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(54) HOUSEHOLD APPLIANCE HAVING VACUUM SYSTEM

(57) Disclosed is a household appliance having a vacuum system, including at least one storage chamber (32) and the vacuum system, where the vacuum system includes: at least one vacuum container (10) located in the storage chamber (32); a vacuum generation device (38) that vacuumizes the vacuum container (10); a control device (39) that controls the vacuumizing process; and a measurement device (13, 45) that detects pressure in the vacuum container (10), sends a detection result to

the control device (39) and is located outside the vacuum container, as suggested herein, the measurement device (13, 45) includes a cassette (18, 19, 42, 43), a pressure sensor (1) disposed in the cassette (18, 19, 42, 43) and capable of carrying out data transmission with the control device (39) and a connection channel (23, 47) that remains normally open, and the connection channel (23, 47) is located between the cassette (18, 19, 42, 43) and the vacuum container (10).

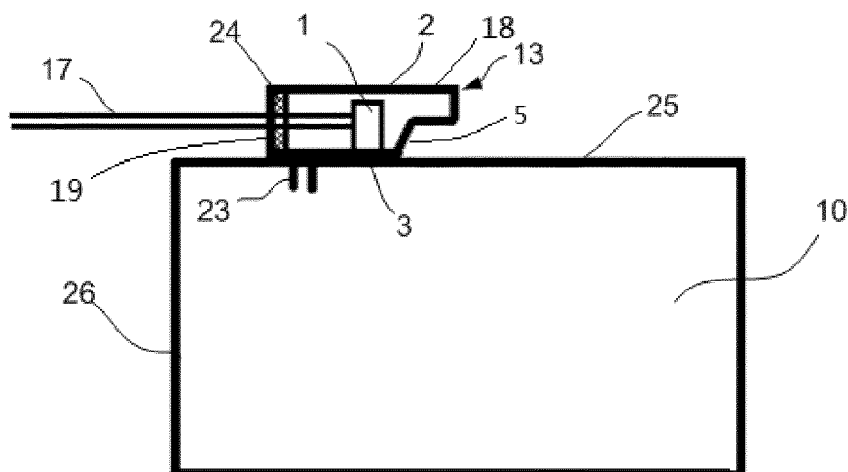


FIG. 4

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Description

BACKGROUND

Technical Field

[0001] The present invention relates to the field of household appliances, and in particular, to a household appliance having a vacuum system.

Related Art

[0002] The household appliance involved in the prior art, for example, a refrigerator, a wine cooler, a closet having a refrigeration function or a locker having a refrigeration function, has a low-oxygen storage environment by setting a vacuum system, especially in the refrigerator, in order to make the food stored longer, use of the vacuum system is becoming more and more common.

[0003] By taking the refrigerator as an example, a general vacuum system includes a vacuum container, a vacuum generation device, a vacuum detection device and a control device, where the vacuum generation device is connected with the vacuum container through a pumping pipeline, the control device, together with the vacuum generation device, is located in a machine chamber of the refrigerator, and currently, the vacuum detection is set in the following two manners: 1. the vacuum detection device (which is generally a pressure sensor) can be disposed in a machine chamber at the bottom of the refrigerator together with the vacuum generation device and the control device, and the vacuum detection device detects pressure in the pumping pipeline located in the machine chamber and sends the pressure data to the control device by taking the pressure in the pumping pipeline as that in the vacuum container; under general circumstances, the vacuum detection device is not disposed in a freezing chamber while the machine chamber is generally located below the freezing chamber, the distance between the machine chamber and the vacuum container is farther, after transmission through the pumping pipeline, especially that the pumping pipeline has been opened just now, the pressure in the pipe cannot be equal to that in the vacuum container immediately, flowing of the gas will require some time, therefore, the pressure in the pumping pipeline detected by the vacuum detection device is likely to be different from the pressure in the vacuum container, so that it is likely to cause the control device to send an incorrect instruction; 2. the vacuum detection device can be directly disposed inside the vacuum container, for example, the vacuum detection device is fixed to a wall inside the vacuum container, this design can solve the problem of an inaccurate measurement result caused by the farther distance in the first manner, but the setting manner still has problems, firstly, as water vapor is generally heavier inside the storage chamber, the pressure sensor usually used in the vacuum detection device is surrounded or covered by the water vapor for

a long time, so the service life of the pressure sensor will be reduced significantly, next, the vacuum detection device needs to transmit the detected pressure data to the control device, the data can be transmitted by using a data line or transmitted by loading a wireless transmitter on the vacuum detection device, the transmission by using the data line needs to set a hole that allows the data line to come in and go out on the wall of the vacuum container, therefore, an additional sealing process is required, and as the difference between inner and outer pressure of the vacuum container is greater, there may be a requirement for the strength of the wall of the vacuum container, and the wall of the vacuum container is generally made of a metal material, or at least a metal strip playing a role of reinforcement is inserted into the wall, but the metal wall or metal strip will at least partially shield data sent from the wireless transmitter, which does not facilitate the control device to send the instruction timely and accurately.

