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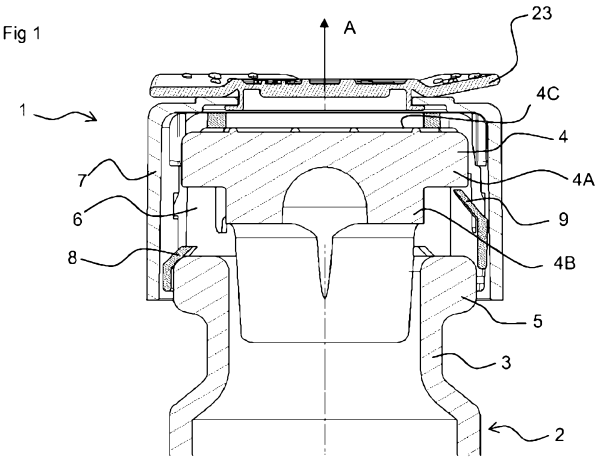
(54) **Title** : LOCKING CAP FOR A VESSEL HAVING A NECK

(54) **Titre** : COIFFE DE VERROUILLAGE POUR RECIPIENT A COL

Fig 1



(57) **Abstract** : The invention relates to a locking cap (1) made of a molded plastic material for a vessel (2) having a neck, intended for blocking a stopper (**4**) in said neck (3), including a wire-cap (6) adapted for surrounding the stopper (**4**) and the neck in the mounted configuration of the cap (1). The wire-cap includes first and second flexible tabs capable of being respectively blocked on the neck and on the stopper (**4**), said first tabs (8) being offset relative to said second tabs (9) in an axial direction relative to said neck (3). The cap (1) also includes a ring (7) surrounding the wire-cap (6) for preventing access to said tabs from outside the ring (7). The ring (7) and the wire-cap (6) are designed so as to be fitted and locked together. The tabs (8, 9) of the wire-cap are respectively arranged at an angle in first and second openings (13, 14) which are formed by the mesh of the wire-cap (6), and in which the tabs (8, 9) can disappear when mounting the cap (1) on the neck (3).

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Une coiffe de verrouillage (1) en matière plastique moulée pour récipient (2) à col destinée à bloquer un bouchon (4) dans ledit col (3) comprend un muselet (6) apte à entourer le bouchon(4) et le col en configuration montée de la coiffe (1). Le muselet a des premières et des secondes languettes flexibles aptes à se bloquer respectivement sur le col et sur le bouchon, (4) lesdites premières languettes (8) étant décalées par rapport auxdites secondes languettes (9) selon une direction axiale par rapport audit col (3). La coiffe (1) comprend aussi une bague (7) entourant le muselet (6) pour empêcher l'accès auxdites languettes depuis l'extérieur de la bague (7). La bague (7) et le muselet (6) sont conçus pour s'emboiter et se verrouiller l'un dans l'autre. Les languettes (8,9) du muselet sont disposées de manières inclinée respectivement dans des premières et des secondes ouvertures (13,14) formées par les mailles du muselet (6) et dans lesquelles les languettes (8,9) peuvent s'effacer lors du montage de la coiffe (1) sur le col (3).

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Locking cap for a vessel having a neck

The invention concerns a locking cover made of a molded plastic material for a vessel having a neck, intended to fix a stopper in the neck of the vessel.

The invention applies more particularly to a locking cover for a necked vessel used particularly in the medical field, in which an elastomeric or rubber stopper is inserted in the neck of the vessel to close the latter in a leaktight manner and, if need be, to keep its contents sterile. Access to the contents of the vessel is obtained by inserting a needle in the stopper through the center of the cover without removing the stopper, thus eliminating any risk of contamination of the contents. The cover thus serves as a safety link between the stopper and the neck of the vessel.

A reference herein to a patent document or other matter which is given as prior art is not to be taken as an admission that that document or matter was known or that the information it contains was part of the common general knowledge as at the priority date of any of the claims.

Throughout the description and claims of this specification the word "comprise" and variations of that word, such as "comprises" and "comprising", are not intended to exclude other additives, components, integers or steps.

