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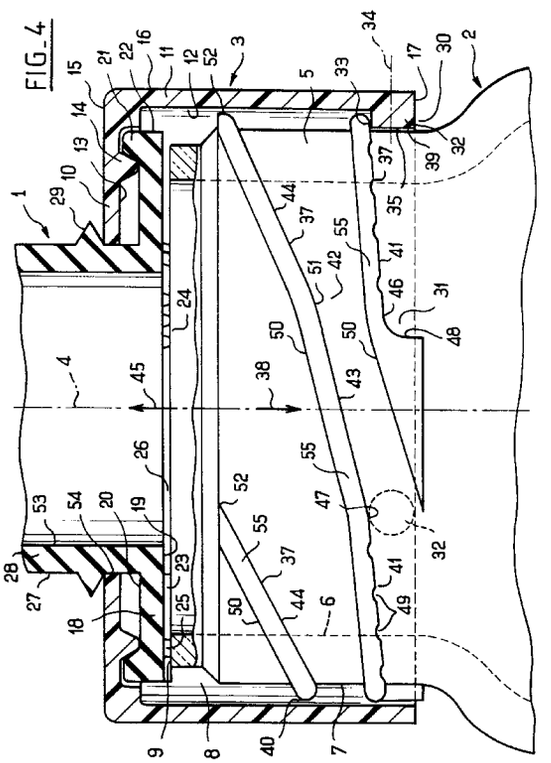
(54) Improvements to feeding-bottle devices with adjustable air inlet.

(57) The present invention relates to a feeding-bottle device with adjustable air inlet.

This device comprises a feeding-bottle (2) having a top-edge face (9), a clamping ring (3) having a flange (10) opposite this top-edge face (9), and a teat (1) having a collar (18) interposed between the flange (10) and the top-edge face (9). By varying the degree by which the clamping ring (3) is screwed onto the feeding-bottle (2), the air inlet passages (26) between the collar (18) of the teat (1) and the top-edge face (9) can be closed or opened. In order to allow a fine adjustment of the cross-section presented by these air inlet passages (26), the clamping ring (3) and the feeding-bottle (2) have respective screwing means (30, 31), the first consisting of studs (32) and the second of inclines (137) which are capable of interacting with these studs and have a milder slope in a screwing zone (41) with clamping of the collar (18) than in a non-clamping screwing zone (42).



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The present invention relates to a feeding-bottle device, comprising:

- a feeding-bottle comprising a neck having a longitudinal axis, a transverse, annular, top-edge face and a longitudinal, external, peripheral screwing face,
- a clamping ring comprising a transverse annular flange, placed opposite the top-edge face and a longitudinal, internal, peripheral screwing face placed opposite the screwing face of the neck,
- a teat comprising a transverse, flat, annular collar, trapped between the top-edge face and the flange, in which the screwing faces have respective, mutually engaged means for longitudinally screwing the clamping ring onto the neck of the feeding-bottle by relative rotation about the longitudinal axis and in which an assembly formed by the top-edge face, the flange and the collar is made so as to open or close, in an adjusted manner, an air inlet passage between the collar and the top-edge face depending, respectively, on the extent by which the clamping ring is screwed onto the neck of the feeding-bottle and the extent by which it clamps the collar, longitudinally, between the flange and the top-edge face.

Most frequently, for this purpose, the elastically flexible and elastically compressible collar bears longitudinally on the top-edge face via ribs on either one which, in the absence of elastic deformation of the collar, leave, between the latter and top-edge face, air inlet passages whose function is to allow an equalization between the pressure inside the feeding-bottle and atmospheric pressure, in order to facilitate feeding; the flange, for its part, bears longitudinally on the collar via an annular moulding which, by screwing the clamping ring onto the neck of the feeding-bottle, makes it possible to deform elastically this annular collar and, possibly, the ribs if the latter are arranged on this collar, up to the point of closing off the abovementioned air passages to a varying degree.

In its European Patent Application No. 0 437 148, the Applicant Company has proposed a more advanced embodiment of such a device, in which the ribs have, longitudinally opposite the moulding of the flange, discontinuities facilitating the elastic deformation of the collar until the latter is continuously applied on the top-edge face, that is to say until the air inlet passages are totally closed off, so as to prevent the liquid contained in the feeding-bottle from leaking when the child using it stops sucking. By facilitating the elastic deformation of the collar, the discontinuities of the ribs further facilitate the opening of the air inlet passages up to an amount which is determined as a function of the needs, linked to the rate at which the baby sucks up the liquid contained in the feeding-bottle; in this respect, means for identifying the state of the mutual screwing of the feeding-bottle and clamping ring facilitate the identifying of a relative emplacement corresponding to a predetermined adjustment of the air inlet passages after, in the course of screwing the clamping ring onto the feeding-bottle neck, the point at which the clamping ring comes to bear on the collar itself bearing on the top-edge face is detected, by feeling a certain resistance while screwing.

However, it seems that even if the improvements proposed in the abovementioned European Patent Application are adopted, there remains a certain difficulty in obtaining a predetermined adjustment of the air inlet passages, that is to say a certain fineness in the choice of relative longitudinal positioning of the clamping ring and feeding-bottle neck, corresponding to a state of predetermined mutual deformation of the collar and teat.

Indeed, the angular offset, relative to the longitudinal axis, between the position which the clamping ring occupies with respect to the feeding-bottle neck when it presses without deformation the collar of the teat onto the top-edge face of the feeding-bottle neck, via ribs, and the relative position corresponding to the elastically deformed collar being in continuous contact with the top-edge face, is only of the order of a few tens of degrees, for example of the order of 40° taking account of the slope, which up till now was still constant, given to the threadings constituting the respective means for longitudinally screwing the clamping ring onto the feeding-bottle neck, this slope being generally selected so as to limit the screwing and unscrewing of the clamping ring with respect to the feeding-bottle neck to a few turns, in order to ease these screwing and unscrewing operations.

The small angular offset between these relative positions of the clamping ring and feeding-bottle neck, corresponding respectively to the maximum opening of the air inlet passages and to the closure of the latter combines with a certain lack of precision in the purely tactile determination of the beginning of the longitudinal clamping of the teat collar between the clamping ring and the top-edge face of the feeding-bottle neck, that is to say the relative position giving the maximum opening of the air inlet passages, to remove any precision in the adjustment of the latter between a state of maximum opening and a state of closure.

The aim of the present invention is to overcome these disadvantages and, for this purpose, the present invention proposes a feeding-bottle device of the type stated in the preamble, characterised in that one of the screwing means consists of at least one stud and the other of the screwing means consists of at least one incline engaged with the stud and having a variable slope, comparatively milder in a clamping screwing zone, engaged with the stud when the

clamping ring occupies, with respect to the neck of the feeding-bottle, positions in which the collar is longitudinally clamped between the flange and the top-edge face, and comparatively steeper in a non-clamping screwing zone, engaged with the stud when the clamping ring occupies, with respect to the neck of the feeding-bottle, positions in which the collar is trapped without longitudinal clamping between the flange and the top-edge face.

Such a division, in the incline constituting the screwing means located on the external peripheral face of the feeding-bottle neck or on the internal peripheral face of the clamping ring, between a non-clamping screwing zone and a clamping screwing zone, makes it possible to select each time the most appropriate slope, namely respectively a relatively steep slope promoting the speed of the screwing and unscrewing operations when the latter do not effect the state of the elastic deformation of the collar and consequently the opening or closing of the air inlet passages, and a comparatively mild slope, designed for a fine adjustment of the relative longitudinal emplacement of the clamping ring and feeding-bottle neck, in order to vary the elastic deformation of the teat collar according to the air inlet needs, when this screwing operation is accompanied by such a deformation, that is to say an effect on the air inlet passages between the teat collar and the top-edge face of the feeding-bottle neck.

This relative angular range of movement may exceed 60° for an unchanged longitudinal rib thickness, for example of the order of 2/10 to 5/10 of a millimetre, for a value of the order of 1° for the slope of the clamping screwing zone, and for a circumference of the order of 13 cm of the external peripheral face of the feeding-bottle neck, which was found to be totally satisfactory during the tests; these numbers are however only given by way of non-limiting example.

