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## (54) Connection system between a cap and a dropper for bottles or flagons containing liquids.

(57) According to the invention a connection system is obtained between a dropper (2; 102) and a cap (1; 101) for bottles or flagons containing liquids. The system comprises a dropper element (2; 102) which can be inserted by pressure into the neck (20) of a bottle (30), and a sealing cap (1; 101) which can be screwed on to the outer thread (16) of the neck (20) of the bottle, wherein the connection between the dropper and the cap is obtained through a thread (7; 107) on the central core (6) of the cap matching a corresponding thread (11; 111) which is present on the inner side of the dropper. The connection between the dropper and the cap is made before they are applied to the bottle neck, so that both the dropper and the cap are applied to the bottle in a single working operation.

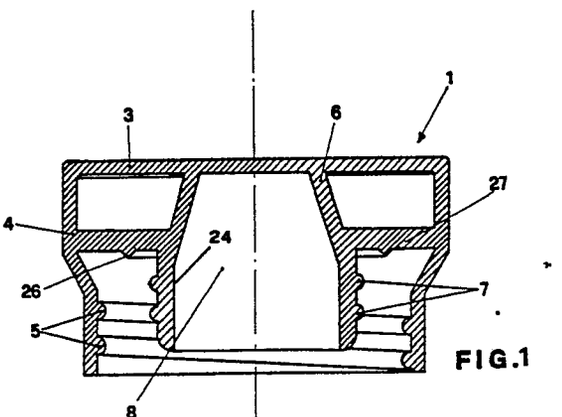


FIG.1

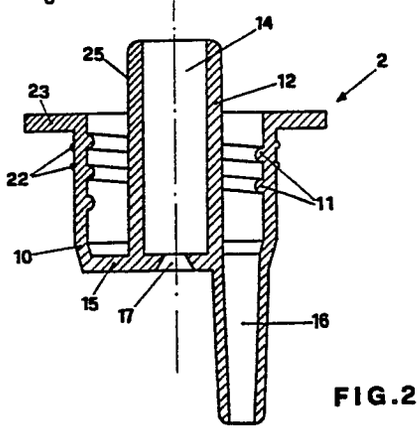


FIG.2

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# CONNECTION SYSTEM BETWEEN A CAP AND A DROPPER FOR BOTTLES OR FLAGONS CONTAINING LIOUIDS

The invention concerns a connection system between a cap and a dropper, particularly suited for bottles containing liquids, especially medicines.

Suitable droppers are applied to the necks of bottles or flagons containing medicines which need to be poured out drop by drop. It is known that said droppers are plastic elements, which are pressed into the opening of the bottle neck and they have in their central position an open duct allowing the exit of the drops. The bottle is closed with a cap which is placed on top of the dropper and tightened on a thread on the outer wall of the bottle neck.

After the bottle has been filled with the medicine, it is necessary to press the dropper element into the opening of the bottle neck and afterwards to screw the cap on the same bottle neck. This is a complex operation which forces the person sealing the bottles to perform two successive operations, since the sealing machines must have a station for the insertion of the dropper and one station for the application of the cap.

In order to decrease the number of operations, attempts have been made, whereby the insertion of the dropper into the bottle neck occurs at the same time as the application of the cap. To this purpose, a known construction has the dropper inserted through pressure in the center of the cap within a seat suited to lodge it. When the cap is screwed around the neck of the bottle, the dropper penetrates the opening of the bottle neck and presses against the wall of said opening, so that after the cap has been completely screwed on the bottle neck, the dropper is lodged within the neck of the bottle in its correct working position.

Such a solution, which would be convenient for establishments which perform the filling up and sealing of the bottles, is, however, difficult to apply, since the droppers and the caps which are suited to receive them present, after they have been connected with each other, a rather unstable junction. In fact, when the cap with its dropper attached is placed on the roller or the vibrating conveyors feeding the automatic machines which have the task of applying the caps to the bottles, it often happens that, because of the vibrations, the dropper comes off the cap sand arranges itself off-center in relation to the inner axis of the cap. It becomes obvious that under these circumstances the correct junction between the cap and the dropper within the bottle can no longer occur. This causes frequent standstills of the sealing machine. If one considers that this operation is usually the final operation of a filling-up and sealing cycle involving a number of working phases, it can easily be understood how the standstill of this operation also causes the standstill of all the preceding phases, with obvious inconveniences to the entire production cycle.

