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(54) Title: SELF-ACTUATING CLOSURE MECHANISMS FOR CLOSABLE ARTICLES

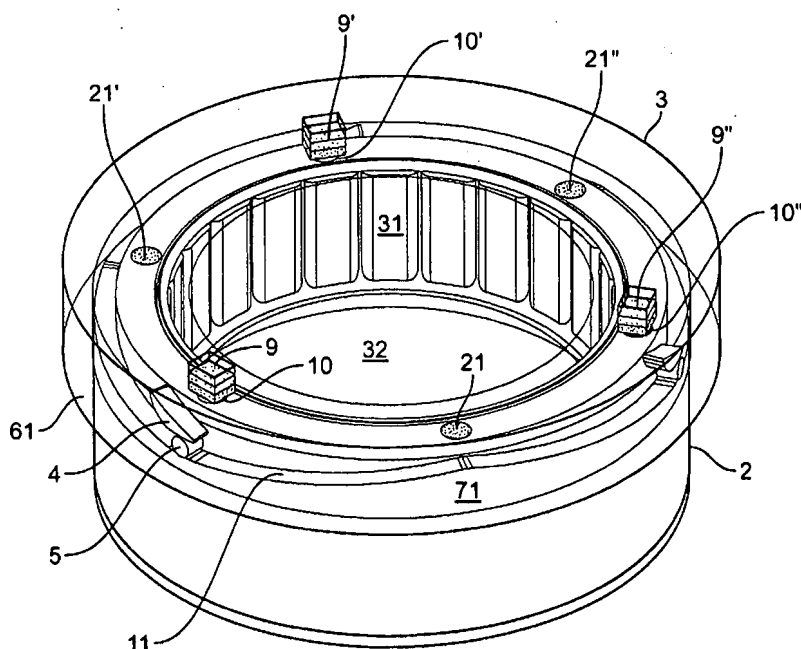


FIG. 1A

(57) Abstract: A self-activating closure mechanism is described, wherein containers (2) and closures (3) have closure elements (9,10), which, upon being brought into proximity to each other, are drawn together and urged into alignment to engage locking members (4,5) by magnets or other mutually attractive or repulsive elements, thereby providing a self-closing assembly.



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## **SELF-ACTUATING CLOSURE MECHANISMS FOR CLOSABLE ARTICLES**

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] This application claims priority based on: (1) U.S. provisional patent application No. 61/087,814, filed August 11, 2008, (2) U.S. Provisional Patent Application No. 61/107,546, filed October 22, 2008, and (3) U.S. Provisional Patent Application No. 61/141,395, filed December 30, 2008. The entire disclosure of each of said U.S. provisional patent applications is incorporated herein by reference.

### **BACKGROUND OF THE INVENTION**

#### **Field of the Invention**

[0002] The invention is in the field of the mechanical arts, and more particularly concerns self-actuating closure mechanisms for articles having components that are mutually closable, more particularly including self-actuating closure mechanisms that may be rotationally engaged, including without limitation embodiments in the form of lidded containers with self-closing mechanisms that operate to automatically mechanically lock and seal the container, no matter how the lid is placed on the container.

#### **Description of the Related Art**

[0003] An example of an article having closable components that may be rotationally engaged is a jar with a threaded lid. Common kitchen jars are often dropped and broken because the lid has not been properly threaded by the previous user.

[0004] Currently, most containers use a standard threaded locking/sealing mechanism or a latch, both of which require specific force to achieve a lock and seal. In the event this required force is not applied properly or fully, two main issues may arise: (1)

the seal is not achieved, thereby potentially compromising the contents of the container, or (2) the lock is not adequate, thereby potentially risking the container and contents should the container be picked up by the lid.

[0005] A prior solution to this problem is to provide containers with a lid having a press-shut clip closure. However, press fit clip lids are only viable for light weight containers and contents. They must be actively pressed shut. Also, most clip lids do not provide an adequate seal.

[0006] Accordingly, a need exists for a self-closing container providing an effective and robust seal for a wide range of contents. More generally, a need exists for more modern closure mechanisms that are self-actuating and convenient, yet provide a strong and positive closure.

## SUMMARY OF THE INVENTION

[0007] It is an object of the invention to provide a self-activating closure that operates in a convenient and straightforward manner and, when incorporated into a container, provides an effective and robust seal for a wide range of container contents. Other desired attributes include:

- The mechanism should preferably close automatically in a smooth and predictable manner, avoiding indefinite, "blocked" or "hung" states in which closure stops short of full engagement.
- The closure should preferably engage in a manner that provides strong, positive resistance to disengagement, when subjected to forces and movements other than a specific, intended disengaging operation.
- The disengaging operation should preferably involve different forces and movements than those resulting from routine storage and handling.
- The closure mechanism should preferably be capable of incorporating a positive seal for solid, liquid and/or gaseous contents.

[0008] In certain embodiments, the present invention achieves these objectives in part by using mutually attractive or repulsive elements such as magnets on the lid and/or the body (canister) of a container to draw the body and lid into engagement, and a mechanical interlock that activates upon engagement and secures the engaged components in a locked position. In these embodiments, the lid simply needs to be placed in proximity of the top of the canister and released. The closure mechanism shown can be adapted to any device having a closure that operates by rotation. By the same principles illustrated, the mechanism can be adapted to non-rotating embodiments, such as closures that linearly slide into place, embodiments with latches, and other closures.

[0009] Other aspects and advantages of the invention will be apparent from the accompanying drawings, and the detailed description that follows.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0010] For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following description taken in conjunction with the accompanying drawings, wherein like reference numerals represent like parts, in which:

[0011] Figure 1 collectively shows various views of an illustrative container in accordance with one embodiment of the invention.

[0012] Figure 1A is a top perspective partially transparent view of the container illustrated throughout the various other views of Figure 1.

[0013] Figure 1B is a partially transparent side elevational view of the container of Figure 1A.

[0014] Figure 1C is a partially transparent top plan view of the container of Figure 1A.

[0015] Figure 1D is a larger partially transparent side elevational view of the container of Figure 1A.

[0016] Figure 1E is a detailed view of area 1E of Figure 1D.

[0017] Figure 1F is a partially transparent side elevational view of the container of Figure 1A, pointing out the section 1H taken for Figure 1H.

[0018] Figure 1G is a partially transparent top plan view of the container of Figure 1A, pointing out the section 1J taken for Figure 1J.

[0019] Figure 1H is a partially transparent cross-sectional side view of the container of Figure 1A.

[0020] Figure 1I is a detailed view of area 1I of Figure 1H.

[0021] Figure 1J is a partially transparent cross-sectional side view of the container of Figure 1A.

[0022] Figure 2 is an exploded parts view of the container of Figure 1A, in a partially transparent top perspective view.

[0023] Figures 3A-3D show another illustrative container in accordance with an alternate embodiment employing different shaped interlock pieces than those employed in Figure 1.

[0024] Figure 4 shows another illustrative container in accordance with an alternate embodiment employing eight mutually attractive magnet pairs.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0025] The following is a description of alternative preferred embodiments of the invention. These embodiments are illustrative only, and the invention, as defined by the claims, is by no means limited to particular examples shown. For example, certain preferred embodiments are described in relation to an implementation with specific magnetic attraction elements, pins, and channels, but it should be appreciated that the disclosure that follows was intended to enable those skilled in the art readily to apply the teachings set forth to other commonly available hardware and materials. The specific features of any particular embodiment should not be understood as limiting the scope of what is claimed.

[0026] The specific embodiments presented herein for purposes of illustrating the invention may be implemented in a rotationally engaging mechanical context concern containers, such as might be used in the kitchen. Of course embodiments other than containers also exist in which the mutually closing members can be engaged with a rotating motion.

[0027] An illustrative article having a rotationally engaged closure in accordance with one embodiment of the invention, in this case article 1 as shown in Figure 1, comprises a body 2 and a lid 3.

[0028] We will sometimes refer herein to the "top" of body 2, and such references will be to the end of body 2 that faces lid 3 in a mutually closed position. Similarly, references to the "bottom" of lid 3 refer to the portion of lid 3 that faces body 2 in a mutually closed position. The term "axis" as used herein will refer to the rotational axis defined when rotating lid 3 to engage/disengage with body 2. "Axial" will mean aligned with the axis, and "radial" and/or "circumferential" will refer to positions in planes perpendicular to the axis.

[0029] In the embodiment illustrated in Figure 1, article 1 is configured as a container with a hollow interior, and is therefore sometimes also referred to as "container 1". Lid 3 is shaped to be engageable with body 2, and rotatable when engaging therewith. Outer lid lip 61 descends circumferentially downward from the top of lid 3 to form a cylindrical structure shaped and sized to drop down upon and receive the upper portion of body 2.

[0030] Figure 2 also depicts container 1, in an exploded parts view.

[0031] There are at least one, and in the case of this embodiment, three, first interlock pieces shaped like first interlock piece 4, fixedly disposed on body 2. In the embodiment shown in Figure 1, first interlock piece 4 is generally in the shape of an inverted circle segment (with some flattening on the arced underside, near area 7, where it is near horizontal), protruding radially from the upper outer circumference of body 2 (or otherwise having a radial extent relative to body 2) and oriented so that

its generally flat upper surface 12 is tilted downward, in this embodiment from left to right when viewed from the side and from outside of container 1. The three first interlock pieces in this embodiment comprise first interlock piece 4 and two other corresponding like pieces (visible but not separately referenced, in Figure 1C), that are likewise fixedly disposed circumferentially around the upper outer circumference of body 2, at approximate 120 degree intervals.

[0032] There is at least one, and in the case of this embodiment, three, second interlock pieces shaped like second interlock piece 5, fixedly disposed on lid 3. In the embodiment shown in Figure 1, second interlock piece 5 has a cylindrical pin shape, oriented radially with respect to the axis of lid 3, and protruding inward from the inner circumference of lid outer lip 61 (or otherwise having a radial extent relative to lid 3). The three second interlock pieces in this embodiment comprise second interlock piece 5 shown in Figure 1, and two other corresponding like pieces (visible but not separately referenced, in Figure 2), likewise fixedly disposed circumferentially on the inner circumference of lid outer lip 61, at approximate 120 degree intervals.

[0033] The cylindrical pin shape of second interlock piece 5 (and its circumferentially corresponding elements) can rotatably engage the underside of first interlock piece 4 (and its circumferentially corresponding elements) when lid 3 is closed on body 2 and rotated relative to body 2. As may be seen in Figure 1E, this rotational engagement has a rotationally defined area of interlock engagement 6, adjacent to the above-mentioned generally flat, horizontal portion (in the area of 7) of the underside of first interlock piece 4, wherein, within the area of interlock engagement 6, an interlocking portion 8 of second interlock piece 5 is disposed against an interlocking portion 7 (of first interlock piece 4 (i.e., a portion within said generally flat, horizontal underside area of first interlock piece 4).

[0034] Further, there is at least one pair of mutually attractive (or repulsive) elements (9, 10), the opposite elements of said pair being disposed respectively on body 2 and lid 3, and

positioned thereon such that their position of strongest attraction to (or repulsion from) each other, as lid 3 rotates relative to body 2, approximately corresponds to the rotational position of lid 3 and body 2 when rotationally positioned in area of interlock engagement 6. In this embodiment, the mutually attractive/repulsive elements are magnets, and preferably strong rare earth magnets. The N/S polarity of the magnets is indicated by light/dark shading (which polarity is immaterial, so long as polarities are consistently treated). In the illustrative embodiment, there are three magnets 9, 9', and 9" circumferentially disposed at approximate 120 degree intervals around lid 3. Opposing magnets 10, 10', and 10" are circumferentially disposed at like intervals and radius on base 2. (Base 2 may also have additional magnets around its upper periphery, for example, magnets 21, 21' and 21", which are N/S-oriented in a direction opposite to the N/S orientation of the other base magnets 10, 10', and 10", so as to repel instead of attract magnets 9, 9', and 9"; such optional, oppositely oriented magnets will be discussed later in this disclosure.) The arrangement of magnets shown here (and like arrangements involving a greater or lesser number of magnets) may of course be reversed between the lid and the base. In the embodiment shown, paired magnets have been used. However, combinations of magnets and unmagnetized magnetic material may alternately be used in an equivalent manner as will be apparent to those of ordinary skill in the art.

[0035] As can be seen in various views in Figure 1, when magnets 9 and 10 are aligned, first and second interlocks 4 and 5 are also in an interlocked position. In the illustrated embodiment, this occurs when all of 4, 5, 9, and 10 are approximately aligned, but it is not necessary that interlock pair 4 and 5 be vertically aligned with magnet pair 9 and 10.

[0036] In addition, there is preferably at least one ramp 11 forming the bottom of an inset running at least partially around the upper outer circumference of body 2. The inner circumferential wall of the inset area above ramp 11 contains first interlock piece 4 as a radial protrusion into said inset. Ramp 11 is inclined relative to the top of body 2 to slope in the direction

of area of interlock engagement 6, and runs beneath first interlock piece 4 in said area of interlock engagement 6, with sufficient clearance to accommodate second interlock piece 5. In this embodiment there are three circumferential ramps, comprising ramp 11 and two other corresponding like ramps (which may be seen in the various views of Figure 1), again at approximate 120 degree intervals. Further in this embodiment (but not necessary to the invention), ramp 11 (and each of the other two corresponding ramps) comprises two sections, one on either side of first interlock piece 4, each section sloped symmetrically about first interlock piece 4, and running toward the underside and beneath first interlock piece 4. These three ramps together define a generally scalloped inset of varying elevational depth around the upper periphery of body 2. As may be implied from the above description, in this embodiment first interlock members 4, etc. protrude from the sides of body 2 into this scalloped inset, and the three areas of maximum ramp depth lie approximately beneath each of first interlock members 4 etc., providing clearance for second interlock piece 5 and its corresponding other two lid interlock pieces.

[0037] Ramp 11 is positioned on body 2 to receive second interlock piece 5 from above as lid 3 is drawn into compression with body 2 from a rotational position in which second interlock piece 5 is approaching a portion of ramp 11 from above ramp 11. Note that the invention will function without ramp 11. However, ramp 11 is preferred, in that it helps to engage the assistance of both gravity and magnetism in translating downward lid motion into rotation in the direction of locking, rather than relying exclusively on the magnets or other attractive/repulsive elements to induce such rotation.

[0038] The respective shapes of interlock pieces 4 and 5 -- in this embodiment, the shape of interlock piece 4 as an inverted generally circle-segment-shaped piece with an underside flatted area, and of second interlock piece 5 as a cylindrical pin -- assist in a smooth closure of lid 3 onto body 2. The respective shapes of upper surface 12 of first interlock piece 4 and lower surface 13 of second interlock piece 5 are such that, in those cases when surfaces 12 and 13 contact each other during closure of lid 3 against

body 2, surfaces 12 and 13 slide against each other when further urged together and rotated with lid 2 and body 3 (respectively). Said sliding is in a direction corresponding to closer engagement of lid 2 and body 3. Said shaping of surfaces 12 and 13 is further such that first interlock piece 4 and second interlock piece 5 slide off of each other at a further position of relative rotation and compression of lid 3 and body 2, above ramp 11 (and then second interlock piece 5 falls onto ramp 11 and proceeds into engagement as otherwise described herein with respect to ramp 11).

[0039] Preferably magnets 9, 9', and 9" will come very close to magnets 10, 10', and 10" at a closure position, but the opposing magnet surfaces preferably should not actually make physical contact. This small separation helps lid 3 maintain positive pressure against base 2 when container 1 is closed, and assists in sealing.

[0040] Base 2 may also have a central opening 32 therein defining an interior space or volume of body 2 (as would normally be the case where article 1 was, for example, a kitchen container having an interior for its contents). Preferably, lid 3 also has cylindrical inner lip 31, preferably fluted to reduce friction, disposed on the bottom of lid 3 and shaped to fit closely within the peripheral wall of central opening 32 of base 2.

[0041] When lid 3 is brought into proximity of body 2, cylindrical inner lip 31 engages the central opening 32 of body 2. Assuming lid 3 and body 2 are approximately upright, when lid 3 is let go of, it will tend to fall (primarily at first in most cases by gravity) toward body 2, preferably guided into a concentric position by cylindrical inner lip 31. As lid 3 gets close to body 2, magnets 9 and 10 (and their corresponding radial counterparts), and/or magnets 9 and 21 (and their corresponding radial counterparts) will get close enough to interact significantly. Magnets 9 and 10 mutually attract, whereas magnets 9 and 21 mutually repel. In either case, the attraction and/or repulsion serves to urge magnets 9 and 10 closer together, and interlock pieces 4 and 5 toward their locked position, and at the same time, draw lid 3 closer to body 2.