Naturally, insofar as, depending on whether the incline is located on the screwing face of the feeding-bottle neck or on the screwing face of the clamping ring, the implementation of the present invention leads to a distinctive shaping of the feeding-bottle or of the clamping ring, respectively, the present invention also applies to a feeding-bottle and clamping ring having such an incline on their respective screwing face.

A person skilled in the art will easily understand that, in order to ensure that the clamping ring and the feeding-bottle neck are coaxial and, consequently, that the teat collar is clamped longitudinally in an even manner between the flange of the clamping ring and the top-edge face of the feeding-bottle, it is preferable to provide the stud and incline in a plurality of specimens, preferably uniformly distributed angularly, about the longitudinal axis. Naturally, the respective numbers of studs and inclines, as well as their angular distribution about the longitudinal axis are identical; thus, the stud and incline are respectively advantageously provided in three specimens, mutually offset angularly by 120° about the longitudinal axis, but this arrangement, even though it is presently considered as optimal, only constitutes a non-limiting example.

The comparatively mild slope of the incline in the screwing zone with clamping of the teat collar makes it possible to locate, with high precision, not only the relative angular positions of the clamping ring and of the feeding-bottle corresponding to predetermined openings of the air inlet passages, but also the relative position corresponding both to the total closing off of the air inlet passages and to a minimum elastic deformation of the collar for this purpose; as a result, much better than the feeding-bottle devices of the prior art, the device according to the invention lends itself to the fitting of stopping means limiting the relative rotation of the clamping ring and feeding-bottle, in the screwing direction, to a value corresponding to the closure of the air inlet passages without excessively compressing the teat collar between the flange of the clamping ring and the top-edge face of the feeding-bottle neck; thus, according to a preferred embodiment of the invention, the incline comprises a stop-piece, for stopping the stud, terminating the clamping screwing zone at the opposite end to the non-clamping screwing zone and limiting the extent by which the clamping ring is screwed onto the neck of the feeding-bottle. This thus prevents excessively forceful clamping which, when repeated, damages the teat collar.

In addition, the relatively high value of the relative angular offset of the clamping ring and feeding-bottle between their relative positions corresponding respectively to a maximum opening of the air inlet passages with no deformation of the teat collar and to a closure of these air inlet passages with elastic deformation of the teat, makes it possible to provide a positioning of the clamping ring with respect to the neck of the feeding-bottle in a certain number of relative positions corresponding to the engagement of the stud with the incline, by the clamping screwing zone, and particularly in intermediate relative positions between the two abovementioned positions, which correspond to limit positions the first of which is detected without difficulty as a result of feeling the change in slope as the clamping ring is progressively screwed onto the feeding-bottle neck, and the second of which is advantageously detected, according to the preferred embodiment which has just been mentioned, by the action of the stop-piece on the stud.

According to a particularly simple embodiment, the positioning means may comprise notches for the snap-fitting of the stud in the clamping screwing zone, which has the advantage of ease of tactile detection and of metering, making it possible to determine without difficulty the degree of opening of the

air inlet passages between their maximum opening and their closure. However, other types of positioning means could be selected and, in particular, visual positioning means could be used, as proposed in the abovementioned European Patent Application No. 0 437 148, the teachings of which shall be advantageously combined with those of the present application, although the arrangements in accordance with the present invention can be also adopted in feeding-bottle devices which do not exhibit the characteristics of the invention described and claimed in the abovementioned European Patent Application.

The division, characteristic of the invention, between a clamping screwing zone and a non-clamping screwing zone is advantageous not only in that it makes it possible, when the stud interacts with the clamping screwing zone, to obtain a fine and accurate adjustment of the air inlet passages, but also in that it makes it possible to select the slope of the non-clamping screwing zone according to criteria which are independent of phenomena which may arise when the flange of the clamping ring clamps the teat collar on the top-edge of the feeding-bottle neck.

In particular, the slope of the incline, in the non-clamping screwing zone, may be selected so as to make the screwing and unscrewing operations as fast as possible, that is to say to make them correspond to a minimum relative rotation of the clamping ring of the feeding-bottle without necessarily incurring a risk of unexpected unscrewing of the clamping ring when, in a state of maximum opening of the air inlet passages, the stud interacts with the clamping screwing zone in the immediate proximity of the transition of the latter with the non-clamping screwing zone.

For this purpose, the slope of the incline is advantageously made to increase, in the non-clamping screwing zone, starting from the clamping screwing zone; thus, the fitting of the clamping ring onto the feeding-bottle neck before feeding, by bringing them longitudinally closer together, is accompanied by a rapid engagement of the stud with the incline, at the point where the slope of the latter is greatest, and then with the screwing proper, corresponding to a milder slope of the incline, before the stud reaches the clamping screwing zone.

For this purpose, it is possible to provide for the slope of the incline to vary continuously in the non-clamping screwing zone.

Preferably, however, the incline comprises, for this purpose, in the non-clamping screwing zone, two parts in which the slope is respectively constant; such a choice enables the user to detect without difficulty, in a tactile manner, the passing of the stud from the part of maximum slope to the part of milder slope and vice versa, which provides improved safety insofar as it is impossible to exclude the possibility of accidental unscrewing of the clamping ring with respect to the feeding-bottle, for example as a result of the latter's weight alone if only the clamping ring is held, when the stud interacts with the inclined part of maximum slope, essentially provided for facilitating the mutual engagement, whereas the slope may be selected, in the intermediate part between this part of maximum slope and the clamping screwing zone, so as to practically eliminate such a risk, the materials making up the feeding-bottle neck and the clamping ring respectively being taken into account.

Other characteristics and advantages of a feeding-bottle device according to the invention will emerge from the following description, relating to two non-limiting illustrative embodiments, as well as attached drawings which make up an integral part of this description.

- Figure 1 shows a detail of a device according to the invention, comprising a feeding-bottle, a clamping ring and a teat, in partial cross-section through a plane passing through a longitudinal axis relative to which the teat, clamping ring and at least one feeding-bottle neck or mouth zone being symmetrical in revolution and when the teat collar is sufficiently compressed and elastically deformed, between the flange of the clamping ring and the top-edge face of the feeding-bottle neck, in order to prevent any passage of air between the collar and the top-edge face.
- Figure 2 shows a view of the clamping ring along a longitudinal direction marked by an arrow II in Figure 1.
- Figure 3 shows the flat development of the external peripheral face of the feeding-bottle neck.
- Figure 4 shows the same device as in Figure 1, in a similar cross-section, when the teat collar, in a relaxed state, leaves air inlet passages presenting a maximum cross-section directly opposite the top-edge face of the feeding-bottle neck.
- Figure 5 depicts, in a view which is in all ways similar to Figure 1, an embodiment variant of the device according to the invention.
- Figure 6 shows a view of the feeding-bottle of this variant along a longitudinal direction marked by an arrow VI in Figure 5.
- Figure 7 shows the plane development of the internal peripheral face of the clamping flange in the case of this variant.
- Figure 8 shows a view of this variant, in all ways similar to the view in Figure 4.

Figures 1 to 4 will first be referred to, wherein the teat, feeding-bottle and clamping ring have been respectively designated by 1, 2, 3 and, when mutually assembled, constitute a device according to the invention and have a respective general symmetry of revolution about the same longitudinal axis 4, which symmetry is possibly limited to a neck or mouth zone

5 as regards the feeding-bottle 2.

More precisely, the neck 5 of the feeding-bottle 2 is delimited, respectively towards the axis 4 and away from the latter, by longitudinal peripheral, respectively internal 6 and external 7 faces in the shape of cylinders of revolution about the axis 4; in a longitudinal direction 45, this external peripheral face 7, via an annular constriction 8, of revolution about the axis 4, and this internal peripheral face 6 are connected to a smooth, plane annular face 9, perpendicular to the axis 4, which face 9 constitutes the top edge of the feeding-bottle 2.

The feeding-bottle 2 is made in a known manner from a rigid material, for example glass or an appropriate synthetic material.