The present invention proposes to eliminate the described inconveniences.

The main purpose of the invention is a connection system between the cap and the dropper of bottles or flagons containing liquids, suited to guarantee a reliable junction between said elements, which will not come apart because of accidental causes.

Another purpose of the invention is a connection system between the cap and the dropper for bottles or flagons containing liquids, such as to allow a safe conveyance of these elements, joined together, by means of vibrating conveyors without any chance that said junction may come apart.

Another purpose of the invention is a connection system between the cap and the dropper allowing the simultaneous application of the two elements, already joined together, on the bottle in a single working operation performed by automatic sealing machines. The above mentioned purposes and others which will be better understood hereafter are fulfilled by a connection system between the cap and the dropper of a bottle containing medicines or similar liquids, wherein the dropper presents a structure consisting of:

- a practically cylindrical body, inserted by pressure into the opening of the bottle neck, said body presenting a ring-shaped rim which will rest flush against the upper rim of the bottle neck,
- a small central tube opened at the top and with a hole on the bottom which acts as a duct for the exit of the drop-by-drop liquid and complete with a thread,
- a tube-shaped duct which extends below the cylindrical body, and wherein the cap presents a cover consisting of:
- an essentially cylindrical outer surface which in its inner part presents a thread matching the thread on the bottle neck;
- a central core which is co-axial with the outer surface, the cylindrical surfaces of said core presenting yet another thread, wherein said connection system is characterized in that the thread (11; 111) on the cylindrical body of the dropper and the thread on the central core of the cap are such that they match each other, thereby making it possible to join the cap and the dropper before said elements are applied to the bottle.

The junction between said dropper and said cap is performed before these elements are ap-

plied to the bottle or the flagon. According to a preferred embodiment of the invention, the cap has its thread obtained on the outer surface of its central core, and it is suited to match a corresponding thread obtained on the inner lateral surface of the dropper which does not touch the bottle neck.

According to another embodiment of the invention the cap has its thread obtained on the inner surfaoes of its central core and it is suited to match a corresponding thread obtained on the outer surface of the tube-shaped duct of the dropper. Thus a secure and highly reliable junction is obtained between the dropper and the cap, since they cannot come apart due to accidental causes. Since the dropper and the cap are securely joined together, and there is no chance of their coming apart, this arrangement presents the further advantage of allowing in a single passage the application of both the dropper and the cap to the bottle, and these two elements joined together can be transported and assembled by means of vibrating conveyors which characterize the modern packing equipment.

Further scope of applicability of the present invention will become apparent from the detailed description and the tables of drawing hereinafter. However, it should be understood that the detailed description and specific example, while indicating a preferred embodiment of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description, and from the drawings, whrein:

- Fig. 1 shows a lengthwise cross-section of the cap of the connection system according to the invention;
- Fig. 2 shows a lengthwise cross-section of the dropper of the connection system according to the invention;
- Fig. 3 represents the cap and the dropper of the system according to the invention, wherein said elements are joined together and applied to the bottle;
- Fig. 4 represents a lengthwise cross-section of a different embodiment of the cap of the connection system according to the invention;
- Fig. 5 represents a lengthwise cross-section of a different embodiment of the dropper of the connection system according to the invention.

The cap of the connection system according to the invention, which is indicated as a whole with 1 in Fig. 1, comprises a cover 3, having a round transversal cross-section, and its lateral surface 4, which is substantially cylindrical, has in its interior a thread 5, through which cap 1 is screwed on to neck 20 of bottle 30, as can be seen in Fig. 3. Cap 1 presents at its center a core 6, having on its outer surface a thread 7, and its inner volume has the configuration of a truncated cone 8.

The dropper of the connection system according to the invention is represented in Fig. 2, wherein it is indicated with 2. It is substantially in the shape of a dome, having a round transversal cross-section, whose lateral surface 10 has an inner thread 11. At its interior it presents a central core 12, also having a round transversal cross-section and protruding above the upper rim 23 of the dropper. In the middle of the central core 12 which extends upward from the bottom 15 of the dropper, there is the duct 14, through which, when bottle 30 is turned upside down, the liquid contained therein exits from opening 17. At the bottom 15 of dropper 2 there is the tube-shaped duct 16 which connects the inner volume of bottle 30 with the outside environment, with the purpose of obtaining the drop-by-drop outpour of liquid 40 through duct 14.

