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## Description

**[0001]** The present invention relates to an improvement to dispensing closures having an end plate, a peripheral side wall depending from the end plate and a spout, which is arranged to pivot between a closed position, where the spout lies flush with the end plate, and an open position, where the spout projects at right angles to the end plate. In particular, the invention relates to a sealing improvement for one-piece, dispensing closures having a pivotable spout. In such one-piece dispensing closures, the spout is connected to the remainder of the closure via a flexible membrane which is designed to invert as the spout is pivoted to its open position. The closure is moulded as a single piece with the spout in its open position and is subsequently closed prior to attaching to a container.

**[0002]** One-piece, pivotable spout, dispensing closures are well known from the prior art. For example, US 4,440,327 describes a dispensing closure comprising a body with a spout pivotably mounted on the body and connected thereto by a flexible membrane. The flexible membrane has a concave configuration when the spout is in its closed position but inverts to a convex configuration when the spout is opened. In its closed configuration, the spout fits into a recess in the closure end plate. The spout is sealed by abutment of the dispensing orifice, at one end of the spout, against the closure side-wall and by abutment of a sealing skirt, at the other end of the spout, against a sealing surface which projects from the body of the closure. In order to hold the spout in its closed position, a latch is provided between the spout and closure body.

**[0003]** It is important that the sealing skirt on the spout is forced hard against the sealing surface on the closure body to ensure that there is no product leakage from the container through the closure spout. In the closure described in US 4,440,327, the dispensing orifice end of the spout abuts a latch surface on the side-wall of the body, which forces the sealing skirt at the other end of the spout, against the sealing surface projecting from the body of the closure. The reaction backwards along the spout provides the sealing force required to obtain a leakproof seal. However, this arrangement cannot always be used. For example, in some circumstances, the closure side-wall does not extend across the dispensing orifice of the spout. Instead, a tear off cover may be provided to prevent the ingress of dirt into the spout and also to provide an indication of whether the closure has been opened i.e. to provide tamper evidence. Once the cover is removed, there is no abutment surface to provide the necessary reaction force to form a seal at the sealing skirt end of the spout.

**[0004]** Hence the aim of the present invention is to provide a leakproof seal between the sealing skirt on the spout and the sealing surface on the closure body, without relying on an abutment surface at the dispensing end of the spout. It is not possible to obtain the neces-

sary sealing force simply by increasing the length of the sealing skirt on the spout, to provide more pressure against the body sealing surface. When the length of the sealing skirt is increased, its leading edge tends to get damaged by the closing action of the spout, causing even greater leakage.

**[0005]** Accordingly, the present invention provides a one-piece dispensing closure comprising

- a rigid body defining a sealing surface and having a peripheral side-wall adapted to co-operate with the neck of a container
- a rigid spout defining a dispensing passageway and pivotable on the body between open and closed positions, the spout having a first, dispensing end and a second end having a sealing skirt arranged to provide a fluid tight seal against the sealing surface of the body,
- and a flexible diaphragm connected between the second end of the spout and the body, the diaphragm arranged to have a concave configuration when the spout is in its closed position and to invert when the spout is pivoted to its open position, characterised in that
- the closure side-wall defines at least one projecting cam surface, arranged to interact with the container neck to distort the closure and thereby pull the sealing skirt on the spout and the sealing surface on the body tightly together.

**[0006]** The required distortion of the closure can be most easily achieved by arranging two cams on a line which is orthogonal to the central axis of the spout (looking at the end plate of the closure).

**[0007]** Considering a closure with a round planar top plate the pressure exerted by the container on the cams has the effect of making the closure go oval. By placing the cam or cams on the diameter of the closure at an angle of approximately 90° to the central axis of spout and the sealing surface, the distortion of cap will tend to form an oval with its minor axis aligned with this central axis. Thus, as the closure is distorted by the cams, the sealing skirt and sealing surface will be pulled together more tightly. This additional sealing pressure gives the liquid and airtight seal required to prevent the product leaking.

**[0008]** Using the distortion principle described above, a good leak-proof seal can be obtained with minimal interference between the sealing skirt and the sealing surface when the spout is opened. It will be apparent that the degree of distortion is dependant upon the flexibility of the closure, the material used, the dimension of the cam or cams and the tolerance of the neck of the container where the cam or cams contact. Preferably, 2 cams are provided on the internal surface of the closure (just above the threads or snap beads used to hold the closure on the container). The cams are located opposite one another on a chord running orthogonal to the

central axis of the spout. This arrangement ensures that the distortion of the cap is symmetrical on either side of the spout and prevents the closure from tilting on the container. Advantageously, where the closure has a substantially circular end plate, the cams are arranged across the diameter of the closure at 90° to the central axis of the spout to ensure that the ovality induced in the closure, when the cams contact the container neck, is square to the sealing faces provided on the spout and the body.

