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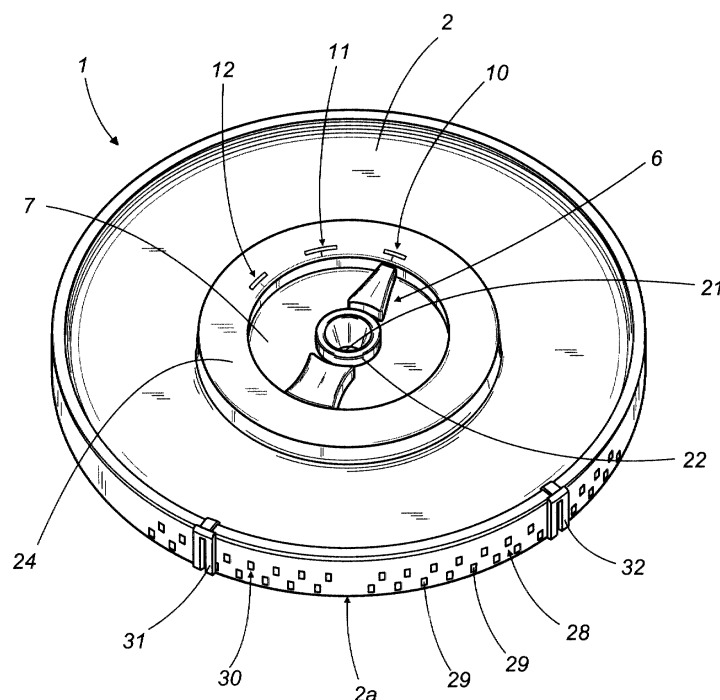
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(54) **A device for closing containers under vacuum**

(57) A device for closing containers (2) under vacuum comprises a lid (in which is obtained an air conduit (4) for placing the interior of the container in communication with the exterior, said conduit (4) having a first and a second end (4a, 4b); a shutter (5) mounted on the lid in correspondence with the first end (4) of the conduit (4a); and a control element (6) mounted on the lid and

movable between at least a first operative position (10) in which it pushes the shutter (5) on the first end (4a) of the conduit (4) in such a way as to close it, a second operative position (11) in which it does not engage the shutter (5) and a third operative position (12) in which it removes the shutter (5) at least partially from the first end (4a) of the conduit (4).

FIG. 1



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Description

[0001] The present invention relates to a device for closing containers under vacuum comprising the characteristics defined in the preamble to claim 1.

[0002] As is well known, there are different types of apparatuses, particularly suitable also for home use, able to allow the packaging of foods under vacuum in such a way as to guarantee their optimal preservation for prolonged periods.

[0003] Particularly widespread are apparatuses comprising a pump connected by means of a suction conduit to a terminal able to be operatively engaged to a container in which the vacuum is to be created.

[0004] Such containers are usually rigid and have a closing device composed of a hermetic lid whereon is mounted a valve where to the suction terminal of the pump is engaged.

[0005] Valves of this type can be typically switched in three operative positions: in the first one they prevent the passage of air into and out of the container, in the second one they allow the suction of air out of the container and in the third one they allow the entrance of air into it.

[0006] When a product placed inside a container is to be packaged under vacuum, the container is shut with a lid of the type described above, then the terminal of the pump is associated to the valve placed in its second operative condition, in order to aspirate the air present in the container. At this point, after positioning the valve in the first operative condition, the suction terminal can be detached from the container and the container can be stored where it is to be preserved. When, subsequently, one wishes to open the container it is necessary to bring the valve to its third operative condition in order to eliminate the vacuum inside the container, letting outside air into it.

[0007] The valves described above usually comprise a shutter mounted in proximity to an end of a conduit that connects the interior of the container with the exterior. When the valve is in the first operative condition a control mechanism pushes the shutter on the end of the conduit in such a way as to prevent the passage of air. On the contrary, if the valve is in the third operative condition, the control mechanism maintains the shutter at a certain distance from the end of the conduit. Usually, when the valve is in the second operative condition, the same mechanism does not engage the shutter. In these conditions, the shutter lifts up from the end of the conduit when the suction terminal is applied to the valve, due to the vacuum created by the pump. When the vacuum ceases, the shutter returns to a position of engagement of the end of the conduit thanks to an elastic return device or pushed by its weight force alone.

[0008] A valve of a similar kind is, for instance, described in US Patent 5 405 038. This document discloses a shutter constituted by an elastic membrane, whereas other products on the market, such as the lid of the

kind shown in Figure 7 of US Patent 5 784 862, comprise a valve with a control mechanism obtained with a screw that places the shutter on the end of the conduit or lifts it therefrom depending on how far it is screwed on.

[0009] The solutions of the prior art, however, exhibit several drawbacks.

[0010] The devices that use membrane shutters, such as the one in the aforementioned US Patent 5 405 038, have poor reliability. Because of its flexibility, the membrane does not assure an effective seal for a long time; moreover, the elastic properties of the membrane may degrade over time, thereby compromising the proper operation of the valve.