Thread 7 which is around the outer periphery of the central core 6 of cap 1 matches thread 11, which is on the inner lateral surface 10 of dropper 2, while thread 5, which is present on the inner lateral surface 4 of cap 1 matches thread 16 which is present on the outer surface of neck 20 of bottle 30. When cap 1 is completely screwed on neck 20 of bottle 30, the arrangement appears as illustrated in Fig. 3, wherein cap 1 is also screwed on dropper 2, whose central core 12 places itself within the seat in the shape of a truncated cone 8, which is present within core 6 of cap 1.

At this point, by rotating cap 1 in the direction opposite to the previous one, it becomes unscrewed.

It is to be observed that both during the screwing and the unscrewing operations, dropper 2 remains securely attached to neck 20 of bottle 30, since it is inserted by pressure into opening 21 and is held in place thanks to the interference of the projections 22. Moreover, the presence of the outer rim 23, which extends horizontally, prevents dropper 2 from accidentally slipping into bottle 30.

As far as the application of cap 1 and of dropper 2 is concerned, dropper 2 is first screwed through its thread 11 on thread 7 of the central core 6 of cap 1, thus insuring the secure junction between cap 1 and dropper 2, this operation being usually performed by means of automatic machines.

It can be observed that at the bottom 27 of cap 1 there is a ring-shaped projection 26, which acts as a seal. In fact, when cap 1 is screwed on to dropper 2, the ring-shaped projection 26 interferes against the horizontal surface 28 of rim 23 of dropper 2, thereby insuring its tightness.

At this point cap 1 with dropper 2 securely attached to it can be placed on vibrating lifting

devices, which will carry it to another machine and place it so, that it can be applied to neck 20 of bottle 30.

Thus the purpose of simultaneously applying cap 1 and dropper 2 to bottle 30 has been fulfilled. This occurs by simply screwing cap 1 on to neck 20 of bottle 30. In fact, since during the screwing operation, cap 1 is axially lowered and since dropper 2 is securely attached to it, because it has been tightly screwed around the cap's central core, dropper 2 is forced into opening 21 of neck 20 of the bottle and at the same time it is rotated within it. Said forceful insertion and rotation continue until the horizontal rim 23 of the dropper reaches its flush position against the horizontal surface 13 of neck 20 of the bottle. Said position is reached only when the cap 1 is completely screwed around neck 20 of the bottle.

After the cap has been applied, it can be screwed on or unscrewed from neck 20 of the bottle any time the user desires to do so, and the dropper will never be removed from the bottle neck. Infact, since all the threads have the same pitch, when cap 1 is unscrewed from neck 20 of bottle 30, thread 7 of cap 1 will also be unscrewed from thread 11 of dropper 2. It is exactly this equality in the pitch of the threads which allows, while cap 1 is being unscrewed from neck 20 of bottle 30, the simultaneous unscrewing of its central core 6 from thread 11, which is present on the lateral wall 10 of the dropper. The same can be said about the screwing of cap 1 on bottle 30.

During these successive screwing and unscrewing operations the dropper element 2 remains secured within opening 21 of neck 20 of the bottle, since the presence of the interfering projections 22 prevent it from moving in any direction.

On the base of what has been decribed, it can easily be understood how the invention fulfils all the proposed purposes. The purpose of obtaining a dropper and a cap which can securely be connected with each other, with no chance that they may be disconnected by accidental causes, has been fulfilled. It has been seen, in fact, that cap 1 and dropper 2 are joined together through their threads 7 and 11 respectively and that, therefore, they can not be disconnected by accidental causes. In fact, two threaded elements, joined together, can not accidentally come apart, but they can only intentionally be taken apart by applying to them a rotational action in a precise and predetermined direction.