[0042] If second interlock piece 5 contacts ramp 11, these forces will tend to pull second interlock piece 5 into locked position under first interlock piece 4. If, on the other hand, in this process second interlock piece 5 comes against the upper surface 12 of first interlock piece 4, second interlock piece 5 will slide down the incline of top surface 12 of first interlock piece 4 and fall onto ramp 11, and again be drawn into locked position under first interlock piece 4. When in locked position, the interlock portion 8 on lower surface 7 of first interlock piece 4, being approximately flat, ensures that the lid remains locked, even if a container with the lid attached on is picked up from the lid.

[0043] The container in this embodiment strongly and positively resists having the lid removed other than by a specific twisting and pulling disengagement motion that rotates second interlock piece 5 out from under and clear of first interlock piece 4 (i.e., against strong magnetic force tending to keep the interlock pieces aligned), and then pulls lid 3 away from body 2 (again, against magnetic force tending to pull the lid and body together). A plain pulling force will not remove lid 2. Nor will a rocking force, lateral force, or a plain twisting force.

[0044] Preferably, repulsive magnets 21, 21' and 22' are disposed at 120 degree intervals circumferentially around body 2, at equal distances centered between magnets 10, 10' and 10". In an embodiment having one or more of these additional magnets, the body magnets are arranged in alternating polarity, to form a N-S-N-S-N-S pattern (in the case of three sets of magnets) around the upper circumference of the body. Preferably, the radial counterparts of ramp 11 intersect, i.e., have their highest points, 71, etc. in positions approximately aligned with magnets 21, 21', and 21"; i.e., at positions where magnets 9, 9', and 9" will encounter approximately maximal repulsive force. This arrangement works especially well to provide a positive, automatic locking action without indefinite states, blockages, "hangs", or dead spots.

[0045] Furthermore, a seal may be provided between lid 3 and base 2. In the illustrated embodiment, such a seal is in the form of O-ring 41, seated at the base of cylindrical inner lip 31 where

it joins lid 3, and against chamfer 42 on base 2 when lid 3 is in closed position on base 2. Flat sealing rings or discs could be used instead of an O-ring. O-ring 41 is dimensioned and placed so that it is approximately optimally compressed for sealing when the assembly of container 1 is in a full locked position.

[0046] Base 2 may further comprise resilient pad 51 on the bottom of base 2. This pad facilitates single-handed use of container 1. The pad provides sufficient friction against a surface such as a table or counter to overcome the attractive force of the magnets when a user twists the lid, so that the user need not necessarily hold the base with the other hand.

[0047] It is not necessary to use three lid magnets. One or more lid magnets, up to any arbitrary number, may be provided. In embodiments of this type, however, where repelling magnets are also used, there should preferably be twice the number of body magnets as there are lid magnets (or vice-versa), so they may be alternating in polarity and equally spaced, with corresponding interlock, and optionally ramp elements for each mutually attracting pair. The illustrated embodiment with three lid magnets and six body magnets is currently preferred.

[0048] Ramp 11 and first and second interlock pieces 4 and 5 and the related structures could be interchanged and/or rearranged as between lid 3 and base 2 of container 1 for equivalent operation. Similarly, lid 3 could be adapted to fit within the central opening 32 of base 2, rather than to fit over the outside top of body 2. Other variations of a similar nature will be apparent to those of ordinary skill in the art.

[0049] There are numerous other embodiments that might be developed for generally rotational closure embodiments in accordance with the principles of the invention.

[0050] For example, in an alternate embodiment, as shown in Figure 3, there are three lid rod magnets 309 radially oriented and positioned in the inner lip 361 of lid 303; body 302 has six sets of ramps 311 with interlock pieces 304 centered over the lowest points of ramps 311 and body magnet 310 radially oriented in the wall of body 302 under interlock piece 304. Thus, in this em-

bodiment, magnets 309 and 310 engage (or repel, as may be the case in a variation of this embodiment) from the side, rather than from the top. Rod magnets 309 do both the jobs of locking pins (5) and lid magnet (9) of the previously discussed embodiment, i.e. the 309 magnets engage with the body ramps 311 and once under the interlock piece 304 provide strong attraction to magnet 310, and thus provide a mechanical lock.

[0051] While the design of the embodiment shown in Figure 3 is generally satisfactory, the incline of the upper surface of first interlock piece 4 of the embodiment shown in Figure 1 has an advantage over the corresponding interlock structure shown in Figure 3 because it avoids a potential "dead spot" in self-closure that exists in the embodiment in the Figure 3 embodiment when the lid 303 is initially placed so that rod magnet 309 is very close to exactly centered over the top of first interlock piece 304, which is approximately level at the topmost portion of its upper surface. The unbroken and continuous incline of the top surface 12 of first interlock piece 4 in the embodiment of Figure 1 avoids this particular situation.

[0052] Figure 4 shows another alternate embodiment having eight pairs of mutually attracting magnets, comprising four pairs 609, 610 in one N-S paired orientation, alternating around the circumference of lid 603 and body 602, with four pairs of magnets 622, 621 oriented in the opposite orientation. The first four pairs 609, 610 are respectively centered over interlocks 604, 605 and the second four pairs 621, 622 are respectively centered over the top-most areas of ramps 611.

[0053] It should be apparent that the various embodiments of the invention may be used for any type of rotating closure not necessarily associated with a cylindrical container, such as a gas tank or other filler cap, vent cap, or the like.

[0054] In addition, the principles of the invention could also be adapted to non-circular geometries, wherein a channel analogous to ramp 11 is linear, and, for example, there are two parallel rows of alternating opposing magnets rather than a circular arrangement.

[0055] Similarly, as mentioned above, in a rotating engagement embodiment, first and second interlock pieces 4 and 5 need not be aligned with magnets 9 and 10, but can be offset at any angle relative to the axis of a circular mechanism or relative to the length of a linear mechanism, so long as positioned so that second interlock piece 5 comes into alignment with first interlock piece 4 when magnets 9 and 10 (or corresponding mutually attractive elements) are aligned, in which case the deepest point of ramp 11 (or corresponding element) would also be moved to align with the lock position defined by the first and second interlock pieces.

[0056] Furthermore, interlocking pieces 4 and 5 could be interchanged with other interlocking elements known to those of skill in the art, including without limitation hooks, latches, interlocking grooves and the like.

[0057] The two embodiments shown in detail here have mutually attractive elements, in this case magnets, disposed differently, in one case to engage along a radius and in another case to engage axially. These are but two of numerous workable arrangements of mutually attractive or repulsive elements, and others that provide both forces to draw the closure pieces together and move them into locking alignment by rotation or sliding will be readily apparent to those of skill in the art. As previously mentioned, combinations of magnets and unmagnetized magnetic material may also be used as an alternative to magnet pairs.

[0058] As explained, a self-actuated closure in accordance with the present invention overcomes the shortcomings of the prior art in many respects. It only requires the placement and release of the lid (or other closing element) in order for it to automatically lock and seal. It does not require manual application of specific force to achieve a lock and seal, and can provide a positive and effective seal for a wide range of containers and contents. It can close automatically in a smooth and predictable manner, avoiding "blocked" or "hung" states in which closure stops short of full engagement. It can engage in a manner that provides strong, positive resistance to disengagement other than by means

of a specific disengaging operation, and the disengaging operation involves different forces and movements than those resulting from routine storage and handling. The closure mechanism is readily capable of incorporating a positive seal for solid, liquid and/or gaseous contents.

[0059] It is apparent, therefore, that the invention meets the objectives set forth above and provides a number of advantages in terms of ease of use and effectiveness, over the prior art. Although the present invention has been described in detail, it should be understood that various changes, substitutions, and alterations may be readily ascertainable by those skilled in the art and may be made herein without departing from the spirit and scope of the present invention as defined by the claims.

We claim:

1. An closable assembly having a self-actuated closure, comprising
  - (a) a body having a round section thereon;
  - (b) a cover having a round section thereon, said round section of said cover being engageable with said round section of said body, being relatively rotatable with respect to said body when engaging therewith, and having an axial position of approximate maximum engagement therewith, said position of approximate maximum engagement being such that, at said position, the axes of said round sections of said cover and said body are approximately aligned;
  - (c) a closure mechanism comprising a first and a second set of mutually interlocking assemblies, wherein the first said interlocking assembly is part of either said body or said cover, and the second said interlocking assembly part of the other of said body or said cover;
  - (d) said first interlocking assembly comprising at least one first interlock piece having a radial extent with respect to the round section of the cover or body of which it is a part;
  - (e) said second interlocking assembly comprising at least one second interlock piece having a radial extent with respect to the round section of the cover or body of which it is a part;
  - (f) said first and second interlock pieces being respectively positioned on said first interlock assembly and said second interlock assembly such that a radially extending portion of said first interlock piece is engageable with said a radially extending portion of said second interlock piece at about said axial position of approximate maximum engagement, said engagement of said first and second interlock pieces further defining an approximate rotational position of engagement;

- (g) said cover and said body each further comprising at least one member of at least one pair of mutually attractive or repulsive elements;
  - (h) said mutually attractive or repulsive elements being respectively positioned on said body and said cover so as to draw said body and said cover into mutual engagement when said body and said cover are brought into proximity of each other; and
  - (i) said mutually attractive or repulsive members being further respectively positioned on said body and said cover so that upon reaching approximately their closest position relative to each other upon said engagement, said cover and said body are relatively positioned angularly at about said approximate rotational position of engagement of said first and second interlock pieces.
2. The assembly of claim 1, wherein said first interlocking assembly further comprises at least one ramp extending at least partially circumferentially around said round section, said ramp sloping from a position proximate the end of said first interlocking assembly that receives said second interlocking assembly (which end is considered as its top), to a position beneath said first interlock piece (relative to said top).
  3. The assembly of claim 1, wherein said first interlock piece is generally shaped as an inverted circle segment, wherein the lower surface of said segment (relative to said top) deviates from circularity in one part by having a relatively flat approximately horizontal section thereat (relative to said top), and wherein the top surface of said segment (relative to said top) slopes downward (relative to said top).
  4. The assembly of claim 1, wherein said second interlock piece is generally shaped as a cylindrical pin.
  5. The assembly of claim 1, wherein said second interlock assembly further comprises a generally circularly shaped guide lip concentric with said round section of the body or cover to which it is attached, said guide lip having a diameter

adapted to fit within or without the round section of the other of said body or cover.

6. The assembly of claim 5, wherein the first interlock piece is in accordance with claim 3 and the second interlock piece is in accordance with claim 4.
7. The assembly of claim 1, wherein said mutually attractive or repulsive elements comprise at least one magnet.
8. The assembly of claim 7, wherein said at least one magnet comprises a rare earth magnet.
9. The assembly of claim 7, wherein said at least one magnet comprises at least one magnet in said cover and at least one mutually attracting magnet in said body.
10. The assembly of claim 7, further comprising at least one unmagnetized element that is magnetically attracted to a magnet.
11. The assembly of claim 9, further comprising at least one additional magnet in said cover or said base, said additional magnet arranged to be mutually repulsive with at least one of said attracting magnets on the other of said cover or said base, and to be approximately furthest from said at least one attracting magnet at about said approximate rotational position of engagement of said first and second interlock pieces.
12. The assembly of claim 9, wherein said magnets comprise a plurality of pairs of mutually attracting magnets on each of said cover and said base, and wherein said first and said second interlock assemblies comprise a corresponding additional respective first and second interlock piece corresponding to each additional magnet pair, wherein the engagement of the respective pairs of first and second interlock pieces approximately rotationally coincide, and wherein each said magnet pair is in approximate mutual rotational alignment at about said approximate rotational position of engagement of said first and second interlock pieces.
13. The assembly of claim 12 further comprising a number of repulsively oriented magnets equal to the number of pairs of

said mutually attracting magnets, said repulsively oriented magnets being placed in alternating positions with said mutually attracting magnets on said cover or said base and wherein each said repulsively oriented magnet is in approximate mutual rotational position of furthest disalignment with said at least one attracting magnet on the other of said cover or said base at about said approximate rotational position of engagement of the said first and second interlock pieces.

14. A self-closing container comprising

- (a) a body;
- (b) a lid shaped to be engageable with said body, and rotatable when engaging therewith, said lid being regarded as being above said body for purposes of defining the orientation of the elements hereinafter recited;
- (c) at least one first interlock piece fixedly disposed on said body;
- (d) at least one second interlock piece fixedly disposed on said lid, said second interlock piece being positioned on said lid and shaped to rotatably engage said first interlock piece when said lid is closed on said body and rotated relative to said body, said rotational engagement having a rotationally defined area of interlock engagement, wherein, within said area of interlock engagement, an interlocking portion of said second interlock piece is disposed against an interlocking portion of said first interlock piece, and beneath said interlocking portion of said first interlock piece;
- (e) at least one pair of mutually attractive (or repulsive) elements, the opposite elements of said pair being disposed respectively on said body and said lid, and positioned thereon such that their position of strongest attraction to (or repulsion from) each other, as said lid rotates relative to said body, approximately corresponds to the rotational position of said lid and said body when positioned in said area of interlock engagement; and
- (f) at least one ramp formed on said body, each such ramp corresponding to each of said at least one first inter-

lock pieces, inclined relative to the direction of said lid to slope in the direction of said area of interlock engagement, and positioned on said body to receive said second interlock piece from above as said lid is drawn into compression with said body from a rotational position in which said second interlock piece is approaching a portion of said ramp from above said ramp;

- (g) wherein an upper surface of said first interlock piece and a lower surface of said second interlock piece are each further shaped such that (a) said surfaces are slidable against each other in the direction corresponding to closer engagement of said lid and said body, in those cases in which said surfaces contact each other during closure of said lid against said body, and (b) such that said first interlock piece and said second interlock are slidable slide off of and out of contact with each other at a further position of relative rotation and compression of said lid and said body, above said ramp.