SUMMARY

[0004] In order to solve at least one of the problems in the household appliance mentioned in Related Art including inaccurate pressure measurement caused by a too far distance between the measurement device and the vacuum container, reduction of the service life of the pressure sensor caused by that water vapor in the vacuum container covers the pressure sensor and the like, the present invention proposes a household appliance having a vacuum system.

[0005] In order to achieve the objective, the present invention provides a household appliance, including at least one storage chamber and a vacuum system, where the vacuum system includes: at least one vacuum container located in the storage chamber; a vacuum generation device that vacuumizes the vacuum container; a control device that controls the vacuumizing process; and a measurement device that detects pressure in the vacuum container, sends a detection result to the control device and is located outside the vacuum container, the measurement device includes a cassette, a pressure sensor disposed in the cassette and capable of carrying out data transmission with the control device and a connection channel that remains normally open, and the connection channel is located between the cassette and the vacuum container.

[0006] A position where the measurement device is fixed can be selected as required by designing a special cassette for the measurement device, for example, the measurement device is fixed to a position near the vacuum container; that a connection channel that remains normally open is disposed between the cassette and the vacuum container, can ensure that pressure in the cassette and the vacuum container is kept the same, and the pressure sensor in the cassette can also real-time detect the pressure in the vacuum container, and can ensure accuracy of the detection result. The pressure

sensor is located in the cassette, and can carry out data transmission with the control device, if the data is transmitted through a data line, it is only necessary to dispose a hole that allows the data line to pass through on the cassette and then seal the hole on the cassette, of which the process difficulty is much less than that of sealing the hole on the vacuum container; if the data is transmitted through a wireless transmitter, the cassette can be made of full plastics, which does not have the problem of signal interference. Therefore, the solution is better than the prior art mentioned in Related Art.

[0007] The previous paragraph has mentioned that the position where the cassette of the measurement device can be selected as required; in one solution, the cassette is directly fixed to the top wall outside the vacuum container, and as the connection channel is located between the cassette and the vacuum container, the connection channel is located at the bottom of the cassette; this solution, in addition to shortening the distance between the cassette and the vacuum container to the greatest extent so as to ensure accuracy of pressure measurement, also causes the water entering into the cassette from the vacuum container to flow back to the vacuum container under the action of gravity, thereby extending the service life of the pressure sensor.

[0008] The cassette may also be disposed on a sidewall of the vacuum container, for some storage chambers, the space between two sidewalls of the vacuum container and a liner of the household appliance is much wider than the space between the top wall or the bottom wall of the vacuum container and the liner of the household appliance, therefore, the cassette may also be fixed to a sidewall of the vacuum container according to the size of the usable space.

[0009] In order to enhance the pressure that can be withstood on the wall of the vacuum container, a stiffener with a certain height is disposed on an outer wall of the vacuum container, the cassette is disposed on one side of the stiffener and is not higher than the stiffener, so that setting of the cassette does not need to occupy the additional space of the storage chamber, and the cassette can be freely chosen to be disposed on the top wall or sidewall of the vacuum container without considering idle spaces between respective walls and the liner of the household appliance.

[0010] The wall of the cassette includes at least one inclined plane that causes water in the cassette to be gathered, which aims to reduce the time during which the water stays in the cassette and accelerate the water in the cassette to flow back to the vacuum container; one solution is, with respect to the situation where the cassette is fixed to the top wall of the vacuum container, extending one end of the inclined plane of the cassette to the top wall of the vacuum container to cause the water flowing down along the inclined plane to directly reach the lowest position in the cassette, so that the water can flow into the vacuum container conveniently from the connection channel that remains normally open; the other

solution is, with respect to the situation where the cassette is fixed to the sidewall of the vacuum container, directly extending one end of the inclined plane of the cassette to the connection channel to cause the water flowing down along the inclined plane to directly enter the connection channel and flow into the vacuum container; the connection channels in the two solutions are located at the lowest position of the cassette, and the design of the inclined plane plays a role of accelerating the flowing of the water.

[0011] The cassette includes a cassette body having an opening and a lid body for closing the opening, and a sealing member is disposed in the opening; if the pressure sensor in the cassette is connected with the control device through a data transmission line, a hole that allows the data transmission line to pass through can be disposed on the lid body, and then is sealed through the sealing member located at the opening, to keep airtightness in the cassette.

[0012] Different from the solution of fixing the cassette to the wall of the vacuum container, the other solution is fixing the cassette to a wall of the storage chamber, for example, the cassette is fixed to an inner wall of the storage chamber, and the cassette may also be fixed to an outside wall the storage chamber, that is, the cassette and the vacuum container are located on two sides of the wall of the storage chamber respectively, the cassette is located on the wall of the storage chamber, the position where the cassette is mounted can be reserved in the process of forming the liner, so that it is unnecessary to re-design the structure of the vacuum container; besides, a user does not touch the cassette when using the vacuum container, also it reduces the possibility of damage to the cassette caused by incorrect operations of the user.