Patent document FR-2893922 discloses a locking cover as described above, in which the cage has a peripheral ring (503A) connected by its bottom edge alternatively to locking tongues of the neck (503G) and to arms (503D) provided with locking tongues for locking onto the stopper. Between the ring and the locking tongues there is a peripheral seat in which is inserted a locking element that pushes the tongues back onto the neck and thus fastens the cover on the neck. This, therefore, constitutes a two-stage locking process for locking the cover on the vessel. A disadvantage of this locking cover is that its production by molding entails a large amount of material and a complex mold.

It would therefore be desirable to offer another locking cover for a vessel having a neck, which can be mounted on the neck quickly and easily, while at the same time being simple and inexpensive to produce.

To this end, the invention is directed to a locking cover made of a molded plastic material for a vessel having a neck, intended to fix a stopper in the neck of the vessel, comprising a cage adapted to surround the stopper and the neck in the mounted configuration of the cover, said cage having first flexible tongues adapted to fix themselves to the neck of

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the vessel and second flexible tongues adapted to fix themselves to the stopper, said first tongues being offset from said second tongues in a given axial direction of the cover, said cover further comprising a ring that surrounds the cage in such a way as to prevent access to said first and second tongues from outside the ring. The ring and the cage are designed to nest one inside the other and to interlock, the ring coming to surround the cage, and in that said first and second tongues of the cage are disposed slantingly respectively in the first and the second openings which are formed by the mesh openings of the cage and into which said tongues can deflect as the cover is being mounted on the neck of the vessel.

With an arrangement of this kind, the locking cover is easy to mount on the neck of the vessel: once the cage has been introduced into and locked inside the ring and the stopper has then been inserted in the cage and locked in place by means of the second tongues, the cover, with the stopper, is then simply inserted onto the neck by the application of axial pressure until the first tongues lock onto the neck. The result, therefore, is a locking cover that is easy to mount on the neck of the vessel and permits quick, easy access to the contents of the vessel by way of the stopper.

In addition, the locking cover can be produced very easily and economically by molding the cage and the ring in respective double-cavity, single-core molds.

A locking cover according to the invention can advantageously have the following particularities:

- it is provided with breakaway regions for breaking away the cage, disposed on one and the other side of each first tongue;
- the ring has a continuous cylindrical surface with internal guide bosses disposed to insert in the openings of the cage;
- the interlock device of the cage and the ring is a catch and notch arrangement;
- the ring has a central aperture intended to be closed by a removable cap adapted to snap onto the ring.

The present invention will be better understood and other advantages will emerge from a reading of the detailed description of an embodiment, taken as an example that is in no way limiting and illustrated by the accompanying drawings.

Figure 1 is a schematic representation in axial section of a locking cover according to the invention, mounted on a stopper inserted in a necked vessel.

Figure 2 is a schematic perspective view of the cage of the locking cover according to the invention.

Figure 3 is a schematic perspective view of the ring of the locking cover according to the invention.

Figure 4 another schematic perspective view of the ring from Fig. 3.

Figure 5 is a schematic perspective view of the cap of the locking cover according to the invention.

Figure 6 is another schematic perspective view of the cap from Fig. 5.

Figure 7 is a schematic representation in axial section of the locking cover according to the invention, closed by a cap and mounted on a stopper.

Represented in Fig. 1 is a locking cover 1 for a vessel 2 having a neck 3 according to the invention, intended to fix a stopper 4 in the neck 3 of the vessel 2, said cover 1 being shown here in a mounted position in which it is merely placed on the neck 3 without being locked.

The neck 3, which here has a circular opening, has at its end a peripheral outer lip 5 to which the locking cover 1 fixes itself when the cover 1 is locked on the neck 3 of the vessel 2. The stopper 4 here has a conventional, generally cylindrical, "T" shape, with a head 4A and a foot 4B, the head being slightly larger in diameter than the foot 4B, such that when the foot 4B of the stopper 4 is inserted in the neck 3, the head 4A abuts against the lip 5 of the neck 3.