The other purpose of obtaining a dropper and a cap which can be joined together and then directly applied in a single working operation to the neck of the bottle for which they are meant, by using automatic sealing machines, has also been fulfilled. In fact, the reliability and security yielded by the threaded connection between the dropper and the cap, permit the application to bottle 30 of cap 1 and of dropper 2 joined together in a single assembly operation, since the chance of the two elements coming apart during their conveyance by means of the vibrating conveyors feeding the sealing machines has been eliminated. Thereby standstills due to jammings caused by the falling apart of the droppers from the caps have also been eliminated.

Another embodiment of the same inventive idea is represented in the Figs. 4 and 5. Fig. 4 represents the cap, indicated as a whole with 101, presenting its thread 107 for its connection to the dropper. Said thread is obtained on the inner lateral surface 124 of its central core 106, while Fig. 5 represents the dropper, indicated as a whole with 102, which presents thread 111 for its connection with the cap obtained on the outer surface 125 of its small central tube 112. In this embodiment the connection of cap 101 with dropper 102 occurs by matching the threads 107 of the cap and 111 of the dropper, while the insertion of the dropper within the bottle neck always occurs by applying pressure, and the connection of the cap with the outer rim of the bottle occurs again through thread 105 obtained on the inner wall of cap 101.

As it occurred in the preceding description, in this embodiment, too, the tightness between cap 101 and dropper 102 is obtained by means of the ring-shaped projection 126 which is present at the bottom 127 of cap 101, when said projection 126 goes to rest against the horizontal surface 128 of rim 123 of dropper 102.

This embodiment also fulfils all the purposes of the invention and attains all its advantages.

During the manufacturing phase, the dropper and the cap according to the invention my undergo changes or modifications which will occur to those skilled in the art with the purpose of improving their function or their construction. Said changes and modifications will however, not exceed the scope of the present patent rights.

## Claims

1) A connection system between a cap and a dropper for a bottle containing medicines or similar substances, wherein the dropper (2; 102) presents a structure comprising:

- a body (10) having a substantially cylindrical shape inserted by pressure into the neck of the bottle (30), complete with a ring-shaped rim (23; 123) resting flush against the upper rim (13) of the neck of the bottle (30),
- a small central tube (12; 112) opened at its top and with a hole on its bottom (15), so as to form a duct (14) for the drop by drop exit of the liquid,

- a thread (11; 111),
- a tube-shaped duct (16) which extends below the bottom (15) of the cylindrical body (10),

and wherein the cap (1; 101) presents a cover 3 comprising:

- an essentially cylindrical outer surface (4) which presents in its inner part a thread (5) matching the thread on the neck of the bottle (30);
- a central core (6) which is co-axial with the outer surface, the cylindrical surfaces of said core presenting yet another thread (7; 107),

characterized in that the thread (11; 111) which is present on the cylindrical body (10) of the dropper (2; 102) and the thread (7; 107) which is present on the central core of the cap (1; 101) match each other, whereby they achieve the junction between the cap and the dropper, before said elements are applied to the bottle.

2) A connection system according to claim 1, characterized in that the thread (7) of the cap (1) and the thread (11) of the dropper (2) are obtained respectively on the outer surface of the central core (6) of the cap (1) and on the inner surface of the cylindrical body (10) of the dropper (2).

3) A connection system according to claim 1, characterized in that the thread (107) of the cap (101) and the thread (111) of the dropper (102) are obtained respectively on the inner surface (124) of the central core (106) of the cap (101) and on the outer surface (125) of the small central tube (112) of the dropper (102).

4) A connection system according to any of the preceding claims, characterized in that the threads (11; 111) of the dropper and (7; 107) of the cap which match each other have the same pitch as the thread (5; 105) belonging to the cap (1; 101) which screws on to the neck (20) of the bottle (30).

5) A connection system according to any of the preceding claims, characterized in that the cap (1; 101) presents at its bottom (27; 127) a ring-shaped projection (26; 126) which rests flush against the flat surface (28; 128) of the upper rim of the dropper (2; 102) thereby insuring the tightness against the outpour of the liquid, when the cap is screwed on the bottle.