**[0009]** The invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig.1 shows an external isometric view of a one-piece, pivotable spout, dispensing closure, according to both the prior art and the invention, with the spout in its open position.

Fig.2 shows a side cross section view of the closure according to the invention, with the spout in its closed position.

Fig.3 shows another cross section view of the closure shown in Fig.2, looking along the central axis of the spout.

Fig.4 shows a view of the interior of the closure shown in Figs. 2 and 3, looking from the base of the closure towards the top plate.

**[0010]** Referring to Fig.1, the present invention provides enhanced sealing performance for a one-piece dispensing closure 1 comprising a body 2, having an end plate 3 with a peripheral side wall 4 depending therefrom, and a spout 5, which is pivotable between open and closed positions about a main hinge axis 6. The spout 5 is joined to the remainder of the closure body 2 via a flexible membrane 7 which is adapted to invert as the spout 5 is opened. A recess 8 is provided in the side-wall 4 of the closure and is arranged to receive the spout 5 when it is in its closed position, thus allowing the spout 5 to lie flush with the end plate 3 of the closure. A latch (not shown) may be provided on the side-wall of the recess 8, to hold the spout 5 in its closed position.

**[0011]** Referring to Fig.2, the spout 5 has a dispensing aperture 51 at one end (distant from the main hinge axis 6) and a sealing skirt 52 at the other end (adjacent to the main hinge axis 6). A sealing plate 21 is defined by the body 2 and is arranged to provide a surface against which the sealing skirt 52 abuts when the spout 5 is in its closed position, forming a fluid tight seal.

**[0012]** Referring to Figs. 2-4, the closure body 2 also has two cam surfaces 22, which are arranged on the internal surface 41 of the side-wall 4. As shown in Figs. 3 and 4, the cam surfaces 22 are positioned so that they contact the neck of a container 9 and are located opposite one another on a chord X-X which is orthogonal to the central axis of the spout Y-Y. The axis Y-Y passes through the centre of the sealing skirt 52 and the sealing

plate 21. The cam surfaces 22 are forced outwards by the container neck 9 (as indicated by the arrows in Figs. 3 and 4), and this distortion pulls the body 2 inwards in a direction perpendicular to the cam surfaces 22 (as indicated by the inward pointing arrows in Fig.4). This in turn pulls the sealing skirt 52 and sealing plate 21 more tightly together.

**[0013]** Although the specific embodiment of the invention has been described with reference to a closure having internal threads which co-operate with external threads on the neck of the container, it will be obvious that the invention could equally be applied to a closure having external threads which co-operate with threads on the internal surface of a container neck. In the latter case, the cam surfaces would also be provided on the external surface of the closure. Furthermore, rather than the cam surface(s) being provided on the closure, they could equally be provided on the container neck finish, although in this arrangement some means of aligning the closure on the container will also have to be provided.

**[0014]** The closure described in the specific embodiment has a round profile. However, the closure may take a different shape, the only limitation being that the shape should allow the closure to distort in the manner described.

## Claims

### 1. A dispensing closure 1 comprising,

- a rigid body 2 defining a sealing surface 21 and having a peripheral side-wall 4 adapted to co-operate with the neck of a container 9,
- a rigid spout 5 defining a dispensing passage-way and pivotable on the body between open and closed positions, the spout 5 having a first, dispensing end 51 and a second end having a sealing skirt 52 arranged to provide a fluid tight seal against the sealing surface 21 of the body, and a flexible diaphragm 7 connected between the second end of the spout 5 and the body 2, the diaphragm 7 arranged to have a concave configuration when the spout 5 is in its closed position and to invert when the spout 5 is pivoted to its open position, **characterised in that**
- the closure side-wall 4 defines at least one projecting cam surface 22, arranged to interact with the container neck 9 to distort the closure 1 and thereby pull the sealing skirt 52 and the sealing surface 21 tightly together.

### 2. A dispensing closure according to claim 1, comprising two cam surfaces 22, located opposite one another on a line lying perpendicular to the central axis of the spout when it is in its closed position.