As can be seen in Fig. 1, the locking cover 1 comprises a cage 6 adapted to surround the stopper 4 and the neck 3, in the locked configuration of the cover 1 on the vessel 2, and a ring 7 adapted to nest over the cage 6, surrounding it. The cage 6 serves to fix the stopper 4 in the neck 3 by means of flexible tongues 8, 9 disposed on the periphery of the cage 6. In the mounted configuration of the cover 1, the ring 7 laterally overlaps the cage 6 completely, thereby preventing any access to the cage 6 and the tongues 8, 9 from outside the ring 7. In addition, the cover 1 is provided with a removable safety cap 23 adapted to snap onto the ring 7 to prevent access to the stopper 4.

As can be seen in Fig. 2, the cage 6 comprises two circlets 10, 11 connected to each other by a plurality of substantially identical arms 12 extending in an axial direction A and forming between them first and second openings 13, 14 corresponding to the mesh openings of the cage 6.

Depicted here are a first, lower circlet 10 that is to be inserted first into the neck 3 of the vessel 2, and a second, upper circlet 11, which is preferably smaller in diameter than the first circlet 10 and is intended to rest on an upper portion 4C of the head 4A of the stopper 4 when the cover 1 is mounted on the stopper 4. Circlet 11 defines, at the center of the cage 6, an aperture 11A – here circular – that is coaxial with the neck 3 of the vessel 2 when the cover 1 is placed on the neck 3, to permit access to the stopper 4 and the vessel 2.

It will be understood that circlet 11 and the arms 12 are sufficiently rigid so that they do not collapse as the cage 6 is inserted in the ring 7.

Shown here are six arms 12 evenly distributed over the periphery of the circlets 10, 11, but their number can vary without departing from the framework of the invention.

As visible in Fig. 2, first flexible tongues 8 adapted to fix themselves to the neck 3 of the vessel 2 and second flexible tongues 9 adapted to fix themselves to the stopper 4 – here, three of each – are disposed, preferably in alternation, on the periphery of circlet 10 between two consecutive arms 12.

The first and second tongues 8, 9 are disposed slantingly in, respectively, the first and the second openings 13, 14 formed by the mesh openings of the cage 6, and are supported by circlet 10 and extend toward the inside of the cage 6 and in the direction of second circlet 11. In this way, when the cage 6 is inserted onto the neck 3 or the stopper 4, the first and second tongues 8, 9 can, in a first stage, deflect elastically into the first and the second openings 13, 14, respectively, assuming a position substantially parallel to the arms 12, and then, in a second stage, resume their slanted position to lock the cage 6 respectively on the neck 3 or on the stopper 4.

As visible in Fig. 2, the first tongues 8 are offset in axial direction A with respect to the second tongues 9. More precisely, the second tongues 9 are raised in the direction of the second circlet 11, such that the distance between the end of a second tongue 9 and circlet 11 substantially corresponds to the height of the head 4A of the stopper 4, so as to lock the head 4A of the stopper 4 between second tongues 9 and circlet 11. Likewise, the distance between the

end of a first tongue 8 and circlet 11 is adapted to lock the first tongues 8 against the lip 5 of the neck 3 of the vessel 2 when the cover 1 is locked on the neck 3.

As represented in Fig. 2, disposed on one and the other side of each first tongue 8 are regions 10A of first circlet 10 that are relatively thin compared to the thickness of the mesh openings, thus forming cut-downs on each side of the tongue 8 and making these regions into breakaway regions that yield if an attempt is made to remove the cage 6 from the vessel 2. It will be understood that regions 10A represent the smallest wall section of the cage 6. Thus, as the cover 1 is locked onto the neck 3 by the application of an axial or other force to the cage 6, the first tongues 8 are retained by the lip 5, thereby producing a torsion torque in regions 10A. One or more of these regions 10A can then break under the effect of the torsion and indicate that the vessel 2 has been opened. It will be noted that tongues 8 here are shaped in such a way that their height allows them to pass under the lip 5 of the neck 3 of the vessel 2, and a pull exerted on the cage 6 causes them to rotate under the lip 5, thus further increasing the torsion effect in regions 10A.

