A valve for dispensing a product contained in a pressurized container includes a valve body, an actutable valving member, and an outlet passage. The valving member may be moveable between a closed position and at least two open positions. The at least two open positions may include a first open position where product is dispensed at a first flow rate and a second open position where product is dispensed at a second flow rate different from the first flow rate. The outlet passage may be selectively communicable with at least a portion of an interior of the valve body. The valving member may comprise a piston axially moveable inside the valve body between the closed position where the piston sealingly isolates said at least a portion of the interior of the valve body from the outlet passage and a position, chosen at least from the first and second open positions, where fluid communication is established between the portion of the interior of the valve body and the outlet passage.
The present invention relates to a valve for a pressurized container. The valve may be used, for example, in the field of cosmetics for dispensing hair products (e.g., lacquers, styling sprays, etc.), personal hygiene products, make-up products, and/or products affording protection against the harmful effects of the sun.

Some conventional valves for use with pressurized containers comprise a valve body having a valve member mounted inside. The valve member may be a valve stem having a portion that emerges outside of the valve body. The valve stem is able to slide sealedly in engagement with a sealing element, such as an annular seal.

The valve stem has, passing through it, an axial duct. One end of the duct opens axially to the outside of the valve body and is configured to be placed in communication with a passage through a valve actuating member having at least one outlet orifice. The other end of the duct opens radially via at least one inlet orifice. When the valve is in the closed position, the at least one inlet orifice faces the sealing element.

In response to an actuating command, the valve is pushed axially inward, and the at least one inlet orifice of the valve stem is placed in communication with the pressurized product inside the valve body. The product is then conveyed, via the valve stem and the passage through the actuating member, towards the outlet orifice.

In the case of a valve with a plurality of inlet orifices, the plurality of inlet orifices are placed in communication with the valve body simultaneously. When the actuating command ceases, a spring contained inside the valve body returns the valve stem to the closed position. Dispensing of the product is thus interrupted.

Some valves, aside from actuation in response to an axial movement, can be actuated in response to a pressure exerted laterally on the valve stem. Such valves may be referred to as “tilt-operated” valves. In other valves referred to as “female” valves, the valve member does not emerge to the outside of the valve body. In these valves, a portion of the actuating member is engaged inside the valve body and commands the opening or the closing of the valve.

A valve with a different configuration is described, for example, in FR 2 725 182, where the valve body has a purge orifice passing therethrough. The purge orifice may be used for dispensing propellant gas, either together with the product or separately. A valve that opens according to this principle may also be designed without a purge orifice.

In each of the aforementioned conventional valve types, the actuating command causes a movement of the valve member, causing the valve member to pass from a closed position to an open position in which the product is dispensed with a determined and unique flow rate. In the first type of conventional valves described above, it is the cross-section of the at least one inlet orifice and/or the plurality of inlet orifices that determines the outlet flow rate. For a valve of the type described in FR 2 725 182, it is the depth and/or the width and/or the number of grooves formed on the internal surface of the valve body that determines the outlet flow rate.

Thus, distinct devices are typically required when the user wishes to be able to choose between two different ways of spraying the same product. For example, in the field of styling products, when dispensing a product in the form of a lacquer, a container equipped with a valve allowing a first flow rate is used. When dispensing the product in the form of a spray, another container equipped with another valve allowing a second flow rate higher than the first is used.

Variable flow rate valves are described in U.S. Pat. Nos. 3,292,827 and 3,195,569. Because of the valve configurations, the two positions with different flow rates are very close to one another. This makes their selective use somewhat subject to chance.

One exemplary subject of the invention relates to a valve capable of dispensing a product at different flow rates. For example, the product may be dispensed at the different flow rates according to desired spray characteristics, while at the same time maintaining mean particle sizes of the same order of magnitude.

Another exemplary subject relates to producing a device that is simple and/or economical.

Aspects and embodiments of the invention are discussed below. It should be understood that these aspects and embodiments are merely exemplary and that the invention could still be practiced without having one or more features of the particular aspects and embodiments described herein.