3. A dispensing closure according to claim 1 or claim 2, wherein the or each cam surface 22 is provided on the internal surface 41 of the closure side-wall 4.
4. A dispensing closure according to any one of the preceding claims, wherein the or each cam surface 22 comprises a rounded projection which extends from the closure side-wall 4 towards the container neck 9.
5. A closure/container combination comprising a closure 1 having
  - a rigid body 2 defining a sealing surface 21 and having a peripheral side-wall 4 adapted to co-operate with the neck of a container 9,
  - a rigid spout 5 defining a dispensing passage-way and pivotable on the body between open and closed positions, the spout having a first, dispensing end 51 and a second end having a sealing skirt 52 arranged to provide a fluid tight seal against the sealing surface 21 of the body,
  - and a flexible diaphragm 7 connected between the second end of the spout 5 and the body 2, the diaphragm 7 arranged to have a concave configuration when the spout 5 is in its closed position and to invert when the spout 5 is pivoted to its open position, and
  - a container having a neck finish 9 adapted to co-operate with the closure 2, **characterised in that** the container neck finish 9 defines at least one projecting cam surface 22, arranged to interact with the closure side wall 4 to distort the closure and thereby pull the sealing skirt 52 and the sealing surface 21 tightly together.

#### Patentansprüche

1. Ausgabeverschluss (1) mit
  - einem steifen Grundkörper (2), der eine Dichtungsfläche (21) definiert und eine sich in Umfangsrichtung erstreckende Seitenwandung (4) aufweist, die dazu bestimmt ist, mit dem Hals eines Behälters (9) zusammenzuwirken,
  - einem steifen Ausguss (5), der einen Austragsdurchgang definiert und der an dem Grundkörper zwischen einer Öffnungs- und einer Schließposition schwenkbar angeordnet ist,
  - wobei der Ausguss (5) ein erstes Austragsende (51) und zweites Ende aufweist, das mit einem Dichtungsrand (52) versehen ist, der mit der Maßgabe angeordnet ist, dass er gegenüber der Dichtungsfläche (21) des Grundkörpers eine Flüssigkeitsdichtung bildet,
  - und mit einer biegsamen Membran (7), die zwischen dem zweiten Ende des Ausgusses (5)

und dem Grundkörper (2) vorgesehen ist, wobei die Membran (7) mit der Maßgabe angeordnet ist, dass sie eine konkave Gestalt hat, sobald der Ausguss (5) sich in seiner Schließposition befindet und dass sie umklappt sobald der Ausguss (5) in seine Öffnungsposition geschwenkt wird,

**dadurch gekennzeichnet, dass** die Seitenwandung (4) des Verschlusses wenigstens eine herausragende Ansatzfläche (22) bildet, die derart angeordnet ist, dass sie mit dem Behälterhals (9) dahingehend zusammenwirkt, dass der Verschluss verzerrt wird, so dass der Dichtungsrand (52) und die Dichtungsfläche (21) fest aneinander gezogen werden.

2. Ausgabeverschluss nach Anspruch 1, bestehend aus zwei Ansatzflächen (22), die einander bezüglich einer solchen Linie gegenüberliegend angeordnet sind, die sich senkrecht zu der Mittelachse des Ausgusses erstreckt, sobald dieser sich in seiner Schließposition befindet.
3. Ausgabeverschluss nach Anspruch 1 oder 2, wobei die oder eine jede Ansatzfläche (22) auf der inneren Oberfläche (41) der Seitenwandung (4) des Verschlusses angeordnet ist.
4. Ausgabeverschluss nach einem der vorangegangenen Ansprüche, wobei die oder eine jede Ansatzfläche (22) ein abgerundetes herausragendes Teil aufweist, welches sich ausgehend von der Seitenwandung (4) des Verschlusses in Richtung auf den Behälterhals (9) hin erstreckt.
5. Kombination, bestehend aus einem Verschluss (1) und einem Behälter mit einem Verschluss (1), der