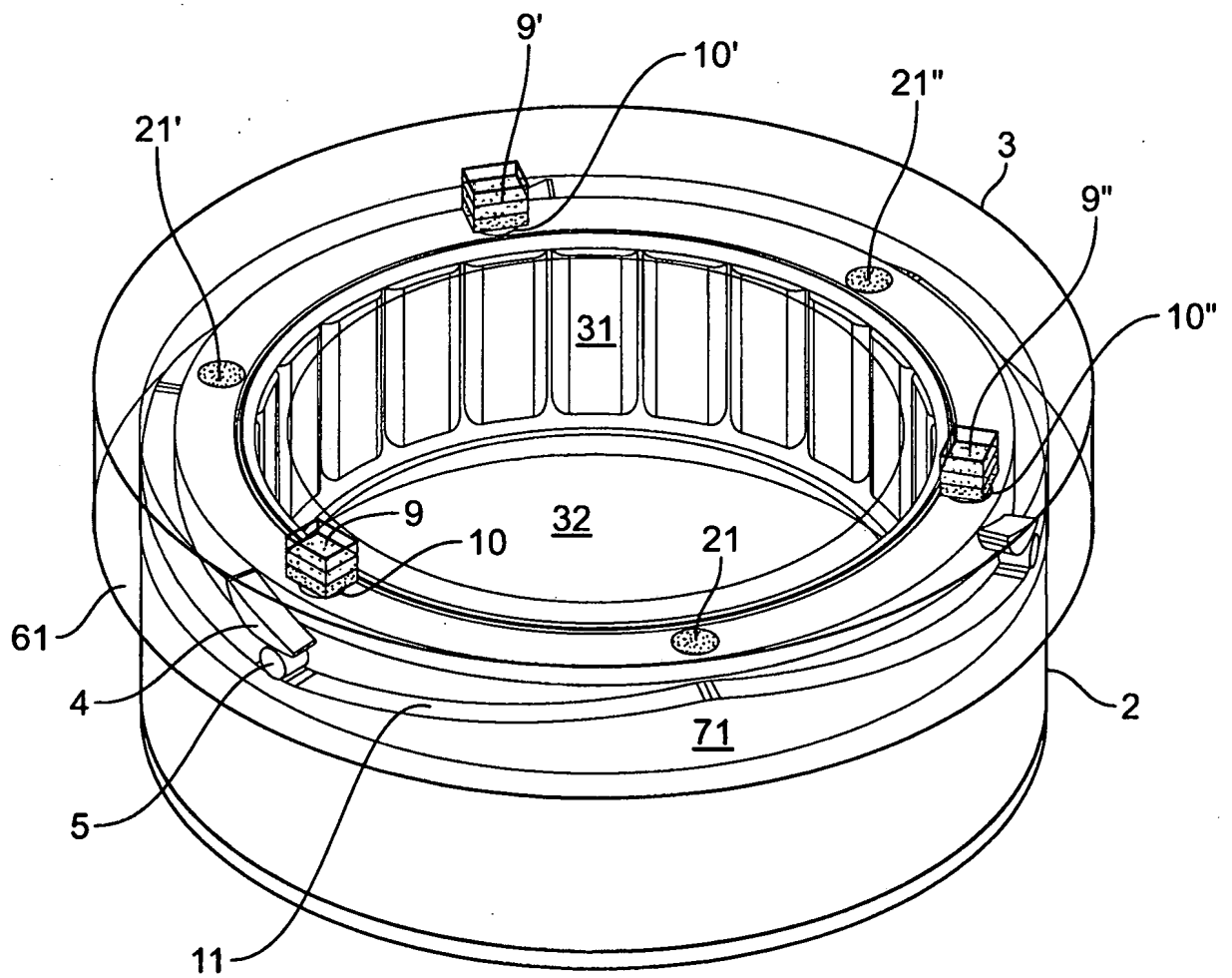


FIG. 1A

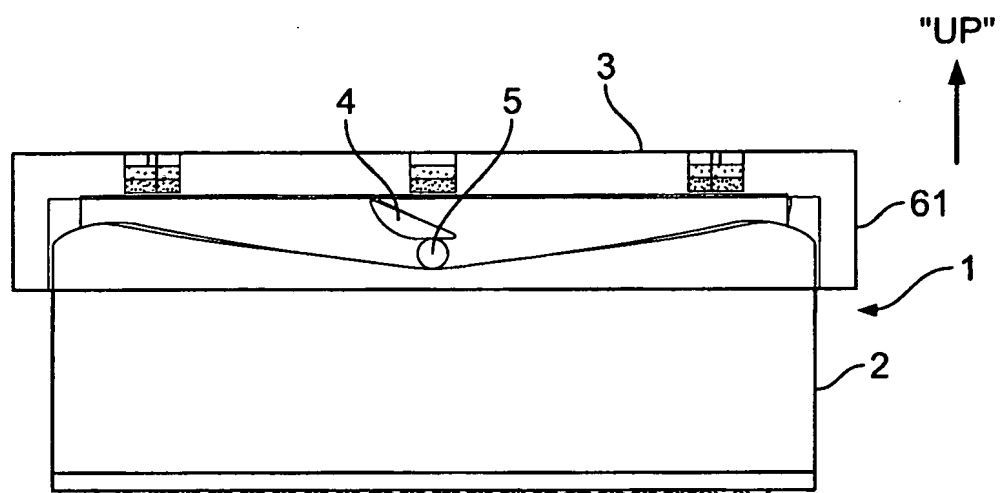


FIG. 1B

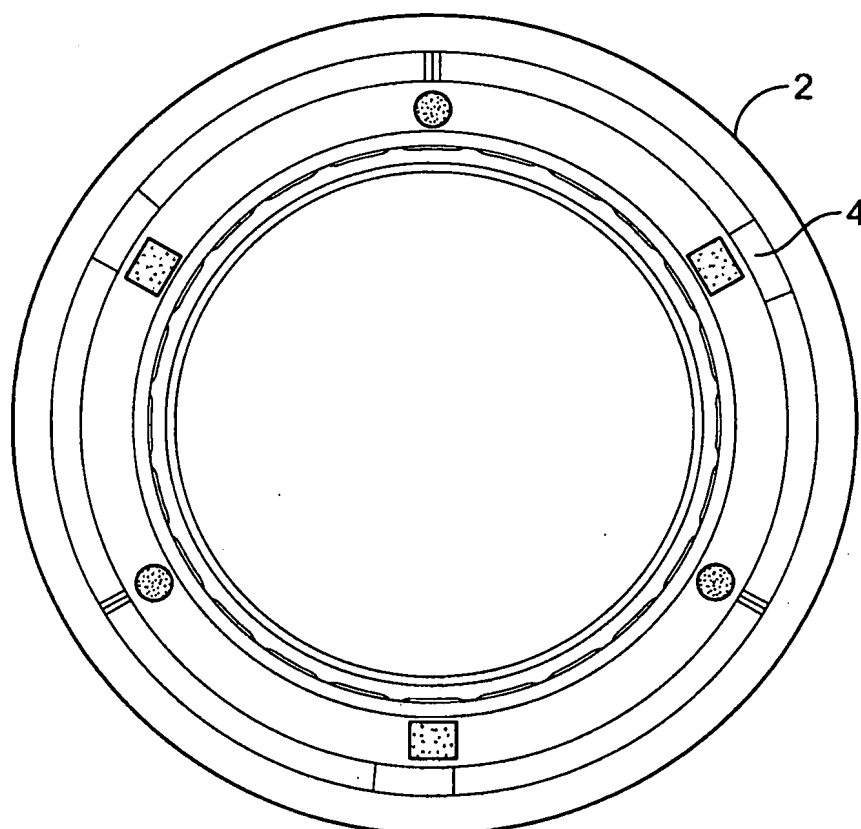


FIG. 1C

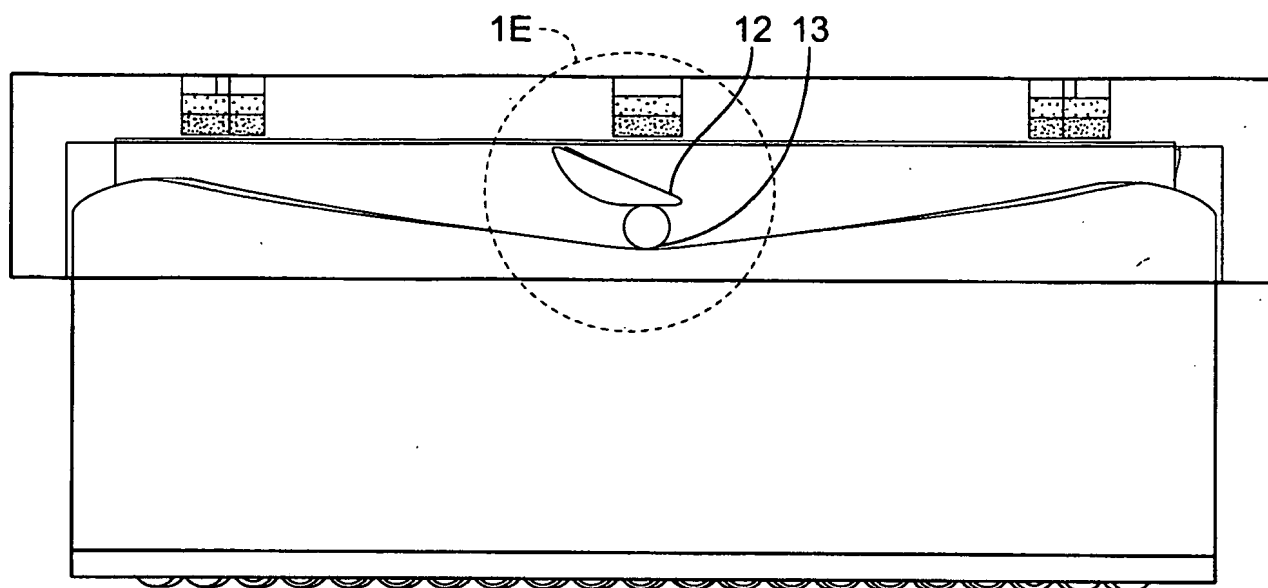


FIG. 1D

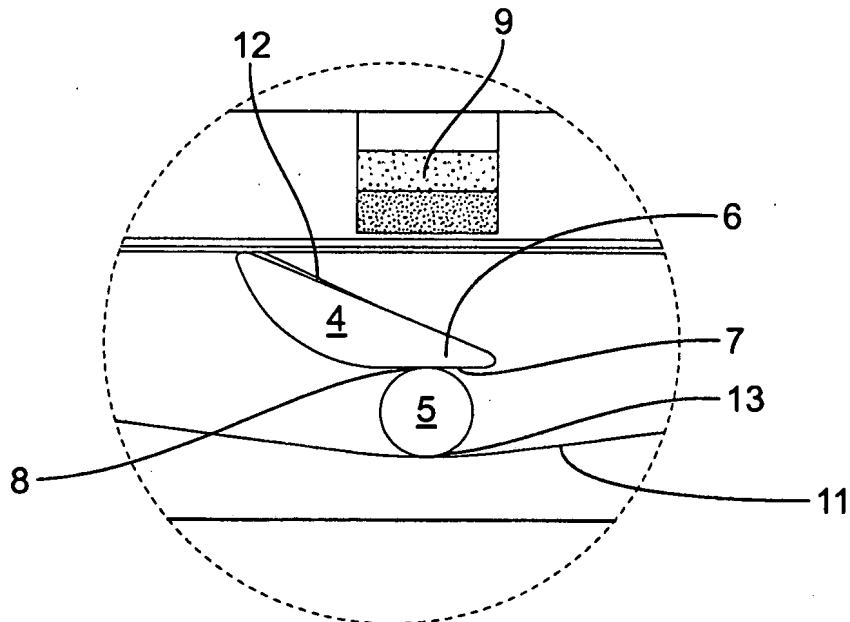
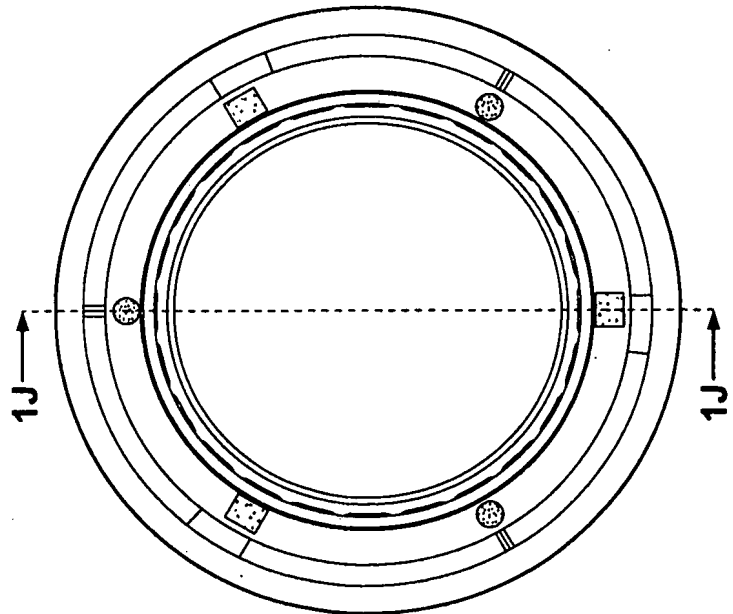
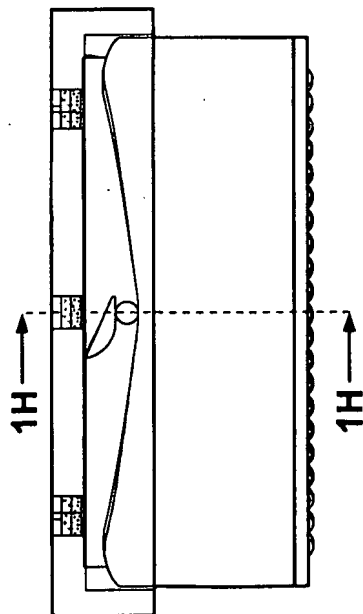
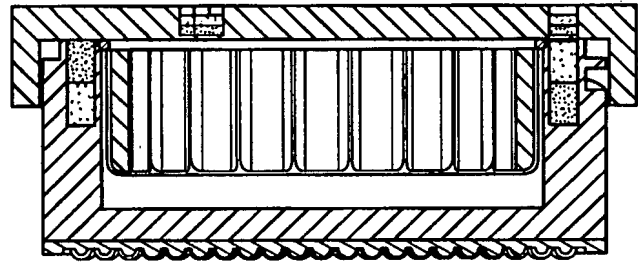
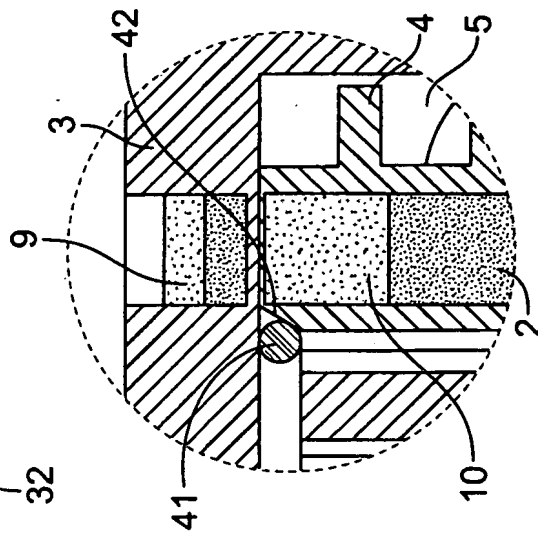
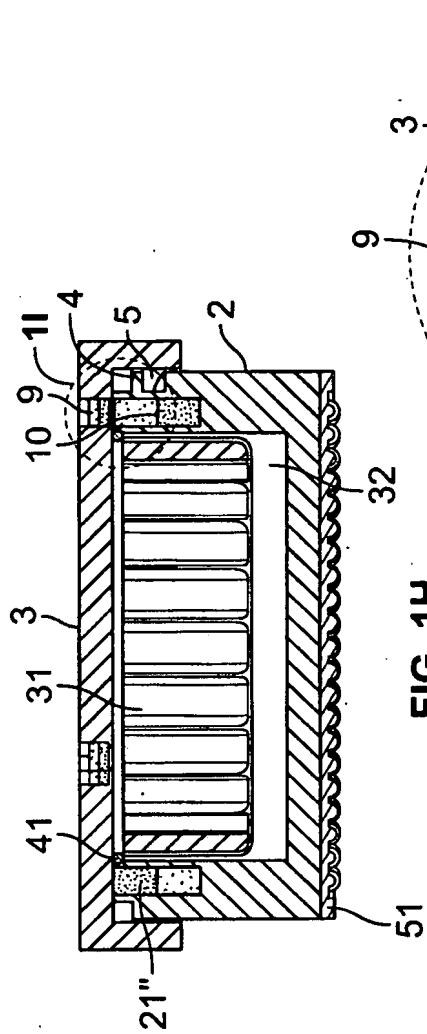