In accordance with a first aspect of the invention, a valve for dispensing a product contained in a pressurized container comprises a valve body, an actuable valve member, and an outlet passage. The valve member may be moveable between a closed position and at least two open positions. The at least two open positions may include a first open position where product is dispensed at a first flow rate and a second open position where product is dispensed at a second flow rate different from the first flow rate. The outlet passage may be selectively communicable with at least a portion of an interior of the valve body. The valve member may comprise a piston axially moveable inside the valve body between the closed position at which the piston sealingly isolates said at least a portion of the interior of the valve body from the outlet passage and a position, chosen at least from the first and second open positions, at which fluid communication is established between said at least a portion of the interior of the valve body and the outlet passage.

As used throughout this disclosure, the term “piston” refers to at least a portion of the valve member that slides within the valve body along an axis, wherein the piston comprises a peripheral portion, in a plane transverse to the aforementioned axis of movement, that sealingly contacts an interior wall of the valve body at least in the closed position. For example, if the piston has a circular cross-section in the plane transverse to the axis of movement, the peripheral portion would be the circumference of the circle.

The piston of the present invention is different from the subject matter disclosed in U.S. Pat. Nos. 3,292,827 and 3,195,569. Those patent documents do not include a slideable piston that sealingly contacts a valve body and isolates at least a portion of an interior of the valve body from an
outlet passage. Rather than disclosing a piston, those patent documents relate to arrangements where a sealing element, separate from the valve body, is combined with a valve stem to isolate an outlet passage from at least a portion of an interior of the valve body without any piston.

[0017] According to an aspect of the invention, the peripheral portion of the piston may be defined by a bulge formed, for example, by molding, with the remainder of the valve member. Alternatively (or additionally), the peripheral portion may be defined by an O-ring fixedly mounted, for example, (by bonding or overmolding) on the remainder of the valve member. Alternatively (or additionally), the peripheral portion may be the free edge of a lip molded or overmolded with the remainder of the valve member.

[0018] The valve member may be moveable from the closed position into a position chosen from at least the first and second open positions in response to an actuating command. The valve may be configured so that the valve member returns to the closed position when the actuating command ceases.

[0019] In at least some embodiments, it may be possible to keep the thickness of a sealing element as small as possible while still providing sealing during valve closure, since the variation in flow rate may be unrelated to the relative position of the inlet orifice(s) of the valve stem with respect to the sealing element. For example, the variation in flow rate may be coupled to the position of the piston inside the valve body. As a result, the various positions with different flow rates may be differentiated without affecting sealing when closed.

[0020] Thus, in one example, when at least some embodiments of the valve are associated with a container containing a styling product (e.g., a hair styling product), in a first open position, the product may be dispensed with a relatively low flow rate, for example, in the form of a lacquer. In a second open position, the product may be dispensed with a higher flow rate, for example, in the form of a spray. The same device can therefore be used for both rates and/or forms of dispensing.

[0021] For the first and second flow rates, the spray characteristics in terms of particle size, may be of the same order of magnitude. Thus, the difference in mean particle size may be, for example, less than about 35%, less than about 25%, less than about 15%, or less than about 10%. In the case of styling products, such as lacquers, the particle size may be generally between about 40 μm and about 55 μm.

[0022] The two open positions may be positions that each allow a different dispensing flow rate. It may be possible for each to be obtained under normal conditions of use by manual actuation, for example with the finger, and sustained as long as desired.

[0023] The user may be informed of the switch from one position to the other by means of arrangements able to generate a perceivable signal, such as one that may, for example, result from the valve member overcoming a slight interference bulge as it passes from the first open position to the second open position. Such a notch or bulge may be perceptible, but not pronounced enough to impede the return of the valve to the closed position.

[0024] Optionally, the difference in dispensing flow rate between the two open positions may be such that the flow of product dispensed in the first open position is visibly and/or audibly different from the flow of product dispensed in the second open position.