[0013] The connection channel sequentially passes through a first small hole formed on the wall of the storage chamber and a second small hole formed on a wall of the vacuum container, and the first small hole is directly opposite the second small hole, which reduces the distance of the connection channel to the greatest extent and improves accuracy of pressure measurement.

[0014] The connection channel is formed by a silicone tube, where the silicone tube is made of a soft material and has a better sealing effect when filled into the small holes.

[0015] The control device and the vacuum generation device are located in a machine chamber at the bottom of the household appliance, that is, the measurement device, the control device and the vacuum generation device are located in different regions.

[0016] The household appliance is a refrigerator, a wine cooler, a closet having a refrigeration function or a locker having a refrigeration function.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The disclosure will become more fully understood from the detailed description given herein below

for illustration only, and thus are not limitative of the disclosure, and wherein:

FIG. 1 is a schematic view of a refrigerator according to a first embodiment of a household appliance having a vacuum system of the present invention;

FIG. 2 is a schematic view of connection between a vacuum container and a measurement device according to the first embodiment of the household appliance having a vacuum system of the present invention;

FIG. 3 is an enlarged view of Part A in FIG. 2;

FIG. 4 is a sectional view of the first embodiment of the household appliance having a vacuum system of the present invention;

FIG. 5 is a sectional view of a second embodiment of a household appliance having a vacuum system of the present invention;

FIG. 6 is a schematic view of connection between a storage chamber cabinet and a measurement device according to a third embodiment of a household appliance having a vacuum system of the present invention;

FIG. 7 is an enlarged view of Part B in FIG. 6;

FIG. 8 is a schematic view of connection between a vacuum container and the measurement device according to the third embodiment of the household appliance having a vacuum system of the present invention; and

FIG. 9 is a sectional view of a fourth embodiment of a household appliance having a vacuum system of the present invention.

DETAILED DESCRIPTION

[0018] Referring to FIG. 1 to FIG. 4, FIG. 1 to FIG. 4 expound in detail a first embodiment of a household appliance having a vacuum system of the present invention.

[0019] FIG. 1 illustrates a three-door refrigerator 30, including a refrigerating chamber 31 located in an upper portion of the refrigerator 30, a freezing chamber 33 located in a lower portion and a middle chamber 32 between the refrigerating chamber 31 and the freezing chamber 33, a vacuum container 10 is placed in the middle chamber 32, and a measurement device 13 is fixed to a top wall outside the vacuum container 10. Below the freezing chamber 33 there is a machine chamber 34, and a compressor 35, a vacuum generation device 38 and a control device 39 that controls running of the vacuum generation device 38 are fixed in the machine chamber

34. The measurement device 13 is connected with the control device 39 through a data transmission line 17 and transmits pressure data measured to the control device 39, and the vacuum generation device 38 is in communication with the vacuum container 10 through a pumping pipeline 37, to pump the vacuum container 10. FIG. 2 illustrates the vacuum container 10 located in the middle chamber 32, the vacuum container 10 has a top wall 25, a sidewall 26 and a rear wall 27, stiffeners 25 playing a role of reinforcement are disposed on the respective walls, the stiffeners 25 have a certain height relative to a surface of the vacuum container 10, and the measurement device 13 is fixed to the top wall 25 outside the vacuum container 10 and is lower than the corresponding stiffener 25, so that it is unnecessary to additionally occupy the space of the middle chamber 32 due to the measurement device 13. The measurement device 13 is disposed in a position on the top wall 25 and near the rear wall 27 and the sidewall 26; in addition, FIG. 2 and FIG. 3 further illustrate a pumping port 12 of the vacuum container, and the measurement device 13 is near the pumping port 12.

[0020] The connecting relationship between the measurement device 13 and the top wall 25 of the vacuum container 10 can be seen more clearly from FIG. 3, the cassette 18, 19 of the measurement device 13 includes a cassette body 18 and a sealed cover 19, a support member 14 is fixed to the top wall 25 of the vacuum container 10, the support member 14 has a U-shaped hole 15 and two fixed holes 16, the two fixed holes 16 are arranged on two sides of the U-shaped hole 15 respectively, the U-shaped hole 15 is used for supporting the data transmission line led out from the cassette 18, 19, and on one side of the sealed cover 19 facing the support member 14, buckles used in conjunction with the fixed holes 16 are disposed corresponding to the positions of the two fixed holes 16, so as to fix the cassette 18, 19 to the support member 14. FIG. 4 is a sectional view of this embodiment; the cassette 18, 19 is fixed to the top wall of the vacuum container 10, the cassette also includes a cassette top wall 2, a cassette bottom wall 3 clinging to the top wall 25 of the vacuum container 10 and a cassette sidewall 5 having an inclined plane, the inclined plane extends to the cassette bottom wall 3, which aims to accelerate the flowing of the water on the sidewall 5 and to make the water flow to the cassette bottom wall 3 as soon as possible, so that the water can flow into the vacuum container 10 from the connection channel 23, and timely discharge of the water in the cassette 18, 19 will significantly improve the service life of the pressure sensor 1.

