of operation, when the user operable element is in the third position.

In a particular embodiment, the user operable element comprises a combination of two elements rotatable, around an axis of rotation, in relation to each other, a first one of the elements comprising a first and a second surface part being at different positions, along the axis of rotation, the first and second surface parts, when engaging or abutting the other one of the elements, defining an expanded and a compressed state, the combination being adapted to compress the container when in the expanded state. Preferably, at least one of the elements further comprises a sloped surface part positioned between the first and the second surface parts, the sloped surface part being adapted to engage the other of the elements and bring the combination from the compressed to the expanded state when the elements are rotated in relation to each other.

In addition, it is desired that the two elements comprise surface parts adapted to transition the combination from the expanded state to the compressed state over a small, such as abruptly during rotation, angular interval, so that the reversing to the compressed state is easily detectable.

In one embodiment, the intermediate element comprises second means for preventing transitioning from the expanded state to the compressed state thereof, the user operable element being adapted to bring the second preventing means out of operation when in the second position. In this situation, decompression of the container may be prevented until it has been ensured that the compression of the container is complete and, thus, that the dose dispensed is as intended. Naturally, these preventing means may take any desirable shape

and perform any function, depending on the actual function of the intermediate element.

Also, in one embodiment, the dispenser further comprises means for determining when the container has been compressed, the determining means being adapted to determine:

- when or if the user operable element is in the first, second, or third position and/or

- when or if the intermediate element is in the expanded or compressed state and/or

- when or if the intermediate element transitions between the compressed and expanded state, and/or

- when or if the container is compressed or expanded.

Each of these positions, states or transitions may be performed one for each dispensing. Such means may be used for determining that a dose of the substance has been dispensed. This may be used for counting the number of doses dispensed. In addition, a point in time of dispensing may be determined, so that compliance with a dispensing scheme may be determined. In addition, it may be desired to compare a present point in time with the dispensing scheme and/or a last point in time of dispensing in order to determine whether another dose of the substance may be dispensed at the present time.

In one embodiment, the dispenser has means for preventing compression of the container, the preventing means being adapted to:

- prevent the user operable element from leaving or taking the first, second, or third position and/or

- prevent the intermediate element from leaving or taking the expanded or compressed state and/or

- prevent the intermediate element from transitioning between the compressed and expanded state, and/or

- prevent the container from being compressed or expanded.

This preventing means may be operated by a processor or the like also performing the above-mentioned determination of whether, at a present point in time, a dispensing is allowable or recommendable based on e.g. a dispensing scheme and/or one or more previous points in time of dispensing. When dispensing is not recommendable or allowable, the preventing means may be operated. This operation may be constant or may be initiated if it is determined that the user wishes to attempt dispensing a dose (such as when the engageable element(s) is/are moved).

In a second aspect, the invention relates to a dispenser for dispensing a substance, the dispenser comprising

- a compressible container comprising the substance, the container being adapted to eject or dispense a dose of the substance when compressed by a first force exerted on the container in a first predetermined direction,

- a blocking element having a blocking position, in which the blocking means prevents compression of the container, and an unblocking position,

- a first engageable element adapted to be engaged by a user in order to exert a second force on the container along the first direction, the second force being equal to or exceeding the first force, and

- a second engageable element adapted to be moved by the user in a second predetermined direction between a first and a second position, the second engageable element moving, at a third position thereof, the blocking

element from the blocking position to the unblocking position and reducing, at the second position thereof, the force exerted by the first engageable element on the container to a force below the first force, the third position being positioned between the first and second positions.

The present blocking element may be adapted to block the actual compression of the container or may be block one or more elements adapted to engage the container and transfer force from the first engageable element in order to compress the container.

As mentioned above, the engageable elements may be directly operated or manipulated by the person or may be manipulated via one or more other elements.

At the second position, the force exerted by the first engageable element is reduced to below that required to compress the container. In that situation, the force exerted by the container will then make the container de-compress.

In one embodiment, the dispenser further has means for allowing movement of the second engageable element from the second position to the first position and preventing movement from the third position toward the first position. In that situation, it is ensured that the container is de-compressed between two compressions thereof.

Alternatively, it may be desired that this movement from the third to the second position and the de-compression of the container is automatic and not preventable by the user.

In one embodiment, the first engageable element comprises a first resilient element adapted to exert the second force on the container, the second engageable element being adapted to, at the second position thereof, reduce the force exerted by the first resilient element. This resilient element may be of the same type as the intermediate element of the first embodiment, and the force

exerted by e.g. a spring may be adapted by adapting the compression of the spring, which may be adapted using a deformable or compressible element.

In one embodiment, the dispenser further has means for determining when the container has been compressed, the determining means being adapted to determine:

- when or if the second engageable element is in the first, second, or third position and/or

- when or if the force exerted is reduced and/or

- when or if the blocking element is in the blocking or unblocking position and/or

- when or if the container is compressed or expanded.

In one embodiment, the dispenser further has means for preventing compression of the container, the preventing means being adapted to:

- prevent the second engageable element from leaving or taking the first, second, or third position and/or

- prevent the blocking element from leaving or taking the blocking or unblocking position and/or

- prevent the container from being compressed or expanded.

In a third aspect, the invention relates to a dispenser for dispensing a substance, the dispenser comprising:

- a compressible container comprising the substance, the container being adapted to eject/output or dispense a dose of the substance when

compressed by a first force exerted on the container in a first predetermined direction,

- an engageable element adapted to be moved in the first predetermined direction by interaction of a user so as to provide a force along the first predetermined direction,

- a first resilient element being adapted to receive the force exerted by the engageable element and exert a second force along the first predetermined direction/axis,

- a second resilient element operable to receive the second force and exert a third force along the first predetermined direction on the container,

one of the first and second resilient elements having a compressible state and a non-compressible state, wherein, in the compressible state, the force exerted is lower than the first force,

- a first blocking element having a first blocking position, in which the blocking means prevents compression of the container, and a first unblocking position,

- a second blocking element having a second blocking position, in which the one of the first and second resilient elements is maintained in its non-compressible state, and a second unblocking position in which that resilient element is in its compressible state,

the engageable element being adapted to be moved by the user between a first and a second position, wherein:

- in the first position, the first and second blocking elements are in the first and second blocking positions, respectively,

- at a third position, the first blocking element is moved from the first blocking position to the first unblocking position, and

- at the second position, the second blocking element is moved from the second blocking position to the second unblocking position,

the third position being positioned between the first and second positions.

According to this aspect, two resilient elements are provided which act to provide a force on the container. Naturally, a force may be provided along the first direction from two directions toward the container (from the top and the bottom, usually), whereby the sequential positioning of the two resilient elements and the container may be in any desired order of these elements.

Naturally, the resilient element with the compressible state may be any type of such element, such as those described above as the intermediate element in relation to the first aspect of the invention. Also, the second blocking element will be adapted to the particular type of compression/deformation which this resilient element is capable of having performed.

It is an advantage if the compression of the compressible, resilient element reduces, such as due to a prolongation of the other resilient element, the force exerted by the other resilient element, so that the container may de-compress.

In one embodiment, the dispenser further has means for allowing movement of the engageable element from the second position to the first position and preventing movement from the third position toward the first position. Then, it is ensured that between two dispensing steps, the container is decompressed.

Alternatively, the movement from the third to the second position may be automatic, and preferably takes place in a manner so that the user, such as by operating the engageable element, is not able to prevent it.

In one embodiment, the dispenser further has means for determining when or if the container has been compressed, the determining means being adapted to determine:

- when or if the engageable element is in the first, second, or third position and/or

- when or if the first and/or second blocking element is in the blocking or unblocking state and/or

- when or if the one of the first and second resilient elements is in or transitions between the compressible and non-compressible state, and/or

- when or if the container is compressed or expanded.

In one embodiment, the dispenser further has means for preventing compression of the container, the preventing means being adapted to:

- prevent the engageable element from leaving or taking the first, second, or third position and/or

- prevent the first and/or second blocking element from leaving or taking its blocking or unblocking position and/or

- prevent the one of the resilient elements from taking or transitioning between the compressible and non-compressible state, and/or

- prevent the container from being compressed or expanded.

A fourth aspect of the invention relates to a dispenser for dispensing a substance, the dispenser comprising:

- a compressible container comprising the substance, the container being adapted to eject or dispense a dose of the substance when compressed by a first force exerted on the container in a first predetermined direction,

- a combination of a first and a second elements rotatable in relation to each other, at least one of the elements comprising a sloped surface adapted to translate one element in relation to the other during rotation of one of the first and second elements in relation to the other, the translation being along the first direction, the combination having a first rotational position in which the first and second elements abut and extend a first distance along the first direction and a second rotational position in which the first and second elements abut and extend a second distance along the first direction, the first distance being larger than the second distance,

- a first resilient/deformable element being adapted to be compressed in the first direction and receive a force exerted by the combination when in the first rotational position and exert a second force along the first predetermined direction on the container, the first resilient element being adapted to exert a second force being equal to or exceeding the first force, when in a first, compressed state, and to exert a second force being smaller than the first force when in a second, non-compressed or less compressed state, and

- an engageable element adapted to be moved in a second direction by interaction of a user so as to provide a rotation of one of the first and second elements of the combination in relation to the other of the first and second elements,

the dispenser further comprising means for preventing the elements of the combination from rotating in one direction in relation to each other.

In this aspect, the surfaces of the elements of the combination are adapted to provide the difference in extent along the first direction, depending on the rotational state or position thereof. As mentioned in relation to the first aspect, it is additionally preferred that the transition from the expanded state to the

compressed state takes place over a small angular interval and preferably abruptly in order for it to be possible or easy to determine this transition.

Again, the resilient/deformable element may be as that described in the first aspect.

Due to the operation of the preventing means, it is ensured that between two dispensing steps, the container is de-compressed. Preferably, as is general for the aspects, the user is not able to interact or prevent this de-compression of the container.

In one embodiment, the dispenser further has a first blocking element having a first blocking position, in which the blocking means prevents compression of the container, and a first unblocking position, the blocking means being adapted to move from the blocking to the unblocking position, when the combination is in its first rotational position. This blocking means makes it possible to e.g. bias a spring or other resilient element so as to be ready to compress the container without compressing the container until the blocking means allow this.

These blocking means may directly prevent compression of the container or may block elements from moving in order to compress the container.

In one element, the dispenser further has means for determining when or if the container has been compressed, the determining means being adapted to determine:

- when or if the user operable element is in the first, second, or third position and/or

- when or if the combination is in the first or the second rotational position and/or

- when or if the container is compressed or expanded.

In one embodiment, the dispenser further has means for preventing compression of the container, the preventing means being adapted to:

- prevent the engageable element from being moved and/or

- prevent the combination from leaving or taking the first and/or second rotational position and/or

- prevent the container from being compressed or expanded.

A fifth aspect relates to a method of operating a dispenser according to the first aspect, the method comprising:

- operating the operable element, such as via one or more other elements, from the first position to the third position and compressing the container, preferably while the intermediate element is in the expanded state,

- bringing the operable element from the third position to the second position and, in the second position, bringing the intermediate element from the expanded state to the compressed state so as to allow the container to de-compress.

In one embodiment, the bringing step is performed while preventing movement of the operable element toward the third and/or first position. In this situation, it is ensured that the container is allowed to de-compress before a next dispensing is performed.

In that situation, the preventing step could comprise operating a ratchet arrangement acting on the user operable element. Other manners of providing this preventing are known.

In one embodiment, when the container de-compresses, the intermediate element transits from the expanded to the compressed state and decreases in extend along the first direction to at least a distance at which the expanding

container expands from the compressed state. In that situation, the compression or reduction in extent of the intermediate element will be able to take up the prolongation or decompression of the container so that the user is not able to, e.g. by operating the engageable element, prevent this decompression or prolongation.

In one embodiment, the operating step comprises a user directly manipulating, such as rotating, the operable element. Alternatively, the user may manipulate the operable element via one or more other elements.

In one embodiment, the operating step comprises the user compressing/biasing a resilient element which, during the bringing step de-compresses/expands and compresses the container.

In that situation, the method may further comprise, in the first position, preventing compression of the container and, when the user operable element is in the third position, allowing compression of the container. Thus, the resilient element may be made ready for compressing the container but may be prevented from doing so until the preventing is removed.

In one embodiment, the operating step comprises rotating, around an axis of rotation, two elements in relation to each other, a first one of the elements comprising a first and a second surface part being at different positions, along the axis of rotation, so as to transition from a compressed state to an expanded state so as to compress the container. As mentioned above, it is additionally desired to have the surfaces of the two elements facilitate transition from the expanded state to the compressed state over a small angular interval and most preferably abruptly.