- einen steifen Grundkörper (2), der eine Dichtungsfläche (21) definiert und eine sich in Umfangsrichtung erstreckende Seitenwandung (4) aufweist, die dazu bestimmt ist, mit Hals eines Behälters (9) zusammenzuwirken,
- einen steifen Ausguss (5) der einen Austragsdurchgang definiert und der an dem Grundkörper zwischen einer Öffnungs- und einer Schließposition schwenkbar angeordnet ist,
- wobei der Ausguss ein erstes Austragsende (51) und ein zweites Ende aufweist, das mit einem Dichtungsrand (52) versehen ist, der mit der Maßgabe angeordnet ist, dass er gegenüber der Dichtungsfläche (21) des Grundkörpers eine Flüssigkeitsdichtung bildet,
- und mit einer flexiblen Membran (7), die zwischen dem zweiten Ende des Ausgusses (5) und dem Grundkörper (2) vorgesehen ist, wobei die Membran (7) mit der Maßgabe angeordnet

net ist, dass sie eine konkave Gestalt hat, sobald der Ausguss 5 sich in seiner Schließposition befindet und dass sie umklappt, sobald der Ausguss (5) in seine Öffnungsposition geschwenkt wird und mit

- einem Behälter, der mit einem Abschlusshals (9) versehen ist, der dazu bestimmt ist, mit dem Verschluss (2) zusammenzuwirken, **dadurch gekennzeichnet, dass** der Abschlusshals (9) des Behälters wenigstens eine herausragende Ansatzfläche (22) bildet, die mit der Maßgabe angeordnet ist, dass sie mit der Seitenwandung (4) des Behälters dahingehend zusammenwirkt, dass der Verschluss verzerrt wird, so dass der Dichtungsrand (52) und die Dichtungsfläche (21) fest aneinander gezogen werden.

## Revendications

### 1. Fermeture de distribution (1), comprenant :

- un corps rigide (2) définissant une surface d'étanchéité (21) et possédant une paroi latérale périphérique (4) conçue pour coopérer avec un goulot de récipient (9),
- un bec rigide (5) définissant un passage de distribution et pouvant pivoter sur le corps entre une position ouverte et une position fermée, le bec (5) possédant une première extrémité de distribution (51) et une seconde extrémité ayant une jupe d'étanchéité (52) conçue pour produire un joint étanche aux fluides au contact de la surface d'étanchéité (21) du corps,
- et un diaphragme flexible (7) connecté entre la seconde extrémité du bec (5) et le corps (2), le diaphragme (7) étant conçu pour présenter une configuration concave lorsque le bec (5) est dans sa position fermée et s'inverser lorsque le bec (5) pivote dans sa position ouverte, **caractérisée en ce que :**
- la paroi latérale de fermeture (4) définit au moins une surface de came en saillie (22) conçue pour interagir avec le goulot de récipient (9) afin de déformer la fermeture (1) et ainsi rapprocher étroitement la jupe d'étanchéité (52) et la surface d'étanchéité (21).

### 2. Fermeture de distribution selon la revendication 1, comprenant deux surfaces de comes (22), disposées opposées l'une à l'autre sur une droite perpendiculaire à l'axe central du bec lorsqu'il est dans sa position fermée.

### 3. Fermeture de distribution selon la revendication 1 ou la revendication 2, dans laquelle la surface de

came ou chacune des surfaces de came (22) est ménagée sur la surface intérieure (41) de la paroi latérale de fermeture (4).

### 4. Fermeture de distribution selon l'une quelconque des revendications précédentes, dans laquelle la surface de came ou chacune des surfaces de came (22) comprend une projection arrondie qui s'étend de la paroi latérale de fermeture (4) vers le goulot de récipient (9).

### 5. Combinaison d'une fermeture et d'un récipient comprenant une fermeture (1) possédant :

- un corps rigide (2) définissant une surface d'étanchéité (21) et possédant une paroi latérale périphérique (4) conçue pour coopérer avec un goulot de récipient (9),
- un bec rigide (5) définissant un passage de distribution et pouvant pivoter sur le corps entre une position ouverte et une position fermée, le bec (5) possédant une première extrémité de distribution (51) et une seconde extrémité ayant une jupe d'étanchéité (52) conçue pour produire un joint étanche aux fluides au contact de la surface d'étanchéité (21) du corps,
- et un diaphragme flexible (7) connecté entre la seconde extrémité du bec (5) et le corps (2), le diaphragme (7) étant conçu pour présenter une configuration concave lorsque le bec (5) est dans sa position fermée et s'inverser lorsque le bec (5) pivote dans sa position ouverte, et
- un récipient possédant un goulot (9) conçu pour coopérer avec la fermeture (1), **caractérisé en ce que** le goulot de récipient (9) définit au moins une surface de came en saillie (22), conçue pour interagir avec la paroi latérale de fermeture (4) afin de déformer la fermeture et ainsi rapprocher étroitement la jupe d'étanchéité (52) et la surface d'étanchéité (21).

Fig.1.