The ring 3 is also made from a rigid material, for example a synthetic material, and, in order to fix the teat 1 on the neck 5 of the feeding-bottle 2, it comprises a flat annular flange 10, perpendicular to the axis 4 and placed longitudinally opposite the top-edge face 9 and a longitudinal skirt 11 peripherally bordering the flange 10, from which this skirt 11 extends in a longitudinal direction 38 opposite to direction 45, and intended to screw the ring 3 longitudinally onto the neck 5 of the feeding-bottle 2, the skirt 11 of which partially envelopes the external peripheral face 7 opposite which it has an internal peripheral face 12 which is also longitudinal and in the shape of a cylinder of revolution about the axis 4. In the region of the flange 10, the internal peripheral face 12 of the skirt 11 is connected to a plane annular face 13 of the flange 10, which face 13 is perpendicular to the axis 4 and faces the top-edge face 9; directly longitudinally opposite the latter, the face 13 has, projecting in the direction 38, a moulding 14 in the shape of an annulus of revolution about the axis 4, in accordance with the teachings of the European Patent Application No. 0 437 148, although the present invention can also be applied independently of the teachings of this European Patent Application. Towards the axis 4, the face 13 is connected to an internal peripheral face 54 in the shape of a cylinder of revolution about the axis 4 towards which this face 54 faces so as to delimit an axial hole 15. This face 54 connects the face 13 of the flange 10 to an opposite face 15 of the latter, which face 15 is also annular, plane and perpendicular to the axis 4. Away from this axis, the face 15 is connected to an external peripheral face 16 of the skirt 11, which face 16 is longitudinal and in the shape of a cylinder of revolution about the axis 4 like the internal peripheral face 12, facing away from the axis 4, and is connected in the direction 38 to the internal peripheral face 12, at the longitudinally opposite end to its connection with the face 15, by a plane annular edge 17 perpendicular to the axis 4.

The teat 1, for its part, is made of a piece of material which is elastically flexible and elastically compressible but waterproof, for example a silicone rubber having a Shore A hardness of the order of 30 to 70. It comprises a flat annular collar 18 of revolution about the axis 4 to which it is perpendicular when referring to an elastically relaxed state depicted in Figure 4. This collar 18, fixing the teat 1 on the feeding-bottle 2 by being trapped between the top-edge face 9 of the latter and the flange 10 of the clamping ring 3, has respectively towards the top-edge face 9 and towards the face 13 of the flange 10 an annular face 19, 20 which, when referring to the elastically relaxed state depicted in Figure 1, is plane and of revolution about the axis 4 to which it is perpendicular. Away from the axis 4 the face 20, via a longitudinal rim 21 in the shape of an annulus of revolution about the axis 4 when referring to the elastically relaxed state depicted in Figure 4 and intended to be housed between the moulding 14 of the flange 10 and the internal peripheral face 12 of the skirt 11, and the face 19 are connected to an external peripheral edge 22 of the collar 18, which edge is longitudinal, is approximately in the shape of a cylinder of revolution about the axis 4 when referring to the elastically relaxed state depicted in Figure 4 and is located, when referring to directions which are radial with respect to this axis 4, between the internal peripheral face 12 of the skirt 11 of the clamping ring 3 and the connection of the constriction 8 of the external peripheral face 7 of the neck 5 of the feeding-bottle 2 with the top-edge face 9.

Longitudinally opposite the latter, at least in part, and applying the teachings of the European Patent Application No. 0 437 148, the face 19 of the collar 18 has, by manufacture in a single piece, ribs 23 which, when referring to the elastically relaxed state depicted in Figure 4, have a configuration which is generally rectilinear and approximately radial relative to the axis 4 and form a projection in the direction 38; these ribs 23 form, for example, groups 24 of three ribs, evenly distributed angularly about the axis 4, that is to say mutually offset by 120° with respect to the latter, it being understood that other arrangements could be adopted in this respect. Also applying the teachings of the abovementioned European Patent Application, each rib 23 has a localised discontinuity 25 longitudinally opposite the moulding 14 of the flange 10, approximately at the same distance, radial relative to the axis 4, from the respective connections of the top-edge face 9 with the internal peripheral face 6 of the neck 5 and with the constriction 8 of the external peripheral face 7 of this neck 5.

Thus, by varying the degree by which the clamping ring 3 is screwed onto the neck 5 of the feeding-bottle 2, in accordance with the teachings of the abovementioned European Patent Application, it is possible either simply to make the collar 18 touch via the ribs 23, without elastic deformation, so that the ribs 23 leave between them, and between the face 19 of the collar 18 and the top-edge face 9, air inlet passages 26 presenting a maximum opening cross-

section, as seen in Figure 4, or to deform elastically the collar 18 and ribs 23, particularly by the longitudinal bearing of the moulding 14 in the region of the discontinuities 25 in the ribs 23, so as to establish between the face 19 of the collar 18 and the top-edge face 9 a continuous contact, in a zone in the shape of an annulus of revolution about the axis 4 and passing through the discontinuities 25 in the ribs 23, so as to close off totally the air passages 26 as seen in Figure 1, or to place the collar 18 and the ribs 23 in an intermediate state of elastic deformation between these two limit states, so as to leave air inlet passages 26 having a smaller cross-section than that which they have in the state of the collar 18 depicted in Figure 4.

Towards the axis 4, the faces 19 and 20 of the collar 18 are respectively connected to an internal peripheral face 53 and to an external peripheral face 27 of a tubular body 28 of the teat 1, which tubular body 28 has a general shape of revolution about the axis 4 and longitudinally connects, through the hole 15, the collar 18 to a nipple (not shown), made for example in accordance with the teachings of the French Patent Application No. 88 02290 of 25 February 1988, this example being in no way limiting; the external peripheral face 27 of the tubular body 28 has a diameter which is substantially identical to that of the internal peripheral face 54 of the flange 10 so as to pass through the hole 15 practically without radial play relative to the axis 4, and has, opposite the face 15 of the flange 10, an annular projection 29 of revolution about the axis 4 intended to hold the teat 1 inside the hole 15 of the clamping ring 3 when the latter is separated from the feeding-bottle 2.

More information with regard to the respective shapings of the teat 1, of the neck 5 of the feeding-bottle 2 and of the clamping ring 3 will be found in the European Patent Application No. 0 437 148 which will be referred to in this respect, it being understood that other methods for creating, between the top-edge face 9 of a neck 5 of feeding-bottle 2 and a face 19 of a collar 18, air inlet passages 26 which are adjustable by elastic deformation of the collar 18, between respectively maximum and zero opening cross-sections, could be selected without necessarily leaving the scope of the present invention; in particular, according to an embodiment variant described in the European Patent Application No. 0 437 148, the ribs 23 having the discontinuities 25 could be transferred from the face 19 of the collar 18 to the top-edge face 9 of the neck 5 of the feeding-bottle 2, just like it would be possible to renounce the advantages brought by the discontinuities 25 in the ribs 23 by providing ribs similar to the ribs 23 but continuous on the face 19 of the collar 18 or the top-edge face 9 of the neck 5 of the feeding-bottle 2.

In fact, the manner in which the air inlet passages 26 are arranged is not a critical aspect of the present invention as long as these passages 26 may be opened to a varying degree or totally closed by the longitudinal screwing or unscrewing of the clamping ring 3 with respect to the neck 5 of the feeding-bottle 2, the present invention relating to a particular method of interaction between the clamping ring 3 and the neck 5 of the feeding-bottle 2 for this purpose.

Figures 1 to 4 depict a first illustrative embodiment of the screwing means 30, 31 respectively provided on the internal peripheral face 12 of the skirt 11 of the clamping ring 3 and on the external peripheral face 7 of the neck 5 and of the mouth 2 according to this particular interaction method.