[0021] In another embodiment, the space between the cassette bottom wall 3 and the top wall 25 of the vacuum container 10 can be manufactured through an integral forming process.

[0022] The measurement device 13 is internally provided with a pressure sensor 1, the pressure sensor 1 transmits data to the control device 39 located in the ma-

chine chamber 34 through the data transmission line 17, the data transmission line 17 passes through the sealed cover 19 of the measurement device 13, and in addition, a sealing member 24 is disposed at the opening closed by the sealed cover 19, to ensure airtightness in the measurement device 13. The connection channel 23 that remains normally open between the measurement device 13 and the vacuum container 10 can be seen from FIG. 4, and in FIG. 4, in order to highlight the effect, the connection channel 23 is slightly extended towards the vacuum container 10. Therefore, in this embodiment, the pressure in the measurement device 13 and the pressure in the vacuum container 10 are kept the same in real time.

[0023] FIG. 5 illustrates a second embodiment of the present invention; the measurement device 13 is fixed on the sidewall of the vacuum container 10, an inclined plane 4 is still disposed on the cassette 18, 19 of the measurement device 13, one end of the inclined plane 4 directly extends to the connection channel 23, and the water at least on the inclined plane 4 can be rapidly discharged out of the cassette 18, 19 through the connection channel 23, and then flows to the vacuum container 10.

[0024] The connection channels 23 in the first and second embodiments are located at the lowest position of the cassette 18, 19, and the design of the inclined planes 4 and 5 plays a role of accelerating the flowing of the water.

[0025] FIG. 6 to FIG. 8 illustrate a third embodiment of the present invention; the cassette 42, 43 of the measurement device 13 is directly fixed to a wall outside a liner 48 of the middle chamber 32, and participates in foaming upon completion of the fixing. The cassette 42, 43 still includes a sealed cover 43 and a cassette body 42, the pressure sensor is located in the cassette body 42 and is connected with a control device 38 through a data transmission line 44, in FIG. 8, a first fixed part 41 integrally formed with the cassette body 42, together with a second fixed part 46, fixes the measurement device 13 to the liner 48, upon completion of the mounting, the liner 48 is located between the first fixed part 41 and the second fixed part 46, and the first fixed part 41 further plays a role of sealing. The cassette 42, 43 is in communication with the top wall of the vacuum container 10 through a silicone tube 47, and the silicone tube 47 forms a connection channel that connects the cassette 42, 43 and the vacuum container.

[0026] FIG. 9 illustrates a fourth embodiment of the present invention and is a sectional view; it can be seen from FIG. 9 that, the measurement device 13 is fixed to the liner 48 of the middle chamber 32, the pressure sensor 1 is disposed in the cassette 42, 43 of the measurement device 13, a sealing member 24 playing a role of sealing is disposed at an opening of the cassette 42, 43, the pressure sensor 1 is connected with the control device 38 through a data line 44, a connection channel 47 is in communication with the cassette 42, 43 and the vacuum container 10, an inclined plane 4 of the cassette 42, 43 directly extends to the connection channel 47, the

connection channel 47 sequentially passes through a first small hole 6 formed on the liner 48 and a second small hole 7 on the sidewall of the vacuum container 10, and in order to reduce the length of the connection channel 47 to the greatest extent, the first small hole 6 is disposed directly opposite the second small hole 7.

Claims

1. A household appliance, comprising at least one storage chamber (32) and a vacuum system, wherein the vacuum system comprises: at least one vacuum container (10) located in the storage chamber (32); a vacuum generation device (38) that vacuumizes the vacuum container (10); a control device (39) that controls the vacuumizing process; and a measurement device (13, 45) that detects pressure in the vacuum container (10), sends a detection result to the control device (39) and is located outside the vacuum container, **characterized in that**, the measurement device (13, 45) comprises a cassette (18, 19, 42, 43), a pressure sensor (1) disposed in the cassette (18, 19, 42, 43) and capable of carrying out data transmission with the control device (39) and a connection channel (23, 47) that remains normally open, and the connection channel (23, 47) is located between the cassette (18, 19, 42, 43) and the vacuum container (10).
2. The household appliance according to claim 1, **characterized in that**, the cassette (18, 19) is fixed to a top wall of the vacuum container (10).
3. The household appliance according to claim 1, **characterized in that**, an outer surface of the vacuum container (10) has a stiffener (11), and the cassette (18, 19) is not higher than the stiffener (11).
4. The household appliance according to claim 1, **characterized in that**, the cassette (18, 19) comprises at least one inclined plane (4, 5) that causes water in the cassette (18, 19) to be gathered.
5. The household appliance according to claim 4, **characterized in that**, one end of the inclined plane (4, 5) extends to an outer surface of the vacuum container (10).
6. The household appliance according to claim 5, **characterized in that**, one end of the inclined plane (5) directly extends to the connection channel (6).
7. The household appliance according to claim 1, **characterized in that**, the pressure sensor (1) is connected with the control device (39) through a data transmission line (17, 44).