In this embodiment, one of the elements may further comprise a sloped surface part positioned between the first and the second surface parts, the rotating step comprises the sloped surface part engaging the other of the elements and bringing the combination from the compressed to the expanded state.

In one embodiment, the method further comprises the step of preventing the intermediate element from transitioning from the expanded state to the compressed state when the user operable element is in the third position, where the intermediate element is brought from the expanded state to the compressed state, when user operable element is in the second position.

In one embodiment, the method further comprises the step of determining when or if the container has been compressed, the determining step comprising determining:

- when or if the user operable element is in the first, second, or third position and/or

- when or if the intermediate element is in the expanded or compressed state and/or

- when or if the intermediate element transitions between the compressed and expanded state, and/or

- when or if the container is compressed or expanded.

As mentioned above, this may be used for counting the number of doses and may be used for determining or estimating compliance to a dispensing scheme and may be used as a basis for determining whether dispensing of a dose is presently allowable or recommendable.

In one embodiment, the method further comprises the step of preventing compression of the container, the preventing step comprising:

- preventing the user operable element from leaving or taking the first, second, or third position and/or

- preventing the intermediate element from leaving or taking the expanded or compressed state and/or

- preventing the intermediate element from transitioning between the compressed and expanded state, and/or

- preventing the container from being compressed or expanded.

This may be used for preventing dispensing of a dose, if this is not allowed or recommendable.

A sixth aspect of the invention relates to a method of operating the dispenser according to the second aspect, the method comprising

- operating the first engageable element and exerting the second force on the container while operating the blocking element,

- subsequently firstly operating the second engageable element from the first to the third position so as to move the blocking element to the unblocking element and compress the container,

- then secondly operating the second engageable element from the third to the second position so as to allow the container to de-compress.

In one embodiment, the method further comprises the step of allowing movement of the second engageable element from the second position to the first position and preventing movement from the third position toward the first position.

In one embodiment, the first engageable element comprises a first resilient element, where the first operating step comprises the first resilient element exerting the second force compressing the container, and wherein the second operating step comprises reducing the force exerted by the first resilient element. As described above, the resilient element may be adapted to exert the force when in an expanded state and not when in a compressed state.

In one embodiment, the method further comprises the step of determining when or if the container has been compressed, the determining step comprises determining:

- when or if the second engageable element is in the first, second, or third position and/or

- when or if the force exerted is reduced and/or

- when or if the blocking element is in the blocking or unblocking position and/or

- when or if the container is compressed or expanded.

In one embodiment, the method further comprises the step of preventing compression of the container, the preventing step comprising:

- preventing the second engageable element from leaving or taking the first, second, or third position and/or

- preventing the blocking element from leaving or taking the blocking or unblocking position and/or

- preventing the container from being compressed or expanded.

In a seventh aspect, the invention relates to a method of operating the dispenser according to the third aspect, the method comprising:

- moving the engageable element from the first to the third position while:

  - exerting a force on the first resilient element,

  - the first resilient exerting the second force on the second resilient element,

- the second resilient element exerting the third force on the container, and

- operating the first blocking element in the first blocking position to prevent compression of the container,

- when the engageable element is in the third position, moving the first blocking element from the first blocking position to the first unblocking position,

- when the engageable element is in the second position, operating the second blocking means to have the one of the first and second resilient elements transition from the non-compressible state to the compressible state to allow the container to de-compress.

In one embodiment, the method further comprises the step of allowing movement of the engageable element from the second position to the first position and preventing movement from the third position toward the first position.

In one embodiment, the method further comprises the step of determining when or if the container has been compressed, the determining step comprising determining:

- when the engageable element is in the first, second, or third position and/or

- when the first and/or second blocking element is in the blocking or unblocking state and/or

- when the one of the first and second resilient elements is in or transitions between the compressible and non-compressible state, and/or

- when the container is compressed or expanded.

In one embodiment, the method further comprises the step of preventing compression of the container, the preventing step comprising:

- preventing the engageable element from leaving or taking the first, second, or third position and/or

- preventing the first and/or second blocking element from leaving or taking its blocking or unblocking position and/or

- preventing the one of the resilient elements from taking or transitioning between the compressible and non-compressible state, and/or

- preventing the container from being compressed or expanded.

A ninth aspect of the invention relates to a method of operating the dispenser according to the fourth aspect, the method comprising:

- moving the engageable element in the second direction so as to rotate one of the first and second elements in relation to the other to have the combination transition from the second rotational position to the first rotational position, so as to bring the first resilient/deformable element to its compressed state,

- at the same time, preventing the elements of the combination from rotating in one direction in relation to each other.

In one embodiment, the method further comprises, during the moving step, preventing compression of the container and, subsequent to the moving step, allowing compression of the container.

In one embodiment, the method further comprises the step of determining when or if the container has been compressed, the determining step comprising determining:

- when the user operable element is in the first, second, or third position and/or

- when the combination is in the first or the second rotational position and/or

- when the container is compressed or expanded.

In one embodiment, the method further comprises the step of preventing compression of the container, the preventing step comprising:

- preventing the engageable element from being moved and/or

- preventing the combination from leaving or taking the first and/or second rotational position and/or

- preventing the container from being compressed or expanded.

In the following, preferred embodiments of the invention are described with reference to the drawing, wherein:

- figures 1-4 illustrate a first embodiment of a dispenser according to the invention,

- figure 5 illustrates a second embodiment of a dispenser according to the invention,

- figures 6-9 illustrate a third embodiment of a dispenser according to the invention,

- figures 10-12 illustrate a fourth embodiment of a dispenser according to the invention,

- figures 13-16 illustrate a fifth embodiment of a dispenser according to the invention, and

- figures 17-20 illustrate a sixth embodiment of a dispenser according to the invention.

In figure 1, a dispenser 10 is illustrated comprising therein a container 12 having a tip 14 from which a dose of a substance contained in the container is dispensed when the container 12 is compressed along its axis of symmetry (vertical in the drawing) presently denoted the first axis or the first direction.

The container 12 is positioned inside a housing having an upper part 16, from which the tip 14 protrudes, and a lower part or button 18 which is depressable in the upward direction, as will be described further below.

In this respect, it should be noted that different types of dispensers or inhalers may have different tips 14, as the tip 14 normally is adapted to the type or manner of dispensing or inhaling. Thus, a nasal dispenser may have one type of tip and an inhaler for oral inhalation may have another. In addition, different types of dispensers may require different characteristics of the tip, depending on e.g. a droplet formation of the dispensed substance. Thus, different tips may have therein (or in other positions of the container) a nozzle adapted to provide the droplets with a given size (distribution) and velocity, and the tip may be used for adapting or maintaining this size (distribution) and/or velocity. This, however, is known to the skilled person.

In the housing, an activating spring 20 is provided between an element 22 abutting the lower part of the container 12 and an element 24 releasably fixed to the button 18 via abutting elements 28/28'.

Between the button 18 and the element 24 is positioned a release spring 26.

In addition, the element 22 is releasably abutting the upper part 16 of the housing via abutting surfaces 30/30'.

The operation of this dispenser 10 is as follows, cf. figures 1-4.

Initially (figure 1), the springs 20 and 26 are in an extended state (the springs may be fully extended or biased to a certain degree), the button 18 is in a first, lower state, extended as far downwards as possible by the action of the spring 26.

When a user pushes the button 18 upwardly, the abutting elements 28 and 28' will abut and act to compress the spring 20 (see figure 2), as upward movement of the element 22 is prevented by the abutting elements 30 and 30'.

At this point, one of two strategies may be followed:

In a first strategy, the element 24 may be locked in this position so as to maintain the spring 20 biased. In that situation, the button 18 may be allowed to move back to the initial position without affecting the biasing of the spring.

Alternatively, the button 18 may be prevented from moving downwardly so as to maintain the spring 20 biased.

When, the button 18 is moved further upwards, at a position (between figures 2 and 3), extending elements 32 act to force the elements 30' toward each other and out of engagement with the elements 30, whereby upward movement of the element 22 and corresponding compression of the container 12 takes place due to the force exerted by the spring 20 being higher than that required to compress the container 12. The compressed state of spring 20 is seen in figure 2 and the dispensing state is seen in figure 3.

When, the button 18 is moved further upwards, the elements 28 will encounter projections 34 forcing the elements 28 toward each other and out of engagement with the surfaces 28', whereby the spring 26 will act to both take up the prolongation of the container 12 due to its spring force being lower than that exerted by the container and to force the button 18 downwards again.

Thus, the action of the spring 26 together with the possibility of the element 24 to move in relation to the button 18 makes it possible for the container to

expand fully, as soon as the elements 28' come out of engagement with the elements 28. In fact, the spring 26 allows the container to expand again fully, and thus to force the elements 30' of the element 22 below the elements 30 to again prevent compression of the container 12. This situation is seen in figure 4.

Resetting the dispenser is now obtained by the user simply releasing the button 18 which, by the operation of the springs 26 and 20 will be pushed to the position of figure 1 while the elements 28' again will abut the elements 28, and the dispenser is ready for the next dispensation.

In this embodiment, means are provided for preventing the button 18 from moving in the downward direction, when the elements 32 have released the engagement of elements 30/30', and until the engagement of elements 28/28' has been broken. In this manner, it is ensured that after dispensing, the container is allowed to expand fully and uninterrupted. In fact, the user has no way of interacting or preventing this expansion.

These preventing means may be ratchets having one or more projections engage a number of grooves in a manner so that movement in one direction only is possible. In that situation, two different tracks may be possible, one for each direction (upwardly and downwardly of the button 18 in the housing). Preventing means of this type may be seen in WO 2005/004960.

These preventing means may be provided between the button 18 and the housing 16 or between the element 24 and the housing 16.

In addition, the means preventing the button 18 from returning to the first position from e.g. the third position may be similar to that used in a clamp (easy fixing and requiring engaging a lock to release it again).

The springs 20 and/or 26 may be replaced by other resilient means (torsion spring, leaf spring, coil spring, resilient material (plastics, elastomers, foam, rubber or the like), compressible gas in a deformable container, deformable container comprising a fluid. In fact, the spring 26 may be omitted, if another

manner of returning the element 24 from the position illustrated in figure 4 to that of figure 1 is provided, such as the user simply pulling the element 24 out before use.

In the present embodiment, a dose counter and/or a locking mechanism may easily be provided, as it is ensured that the button 18 always performs the full movement through at least the third, fourth and lastly the second positions, so that a full dose is always dispensed (due to the action of the spring 20 providing a full compression of the container) and due to the container always being fully expanded, ensuring that the next dose is completely dosed. Thus, any position along the movement of the button 18 may be used for counting the doses dispensed.

Naturally, alternatively or in addition, it may be desired to ensure that the canister always performs the full movement from fully extended to fully compressed and back to fully extended. Otherwise – or in addition – it may be desired to ensure that the element 22 and/or 24 performs the full movement required and illustrated.

Thus, a plurality of positions and elements may be used for this dose counting.

In addition, the same elements and/or positions may be used for locking out further dispensing by preventing the elements from taking or leaving the position(s) determined.

In addition, any position of the button 18 may be used as a locking position for preventing dispensing of further doses, if a lock-out is desired. Alternatively, the blocking elements 30/30' or 28/28' may be prevented from disengaging or re-engaging to also facilitate prevention of the dispensing of further doses. One manner of obtaining this is to simply rotate the element(s) 22 or 24 to prevent the elements 28 from engaging with the elements 34 or the elements 32 engaging the elements 30', if these are not positioned along the full inner surface (are not rotationally symmetric). Another manner is to prevent any of the elements 18, 22 and 24 from moving axially.

Lock-out may be desired for certain types of substances and in particular on the basis of a comparison of previous points of time of dispensing doses and a dispensing scheme describing the preferred or required dispensing times and doses. This is known technology.

Figure 5 illustrates an embodiment similar to that of figures 1-4. In this embodiment, the dispenser 40 has an upper housing 56 and a lower part or button 58 translatable into or in the direction of the upper housing 56.

Again, the container 12 is positioned in the housing with the tip 14 protruding there from.

Also, as in the first embodiment, a spring 60 is provided to be loaded by depression of the button 58, while interaction of elements 70 and 70' prevent the container 12 from being depressed during loading of the spring 60. In addition, an element 64 has elements 68 engaging surfaces 68' of the button, preventing the element 64 from displacing and preventing the spring 60 from compressing.

