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(54) Device for vacuum-sealing bags

(57) A device for vacuum-sealing bags, that comprises a box-shaped frame (2), a cavity (3) formed inside the box-shaped frame, a cover (16) for covering the cavity (3) that is rotatably connected to the frame (2) above the cavity (3), a hollow prism-shaped supporting element

(18) for supporting one end of a bag (40) that has to be sealed, the supporting element (18) being detachably positionable in the cavity (3) and having a chamber (19) that is closed hermetically by the cover (16), the chamber (19) being connectable to a vacuum generation device (10).

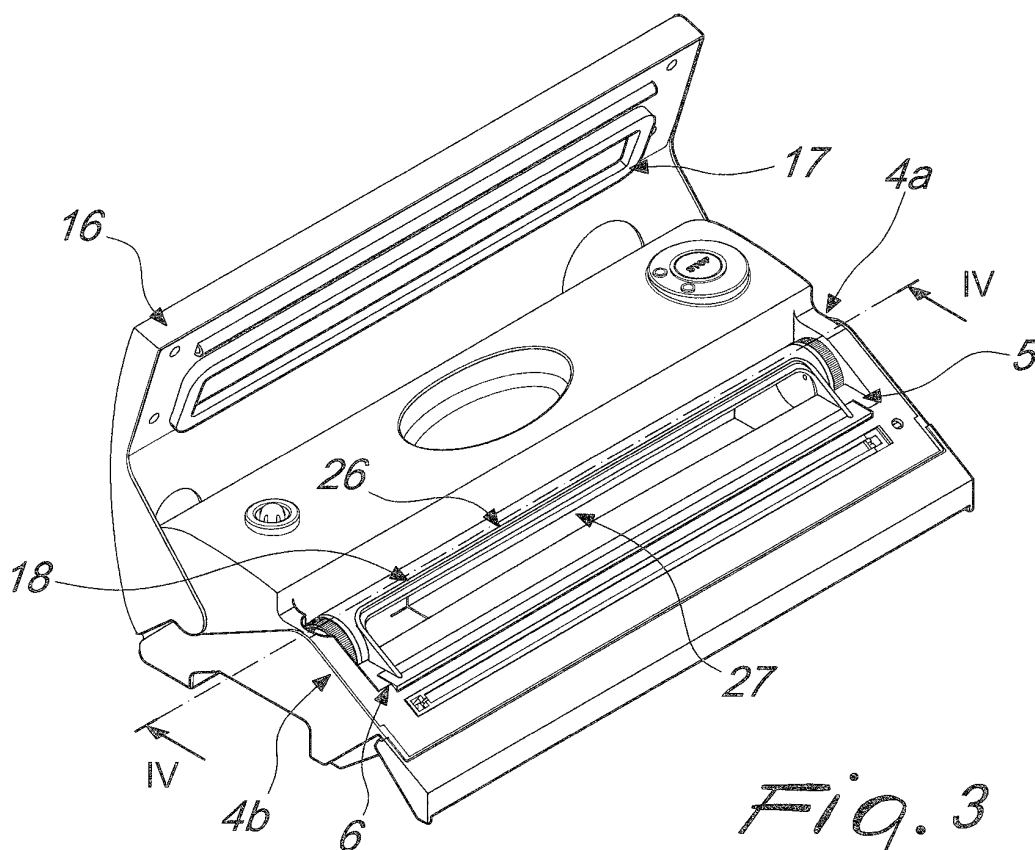


Fig. 3

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Description

[0001] The present invention relates to a device for vacuum-sealing bags.

[0002] The use of airtight bags in which a partial vacuum, commonly termed "vacuum", is generated is generally intended to preserve perishable materials, such as for example food, by virtue of the protection thus afforded against the oxidation processes that instead occur in contact with air.

[0003] Vacuum is created inside said bags, which contain the perishable material to be protected, by way of appropriate sealing devices, which extract part of the air that is present in the bags and close them so as to prevent subsequent inflow of air from outside.

[0004] A first known type of sealing device is currently known which comprises a nozzle, which is connected to vacuum generation means and can be inserted within the bag to be sealed, and means for the thermal bonding of the flaps of said bag.

[0005] The main drawback of this first known type of sealing device is that the thermal bonding of the flaps can occur only after the nozzle has been removed, requiring a high degree of synchronization between the two operations.

[0006] Another drawback of this sealing device relates to the fact that since the nozzle is inserted directly inside the bag, any liquids or powders that are present therein are sucked up and can damage the vacuum generation means.

[0007] Moreover, US-4,941,310 discloses a second known type of sealing device, which is substantially constituted by a box-like structure to which a cover is articulated laterally.

[0008] The box-like structure has a base on which there is a region for supporting the sealable ends of a bag, while the movable cover is provided at the front with a face that can be positioned over said sealable ends; a chamber is formed between said base and said cover and the vacuum can be provided inside it, said chamber having such dimensions as to accommodate only the sealable ends of the bag.

[0009] This second known type of sealing device further comprises static sealing means, which surround said chamber and are arranged between the base and the cover so as to affect externally the sealable ends of the bag when the cover is in the closure position, so as to ensure a static seal only at the open end of said bag.

[0010] Said known sealing device further comprises first means for producing vacuum inside the chamber, which are arranged so as to draw the air from the upper part of the chamber, and second means for heat-sealing the sealable flaps of the bag; there is also a tray, formed below the base of the box-like structure, for collecting liquids or powders sucked up from the inside of said bag.

[0011] The main drawback of this second known type of sealing device is that it is difficult to clean, since the tray for collecting liquids or powders is rigidly coupled to

the base and therefore difficult to access and even more difficult to wash, and all this entails negative repercussions on the overall hygiene of the machine.

[0012] The aim of the present invention is to solve the above-described problems, eliminating the drawbacks of the cited known art, by providing a device that allows to obtain reliable vacuum-sealing of bags, at the same time allowing its rapid and effective cleaning and improving the overall hygiene of the process.

[0013] Another object is to provide a device that is structurally simple and has low manufacturing costs.

[0014] This aim and these and other objects that will become better apparent hereinafter are achieved by a device for vacuum-sealing bags, which comprises a box-like frame that forms inside it a cavity and above which a cover for covering said cavity is rotatably connected, characterized in that a hollow prism-shaped supporting element for one end of said bags can be positioned detachably in said cavity, said supporting element having a chamber that is closed hermetically by said cover and is connected to means for generating vacuum.