In this example, the screwing means 30 comprise, in a manner fixed to the skirt 11 for example by manufacture in a single piece with the latter, at least one stud 32 placed so as to project towards the axis 4, radially relative to the latter, on the internal peripheral face 12 of the skirt 11, in the immediate proximity of the edge 17 of the latter; preferably, a plurality of these studs 32 are provided, in such a way that they are uniformly distributed angularly about the axis 4, and a preferred embodiment has been particularly depicted in Figure 2, according to which three mutually identical studs 32 are thus provided, with an identical longitudinal emplacement and mutual angular offset, relative to the axis 4, of 120°. Each stud 32 is delimited, in the example depicted, by an external peripheral face 33 in the shape of a cylinder of revolution about a respective axis 34, perpendicular to the axis 4, with a diameter which is much smaller than the longitudinal dimension of the internal peripheral face 12 of the skirt 11 so as to localise the studs 32 closely, in the immediate proximity of the edge 17 of the skirt 11; respectively away from the axis 4 and towards the latter, the external peripheral face 33 of each stud 32 is connected to the internal peripheral face 12 of the skirt 11 and to a plane frontal face 35, perpendicular to the respective axis 34 and located at a distance from the axis 4 which is substantially equal to the radius of the external peripheral face 7 of the neck 5 although slightly greater than this radius so that some functional play 39, which is radial relative to the axis 4, is left between each frontal face 35 and the external peripheral face 7. A person skilled in the art will easily deduce, from the rest of the description, that other shapes could be adopted for each stud 32, and particularly for the external peripheral face 33 of the latter, without necessarily leaving the scope of the present invention, within the limits of the compatibility with the screwing means 31 borne by the external peripheral face 7 of the neck 5 of the feeding-bottle 2, which means will now be described.

These means 31 comprise, in as many specimens as there are studs 32 and with the same angular distribution about the axis 4, that is to say in three specimens which are mutually offset angularly by 120° relative to the axis 4, threads 55 fixed to the neck 5 and advantageously manufactured in a single

piece with the latter, each of these threads 55 constituting an incline 37 intended to interact with the external peripheral face 33 of a respective stud 32 and, for this purpose, facing the longitudinal direction 38.

For this purpose, each thread 55 has a constant continuous cross-section, which is for example approximately semi-circular, and forms on the external peripheral face 7 of the neck 5 of the feeding-bottle 2 a projection which is radial relative to the axis 4, corresponding approximately to the projection which each stud 32 forms, radially relative to this axis 4, on the external peripheral face 12 of the skirt 11 so that when the clamping ring 3 is screwed onto the zone of the neck 5 of the feeding-bottle 2 by interaction of the screwing means 30 and 31, each thread 55 is placed in the immediate proximity of this peripheral face 12 while keeping with respect thereto some functional play 40 of the same order of magnitude as the above-mentioned functional play 39.

With a view to implementing the present invention, each thread 55 has at least two slopes in the same direction, namely in the example depicted three slopes in the same direction so as to subdivide the corresponding incline 37 into two main zones 41, 42 respectively for screwing with longitudinal clamping of the collar 18 between the flange 10 and the top-edge face 9 of the neck 5 of the feeding-bottle 2 and for screwing without such clamping, the non-clamping screwing zone 42 being itself subdivided into two parts 43, 44, respectively for screwing proper and for approach. Each incline 37 thus extends over approximately 180°, relative to the axis 4, which makes it possible to screw or unscrew the clamping ring 3 with respect to the feeding-bottle 2 by a maximum relative rotation of a half-turn, and the clamping screwing zone 41 as well as each of the parts 43, 44 of the non-clamping screwing zone 42 extends over approximately 60° relative to the axis 4, that is to say over approximately 1/6 of a turn, with a respective helical shape. This shape and these values however only constitute non-limiting examples, and it will be possible to select other shapes and other values without necessarily leaving the scope of the present invention.

In the clamping screwing zone 41, the slope of the incline 37 is less than the slope of the latter in the part 43 of the non-clamping screwing zone 42, itself being less than the slope in the part 44 of this zone 42.

In practice, the slope in the clamping screwing zone 41 is such that when a stud 32 bears in the direction 45 against the extreme part 46 of this zone 41 which is furthest away longitudinally from the top-edge face 9 of the neck 5 of the feeding-bottle 2, as shown in Figure 1, the collar 18 assumes, under the pressure from the flange 10, its shape which totally closes off the air inlet passages 26 but that beginning to unscrew, by progression of the stud 32 along the clamping screwing zone 41, starting from this extreme part 46 of the latter, brings about the progressive opening of the air inlet passages 26. In addition, this slope is such that when a stud 32 bears in the direction 45 at the transition 47 between the clamping screwing zone 41 and the part 43 of the non-clamping screwing zone 42, as shown in Figure 4, the collar 18 assumes its elastically relaxed shape, that is to say, it frees the air inlet passages 26 with a maximum cross-section, while being held against the top-edge face 9 of the neck 5 of the feeding-bottle 2 by the flange 10 of the clamping ring 3. It will be noted that in these two positions of a stud 32 with respect to the clamping screwing zone 41 as well as in any intermediate position, the elasticity of the collar 18 tends to hold the stud 42 pressed in the direction 45 against this zone 41 so that, in particular, the opening of the air inlet passages 26 with an increasing opening cross-section takes place automatically, as a result of the elasticity of the collar 18, as the clamping ring 3 is progressively unscrewed from the position of the latter, with respect to the feeding-bottle 2, depicted in Figure 1 and until the relative position depicted in Figure 4, each stud 32 travels along the zone 41 of a respective incline 37.

In other words, the slope of the clamping screwing zone 41, considering its angular development relative to the axis 4 and the circumference of the external peripheral face 7 of the neck 5 of the feeding-bottle 2, is such that the longitudinal distance covered by a stud 32, travelling along it from its extreme part 46 until the transition 47 with the part 43 of the zone 42, corresponds substantially to the thickness of a rib 23, measured longitudinally at rest. By way non-limiting example, favourable results were obtained during the tests by providing a slope of 1° for the clamping screwing zone 41, for a thickness of each rib 23, in the elastically relaxed state of the collar 18, of the order of 2/10 to 5/10 of a millimetre, an angular development of the order of 60° for the zone 41 and a circumference of the order of 13 cm for the external peripheral face 7 of the neck 5 of the feeding-bottle 2.

As depicted, means are preferably provided for halting the screwing of the clamping ring 3 on the neck 5 of the feeding-bottle 2 when the studs come into contact with the part 46 of the clamping screwing zones 41, for example in the form of a respective stop-piece 48 having the shape of a shoulder forming a projection, both with respect to the respective incline 37, in the direction 38, and on the external peripheral face 7 of the neck 5, in a plane including the axis 4, in the immediate proximity of the extreme part 46. In addition, in order to facilitate the identifying of the angular position of the clamping ring 3 with respect to the neck 5 of the feeding-bottle 2 when the studs 32 travel along the clamping screwing zones 41, that is to say the identifying of a certain number of predetermined opening cross-sections of the air in-

let passages 26, the clamping screwing zone 41 is advantageously provided with positioning means, for example in the form of notches 49 allowing a reversible snap-fitting, under the effect of the elasticity of the collar 18, of the respectively corresponding stud 32; four notches 49 have thus been provided in each zone 41 in the example depicted, between the extreme part 46 and the transition 47, with an even angular distribution relative to the axis 4, but other selections could have been made without necessarily leaving the scope of the present invention.

In the screwing part 43 proper of the non-clamping screwing zone 42, the incline 37 has a much steeper slope than that which it has in the clamping screwing zone 41, and for example a slope of 8° 45 min, a number which has given favourable results during the tests but nevertheless only constitutes a non-limiting example. When a stud 32 travels along this part 43 of the zone 42 of the incline 37, it is no longer forced in the direction 45, that is to say towards a contact with the incline 37, by the elasticity of the collar 18 which is in the elastically relaxed state; now, considering the angular development and angular positioning of the threads 36 which have been described, each stud 32 must advance over part of its travel along a respective incline 37 between the thread 55 which defines this incline 37 and a flank 50, delimiting in the direction 45 a thread 55 which is immediately adjacent in the direction 38; in particular, the extreme part 46 of the clamping screwing zone 41 of the incline 37 of the thread 55 which is immediately adjacent in the direction 38 corresponds longitudinally to the transition 51 between the parts 43 and 44 of the non-clamping screwing zone 42 of the incline 37 of a thread 55; in order to avoid any locking of a stud 32 by this immediately adjacent thread 55 in the region of the extreme part 46 of the clamping screwing zone 41 of the incline 37 of this thread, each flank 50 is prolonged beyond the region of the extreme part 46 and the stop-piece 48 of the corresponding incline 37, parallel or approximately parallel to the screwing part 43 proper of the non-clamping screwing zone 42 of the incline 37 of a thread 55 which is immediately adjacent in the direction 45, keeping with regard to this part 43 a gap which is sufficient for allowing a stud 32 to pass through; this gap is preferably close to the diameter of the external peripheral face 33 of such a stud so that the latter is guided positively between the part 43 of the zone 42 of the incline 37 corresponding to it, and the flank 50 of the thread 55 which is immediately adjacent in the direction 38 as the screwing part 43 proper is progressively cleared.

