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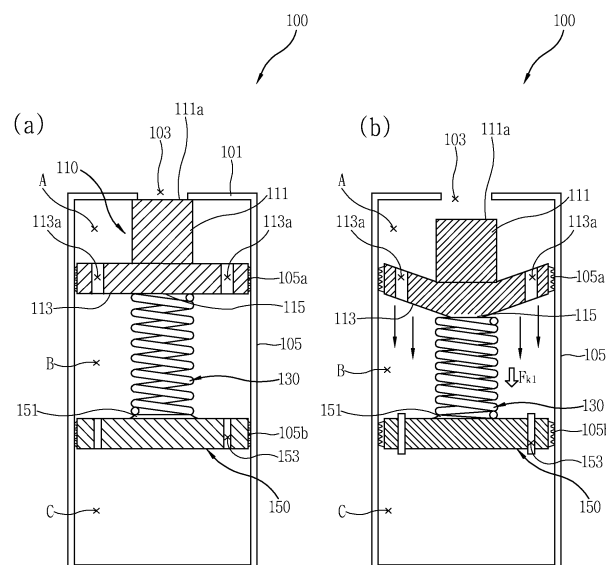
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(54) Refrigerator having air pressure adjusting apparatus for storage container

(57) The present disclosure relates to a refrigerator having an air pressure adjusting apparatus (100) for a storage container (1), and more particularly, a refrigerator having an air pressure adjusting apparatus (100) for a storage container (1), capable of uniformly maintaining internal air pressure of the storage container (1) by increasing the internal air pressure by way of an introduction of external air when the internal air pressure is ex-

cessively lowered and also preventing damages of the storage container (1). The refrigerator includes a storage container (1) having an inner accommodating space and installed to be drawn out of and inserted into the refrigerator, and an air pressure adjusting apparatus (100) to allow external air to be introduced into the storage container (1) based on internal air pressure of the storage container (1), so as to increase the internal air pressure.

FIG. 4



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] This specification relates to a refrigerator having an air pressure adjusting apparatus for a refrigerator storage container.

2. Background of the Invention

[0002] In general, a refrigerator is equipment for keeping foods and the like in a cold state for an extended time by generating cold air in response to driving a refrigerating cycle installed inside the refrigerator and supplying the generated cold air into a refrigerating chamber and a freezing chamber.

[0003] The refrigerator is typically provided with a storage container for keeping and storing vegetables. Also, when vegetables are generally stored in the refrigerator, they should be kept in the freshest state. Therefore, it may be important to maintain the space for keeping vegetables in an optimal condition.

[0004] FIG. 1 is a perspective view illustrating a storage container for a refrigerator according to the related art. A storage container 10 for a refrigerator according to the related art may include a box receiving unit 11 and a box 13.

[0005] The storage container for the refrigerator, as illustrated in FIG. 1, is a drawer-type storage container 10, which has a two-box form having the box receiving unit 11 and the box 13. Or, although not shown, the storage container 10 for the refrigerator may be implemented as a single-box form (1-box form) that a cover on a box closes the box.

[0006] For the two-box type storage container as shown in FIG. 1, when the box 13 is closed by being inserted into the box receiving unit 11, an inside of the storage container 10 is sealed and maintained almost in a vacuum state, resulting in improvement of freshness of vegetables stored.

[0007] This related art two-box type storage container is sealed in the form of the drawer to keep foods fresh for an extended time. Here, a vacuum pump is mounted in the sealed storage container and the storage container is set to be under predetermined pressure by the vacuum pump, such that the inside of the storage container can be uniformly maintained in a state close to vacuum (approximately 0.8 atm for example). Accordingly, foods and the like may be kept fresh in the storage container for the extended time.

[0008] However, the related art storage container for vacuum storage has a difficulty in uniformly maintaining an internal vacuum degree (a degree close to vacuum) and sometimes causes an excessive vacuum degree. These may greatly affect the freshness of vegetables and the like stored in the storage container.