[0015] Further characteristics and advantages of the present invention will become better apparent from the following detailed description of a particular but not exclusive embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of the vacuum-sealing device according to the invention in the closure position;

Figure 2 is a perspective view of the device according to the invention in the closure position, with a bag applied thereto;

Figure 3 is a perspective view of the vacuum-sealing device in the open position;

Figure 4 is a sectional view, taken along the line IV-IV of Figure 3, of a detail of the invention;

Figure 5 is an exploded perspective view of the vacuum-sealing device according to the invention;

Figure 6 is a sectional view, taken along the line VI-VI of Figure 1, of the device according to the invention.;
Figure 7 is a perspective view of a detail of the invention.

[0016] In the embodiments that follow, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other embodiments.

[0017] Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0018] With reference to the figures, the reference numeral 1 designates a device for vacuum-sealing bags 40, which comprises a frame 2 that has a box-like structure and on the upper front surface of which there is a cavity 3 that is open upward.

[0019] The cavity 3, which has a generally triangular

transverse cross-section, may conveniently be slightly shorter than the frame 2, being delimited laterally by two first walls 4a and 4b, which are arranged vertically.

[0020] A first gasket 6, made for example of rubber, is conveniently provided on the first front edge 5 of the cavity 3 and lies transversely approximately along the entire width of said first edge.

[0021] The cavity 3 has a bottom 7 on which there is advantageously, preferably proximate to a second rear wall 8 of said cavity, a receptacle 9 that is open upward and runs along at least part of, or over the entire width of said cavity; said receptacle has a cross-section that has a selected geometric shape, for example, selected to be U-shaped or rectangular or trapezoidal or as a differently shaped geometric body.

[0022] Means for generating vacuum are accommodated inside the frame 2, in a region that is not occupied by the cavity 3, and are constituted by a suction device 10, to which a first pipe or tube 11 is connected which supports, at its free end, an internally perforated connector 12.

[0023] Said connector is conveniently generally L-shaped and can be accommodated with an interlocking coupling within the first wall 4a, a wing 13 of said connector facing the inside of the cavity 3; the wing 13 of said connector is therefore arranged along an axis that is approximately parallel to the axis of the receptacle 9 at one side of the cavity 3.

[0024] The connector 12 further has a hole 14 at both of its opposite ends, so as to connect the cavity 3 to the first tube 11 and to the suction device 10.

[0025] The suction device 10 is controlled by means of an electronic device 15 for adjusting and controlling the level of vacuum, which is also accommodated within the frame 2.

[0026] A cover 16 for covering the cavity 3 is rotatably associated above the frame 2 and supports in a lower region a second gasket 17, which is closed in a loop and has a generally rectangular plan shape.

[0027] The second gasket 17 is constituted by a first straight ridge 17a, which is arranged at the front, by a second straight ridge 17b, which is parallel to the first cross-member and is arranged behind it, and by two third lateral ridges 17c, which are also straight and are perpendicular to the first and second ridges 17a and 17b and mutually connect them, so as to form a closed loop.

[0028] Conveniently, the length of the first and second ridges of the second gasket is approximately equal to, or shorter than, the length of the first gasket 6, so that the second gasket can be accommodated within the cavity 3 when the cover 16 is in the closed position.

[0029] Advantageously, the first ridge 17a of the second gasket 17 is rigidly coupled below the cover 16 in such a position as to abut against the first gasket 6 when said cover is in the closed position and if there are no other external elements interposed between them.

[0030] The device 1 according to the invention further comprises a supporting element 18, which is shaped like

a hollow prism, is advantageously shaped complementarily with respect to the receptacle 9 formed on the bottom 7 of the chamber 3, and is slightly shorter than said receptacle, so that it can be accommodated detachably therein, ensuring a preset play for its fitting.

[0031] In a further advantageous but not exclusive embodiment of the invention, the supporting element 18 has a cylindrical shape and the receptacle 9 has a semicylindrical shape, so that the supporting element 18 can be accommodated therein, protruding upward with approximately half of its volume.

[0032] A chamber 19 is formed inside the supporting element 18, is open at an opening 20 that is formed longitudinally on a portion of the lateral face of said supporting element that is directed toward the cover in the closed condition and affects, or extends in the supporting element 18 for part of its extension comprised between its two opposite lateral ends 21 and 22.

[0033] A generally flat tab 23 protrudes radially from the supporting element 18 at the second edge 20a of the opening 20, which is arranged downward when the supporting element 18 is accommodated within the receptacle 9, and is approximately as long as the opening 20 and lies approximately horizontally when said supporting element is accommodated within the receptacle 9.

[0034] The tab 23 is arranged on the bottom 7 of the cavity 3 and affects or extends over it up to its first front edge 5.

[0035] Advantageously, the width of the tab 23 is such that it rests, at its free end 24, on a portion of the first gasket 6, which further is conveniently slightly longer than the tab 23, so that said tab rests thereon along its entire length.

[0036] Two vertically arranged lateral wings 25 delimit the tab 23 at its ends, have a generally triangular shape and connect, by means of their third upper edges 25a, the free end 24 of the tab 23 to the fourth upper edge 20b of the opening 20.

[0037] Advantageously, the mutual distance between the lateral wings 25 is approximately equal to the distance between the third ridges 17c of the second gasket 17, at which they are accordingly positioned when the cover 16 is in the closed position.

[0038] When the cover 16 is in the closed position, the fourth upper edge 20b of the opening 20 is instead arranged below the second upper ridge 17b of the second gasket 17, so that the second ridge 17b abuts against the lateral surface of the supporting element 18 above the fourth edge 20b.

[0039] Since the first ridge 17a of the gasket 17 abuts, in this condition, against the first gaskets 6, the opening 20 is closed hermetically by said ridge.

[0040] In order to improve the efficiency of said hermetic closure, a protrusion 26 can protrude externally from the supporting element 18 at the third edges 25a and proximate to the fourth edge 20b, said protrusion being approximately C-shaped in plan view and matching the shape of the second gasket 17 at its second and third

ridges; said protrusion interferes, when the cover is placed in the closure position, against the second gasket 17, providing substantial airtightness.