The operation of the dispenser 40 starts with the depression of the button 58, whereby the element 64 is translated upwards, compressing the spring 60 while the elements 70 and 70' prevent the container 12 from being compressed.

When the button 58 is sufficiently depressed, elements 52 of the button 58 will make the elements 70 and 70' disengage, allowing the element 62 to move upwardly due to the action of the spring 60, whereby the container 12 will be compressed and a dose will be dispensed.

During compression of the container 12, the element 62, which is rotatably locked to the element 64, will rotate due to protrusions 66 thereof interacting with a thread 67 of the inner surface of the upper housing 56.

This rotation brings about a disengagement of the elements 68 and 68', as these are provided only at a part of the circumference (are not rotationally symmetric

around the axis of the container 12). Thus, when the container 12 is compressed, the elements 62/64 are rotated (around the axis of the container 12) a sufficient degree for the elements 68/68' to disengage.

As a consequence thereof, the engagement between elements 68 and 68' is broken, and the element 64 is allowed to move into the inner part of the button 58, where after the spring 60 is de-compressed, reducing the force compressing the container 12, where after the container 12 is allowed to expand, forcing the elements 62/64/60 downwards.

Finally, the position illustrated in figure is obtained by the user simply pulling the tab 58 downwards, so that the elements 68/68' pass each other and re-engage when the button 58 is again pushed inwardly.

As in the first embodiment, the dispenser 40 is provided with means ensuring that the button 58 is allowed to move only upwardly from the lower position to the position at which the elements 68/68' disengage in order to ensure that a single dose is dispensed and the container 12 is allowed to subsequently expand without risking the dosing of additional full or partial doses. In this embodiment, these means are not required in that once the elements 70/70' disengage, the dispensing and subsequent expansion of the container 12 and the disengagement of the elements 68/68' automatically takes place. Thus, no additional means need be provided for ensuring the correct order of these actions.

Again, the dispenser 40 may be provided with a dose counter and/or lock-out means in order to check or fulfil a medication scheme. Lock-out may be obtained by preventing the elements 58, 62 and/or 64 from moving axially (along the first direction), blocking the elements 70' from being pushed toward the centre, rotating the element 58 so that the element 68' cannot engage it or so that it cannot engage with the elements 70' and release these. Also, the element 62 may be prevented from rotating.

In figures 6-9, a third embodiment is illustrated in which a dispenser 80 comprises a housing 86 inside which the container 12 is positioned with the tip 14 extending out thereof.

Inside the housing 86, an element 82 is engaging the lower part of the container 12 and a further element 94 is positioned in relation to the element 82, and a loading spring 90 is provided there between. A handle 88, rotatably attached to the housing 86, is provided, which engages, in the initial position of figure 6, an upper part of the element 94 and is adapted to translate the element 94 upwardly in order to compress the spring 90 due to the element 82 being prevented from moving upwardly due to the interaction of elements 100' of the element 82 and protrusions 100 of the housing 86.

At the position illustrated in figure 7, the handle 88 has been moved so far inwardly that elements 102 of the element 94 force the elements 100' toward each other and out of engagement with the protrusions 100. Also, the handle 88 disengages the element 94. Then, elements 98 of the element 94 pass and engage with protrusions 98' of the housing in order to prevent the element 94 from moving downwards. This results in the element 82 being moved upwardly due to the action of the now compressed spring 90 and the locking provided by the elements 98 and protrusions 98', whereby the container 12 is compressed and dispenses a dose.

When dispensing the dose, as is seen in figure 8, protrusions 84 act to deform the protrusions 98' out of engagement with the elements 98, whereby the element 94 is again allowed to move downwardly, relaxing the spring 90 and thus allowing the container 12 to expand. The expansion of the container 12 forces both the protrusions 84 and the elements 98 under the protrusions 98' as well as the elements 100' under the protrusions 100 (figure 9), so that the initial position of figure 6 may again be obtained by pulling the handle 88 outwardly so as to engage again the element 94, due to the upper part of element 94 being able to flex, or the upper part of the handle 88 being flexible (illustrated by the spring) so as to facilitate engagement between it and the upper part of the handle 88.

As is the situation in relation to the first two embodiments, the embodiment of figures 6-9 may also comprise means preventing movement of the handle 88 away from the housing 86, before the position is obtained at which both the dispensing as well as the expansion has taken place. Alternatively, means may be provided for ensuring that the element 94 is only moved upwardly, until the uppermost position is reached, where after it may move to its lowermost position.

However, such means are not required in that once the elements 100/100' disengage, the dispensing of the dose and the subsequent expansion of the dose by the intervention of the projections 84 automatically follows without the user having any way of preventing or affecting this.

Again, a dose counter and/or a lock-out mechanism may be provided. Lock-out may be provided by preventing engagement between the elements 88 and 102, by preventing the elements 82 and/or 102 from moving axially (along the first direction), preventing the handle 88 from moving inwardly or outwardly, preventing moving the elements 100' toward each other and out of engagement with the elements 100, and/or preventing rotation of the elements 82 and/or 102, when the element 102 is not rotationally symmetric around the longitudinal axis of the dispenser.

Figures 10-12 illustrate a fourth embodiment of a dispenser 110 comprising a housing 116 inside which the container 12 is positioned with the tip 14 extending out there from.

At the bottom of the housing 116, a rotatable button 118 is provided which is used for compressing a spring 120 to be used for compressing the container 12 and consequently have a dose dispensed there from.

In this embodiment, the compression of the spring 120 is obtained by rotating the button 118 which rotates an element 126 in relation to an abutting element 124.

The two elements 126/124 have abutting, slanted surfaces which, when rotated in a first direction in relation to each other, will translate/rotate the element 124 upwardly in relation to the element 126, thus compressing the spring 120 due to the spring 120 abutting an element 122 being prevented from moving upwardly due to a tip130 of an elongate element 131 engaging an indentation 130' of the element 122.

Thus, rotating the elements 126 and 124 a predetermined angle in relation to each other will translate the element 124 and compress the spring 120 and result in the elements 124 and 126 abutting each other at surfaces parallel to the direction of compression of the spring 120 as is illustrated in figure 11.

From this loaded position, the user now pushes the lower part of the elongate element 131 thus removing the tip 130 from the indentation 130', thereby allowing the element 122 to move upwardly and the container 12 to compress.

At the same time, an element 132 attached to the lower end of the elongate element 131 will be translated to the left. Between the element 132 and the element 126, a ratchet arrangement is provided which, when the element 132 is pushed inwardly will allow this to take place without rotating the element 126. This is further facilitated by a ratchet arrangement between the element 126 and the housing 116 preventing the element 26 from rotating in that direction. Subsequently, the spring acting between the element 131 and the housing 116 will push the element 132 outwardly, whereby the ratchet arrangement will engage the element 126 and rotate that in the direction also allowed by the ratchet arrangement between the element 126 and the housing.

In fact, it may be desired to provide a rotation stop between the element 126 and the housing 116 in order to allow only a certain rotation of the element 126 in relation to the housing 116 – i.e. the rotation required to bring the elements 126 from the position of figure 10 to that of figure 11. A torsion spring or the like may be provided to bring the button 118 back to the initial position upon rotation thereof to bring the element 126 from the position of figure 10 to that

of figure 11, as the element 126 is brought back due to the action of the spring between the element 131 and the housing 116.

As is the case in the previous embodiments, it is ensured that the element 126 may only rotate in the same direction, whereby, subsequent to the dispensing of the dose, the element 126 is rotated further so that the element 132 is pushed outwardly, so that the element 124 again is moved downwardly (abruptly due to the sharper surfaces illustrated), and so that the element 130 is again introduced into the indentation 130' to be ready for the next dispensation.

Again, a dose counter and/or a lock-out arrangement may be used. Lock-out may be obtained by preventing rotation of the element 126 and/or 118, blocking movement of the element 131 or at least the tip part thereof (such as by dividing the element 131 in two separatable parts), blocking axial movement of the element(s) 122 and/or 124, or removing engagement between the elements 126 and 118.

Another embodiment is illustrated in figures 13-16. This embodiment is similar to that of figures 10-12 in that rotation of a button 148 brings about a relative rotation of two elements, 154 and 156, having slanted surface parts, whereby one part, 154, is translated and/or rotated upwardly, relative to element 156, so as to compress a spring 150 positioned between the element 154 and an element 152 abutting the container 12 and being prevented from moving upwardly by interaction of elements 160' of the element 152 and protrusions 160 of the housing 146.

In figure 14, a position is seen in which the spring 150 is compressed. Further rotating the button 148 will bring about a further translation/rotation of the element 154, whereby elements 162 thereof will act to force the elements 160' toward each other and thus out of engagement with the protrusions 160, whereby the element 152 will be allowed to move upwardly due to the action of the compressed spring 150. Movement downwardly of the element 154 is prevented due to the action of the user operating the button 148 and/or due to the operation of any means provided preventing the button 148 from being

rotated further in that direction. Thus, a dose is dispensed when the container 12 is compressed.

Further rotation of the elements 154 and 156 in relation to each other will revert these elements to the situation illustrated in figure 13, whereby the container 12 will be allowed to expand and force the elements 160' below the protrusions 160.

In the present embodiment, the button 148 has an upwardly extending element 148' adapted to engage each of the elements 154 and 156 (extending elements 154' and 156', respectively) in a manner so that rotation, around the longitudinal axis of the element 148', in a first direction will rotate the element 154 only, and rotation in the opposite direction will rotate the element 156 only. As mentioned, it may be desired to provide a rotation stop preventing rotation in the initial direction beyond the position illustrated in figure 15. Thereafter, rotation is performed in the other direction to revert to the position of figure 13.

In general, it is ensured that the two elements 154 and 156 always rotate in the same direction in relation to each other, whereby it is ensured that between two dispensing positions at which the elements 154 and 156 are in the extended position relative to each other, a most compressed position is obtained at which the container is adapted to extend.

Naturally, instead of rotating both elements 154/156 sequentially, only one may be rotated as in the embodiment of figures 10-12.

Requiring a rotation in the two directions, however, has the advantage that it is ensured (simply by the time required for a person to perform two opposite movements) that the container 12 is allowed to fully dispense the dose, before the rotation in the other direction reaches the point at which the element 154 again drops to its lower position.

As in the above embodiments, the present embodiment may be fitted with a dose counter or a lock-out mechanism. Lock-out may be obtained by preventing

the elements 152 and/or 154 from moving axially, preventing the elements 148 and/or 166 from rotating, rotating the element 152 so that the element 162 is not able to bring the elements 160/160' out of engagement, and/or removing engagement between the element 148 and the elements 154/156.

A final embodiment is illustrated in figures 17-20. Again, the housing 186 and the container 12 are provided.

In this embodiment, a handle 188 is pushed inwardly, pulling an element 194 upwardly, thereby biasing a spring 190 provided between the element 184 and an element 182, which is blocked from upward movement due to the engagement of elements 200/200'. Thus, the spring 190 is biased but the container blocked from compressing. At the same time, the handle 188 disengages the element 194, which thereby is free to move downwardly (cf. below).

At the position illustrated in figure 18, the spring 190 is biased and this position is locked in that a hook 198 of the element 194 engages the housing at an opening 198'.

Subsequent to this, the element 199 is pushed toward the housing at its upper end, whereby the elements 200/200' will disengage, allowing the spring 190 to compress the container 12.

At the end of this movement (see figure 19), the hook 198 is allowed to disengage the opening 198, whereby the spring force of the container 12 will force the element 182 downwardly, and the element 194 will drop to its lower position also due to the force of the spring 190. Then, the elements 200/200' will again engage, and the position of figure 17 may again be obtained by pulling the handle 188 outwardly so as to again engage the element 182.

In this embodiment, a lock-out arrangement is illustrated in that at the lower part of the housing, a piezo actuator 210 is provided which is able to move an element 212 into engagement with a lower part of the element 194 and thereby

prevent this element from moving upwardly. This lock-out arrangement and any dose counter may be controlled by e.g. a controller or processor provided on a PCB 214 of the dispenser.

Other lock-out methods may be: preventing outward or inward movement of the handle 188, preventing engagement between the handle 188 and the element 194, preventing axial movement of the element(s) 182 and/or 194, preventing movement of the element 199, rotating the element 194 so that the elements 188 and 194 cannot engage, and/or dividing the element 199 into a part with the tip 200 and one engageable by the person, which two parts are detachable.