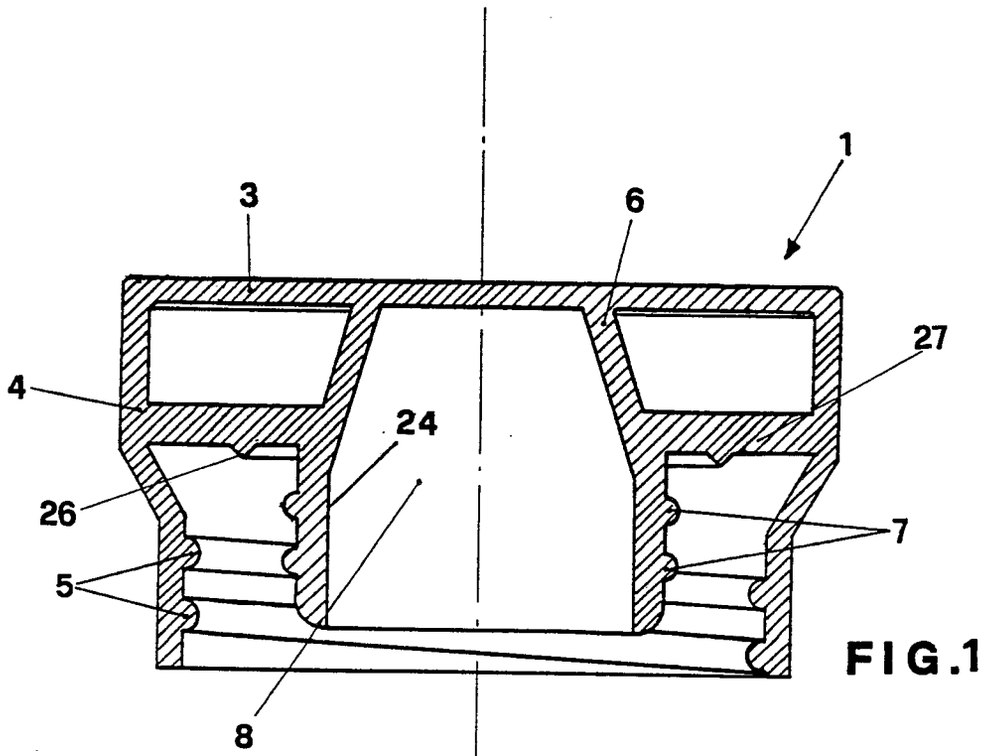


FIG.1

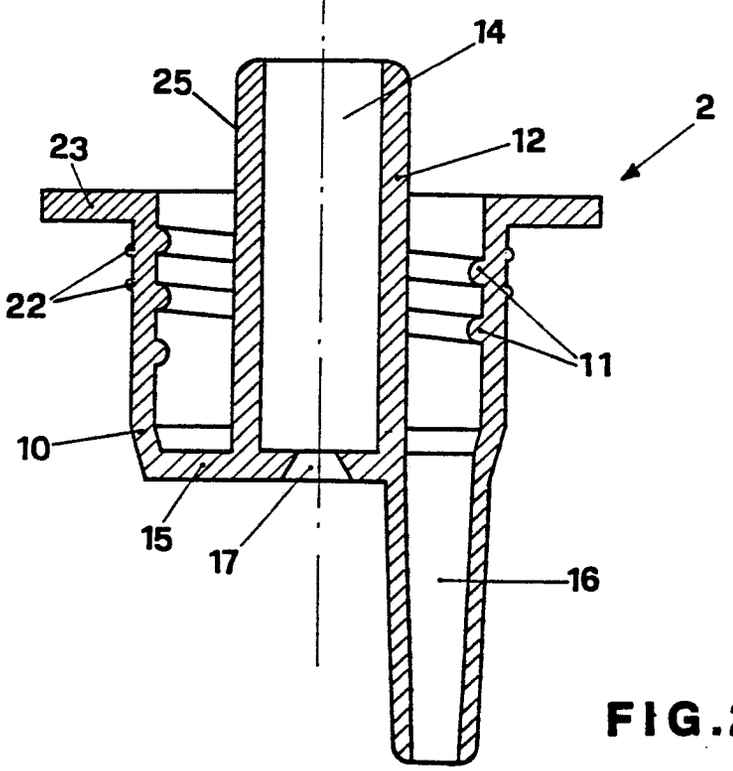


FIG.2

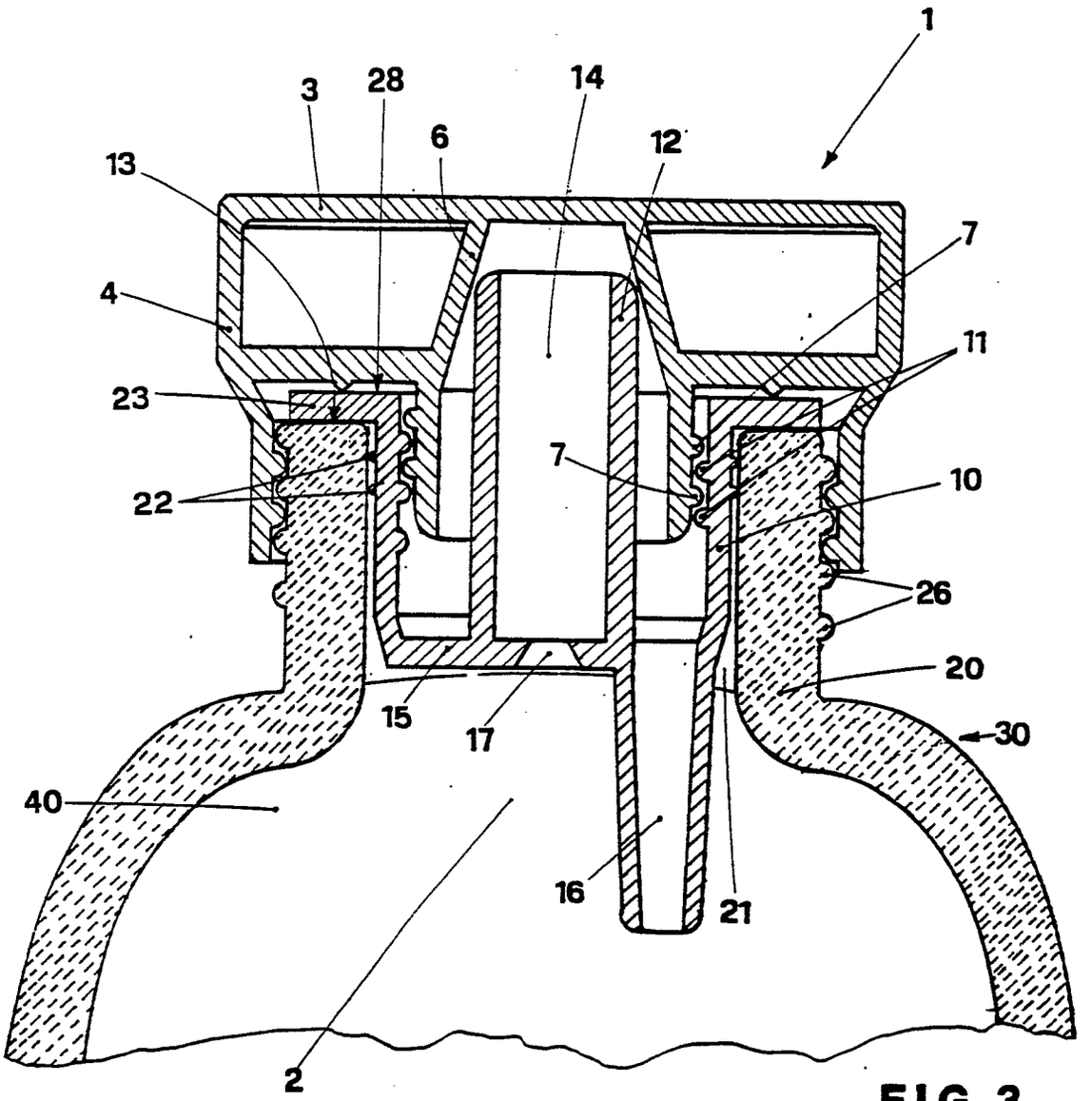


FIG.3

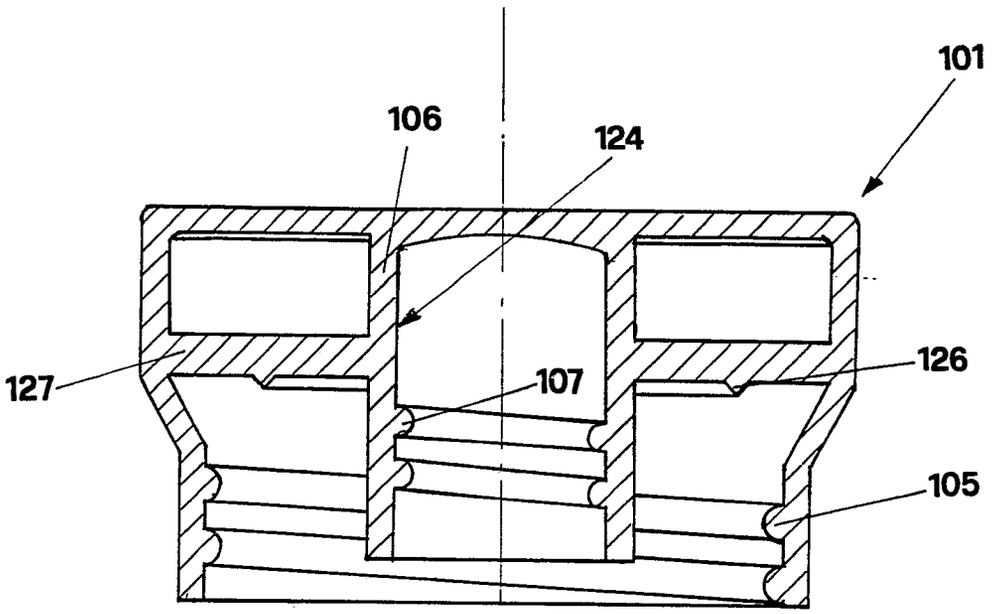


FIG.4

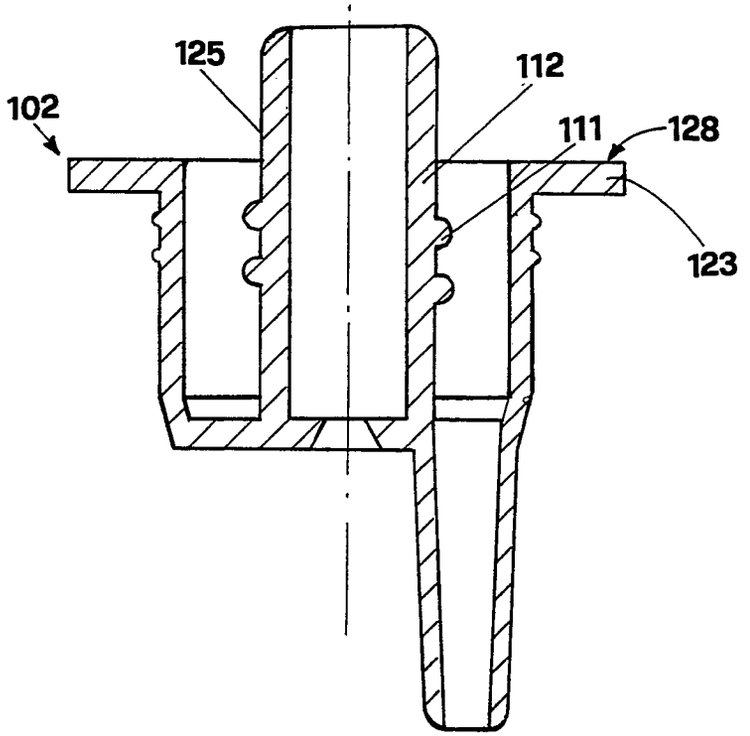


FIG.5

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# EUROPEAN SEARCH REPORT

Application Number

EP 89 11 8265

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
|---|---|---|---|
| X | DE-A-2 510 257 (DEUSSEN)<br>* Page 13, lines 2-19 ; page 20, line 11 - page 21, line 14; figures 1,2,10,11 * | 1,3,4 | B 65 D 47/18<br>B 65 D 47/12<br>B 65 D 51/18 |
| Y | | 5 | |
| A | FR-A-1 591 352 (GUIGNOT)<br>* Figures * | 2 | |
| Y | FR-A-2 450 756 (STELLA)<br>* Figures 1,2 * | 5 | |

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 D

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 09-02-1990 | NEWELL P.G. |

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