[0041] A partition 27 is accommodated axially and centrally with respect to the chamber 19, is generally Y-shaped or X-shaped, and is shorter than said chamber; a generally horizontal wall of the partition 27 is conveniently arranged at the same level as the tab 23, so as to constitute, in cooperation with said tab, a supporting surface for the sealable flaps of a bag 40.

[0042] The supporting element 18 further has, at one of its ends, a lug 28, which protrudes from one of its end faces in a longitudinal direction and is provided internally with a through hole; advantageously, the lug 28 is arranged at the same level as, or above, the tab 23.

[0043] The lug 28 is externally shaped complementarily with respect to the hole 14 that is open at the wing 13, which faces the inside of the cavity 3, of the connector 12, so as to be detachably insertable therein by interlocking, connecting the chamber 19 to the first tube 11 and the suction device 10 and at the same time isolating the cavity 3 from said tube and said device.

[0044] Moreover, a valve 29 is arranged on an external surface of the frame 2 and is connected to the suction device 10 by means of a second tube 30, which is also connected, optionally by means of the first tube 11, to the chamber 19; the first end of a tube, connected at its second end to the inside of a vessel by means of an identical and separate valve provided thereon, can be connected to said valve.

[0045] The valve 29 is normally closed, ensuring the hermetic closure of the second tube 30; when the first end of the tube is connected thereto, the valve 29 opens automatically, connecting to the suction device 10 said tube and, by means of an identical and separate valve connected to the second end of the tube, the vessel.

[0046] The valve 29 further acts as a vent in order to allow, by way of a selective actuation thereof, which is either manual or motorized, provided by means of an electrically-actuated device, the inflow of air from the outside toward the depressurized chamber, in order to balance the pressure that acts inside said chamber with respect to the ambient pressure and thus allow to open it.

[0047] Moreover, the sealing device 1 can comprise a pressure sensor 32, preferably of the type with variable inductance, which is capable of detecting continuously the difference in pressure between the chamber 19 and the outside environment and of transmitting to the device 15 for adjusting and controlling the level of partial vacuum an electrical signal that is proportional thereto.

[0048] Said signal can be processed according to preset algorithms by the adjustment and control device, which regulates the suction device depending on the level of partial vacuum to be produced inside the chamber 19.

[0049] There are also means 31 for heat-sealing the sealable ends of a bag 40, which are for example operated electrically and are capable of melting said sealable

ends together so as to ensure the airtightness of said bag; said means can be activated automatically once the chosen level of partial vacuum has been reached.

[0050] The operation of the device for vacuum-sealing bags therefore entails that while the cover 16 is in the open position and therefore raised, the sealable ends of a bag that contains products to be placed in vacuum are positioned on the supporting element 18 at its tab 23.

[0051] The cover 16 can then be closed, so that a portion of the flaps of the bag is blocked between the first gasket 6 and the first front ridge 17a of the second gasket 17; by way of the use of known types of bag provided with appropriate internal channels, the passage of air from the inside of the bag toward the chamber 19 formed inside the supporting elements 18 is still ensured.

[0052] Moreover, the chamber 19 is closed hermetically by the second gasket 17 and is connected on one side to the suction device 10 and on the other side to the inside of the bag.

[0053] Once the cover 16 has been closed, the vacuum generation means are activated automatically or by means of a manual intervention of the user; in particular, the suction device 10 generates a partial vacuum inside the chamber 19, which draws the air contained inside the bag.

[0054] Moreover, said partial vacuum acts so as to reinforce the closure of the cover 16 against the frame 2, so as to increase the seal offered by the second gasket as the difference in pressure between the chamber 19 and the outside environment increases.

[0055] During this process, the difference in pressure between the chamber 19 and the outside environment is detected continuously by the pressure sensor 32 and transmitted to the device 15 for adjusting and controlling the level of partial vacuum, which calibrates the operation of the suction device 10.

[0056] Once the chosen level of negative pressure inside the chamber 19 and therefore inside the bag has been reached, the means for welding the sealable ends of the bag are activated automatically, and said bag is thus sealed with respect to the outside environment.

[0057] The adjustment and control device then interrupts the operation of the suction device; in this condition, the pressure inside the chamber 19 remains in any case lower than the ambient pressure, preventing its opening on the part of the user.

[0058] It is therefore possible to operate manually, or optionally by means of an electric actuation device, the valve 29, which connects the chamber 19 to the outside environment, allowing air to enter it and allowing to restore the ambient pressure, so as to allow easy opening of said chamber and removal of the sealed bag, inside which the chosen level of vacuum remains.

[0059] Optionally, the level of vacuum that can be provided inside the bag can be set by the user by programming the device 15 for adjusting and controlling the level of partial vacuum, so that said device, by detecting continuously the partial vacuum that occurs inside the cham-

ber by means of the sensor 32 and by consequently driving the suction device 10, stabilizes the pressure inside the chamber once it has reached the set level.

[0060] During the vacuum-sealing of bags, liquids or powders contained inside them can be entrained into the chamber 19 by the partial vacuum that has been generated therein; these particles therefore tend to fall onto the bottom of the chamber 19 by gravity and can accumulate there over time.

[0061] The chamber 19 can be cleaned easily, with the cover 16 in the open position, by disengaging the lug 28 from the connector 12 and removing the supporting element 18 from the receptacle 9.

[0062] The supporting element 18 can therefore be easily cleaned and sanitized, optionally also by using detergent liquids, before it is returned inside the receptacle 9 for reuse.

[0063] The arrangement of the lug 28 above, or at the same level as, the tab 23 prevents any liquids or powders aspirated from the inside of the bag from reaching the suction device 10 and damaging it; in this manner, the need to place filters between the chamber 19 and the suction device 10 is avoided.

[0064] If one wishes to generate vacuum inside a container provided with a valve 29, is possible to connect said valve to the vacuum-sealing device by means of a tube, which is inserted at its first end in the identical and separate valve 29 that is provided on the sealing device 1 and is connected to the suction device 10.

[0065] Once the intended level of vacuum has been obtained inside the container, removal of the tube from each valve 29 causes the automatic closure of said valves, so as to ensure that vacuum is retained inside the container and allow reuse of the vacuum-sealing device 1.

[0066] It has thus been found that the invention has achieved the intended aim and object, a device having been provided which allows to achieve reliable vacuum-sealing of bags, at the same time allowing its quick and effective cleaning and improving the overall hygiene of the process.

