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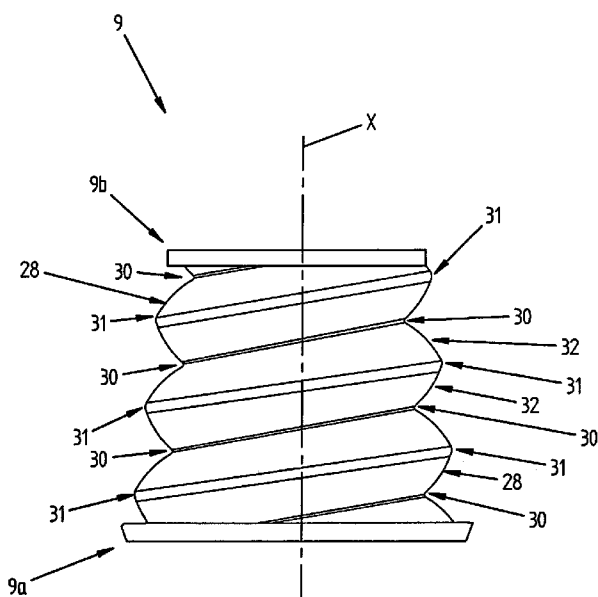


FIG. 2

(57) Abstract: The present invention concerns an elastic element (9; 100) for a device (1) for dispensing fluids (L), comprising a surface (28) that develops around a main longitudinal axis (X), comprising a portion with spiral-shaped development that defines, in cross section according to a section plane containing the longitudinal axis (X), an alternation between external tips (31; 131; 231) and internal tips (30; 130; 230), each one of said external tips being connected to a corresponding adjacent internal tip (30; 130; 230) by a connection portion (32; 132) belonging to the surface (28). Said internal tips (30; 130; 230) are aligned along an internal envelope axis (Yi) that forms with the main longitudinal axis (X) an angle (A) preferably included between 2° and 12°. The subject of the invention also includes the device for dispensing fluids (L).

ELASTIC ELEMENT FOR A DEVICE FOR DISPENSING FLUIDS OR MIXTURES AND DEVICE COMPRISING SAID ELASTIC ELEMENT.

TECHNICAL FIELD OF THE INVENTION

The invention concerns an elastic element for a device for dispensing a fluid, said
5 device being suited to be applied to a container containing said fluid, particularly
suited to dispense food substances, perfumes or detergents in general, even in the
form of spray or foam.

DESCRIPTION OF THE STATE OF THE ART

As already known, dispensing devices that are applied to the container of the
10 product in question are widely used to dispense liquid or creamy products, like
food substances, soaps, creams, detergents or perfumes.

Said devices substantially comprise a cap provided with means for connection to
the neck of the container and a hollow body defining a fluid suction/compression
chamber, also called "accumulation chamber", to which a piston is slidingly
15 coupled.

The piston comprises a plunger and a rod, provided with an actuator element,
also called spout or nozzle, that can be operated by the user.

In order to dispense a dose of the fluid contained in the device, the user pushes
the actuator element, and thus the piston, starting from an initial rest position of
20 the same and reaching a second final operating position.

During the pushing stage, the fluid dose flows out through a suitable duct
associated with the nozzle.

Once the fluid has been dispensed, the operator releases the actuator element that,
together with the piston, automatically returns to the initial rest position.

25 In order to allow said automatic return movement, the device is advantageously
provided with elastic means associated with the piston and with the actuator
element, which are compressed and loaded by the operator during the pushing
stage and that exert a thrusting and decompression action on the piston when the
operator releases the actuator.

30 The elastic means in the initial rest position of the actuator and of the piston are
preferably in a pre-load condition. This means that they are assembled in a
slightly compressed condition to generate a pre-load force on the piston and
maintain it stable in its rest position.

When the user acts on the actuator, therefore, he/she exerts a thrusting force that
35 makes it possible both to dispense the fluid present in the suction/compression

chamber and to load the elastic means associated with the piston.

The elastic means usually employed in the known art need a force that increases as the extent of the compression increases.

For example, the compression force in the elastic means of known type
5 constituted by metal helical springs has an increasing linear trend with respect to the extent of the compression.

This is advantageous for the user, who must push the actuator with an increasing thrusting force in order to dispense the product efficiently.

Furthermore, the force of the elastic means generated during the decompression
10 stage in order to bring the piston back to the rest position is lower than the force exerted by the user during its compression, given the same extent of compression.

Said effect, known also as hysteresis of the elastic means, actually causes a given quantity of energy to be lost between the compression and decompression of the
15 elastic means.

This may cause, furthermore, the incorrect return of the piston and the actuator element associated with it to the initial rest position.

It is the object of the applicant to find a solution for making said elastic means so that they reproduce as much as possible the ideal conditions, that is, to provide
20 elastic means needing an essentially constant compression force, independently of the degree of compression to which they are subjected.

It is a further object of the applicant to provide elastic means with minimum hysteresis and consequently minimum quantity of energy dispersed between the activation and the release of the actuator during the dispensing operation.

25 A further drawback of the elastic means of known type is constituted by the fact that in their position of maximum compression they have considerable overall dimensions. This sets a limit to the minimum size of the device with which they are associated.

In fact, there is also the much felt need that the devices described above should
30 have the smallest possible size. This is important in order to reduce the overall dimensions of the device-container unit as much as possible, to minimize the space required for storage and to maximize the quantity of product stored in the container.

It is thus a particular object of the invention to provide an elastic element for a
35 device for dispensing fluids whose characteristics during compression and

decompression reproduce as much as possible the ideal characteristics.

It is another object of the invention to provide an elastic element for a device for dispensing fluids that is more compact than the devices of known type comparable to it.

- 5 It is a further object of the invention to propose a solution that can be adopted to carry out any device for dispensing fluids or mixtures, even in the form of foam, like for example the dispensing devices called foamers or sprayers.

SUMMARY OF THE PRESENT INVENTION

- 10 The present invention is based on the general consideration that it is desirable to provide an elastic element for a device for dispensing fluids whose behaviour during compression and decompression reproduces as much as possible the ideal behaviour by properly intervening on its geometrical and/or constructional characteristics.

- 15 According to a first embodiment, the object of the present invention is an elastic element for a device for dispensing fluids according to claim 1, meaning an elastic element for a device for dispensing fluids comprising a surface that develops around a main longitudinal axis, said surface comprising at least one portion resembling a spiral that in cross section, according to a cross section plane containing said longitudinal axis, defines an alternation of external tips and
20 internal tips, each one of said external tips being connected to a corresponding adjacent internal tip through a connection portion belonging to said surface, wherein said internal tips are aligned according to an internal envelope axis forming with said main longitudinal axis an angle preferably included between 2° and 12°.

- 25 More preferably, the internal envelope axis forms with the main longitudinal axis an angle included between 5° and 9°, even more preferably an angle equal to 7°. According to a preferred embodiment of the invention, the external tips are aligned along an external envelope axis that forms with the main longitudinal axis an angle preferably included between 2° and 12°.