The approach part 44 of the non-clamping screwing zone 42 extends for its part from the transition 51 until the connection between the external peripheral face 7 of the neck 5 of the feeding-bottle 2 with the constriction 8, with a slope which is still increased with respect to that of the screwing part 43 proper, and for example of 16° 42 min, this value, however, only being stated by way of non-limiting example; in this region, each stud 32 is free to advance longitudinally between the part 44 of the incline 37 corresponding to it and the flank 50 of the thread 55 which is immediately adjacent in the direction 38 as a result of the substantial difference in slope between the respective inclines 37, that is to say between these threads 55 themselves.

Thus, the slope of each incline 37 increases progressively, from the extreme part 46, comparatively furthest away longitudinally from the top-edge face 9, to an extreme part 52 constituted by the opposite end of the part 44 to the transition 51 of the latter with the part 43, separated longitudinally by a distance of the order of 12 mm with regard to the extreme part 46 in the non-limiting example depicted.

Other means could be used for obtaining this slope progression, forming a distinctive feature of the present invention. Thus, according to an embodiment which is not shown but may be easily understood by a person skilled in the art, it would be possible to connect to a clamping screwing zone 41, identical to that which has been described, a non-clamping screwing zone 42 in which the slope would be constant, while being greater than that of the clamping screwing zone 41. According to another embodiment, represented diagrammatically by a dot-and-dash line 37' in Figure 1, the incline could have a continuous slope variation, preferably limited to the non-clamping screwing zone 42, between a minimum slope which it would have in its zone which is furthest away longitudinally from the top-edge face 9 of the neck 5 of the feeding-bottle 2, for constituting the clamping screwing zone 41, and a maximum slope which it would have in an extreme part located nearest longitudinally to this top-edge face 9.

In addition, considering the privileged interaction which is established between the external peripheral face 33 of each stud 32 and the clamping screwing zone 41 of a respectively corresponding incline 57, it would be possible to give this external peripheral face 33 a shape such that it has, in contact with the zone 41 of the incline 37, a helical facet of identical inclination, so as to increase the mutual contact surface. A positioning similar to that ensured, in the case of the embodiment depicted in Figures 1 to 4, by the reversible snap-fitting of each stud 32 in one of the notches 49 of the zone 41 of the corresponding incline 37 could then be advantageously ensured by the reversible mutual snap-fitting, under the effect of the elasticity of the collar 18, of a notch arranged on this facet and of one of the bosses arranged on the zone 41 of each incline 47, with a plurality of respective bosses, for example four, replacing the previously described notches 49 and laid out like the latter.

As shown in Figures 5 to 8 which will presently be referred to and in which can again be found the nu-

merical references 1 to 29 designating parts of the device identical to those which have been described with the same references in relation to Figures 1 to 4, as well as the longitudinal direction references 38 and 45, the screwing means respectively provided on the internal peripheral face 12 of the skirt 11 of the clamping ring 3 and on the external peripheral face 7 of the neck 5 of the bottle 2 may be transposed.

Thus, in the embodiment depicted in Figures 5 to 8, it is the external peripheral face 7 of the neck 5 of the mouth 2 which has, in this case in the immediate proximity of the constriction 8, three studs 132 projecting from this external peripheral face 7, along axes 134 which are radial with respect to the axis 4, this number and this relative arrangement of the studs 132 of course only constituting, also in this case, non-limiting examples. Each stud 132 is delimited by an external peripheral face 133 in the shape of a cylinder of revolution about the axis 134 and by a frontal face 135 perpendicular to this axis and facing the internal peripheral face 12 of the skirt 11 of the clamping ring 3, keeping with regard to this face 12 some functional play 139, which is radial relative to the axis 4, and in all ways comparable to the previously described functional play 39; the dimensioning of the external peripheral face 133 is selected in the same way as that of the external peripheral face 33.

The studs 132 thus constitute on the external peripheral face 7 of the neck 5 of the feeding-bottle 2 respective screwing means 130, which are in all ways comparable to the screwing means 30 provided on the internal peripheral face 12 of the skirt 11 in the case of the embodiment described with reference to Figures 1 to 4, for interacting with screwing means 131 which are for their part in all ways comparable to the screwing means 31 but borne in this case by this internal peripheral face 12 instead of being borne by the external peripheral face 7 of the neck 5 of the feeding-bottle 2.

These means 131 are in the form of three threads 155 which are mutually identical and distributed angularly with a mutual offset of 120° relative to the axis 4 and each of which is intended to interact with a respective stud 132 by constituting a respective incline 137 facing in this case in the longitudinal direction 45, each thread 155 having in the direction 38 only one flank 150 which is for its part comparable to the flank 50 of the threads 55.

With a view to implementing the present invention, each incline 137 runs progressively further away from the face 13 of the flange 10, with a slope which increases either progressively, in a continuous manner, as has been represented diagrammatically by a dot-and-dash line as 137', or with a sudden variation between two zones 141 and 142, for screwing with clamping and for screwing without clamping respectively, this latter zone being preferably subdivided into two parts 143 and 144 for screwing proper and for approach respectively.

The clamping screwing zone 141 is in all ways comparable to the previously described zone 41 and, in the example depicted, extends helically with a predetermined slope as was said with regard to the clamping screwing zone 41, from an extreme part 146 which is comparatively closer longitudinally to the face 13 of the flange 10 and with which a respective stud 132 interacts when the collar 18, by elastic deformation between the flange 10 and the top-edge face 9, presses without discontinuity on the latter so as to prevent any passage of air between them, as shown in Figure 5, to a transition 147 with the part 143 of the zone 142, a stud 132 bearing in the direction 38 against the zone 141 in the region of this transition 147 corresponding to an elastically relaxed state of the collar 18, which is nonetheless held without longitudinal play between the flange 10 and the top-edge face 9 of the neck 5 of the feeding-bottle 2, as shown in Figure 8. For this purpose, the angular development and slope of the zone 141 may be defined as was said with regard to the zone 41 of the threads 36. Like this zone 41, the zone 141 may have notches 149 for positioning certain positions of the respectively corresponding stud 132, so as to define a certain number of relative positions of the clamping ring 3 and of the feeding-bottle 2 corresponding to predetermined cross-sections of the air inlet passages 26, and a stop-piece 148 may be provided in the region of the extreme part 146 of the zone 141 for preventing, by abutment against a respectively corresponding stud 132, excessive screwing of the ring 3 onto the neck 5 of the feeding-bottle 2, which could result in the collar 18 being damaged.

The screwing part 143 proper of the non-clamping screwing zone 142 may for its part be shaped and placed in position as was said for the part 43 of the zone 42, and is connected by a transition 151 to the approach part 144, which may be dimensioned and placed in position as was said for the approach part 44 and extends as far as an extreme part 152 located in the region of the edge 17 of the skirt 11 of the ring 3.

Naturally, in this case also, the threads 155 have relative to the axis 4 radial dimensions such that some functional play 140, of the same order of magnitude as the functional play 139, is left between them and the external peripheral face 7 of the neck 5 of the bottle 2.

A person skilled in the art will easily understand that this other embodiment of a device according to the invention may experience the same variants as the embodiment described with reference to Figures 1 to 4, just as other variants may also be provided without necessarily leaving the scope of the present invention.