[0067] The materials used, as well as the dimensions that constitute the individual components of the invention, may of course be more pertinent depending on the specific requirements.

[0068] The various means for performing certain different functions need not certainly coexist only in the illustrated embodiment but can be present per se in many embodiments, including ones that are not illustrated.

[0069] The characteristics mentioned as being advantageous, convenient or the like may also be omitted or be replaced with equivalents.

[0070] The terms "generally" and "approximately" are intended to indicate that the form or position features to which they refer can have slight variations with respect to the exact position or shape shown in the figures, all within the accepted ranges recognized for the pertinent technical field.

[0071] The disclosures in Italian Patent Application No. TV2004A000092 from which this application claims priority are incorporated herein by reference.

[0072] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A device for vacuum-sealing bags, comprising a box-like frame (2) that forms inside it a cavity (3) and above which a cover (16) for covering said cavity is rotatably connected, **characterized in that** it further comprises a hollow prism-shaped supporting element (18) for one end of said bags (40) that can be positioned detachably in said cavity (3), said supporting element (18) having a chamber (19) that is closed hermetically by said cover (16) and is connected to means (10) for generating vacuum.
2. The device according to claim 1, **characterized in that** said cavity (18) is formed on the upper front surface of said frame (2) and is open upward, said cavity (3) preferably having a generally triangular transverse cross-section and being slightly narrower than said frame (2), being delimited laterally by two first vertically arranged walls (4a, 4b), a first gasket (6) being provided on the first front edge (5) of said cavity (3), being preferably made of rubber and lying transversely approximately along the entire width of said first edge (5), said cavity (3) having a bottom (7) on which, preferably proximate to a second rear wall (8) of said cavity (3), at least one receptacle (9) is provided that is open upward and covers at least part of the width of said cavity (3).
3. The device according to claims 1 and 2, **characterized in that** said receptacle (9) has a cross-section that has a selected geometric shape, preferably a U-shape or rectangular or trapezoidal, or of a differently shaped geometric body.
4. The device according to claims 1 and 3, **characterized in that** said vacuum generation means are constituted by a suction device (10) to which a first tube (11) is connected, said tube (11) supporting, at its free end, an internally perforated connector (12), said vacuum generation means (10) being accommodated inside said frame (2), in a region that is not affected by said cavity (3).
5. The device according to claims 1 and 4, **characterized in that** said connector (12) is generally

L-shaped, has an open hole (14) at both of its opposite ends, and can be accommodated with an interlocking coupling within one of said first walls (4a, 4b), with one wing (13) thereof facing the inside of said cavity (3) and being arranged along an axis that is parallel to the axis of said receptacle (9) at one side of said cavity (3).

6. The device according to claims 1 and 5, **characterized in that** said suction device (10) is regulated by way of an electronic device (15) for adjusting and controlling the level of partial vacuum, which is accommodated inside said frame (2).
7. The device according to claims 1 and 6, **characterized in that** said frame (2) supports, in a lower region, a second gasket (17), which is closed in a loop and has a generally rectangular plan shape.
8. The device according to claims 1 and 7, **characterized in that** said second gasket (17) is constituted by a first straight ridge (17a) arranged at the front, by a second straight ridge (17b) that is parallel to the first cross-member and is arranged behind it, and by two third likewise straight lateral ridges (17c), which are perpendicular to said first and second ridges (17a, 17b) and connect them so as to form a closed loop.
9. The device according to claims 1 and 8, **characterized in that** the length of said first and second ridges (17a, 17b) of said second gasket (17) is approximately conveniently equal to, or smaller than, the length of said first gasket (6), said second gasket (17) being accommodatable inside said cavity (3) when said cover (16) is in the closure position.
10. The device according to claims 1 and 9, **characterized in that** said first ridge (17a) of said second gasket (17) is advantageously coupled in a lower region to said cover (16) in such a position that it abuts, when said cover (16) is in the closed position and there are no external elements interposed between them, on said first gasket (6).
11. The device according to claims 1 and 10, **characterized in that** said supporting element (18) is shaped complementarily to said at least one receptacle (9) formed on said bottom (7) of said chamber (3) and is slightly shorter than said receptacle (9), and can be accommodated detachably therein and allows a preset play for its fitting.
12. The device according to claims 1 and 11, **characterized in that** said supporting element (18) is cylindrical and said at least one receptacle (9) is semicylindrical, said supporting element (18) being accommodatable in said receptacle (9) and protruding

upward from it with approximately half of its volume.