[0025] The valve may be in communication with the product via a dip tube, the product then being propelled by means of a liquefied or compressed gas. Alternatively, the product may be contained inside a flexible-walled pouch and the propellant gas located outside of the pouch.

[0026] The valve member may move from the closed position to the second open position by passing through the first open position, and a flow rate of product from the valve may change gradually from the first flow rate to the second flow rate when the valve member moves between the first and second open positions. This may offer flexibility in choosing the characteristics for dispensing the product.

[0027] According to one aspect, the valve body may comprise an internal surface defining at least one axially extending groove. The peripheral portion of the piston may face the at least one axially extending groove when the piston is in a position chosen at least from the first and second open positions. At least one of the angular width and the depth of the at least one axially extending groove may vary along an axis of movement (i.e., in a direction of movement) of the valve member.

[0028] Thus, the depth of the groove may be practically zero at a first end, and may be, for example, on the order of several tens of a millimeter at a second end, remote from the first end. Likewise, the angular width of the groove may be on the order of zero near the first end, and be on the order of several degrees near the second end.

[0029] Alternatively, a flow rate of product from the valve may change in a stepwise, or roughly incremental, manner from the first flow rate to the second flow rate when the valve member moves between the first and second open positions.

[0030] According to one aspect, the valve body may comprise an internal surface defining a first axially extending groove and a second axially extending groove separate from the first axially extending groove. In the first open position, the peripheral portion of the piston may face at least the first axially extending groove, and, in the second open position, the peripheral portion of the piston may face at least the second axially extending groove.

[0031] Indeed, in the second position, the peripheral portion of the piston may face both the first and second grooves. In that case, both the first and second grooves can be of identical cross-section. Alternatively, the peripheral portion may face only the second groove, provided that the transversal cross-section of the second groove has a different configuration from the surface configuration of the first groove, in order to ensure a flow rate difference.

[0032] Alternatively, the internal surface of the valve body may have a number of mutually parallel axial grooves whose upper ends are axially offset. Thus, for a first depressed position the peripheral portion of the piston may face a first axial groove, thus allowing a first outlet flow rate. For a second depressed position, the peripheral portion may face,
in addition to the first groove, a second groove parallel to the first, thus allowing a second outlet flow rate higher than the first flow rate.

[0033] The valving member may comprise a valve stem emerging outside of the valve body. The valve stem may comprise an axial duct passing therethrough. The axial duct may comprise an outlet orifice and an inlet orifice, wherein the axial duct opens to the outside via an outlet orifice, and the inlet orifice is isolated from the interior of the valve body in the closed position.

[0034] In response to an actuating command, the valve stem may move axially into sealed engagement with a sealing element in the valve body in the closed position. In the closed position, the inlet orifice opens in a lateral direction facing the sealing element, thereby shutting off the inlet orifice. The sealing element may comprise, for example, an annular seal.

[0035] Another aspect relates to a device for packaging and dispensing a product. The device comprises a container configured to contain a pressurized product and a valve according to the present disclosure. The valve being configured to dispense product from the container.

[0036] The container may contain a pressurized product. The product may be a cosmetic product, for example, a hair product, a personal hygiene product, a make-up product, a skin care product, and/or a product affording protection against harmful effects of the sun. The product may be pressurized using a compressed or liquefied gas. The propellant gas may be in contact with the product or separated from the propellant gas by a piston or a flexible pouch inside which the product is contained.

[0037] The dispenser may also comprise an actuating member configured to actuate the valve and dispensing the product under pressure. The product may be dispensed via at least one dispensing orifice formed, for example, in a nozzle, such as a nozzle of the actuator. Optionally, the dispensing orifice may have a swirl effect on the product being dispensed.

[0038] According to yet another aspect of the disclosure, a method of dispensing product may comprise providing a dispenser according to the disclosure, actuating the valve to dispense an amount of product, and directing the dispensed product onto a surface. The surface may comprise hair and/or skin.

[0039] The term “providing” is used in a broad sense, and refers to, but is not limited to, making available for use, enabling usage, giving, supplying, obtaining, getting a hold of, acquiring, purchasing, selling, distributing, possessing, making ready for use, and/or placing in a position ready for use.