A piezo actuator 210 of this type, which translates or rotates an element 212 into engagement with the element which is to be prevented from moving, has the advantage that the element 212 may take up any position along the translation or rotation and maintain the position with a sufficient force without requiring power. An element of this type may be the the PiezoWave ™ provided by PiezoMotor of Uppsala, Sweden.

Elements of this type operate by generating a wave-like pattern along a longitudinal direction of two opposing piezo elements, which wave-like pattern operates and translates the element 212 positioned there between in the direction of the waves. Turning off the power will remove the wave-like pattern and thus the movement of the element 212. Then, the friction between the element 212 and the piezo elements will act to maintain the element 212 in the same longitudinal position unless a considerable force (compared to the small dimensions of the actuator 210) acts on the element 212 in the longitudinal direction.

Naturally, this type of lock-out arrangement may be used in any of the illustrated embodiments, and features of individual embodiments may be replaced or mixed with those of other embodiments.

CLAIMS

1. A dispenser for dispensing a substance, the dispenser comprising

- a compressible container comprising the substance, the container being adapted to eject or dispense a dose of the substance when compressed by a first force exerted on the container in a first predetermined direction/axis,

- an intermediate element having a first state, in which it is compressed in the first direction, and a second state in which it is expanded in the first direction,

- a user operable element movable in a direction from a first to a second position, a third position being provided between the first and second positions,

the operable element being adapted to compress the container when the operable element is in the third position, and

the operable element being adapted to, in the second position, bring the intermediate element from the expanded state to the compressed state.

2. A dispenser according to claim 1, further comprising means for preventing the operable element, when positioned between the third and second positions, from moving toward the third position.

3. A dispenser according to claim 2, wherein the preventing means comprises a ratchet arrangement acting on the user operable element.

4. A dispenser according to any of the preceding claims, further comprising a housing, the container, the intermediate element, and the user operable element being positioned sequentially along the first direction in the housing so as to abut or engage.

5. A dispenser according to any of the preceding claims, wherein a difference in extent along the first direction between the compressed and expanded states of the intermediate element is at least a distance which the container is to be compressed.

6. A dispenser according to any of the preceding claims, wherein the user operable element is adapted to be manipulated, such as rotated, directly by the user.

7. A dispenser according to any of the preceding claims, wherein the user operable element comprises a resilient element adapted to be compressed/biased by operation of the user and which is adapted to compress the container when de-compressing/expanding.

8. A dispenser according to claim 7, further comprising first means for preventing compression of the container, the first preventing means being brought out of operation, when the user operable element is in the third position.

9. A dispenser according to any of the preceding claims, wherein the user operable element comprises a combination of two elements rotatable, around an axis of rotation, in relation to each other, a first one of the elements comprising a first and a second surface part being at different positions, along the axis of rotation, the first and second surface parts, when engaging or abutting the other one of the elements, defining an expanded and a compressed state, the combination being adapted to compress the container when in the expanded state.

10. A dispenser according to claim 9, the one of the elements further comprising a sloped surface part positioned between the first and the second surface parts, the sloped surface part being adapted to engage the other of the elements and bring the combination from the compressed to the expanded state when the elements are rotated in relation to each other.

11. A dispenser according to any of the preceding claims, wherein the intermediate element comprises second means for preventing transitioning from the expanded state to the compressed state thereof, the user operable element being adapted to bring the second preventing means out of operation when in the second position.

12. A dispenser according to any of the preceding claims, the dispenser further comprising means for determining when or if the container has been compressed, the determining means being adapted to determine:

- when or if the user operable element is in the first, second, or third position and/or

- when or if the intermediate element is in the expanded or compressed state and/or

- when or if the intermediate element transitions between the compressed and expanded state, and/or

- when or if the container is compressed or expanded.

13. A dispenser according to any of the preceding claims, further comprising means for preventing compression of the container, the preventing means being adapted to:

- prevent the user operable element from leaving or taking the first, second, or third position and/or

- prevent the intermediate element from leaving or taking the expanded or compressed state and/or

- preventing the intermediate element from transitioning between the compressed and expanded state, and/or

- preventing the container from being compressed or expanded.

14. A dispenser for dispensing a substance, the dispenser comprising

- a compressible container comprising the substance, the container being adapted to eject or dispense a dose of the substance when compressed by a first force exerted on the container in a first predetermined direction,

- a blocking element having a blocking position, in which the blocking means prevents compression of the container, and an unblocking position,

- a first engageable element adapted to be engaged by a user in order to exert a second force on the container along the first direction, the second force being equal to or exceeding the first force, and

- a second engageable element adapted to be moved by the user in a second predetermined direction between a first and a second position, the second engageable element moving, at a third position thereof, the blocking element from the blocking position to the unblocking position and reducing, at the second position thereof, the force exerted by the first engageable element on the container to a force below the first force, the third position being positioned between the first and second positions.

15. A dispenser according to claim 14, further comprising means for allowing movement of the second engageable element from the second position to the first position and preventing movement from the third position toward the first position.

16. A dispenser according to claim 14 or 15, wherein the first engageable element comprises a first resilient element adapted to exert the second force on the container, the second engageable element being adapted to, at the second position thereof, reduce the force exerted by the first resilient element.

17. A dispenser according to any of claims 14-16, the dispenser further comprising means for determining when or if the container has been compressed, the determining means being adapted to determine:

- when or if the second engageable element is in the first, second, or third position and/or

- when or if the force exerted is reduced and/or

- when or if the blocking element is in the blocking or unblocking position and/or

- when or if the container is compressed or expanded.

18. A dispenser according to any of claims 14-17, further comprising means for preventing compression of the container, the preventing means being adapted to:

- prevent the second engageable element from leaving or taking the first, second, or third position and/or

- prevent the blocking element from leaving or taking the blocking or unblocking position and/or

- prevent the container from being compressed or expanded.

19. A dispenser for dispensing a substance, the dispenser comprising:

- a compressible container comprising the substance, the container being adapted to eject or dispense a dose of the substance when compressed by a first force exerted on the container in a first predetermined direction,

- an engageable element adapted to be moved in the first predetermined direction by interaction of a user so as to provide a force along the first predetermined direction,

- a first resilient element being adapted to receive the force exerted by the engageable element and exert a second force along the first predetermined direction,

- a second resilient element operable to receive the second force and exert a third force along the first predetermined direction on the container,

one of the first and second resilient elements having a compressible state and a non-compressible state, wherein, in the compressible state, the force exerted is lower than the first force,

- a first blocking element having a first blocking position, in which the blocking means prevents compression of the container, and a first unblocking position,

- a second blocking element having a second blocking position, in which the one of the first and second resilient elements is maintained in its non-compressible state, and a second unblocking position in which that resilient element is in its compressible state,

the engageable element being adapted to be moved by the user between a first and a second position, wherein:

- in the first position, the first and second blocking elements are in the first and second blocking positions, respectively,

- at a third position, the first blocking element is moved from the first blocking position to the first unblocking position, and

- at the second position, the second blocking element is moved from the second blocking position to the second unblocking position,

the third position being positioned between the first and second positions.

20. A dispenser according to claim 19, the dispenser further comprising means for allowing movement of the engageable element from the second position to the first position and preventing movement from the third position toward the first position.

21. A dispenser according to claim 19 or 20, the dispenser further comprising means for determining when or if the container has been compressed, the determining means being adapted to determine:

- when or if the engageable element is in the first, second, or third position and/or

- when or if the first and/or second blocking element is in the blocking or unblocking state and/or

- when or if the one of the first and second resilient elements is in or transitions between the compressible and non-compressible state, and/or

- when or if the container is compressed or expanded.

22. A dispenser according to any of claims 19-21, further comprising means for preventing compression of the container, the preventing means being adapted to:

- prevent the engageable element from leaving or taking the first, second, or third position and/or

- prevent the first and/or second blocking element from leaving or taking its blocking or unblocking position and/or

- prevent the one of the resilient elements from taking or transitioning between the compressible and non-compressible state, and/or

- prevent the container from being compressed or expanded.

23. A dispenser for dispensing a substance, the dispenser comprising:

- a compressible container comprising the substance, the container being adapted to eject or dispense a dose of the substance when compressed by a first force exerted on the container in a first predetermined direction,

- a combination of a first and a second elements rotatable in relation to each other, at least one of the elements comprising a sloped surface adapted to translate one element in relation to the other during rotation of one of the first and second elements in relation to the other, the translation being along the first direction, the combination having a first rotational position in which the first and second elements abut and extend a first distance along the first direction and a second rotational position in which the first and second elements abut and extend a second distance along the first direction, the first distance being larger than the second distance,

- a first resilient/deformable element being adapted to be compressed in the first direction and receive a force exerted by the combination when in the first rotational position and exert a second force along the first predetermined direction on the container, the first resilient element being adapted to exert a second force being equal to or exceeding the first force, when in a first, compressed state, and to exert a second force being smaller than the first force when in a second, non-compressed state, and

- an engageable element adapted to be moved in a second direction by interaction of a user so as to provide a rotation of one of the first and second

elements of the combination in relation to the other of the first and second elements,

the dispenser further comprising means for preventing the elements of the combination from rotating in one direction in relation to each other.

24. A dispenser according to claim 23, the dispenser further comprising a first blocking element having a first blocking position, in which the blocking means prevents compression of the container, and a first unblocking position, the blocking means being adapted to move from the blocking to the unblocking position, when the combination is in its first rotational position.

25. A dispenser according to claim 23 or 24, the dispenser further comprising means for determining when or if the container has been compressed, the determining means being adapted to determine:

- when or if the user operable element is in the first, second, or third position and/or

- when or if the combination is in the first or the second rotational position and/or

- when or if the container is compressed or expanded.

26. A dispenser according to any of claims 23-25, further comprising means for preventing compression of the container, the preventing means being adapted to:

- prevent the engageable element from being moved and/or

- prevent the combination from leaving or taking the first and/or second rotational position and/or

- prevent the container from being compressed or expanded.

27. A method of operating a dispenser according to claim 1, the method comprising:

- operating the operable element from the first position to the third position and compressing the container,

- bringing the operable element from the third position to the second position and, in the second position, bringing the intermediate element from the expanded state to the compressed state so as to allow the container to de-compress.

28. A method according to claim 27, wherein the bringing step is performed while preventing movement of the operable element toward the third and/or first position.

29. A method according to claim 28, wherein the preventing step comprises operating a ratchet arrangement acting on the user operable element.

30. A method according to any of claims 27-29, wherein, when the container de-compresses, the intermediate element transits from the expanded to the compressed state and decreases in extend along the first direction to at least a distance at which the expanding container expands from the compressed state.

31. A method according to any of claims 27-30, wherein the operating step comprises a user directly manipulating, such as rotating, the operable element.

32. A method according to any of claims 27-31, wherein the operating step comprises a user compressing/biasing a resilient element which, during the bringing step de-compresses/expands and compresses the container.

33. A method according to claim 32, further comprising, in the first position, preventing compression of the container and, when the user operable element is in the third position, allowing compression of the container.

34. A method according to any of claims 27-33, wherein the operating step comprises rotating, around an axis of rotation, two elements in relation to each other, a first one of the elements comprising a first and a second surface part being at different positions, along the axis of rotation, so as to transition from a compressed state to an expanded state so as to compress the container.

35. A method according to claim 34, wherein one of the elements further comprises a sloped surface part positioned between the first and the second surface parts, the rotating step comprises the sloped surface part engaging the other of the elements and bringing the combination from the compressed to the expanded state.

36. A method according to any of claims 27-35, further comprising the step of preventing the intermediate element from transitioning from the expanded state to the compressed state when the user operable element is in the third position, where the intermediate element is brought from the expanded state to the compressed state, when user operable element is in the second position.

37. A method according to any of claims 27-36, the method further comprising the step of determining when or if the container has been compressed, the determining step comprising determining:

- when or if the user operable element is in the first, second, or third position and/or

- when or if the intermediate element is in the expanded or compressed state and/or

- when or if the intermediate element transitions between the compressed and expanded state, and/or

- when or if the container is compressed or expanded.

38. A method according to any of claims 27-37, the method further comprising the step of preventing compression of the container, the preventing step comprising:

- preventing the user operable element from leaving or taking the first, second, or third position and/or

- preventing the intermediate element from leaving or taking the expanded or compressed state and/or

- preventing the intermediate element from transitioning between the compressed and expanded state, and/or

- preventing the container from being compressed or expanded.