[0011] On the other hand, solutions of the type with screw-controlled shutter are characterised by a considerable complexity of construction, requiring a high number of components of rather complicated shape, and are therefore characterised by high manufacturing costs. Moreover, the shutter of these devices has the tendency to become unscrewed because the helix corner of the screw allows the opposite movement also when the device is in the closed position.

[0012] Prior art device are, moreover, characterised by large bulk, caused by the fact that they comprise a valve that extends in a transverse direction to the plane of development of the lid.

[0013] In light of the above description, the aim of the present invention is to provide a device for closing containers under vacuum that is able to solve the aforementioned drawbacks.

[0014] In particular, the technical task of the invention is to provide a reliable device, obtained with a limited number of components and characterised by a considerable simplicity of construction.

[0015] Another aim of the invention is to obtain a device for closing containers under vacuum that is characterised by very reduced size.

[0016] The specified technical task and the aims set out above are substantially achieved by a device for closing containers under vacuum according to the description provided in the accompanying claims.

[0017] The description shall now be provided, purely by way of non limiting example, of some preferred but not exclusive embodiments of a device for closing containers under vacuum illustrated in the accompanying drawings, in which:

- Figure 1 shows a perspective view of the device of to the invention according to a first embodiment;
- Figure 2 shows an exploded view of the device of Figure 1;
- Figure 3 shows a transverse section of a detail of the device of Figure 1 in a first operative condition;
- Figure 4 shows a longitudinal section of the detail of Figure 3;
- Figure 5 shows a cross section of a detail of the device of Figure 1 in a second operative condition;
- Figure 6 shows a longitudinal section of the detail

of Figure 5;

- Figure 7 shows a cross section of a detail of the device of Figure 1 in a third operative condition;
- Figure 8 shows a longitudinal section of the detail of Figure 7;
- Figure 9 show an enlarged view of a detail of Figure 8;
- Figure 10 shows a partial longitudinal section of the device of the invention;
- Figure 11 shows a longitudinal section of a detail of the device in accordance with a second embodiment; and
- Figure 12 shows a longitudinal section of a detail of the device in accordance with a third embodiment.

[0018] With reference to the aforementioned figures, the device for closing containers under vacuum according to the invention is globally indicated with the number 1.

[0019] It comprises a lid 2 which typically is shaped counter to the opening of the container, not shown in the drawings, that it has to close. On the lower surface of the lid 2 is applied a gasket 3 that assures the hermetic seal between the lid 2 and the container.

[0020] An air conduit 4 is obtained in the lid 2 to place in communication the interior of the container with the exterior. In particular the conduit 2 has a first end 4a preferably facing the exterior and a second end 4b facing the container.

[0021] A shutter 5, advantageously of spherical shape, is mounted on the lid 2 in correspondence with the first end 4a of the conduit 4.

[0022] The shutter 5 is enclosed in a control element 6 constituted for instance by a knob 7 of substantial circular plan shape. In particular the control element 6 has a first groove 8 that defines in collaboration with the first end 4a of the conduit 4 a seat 9 for the shutter 5.

[0023] The control element 6 is movable between at least a first, a second and a third operative position, indicated respectively with the numbers 10, 11, 12 in Figure 1. Consequently in the groove 8 are identified a first, a second and a third segment, indicated with the numbers 13, 14, 15, which are located respectively in correspondence with the first end 4a of the conduit when the control element 6 is in the first 10, in the second 11 and in the third 12 operative position.

[0024] When the control element 6 is in the first operative position 10, it thrusts the shutter 5 on the first end 4a of the conduit 4 in such a way as to close it, differently when the element 6 is in the second operative position 11 it does not engage the shutter 5. This takes place thanks to the fact that the depth of the first segment 13 of the groove 8 is smaller than the depth of the second segment 14. The same first segment 13 also has a portion with constant depth 13a that engages the shutter 5 when the control element 6 is in the first operative position 10. This constructive detail assures a stable positioning of the shutter; if on the contrary, the shutter 5

were set against the end of the conduit 4 by an inclined portion of the groove 8, the shutter 5 would tend to move towards the region of the groove at greater depth.

[0025] The third segment 15 of the groove 8 instead has a portion 15a shaped substantially as a step, which sets itself against the shutter 5, as shown in Figure 9, to move it away from the first end 4 of the conduit 4 when the control element 6 is in the third operative position 12.

[0026] In correspondence with the first end 4a of the conduit is advantageously mounted a ring gasket 16, against which the shutter 5 is set when it closes the conduit 4. The ring gasket 16 can be constituted by a common O-ring, as shown in Figure 2. Alternatively, gaskets can be used that have a first portion 17 substantially counter-shaped to a cone frustum with circular base, as shown in Figures 11 and 12. The choice of this type of geometry is made to ensure that the shutter 5, even when it is forcibly thrust inside the gasket 16, does not remain stuck therein. For the same reason gaskets 16 are used having a second portion 18 whose radial section develops in a direction substantially transverse to the first end 4a of the conduit, in order to guarantee to the shutter 5 an ample bearing base on the gasket 16 and prevent it from penetrating excessively into the annular gasket 16 remaining jammed therein.