- 30 More preferably, the external envelope axis forms with the main longitudinal axis an angle included between 5° and 9°, even more preferably an angle equal to 7°. Advantageously, the internal envelope axis and the external envelope axis form with said main longitudinal axis angles that are essentially the same.

- 35 According to a preferred embodiment of the invention, the connection portion comprises a curved section.

According to another preferred embodiment of the invention, the connection portion has a mixtilinear development.

The curved section advantageously comprises an arc of a circle.

The curvature radius of said arc of a circle has a value preferably included
5 between 0.15 and 0.6 times the value of the width of the surface in the intermediate area of the elastic element.

With reference to the present invention, the expression “width of the surface in the intermediate area of the elastic element” means a parameter defined as the distance intercepted by the surface of the elastic element on an axis that is
10 perpendicular to the main axis and passes through the median point of the height of the elastic element.

More preferably, the curvature radius has a value included between 0.25 and 0.45 times the value of the width of the surface in the intermediate area of the elastic element, even more preferably a value equal to 0.35 times the value of the width
15 of the surface in the median area of the elastic element.

According to a preferred embodiment of the invention, the thickness of the surface has a value preferably included between 0.01 and 0.04 times the value of the width of the surface in the median area of the elastic element.

More preferably, the thickness has a value included between 0.02 and 0.03 times the value of the width of the surface in the median area of the elastic element,
20 even more preferably a value equal to 0.025 times the value of the width of the surface in the median area of the elastic element.

According to a preferred embodiment of the invention, the distance between two adjacent internal tips has a value preferably included between 0.01 and 0.05
25 times the value of the width of the surface in the median area of the elastic element.

More preferably, the distance between two of said adjacent inner tips has a value included between 0.02 and 0.04 times the value of the width of the surface in the intermediate area of the elastic element, even more preferably a value equal to
30 0.032 times the value of the width of the surface in the median area of the elastic element.

According to another preferred embodiment of the invention, the distance between two adjacent external tips has a value preferably included between 0.01 and 0.05 times the value of the width of the surface in the median area of the
35 elastic element.

5 More preferably, the distance between two adjacent external tips has a value included between 0.02 and 0.04 times the value of the width of the surface in the median area of the elastic element, even more preferably a value equal to 0.032 times the value of the width of the surface in the intermediate area of the elastic element.

Advantageously, the distance between two adjacent internal tips is essentially equal to the distance between two adjacent external tips.

According to a preferred embodiment of the invention, the surface comprises a material having a tensile modulus preferably included between 50 MPa and 300 Mpa.

More preferably, the surface comprises a material having a tensile modulus included between 80 MPa and 220 Mpa.

According to a preferred embodiment of the invention, the surface comprises a material whose hardness is preferably included between 20 Shore D and 70 Shore D.

More preferably, the surface comprises a material whose hardness is included between 35 Shore D and 60 Shore D, even more preferably equal to 0.45 Shore D.

Preferably, the elastic element of the invention comprises a portion that is essentially in the shape of a truncated cone.

According to another preferred embodiment of the invention, the elastic element comprises two portions essentially in the shape of a truncated cone.

Properly, at the level of at least one of the internal tips and/or at the level of at least one of the external tips the thickness of the surfaces increases compared to the adjacent areas.

According to a second aspect of the invention, its subject also includes a device for dispensing fluids according to claim 15, that is, a device for dispensing fluids comprising an elastic element carried out as described above.

BRIEF DESCRIPTION OF THE DRAWINGS

30 Further advantages, objects and characteristics, as well as further embodiments of the present invention are defined in the claims and will be illustrated in the following description, with reference to the enclosed drawings; in the drawings, corresponding or equivalent characteristics and/or components are identified by the same reference numbers. In particular:

35 - Figure 1 shows a longitudinal cross section of a possible embodiment of a

device for dispensing fluids or mixtures comprising the elastic element of the invention;

- Figure 2 shows a plan view of the elastic element carried out according to the invention;
- 5 - Figure 3 is a view of a longitudinal cross section of the element shown in Figure 2;
- Figure 3A shows an enlarged detail of fig. 3;
- Figure 4 show the trend of some characteristic parameters of the elastic element of Figure 2;
- 10 - Figure 5 shows a variant embodiment of the elastic element of Figure 2;
- Figure 6 shows an enlarged view of another construction variant of the elastic element shown in Figure 2;
- Figure 7 shows an enlarged view of a further construction variant of the elastic element shown in Figure 2;
- 15 - Figures 8 and 9 show each a longitudinal cross section of the device shown in Figure 1, in the same number of operating positions.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

The examples of embodiment of the invention described below refer to a device for dispensing fluids and in particular for dispensing detergent liquids. It is clear
20 that the solution proposed can be applied also to devices for dispensing perfumes or food products, or any other fluid in general that must be drawn from a container and conveyed towards the outside even in the form of foam or spray.

An embodiment of a device 1 for dispensing fluids according to the present invention, applied to the neck N of a container C containing a fluid L to be
25 dispensed, is shown in Figure 1.

It comprises a hollow body 2 that defines a suction/compression chamber 3 for the fluid L, provided with a suction duct 4 for the fluid L, to which a piston 5 is slidingly coupled, said piston being movable from a first rest position, visible in Figure 1, to at least a second operating position, shown in Figure 8.

30 The device 1 can be operated by the user through an actuator element 6, comprising an operating button called also spout or nozzle 7, which is integral with the piston 5.

The hollow body 2 is integral with a ring nut 16 that supports and guides the piston 5. The supporting ring nut 16 is in turn associated with a bearing element
35 17 suited to be applied to the neck N of the container C. In the variant

embodiment illustrated herein, an inner thread 17a makes said application possible.

It is evident that in variant embodiments of the invention the bearing element 17 may be provided with different means for connection to the neck of the container C, like for example snap-fitting means or even glueing means.

Elastic means, indicated as a whole by 8, are suited to guarantee the return of the piston 5 from the operating position to the rest position once the fluid has been dispensed.

The elastic means 8 comprise an elastic element 9 interposed between the bearing element 17 and the actuator element 6.

The elastic element 9, shown in detail in Figures 2 and 3, counteracts the bearing element 17 with its first end 9a and the actuator element 6 with its second end 9b, opposite the first one 9a.

The first end 9a of the elastic element 9 is housed in a suitable seat 17b created in the bearing element and analogously the second end 9b of the elastic element 9 is housed in a suitable seat 6a created in the actuator element.

According to variant embodiments of the invention, the first end 9a of the elastic element 9 may be associated with the supporting ring nut 16 and in the same way the second end 9b of the elastic element 9 may be directly associated with the piston 5.

According to an alternative embodiment of the invention, the elastic element 9 may be overturned in such a way as to present its first end 9a in contact with the actuator 6, or the piston 5, and its second end 9b in contact with the supporting element 17 or the ring nut 16.

As regards the piston 5, it comprises a supporting element 5a to which a plunger 5b is slidingly coupled, said plunger 5b tightly cooperating with the walls of the suction/compression chamber 3.

The supporting element 5a is coupled through interference with a rod 12 integral with the actuator element 6.