39. A method of operating the dispenser according to claim 14, the method comprising

- operating the first engageable element and exerting the second force on the container while operating the blocking element,

- subsequently firstly operating the second engageable element from the first to the third position so as to move the blocking element to the unblocking element and compress the container,

- then secondly operating the second engageable element from the third to the second position so as to allow the container to de-compress.

40. A method according to claim 39, further comprising the step of allowing movement of the second engageable element from the second position to the first position and preventing movement from the third position toward the first position.

41. A method according to claim 39 or 40, wherein the first engageable element comprises a first resilient element, where the first operating step comprises the first resilient element exerting the second force compressing the container, and wherein the second operating step comprises reducing the force exerted by the first resilient element.

42. A method according to any of claims 39-41, the method further comprising the step of determining when or if the container has been compressed, the determining step comprises determining:

- when or if the second engageable element is in the first, second, or third position and/or

- when or if the force exerted is reduced and/or

- when or if the blocking element is in the blocking or unblocking position and/or

- when or if the container is compressed or expanded.

43. A method according to any of claims 39-42, further comprising the step of preventing compression of the container, the preventing step comprising:

- preventing the second engageable element from leaving or taking the first, second, or third position and/or

- preventing the blocking element from leaving or taking the blocking or unblocking position and/or

- preventing the container from being compressed or expanded.

44. A method of operating the dispenser according to claim 19, the method comprising:

- moving the engageable element from the first to the third position while:

  - exerting a force on the first resilient element,

  - the first resilient exerting the second force on the second resilient element,

  - the second resilient element exerting the third force on the container, and

  - operating the first blocking element in the first blocking position to prevent compression of the container,

- when the engageable element is in the third position, moving the first blocking element from the first blocking position to the first unblocking position,

- when the engageable element is in the second position, operating the second blocking means to have the one of the first and second resilient elements transition from the non-compressible state to the compressible state to allow the container to de-compress.

45. A method according to claim 44, the method further comprising the step of allowing movement of the engageable element from the second position to the first position and preventing movement from the third position toward the first position.

46. A method according to claim 44 or 45, the method further comprising the step of determining when or if the container has been compressed, the determining step comprising determining:

- when or if the engageable element is in the first, second, or third position and/or

- when or if the first and/or second blocking element is in the blocking or unblocking state and/or

- when or if the one of the first and second resilient elements is in or transitions between the compressible and non-compressible state, and/or

- when or if the container is compressed or expanded.

47. A method according to any of claims 44-46, further comprising the step of preventing compression of the container, the preventing step comprising:

- preventing the engageable element from leaving or taking the first, second, or third position and/or

- preventing the first and/or second blocking element from leaving or taking its blocking or unblocking position and/or

- preventing the one of the resilient elements from taking or transitioning between the compressible and non-compressible state, and/or

- preventing the container from being compressed or expanded.

48. A method of operating the dispenser according to claim 23, the method comprising:

- moving the engageable element in the second direction so as to rotate one of the first and second elements in relation to the other to have the combination transition from the second rotational position to the first rotational position, so as to bring the first resilient/deformable element to its compressed state,

- at the same time, preventing the elements of the combination from rotating in one direction in relation to each other.

49. A method according to claim 48, the method further comprising, during the moving step, preventing compression of the container and, subsequent to the moving step, allowing compression of the container.

50. A method according to claim 48 or 49, the method further comprising the step of determining when or if the container has been compressed, the determining step comprising determining:

- when or if the user operable element is in the first, second, or third position and/or

- when or if the combination is in the first or the second rotational position and/or

- when or if the container is compressed or expanded.

51. A method according to any of claims 48-50, further comprising the step of preventing compression of the container, the preventing step comprising:

- preventing the engageable element from being moved and/or

- preventing the combination from leaving or taking the first and/or second rotational position and/or

- preventing the container from being compressed or expanded.