8. The household appliance according to claim 1, **characterized in that**, the cassette (18, 19) comprises a cassette body (18) having an opening and a lid body (19) for closing the opening, and a sealing member (24) is disposed in the opening. 5
9. The household appliance according to claim 1, **characterized in that**, the cassette (42, 43) is fixed to a wall of the storage chamber (32). 10
10. The household appliance according to claim 9, **characterized in that**, the cassette (42, 43) and the vacuum container (10) are located on two sides of the wall of the storage chamber (32) respectively. 15
11. The household appliance according to claim 9, **characterized in that**, the connection channel (23, 47) sequentially passes through a first small hole (7) formed on the wall of the storage chamber (32) and a second small hole (8) formed on a wall of the vacuum container (10), and the first small hole (7) is directly opposite the second small hole (8). 20
12. The household appliance according to claim 9, **characterized in that**, the connection channel (47) is formed by a silicone tube. 25
13. The household appliance according to claim 1, **characterized in that**, the control device (39) and the vacuum generation device (38) are located in a machine chamber (34) at the bottom of the household appliance. 30
14. The household appliance according to claim 1, **characterized in that**, the household appliance is a refrigerator, a wine cooler, a closet having a refrigeration function or a locker having a refrigeration function. 35

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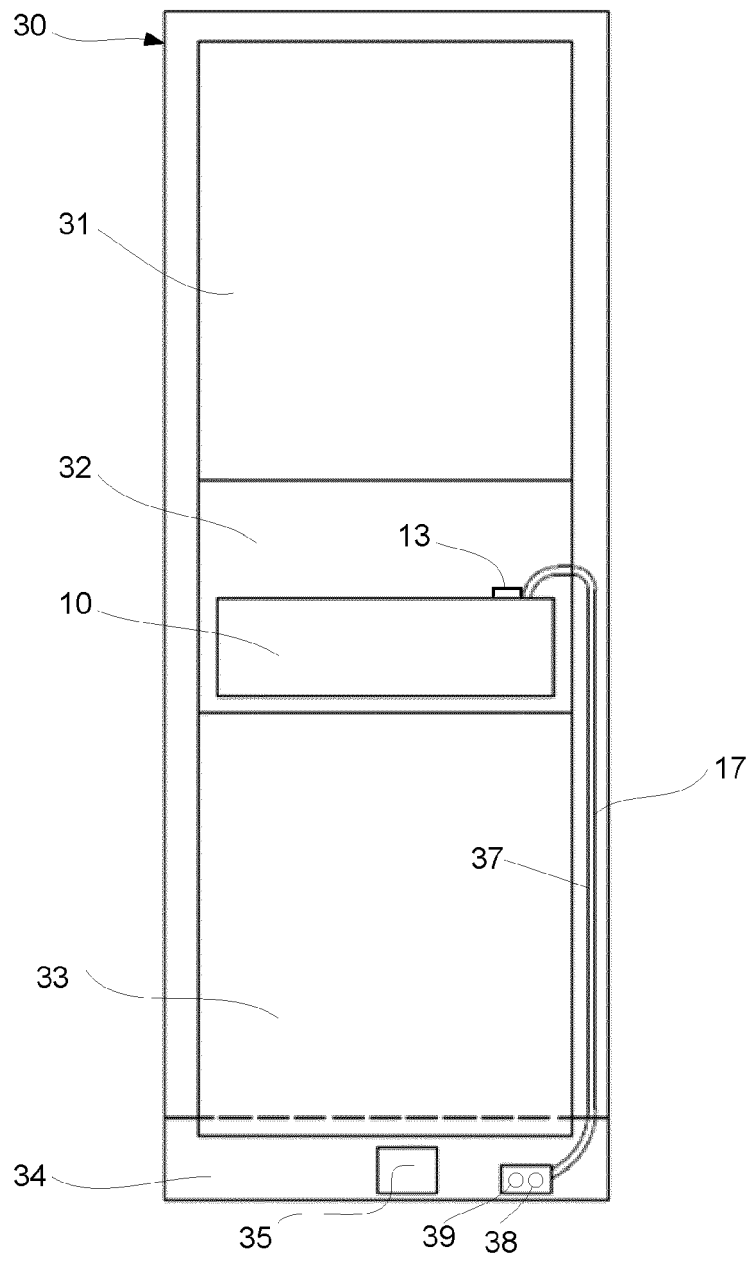