It will be noted that first tongues 8 and the corresponding openings 13 here are wider than second tongues 9 and the corresponding openings 14, thus making it possible for the cage 6 to be fixed more firmly to the neck 3 than to the stopper 4.

As can be seen in Fig. 2, each arm 12 of the cage 6 is further provided with an outer positive catch 15 that extends outward toward the first circlet 10 and is intended to fasten the ring 7 on the cage 6, the inclination of the catches 15 serving to facilitate the insertion of the cage 6 in the ring 7.

It can also be seen in Fig. 2 that each arm 12 of the cage 6 is reinforced, at the level of its upper portion adjoining second circlet 11, by an inner bulge 12A intended to wedge the stopper 4 in place in the mounted position of the cover 1.

In addition, formed on circlet 10 of the cage 6, opposite every second tongue 9, are respective notches 16 (here, three in number) intended to assist in orienting the cage 6 with respect to an automatic assembly machine during the assembly of the cage 6 and the ring 7 to form the cover 1.

Figure 3 represents the ring 7 in the form of a sleeve having a continuous, substantially cylindrical surface, which in the mounted configuration of the cover 1 surrounds the cage 6 to prevent access to the tongues 8, 9. The ring 7 has an open bottom end 7A that is to be inserted

first onto the cage 6 and a top end 7B that is partially closed, with the result that when the ring 7 is nested on the cage 6, the top end 7B of the ring 7 overlaps the cage 6 while at the same time leaving at the center of the ring 7 an aperture 17, circular in this case, that is coaxial with the aperture 11A of the cage 6, and, when the cover is mounted on the neck 3, coaxial with the neck 3, to permit access to the stopper 4 and the vessel 2.

Ring 7 is provided on an inner wall 18 with notches 19 designed to cooperate with the catches 15 of the cage 6 to form an interlock device that locks the ring 7 on the cage 6. The notches 19 are preferably blind, that is, they do not pass all the way through the wall 18 of the ring 7, to make for a compact cover 1 and to keep impurities from getting inside the cover 1.

The ring 7 is further provided on its inner wall 18 with internal guides 20, 21 intended to interpose themselves between the arms 12 of the cage 6 to guide the positioning of the cage 6 relative to the ring 7 as the cage 6 is inserted in the ring 7. It will be understood that the guides 20, 21 preferably have dimensions respectively adapted to openings 13, 14, with a height in the axial direction A that is less than the height of openings 13, 14, to enable the tongues 8, 9 to deflect into the openings 13, 14 when the cover 1 is inserted on the neck 3. Represented here for each guide 20, 21 is a pair of respective bosses that position themselves laterally in a mesh opening of the cage 6 respectively against adjacent arms 12 of the cage 6 when the ring 7 and the cage 6 are nested one inside the other. These bosses here have a beveled shape on the side abutting an arm 12, to further facilitate the guiding of the cage 6 into the ring 7.

As represented in Fig. 4, the top end 7B of the ring 7 is provided with a shoulder 22, circular in this case, which borders aperture 17 and is truncated to form two substantially parallel sides 22A, thus providing a means of orienting the ring 7 relative to the automatic assembly machine.

Figure 5 shows the cap 23 seen from its external side 23A (that is, the external side of cap 23 when it is snapped onto cover 1). Cap 23 here has the shape of a disk with raised wings 24 (three wings in this case), equipped on external side 23A with gripping elements 25, here in the form of reinforcing studs, to make the cap 23 easier to take hold of when it is to removed from the cover 1. The gripping elements could also be in the form of circular-arc-shaped beads or any element in relief facilitating the grasping of the cap 23.