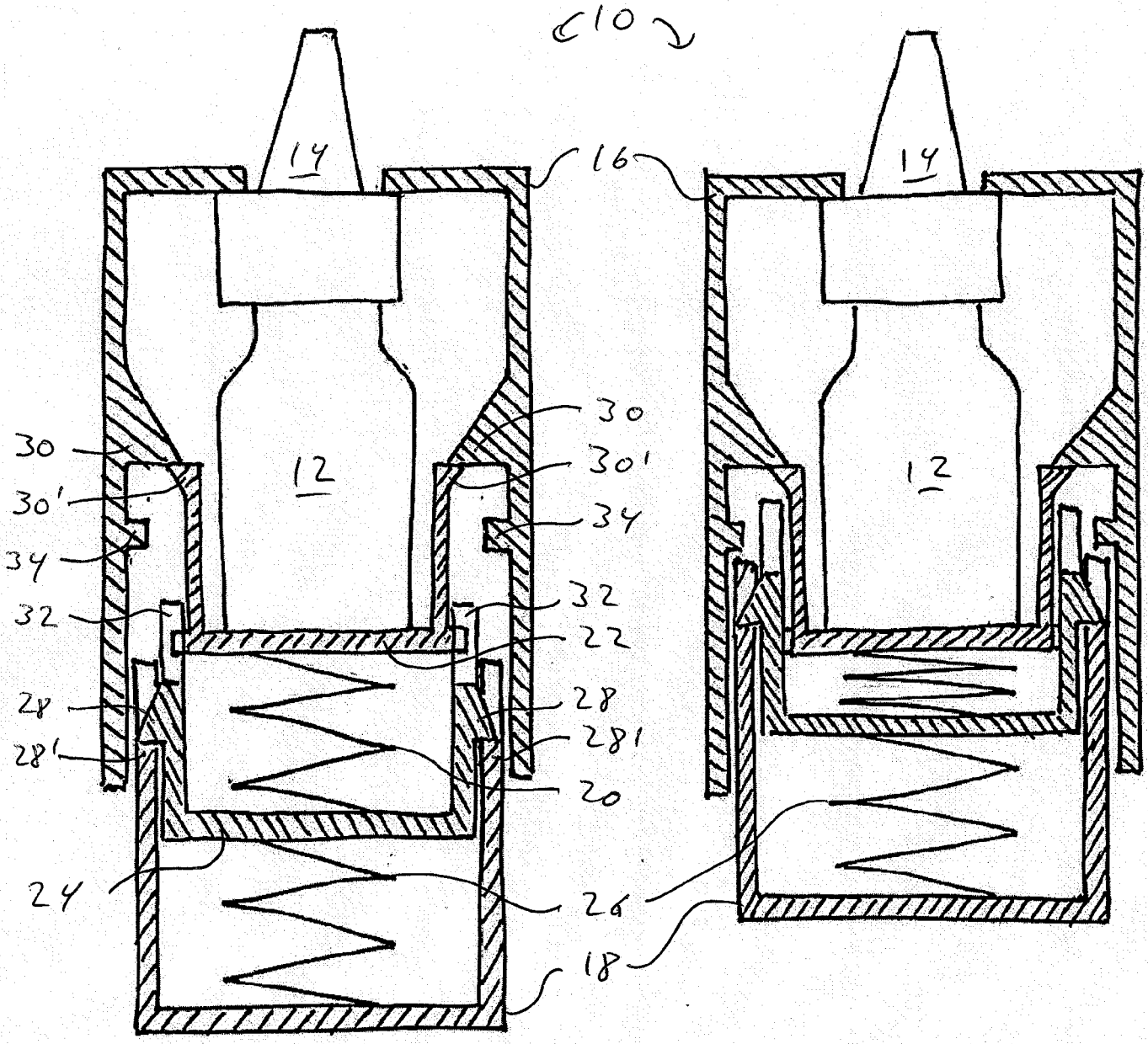

FIGURE 1

FIGURE 2

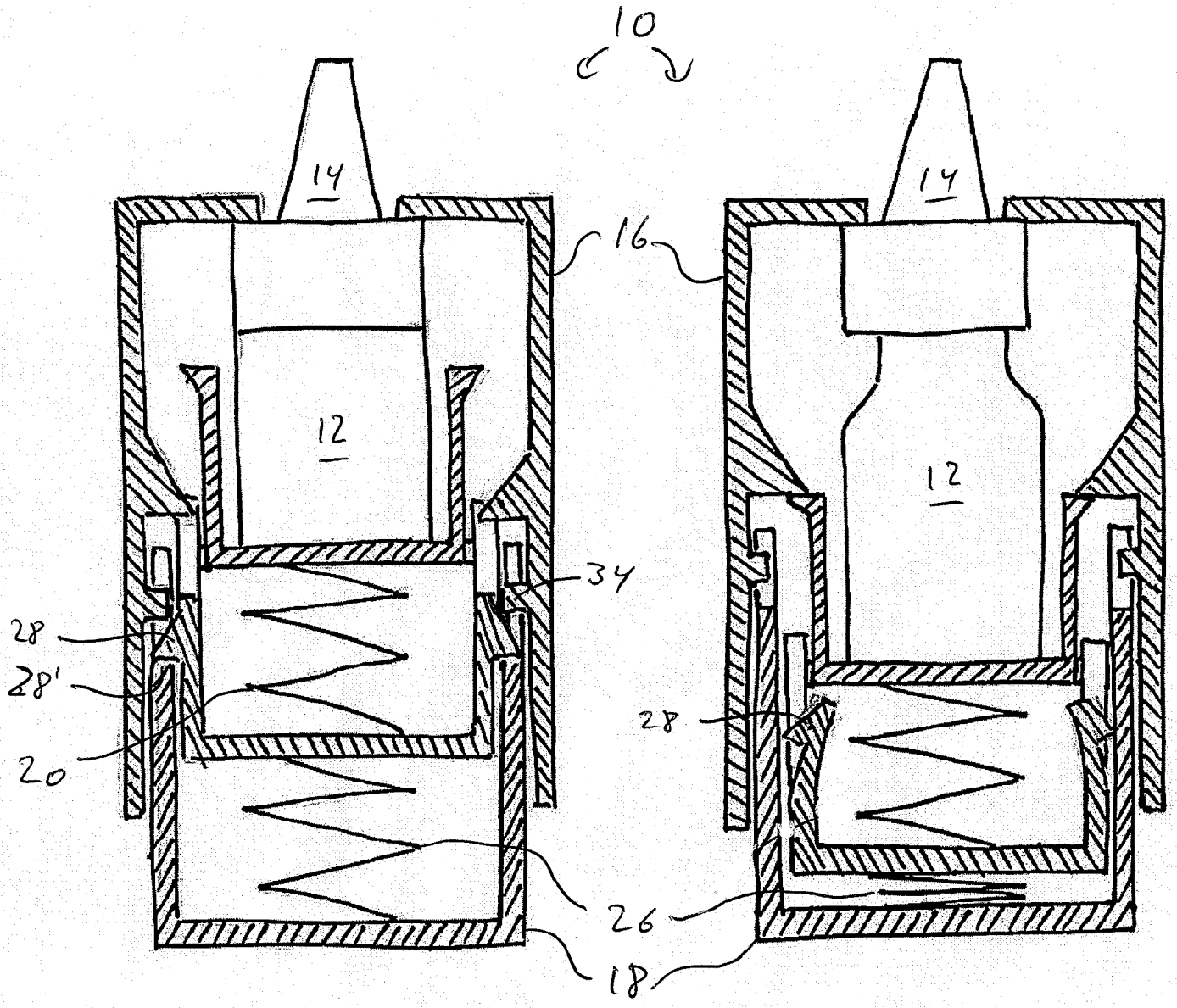

FIGURE 3

FIGURE 4

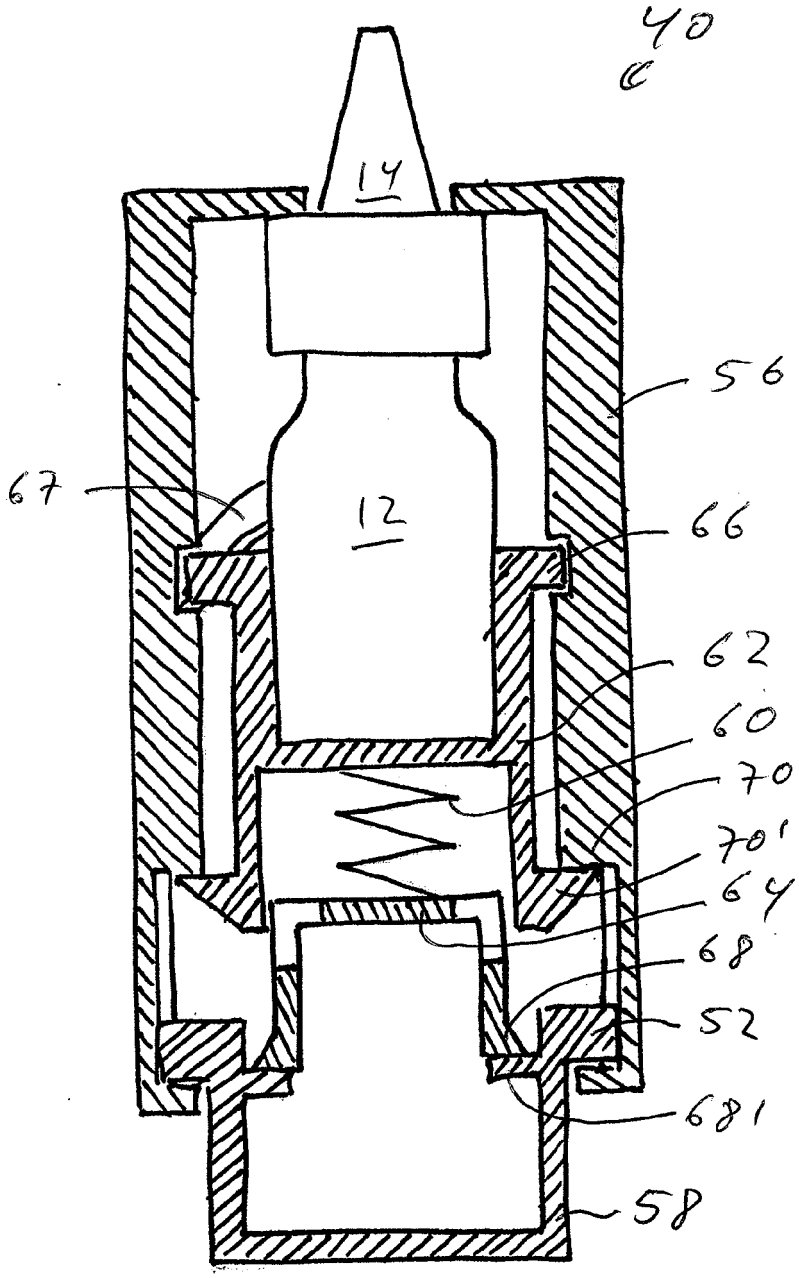

FIGURE 5

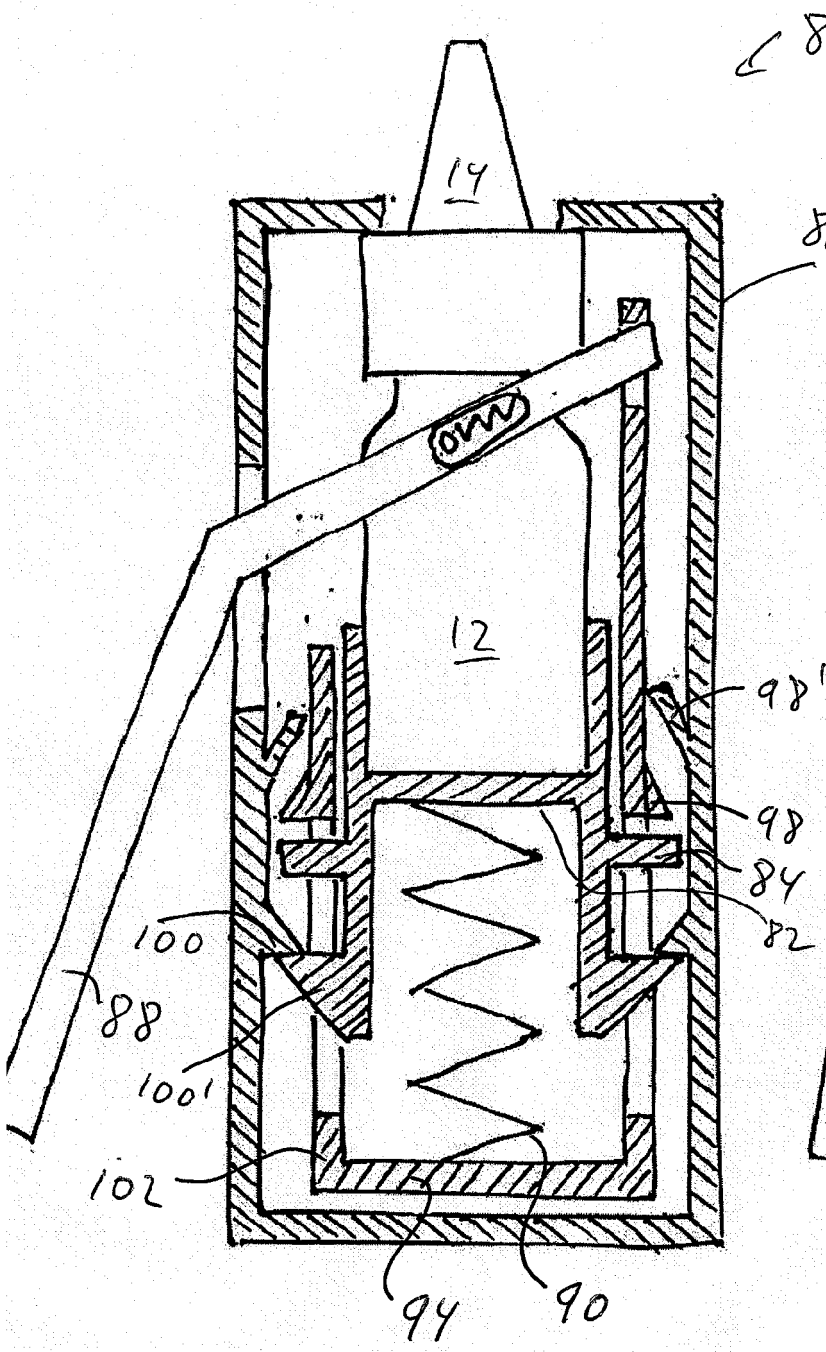

FIGURE 6

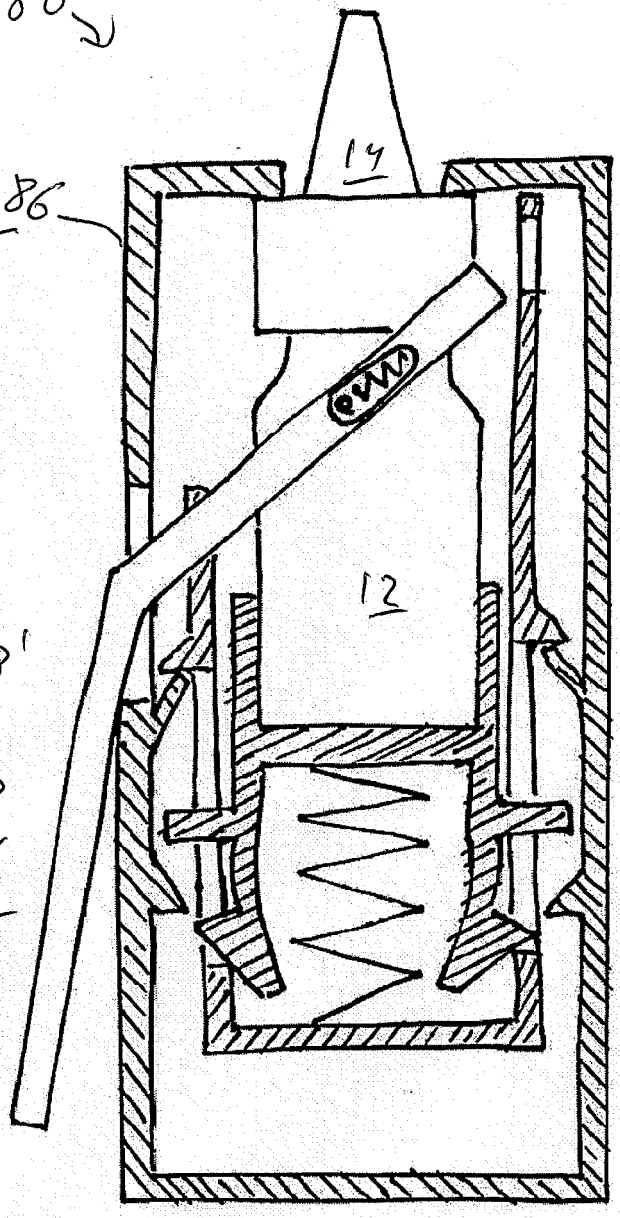

FIGURE 7

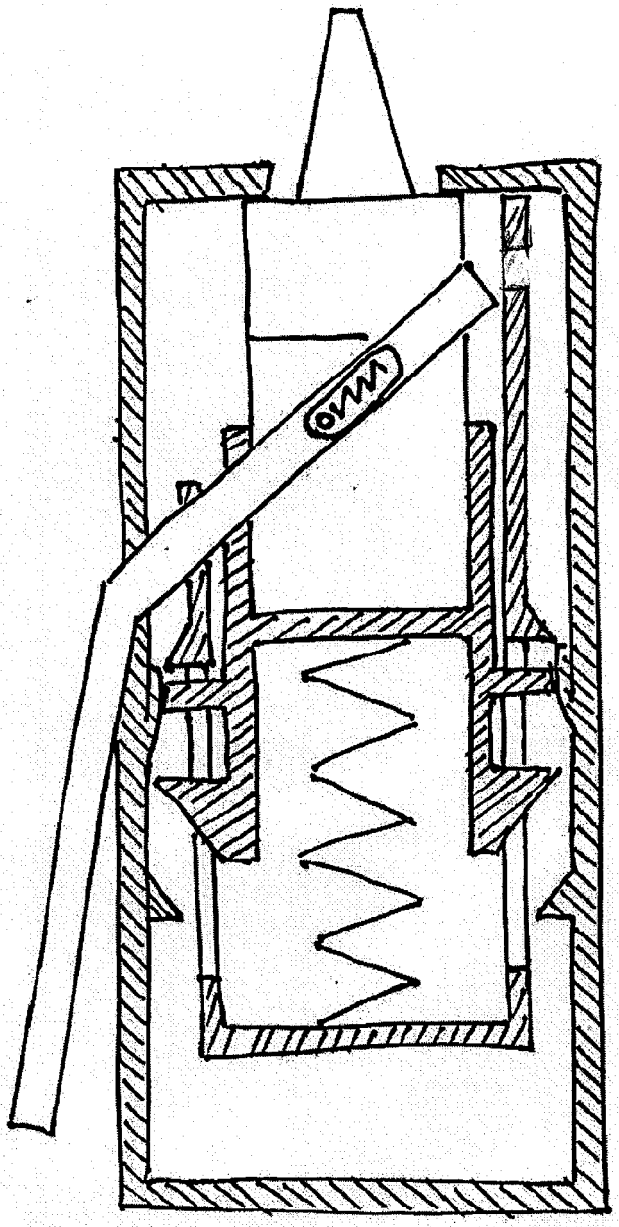

FIGURE 8

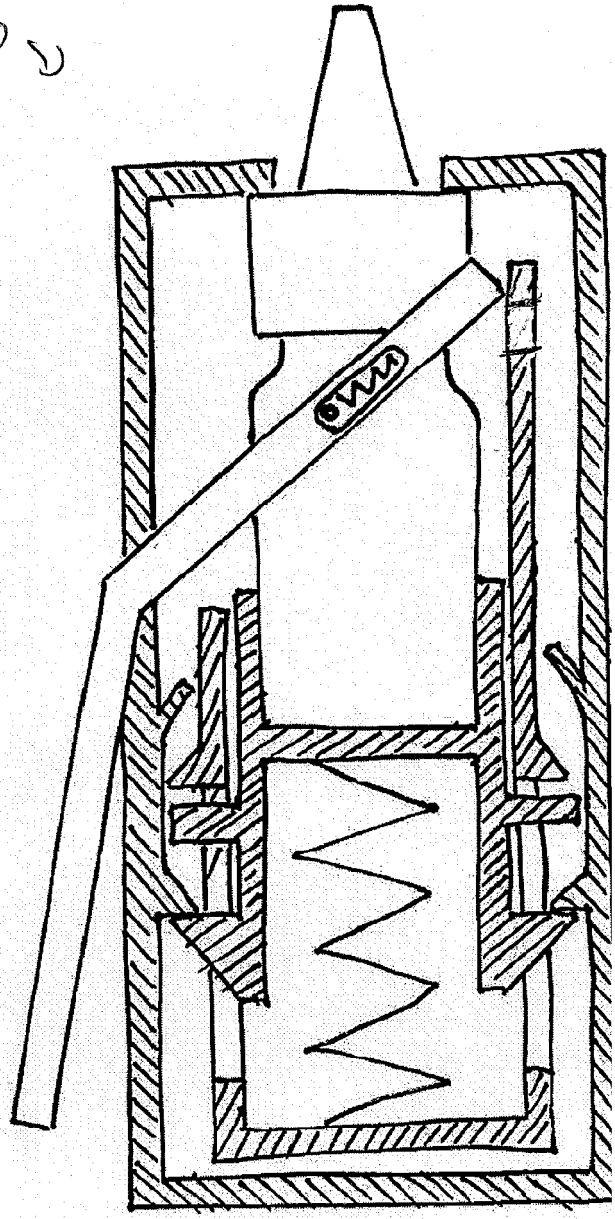

FIGURE 9

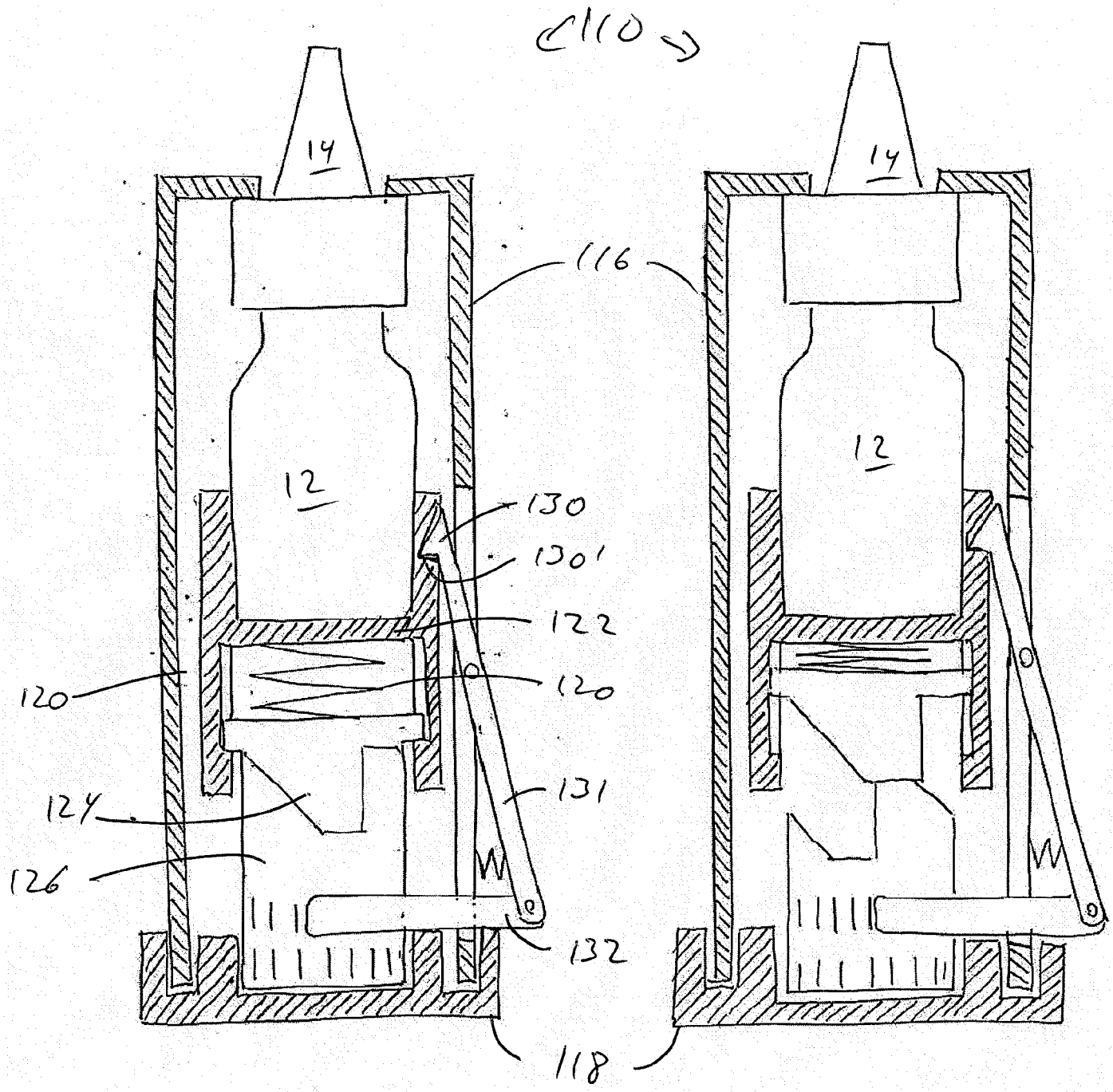

FIGURE 10 FIGURE 11

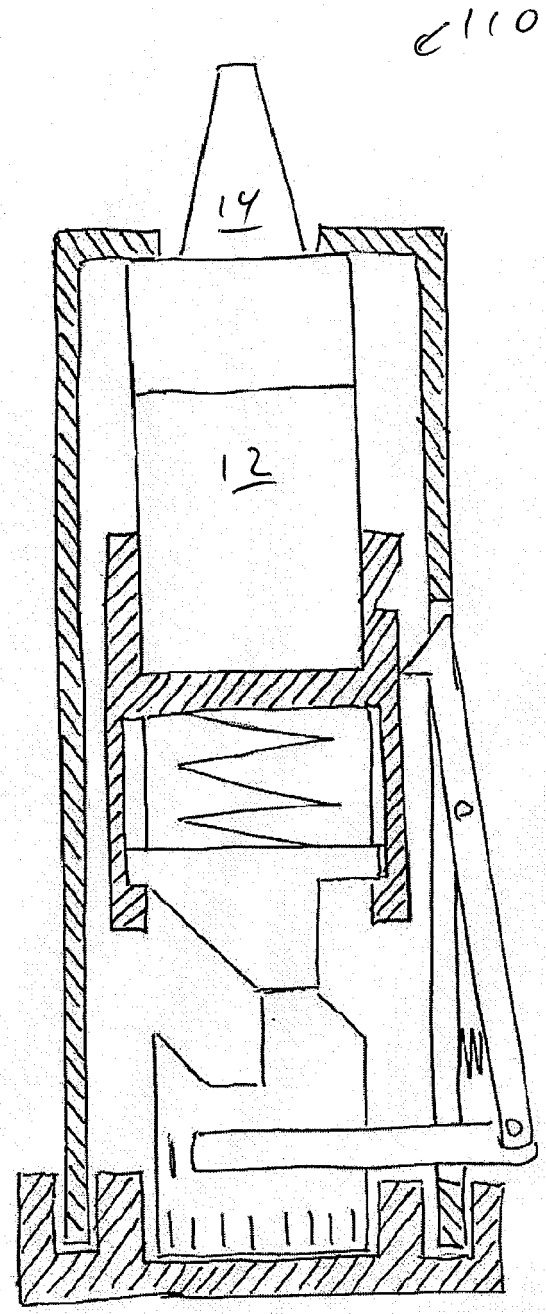

FIGURE 12

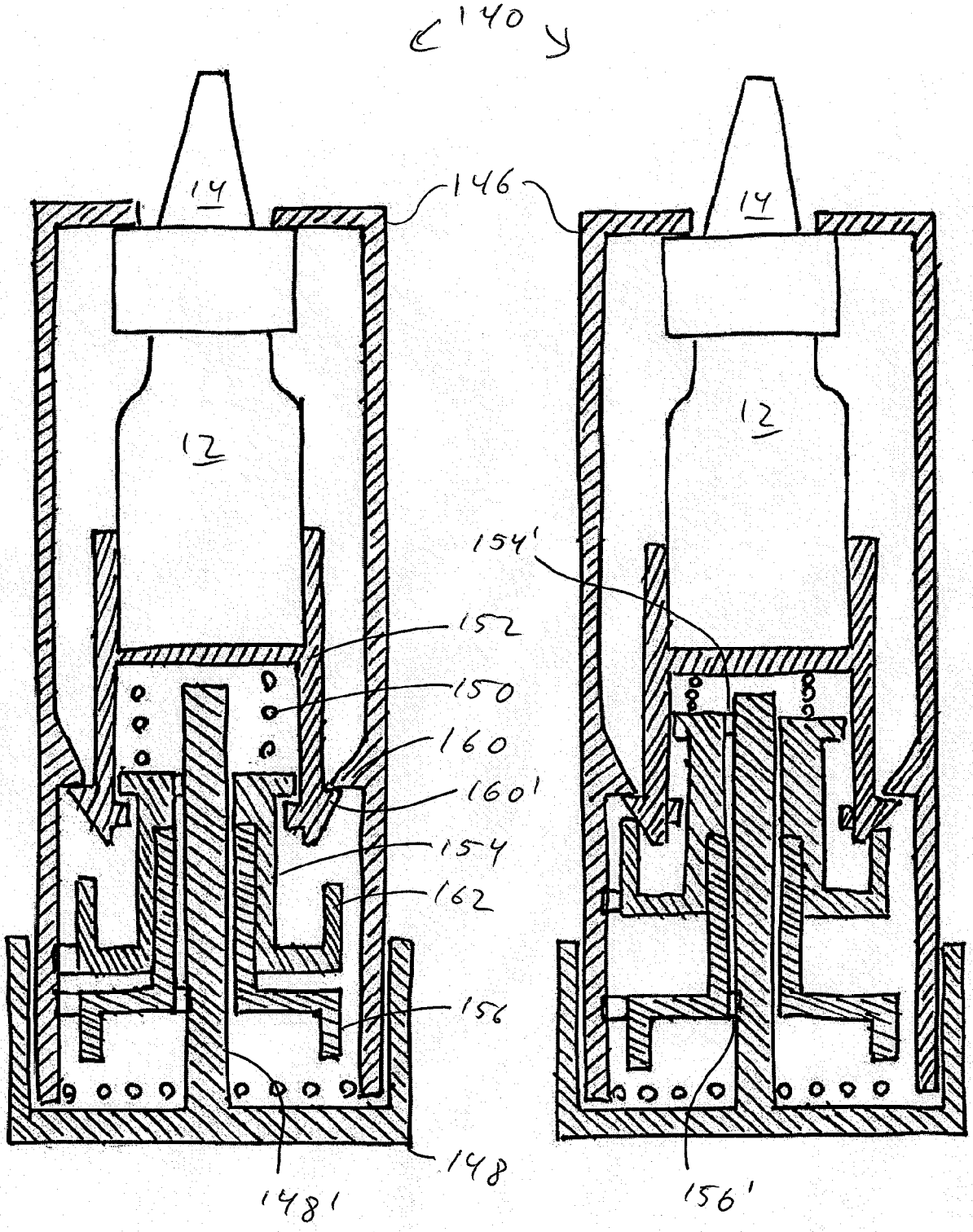

FIGURE 13

FIGURE 14

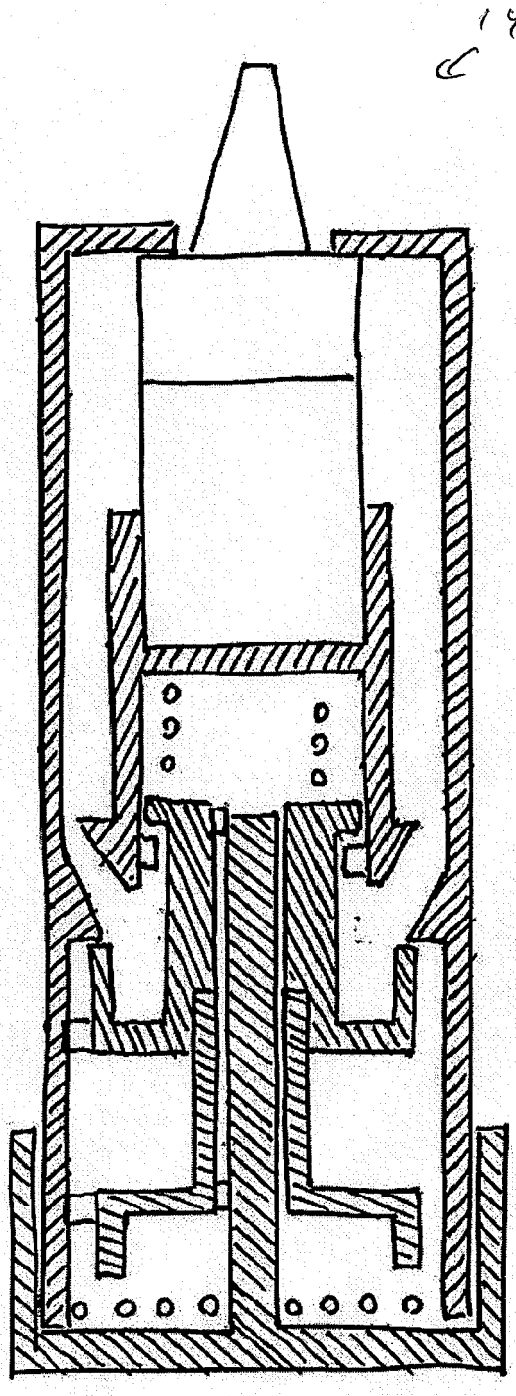

FIGURE 15

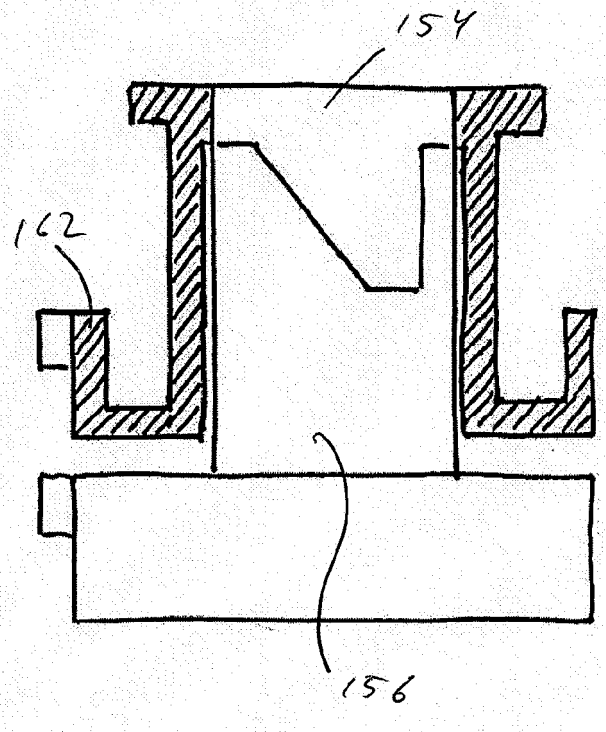

FIGURE 16

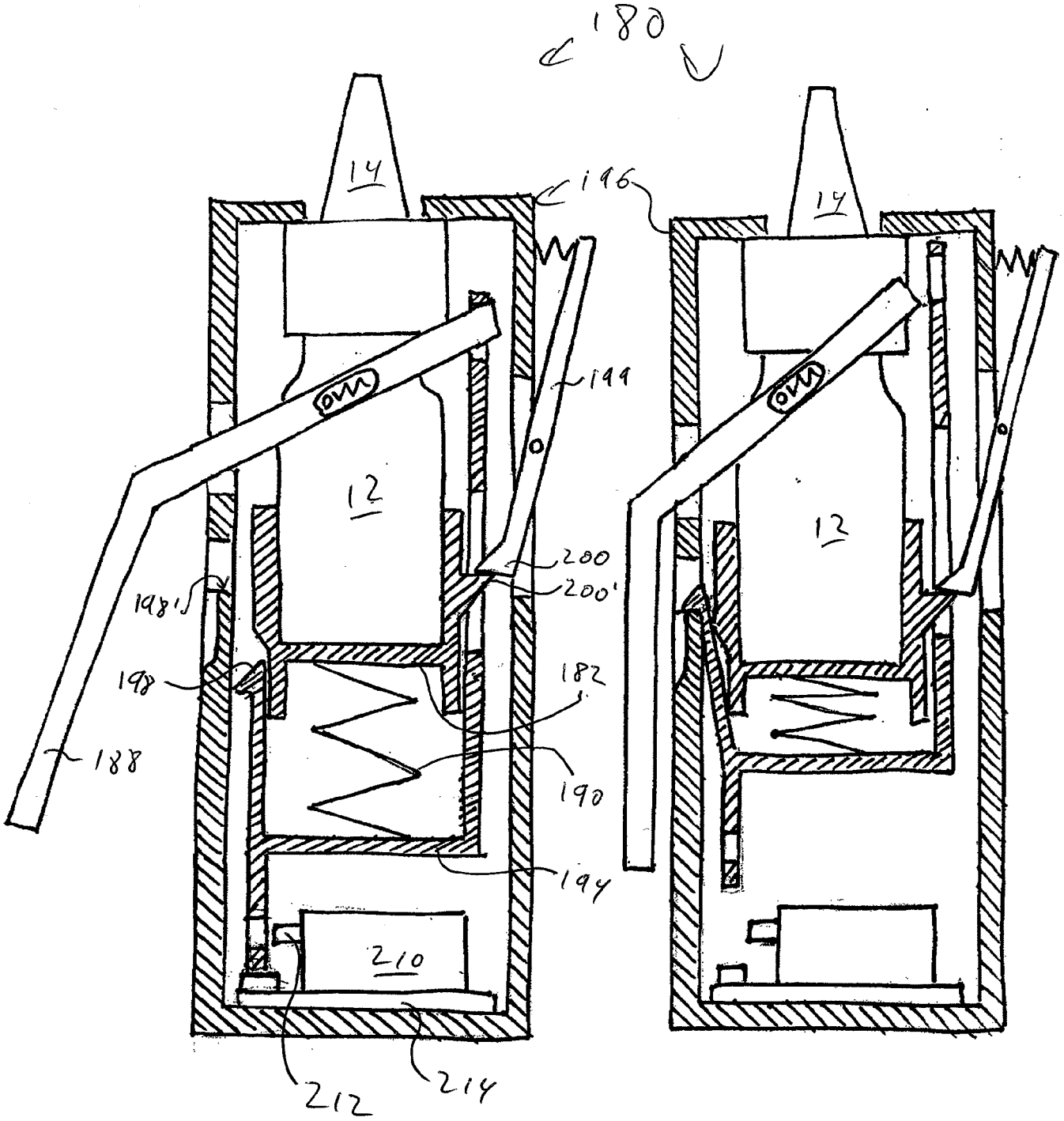

FIGURE 17

FIGURE 18

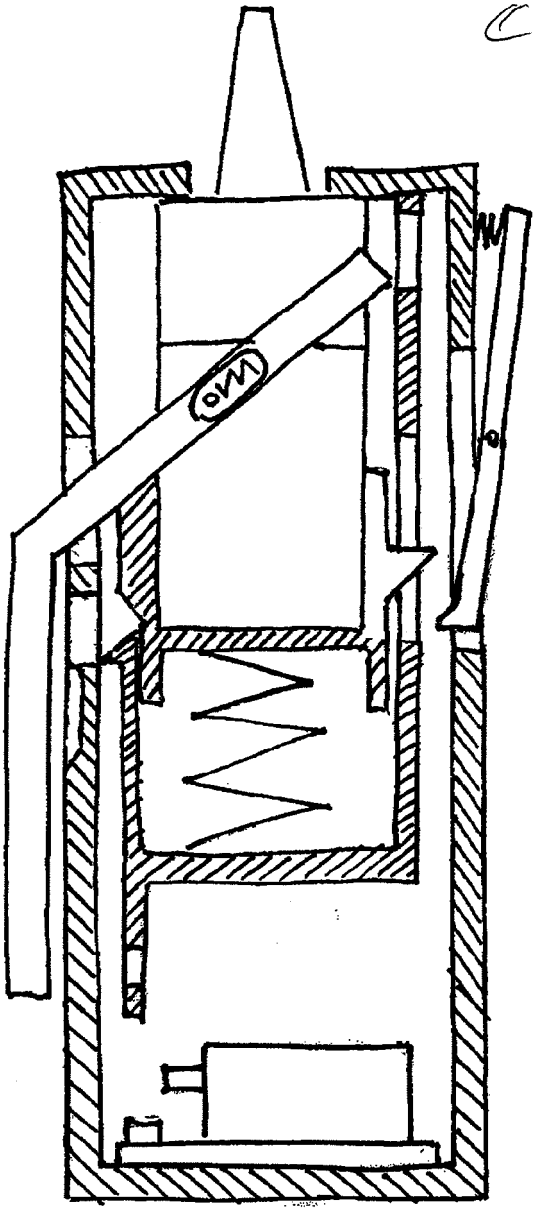

FIGURE 19

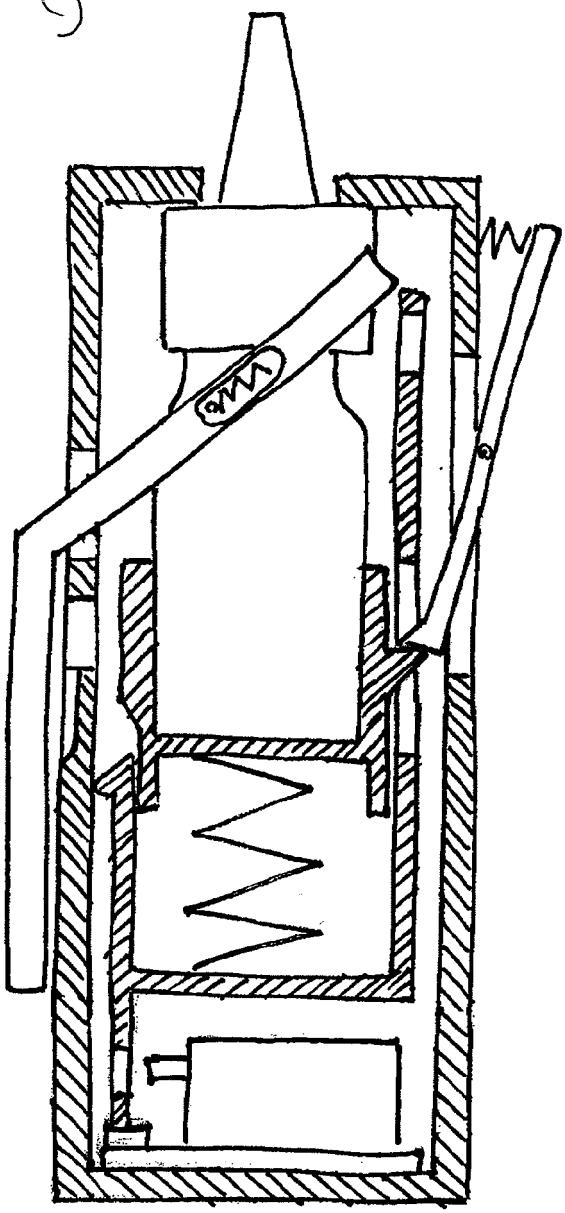

FIGURE 20

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/050496

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

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 B05B B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 398 252 A (BESPAK PLC [GB]) 18 August 2004 (2004-08-18) page 30, line 1 - page 31, line 30; figures 22-31 page 35, line 20 - page 36, line 2; figure 43 ----	1-13, 27-38