[0009] In addition, when the vacuum pump is controlled to maintain a predetermined vacuum degree in the storage container, the vacuum pump may be continuously operating due to several reasons such as system breakdown, a system error and the like. This may cause the internal air pressure of the storage container to be kept lowered. Accordingly, the internal air pressure of the storage container may be in an excessively lowered state.

10 SUMMARY OF THE INVENTION

[0010] Therefore, to overcome the drawbacks of the related art, an aspect of the detailed description is to provide a refrigerator having an air pressure adjusting apparatus for a refrigerator storage container, capable of uniformly maintaining internal air pressure of the storage container by opening a path for allowing external air to be introduced into the storage container when the internal air pressure of the storage container is excessively lowered below a predetermined air pressure.

[0011] Another aspect of the detailed description is to provide a refrigerator having an air pressure adjusting apparatus for a refrigerator storage container, capable of maintaining an appropriate vacuum degree by raising air pressure using external atmospheric pressure so as to prevent internal air pressure of the storage container from being drastically lowered.

[0012] Another aspect of the detailed description is to provide a refrigerator having an air pressure adjusting apparatus for a refrigerator storage container, capable of preventing an abnormal decrease of internal air pressure of the storage container by mounting the air pressure adjusting apparatus onto an outer wall of the storage container to be exposed to external air, and preventing in advance the risk of breakage of the storage container even when internal air pressure is continuously lowered due to breakdown of a vacuum pump, an error and the like.

[0013] To achieve these and other advantages and in accordance with the purpose of this specification, as embodied and broadly described herein, there is provided a refrigerator including a storage container having an inner accommodating space and installed to be drawn out of and inserted into the refrigerator, and an air pressure adjusting apparatus to allow external air to be introduced into the storage container based on internal air pressure of the storage container, so as to increase the internal air pressure.

[0014] The air pressure adjusting apparatus may selectively allow the external air to be introduced into the storage container based on a difference between the internal air pressure of the storage container and external air pressure.

[0015] The refrigerator may further include a vacuum pump to suck internal air of the storage container. Here, the air pressure adjusting apparatus may allow the external air to be introduced into the storage container when the internal air pressure of the storage container is low-

ered below a predetermined air pressure by the vacuum pump.

[0016] The air pressure adjusting apparatus may further include a casing having a through hole formed through the casing to allow for an introduction of external air therethrough, and a movable member installed in the casing to be movable up and down so as to selectively close and open the through hole based on a difference between the internal air pressure of the storage container and the external atmospheric pressure.

[0017] Here, the casing may be formed in a shape of a hollow tube, and have an upper portion with the through hole formed therethrough, and a lower portion open and inserted into the storage container.

[0018] The movable member may be formed of rubber.

[0019] In accordance with another exemplary embodiment of the present disclosure, the air pressure adjusting apparatus may further include a supporting member fixedly installed within the casing with being spaced apart from the movable member, and an elastic member fixedly installed between the movable member and the supporting member.

[0020] Here, the casing may include a cylindrical part formed in a shape of a hollow circular pipe, and the cylindrical part may include, on an inner circumferential surface thereof, a first contact portion onto which the movable member is adhered, and a second contact portion onto which the supporting member is adhered.

[0021] The movable member may include an opening/closing portion to open and close the through hole, a deformable portion connected to the opening/closing portion and allowing for up and down movements of the opening/closing portion, and an elastic member fixing portion to fix the elastic member.

[0022] Here, the deformable portion may include a plurality of air holes formed through the deformable portion in a thickness direction of the deformable portion. Also, the deformable portion may be formed as a circular rubber member adhered onto an inner circumferential surface of the cylindrical casing, and be concavely deformed and restored in the thickness direction thereof in response to the down and up movements of the opening/closing portion formed on a central portion of the casing, with an outer circumference of the deformable portion being fixedly adhered onto the casing.

[0023] The elastic member may be implemented as a spring.

[0024] The supporting member may include an elastic member fixing portion to fix the elastic member, and a plurality of air holes formed through the supporting member in a thickness direction of the supporting member.