[0027] In the control element 6 is preferably obtained also a second groove 19, extending between a first and a second end, indicated respectively with the numbers 19a and 19b, in which is inserted a pin 20 of the lid 2. This pin 20 engages with the second end 19a of the second groove 19 when the control element 6 is in the third operative position 10 in such a way as to determine an end stop for the rotation of the control element 6 and assure that the element 6 is always correctly and precisely positioned when it is in the third operative position 10.

[0028] In the preferred embodiment, shown in the drawings, the control element 6 is pivotally mounted on the lid 2 whilst in its interior the first and the second groove 8, 19 develop substantially according to arcs of circumferences. In the same control element 6 is further obtained an airway 21 which puts in communication the seat 9 of the shutter 5 with an annular union 22 which can be associated to the suction terminal of a pump, considered known and not shown in the drawings. It can be observed that the union 22 is substantially ring shaped in order to be compatible both with the suction terminals that are associated to the union in correspondence with their inner diameter and with those that are associated to the union in correspondence with their outer diameter.

[0029] The hermetic seal of the control element 6 on the lid 2 is assured by a gasket 23 of the "quad ring" type, i.e. a gasket that has four sealing lips. On said gasket 23 the element 6 is held under pressure by a closing ring nut, indicated in the drawings with the number 24.

[0030] Figure 10 also shows a protecting element 25 which is removably mounted on the lid 2 in correspond-

ence with the second end 4b of the conduit 4. This element 25 has a central appendage 25a which is inserted by pressure into a respective seat 2b in the lower part of the lid 2.

[0031] The element 25 defines in collaboration with the lid 2 a chamber 26 towards which the second end 4b of the conduit is oriented. A plurality of holes 27 puts the chamber 26 in connection with the space exterior thereto.

[0032] The function of the described protecting element 25 is to prevent material present in the container from settling in the conduit 4 during the suction of the air from the container to be placed under vacuum, thereby comprising the proper operation of the whole closing device 1. The application of the protecting element 25 allows to isolate the conduit 4 from the interior of the container, making any material lifted during the air suction operation in correspondence with lateral holes 27, which subsequently can easily be cleaned removing the protecting element and washing it.

[0033] The device according to the invention further comprises a date indicator 28 that allows to show the expiration date of a food product inside the container whereto the closing device is associated. Said date indicator 28 is advantageously located on the lateral surface 2a of the lid and it is in particular obtained showing on said surface 2a a first series of numbers 29 indicating the days of the month and a second series of numbers 30 indicating the months of the year. Also provided are a first cursor 31 and a second cursor 32 movable along the lateral surface 2a to show a number of each series, thereby unambiguously indicating the expiration date of the product.

[0034] The operation of the device according to the invention, previously described in prevalently structural terms, is as follows.

[0035] After associating the lid 2 to the container in which the product to be packaged under vacuum is present, the control element 6 is brought to the second operative position 11 and the suction terminal of a pump is associated to the union 22.

[0036] In these conditions the control element 6 does not engage the shutter 5, i.e. the first groove 8 defines, in collaboration with the first end 4a of the conduit 4, a seat in which the shutter can move freely.

[0037] Consequently, when the terminal aspirates air from the container the shutter 5 is lifted by the vacuum created by the pump and brought to a position in which it does not engage the first end 4a of the conduit, on the contrary if for any reason said vacuum should be lost the shutter 5 returns to engage the first end 4a of the conduit, thrust both by its own weight force and by the possible pressure differential existing between the exterior and the interior of the container.

[0038] When the pump has created the degree of vacuum desired inside the container the control element 6 is positioned in the first operative position 10. The first segment 13 of the groove 8, characterised by a small

depth, will now engage the shutter 5 in such a way as to thrust it on the first end 4a of the conduit 4 which will thus be securely shut.

[0039] In the container under vacuum is to be re-opened, it is sufficient to bring the control element 6 to the third operative position 12. In this way the step portion 15 of the first groove 8 moves the shutter 5 laterally and partially away from the first end 4a of the conduit, freeing an airway through which external air can re-enter the container. It should be noted that the angular travel of the control element 6 in this open position is very critical and must be determined with precision to prevent the shutter 5 from completing exiting the seat 9 obtained from the gasket 16, making it impossible for the shutter 5 to return to the seat 9. This third operative position 12 is determined with precision by the fixed pin 20 on the lid 2 which bears down on the second end of the second groove 19.

[0040] The invention achieves important advantages.

First of all, it should be noted that the device of the invention is characterised by a considerable simplicity of construction. It is constituted by a very limited number of easily manufactured elements. The solution provided by the present invention, moreover, is extremely reliable, since the position of the shutter is always precisely controlled by means of the first groove. The described device also has very limited size, inside and outside the container, compared to prior art solutions, since it does not have any element that requires a vertical direction of development of actuation.

[0041] The invention thus conceived can be subject to numerous modifications and variations, without thereby departing from the scope of the inventive concept. Moreover, all components can be replaced by technically equivalent elements.