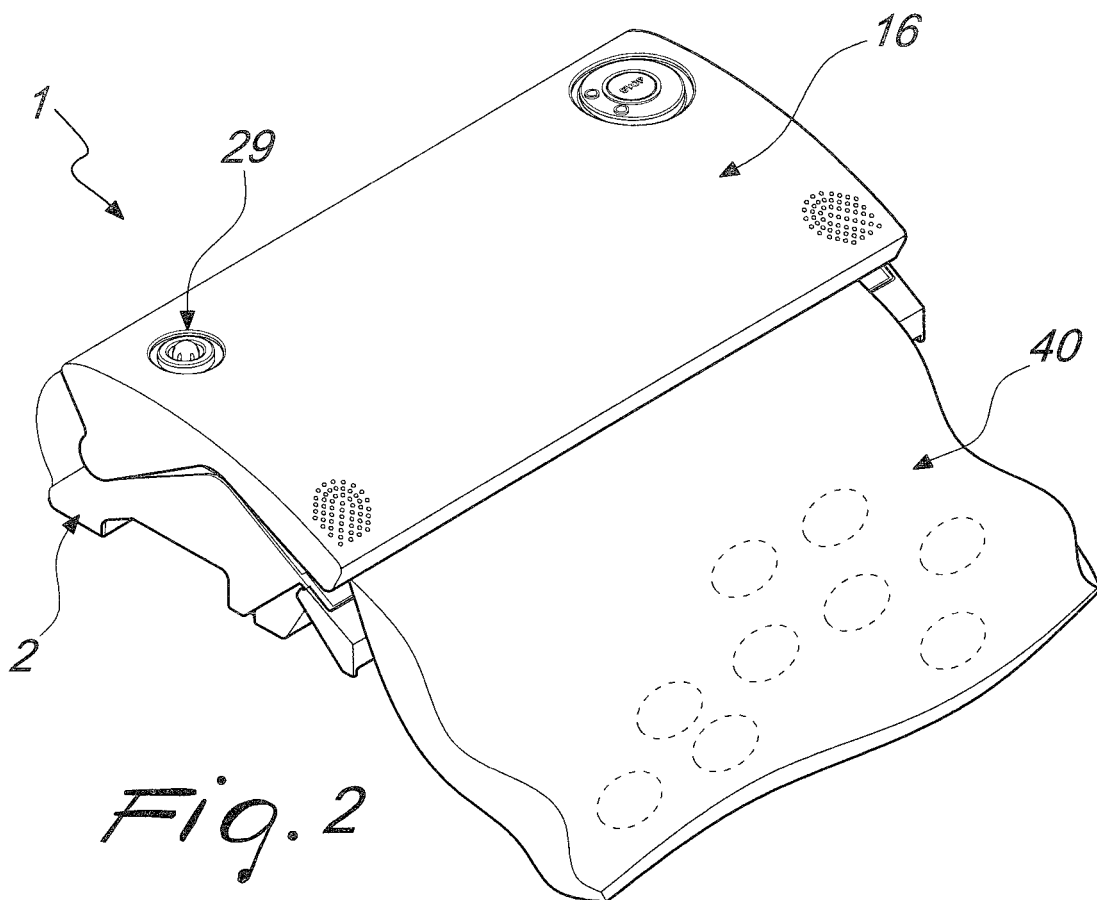
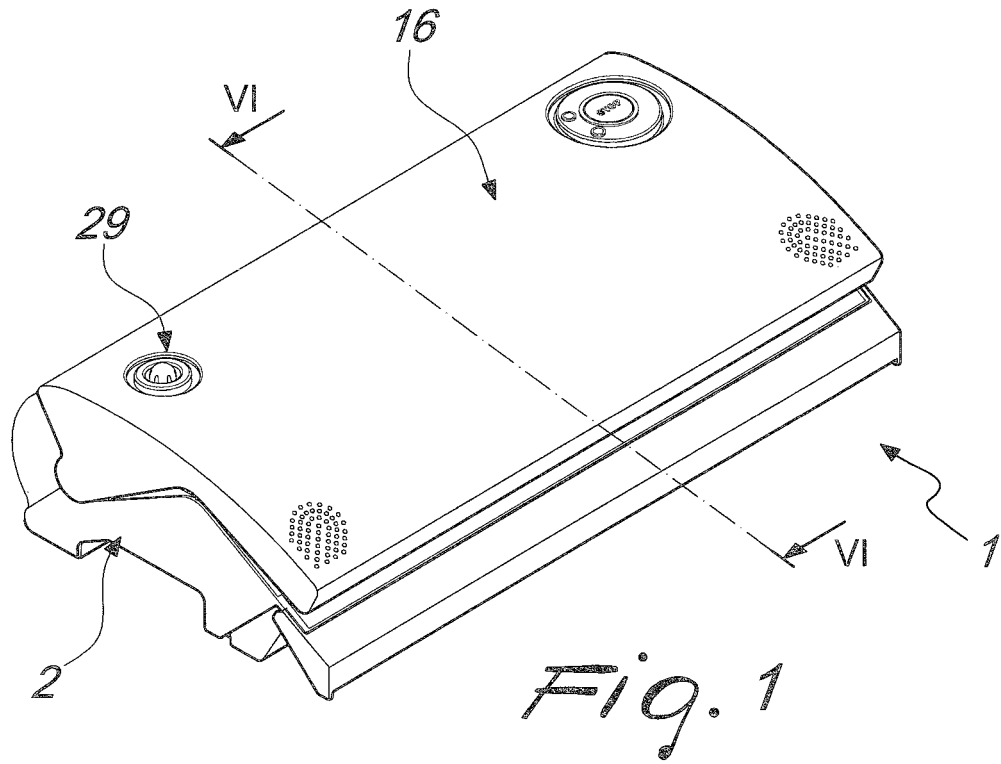
13. The device according to claims 1 and 12, **characterized in that** said chamber (19) formed inside said supporting element (18) is open at an opening (20) that is formed longitudinally on a portion of the lateral face of said supporting element (18), said opening (20) being directed toward said cover (16) in the closed condition and affecting said supporting element for a portion of its extension that is comprised between its two opposite lateral ends (21, 22).
14. The device according to claims 1 and 13, **characterized in that** a generally flat tab (23) protrudes radially from said supporting element (18) at a second edge (20a) of said opening (20) that is arranged in a lower region when said supporting element (18) is accommodated inside said receptacle (9), said tab (23) being as long as said opening (20) and being arranged horizontally when said supporting element (18) is accommodated within said receptacle (9) so as to affect said bottom (7) of said cavity (3) up to said first front edge thereof.
15. The device according to claims 1 and 14, **characterized in that** said tab (23) rests, at one (24) of its free ends, on a portion of said first gasket (6), said first gasket (6) being slightly longer than said tab (23), said tab (23) resting above said first gasket (6) along its entire length.
16. The device according to claims 1 and 15, **characterized in that** said tab (23) is delimited at its ends by two lateral wings (25) that are arranged vertically, are generally triangular and connect by way of their first third upper edges (25a) said free end (24) of said tab (23) to a fourth upper edge (20b) of said opening (20).
17. The device according to claims 1 and 16, **characterized in that** the mutual distance between said lateral wings (25) is approximately equal to the distance between said third ridges (17c) of said second gasket (17), said lateral wings (25) being positioned, when said cover (16) is in the closure position, at said third ridges (17c).
18. The device according to one or more of the preceding claims, **characterized in that** when said cover (16) is in the closed position, said fourth upper edge (20b) of said opening (20) is arranged downward with respect to said second upper ridge (17b) of said second gasket (17), said second ridge (17b) abutting against the lateral surface of said supporting element (18) above said fourth edge (20b).
19. The device according to claims 1 and 18, **characterized in that** a protrusion (26) protrudes externally

from said supporting element (18) at said third edges (25a) and proximate to said fourth edge (20b), has a C-shaped plan configuration that matches said second gasket (17) at said second and third ridges (17b, 17c), said protrusion (26) interfering against said second gasket (17) when said cover (16) is in the closed position.