FIG. 1E



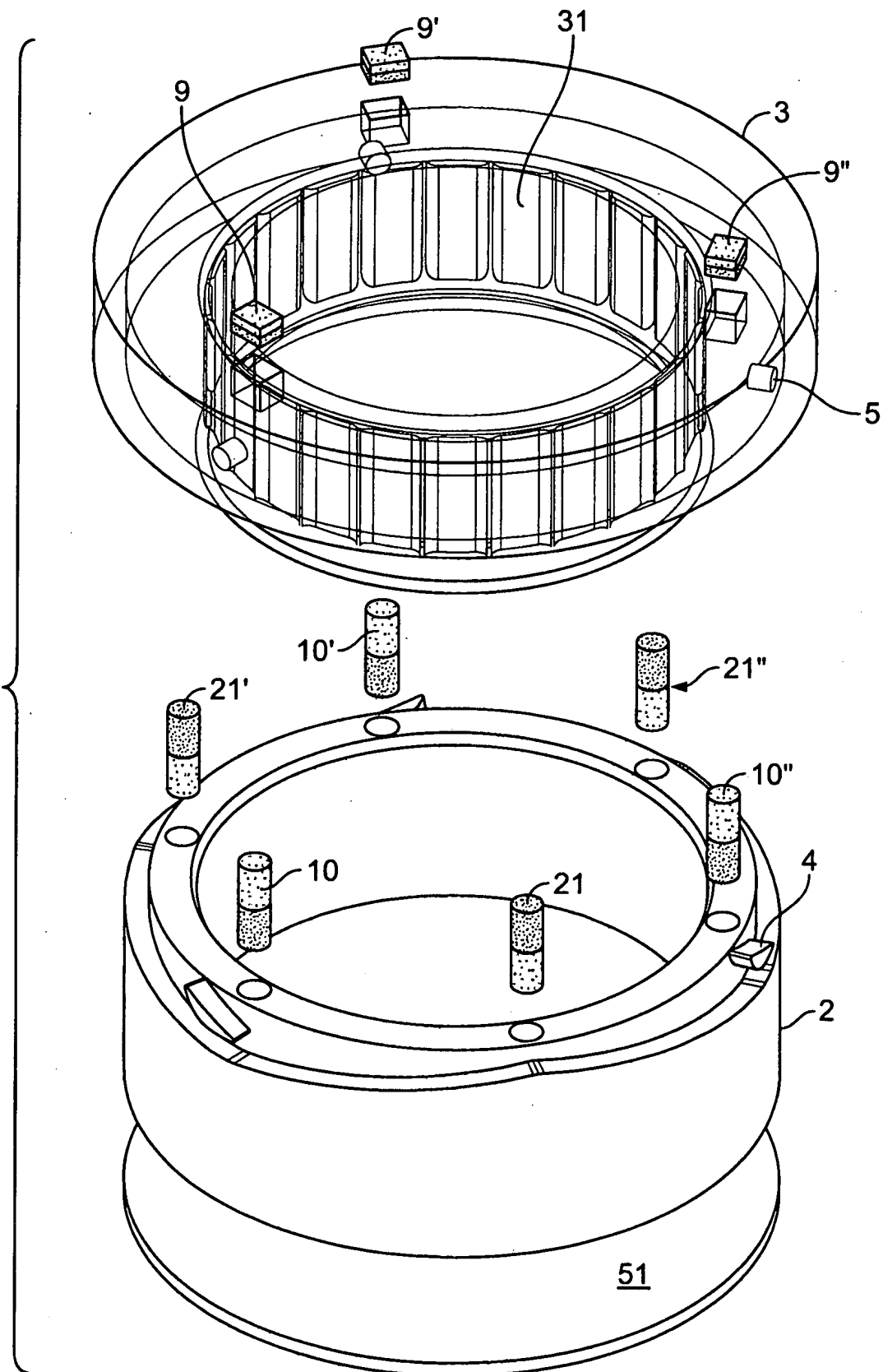


FIG. 2

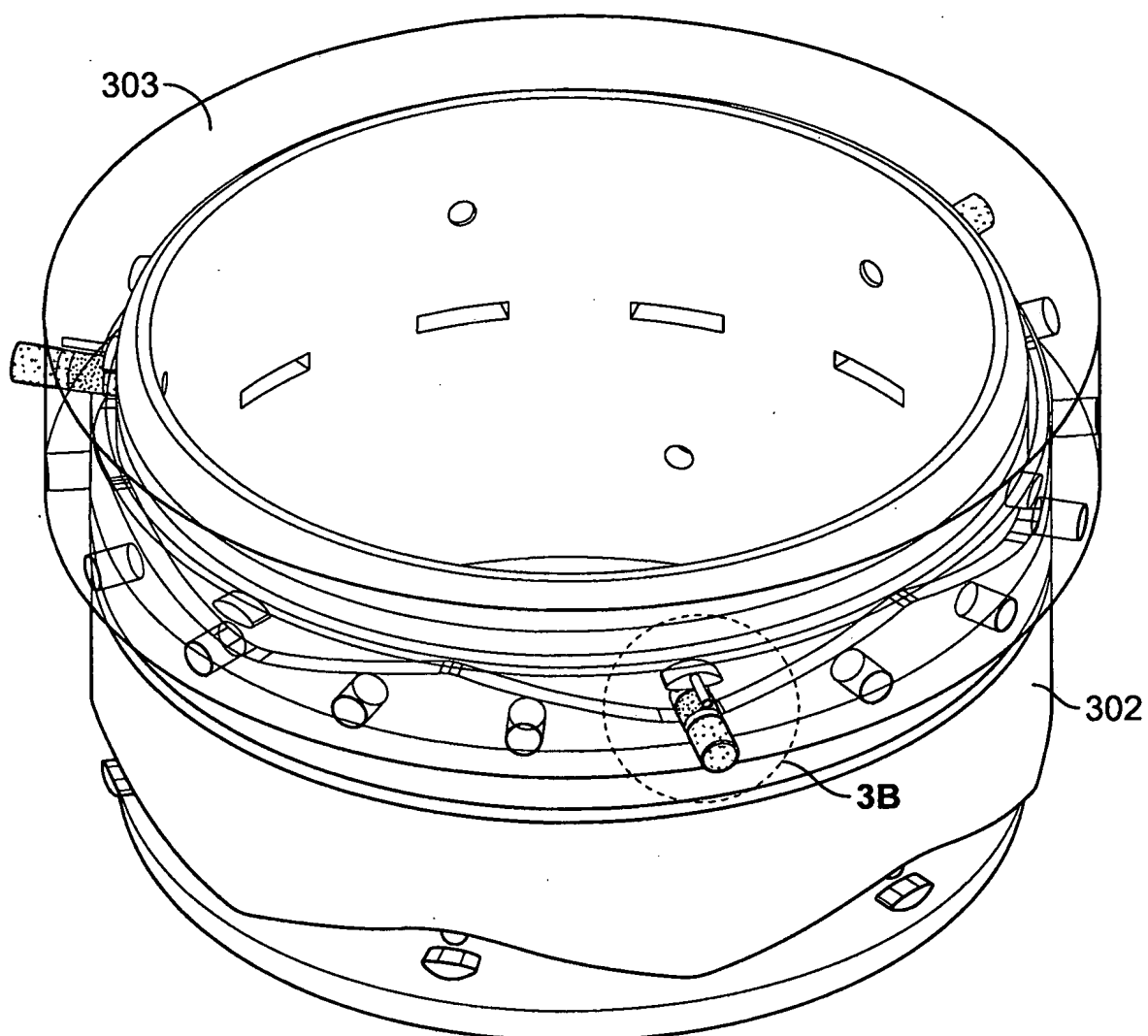


FIG. 3A

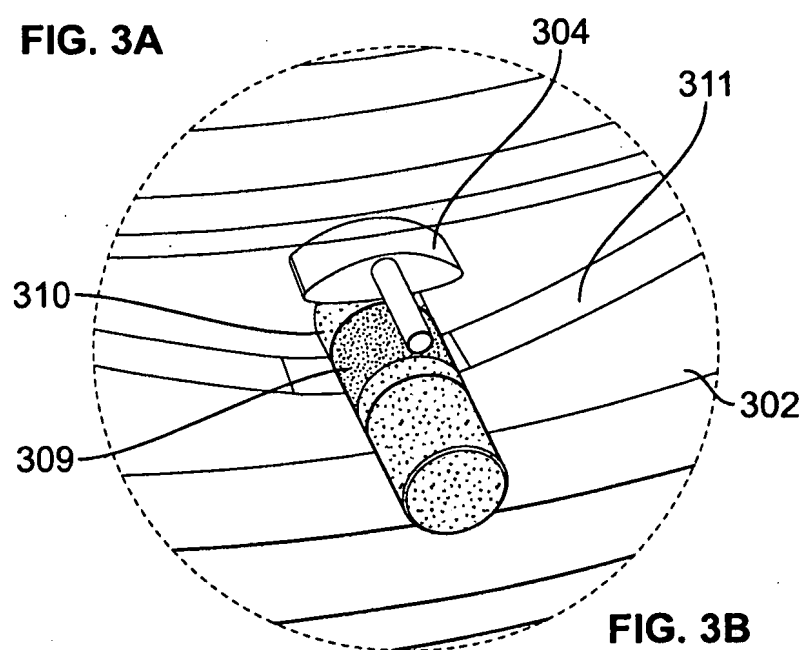


FIG. 3B

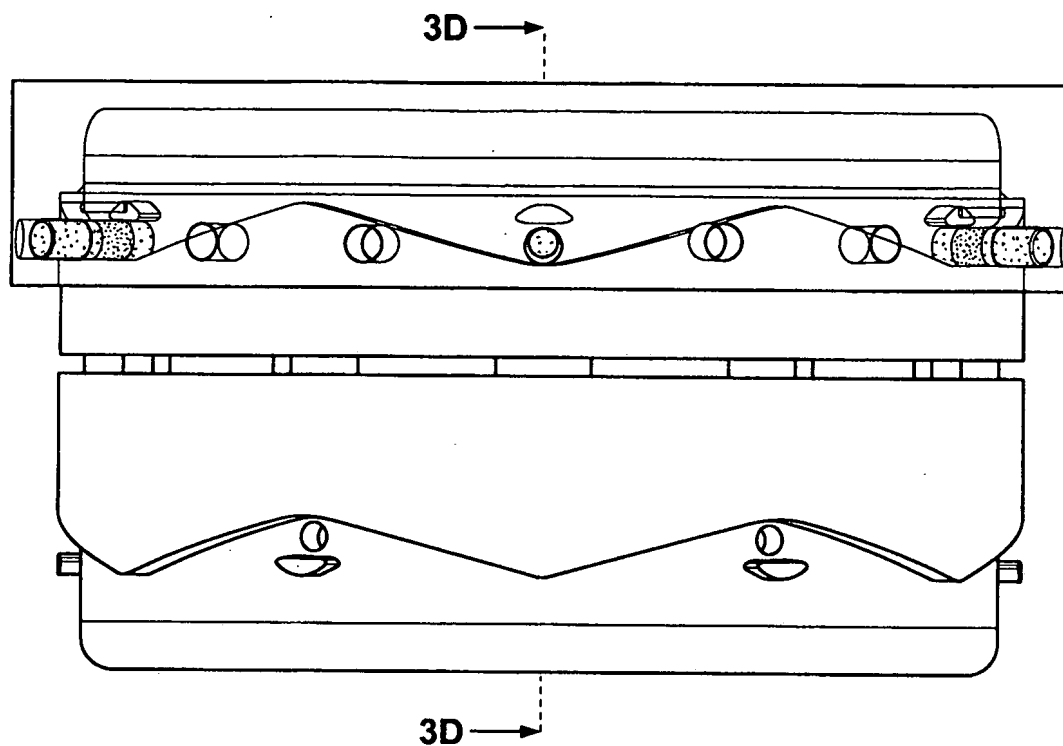


FIG. 3C

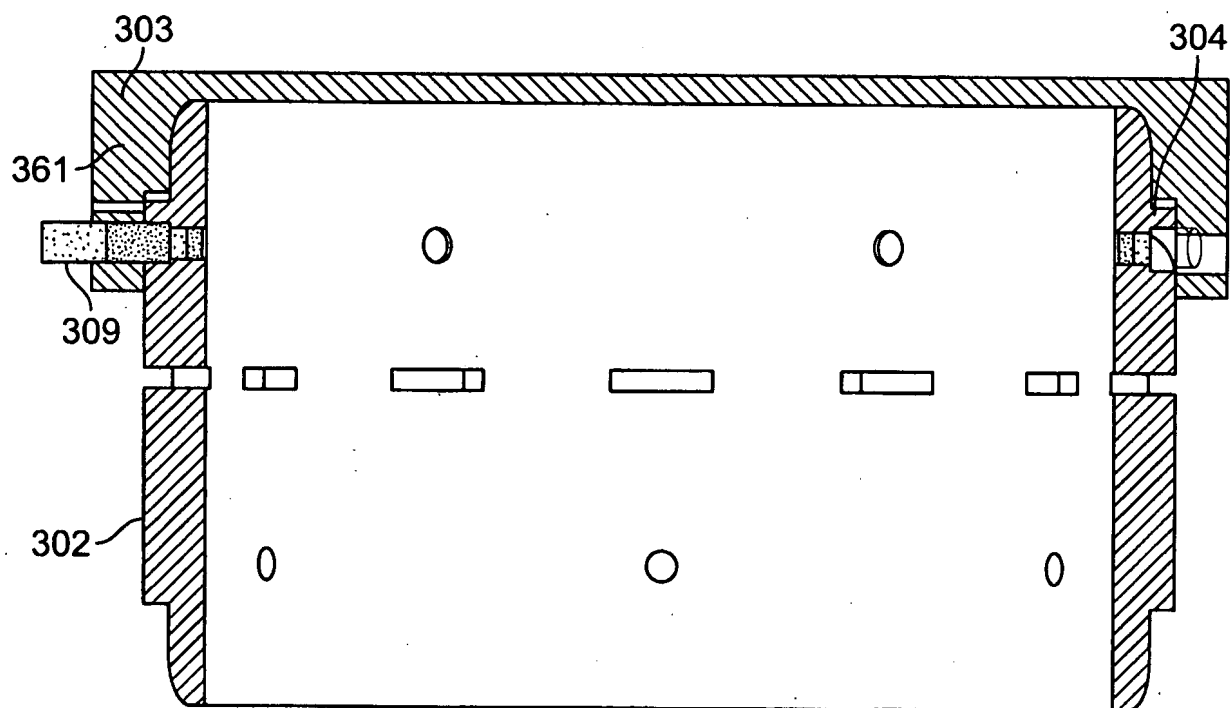


FIG. 3D

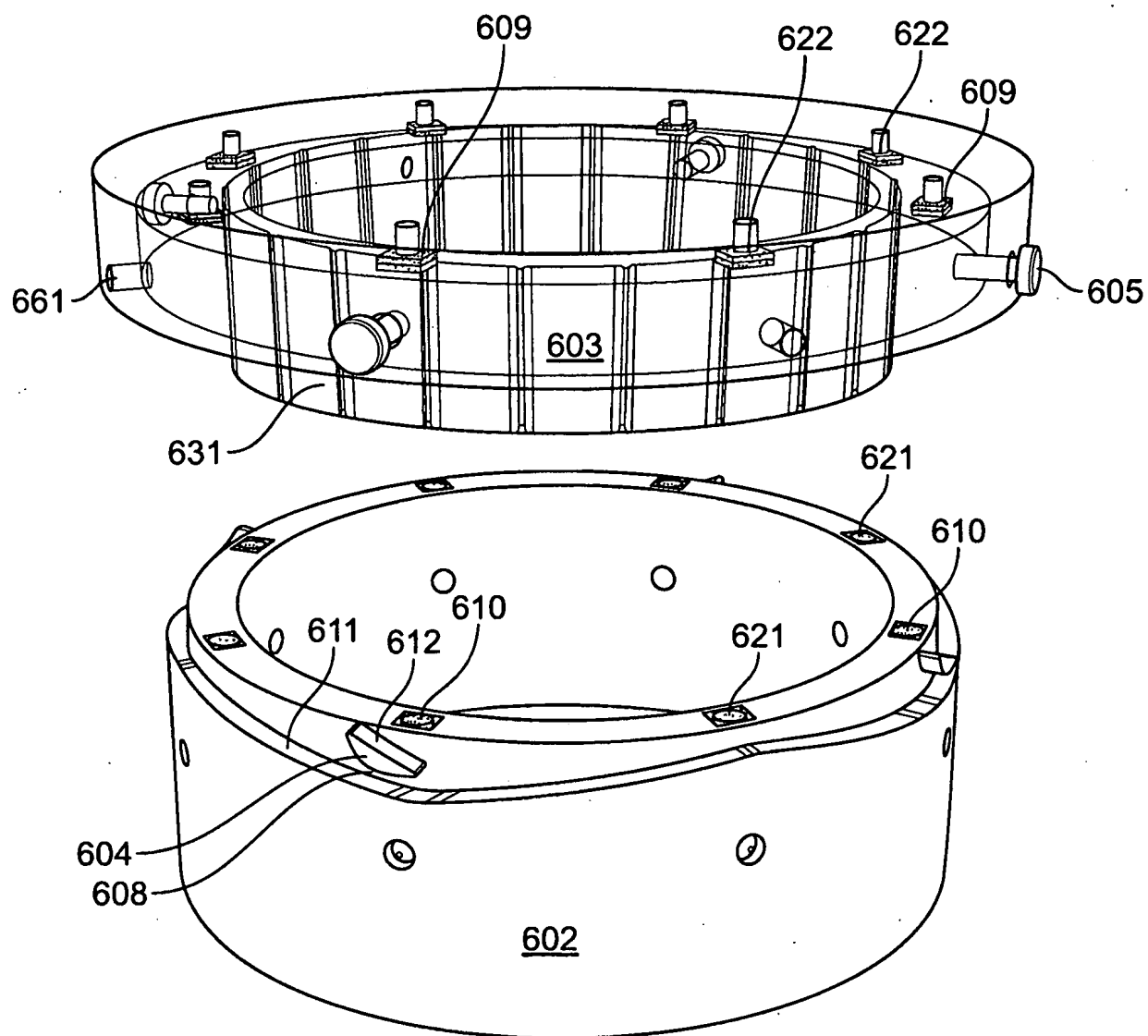


FIG. 4

## INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2009/006349

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. B65D43/02 B65D50/06

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages              | Relevant to claim No. |
|-----------|-------------------------------------------------------------------------------------------------|-----------------------|
| A         | DE 20 64 615 A1 (KEELERIC)<br>23 December 1971 (1971-12-23)<br>claims; figures                  | 1,14                  |
| A         | CH 658 438 A5 (SASEB AG)<br>14 November 1986 (1986-11-14)<br>abstract; figures                  | 1,14                  |
| A         | EP 0 630 823 A1 (CORONET WERKE GMBH [DE])<br>28 December 1994 (1994-12-28)<br>abstract; figures | 1,14                  |
| A         | FR 2 623 166 A1 (TOLILA PIERRE [ES])<br>19 May 1989 (1989-05-19)<br>abstract                    | 1,14                  |



Further documents are listed in the continuation of Box C.



See patent family annex.

## \* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

9 December 2009

Date of mailing of the international search report

17/12/2009

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
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 Fax: (+31-70) 340-3016

Authorized officer

Serrano Galarraga, J

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2009/006349

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date      |
|-------------------------------------------|---------------------|----------------------------|--------------------------|
| DE 2064615                                | A1                  | 23-12-1971                 | NONE                     |
| CH 658438                                 | A5                  | 14-11-1986                 | IT 1145181 B 05-11-1986  |
| EP 0630823                                | A1                  | 28-12-1994                 | DE 9309236 U1 07-10-1993 |
| FR 2623166                                | A1                  | 19-05-1989                 | NONE                     |

From the INTERNATIONAL BUREAU

**PCT**NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

To:

HOARTON, Lloyd  
Forresters  
Forresters House  
52 Bounds Green Road  
London, N11 2EY  
ROYAUME-UNI

Date of mailing (day/month/year)

04 February 2011 (04.02.2011)

Applicant's or agent's file reference

M34880-LDH/ns

## IMPORTANT NOTIFICATION

International application No.