The supporting element 5a and the rod 12 are provided with a dispensing duct 13 for the fluid L that communicates with the suction/compression chamber 3 and with the external environment E.

First valve means 14 arranged downstream of the suction duct 4 and second valve means 15 arranged upstream of the dispensing duct 13 regulate the flow of the fluid L from the container C to the suction/compression chamber 3 and its

outflow from the chamber 3 to the dispensing duct 13.

In the example of embodiment represented, the first valve means 14 comprise a ball 14a in a non metallic material, while the second valve means 15 are constituted by sealing edges 15a belonging to the plunger 5b, suited to cooperate with the supporting element 5a and with the walls of the suction/compression chamber 3 and suited to be engaged in corresponding grooves obtained in the guide and support ring nut 16.

The elastic element 9 is described here below with reference to Figures 2 and 3.

The elastic element 9 comprises an external surface 28 that extends over a predetermined length H between the first end 9a of the first elastic element 9, or base end, and its second end 9b, or upper end.

The length H thus defines the height of the elastic element 9.

The external surface 28 develops around a main longitudinal axis X in order to envelope it completely, except for the lower and upper openings 28a and 28b at the level of the corresponding base end 9a and upper end 9b, as shown in Figure 3.

On the elastic element 9 it is possible to identify the parameter D0, as shown in Figure 3, defined as the distance intercepted by the external surface 28 of the elastic element 9 on an axis perpendicular to the main axis X and passing through the median point Hm of the height H. The parameter D0 represents, therefore, the width of the external surface 28 in the median area of the elastic element 9.

The external surface 28 of the elastic element 9 has a spiral-shaped development. As can be seen in the longitudinal cross section of Figure 3, said spiral-shaped profile defines an alternation of external tips 31 and internal tips 30 for the external surface 28.

Each external tip 30 is connected to a corresponding adjacent internal tip 31 through a connection portion 32.

The connection portions 32 have essentially the same profile and preferably comprise a curved section 33, as shown in Figure 3A.

The curved section 33 preferably comprises an arc of a circle with radius R.

The curvature radius R of the arc of a circle 33 is selected based on the value of the parameter D0 and is preferably included between $0.15 \cdot D0$ and $0.60 \cdot D0$, more preferably included between $0.25 \cdot D0$ and $0.45 \cdot D0$, and even more preferably equal to $0.35 \cdot D0$.

Advantageously, said curvature radiuses for the arc of a circle of the curved

section 33 make it possible to reduce to a minimum the stroke necessary to bring the elastic element 9 to the pre-load condition, meaning in the slightly compressed condition suited to generate a pre-load force on the piston 5 and keep it stable in the rest position.

- 5 In the embodiment of the invention described herein, the curved sections 33 along the elastic element 9 between the first end 9a and the second end 9b have an essentially constant curvature radius R.

According to variant embodiments, however, the curved sections 33 along the elastic element 9 between the first end 9a and the second end 9b may present
10 different curvature radiuses.

The internal tips 30 are essentially aligned along an internal envelope axis Y_i . The internal envelope axis Y_i forms with the main longitudinal axis X an angle A, as indicated in Figure 3.

- Preferably, the angle A between the internal envelope axis Y_i and the main longitudinal axis X is included between 2° and 12° , more preferably between 5° and 9° , and even more preferably is equal to 7° .
15

Analogously, the external tips 31 are essentially aligned along an external envelope axis Y_e . The external envelope axis Y_e forms with the main longitudinal axis X an angle B, as indicated in Figure 3.

- 20 Preferably, the angle B between the external envelope axis Y_e and the main longitudinal axis X is included between 2° and 12° , more preferably between 5° and 9° , and even more preferably is equal to 7° .

The shape of the elastic element 9 is essentially that of a truncated cone.

- Advantageously, the above mentioned angles A between the internal envelope axis Y_i and the main longitudinal axis X and the angles B between the external envelope axis Y_e and the main longitudinal axis X make it possible to reduce the overall dimensions of the elastic element 9 in the compressed condition, as will be explained in greater detail below.
25

- In fact, when the elastic element 9 is compressed, the internal tips 30 and the external tips 31 of the external surface 28 are in staggered and non overlapping positions, and therefore the turns that make up the external surface 28 penetrate each other.
30

- The external surface 28 of the elastic element 9 tends to have an essentially constant thickness S. The external surface 28, in conclusion, defines a wall with thickness S. For this reason, the term "external surface" in the present invention
35

means a wall having its own thickness.

The thickness S of the external surface 28 is selected based on the value of the parameter $D0$ and is preferably included between $0.01 \cdot D0$ and $0.04 \cdot D0$, more preferably included between $0.02 \cdot D0$ and $0.03 \cdot D0$, and even more preferably equal to $0.025 \cdot D0$.

Advantageously, such thickness S of the external surface 28 makes it possible to optimize the ratio between elastic force and minimum hysteresis of the material.

The distance $D1$ between two adjacent internal tips 30 is selected based on the value of the parameter $D0$ and is preferably included between $0.01 \cdot D0$ and $0.5 \cdot D0$, more preferably included between $0.02 \cdot D0$ and $0.04 \cdot D0$, and even more preferably equal to $0.032 \cdot D0$.

The distance $D2$ between two adjacent external tips 31 is selected based on the value of the parameter $D0$ and is preferably included between $0.01 \cdot D0$ and $0.5 \cdot D0$, more preferably included between $0.02 \cdot D0$ and $0.04 \cdot D0$, and even more preferably equal to $0.032 \cdot D0$.

Advantageously, said distance $D1$ between two adjacent internal tips 30 and said distance $D2$ between two adjacent external tips 31 make it possible to optimize the load of the elastic element 9 with respect to its dimensions when it is compressed.

The external surface 28 is preferably made of a plastic material, like for example polypropylene, polyethylene or TPE (thermoplastic elastomer).

This allows the elastic element 9 to be advantageously produced through a moulding process.

The material of which the external surface 28 is made is advantageously of the resilient type.

The tensile modulus of said material is preferably included between 50 Mpa and 300 Mpa, more preferably included between 80 Mpa and 220 Mpa.

Advantageously, providing such a value for the tensile modulus makes it possible to optimize the hysteresis value of the material used, thus reducing the dimensions of the elastic element 9.

The hardness of the material of which the external surface is made is preferably included between 20 and 70 Shore D, more preferably included between 35 and 60 Shore D, and even more preferably equal to 45 Shore D.

Advantageously, providing such a hardness value makes it possible to optimize the hysteresis value of the material used, thus reducing the dimensions of the

elastic element 9.

Figure 4 shows an elastic element 9 according to the invention, with length H equal to 29 mm, in which $R=7,4\text{mm}$, $S=0,5\text{mm}$, $D1=6,8\text{mm}$, $D2=6,8\text{mm}$, $A=6,8^\circ$, $B=6,8^\circ$, made of TPE (thermoplastic elastomer).

5 Said curve shows the trend of the loading force of the elastic element 9 (y-coordinate axis B) with respect to the extent of the compression of the elastic element 9 (x-coordinate axis A). The curve represents a complete cycle constituted by a compression stage Wc and a decompression or release stage Wd of the elastic element 9.