[0040] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

[0041] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate exemplary embodiments of the invention and, together with the description, serve to explain some of the principles of the invention. In the drawings,
duct 18 opens to the outside of the valve body via an axial orifice 19. Near the other end of the duct 18, an orifice 20 opens radially. When the valve 10 is in a closed position (FIG. 2A), the orifice 20 is in sealed engagement against the internal edge of the sealing member 13.

[0056] As shown in FIGS. 3A and 3B, the dispensing head 50 may be in the form of a push button. The push button may be mounted, for example, forcibly mounted, on the emerging portion 15 of the valve member 14. The dispensing head 50 includes a passage 53 therethrough. One end of the passage 53 is in communication with the duct 18 in the valve member 14. The other end of the passage 52 opens to atmosphere via a dispensing orifice 51. The dispensing orifice 51 may be defined, for example, by a nozzle. The dispensing orifice 51 may include swirl-inducing ducts.

[0057] A portion 24 of the valve member 14 is situated inside the valve body 11. The portion may comprise a peripheral bulge 28. The peripheral bulge 28 may, when the valve is in the closed position (FIG. 2A), press sealingly against the internal surface of the valve body 11. When the peripheral bulge 28 presses sealingly against the internal surface of the valve body 11, the orifice 20 may be isolated from an interior of the valve body 11 below the peripheral bulge 28. The interior of the valve body may contain, for example, pressurized product.

[0058] By exerting axial pressure on the valve member 14, via the dispensing head 50, an angular part, or chamfer, of the bulge 28 may be brought into a position at which it faces a groove 23 formed on the internal surface of the valve body 11. In this position, the orifice 20, which no longer faces the annular seal 13, is no longer isolated from the interior of the valve body 11 below the bulge. As a result, pressurized product in the valve body 11 below the bulge 28 rises up into the upper part of the valve body 11 via the space formed between the peripheral bulge 28 and the floor of the groove 23. The pressurized product flows into the orifice 20, into the valve member 14, and is dispensed via the dispensing orifice 51. When the actuating pressure ceases, the spring 17 returns the valve 10 to its closed position (FIG. 2A).

[0059] As shown in FIG. 2B, the groove 23 may have an angular width which increases gradually towards the bottom of the container. Thus, by exerting a moderate pressure axially on the dispensing head 50, the valve member 14 may be pushed inward by a distance to a first open position (FIG. 3A) such that the peripheral bulge 28 of the valve member 14 faces a narrow-width portion of the groove 23. In this first open position, product may dispensed with a relatively low flow rate. For example, the flow rate at the first open position may be about 0.16 grams per second.

[0060] As the pressure exerted on the dispensing head 50 increases, the flow rate increases until a second open position (FIG. 3B) is reached. In this second open position, the bulge 28 may face the widest part of the groove 23. In this position, product may dispensed with a flow rate significantly higher than the flow rate at the first open position (FIG. 3A). The particle sizes may be approximately the same at both the first and second open positions. For example, the flow rate at the second open position may be about 0.67 grams per second.

[0061] According to another exemplary aspect of the invention, as illustrated in FIGS. 4A, 4B, 5A, and 5B, the groove 23 may have a substantially constant width over its entire height, but may have a depth that increases gradually towards the bottom of the container.

[0062] By exerting a moderate pressure axially on the dispensing head 50, the valve member 14 may be pushed inward by a distance to a first open position (FIG. 5A) such that the peripheral bulge 28 of the valve member 14 faces a shallow-depth portion of the groove 23. At the first open position, the product may be dispensed at a relatively low flow rate.

[0063] As the pressure exerted on the dispensing head 50 is increased, the flow rate from the valve 10 increases until the second open position (FIG. 5B) is reached. In the second open position, the bulge 28 may face the deepest part of the groove 23. In this position, the product may be dispensed with a flow rate higher than the flow rate at the first open position (FIG. 5A).