Figure 6 shows the cap 23 from the internal side 23A (that is, the side of the cap 23 that is in contact with the cover 1 when snapped onto the cover 1). An annular bead 26 is formed here

at the center of the internal side 23A of the cap 23 and is intended to be inserted in the aperture 17 of the ring 7. When the cap 23 is snapped onto the cover 1, the bead 26 is preferably bent back toward the outside, assuming an L-shaped profile, to hold the cap 23 on the cover 1 as described below.

The cap 23 can be mounted initially on the ring 7 by snap fastening or welding, or by any other irreversible method of attachment known to those skilled in the art. For example, to mount the cap by snap fastening, the cap 23 is first inserted on the ring 7 by inserting the bead 26 into the aperture 17 of the ring 7, and the assembly is then heated to deform the bead 26 in order to bend it around the upper portion 7B of the ring 7 and give it its L-shaped profile, thus making it possible to jam the cap 23 onto the ring 7, as is visible in Fig. 1.

It will be understood that the overall cylindrical shape of the cage 6 and the ring 7 makes it possible for the cover 1 to adapt to all types of vessels 2 having a lipped circular neck 3, and does not require orienting either the cover 1 or the stopper 4 on the neck 3.

The cage 6, the ring 7 and the cap 23 of the cover 1 are preferably made by molding a plastic material, adapted to withstand a lyophilization process if need be. In particular, the plastic material of the cage 6 is hard, so that the torsion described earlier above causes the breakaway regions 10A to break rather than just elastically deform.

The respective shapes of the cage 6, the ring 7 and the cap 23 are relatively simple, thus permitting the use of double-cavity molds with a single core and axial stripping, and, consequently, easy and inexpensive production. In addition, the simplified shapes of these elements advantageously make it possible to reduce the amount of material necessary for the production of the cover 1.

The assembly of the cover 1 and the stopper 4 will now be described with reference to Fig. 7. The first step is to insert the cap 23 onto the ring 7 and to secure it as described above, such that the cap 23 closes the aperture 17 of the ring 7. The cage 6 is then inserted in direction A into the ring 7 provided with the cap 23, the openings 13, 14 of the cage 6 being lined up with the respective guides 20, 21 of the ring 7, until the catches 15 of the cage 6 seat in the notches 19 of the ring 7. The aperture 11A of the cage 6 is then closed by means of the cap 23.

The stopper 4 is then placed in the cover 1 easily and without effort, merely by applying axial pressure in direction A. The head 4A of the stopper 4 is inserted in the cage 6 until the upper portion 4C of the stopper 4 comes into contact with the upper circlet 11 of the cage 6. As

the stopper 4 is inserted, the second tongues 9 deform elastically to let the stopper past and then go back to their initial shape once the stopper 4 is in place, positively engaging behind the head 4A of the stopper 4, so as to lock the stopper 4 in the position indicated in Fig. 4. The stopper 4 is then fixed over its periphery in the cage 6 by the bulges 12A, in the position indicated in Fig. 7.

The assembly formed by the locking cover 1 and the stopper 4 can then be mounted on a vessel 2 by inserting the foot 4B of the stopper 4 into the neck 3 of the vessel 2 simply by applying axial pressure to the cover 23 in direction A, thereby forcing the first tongues 8 to deform elastically in order to get past the lip 5 of the neck 3, and then to resume their initial shape and thus positively engage behind the neck 3 and lock the cover 1 on the neck 3. At the same time, the second tongues 9 partially deflect against the neck 3 of the vessel 2.

The result is a closure for the vessel 2 that is leaktight due to the stopper 4 and tamper-proof by virtue of the locking cover 1, since the cage 6 serves to lock the stopper 4 in the neck 3 and the ring 7 prevents any access to the cage 6, and in particular to the tongues 8, 9. It will be appreciated that the cage 6 therefore serves as a link that fastens together the vessel 2, the stopper 4 and the second ring 7 provided with the cap 23, and that the second ring 7 serves as a safeguard.