10 In particular, the elastic element 9 is subjected to a maximum compression Cm of approximately 17.5mm and then released.

The values indicated in the diagram show that the elastic element 9 during the compression stage Wc has a central area included between the compression values $Ci=5\text{mm}$ and $Cf=13\text{mm}$ with essentially ideal characteristics, meaning

15 that for a considerable section the loading force applied has an essentially constant development with a value Fc of approximately 2.3 Kgf.

The elastic element 9 is mounted on the dispensing device 1 so that it operates in an ideal manner and thus between said extreme compression values included between Ci and Cf.

20 In particular, in the rest condition shown in Figure 1, the elastic element 9 will be in a pre-load condition, slightly compressed and with a compression value Ci equal to 5mm.

Analogously, in the condition of maximum compression shown in Figure 9 and described below, the elastic element 9 will be in a compressed condition with a

25 compression value Cf equal to 13mm.

It should be noted, finally, that the hysteresis of the elastic element 9 of the invention is advantageously reduced. In fact, the amplitude of the hysteresis D given by the difference between the loading force Fc during the compression stage Wc and the loading force Fd during the decompression stage Wd is

30 reduced.

Preferably, the amplitude of the hysteresis D is maintained at values that are lower than half of the maximum compression force Fcmax of the elastic element in correspondence to the value of the maximum compression Cm, meaning preferably $D \leq 0,5 * F_{cmax}$.

35 More preferably, the amplitude of the hysteresis D is maintained at values that

are lower than a quarter of the maximum compression force F_{cmax} of the elastic element corresponding to the value of the maximum compression C_m , meaning $D \leq 0,25 * F_{cmax}$.

5 With reference to Figure 9, the value of the maximum compression force F_{cmax} is approximately 4Kgf and the amplitude of the hysteresis D is maintained at values essentially below 1Kgf over the entire compression and decompression cycle.

The area included between the curve of the compression stage W_c and the curve of the decompression stage W_d , which represents the energy dispersed during a compression and decompression cycle of the elastic element, is also reduced.

10 A variant embodiment of the elastic element of the invention, indicated as a whole by 100 in Figure 5, is differentiated from the previous one due to the fact that it comprises two portions, indicated respectively by numbers 101 and 102 and essentially in the shape of a truncated cone, in the case at hand adjacent to and opposing each other.

Another embodiment of the invention is illustrated in the detail of Figure 6.

Said embodiment is differentiated from the previous ones due to the fact that the connection portion 132 between the external tip 130 and the adjacent internal tip 131 follow an essentially mixtilinear development, comprising a first curved section 133, preferably an arc of a circle, and a second essentially linear section 134.

A further embodiment of the invention is illustrated in the detail of Figure 7.

Said embodiment is differentiated from the previous ones due to the fact that at the level of the external tips 230 and of the internal tips 231 the thickness of the lateral surface increases, so as to define a rib for said tips.

Said rib gives more resistance to the external surface at the level of the tips 230 and 231, which are subjected to continuous stress during compression and decompression of the elastic element being operated.

30 The operation of the dispensing device 1 that is the subject of the invention is described making reference to a dispensing system that uses the first example of elastic element 9 described, that is, that shown in Figures 2 and 3, referring to Figure 1 where it is in the initial rest condition, and to Figures 8 and 9.

From an operational point of view, the user acts on the actuator element 6, exerting a pressure P that moves the piston 5 axially.

35 In this way the user loads the elastic means 8 and compresses the product

contained in the suction/compression chamber 3.

The increase in pressure makes the plunger 5b slide on the supporting element 5a, thus ensuring the flow of the fluid L contained in the suction/compression chamber 3 first towards the dispensing duct 13 and then towards the outside E, following the course indicated by 25, shown in Figure 8.

The plunger 5b, once it has reached the bottom of the suction/compression chamber 3, is released by the user, thus allowing the elastic means 8 to bring it back to its initial rest position shown in Figure 1.

The elastic return of the piston 5 generates a vacuum inside the suction/compression chamber 3 and said vacuum causes the operation of the first valve means 14 downstream of the suction duct 4 and makes the fluid L flow into the chamber itself, by sucking it from the container C, thus preparing the device 1 for the successive use.

It is worth mentioning that, advantageously, the position and the shape of the proposed elastic means 8 allow the overall dimensions of the device 1 to be optimized. It should be observed, in fact, that when the piston 5 has reached the end of stroke, as shown in Figure 8, the size of the truncated cone-shaped elastic element 9 is reduced.

In fact, the internal tips 30 and the external tips 31 of the external surface 28 are in staggered and non overlapping positions, and therefore the turns that make up the external surface 28 penetrate each other when the piston 5 has reached the end of stroke.

Advantageously and preferably, all the parts of the device proposed can be made of a plastic or synthetic material.

The elastic element of the present invention has been described in association with a fluid dispensing device. However, in variant embodiments of the invention, the elastic element of the invention can be used in devices suited to dispense fluids in the form of foam.

In this case the dispensing device will be provided, in a known manner, with suitable means for conveying pressurized air into a mixing chamber, downstream of which means suited to contribute to the formation of foam are located.

Furthermore, the external surface of the elastic element of the present invention has been described as essentially closed, except for the lower and upper openings. However, in variant embodiments of the invention, the external surface may comprise through openings, such as not to affect the desired functionality of

the elastic element.

Again, the extreme compression values C_i and C_f with which the elastic element is mounted on the dispensing device can be chosen more or less near the extreme values corresponding to zero compression and maximum compression C_m ,
5 though guaranteeing the characteristics and the advantages described above. In particular variant embodiments, for example, the extreme values C_i and C_f can be respectively chosen essentially equal to 0 and C_m .

The values indicated in the diagram show that the elastic element 9 during the compression stage W_c has a central area included between the compression
10 values $C_i=5\text{mm}$ and $C_f=13\text{mm}$ with essentially ideal characteristics, meaning that for a considerable section the loading force applied has an essentially constant development with a value F_c of approximately 2.3 Kgf.

The elastic element 9 is mounted on the dispensing device 1 so that it operates in an ideal manner and thus between said extreme compression values included
15 between C_i and C_f .

In particular, in the rest condition shown in Figure 1, the elastic element 9 will be in a pre-load condition, slightly compressed and with a compression value C_i equal to 5mm.

Analogously, in the condition of maximum compression shown in Figure 9 and
20 described below, the elastic element 9 will be in a compressed condition with a compression value C_f equal to 13mm.

The above description clearly shows that the solution proposed allows the drawbacks described to be eliminated and the set goals to be achieved.

It has thus been shown that the present invention allows all the set objects to be
25 achieved. In particular, it makes it possible to provide an elastic element for a device for dispensing fluids whose characteristics during compression and decompression reproduce as much as possible the ideal characteristics.

Even though the invention has been described with reference to the enclosed drawings, upon implementation certain modifications may be made that shall all
30 be considered protected by the present patent, provided that they fall within the scope of the inventive concept expressed in the following claims.