KEY

[0042]

- 1- device
- 2- lid
- 2a- lateral surface
- 2b- seat for protecting element 25
- 3- gasket
- 4- air conduit
- 4a- first end
- 4b- second end
- 5- shutter
- 6- control element
- 7- knob
- 8- first groove
- 9- shutter seat
- 10- first operative position
- 11- second operative position
- 12- third operative position
- 13- first segment
- 13a- constant depth portion

- 14- second segment
- 15- third segment
- 15a- step portion
- 16- ring gasket
- 17- first gasket portion
- 18- second gasket portion
- 19- second groove
- 19a- first groove end
- 19b- second groove end
- 20- pivot pin
- 21- air way
- 22- union
- 23- "quad ring" gasket
- 24- ring nut
- 25- protecting element
- 25a- central appendage
- 26- chamber
- 27- lateral hole
- 28- date indicator
- 29- first series of numbers
- 30- second series of numbers
- 31- first cursor
- 32- second cursor

Claims

1. Device for closing containers under vacuum comprising:

- a lid (2) in which is obtained an air conduit (4) to place in communication the interior of the container with the exterior, said conduit (4) having a first and a second end (4a, 4b);
- a shutter (5) mounted on the lid (2) in correspondence with the first end (4a) of the conduit (4); and
- a control element (6) mounted on the lid (2) and movable between at least a first operative position (10) in which it thrusts the shutter (5) on the first end (4a) of the conduit in such a way as to close it, a second operative position (11) in which it does not engage the shutter (5) and a third operative position (12) in which it moves the shutter (5) at least partially away from the first end (4a) of the conduit; **characterised in that** in the control element (6) is obtained a first groove (8) defining in collaboration with the first end (4a) of the conduit a seat (9) for the shutter (5), said first groove (8) having at least a first, a second, and a third segment (13, 14, 15) located in correspondence with the first end (4a) of the conduit when the control element (6) is respectively in the first, in the second and in the third operative position (10, 11, 12), said first segment (13) having smaller depth than the depth of the second segment (14), said third segment (15) comprising a substantially step

shaped portion (15a) that sets against the shutter (5) to move it away from the first end (4a) of the conduit when the control element (5) is in the third operative position (12).

2. A device as claimed in claim 1, **characterised in that** said first segment (13) of the first groove (8) has a portion (13a) at constant depth that engages the shutter (5) when the control element (6) is in said first operative position (10).
3. A device as claimed in any of the previous claims, **characterised in that** the shutter (5) has substantially spherical shape.
4. A device as claimed in any of the previous claims, **characterised in that** the control element (6) is pivotally mounted on the lid (2) and **in that** the first groove (8) develops substantially according to a circumference arc.
5. A device as claimed in any of the previous claims, **characterised in that** it has a ring gasket (16) mounted on the lid in correspondence with the first end (4a) of the conduit, the shutter (5) setting against said gasket (16) when it closes the conduit (4a).
6. A device as claimed in claim 6, **characterised in that** said ring gasket (16) has at least a first portion (17) substantially counter shaped relative to a cone frustum with circular base.
7. A device as claimed in claim 5 or 6, **characterised in that** said ring gasket (16) has a second portion (18) having its radial section developing in a direction substantially transverse to the first end (4a) of the conduit.
8. A device as claimed in any of the previous claims, **characterised in that** in the control element (6) is obtained a second groove (19) having a first and a second end (19a, 19b), said lid (2) having a pivot pin (20) inserted in said second groove (19) and engaging the second end (19b) of the second groove (19) when the control element (6) is in the third operative position (12).
9. A device as claimed in any of the previous claims, **characterised in that** it comprises a removable protecting element (25) mounted on the lid (2) in correspondence with the second end (4b) of the conduit (4), said protecting element (25) defining in collaboration with the lid (2) a chamber (26) towards which is oriented said second end (4b) of the conduit (4), said protecting element (25) having a plurality of holes (27) to place in communication the interior of the chamber (26) with the exterior of the chamber (26).

10. A device as claimed in any of the previous claims,
characterised in that it comprises a union (22), in
communication with the air conduit (4), said union
(22) being substantially ring shaped in order to be
compatible both with suction terminals that are as- 5
sociated to the union in correspondence with their
inner diameter and with those that are associated
to the union in correspondence with their outer di-
ameter.

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11. A device as claimed in any of the previous claims,
characterised in that it comprises a date indicator
(28) located on the lateral surface (2a) of the lid (2).