PCT/IB2009/006349

International filing date (day/month/year)

23 July 2009 (23.07.2009)

## 1. The following indications appeared on record concerning:

☒ the applicant☐ the inventor☐ the agent☐ the common representative

Name and Address

State of Nationality

State of Residence

Telephone No.

Facsimile No.

E-mail address

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person☐ the name☐ the address☐ the nationality☐ the residence

Name and Address

State of Nationality

State of Residence

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2 kleomenous Str.

1061 Nicosla

Cyprus

Telephone No.

Facsimile No.

E-mail address

☐ Notifications by e-mail authorized

## 3. Further observations, if necessary:

The person identified in Box 2 is now recorded as applicant for all designated States except the United States of America. HAJICHRISTOU Louis and Christiana are now recorded as applicant for the United States of America only and inventor for all designated States.

## 4. A copy of this notification has been sent to:

☐ the receiving Office☐ the International Searching Authority☐ the Authority(ies) specified for supplementary search☐ the International Preliminary Examining Authority☒ the designated Offices concerned☐ the elected Offices concerned☐ other:

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(51) Int. Cl.

(22) 申请日 2009. 07. 23

B65D 43/02 (2006. 01)

B65D 50/06 (2006. 01)

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61/087, 814 2008. 08. 11 US

61/107, 546 2008. 10. 22 US

61/141, 395 2008. 12. 30 US

(85) PCT申请进入国家阶段日

2011. 03. 31

(86) PCT申请的申请数据

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W02010/018431 EN 2010. 02. 18

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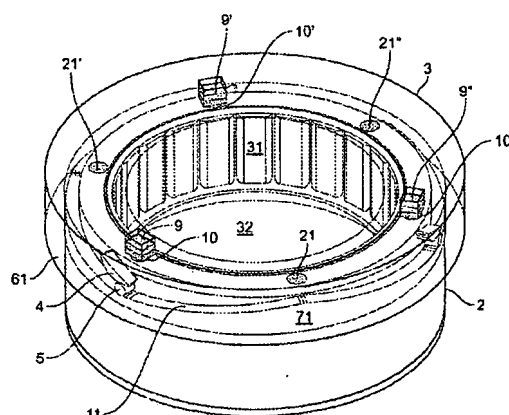
权利要求书 3 页 说明书 7 页 附图 9 页

(54) 发明名称

用于可闭合物品的自驱动封盖机构

(57) 摘要

本发明描述了自驱动封盖机构, 其中, 容器 (2) 和封盖 (3) 具有封盖元件 (9, 10), 它们在彼此靠近时通过磁体或其它相互吸引或排斥元件被拉动到一起并且被推动对准以接合锁紧构件 (4, 5), 从而提供自闭合组件。



1. 一种具有自驱动封盖的可闭合组件,包括:

(a) 在其上具有圆形部分的主体;

(b) 在其上具有圆形部分的盖子,所述盖子的所述圆形部分能与所述主体的所述圆形部分接合,在与之接合时能相对于所述主体旋转,并且具有与之大致最大接合的轴向位置,所述大致最大接合的位置设置成使得在所述位置处,所述盖子的所述圆形部分的轴线和所述主体的所述圆形部分的轴线大致对准;

(c) 包括第一和第二互锁组件组的封盖机构,其中,第一互锁组件是所述主体或所述盖子的一部分,第二互锁组件是所述主体或所述盖子中另一个的一部分;

(d) 所述第一互锁组件包括至少一个第一互锁件,所述第一互锁件相对于包括其的所述盖子或主体的圆形部分具有径向延伸长度;

(e) 所述第二互锁组件包括至少一个第二互锁件,所述第二互锁件相对于包括其的所述盖子或主体的圆形部分具有径向延伸长度;

(f) 所述第一互锁件和第二互锁件分别定位在所述第一互锁组件和所述第二互锁组件上,以使得在所述大致最大接合的轴向位置附近,所述第一互锁件的径向延伸部分能与所述第二互锁件的径向延伸部分接合,所述第一互锁件和第二互锁件的所述接合还限定了大致旋转接合位置;

(g) 所述盖子和所述主体每一个还包括至少一对相互吸引或排斥元件中的至少一个构件;

(h) 所述相互吸引或排斥元件分别定位在所述主体和所述盖子上,从而在所述主体和所述盖子彼此靠近时将所述主体和所述盖子拉动成相互接合;和

(i) 所述相互吸引或排斥构件还分别定位在所述主体和所述盖子上以使得在实现所述接合时,在大致达到其相对于彼此最接近位置的情况下,在所述第一互锁件和第二互锁件的所述大致旋转接合位置附近,所述盖子和所述主体在角度上相对定位。

2. 如权利要求1所述的组件,其中,所述第一互锁组件还包括围绕所述圆形部分至少部分地周向延伸的至少一个斜面,所述斜面从靠近接收所述第二互锁组件的所述第一互锁组件的端部(所述第一互锁组件的端部称作其顶部)的位置向位于所述第一互锁件下面的位置(相对于所述顶部)倾斜。

3. 如权利要求1所述的组件,其中,所述第一互锁件大体成形为倒圆弓形,其中,所述倒圆弓形的下表面(相对于所述顶部)通过在该处具有相对平坦的大致水平部分(相对于所述顶部)而使一部分不为圆形,并且其中,所述倒圆弓形的顶表面(相对于所述顶部)向下倾斜(相对于所述顶部)。

4. 如权利要求1所述的组件,其中,所述第二互锁件大体成形为圆柱形销。

5. 如权利要求1所述的组件,其中,所述第二互锁组件还包括与其所附接到的所述主体或盖子的所述圆形部分同心的大体圆形导向唇部,所述导向唇部具有适于装配在所述主体或盖子中的另一个的圆形部分内或外的直径。

6. 如权利要求5所述的组件,其中,所述第一互锁件如权利要求3所述,第二互锁件如权利要求4所述。

7. 如权利要求1所述的组件,其中,所述相互吸引或排斥元件包括至少一个磁体。

8. 如权利要求7所述的组件,其中,所述至少一个磁体包括稀土磁体。

9. 如权利要求 7 所述的组件, 其中, 所述至少一个磁体包括位于所述盖子中的至少一个磁体和位于所述主体中的至少一个相互吸引磁体。

10. 如权利要求 7 所述的组件, 还包括磁性吸引到磁体上的至少一个未磁化元件。

11. 如权利要求 9 所述的组件, 还包括位于所述盖子或所述底座中的至少一个附加磁体, 所述附加磁体布置成与位于所述盖子或所述底座中另一个上的所述吸引磁体中的至少一个相互排斥, 并且在所述第一互锁件和第二互锁件的所述大致旋转接合位置附近与所述至少一个吸引磁体相距大致最远。

12. 如权利要求 9 所述的组件, 其中, 所述磁体包括位于所述盖子和所述底座中的每一个上的多个相互吸引磁体对, 并且其中, 所述第一互锁组件和所述第二互锁组件包括与每个附加磁体对相对应的相应附加第一和第二互锁件, 其中, 各对第一互锁件和第二互锁件的接合大致旋转重合, 并且其中, 在所述第一互锁件和第二互锁件的所述大致旋转接合位置附近, 每个所述磁体对大致相互旋转对准。

13. 如权利要求 12 所述的组件, 还包括与所述相互吸引磁体对的数量相等的多个排斥定向的磁体, 所述排斥定向的磁体在所述盖子或所述底座上放置于与所述相互吸引磁体交替的位置, 并且其中, 在所述第一互锁件和第二互锁件的所述大致旋转接合位置附近, 每个所述排斥定向的磁体位于与所述盖子或所述底座中另一个上的所述至少一个吸引磁体大致最远错开的相互旋转位置。

14. 一种自闭合容器, 包括:

(a) 主体;

(b) 盖子, 所述盖子成形为能与所述主体接合并且能在与之接合时旋转, 为限定下述元件的方向的目的, 认为所述盖子位于所述主体上面;

(c) 固定地布置在所述主体上的至少一个第一互锁件;

(d) 固定地布置在所述盖子上的至少一个第二互锁件, 所述第二互锁件位于所述盖子上并且成形为能在所述盖子闭合在所述主体上并相对于所述主体旋转时与所述第一互锁件旋转接合, 所述旋转接合具有旋转限定的互锁接合区域, 其中, 在所述互锁接合区域内, 所述第二互锁件的互锁部分布置成抵靠所述第一互锁件的互锁部分, 并且位于所述第一互锁件的所述互锁部分下面;

(e) 至少一对相互吸引(或排斥)元件, 所述对中的相对元件分别布置在所述主体和所述盖子上, 并且在其上定位成使得当所述盖子相对于所述主体旋转时, 它们彼此吸引(或排斥)最强的位置大致对应于在位于所述互锁接合区域中时所述盖子和所述主体的旋转位置; 和

(f) 形成在所述主体上的至少一个斜面, 每个这种斜面对应于所述至少一个第一互锁件中的每一个, 相对于所述盖子的方向倾斜以沿着所述互锁接合区域的方向倾斜, 并且定位于所述主体上, 以在所述盖子从其中所述第二互锁件由所述斜面上方靠近所述斜面的一部分的旋转位置被拉动成压紧所述主体时, 从上方接收所述第二互锁件;

(g) 其中, 所述第一互锁件的上表面和所述第二互锁件的下表面每一个进一步成形为使得 (a) 在所述盖子闭合所述主体期间所述表面彼此接触的情况下, 所述表面能沿着与所述盖子和所述主体的更加紧密接合相对应的方向抵靠彼此滑动, 并且 (b) 在所述斜面上方, 在所述盖子和所述主体相对旋转和压紧的另一位置处, 使得所述第一互锁件和所述第

二互锁件能彼此滑开并脱离接触。

## 用于可闭合物品的自驱动封盖机构

[0001] 相关申请的交叉引用

[0002] 本申请要求以下申请的优先权：(1) 提交于 2008 年 8 月 11 日的美国临时专利申请 No. 61/087,814, (2) 提交于 2008 年 10 月 22 日的美国临时专利申请 No. 61/107,546 和 (3) 提交于 2008 年 12 月 30 日的美国临时专利申请 No. 61/141,395。所述每个美国临时专利申请的全部内容在此引入作为参考。

### 技术领域

[0003] 本发明涉及机械领域,更特别地说,涉及用于具有可相互闭合部件的物品的自驱动封盖机构,更特别地包括可旋转接合的自驱动封盖机构,包括但不限于呈具有自闭合机构的带盖容器形式的实施例,所述自闭合机构可自动地机械锁紧和密封容器,与盖子如何放在容器上无关。

### 背景技术

[0004] 具有可旋转接合的可闭合部件的物品实例是带螺纹盖的瓶子。普通的厨用瓶子常常由于盖子未被前一使用者正确旋紧而掉落并打碎。

[0005] 目前,大部分容器采用标准螺纹锁紧/密封机构或闭锁装置,两者均需要特定作用力来实现锁紧和密封。在未正确或完全施加该所需作用力的情况下,会产生两种主要的问题：(1) 未实现密封,从而有可能损及容器的内容物,或者 (2) 未充分锁紧,从而在通过盖子拿起容器时有可能使容器和内容物受到风险。

[0006] 先前对该问题的解决方案是提供具有带压合夹紧封盖的盖子的容器。然而,压合夹紧盖子仅可用于重量轻的容器和内容物。它们必须有效地压合。同样,大部分夹紧盖子不提供充分的密封。

[0007] 因此,需要给各种内容物提供有效和牢固密封的自闭合容器。更一般地说,需要更先进的封盖机构,它们是自驱动的且方便使用,还能提供牢固和可靠的封盖。

### 发明内容

[0008] 本发明的一个目的是提供一种自驱动封盖,所述自驱动封盖以方便简单的方式操作,并且在结合到容器中时为各种容器和内容物提供有效和牢固密封。其它希望的特点包括：

[0009] ● 机构应当优选地以顺利和可预测的方式自动闭合,避免封盖未完全接合而停住的不确定的“阻住”或“卡住”状态。

[0010] ● 当经受除了特定的用于脱离接合操作之外的作用力和运动时,封盖应当优选地以牢固、可靠地阻止脱离接合的方式接合。

[0011] ● 脱离接合操作应当优选地涉及和常规储存和搬运引起的作用力和运动不同的作用力和运动。

[0012] ● 封盖机构应当优选地能够结合用于固体、液体和/或气体内容物的可靠密封。

[0013] 在某些实施例中,本发明通过使用位于容器盖子和/或主体(罐体)上的诸如磁体的相互吸引或排斥元件以将主体和盖子拉动至彼此接合、以及在接合时致动并且将接合部件固定在锁紧位置的机械互锁装置来实现这些目的。在这些实施例中,盖子仅需要放置成靠近罐体的顶部并放开。所示封盖机构可适合于具有通过旋转进行操作的封盖的任何装置。利用与所示相同的原理,本发明的机构可适合于非旋转实施例,例如线性滑动就位的封盖、带闭锁装置的实施例、或者其它封盖。

[0014] 在阅读附图和其后的详细说明书的基础上,本发明的其它方面和优点变得显而易见。

#### 附图说明

[0015] 为了更充分地理解本发明及其优点,现在参照结合附图进行的以下说明,其中,相同的附图标记表示相同的部件,其中:

[0016] 图1共同显示了根据本发明的一个实施例的示例性容器的各种视图。

[0017] 图1A是图1的各个其他视图中所示容器的半透的顶部透视图。

[0018] 图1B是图1A所示容器的半透的侧视图。

[0019] 图1C是图1A所示容器的半透的俯视图。

[0020] 图1D是图1A所示容器的放大的、半透的侧视图。

[0021] 图1E是图1D所示区域1E的详视图。

[0022] 图1F是图1A所示容器的半透的侧视图,指明了为图1H所截取的截面1H。

[0023] 图1G是图1A所示容器的半透的俯视图,指明了为图1J所截取的截面1J。

[0024] 图1H是图1A所示容器的半透的侧视横截面图。

[0025] 图1I是图1H所示区域1I的详视图。

[0026] 图1J是图1A所示容器的半透的侧视横截面图。

[0027] 图2是以半透的顶部透视图示出的图1A所示容器的分解部件图。

[0028] 图3A-3D显示了根据可替换实施例的另一示例性容器,使用与图1形状不同的互锁件。

[0029] 图4显示了根据可替换实施例的另一示例性容器,使用八个相互吸引的磁体对。

#### 具体实施方式

[0030] 下面将描述本发明的可替换的优选实施例。这些实施例仅为示例说明性,如权利要求所限定的本发明不局限于所示的特定实例。例如,本文结合利用特定的磁性吸引元件、销和通道的实施方式描述了某些优选实施例,但是应当认识到,以下描述的内容意在使本领域的技术人员能够将本发明的教导容易地应用于其它常用的硬件和材料。任何特定实施例的具体特征不应理解为限制所要求保护的范围。

[0031] 此处为示例说明本发明的目的所呈现的具体实施例可以应用于旋转接合的机械意义的容器,例如可以在厨房中使用的容器。毫无疑问,还存在除容器之外的实施例,其中,相互闭合构件可以利用旋转运动接合。

[0032] 具有根据本发明一个实施例的旋转接合封盖的示例性物品(在这种情况下为图1所示物品1)包括主体2和盖子3。

[0033] 本文中有时会提到主体 2 的“顶部”，是指主体 2 在相互闭合位置面向盖子 3 的端部。类似地，盖子 3 的“底部”是指盖子 3 在相互闭合位置面向主体 2 的部分。本文使用的术语“轴线”是指旋转盖子 3 以接合 / 脱离主体 2 时所限定的旋转轴线。“轴向”是指与轴线对准，“径向”和 / 或“周向”是指位于与轴线垂直平面中的位置。

[0034] 在图 1 所示实施例中，物品 1 构造为具有中空内部的容器，因此有时也称作“容器 1”。盖子 3 成形为可与主体 2 接合，并且可在与其接合时旋转。外部盖唇 61 从盖子 3 的顶部周向下降以形成圆筒形结构，该圆筒形结构的形状和大小适于落在主体 2 的上部上并接收主体 2 的上部。