CLAIMS

1. Elastic element (9; 100) for a device (1) for dispensing fluids (L), comprising a surface (28) that develops around a main longitudinal axis (X), said surface (28) comprising at least one portion with spiral-shaped development, whose cross section according to a section plane containing said longitudinal axis (X) defines an alternation of external tips (31; 131; 231) and internal tips (30; 130; 230), each one of said external tips (31; 131; 231) being connected to a corresponding adjacent internal tip (30; 130; 230) by means of a connection portion (32; 132) belonging to said surface (28), **characterized in that** said internal tips (30; 130; 230) are aligned along an internal envelope axis (Yi) that forms an angle (A) preferably included between 2° and 12° with said main longitudinal axis (X).
2. Elastic element (9; 100) according to claim 1), **characterized in that** said external tips (31; 131; 231) are aligned along an external envelope axis (Ye) that forms an angle (B) preferably included between 2° and 12° with said main longitudinal axis (X).
3. Elastic element (9; 100) according to claim 2), **characterized in that** said internal envelope axis (Yi) and said external envelope axis (Ye) form substantially equal angles (A, B) with said main longitudinal axis (X).
4. Elastic element (9; 100) according to any of the preceding claims, **characterized in that** said connection portion (32; 132) comprises a curved section (33, 133).
5. Elastic element (9; 100) according to claim 4), **characterized in that** said curved section (33, 133) comprises an arc of a circle.
6. Elastic element (9; 100) according to claim 5), **characterized in that** the curvature radius (R) of said arc of a circle has a value preferably included between 0.15 and 0.6 times the value of the width of said surface (28) in the median area of said elastic element (9; 100).
7. Elastic element (9; 100) according to any of the preceding claims, **characterized in that** said surface (28) has a thickness (S) whose value is preferably included between 0.01 and 0.04 times the value of the width of said surface (28) in the median area of said elastic element (9; 100).
8. Elastic element (9; 100) according to any of the preceding claims, **characterized in that** the distance (D1) between two of said adjacent internal tips (30; 130; 230) has a value that is preferably included between 0.01 and

- 0.05 times the value of the width of said surface (28) in the median area of said elastic element (9; 100).
9. Elastic element (9; 100) according to any of the preceding claims, **characterized in that** the distance (D2) between two of said adjacent external tips (31; 131; 231) has a value that is preferably included between 0.01 and 0.05 times the value of the width of said surface (28) in the median area of said elastic element (9; 100).
10. Elastic element (9; 100) according to any of the claims from 8) to 9), **characterized in that** said distance (D1) between two of said adjacent internal tips (30; 130; 230) is substantially equal to said distance (D2) between two of said adjacent external tips (31; 131; 231).
11. Elastic element (9; 100) according to any of the preceding claims, **characterized in that** said surface (28) comprises a material whose tensile modulus is preferably included between 50MPa and 300 Mpa.
12. Elastic element (9; 100) according to any of the preceding claims, **characterized in that** said surface (28) comprises a material whose hardness is preferably included between 20 Shore D and 70 Shore D.
13. Elastic element (9; 100) according to any of the preceding claims, **characterized in that** it comprises a portion that is substantially in the shape of a truncated cone.
14. Elastic element according to any of the preceding claims, **characterized in that** at the level of at least one of said internal tips (230) and/or at the level of at least one of said external tips (231) said surface (28) has increased thickness compared to the adjacent areas.
- 15) Device (1) for dispensing fluids (L) comprising an elastic element (9; 100) according to any of the preceding claims.