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FIG. 1

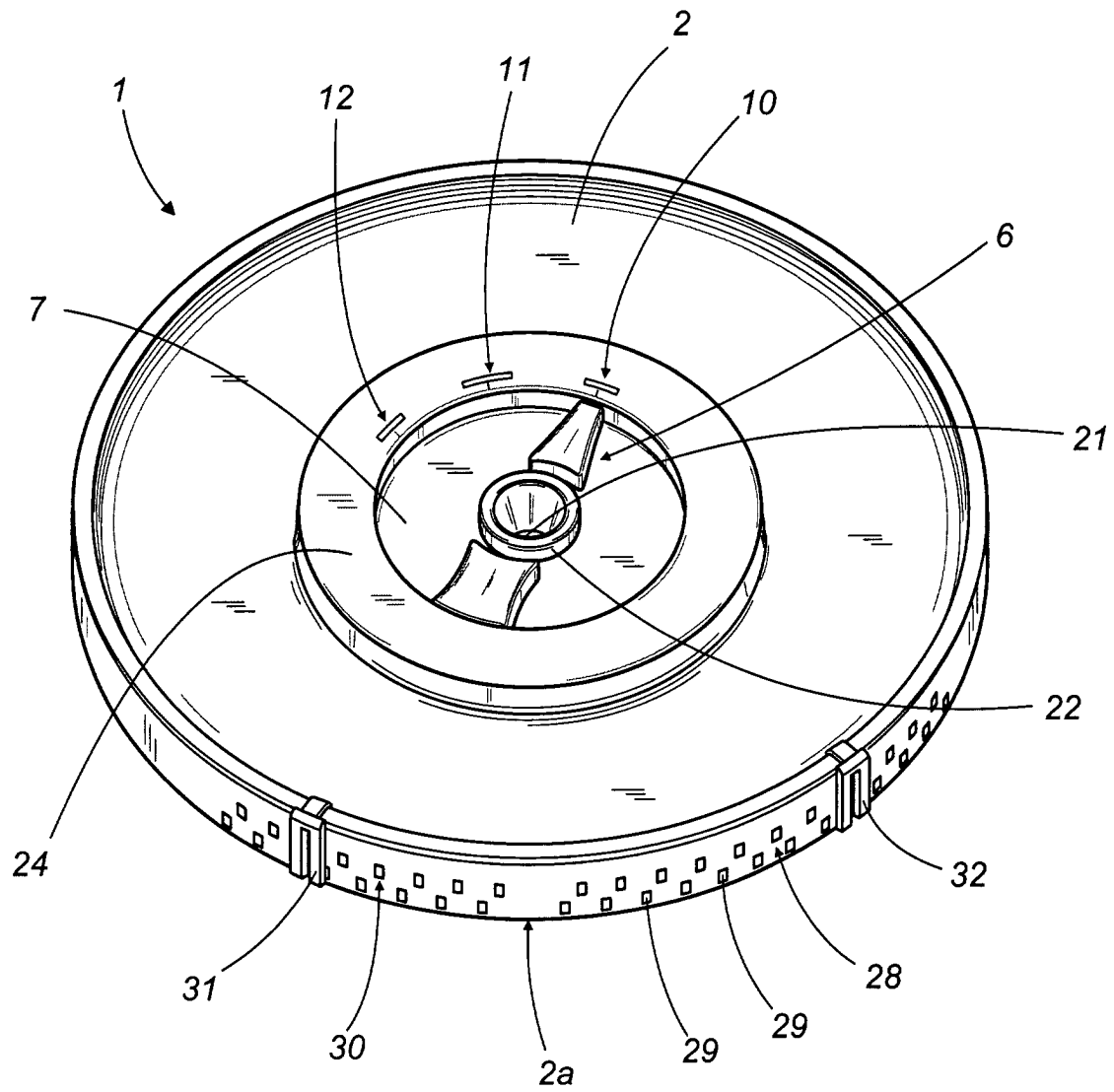


FIG. 2

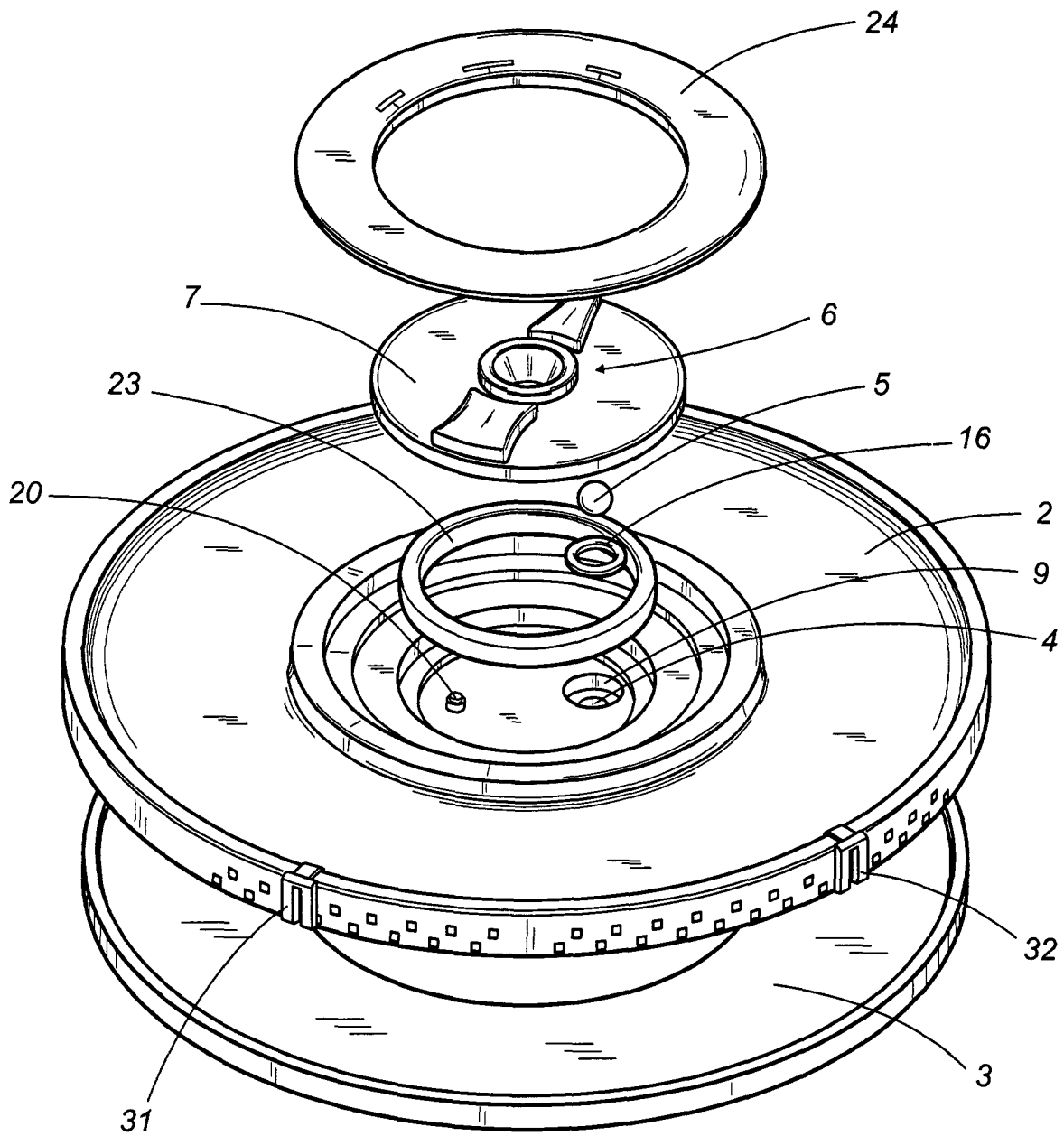