20. The device according to claims 1 and 19, **characterized in that** a partition (27) is accommodated axially with respect to said chamber (19) and in a central position with respect to it and has a generally Y-shaped or X-shaped cross-section and is shorter than said chamber (19), a generally horizontal wall of said partition being arranged at the same level as said tab (23), so as to constitute, in cooperation with said tab (23), a supporting surface for the flaps to be welded of an end of said bag (40).
21. The device according to claims 1 and 20, **characterized in that** said supporting element (18) has, at one of its ends, a lug (28) that protrudes from an end face of said supporting element (18) in a longitudinal direction and is internally provided with a through hole, said lug (28) being positioned at the same level as, or above, said tab (23).
22. The device according to claims 1 and 21, **characterized in that** said lug (28) is externally shaped complementarily with respect to said open hole (14) at said wing (13) of said connector (12) that faces the inside of said cavity (3) and can be inserted therein detachably with an interlocking coupling, so as to connect said chamber (19) to said first tube (11) and said suction device (10) and isolate said cavity (3) from said chamber (19), said first tube (11) and said suction device (10).
23. The device according to one or more of the preceding claims, **characterized in that** it comprises a valve (29), which is arranged at an external surface of said frame (2) and is connected to said suction device (10) by way of a second tube (30), which is connected, optionally by way of said first tube (11), also to said chamber (19), said valve (29) being actuatable selectively, either manually or by way of an electrically-operated device, so as to allow the passage of air from the outside environment toward said chamber (19).
24. The device according to claims 1 and 23, **characterized in that** the first end of a tube can be connected to said valve (29), said tube being connected at its second end to the inside of a vessel by means of an identical and separate valve provided on said vessel.
25. The device according to one or more of the preceding

claims, **characterized in that** it comprises a pressure sensor (32), preferably of the variable inductance type.

26. The device according to one or more of the preceding claims, **characterized in that** it comprises means (31) for heat-sealing the sealable ends of said bag (40), which are preferably actuated electrically and can be activated automatically once the intended level of partial vacuum has been reached inside said chamber (19).