Claims

1. Feeding-bottle device, comprising:
   - a feeding-bottle (2) comprising a neck (5) having a longitudinal axis (4), a transverse, annular, top-edge face (9) and a longitudinal, external, peripheral screwing face (7),
   - a clamping ring (3) comprising a transverse annular flange (10), placed opposite the top-edge face (9) and a longitudinal, internal, peripheral screwing face (12) placed opposite the screwing face (7) of the neck (5),
   - a teat (1) comprising a transverse, flat, annular collar (18), trapped between the top-edge face (9) and the flange (10),

   in which the screwing faces (7, 12) have respective, mutually engaged means (30, 31, 130, 131) for longitudinally screwing the clamping ring (3) onto the neck (5) of the feeding-bottle (2) by relative rotation about the longitudinal axis (4) and in which an assembly formed by the top-edge face (9), the flange (10) and the collar (18) is made so as to open or close, in an adjusted manner, an air inlet passage (26) between the collar (18) and the top-edge face (9) depending, respectively, on the extent by which the clamping ring (3) is screwed onto the neck (5) of the feeding-bottle (2) and the extent by which it clamps the collar (18), longitudinally, between the flange (10) and the top-edge face (9),
   characterised in that one (30, 130) of the screwing means (30, 31, 130, 131) consists of at least one stud (32, 132) and the other (31, 131) of the screwing means (30, 31, 130, 131) consists of at least one incline (37, 137) engaged with the stud (32, 132) and having a variable slope, comparatively milder in a clamping screwing zone (41, 141), engaged with the stud (32, 132) when the clamping ring (3) occupies, with respect to the neck (5) of the feeding-bottle (2), positions in which the collar (18) is longitudinally clamped between the flange (10) and the top-edge face (9), and comparatively steeper in a non-clamping screwing zone (42, 142), engaged with the stud (32, 132) when the clamping ring (3) occupies, with respect to the neck (5) of the feeding-bottle (2), positions in which the collar (18) is trapped without longitudinal clamping between the flange (10) and the top-edge face (9).

2. Device according to Claim 1, characterised in that the stud (32, 132) and the incline (37, 137) are respectively provided in three specimens, which are mutually offset angularly by 120° about the longitudinal axis (4).

3. Device according to either of Claims 1 and 2, characterised in that the incline (37, 137) comprises a stop-piece (48, 148), for stopping the stud (32, 132), terminating the clamping screwing zone (41, 141) at the opposite end to the non-clamping screwing zone (42, 142) and limiting the extent by which the clamping ring (3) is screwed onto the neck (5) of the feeding-bottle (2).

4. Device according to any one of Claims 1 to 3, characterised in that it comprises means (49, 149) for positioning the clamping ring (3) with respect to the neck (5) of the feeding-bottle (2) in relative positions corresponding to the engagement of the incline (37, 137), with the stud (32, 132), by the clamping screwing zone (41, 141).

5. Device according to Claim 4, characterised in that the positioning means (49, 149) comprise notches (49, 149) for the reversible snap-fitting of the stud (32, 132) in the clamping screwing zone (41, 141).

6. Device according to any one of Claims 1 to 5, characterised in that the slope of the incline (37, 137) increases, in the non-clamping screwing zone (42, 142), starting from the clamping screwing zone (41, 141).

7. Device according to Claim 6, characterised in that the slope of the incline (37', 137') varies continuously in the non-clamping screwing zone (42, 142).

8. Device according to Claim 6, characterised in that the incline (37, 137) comprises, in the non-clamping screwing zone (42, 142), two parts (43, 44, 143, 144) in which the slope is respectively constant.

9. Feeding-bottle intended to be part of a device according to any one of Claims 1 to 8, characterised in that its neck (5) comprises the said variable-slope incline (37), on the screwing face (7).

10. Clamping ring intended to be part of a device according to any one of Claims 1 to 8, characterised in that it comprises the said variable-slope incline (137) on its screwing face (12).

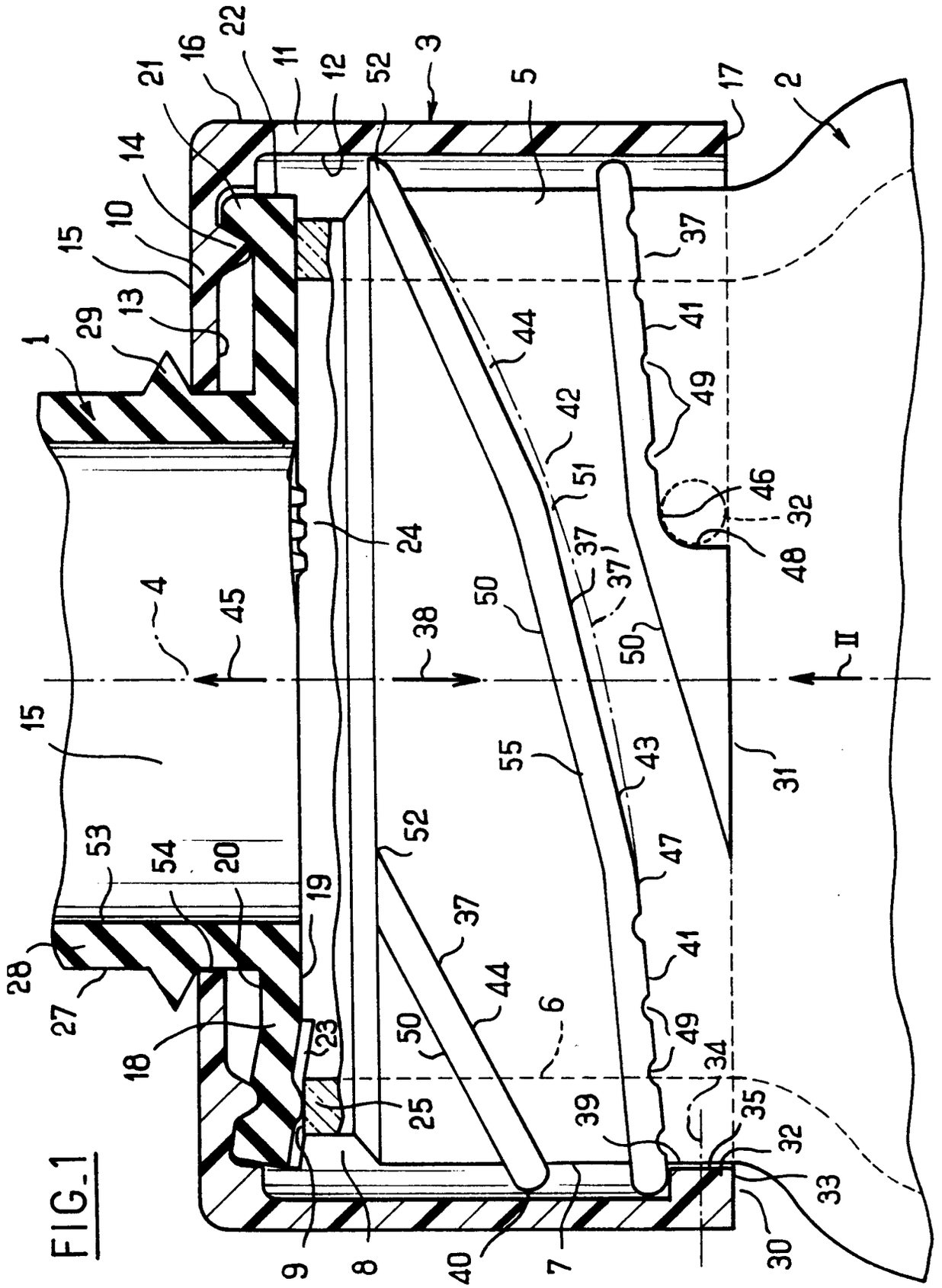
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FIG.1