FIG. 3

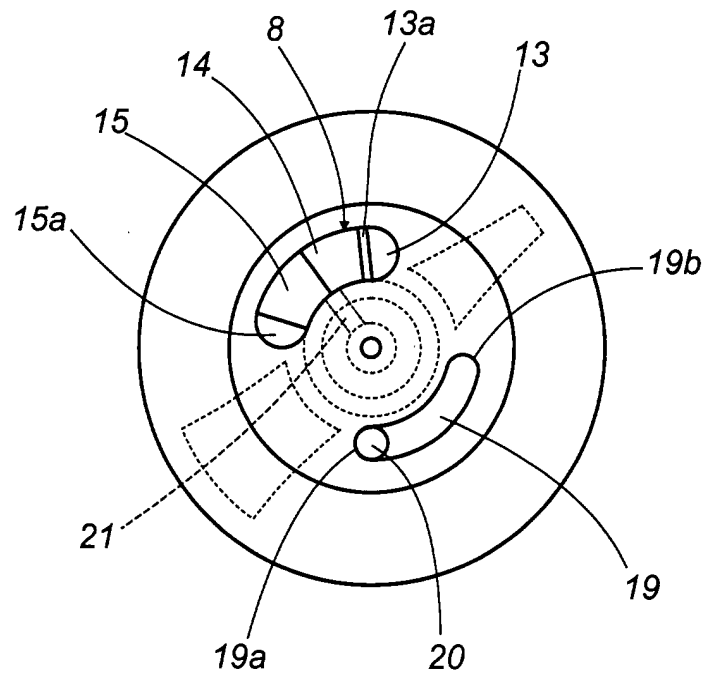


FIG. 4

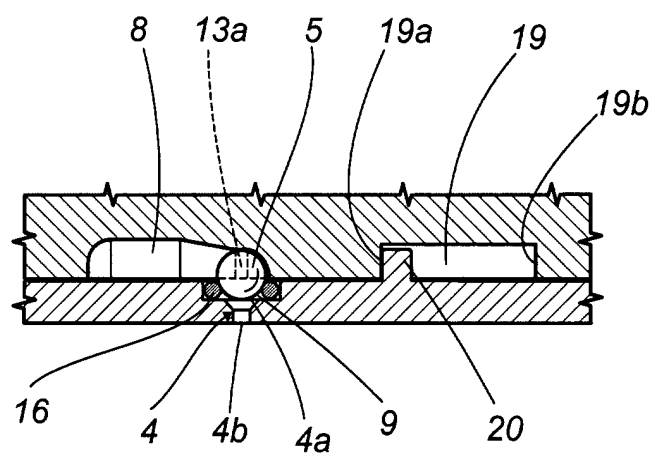


FIG. 5

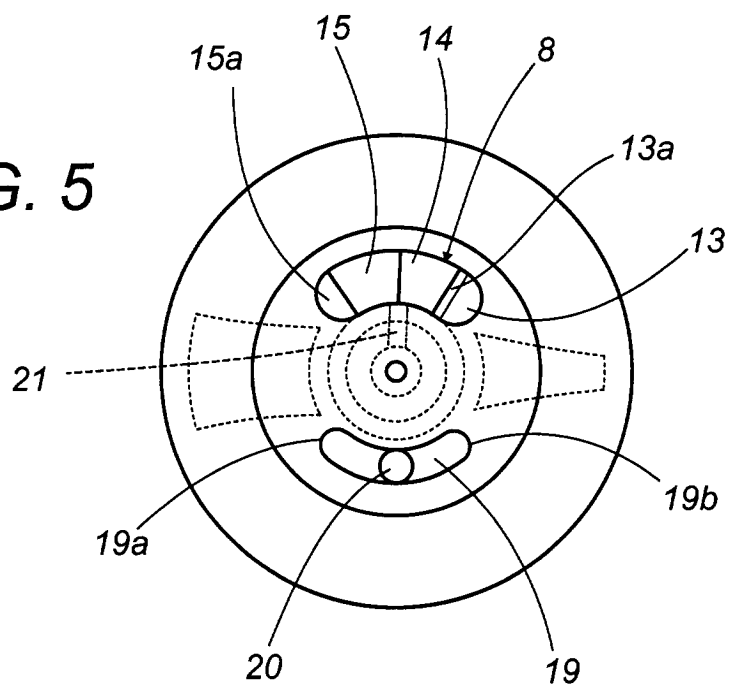


FIG. 6