For some medical applications, it may be necessary to lyophilize the contents of the vessel 2. In that case, after contents for lyophilization have been introduced into the sterile vessel 2, the foot 4B of the stopper 4 locked in the cover 1 is placed in the neck 3 without pushing it all the way in and without engaging the first tongues 8 on the neck 3, in the position shown in Fig. 1. An opening 4D in the foot 4B of the stopper 4 (more visible in Fig. 7) then makes it possible to proceed with the desired lyophilization. Once the lyophilization has been performed, the stopper 4 with the cover 1 can be pushed the rest of the way into the neck 3, as indicated above, to hermetically seal the vessel 2.

When it is desired to access the contents of the vessel 2, the cap 23 need only be removed to expose the respective apertures 11A, 17 of the cage 6 and of the ring 7, and thus the upper portion 4C of the stopper 4, into which a needle can be inserted to penetrate into the vessel 2. The contents of the vessel 2 can then be used and, if need be, rehydrated.

It will be understood that once the cap 23 has been removed it cannot be reattached to the locking cover 1, so single use of the vessel 2 is assured. Furthermore, the locking cover 1 cannot

be removed from the vessel 2 without damaging the breakaway regions 10A of the cage 6, which is readily visible and eliminates any risk of reuse of the vessel 2.

It will also be noted that since the stopper 4 is inserted in the cover 1 after the assembly of the cage 6, the ring 7 and the cap 23 to form the cover 1, the cover 1 and the stopper 4 can advantageously be stored separately before use.

It goes without saying that the present invention is in no way limited to the foregoing description of an embodiment, which can undergo some modifications without thereby departing from the framework of the invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A locking cover made of a molded plastic material for a vessel having a neck, intended to fix a stopper in said neck of said vessel, comprising a cage adapted to surround said stopper and said neck in the mounted configuration of said cover, said cage having first flexible tongues adapted to fix themselves to said neck of said vessel and second flexible tongues adapted to fix themselves to said stopper, said first tongues being offset from said second tongues in a given axial direction of said cover, said cover further comprising a ring that surrounds said cage in such a way as to prevent access to said first and second tongues from outside said ring, wherein said ring and said cage are designed to nest one inside the other and to interlock, said ring coming to surround said cage, and in that said first and second tongues of said cage are disposed slantingly respectively in the first and the second openings which are formed by the mesh openings of said cage and into which said tongues can deflect as said cover is being mounted on said neck of said vessel.

2. The cover as in claim 1, wherein breakaway regions for breaking away said cage are provided on one and the other side of each said first tongue.

3. The cover as in any one of the preceding claims, wherein said ring has a continuous cylindrical surface with internal guide bosses disposed to insert in said openings of said cage.

4. The cover as in any one of the preceding claims, wherein the interlock device of said cage and said ring is a catch and notch arrangement.

5. The cover as in any one of the preceding claims, wherein said ring has a central aperture intended to be closed by a removable cap adapted to snap onto said ring.

6. A locking cover according to any one of the embodiments substantially as herein described with reference to the accompanying drawings.