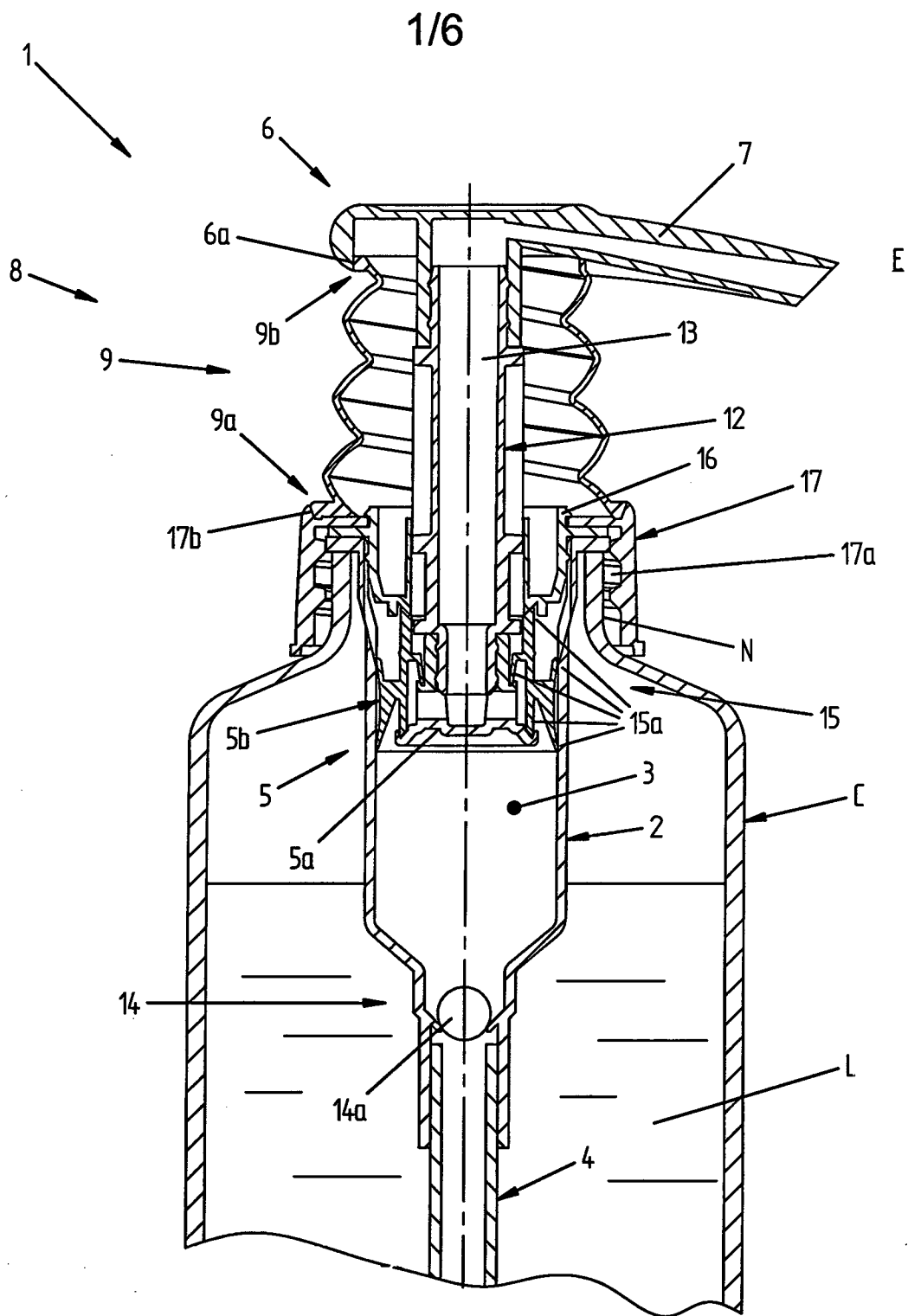


FIG. 1

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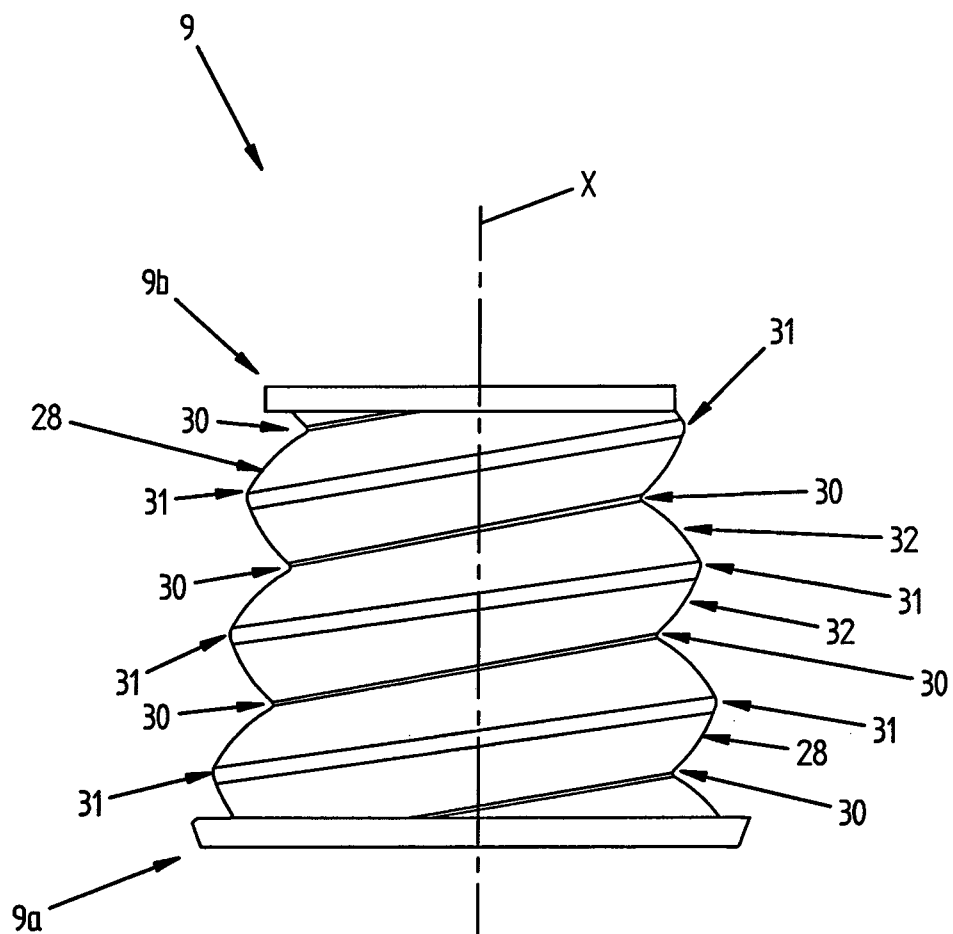
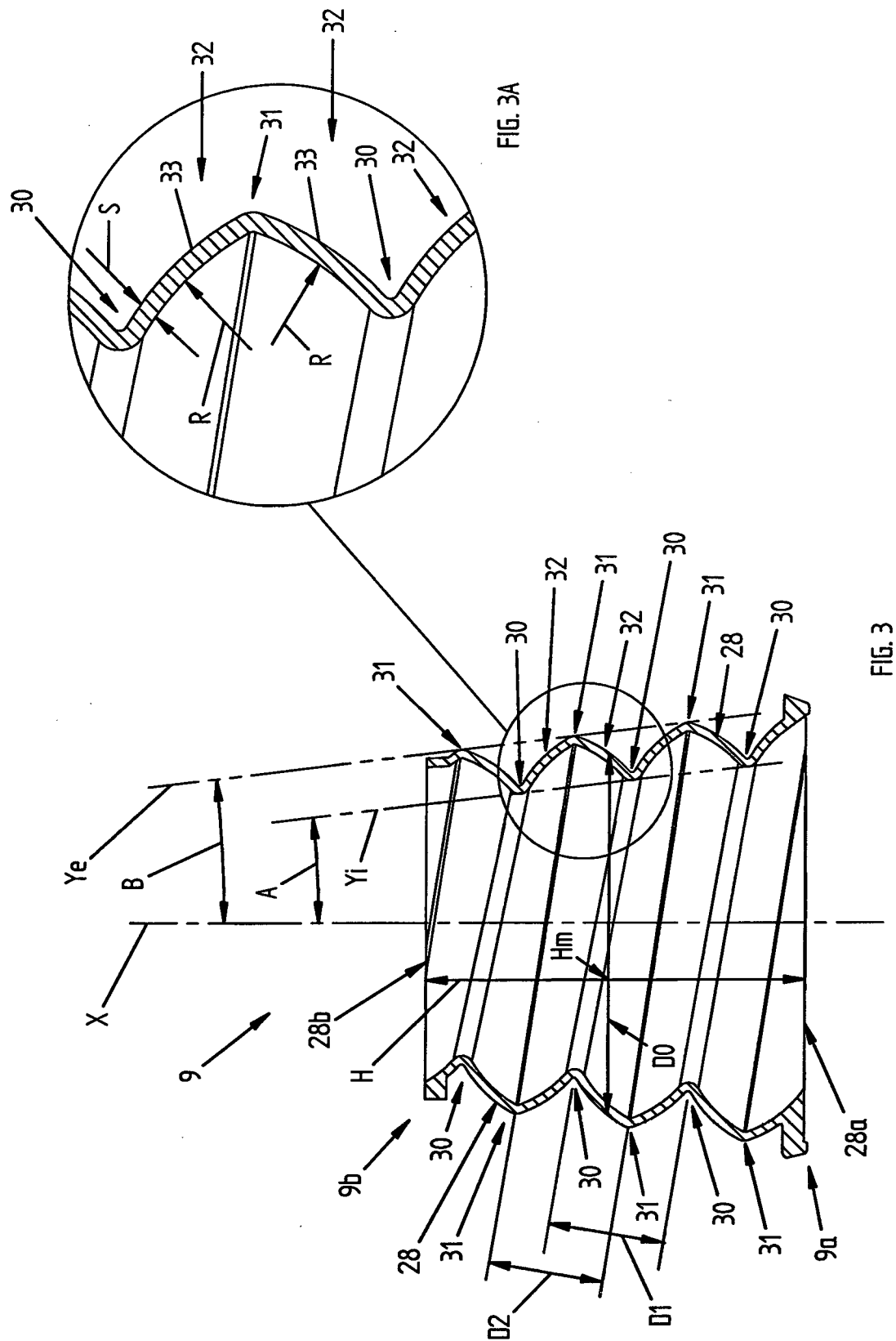