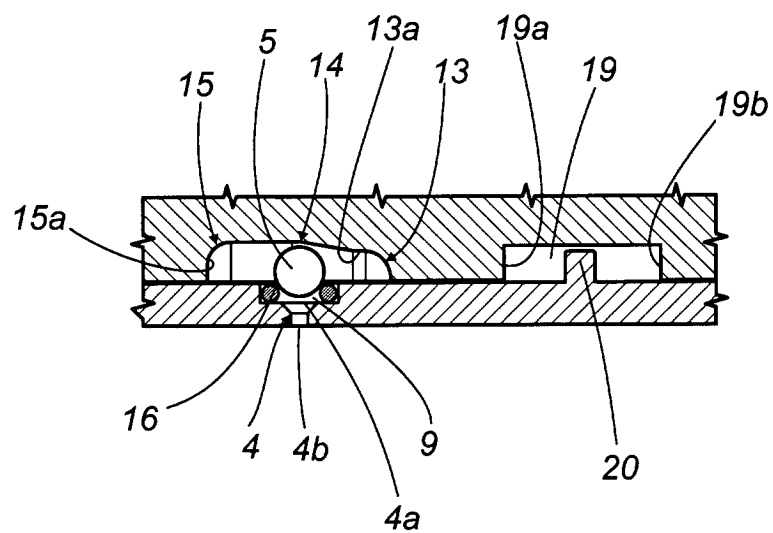


FIG. 7

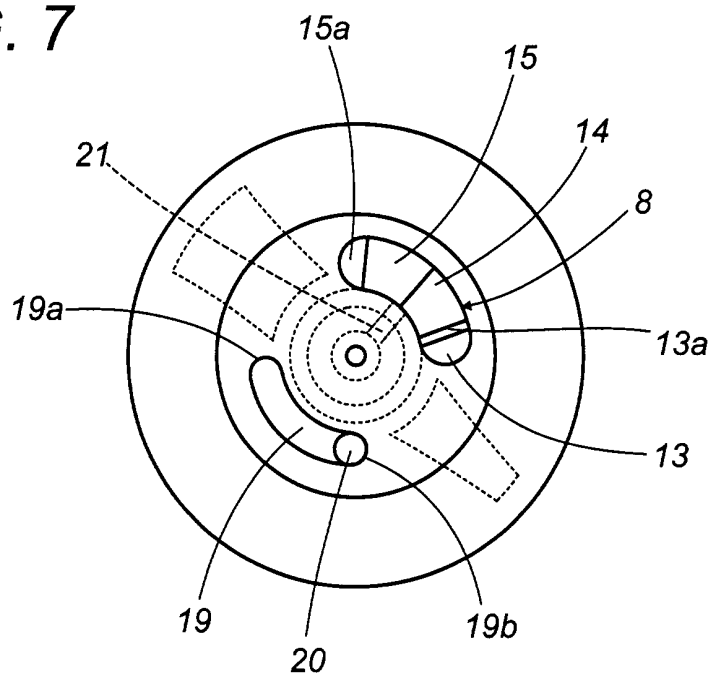


FIG. 8

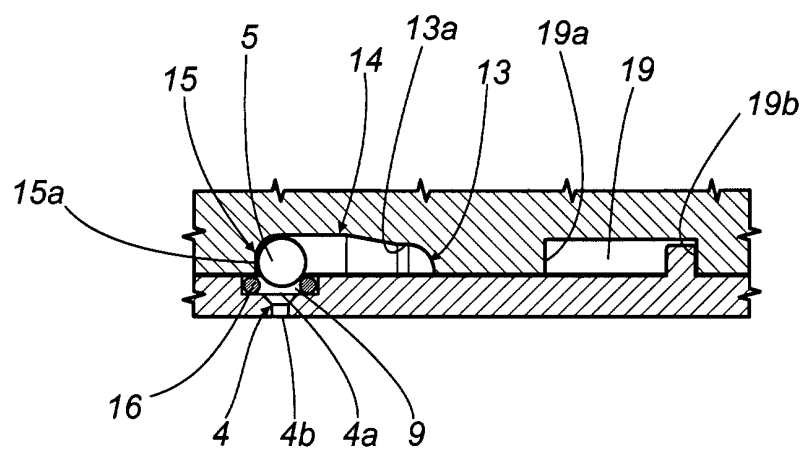


FIG. 9