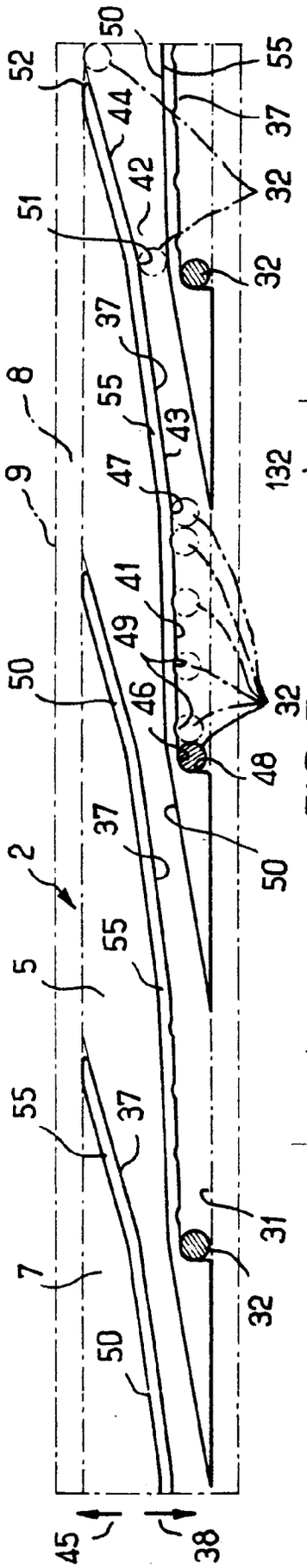

FIG_3

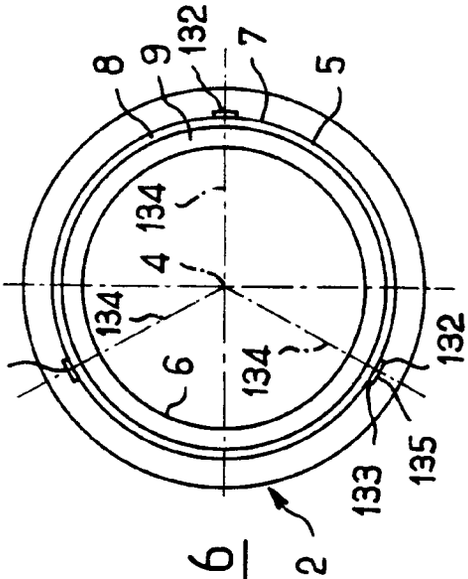

FIG_6

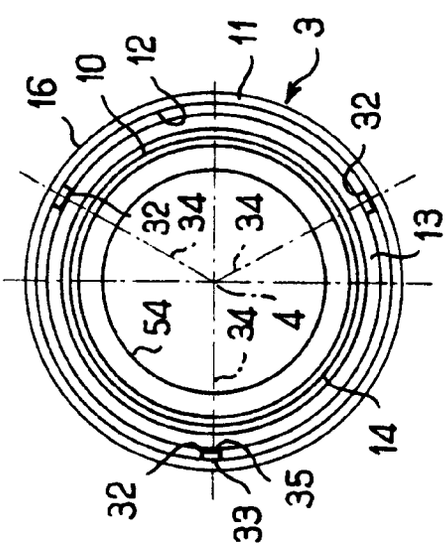

FIG_2

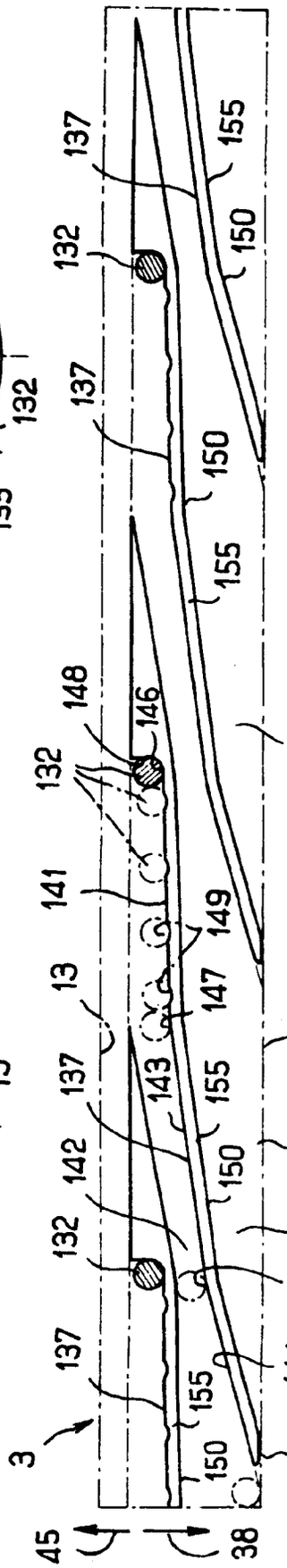

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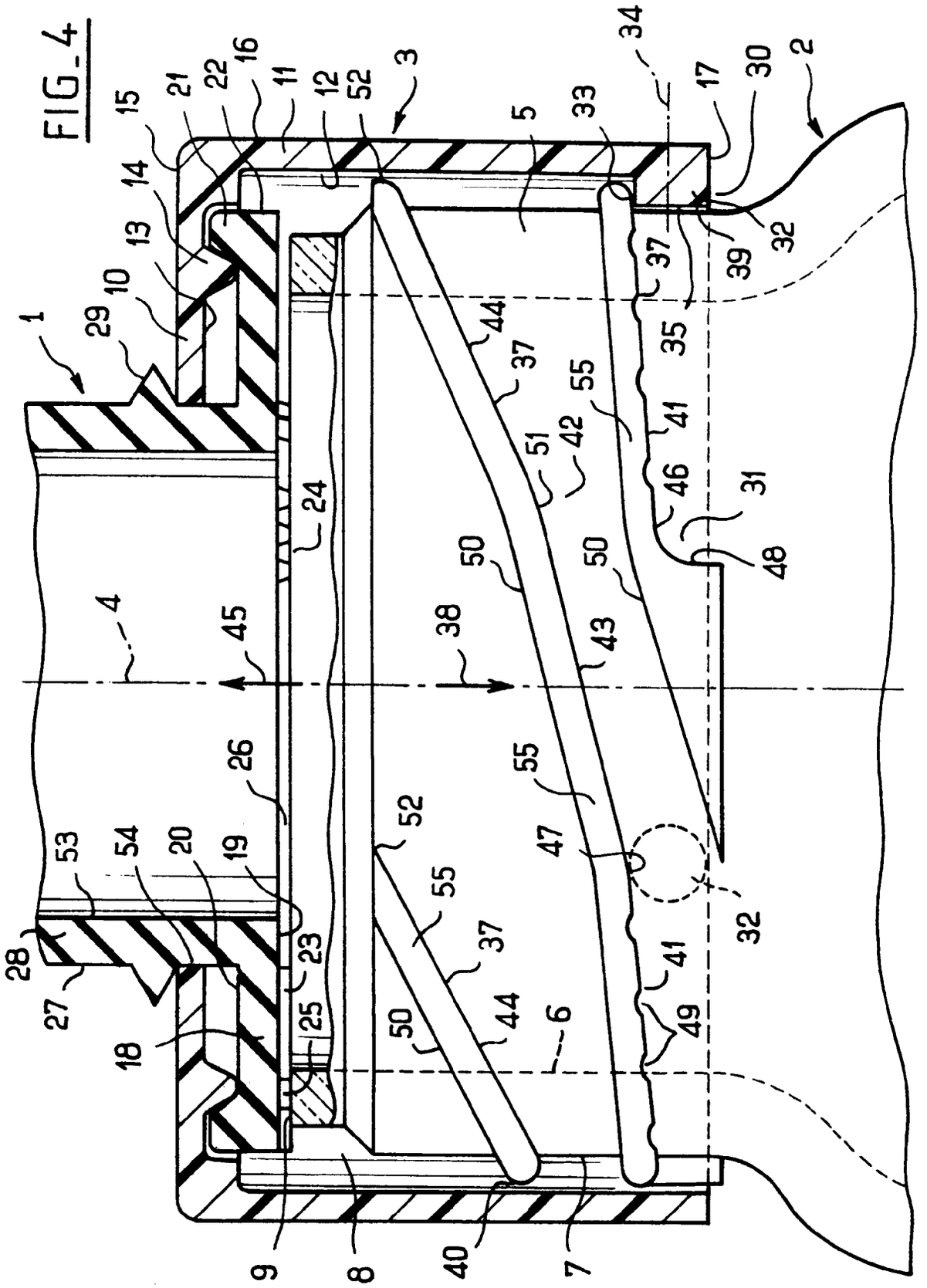
FIG_4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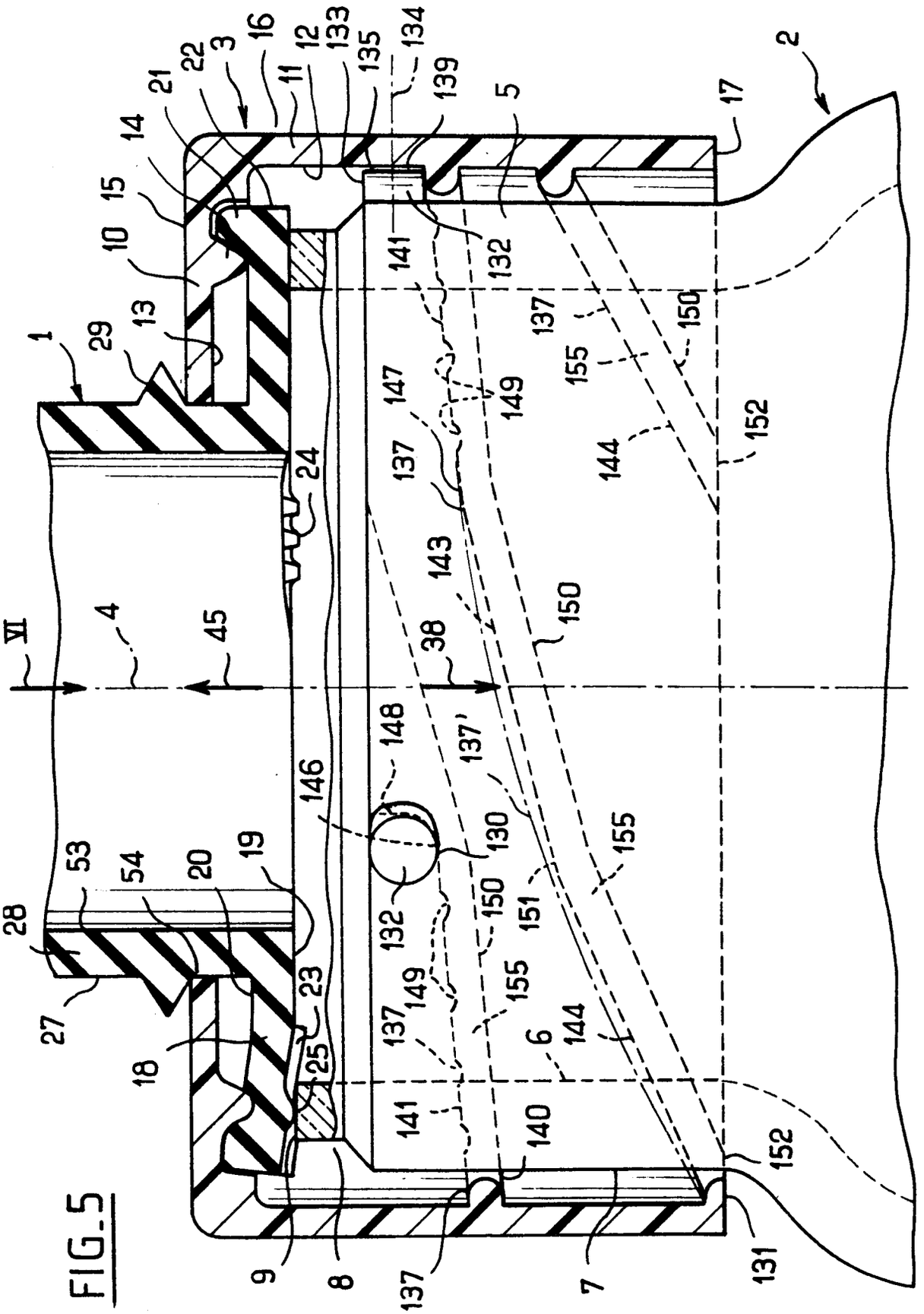
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FIG.5

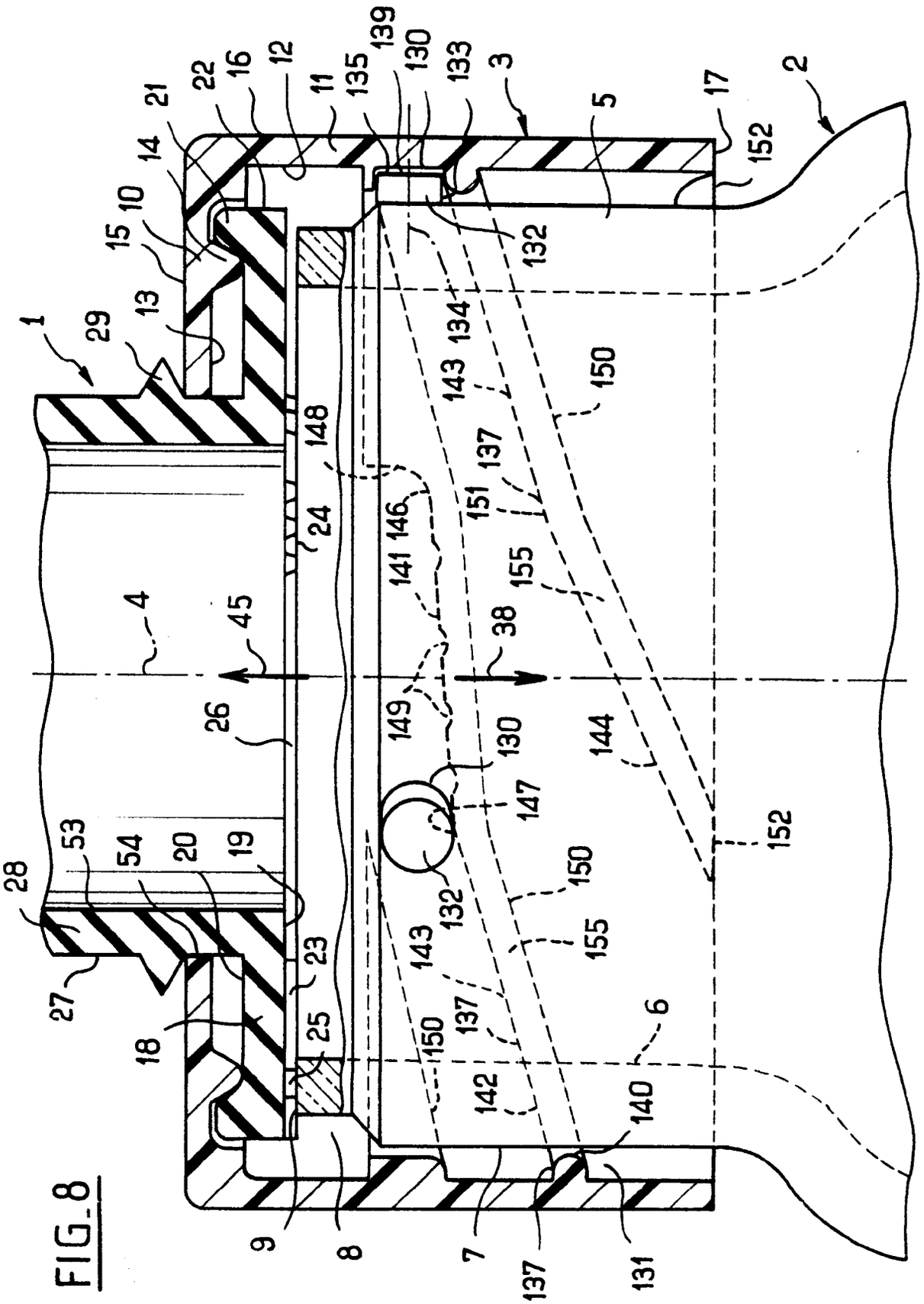
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FIG_8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 40 2207

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)
A,D	EP-A-0 437 148 (JOHNSON & JOHNSON S.A.) * figures *	1-10	A61J11/04 A61J9/04
A	FR-A-421 720 (LATAPIE) * page 2, line 31 - line 35; figures *	1,3	
A	FR-A-776 807 (YAGER)		

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

A61J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10 November 1993	GODOT, T

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