FIG. 2



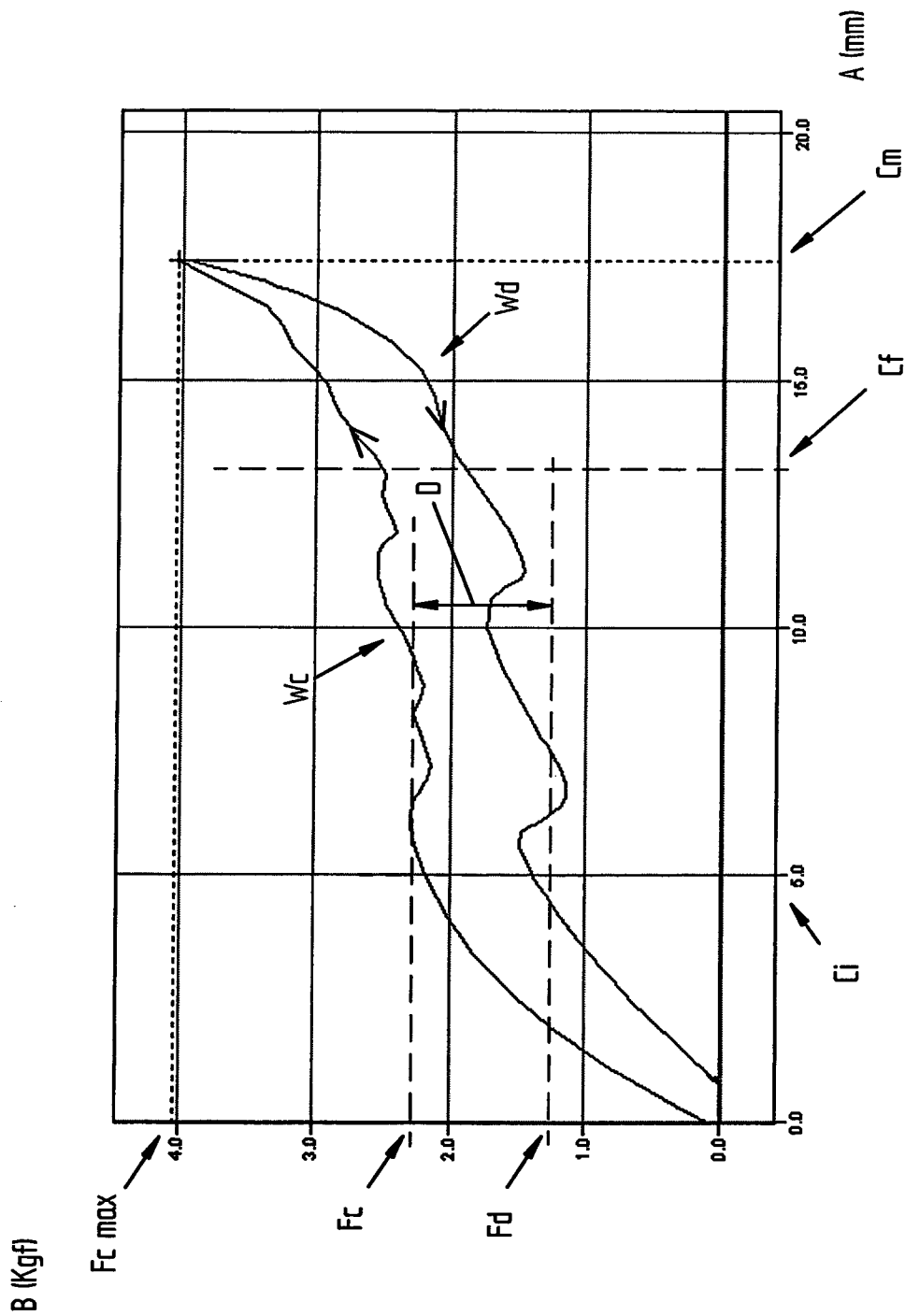
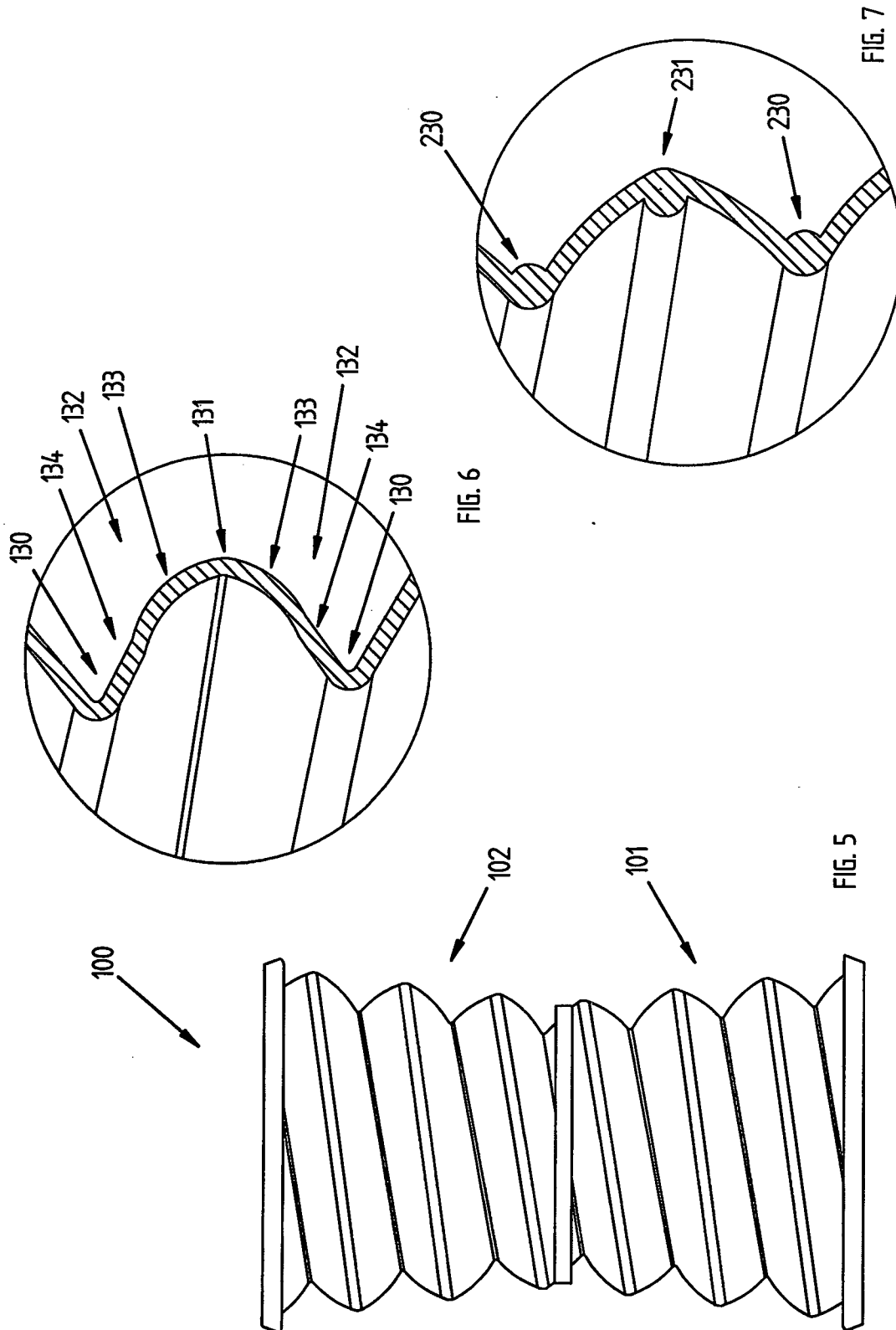