[0025] In accordance with another exemplary embodiment of the present disclosure, the supporting member may include an elastic member fixing portion formed on an upper surface of the supporting member to fix the elastic member, a plurality of air holes formed through the supporting member in a thickness direction of the supporting member, a frame fixedly adhered onto a sec-

ond contact portion of the casing, and a plurality of supporting legs extending from the frame toward a central portion of the supporting member. Accordingly, the supporting member may fixedly support the elastic member fixing portion on an inner circumferential surface of the casing.

[0026] The storage container may include a box having a front part and a main body, and forming an inner accommodating space, the box being drawn out and inserted, and a box receiving unit to receive the box therein in an airtight state.

[0027] As described above, the present disclosure may acquire the following effects by the aforementioned technical solutions and configurations, coupling relationships and operation relationships to be explained later.

[0028] The present disclosure may allow internal air pressure of a storage container to be uniformly maintained by opening a path for an introduction of external air into the storage container even when the internal air pressure is lowered below a predetermined air pressure.

[0029] The present disclosure may prevent damage of the storage container due to a continuously decrease of the internal air pressure of the storage container, which may be caused by breakdown of a system, a breakdown of a vacuum pump, an error and the like.

[0030] Also, the present disclosure may prevent the internal air pressure of the storage container from being lowered below a predetermined air pressure by adjusting an elastic coefficient of an elastic member of the air pressure adjusting apparatus, namely, a spring constant of a spring.

[0031] Further scope of applicability of the present application will become more apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate exemplary embodiments and together with the description serve to explain the principles of the invention.

[0033] In the drawings:

FIG. 1 is a perspective view of a storage container for a refrigerator according to the related art;
FIG. 2 is a perspective view illustrating a storage container having an air pressure adjusting apparatus in accordance with one exemplary embodiment;
FIG. 3 is an inner perspective view of the air pressure adjusting apparatus in accordance with the one ex-

emplary embodiment;

FIG. 4 is an inner sectional view illustrating an operating state of the air pressure adjusting apparatus in accordance with the one exemplary embodiment;

FIG. 5 is a perspective view illustrating a movable member of the air pressure adjusting apparatus in accordance with the one exemplary embodiment; and

FIG. 6 is a perspective view illustrating a supporting member of the air pressure adjusting apparatus in accordance with the one exemplary embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0034] Description will now be given in detail of a refrigerator having an atmospheric pressure controllable storage container and a storage method thereof according to the exemplary embodiments, with reference to the accompanying drawings.

[0035] Terms or words used in this specification and the claims should not be construed as being limited to typical or dictionary definition, but be understood as meaning and conception that come within the technical scope of the present disclosure based on a principle that the inventor is able to appropriately define the conception of terms for describing his invention in the best way.

[0036] Therefore, the preferred embodiments described herein and configurations shown in the drawings are merely illustrative and should not be construed to limit the spirit of the invention. Therefore, it should be understood that there can be various equivalents and variations which can substitute the preferred embodiments at the time point of filing this application.

[0037] Hereinafter, description will be given of an air pressure adjusting apparatus for a storage container and a refrigerator having the same in accordance with one exemplary embodiment, with reference to FIGS. 2 to 6.

[0038] FIG. 2 is a perspective view illustrating a storage container for a refrigerator in accordance with one exemplary embodiment, FIG. 3 is an inner perspective view of the air pressure adjusting apparatus in accordance with the one exemplary embodiment, and FIG. 4 is an inner sectional view illustrating an operating state of the air pressure adjusting apparatus in accordance with the one exemplary embodiment.

[0039] Also, FIG. 5 is a perspective view illustrating a movable member of the air pressure adjusting apparatus, and FIG. 6 is a perspective view illustrating a supporting member of the air pressure adjusting apparatus.

[0040] Referring to FIGS. 2 and 3, a refrigerator according to the present disclosure may include a storage container 1 having a box 213 formed by a front portion and a main body, forming an inner storage space as an accommodation space, and installed to be drawn out of and inserted into the refrigerator, and a box receiving unit 211 for receiving the box 213 therein and hermetically closing an inside of the box 213, and an air pressure adjusting apparatus 100 installed on the storage contain-

er 1 to raise internal air pressure of the storage container 1 by allowing an introduction of external air into the storage container 1 based on a level of the internal air pressure.