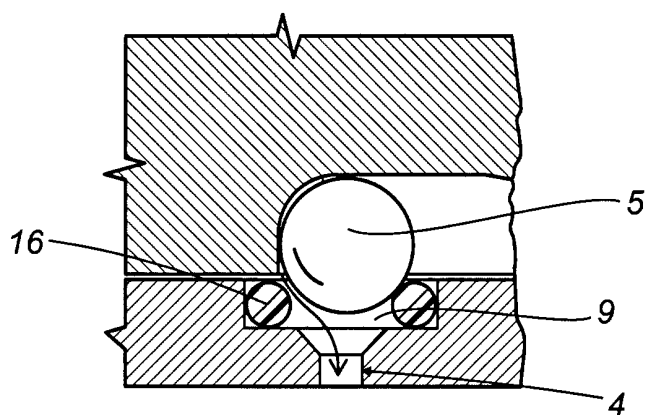


FIG. 10

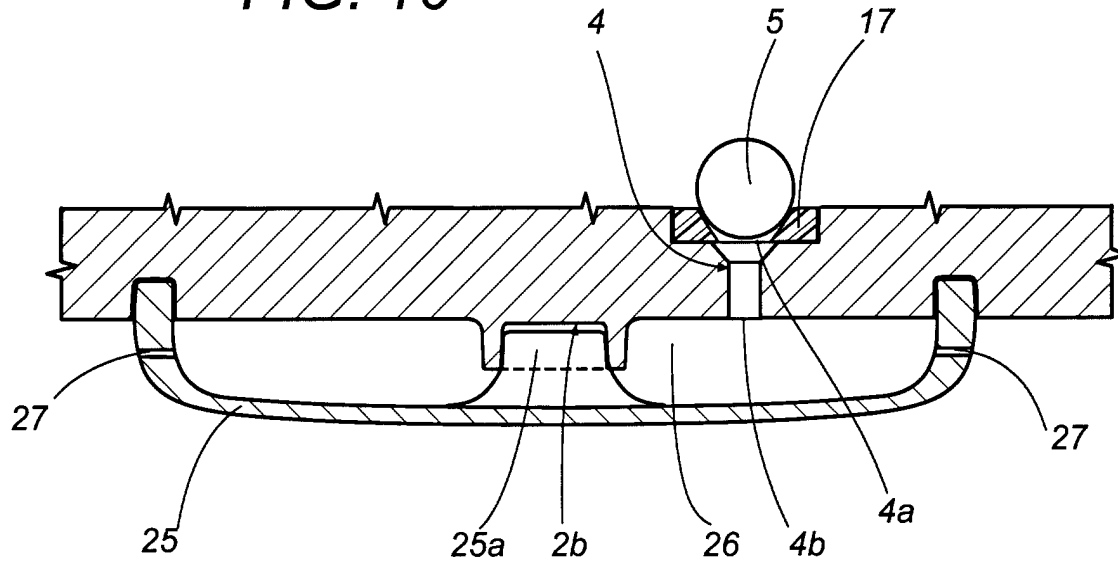


FIG. 11

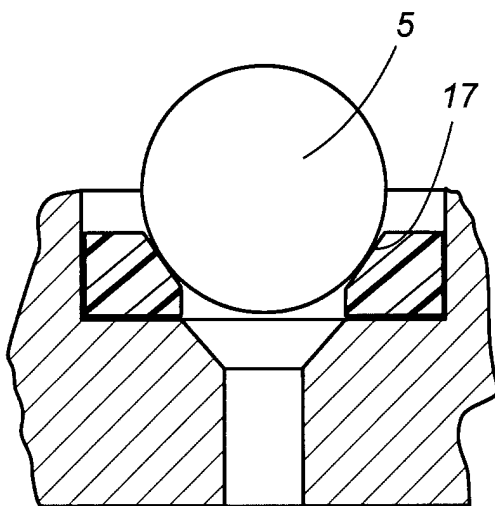


FIG. 12