[0035] 图 2 也以分解部件图形式显示了容器 1。

[0036] 至少一个与第一互锁件 4 形状相同的第一互锁件（在本实施例中为三个）固定地设置在主体 2 上。在图 1 所示实施例中，第一互锁件 4 基本上具有倒圆弓形状（在几乎水平的区域 7 附近，在弓形下侧具有大致平坦部），从主体 2 的上部外周径向突出（或者相对于主体 2 具有径向延伸长度）并且定向成使其大体平坦上表面 12 向下倾斜，在本实施例中，在从容器 1 的侧面及外部观察时为从左向右倾斜。本实施例中的三个第一互锁件包括第一互锁件 4 和其它两个相应的同样部件（在图 1C 中可以看见，但未分别标出），它们同样围绕主体 2 的上部外周以大约 120 度间隔沿周向固定地布置。

[0037] 至少一个与第二互锁件 5 形状相同的第二互锁件（在本实施例中为三个）固定地设置在盖子 3 上。在图 1 所示实施例中，第二互锁件 5 具有圆柱销形状，相对于盖子 3 的轴线径向定向，并且从盖子外唇 61 的内周向内突出（或者相对于盖子 3 具有径向延伸长度）。本实施例中的三个第二互锁件包括图 1 所示的第二互锁件 5、以及其它两个相应的同样部件（在图 2 中可以看见，但未分别标出），它们同样地以大约 120 度间隔沿周向固定地布置在盖子外唇 61 的内周上。

[0038] 第二互锁件 5（及其周向相应元件）的圆柱销形状能够在盖子 3 闭合在主体 2 上并相对于主体 2 旋转时与第一互锁件 4（及其周向相应元件）的下侧旋转接合。如图 1E 所示，该旋转接合具有旋转限定的互锁接合区域 6，邻近第一互锁件 4 的下侧的上述大体平坦、水平部分（在区域 7 中），其中，在互锁接合区域 6 中，第二互锁件 5 的互锁部分 8 布置成抵靠第一互锁件 4 的互锁部分 7（即，第一互锁件 4 的所述大体平坦、水平下侧区域内的部分）。

[0039] 进一步地，存在至少一对相互吸引的（或排斥的）元件（9, 10），所述一对相对的元件分别布置在主体 2 和盖子 3 上，并且在其上定位成使得当盖子 3 相对于主体 2 旋转时，它们彼此吸引（或排斥）最强的位置大致对应于旋转定位在互锁接合区域 6 中时盖子 3 和主体 2 的旋转位置。在本实施例中，相互吸引 / 排斥的元件是磁体，优选为强稀土磁体。磁体的 N/S 极由淡 / 浓阴影表示（极性不重要，只要对极性一致地处理即可）。在示例性实施例中，围绕盖子 3 以大致 120 度间隔沿周向布置有三个磁体 9、9' 和 9''。相对的磁体 10、10' 和 10'' 以相同的间隔和半径沿周向布置在底座 2 上。（底座 2 还可以具有围绕其上部外周的附加磁体，例如，磁体 21、21' 和 21''，其 N/S 朝向与其它底座磁体 10、10' 和 10'' 的 N/S 朝向相反，从而排斥磁体 9、9' 和 9''（而非吸引）；本发明随后将讨论这种可选的朝向相反的磁体。）毫无疑问，这里所示的磁体结构（以及包括更多或更少数量的磁体的相似结构）可以在盖子和底座之间颠倒。在所示实施例中使用了成对的磁体。然而，对本领域的技术人员显而易见的是，可以以等效的方式交替地使用磁体和非磁化磁性材料的组合。

[0040] 从图 1 所示不同视图中可以看出,当磁体 9 和 10 对准时,第一和第二互锁件 4 和 5 也处于互锁位置。在所示实施例中,这在所有 4、5、9 和 10 大致对准时发生,但是互锁件对 4 和 5 不必与磁体对 9 和 10 竖直地对准。

[0041] 另外,优选地存在至少一个斜面 11,其形成至少部分地围绕主体 2 的上部外周延伸的插入件的底部。插入件的位于斜面 11 上方的内部周壁容纳第一互锁件 4,第一互锁件 4 作为伸入所述插入件的径向突起。斜面 11 相对于主体 2 的顶部倾斜以沿互锁接合区域 6 的方向倾斜,并且在所述互锁接合区域 6 中在第一互锁件 4 下面延伸,具有足够的间隙以容纳第二互锁件 5。在本实施例中,具有同样以大致 120 度间隔布置的三个周向斜面,包括斜面 11 和其它两个相应的同样斜面(其在图 1 所示各种视图中可以看出)。进一步,在本实施例中(但不为本发明所必需),斜面 11(以及其他两个相应斜面中的每一个)包括两个部分,第一互锁件 4 的每一侧各有一个,每一部分相对于第一互锁件 4 对称地倾斜,并且朝向下侧和在第一互锁件 4 下面延伸。这三个斜面共同限定了围绕主体 2 的上部外周具有可变海拔深度的大体扇形插入件。从上面的描述可以看出,在本实施例中,第一互锁构件 4 等从主体 2 的侧面伸进该扇形插入件中,三个最大斜面深度的区域大致位于每个第一互锁构件 4 等下面,为第二互锁件 5 及其相应的其它两个盖子互锁件提供了间隙。

[0042] 斜面 11 定位在主体 2 上以在盖子 3 从旋转位置(在该位置中,第二互锁件 5 从斜面 11 的上方接近斜面 11 的一部分)与主体 2 形成压缩时接收来自上方的第二互锁件 5。应当注意,本发明在没有斜面 11 的情况下也能起作用。然而,斜面 11 是优选的,因为它有助于重力和磁力将盖子的向下运动转换为沿锁紧方向的旋转,而不是仅依靠磁体或其它吸引/排斥元件来引起这样的旋转。

[0043] 互锁件 4 和 5 的相应形状(在本实施例中,互锁件 4 的形状为具有下侧平坦区域的大体倒圆弓形件,并且第二互锁件 5 为圆柱形销)有助于盖子 3 顺利闭合到主体 2 上。第一互锁件 4 的上表面 12 和第二互锁件 5 的下表面 13 的各自形状使得当表面 12 和 13 在盖子 3 闭合主体 2 期间彼此接触时,表面 12 和 13 在被进一步推到一起和随着盖子 2 和主体 3(分别地)旋转时彼此抵靠着滑动。所述滑动沿与盖子 2 和主体 3 更紧密接合相对应的方向进行。进一步地,表面 12 和 13 的所述形状使得在斜面 11 上方,在盖子 3 和主体 3 的相对旋转和压缩的另一位置处,第一互锁件 4 和第二互锁件 5 彼此滑脱开(随后,第二互锁件 5 落在斜面 11 上并与斜面 11 形成接合,如本文描述的那样)。

[0044] 优选地,磁体 9、9' 和 9'' 在闭合位置处将非常靠近磁体 10、10' 和 10'',但是相对的磁体表面优选地不会发生物理接触。这种小的分离有助于在容器 1 闭合时使盖子 3 对底座 2 保持正压,并且有助于实现密封。

[0045] 底座 2 还可以具有在其中限定了主体 2 的内部空间或容积的中心开口 32(这通常为下述情形,物品 1 例如为厨用容器,具有用于容物的内部空间)。优选地,盖子 3 还具有圆柱形内唇 31,优选地带有沟槽以减少摩擦,圆柱形内唇 31 设置在盖子 3 的底部上并且成形为紧密配合在底座 2 的中心开口 32 的周壁内。

[0046] 当盖子 3 靠近主体 2 时,圆柱形内唇 31 接合主体 2 的中心开口 32。假定盖子 3 和主体 2 大致直立,当盖子 3 松开时,它将朝向主体 2 落下(在大部分情况下,最初主要是依靠重力),优选地通过圆柱形内唇 31 被引导至同心位置。当盖子 3 靠近主体 2 时,磁体 9 和 10(及其相应的径向配对物)、和/或磁体 9 和 21(及其相应的径向配对物)将靠近到足以

发生显著地相互作用。磁体 9 和 10 相互吸引,而磁体 9 和 21 相互排斥。在任一情况下,吸引和 / 或排斥用于使磁体 9 和 10 更为靠近,将互锁件 4 和 5 推向其锁紧位置,同时,使盖子 3 更靠近主体 2。

[0047] 如果第二互锁件 5 接触斜面 11,这些作用力将把第二互锁件 5 拉动到位于第一互锁件 4 下面的锁紧位置。另一方面,如果在该过程中,第二互锁件 5 靠着第一互锁件 4 的上表面 12 移动,第二互锁件 5 将沿着第一互锁件 4 的上表面 12 的斜度滑动并且落到斜面 11 上,并且再次被拉动到位于第一互锁件 4 下面的锁紧位置。当处于锁紧位置时,位于第一互锁件 4 的下表面 7 上大致平坦的互锁部分 8 确保盖子保持锁紧,即使利用盖子将容器(盖子附接到其上)拿起的情况下。

[0048] 除了通过特定的扭转和拉动脱离接合动作之外,本实施例中的容器可以牢固、可靠地防止盖子脱开,所述扭转和拉动脱离接合动作使第二互锁件 5 从第一互锁件 4 下面旋转离开第一互锁件 4(即,克服使互锁件保持对准的强磁力),随后拉动盖子 3 离开主体 2(同样克服趋于将盖子和主体拉动到一起的磁力)。仅靠拉力不能打开盖子 2。摆动力、横向力或仅靠扭转力也不能打开盖子。

[0049] 优选地,排斥磁体 21、21' 和 22' 以 120 度间隔围绕主体 2 沿周向布置,以相等的距离位于磁体 10、10' 和 10'' 之间的中间处。在具有一个或多个这些附加磁体的实施例中,主体磁体按交替磁极布置以围绕主体上周形成 N-S-N-S-N-S 方式(在三组磁体的情况下)。优选地,斜面 11 的径向配对物相交,即在与磁体 21、21' 和 21'' 大致对准的位置(即在磁体 9、9' 和 9'' 遇到大致最大排斥力的位置处)具有最高点 71 等。这种结构尤其有助于提供可靠的自动锁紧作用,不会产生不稳定状态、阻住、“卡住”或死点。

[0050] 此外,密封件可以设置在盖子 3 和底座 2 之间。在所示实施例中,这种密封件为 O 形圈 41,置于与盖子 3 连接的圆柱形内唇 31 的底部上并且在盖子 3 处于底座 2 上的闭合位置时抵靠底座 2 上的倒角 42。可以使用平压密封环或盘代替 O 形圈。O 形圈 41 的尺寸和位置使得当容器 1 的组件处于完全锁紧位置时,O 形圈实现大致最佳的压缩密封。

[0051] 底座 2 还可以包括位于底座 2 的底部上的弹性垫 51。该弹性垫有助于单手使用容器 1。弹性垫提供与例如桌子或台子的表面的充分摩擦或者在使用者扭转盖子时克服磁体的吸引力,使得使用者不必用另一只手握住底座。

[0052] 不必使用三个盖子磁体。可以设置一或多个(直到任意数量的)盖子磁体。然而,在这种类型的实施例中,在还使用排斥磁体的情况下,主体磁体的数量优选地应当为盖子磁体的两倍(或反之亦然),使得它们可以磁极交替并且与用于每个相互吸引对的相应互锁件和可选的斜面件等距离隔开。具有三个盖子磁体和六个主体磁体的所示实施例是目前优选的。

[0053] 为等效操作目的,斜面 11、第一和第二互锁件 4 和 5 以及相关结构可以在容器 1 的盖子 3 和底座 2 之间互换和 / 或重新布置。类似地,盖子 3 可适于装配在底座 2 的中心开口 32 内,而非装配在主体 2 的外侧顶部上。其它类似性质的变形对于本领域普通技术人员来说显而易见。

[0054] 存在对根据本发明原理的基本上旋转封盖实施例进行改进的许多其它实施例。

[0055] 例如,在一个可选实施例中,如图 3 所示,具有三个径向定向并定位在盖子 303 的内唇 361 中的盖子杆状磁体 309;主体 302 具有六组斜面 311,其中,互锁件 304 中心定位在

斜面 311 的最低点上并且主体磁体 310 在互锁件 304 下方主体 302 的壁部上径向定向。因此,在本实施例中,磁体 309 和 310 从侧面接合(或排斥,这可以是本实施例的变形中的情况),而非从顶部接合。杆状磁体 309 起到先前所述实施例的锁紧销(5)和盖子磁体(9)的作用,即,磁体 309 与主体斜面 311 接合,并且一旦位于互锁件 304 下面时向磁体 310 提供对强吸引力,从而提供机械锁紧装置。

[0056] 尽管图 3 所示实施例的设计大体上令人满意,但是图 1 所示实施例的第一互锁件 4 的上表面的倾斜度优于图 3 所示相应的互锁结构,因为它避免了图 3 所示实施例中在盖子 303 首先放置成使杆状磁体 309 非常接近中心定位在第一互锁件 304 的顶部(大约位于其上表面最高部分的高度)时,存在的自动封盖中可能的“死点”。图 1 所示实施例中的第一互锁件 4 的上表面 12 的连续未间断斜度避免了这种特定情况。

[0057] 图 4 显示了另一可替换实施例,具有八对相互吸引的磁体,包括围绕盖子 603 和主体 602 的周边交替的 N-S 成对朝向的四对 609、610,以及沿相反方向定向的四对磁体 622、621。第一组四对 609、610 分别中心定位在互锁件 604、605 上方,第二组四对 621、622 分别中心定位在斜面 611 的最顶部区域上方。

[0058] 显而易见的是,本发明的各个实施例可用于任何类型的旋转封盖,不必与圆筒形容器相关,诸如气罐或者其它填充物盖、通气孔盖、或类似物。

[0059] 另外,本发明的原理还适用于非圆形几何形状,其中,与斜面 11 类似的通道为直线形,例如,存在两排平行的交替相对的磁体,而非圆形布置。

[0060] 类似地,如上所述,在旋转接合实施例中,第一和第二互锁件 4 和 5 不需要与磁体 9 和 10 对准,而是可以相对于圆形机构的轴线或相对于线性机构的长度以任意角度偏置,只要定位成在磁体 9 和 10(或相应的相互吸引元件)对准时使第二互锁件 5 与第一互锁件 4 对准即可,在这种情况下,斜面 11(或相应元件)的最深点还会移动到与由第一和第二互锁件限定的锁紧位置对准。

[0061] 此外,互锁件 4 和 5 能够与本领域技术人员熟知的其它互锁件互换,包括但不限于钩、掣子、互锁凹槽和类似物。

[0062] 这里详细显示的两个实施例具有布置方式不同的相互吸引元件(在这种情况下为磁体),在一种情况下沿着径向接合,在另一种情况下轴向接合。这些只是相互吸引或排斥元件的众多可用布置方案中的两种,提供将封盖元件拉到一起并通过旋转或滑动使其移动至锁紧对准定位的作用力的其它结构对于本领域技术人员来说显而易见。正如前面提到的那样,还可以使用磁体和非磁化磁性材料的组合来代替磁体对。

[0063] 如所解释的那样,根据本发明的自驱动封盖克服了现有技术许多方面的缺点。人们只需要放置和松开盖子(或其它闭合元件)以使其自动锁紧和密封。无需手动施加特定作用力来实现锁紧和密封,并且可以为各种容器和内容物提供可靠有效的密封。它能够以顺利和可预测的方式自动关闭,避免封盖未完全接合而停住的“阻住”或“卡住”状态。除了使用特定的脱离接合操作外,它能够以牢固、可靠地阻止脱离接合的方式进行接合,所述脱离接合操作涉及和常规储存和搬运引起的作用力和运动不同的作用力和运动。封盖机构能够容易地结合用于固体、液体和/或气体内容物的可靠密封。

[0064] 因此,显而易见的是,本发明满足了上述目标,并且与现有技术相比在易用性和有效性方面提供了许多优点。虽然已经对本发明进行了详细描述,但是应当理解的是,许多可