[0041] The storage container 1 is a container inserted in a general refrigerator and may be implemented as a single-box (or 1-box) type or a two-box (or 2-box) type. The single-box (1-box) type may include a box having an upper opening and a cover to cover the upper opening. The two-box type may be a type of storage container which is sealed in a drawer-like manner, as illustrated in FIG. 2, and include a box receiving unit 211 having a front opening and a box 213 inserted in and drawn out of the box receiving unit 211. This exemplary embodiment illustrates a two-box type storage container 1, but not be limited to this. The storage container according to the present disclosure may also be implemented as a single-box type.

[0042] The air pressure adjusting apparatus 100, as illustrated in FIG. 2, may preferably be inserted into the storage container 1 from the outside of the box receiving unit 211.

[0043] Especially, the air pressure adjusting apparatus 100 may be installed on an upper plate 211a or a side plate 211b of the box receiving unit 211. Here, when it is installed on the side plate 211b, the apparatus may overlap the box 213 when the box 213 is inserted. In this case, the apparatus may be inserted into the upper plate 211a. Although not shown, the air pressure adjusting apparatus 100 may also be installed on a rear surface of the box receiving unit 211.

[0044] In the air pressure adjusting apparatus 100, when the internal air pressure of the storage container 1 is lowered below a predetermined air pressure, a path for an introduction of external air into the storage container 1 (a through hole 103 in FIG. 3) may be open to raise the internal air pressure, thereby maintaining uniform internal air pressure of the storage container 1.

[0045] The air pressure adjusting apparatus 100 may operate as a valve which is driven when the internal air pressure of the storage container 1 is below the predetermined air pressure after the box 213 is hermetically received in the box receiving unit 211.

[0046] When the internal pressure of the storage container is lowered below the predetermined air pressure, the air pressure adjusting apparatus 100 functioning as the valve may be opened to allow external air to be introduced into the storage container 1, thereby preventing the internal air pressure of the storage container 1 from being lowered below the predetermined air pressure. This may result in adjusting the internal air pressure, and accordingly avoiding in advance spoiling, drying and the like of stuffs stored in the storage container.

[0047] Referring to FIG. 3, the air pressure adjusting apparatus 100 may include a casing having a through hole 103 formed through the casing to allow for an introduction of external air, a movable member 110 installed in the casing and movable forward and away from the

through hole, for example, upwardly and downwardly, to selectively open and close the through hole 103 based on a level difference between internal air pressure of the storage container 10 and external air pressure, a supporting member 150 fixed in the casing with being spaced apart from a lower portion of the movable member 110, and an elastic member 130 fixed between the movable member 110 and the supporting member 150.

[0048] The air pressure adjusting apparatus 100 may function as a valve which is driven under a predetermined air pressure. Specifically, the air pressure adjusting apparatus 100 may be open below a predetermined air pressure and closed over a predetermined air pressure. Here, the predetermined air pressure may be decided by adjusting an elastic coefficient of the elastic member 130.

[0049] The casing may have a form of a hollow tube. The casing may include a upper surface through which the through hole 103 is formed, and an open lower surface hermetically inserted into the storage container 1. The casing may also be formed in a cylindrical shape or a square shape.

[0050] Still referring to FIG. 3, an inside of the casing may be divided into a first inner space A, a second inner space B and a third inner space C based on the movable member 110 and the supporting member 150. Here, an outer circumference of the movable member 110 may adhered onto a first contact portion 105a of an inner circumferential surface of the casing. The first inner space A and the second inner space B may change due to curvature of the movable member 110.

[0051] FIG. 4 illustrates a boundary between the first inner space A and the second inner space B. When the storage container 1 is under an appropriate internal air pressure (see FIG. 4A), the movable member 110 may not be downwardly curved (or concavely transformed) and accordingly an even boundary may be present between the first and second inner spaces A and B. However, when the internal air pressure of the storage container 1 is lower than external air pressure (see FIG. 4B), the movable member 110 may be downwardly curved and a downwardly curved boundary may be present between the first and second inner spaces A and B.