Fig 1

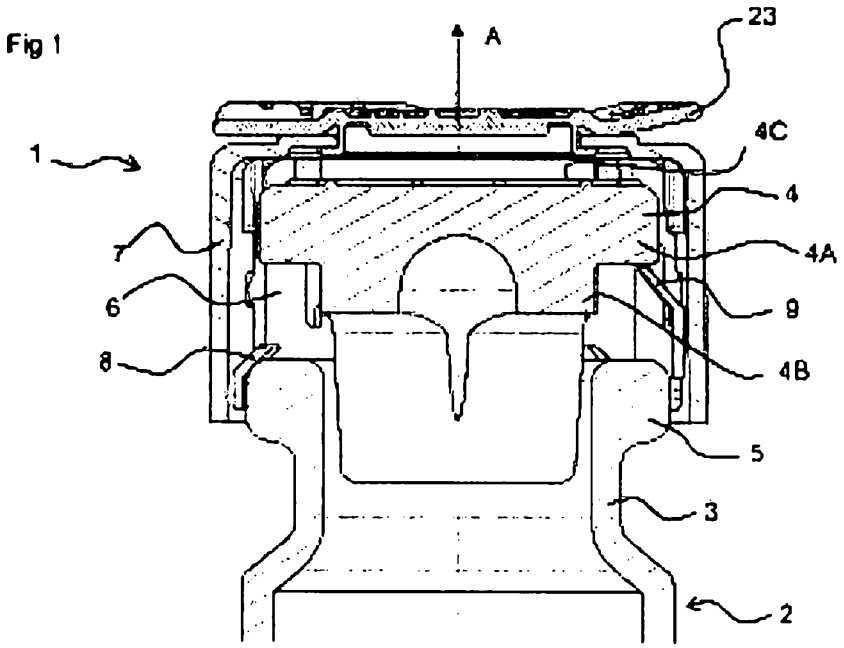

Fig 2

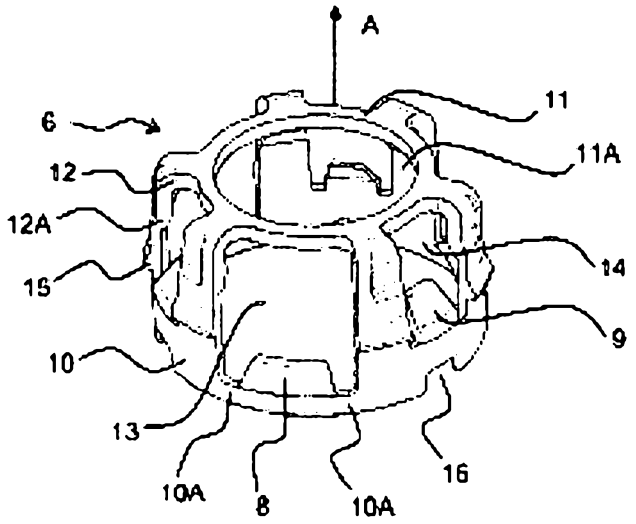

Fig 3

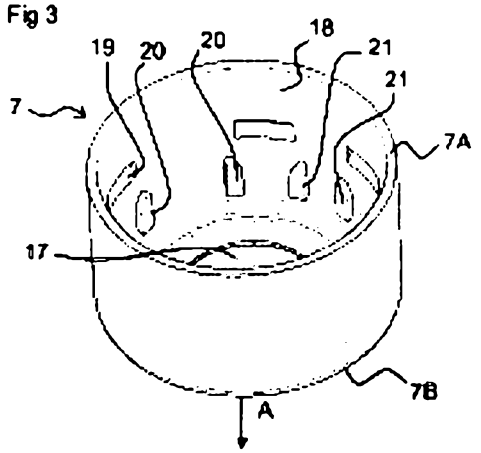

Fig 4

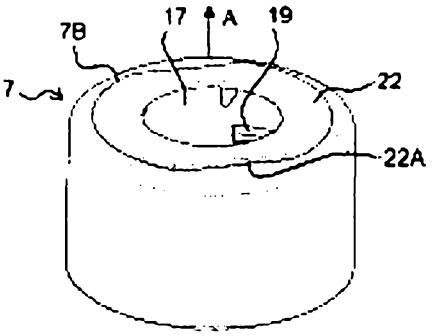

Fig 5

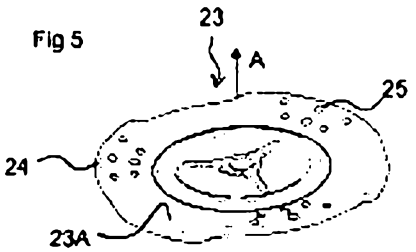

Fig 6

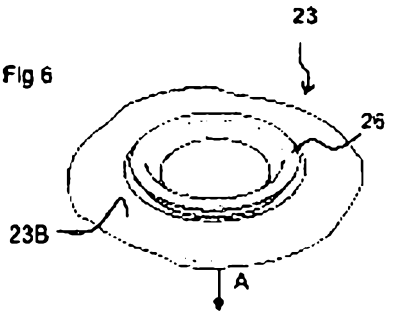

Fig 7