X	WO 93/18812 A (GALLI ROSARIA & C [IT]) 30 September 1993 (1993-09-30) page 7, line 2 - page 9, line 11; figures 1-3 ----	1-8, 11-13, 27-33, 36-38
	-/--	

[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
8 April 2009	25/06/2009

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, Fax: (+31-70) 340-3016	Gineste, Bertrand

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/050496

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 027 808 A (RICH MICHAEL [US] ET AL) 2 July 1991 (1991-07-02) column 3, line 64 - column 4, line 18; figures 2,3	1-8, 11-13, 27-33, 36-38
P,X	US 2008/156321 A1 (BOWMAN NICHOLAS [GB] ET AL) 3 July 2008 (2008-07-03) paragraphs [0080] - [0084]; figures 8a-8d	1-8, 11-13, 27-33, 36-38

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2009/050496

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

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

2. ☐ Claims Nos.:
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 No. 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:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.

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

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

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

1-13, 27-38

Remark on Protest

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

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

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-13,27-38

   A dispenser defined by its intermediate element and a method of operating it

   ---

2. claims: 14-18,39-43

   A dispenser defined by its blocking element and a method of operating it

   ---

3. claims: 19-22,44-47

   A dispenser defined by its second resilient element and a method of operating it

   ---

4. claims: 23-26,48-51

   A dispenser defined by its rotatable elements and a method of operating it

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2009/050496

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2398252 A	18-08-2004	EP 1596912 A1	23-11-2005
		WO 2004071561 A1	26-08-2004
		JP 2006517430 T	27-07-2006
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US 2008156321 A1	03-07-2008	WO 2008082359 A1	10-07-2008