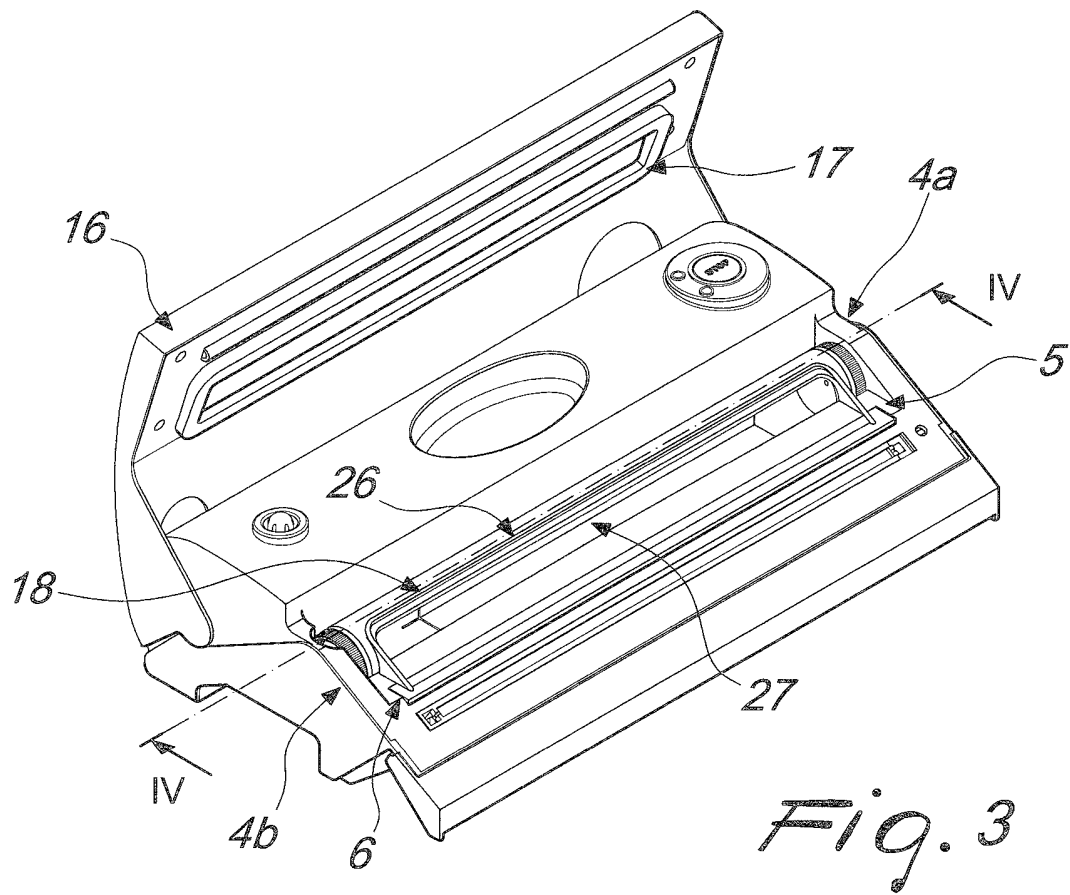


Fig. 3

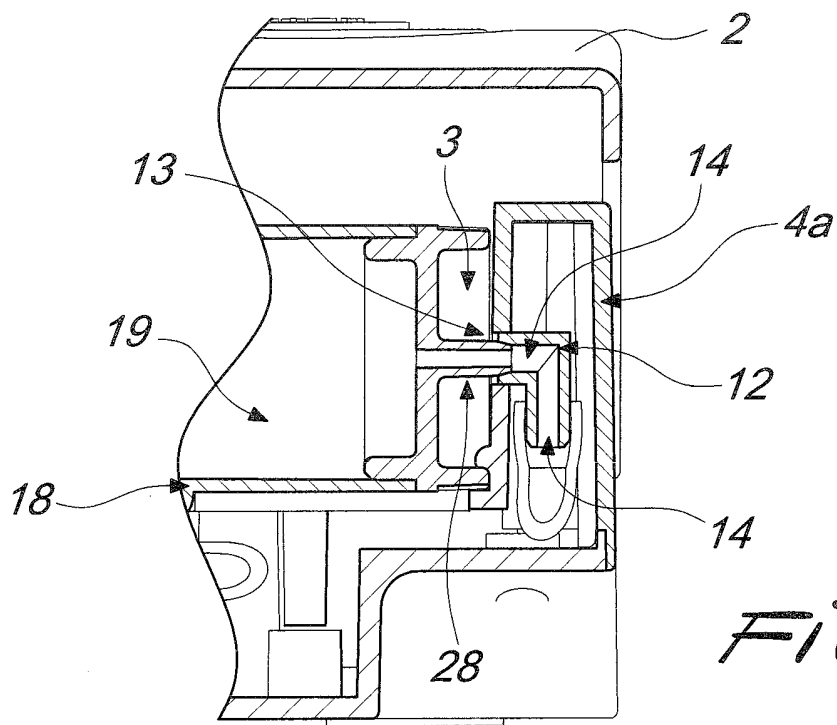


Fig. 4

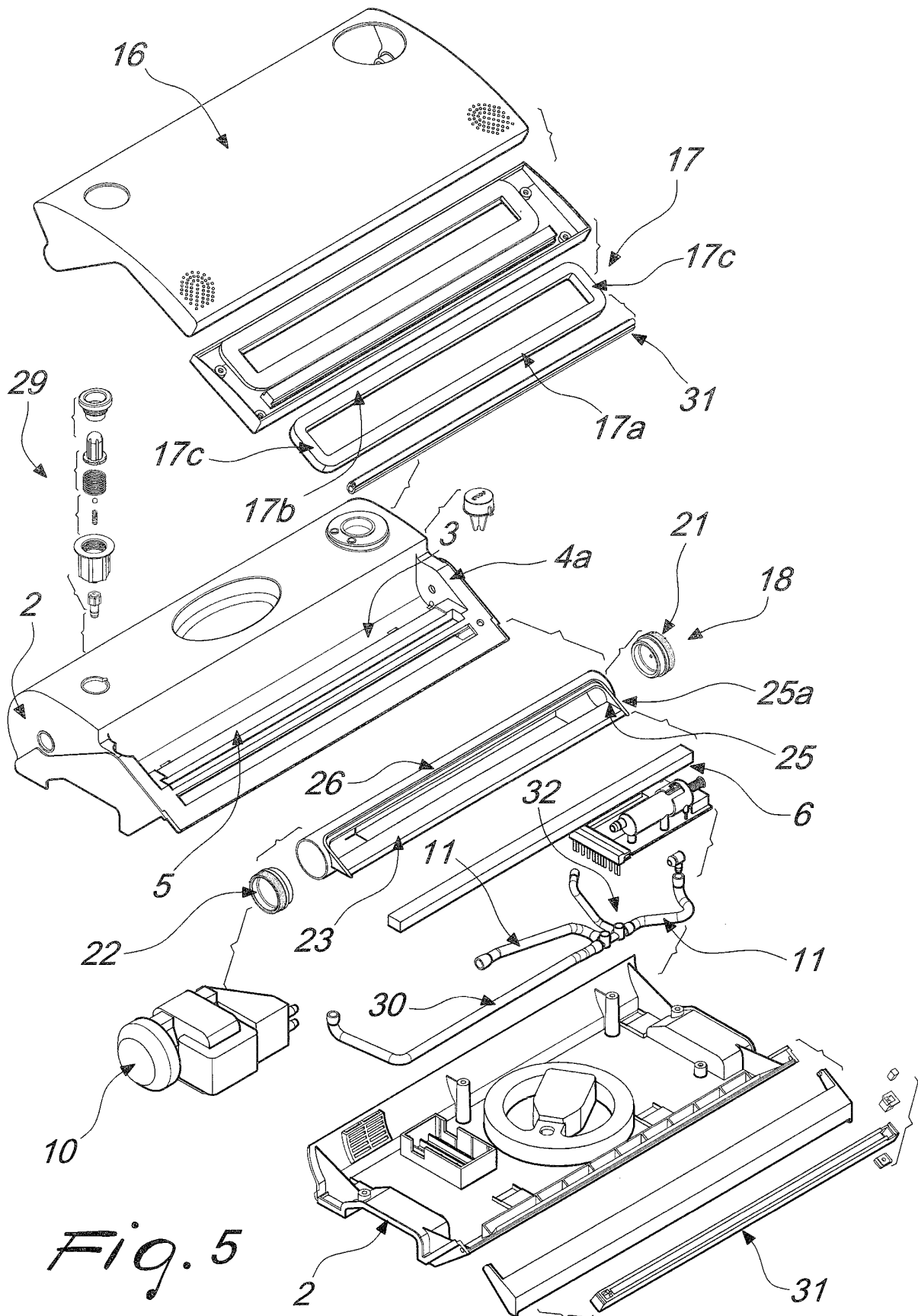


Fig. 5

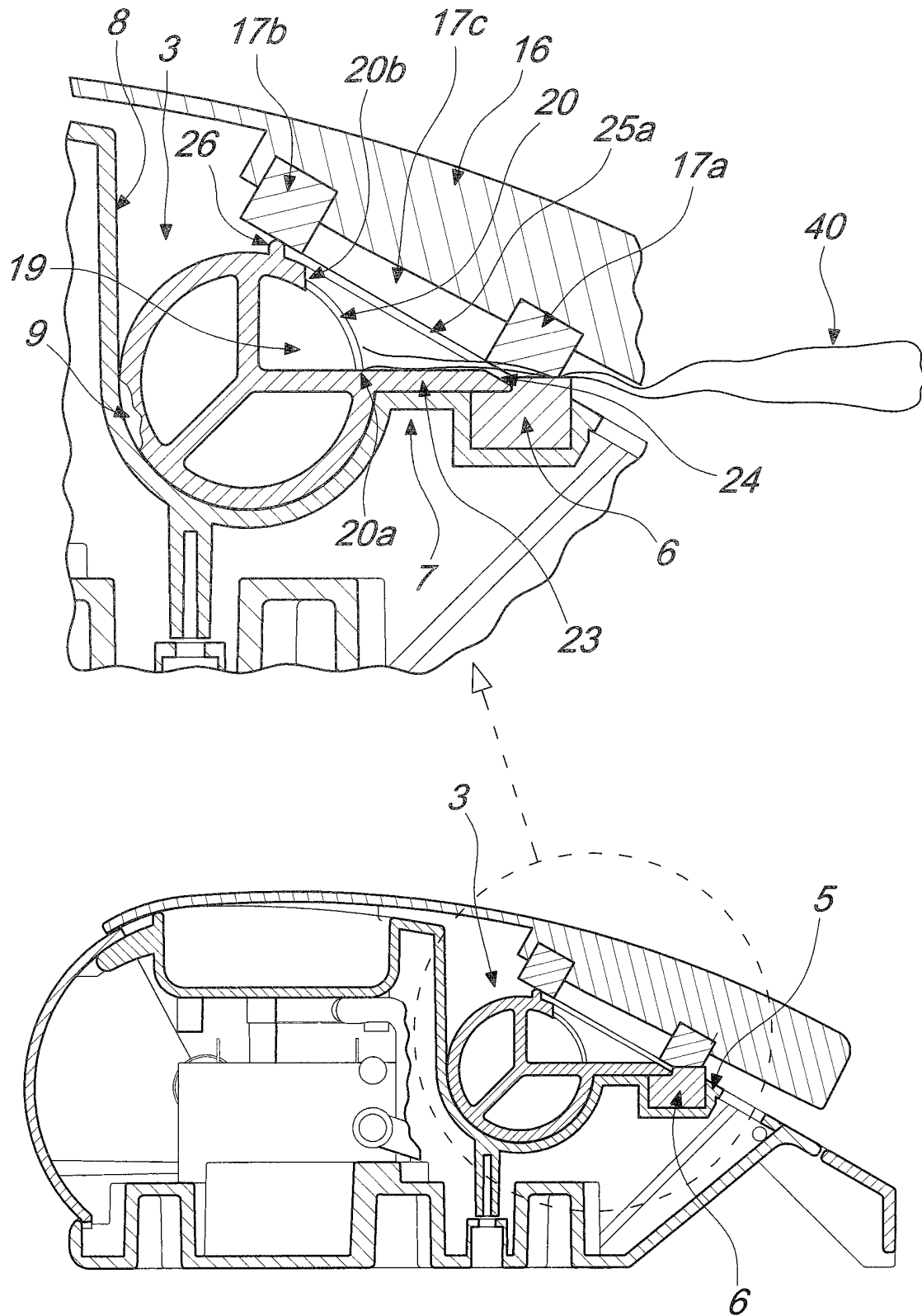