FIG. 4

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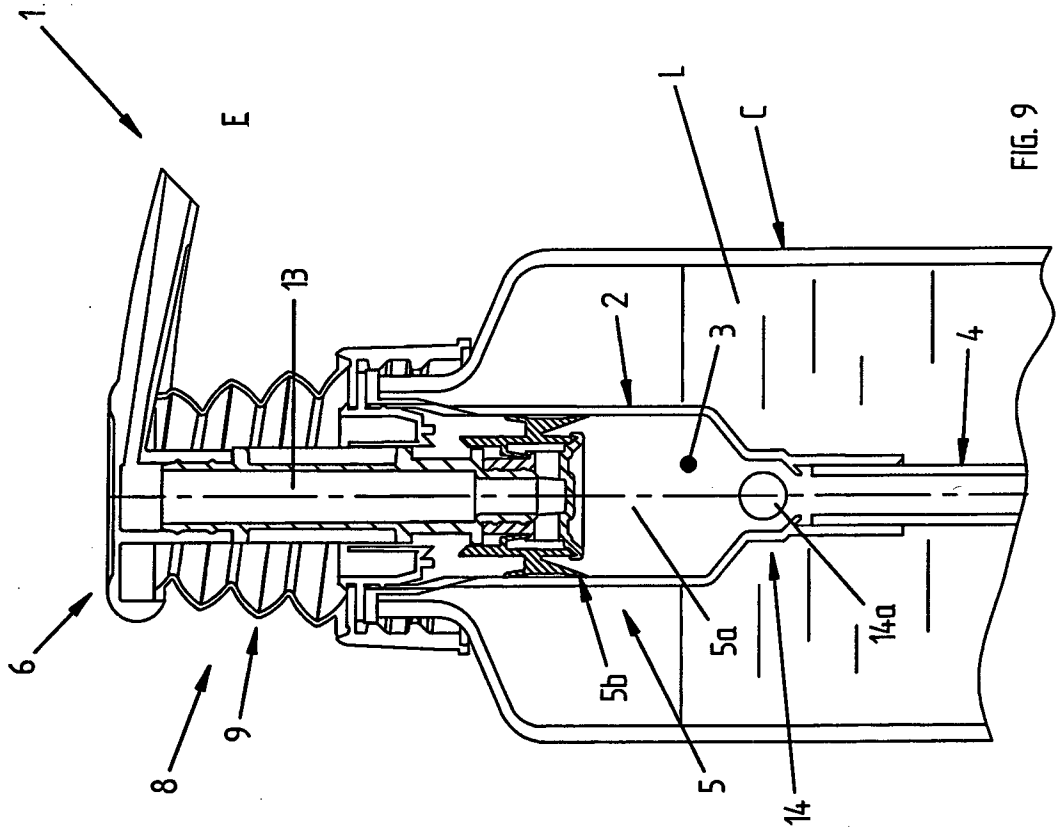


FIG. 9

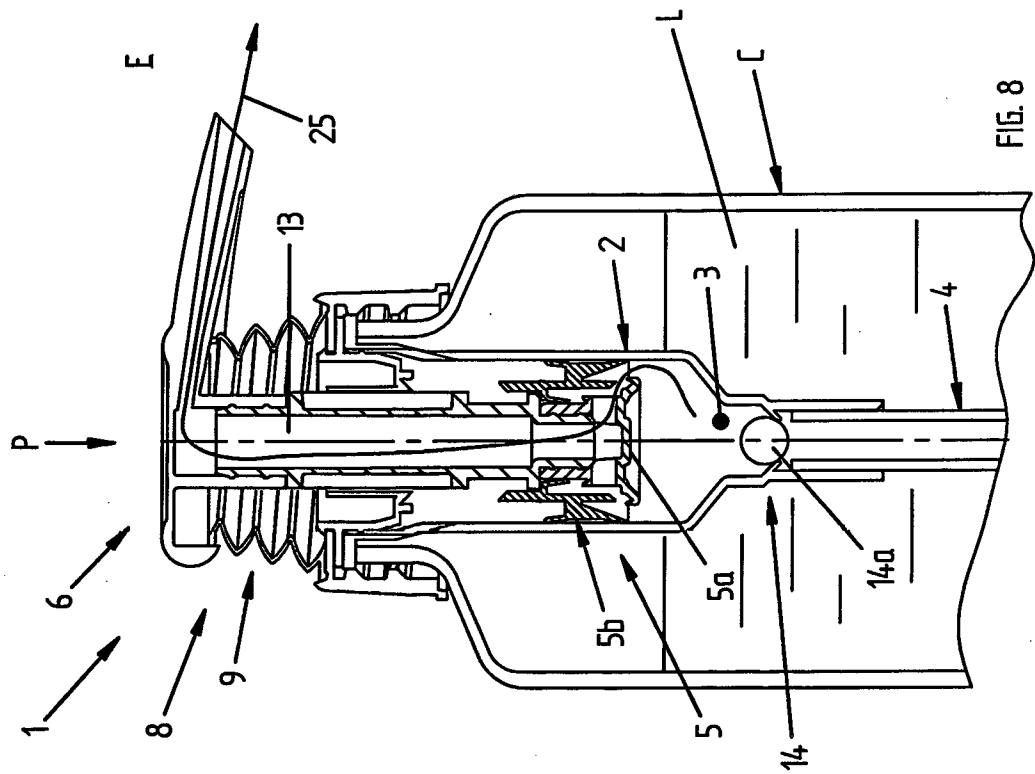


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/000109

A. CLASSIFICATION OF SUBJECT MATTER
INV. B05B11/00
ADD.

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)
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 practicable, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 2 833 448 A (LERNER LOUIS L) 6 May 1958 (1958-05-06) column 1, line 54 - column 3, line 21; figures -----	1-15
X	EP 1 154 863 A1 (TAPLAST SPA [IT]) 21 November 2001 (2001-11-21) figures -----	1-13,15
X	US 3 143 429 A (SWANSON EMERY C ET AL) 4 August 1964 (1964-08-04) figures ----- -/--	1-13,15



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

3 May 2012

Date of mailing of the international search report

11/05/2012

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Endrizzi, Silvio

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2012/000109

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 6 279 784 B1 (O'NEILL RICHARD K [US]) 28 August 2001 (2001-08-28) figures -----	1

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Information on patent family members

International application No

PCT/IB2012/000109

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