FIG. 1

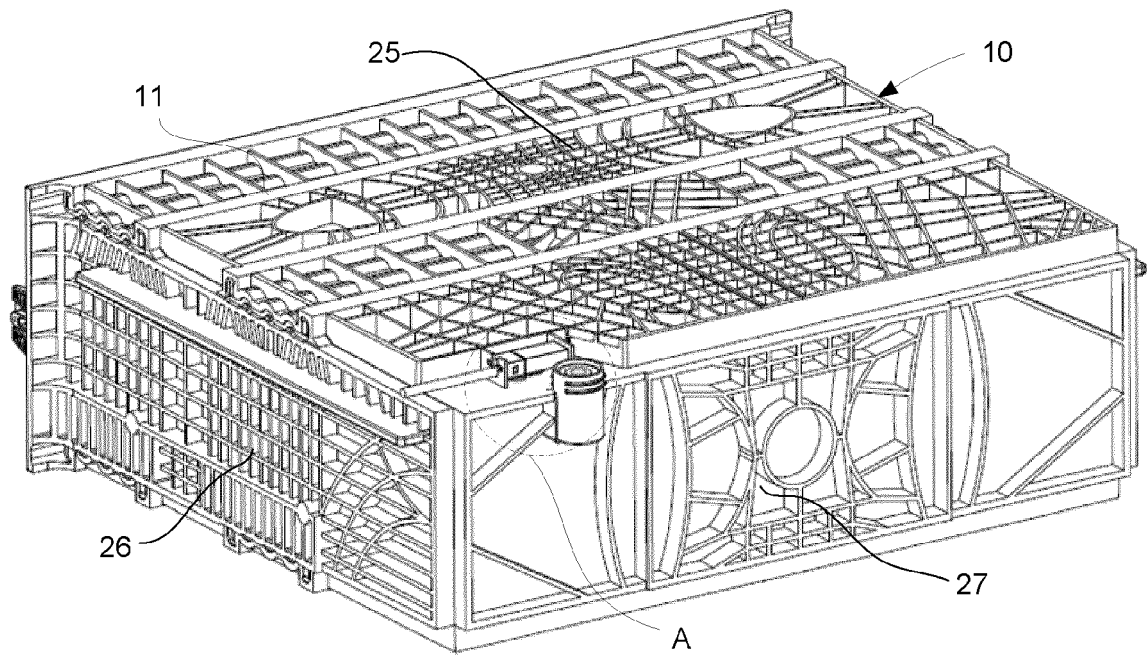


FIG. 2

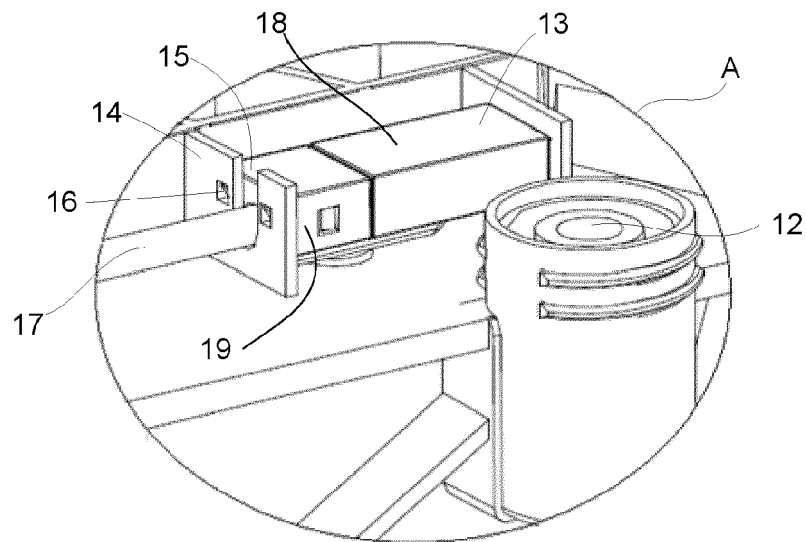


FIG. 3

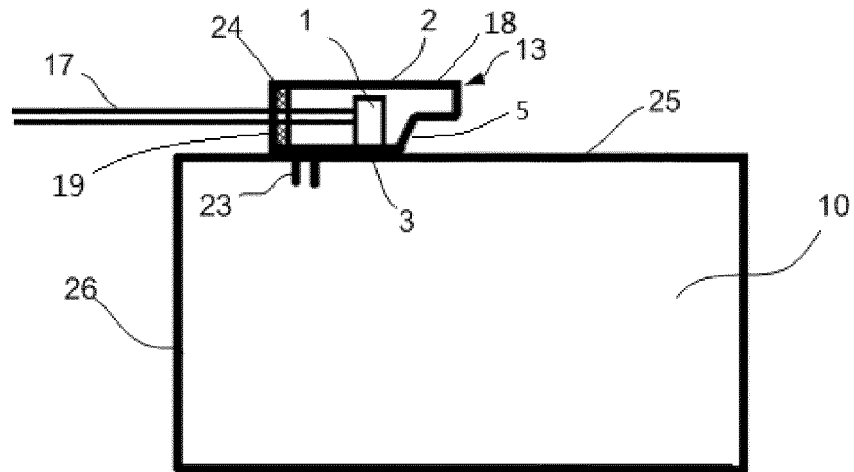


FIG. 4

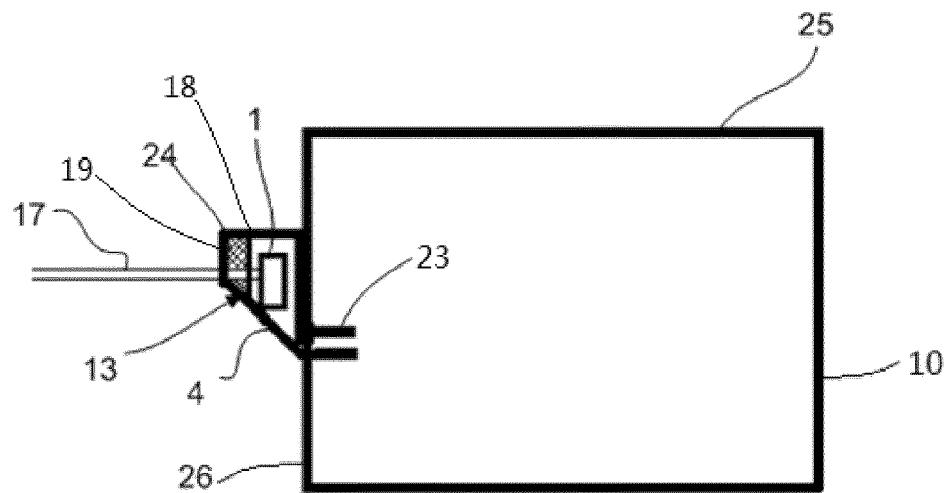


FIG. 5

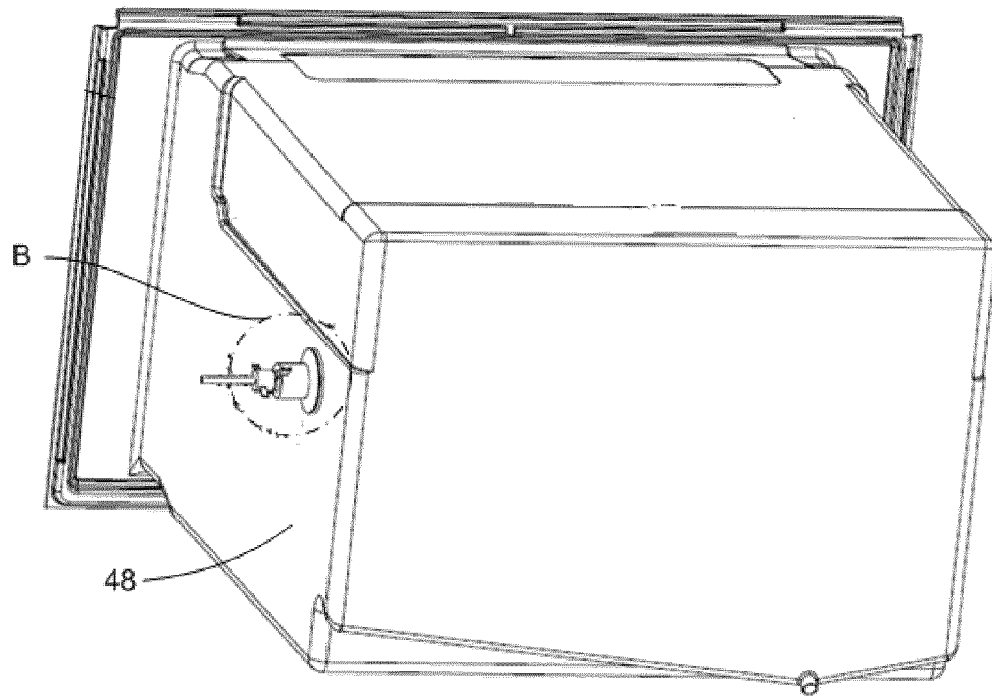