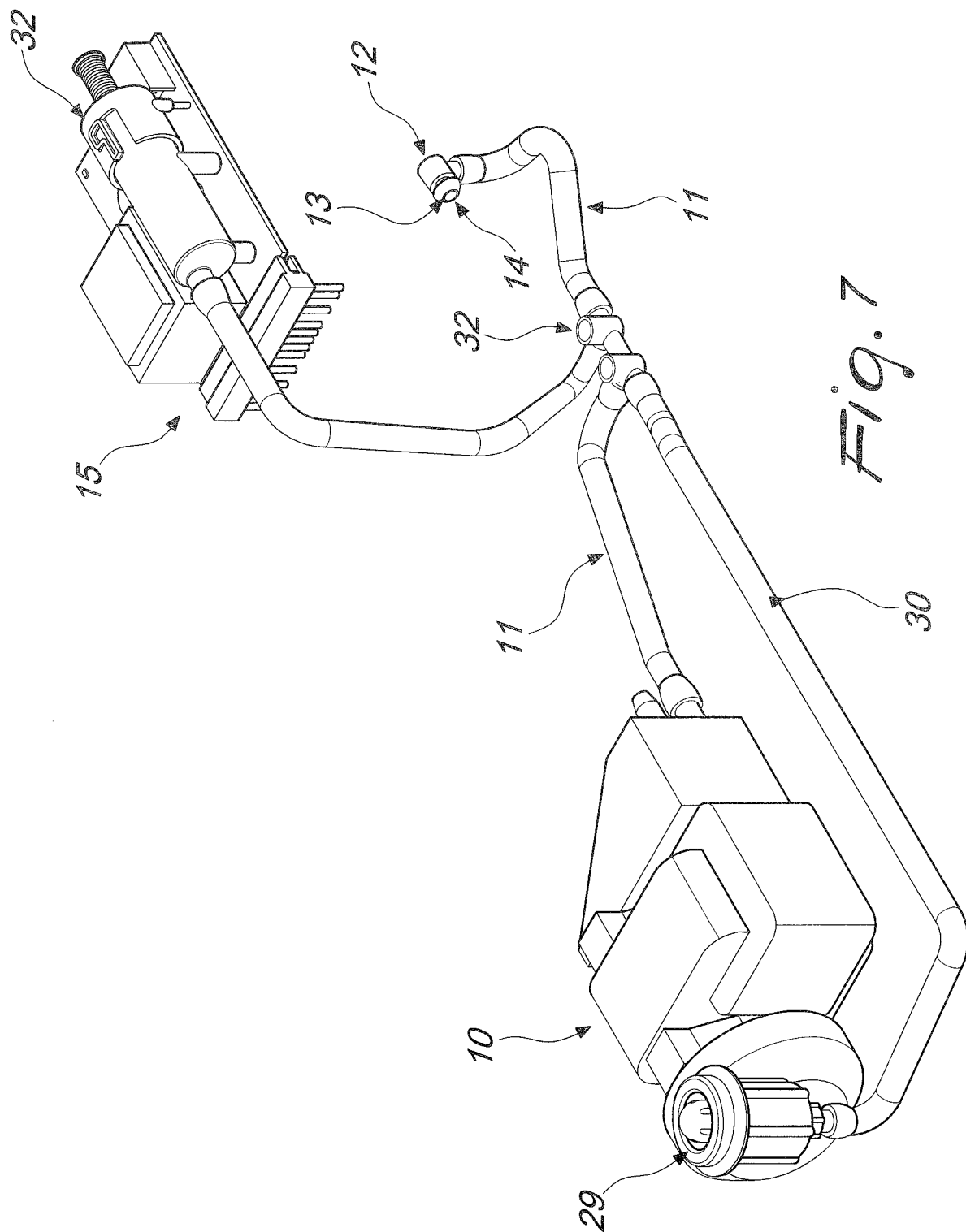


Fig. 6





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 10 4069

DOCUMENTS CONSIDERED TO BE RELEVANT			
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