[0064] According to another exemplary aspect, as illustrated in FIG. 6, the valve body 11 may comprise a second axially extending groove 25 separate from the first axially extending groove 23. In the first open position, the peripheral bulge 28 of the valve member 14 may face the first axially extending groove 23, and, in the second open position, the peripheral bulge 28 of the valve member 14 may face the first and second axially extending grooves 23, 25.

[0065] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure and methodology of the present invention. Thus, it should be understood that the invention is not limited to the embodiments and examples discussed in the specification. Rather, the present invention is intended to cover modifications and variations.

What is claimed is:

1. A valve for dispensing a product contained in a pressurized container, the valve comprising:

a valve body;
an actuable valve member moveable between a closed position and at least two open positions, wherein the at least two open positions include a first open position where product is dispensed at a first flow rate, and a second open position where product is dispensed at a second flow rate different from the first flow rate; and

an outlet passage selectively communicable with at least a portion of an interior of the valve body,

wherein the valve member comprises a piston axially moveable inside the valve body between the closed position where the piston sealingly isolates said at least a portion of the interior of the valve body from the outlet passage and a position, chosen at least from the first and second open positions, where fluid communication is established between said at least a portion of the interior of the valve body and the outlet passage.

2. The valve according to claim 1, wherein the valve member moves from the closed position to the second open position by passing through the first open position.

3. The valve according to claim 2, wherein a flow rate of product from the valve changes gradually from the first flow
rate to the second flow rate when the valving member moves between the first and second open positions.

4. The valve according to claim 1, wherein the valve body comprises an internal surface defining at least one axially extending groove.

5. The valve according to claim 4, wherein the at least one axially extending groove has an angular width and a depth, at least one of the angular width and the depth of the at least one axially extending groove varying along an axis of movement of the valving member.

6. The valve according to claim 4, wherein the piston comprises a peripheral portion facing the at least one axially extending groove when the piston is in a position chosen at least from said first and second open positions.

7. The valve according to claim 1, wherein a flow rate of product from the valve changes in a stepwise manner from the first flow rate to the second flow rate when the valving member moves between the first and second open positions.

8. The valve according to claim 4, wherein the internal surface defines a second axially extending groove separate from the at least one axially extending groove.

9. The valve according to claim 8, wherein the piston comprises a peripheral portion facing, in the first open position, at least the at least one axially extending groove, and, in the second open position, at least the second axially extending groove.

10. The valve according to claim 1, wherein the valving member comprises a valve stem at least partially emerging outside of the valve body, the valve stem comprising an axial duct passing therethrough, the axial duct comprising an outlet orifice and an inlet orifice, the axial duct opening to the outside of the valve via the outlet orifice, the inlet orifice being isolated from the interior of the valve body in the closed position.

11. The valve according to claim 10, further comprising a sealing element in the valve body, wherein, in the closed position, the inlet orifice opens in a lateral direction facing the sealing element.

12. The valve according to claim 11, wherein the sealing element comprises an annular seal.

13. A dispenser, comprising:
    a container configured to contain a pressurized product; and
    the valve according to claim 1 associated with the container.

14. The dispenser of claim 13, further comprising:
    a pressurized product contained in the container.

15. The dispenser of claim 14, wherein the product comprises a cosmetic product.

16. The dispenser of claim 15, wherein the product comprises at least one of a hair product, a personal hygiene product, a make-up product, a skin care product, and a product affording protection against harmful effects of the sun.

17. The dispenser of claim 13, further comprising:
    an actuating member configured to actuate the valve.

18. The dispenser of claim 17, wherein the actuating member defines at least one dispensing orifice, the product being dispensed from the at least one dispensing orifice.

19. The dispenser of claim 18, wherein the actuating member is configured to impart a swirl effect on the product being dispensed.

20. A method of dispensing product, comprising:
    providing the dispenser of claim 14,
    actuating the valve to dispense an amount of product; and
    directing the dispensed product onto a surface.

21. The method of claim 20, wherein the surface comprises at least one of hair and skin.

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