FIG. 6

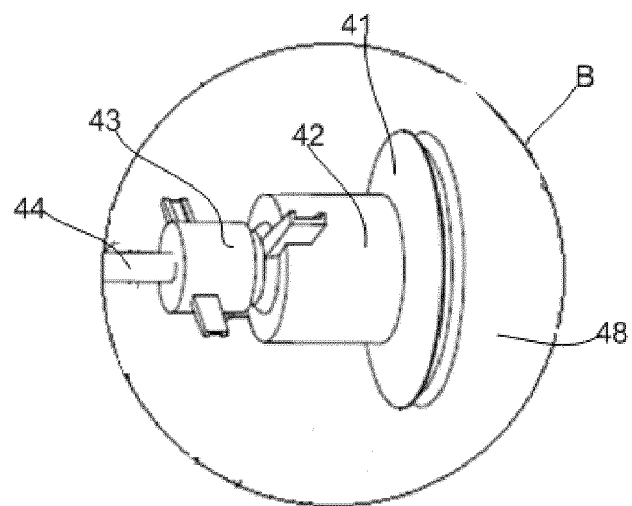


FIG. 7

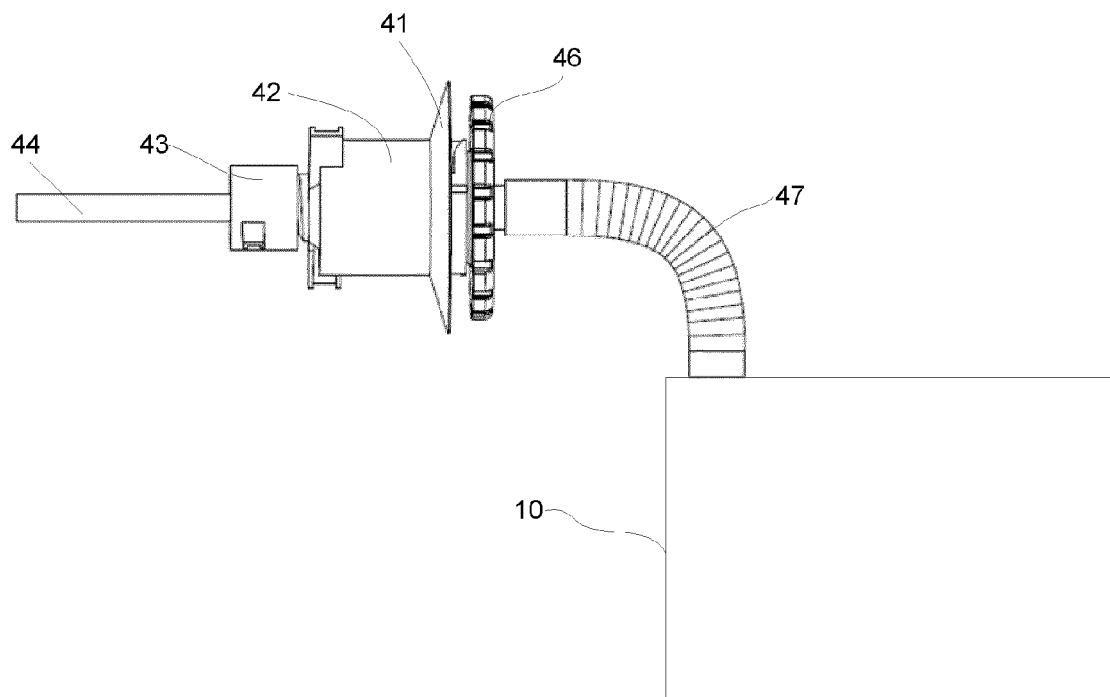


FIG. 8

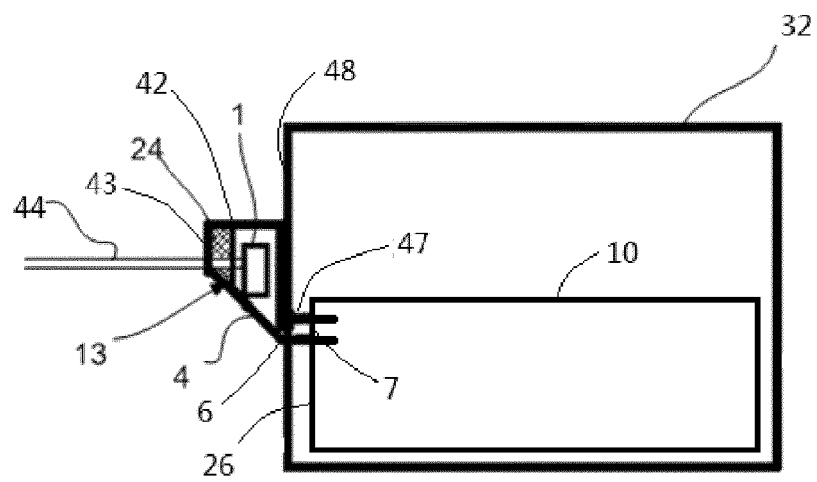


FIG. 9



EUROPEAN SEARCH REPORT

 Application Number
 EP 15 17 0365

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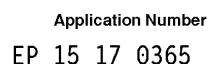
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		23 October 2015	Bejaoui, Amin
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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