以由本领域技术人员容易地确定,并且可以做出许多改变、替换和变型,而不脱离由权利要求所限定的本发明精神和范围。

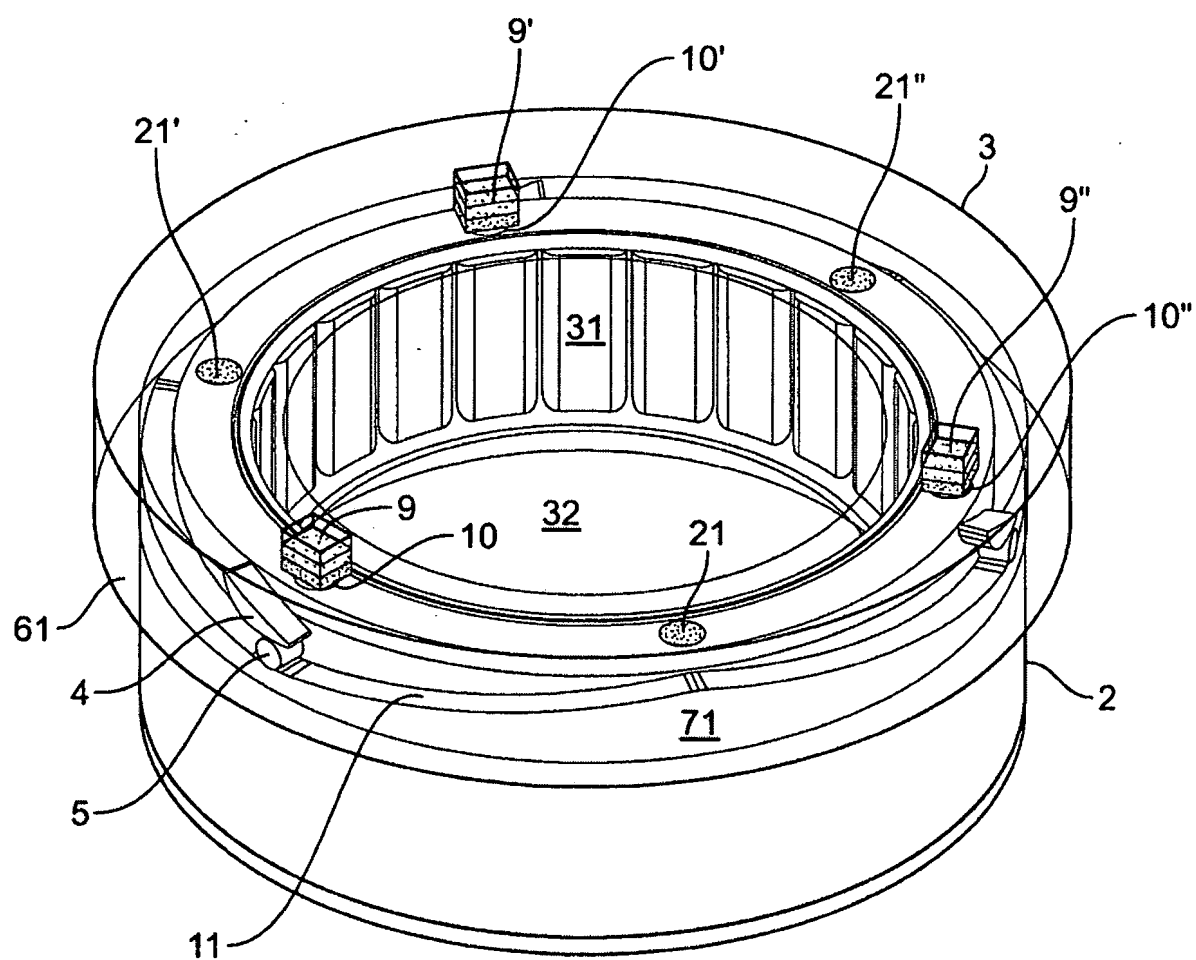


图 1A

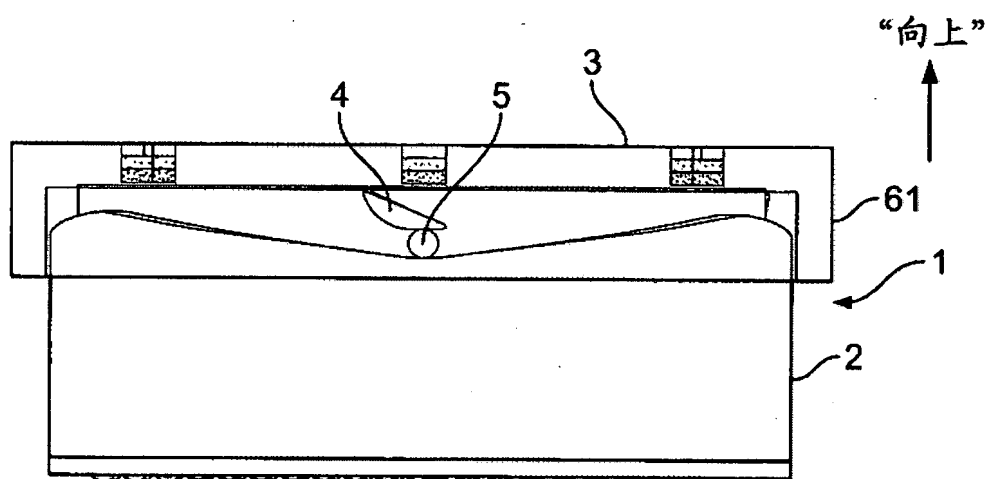


图 1B

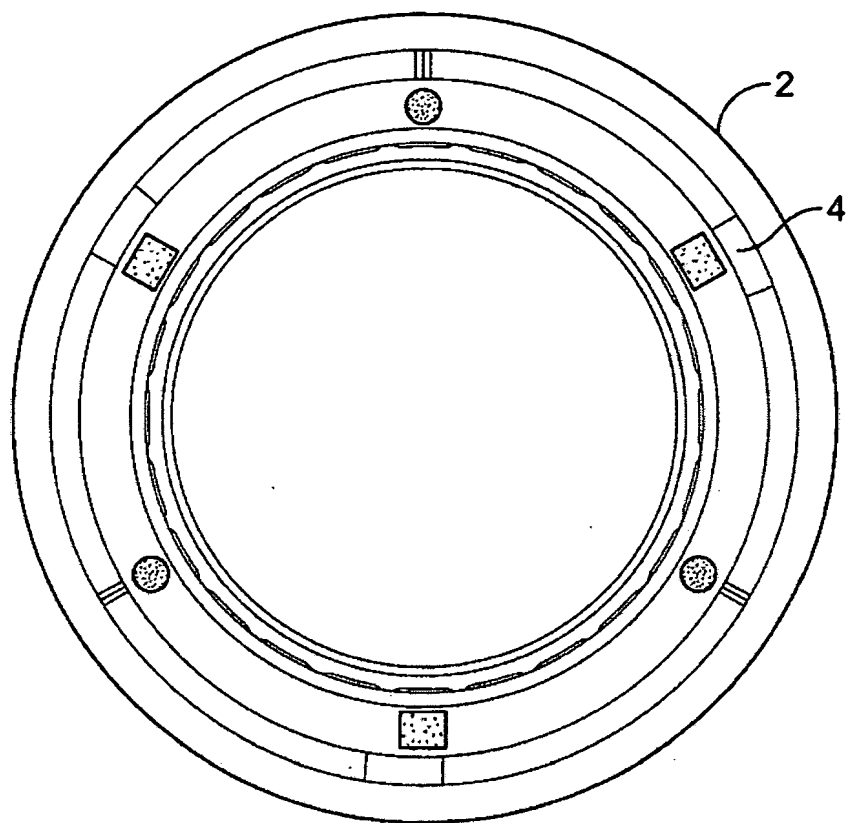


图 1C

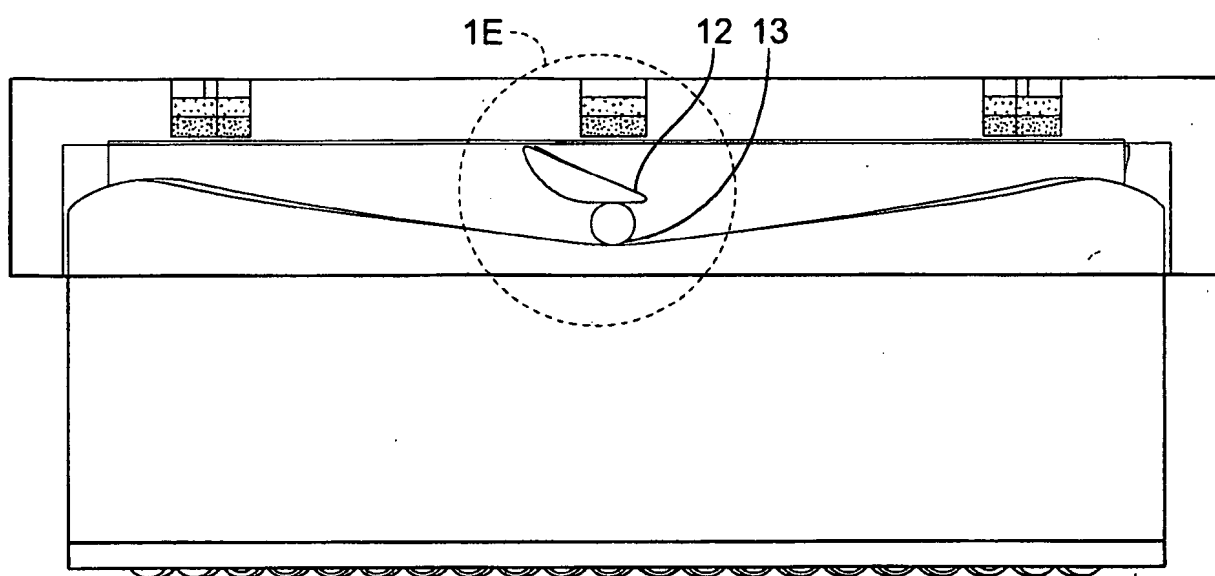


图 1D

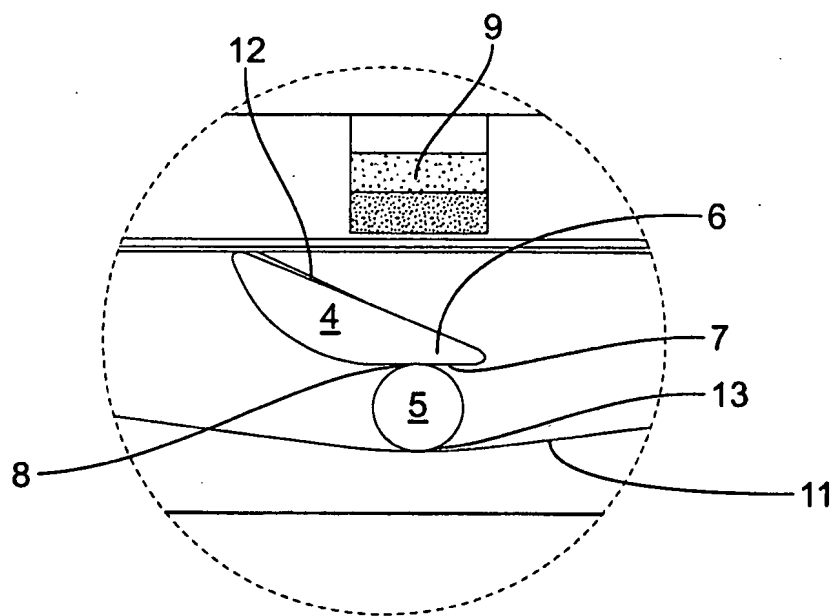


图 1E

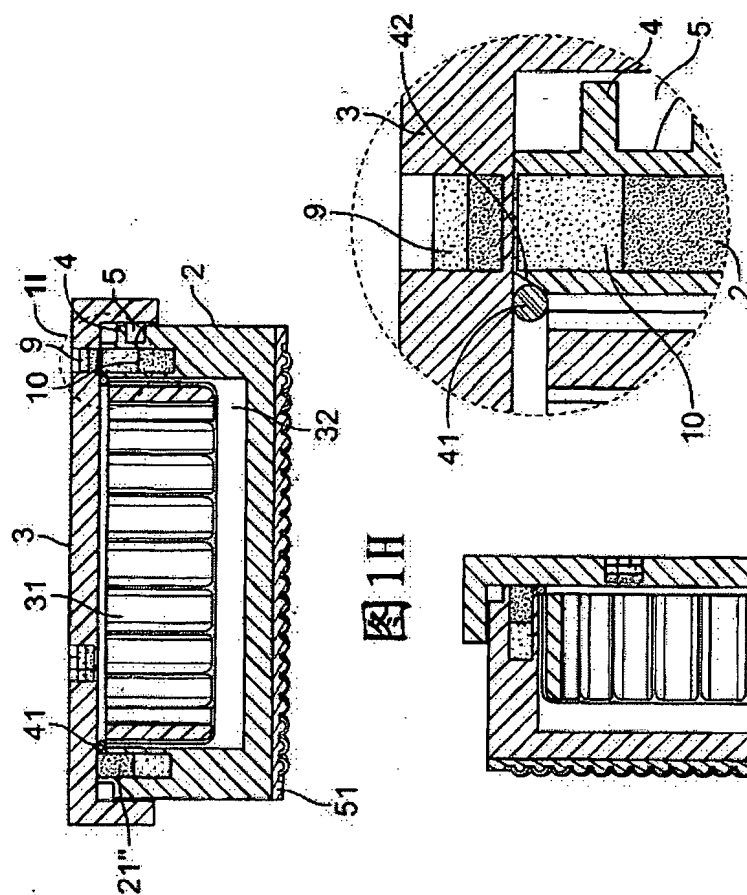


图1H

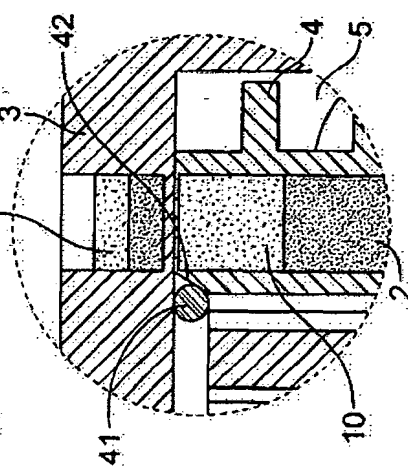


图1I