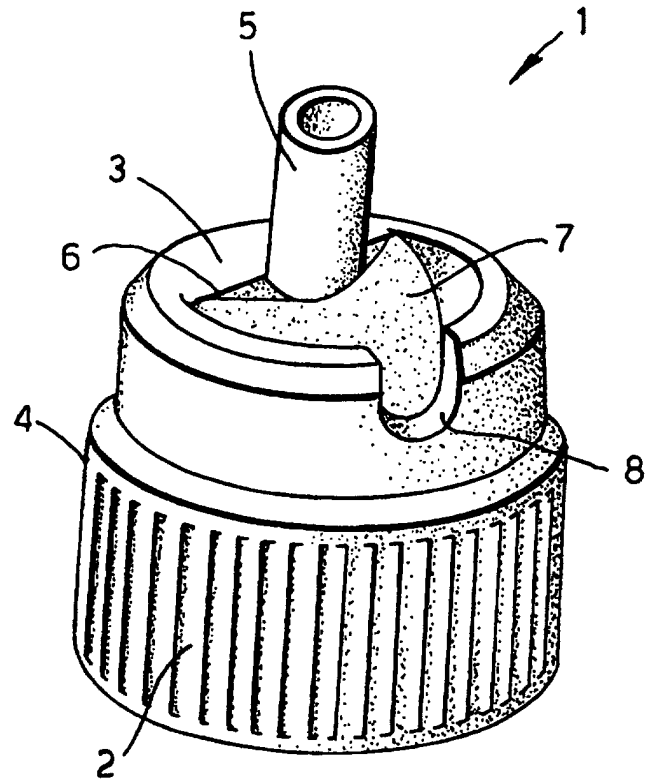


Fig.2.

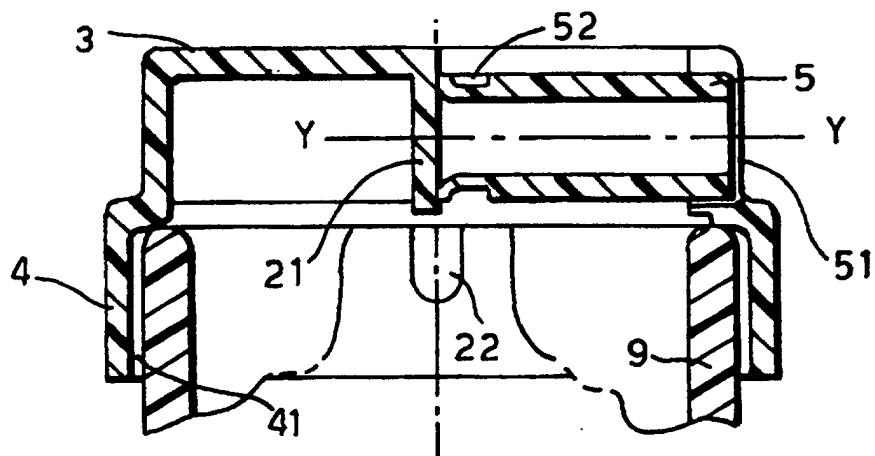


Fig.3.

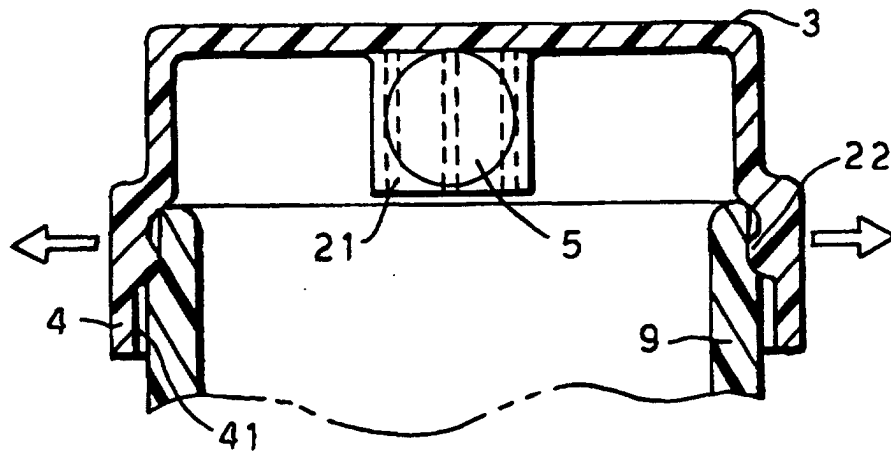


Fig.4.