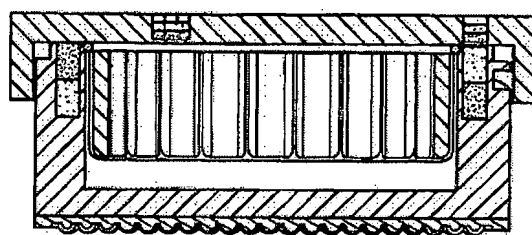


图1J

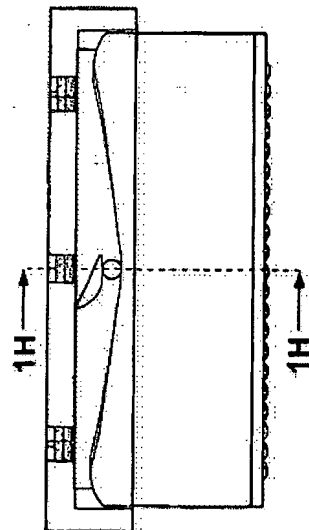


图1F

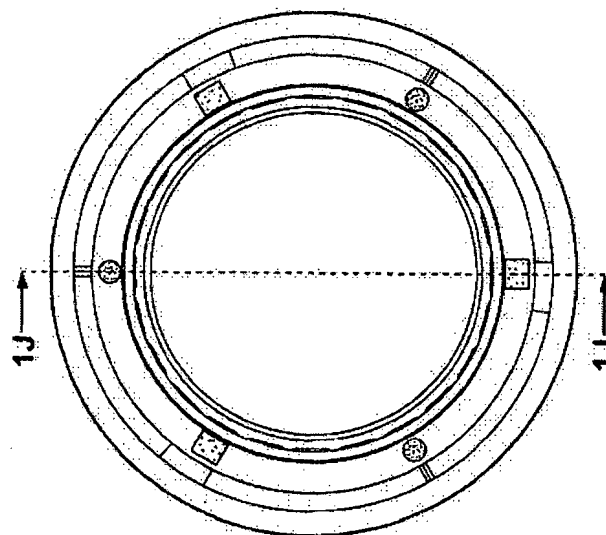


图1G

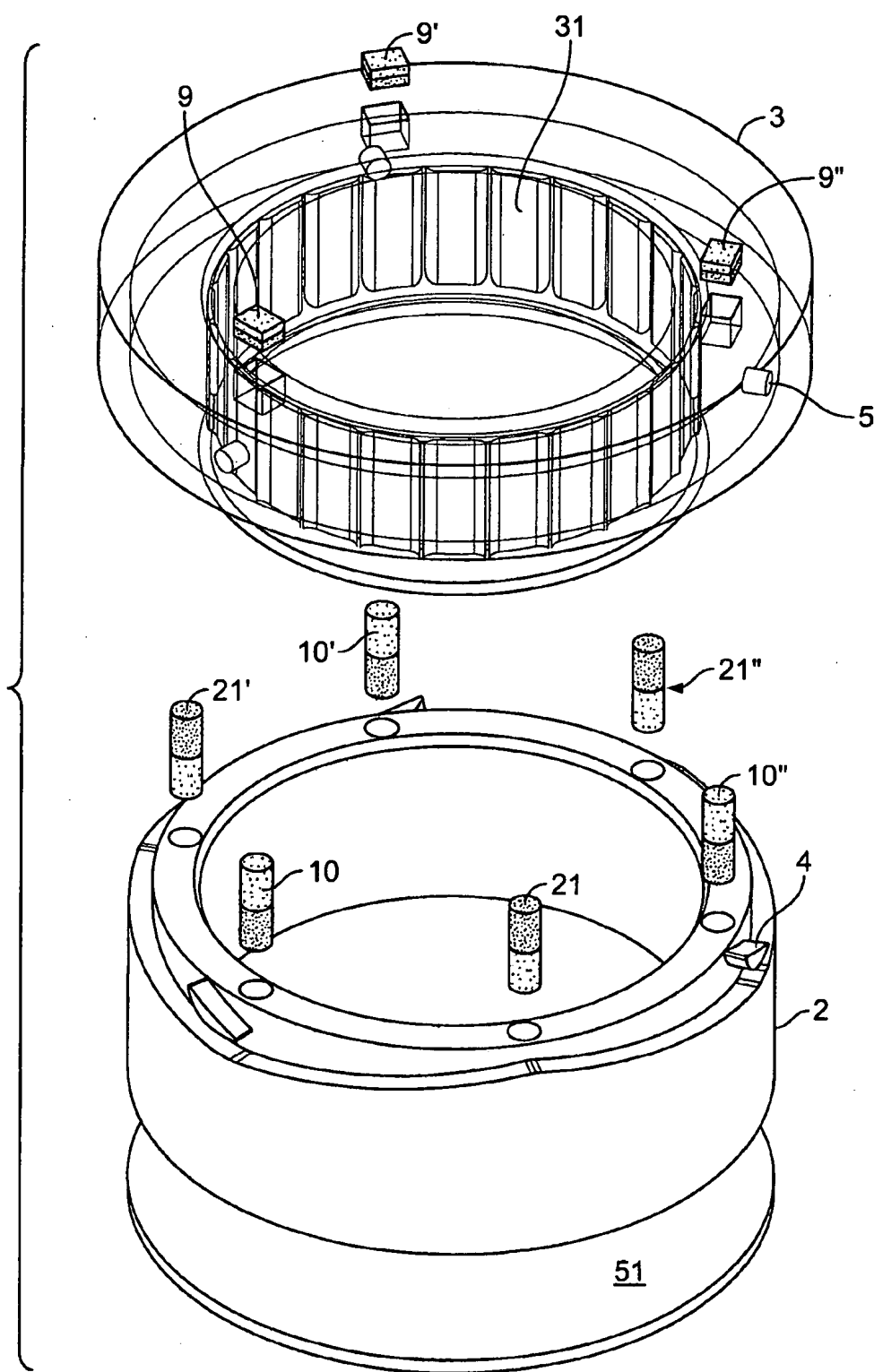


图 2

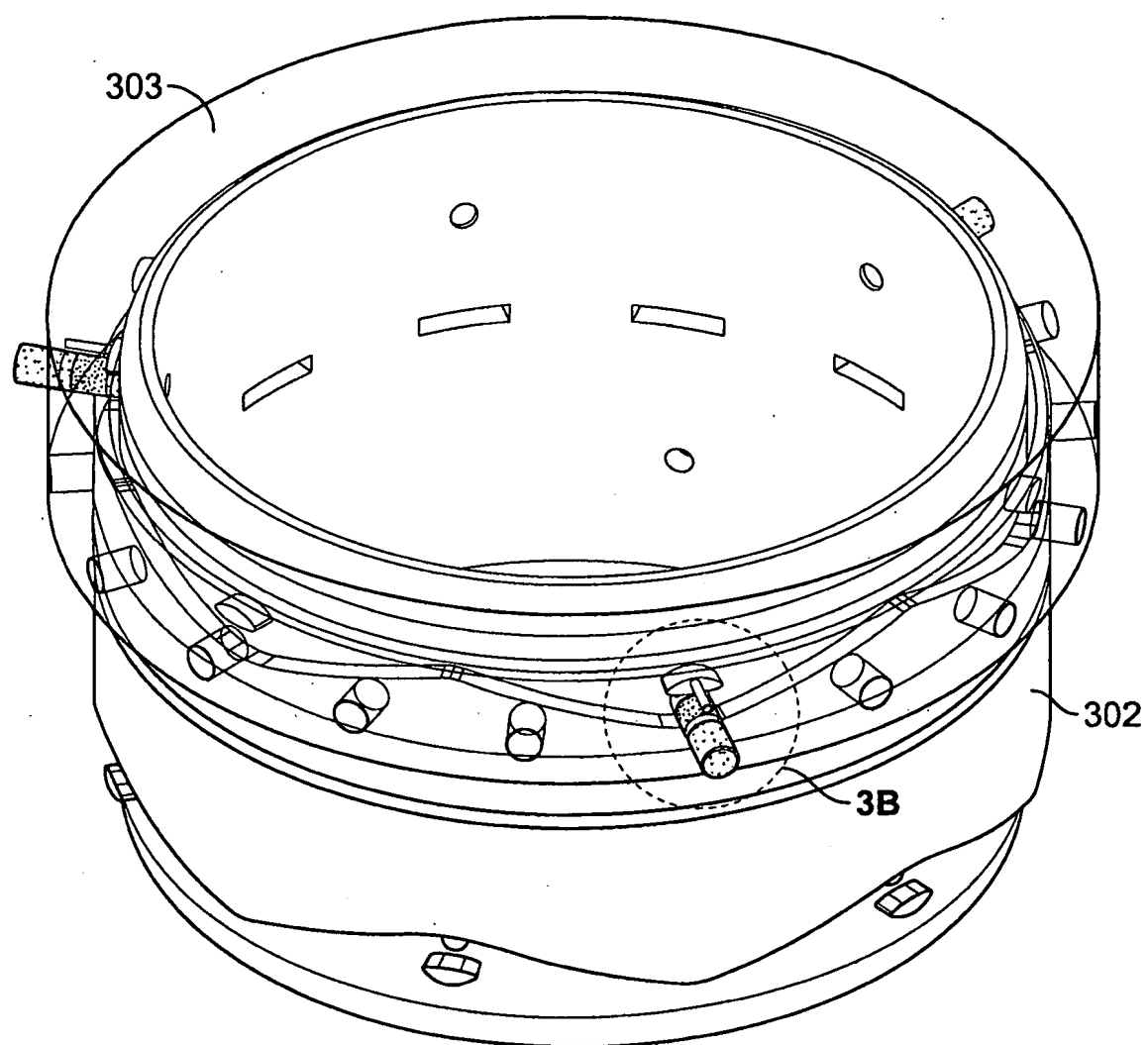


图 3A

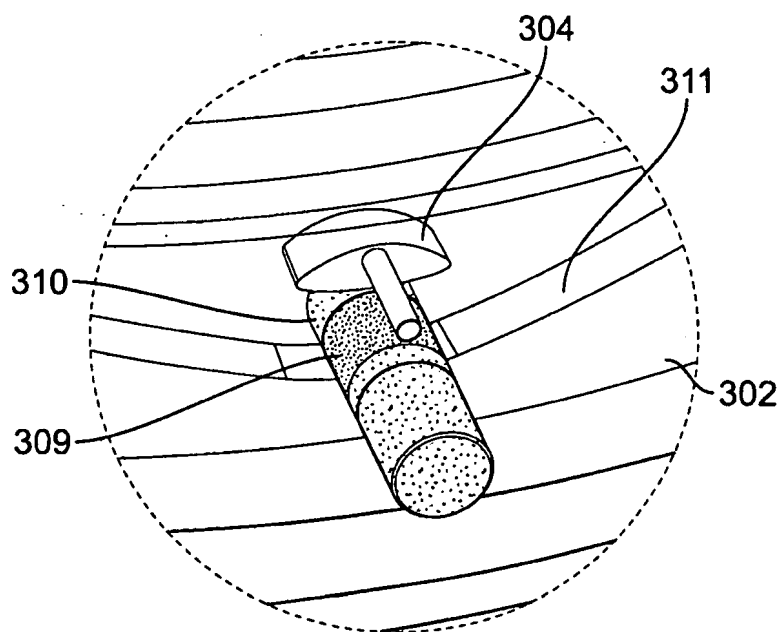


图 3B

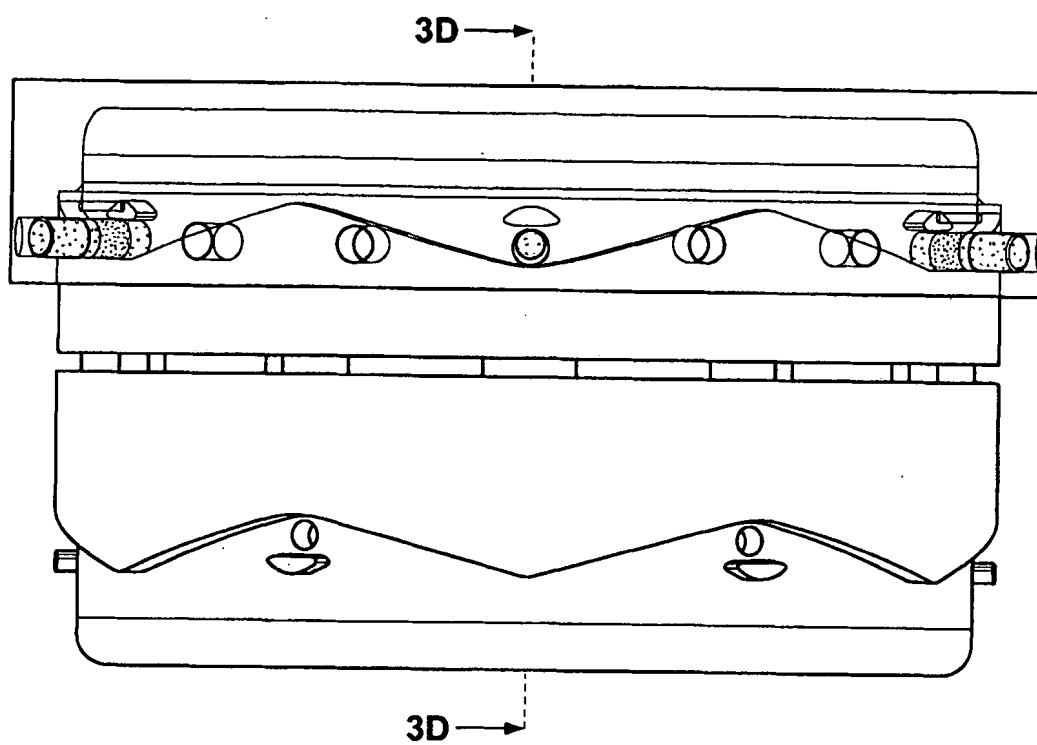


图 3C

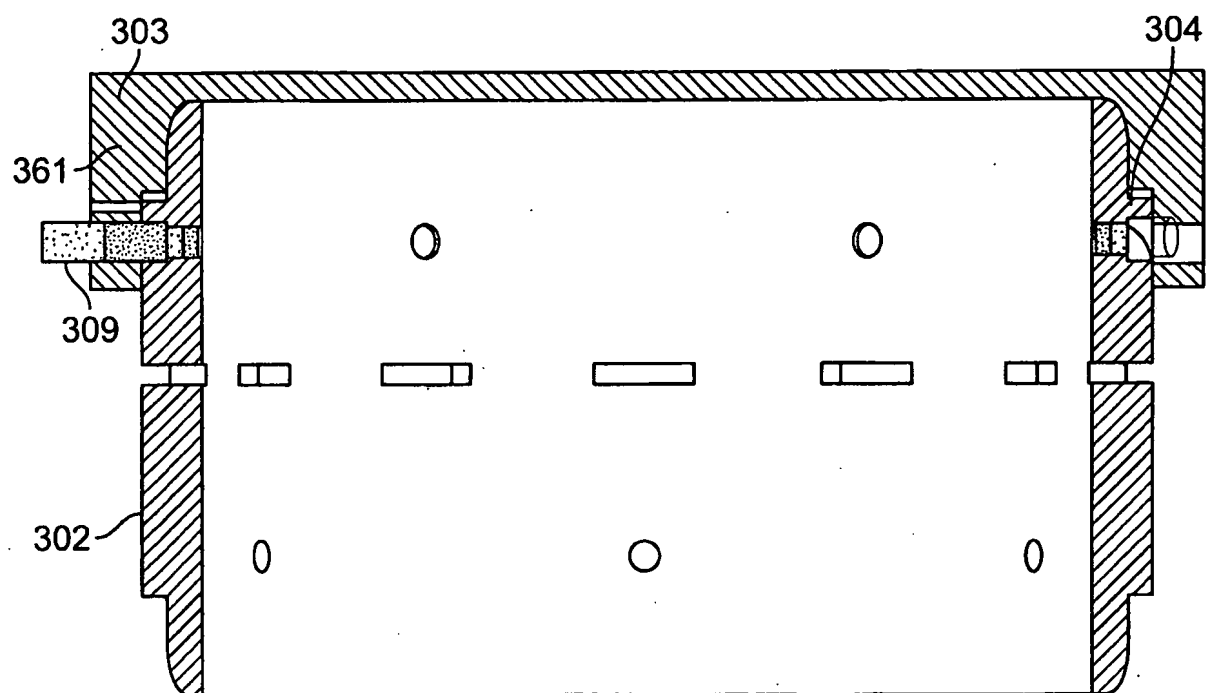


图 3D

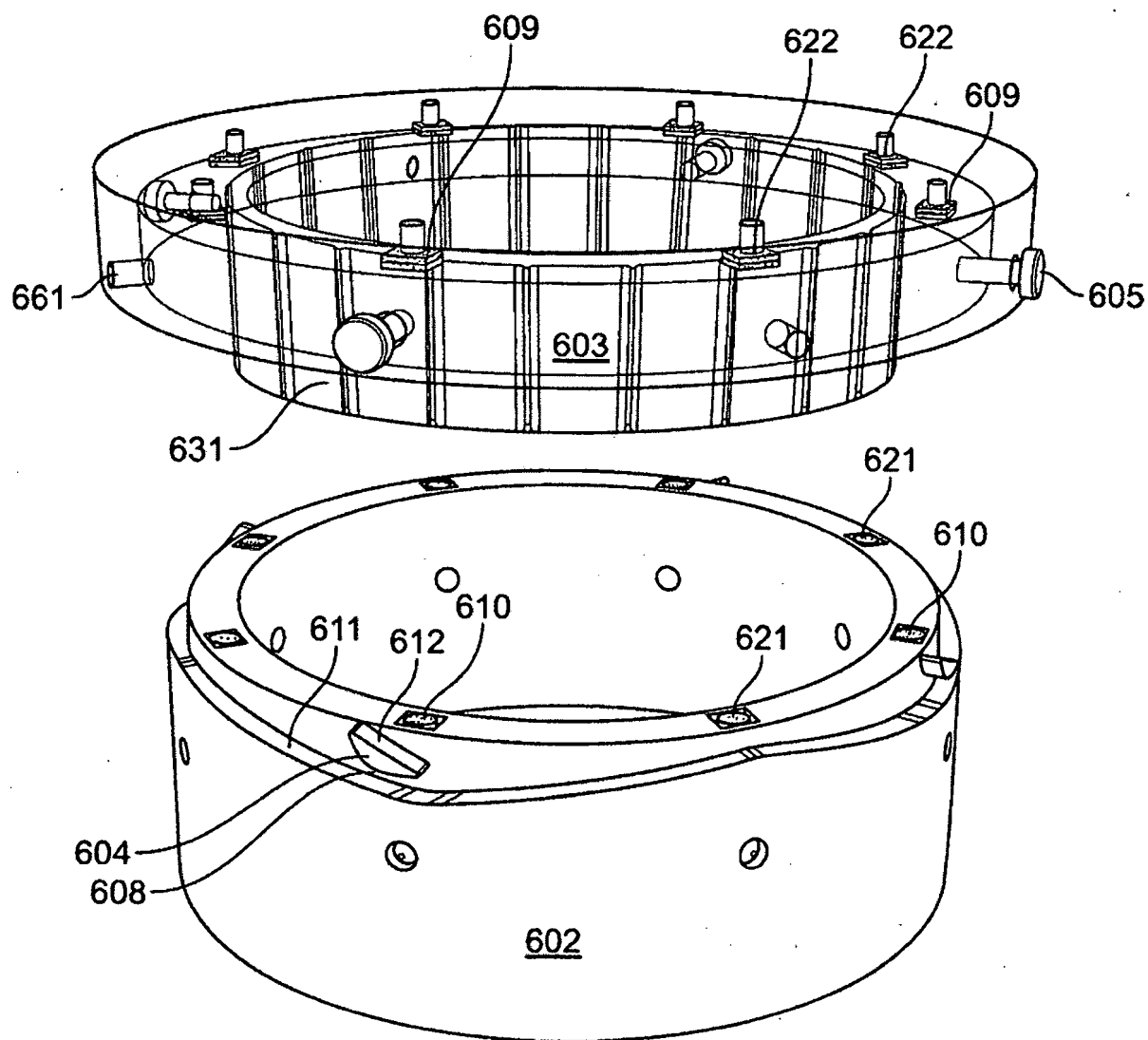


图 4