[0052] The casing may include a cylindrical part 105 formed in a hollow circular tube. On an inner circumferential surface of the cylindrical part 105 may be provided with a first contact portion 105a onto which the movable member 110 is adhered, and a second contact portion 105b onto which the supporting member 150 is adhered.

[0053] Referring to FIGS. 3 and 5, the movable member 110 may include an opening/closing portion 111 to open and close the through hole 103, a deformable portion 113 to allow for up and down movements of the opening/closing portion 111, and an elastic member fixing portion 115 to fix the elastic member 130.

[0054] The opening/closing portion 111, as shown in FIGS. 3 to 5, may open and close the through hole 103, as an air intake opening through which external air is introduced after the casing is hermetically coupled to the

storage container 1. The through hole 103 may be open and closed in response to down and up movements of the opening/closing portion 111. Therefore, the opening/closing portion 111 may preferably be formed of rubber to airtightly close the through hole 103.

[0055] The deformable portion 113 of the movable member 110 may be implemented as a circular rubber member which is adhered onto the inner circumferential surface of the cylindrical casing. The deformable portion 113 may be moved up and down in response to the up and down movements of the opening/closing portion 111, which is formed on a central area of the deformable portion 113, in a state that the outer circumference of the deformable portion 113 is fixed onto the casing.

[0056] As illustrated in FIGS. 4 and 5, the up and down movements of the opening/closing portion 111 may be realized by the deformable portion 113. The deformable portion 113 may be formed of rubber to be concavely transformed (downwardly curved) and then restored to its initial shape, with the outer circumference of the deformable portion 113 being fixedly adhered onto the first contact portion 105a of the casing.

[0057] The deformable portion 113 may have a planar form as the same shape (for example, a circular shape) as a section of the casing, and be made of rubber with a predetermined elastic coefficient for transformation. Here, the predetermined elastic coefficient of the deformable portion 113 may depend on air pressure, which is desired to be maintained within the storage container.

[0058] Referring to FIGS. 3 and 4, the deformable portion 113 may include a plurality of air holes 113a formed through the deformable portion 113 in a thickness direction of the deformable portion 113. The movable member 110 may be made of rubber.

[0059] Referring to FIGS. 4 and 5B, the elastic member 130 may be fixed to the elastic member fixing portion 115 which is located on a central area of a lower surface of the movable member 110. The elastic member 130 may have a lower end supported by the supporting member 150 to prevent up and down movements thereof, and an upper end pressed and extended as the movable member 110 moves down and up with being concavely transformed (or downwardly curved) and restored. The elastic member 130 may be a spring having a predetermined elastic coefficient.

[0060] An air pressure maintenance condition, which is preset according to a difference between the internal air pressure of the storage container 1 and external pressure, may be decided based on the elastic coefficient of the deformable portion 113 and the elastic coefficient of the elastic member 130. Especially, referring to FIGS. 3 and 4, when the elastic member 130 is the spring, the internal air pressure of the storage container 1 to be maintained may be set by an elastic restoring force F_k using a spring constant.

[0061] Referring to FIG. 4, when the deformable portion 113 is maintained in an even state (see FIG. 4A), the internal air pressure of the storage container 1 may

be higher than a predetermined air pressure. Accordingly, an upper surface 111a of the opening/closing portion 111 may close the through hole 103 to maintain an airtight state of the inside of the storage container 1 and the internal air pressure of the storage container may thusly be maintained as it is (see FIG. 4A).

[0062] However, when the internal air pressure of the storage container 1 becomes lower than the predetermined air pressure (for example, 0.8 atm) to generate an air pressure difference (i.e., a pressure difference between inside and outside of the storage container 1) which has a greater force than an elastic restoring force, which is generated by the elastic coefficients of the movable member 110 and the elastic member 130, the opening/closing portion 111 may be pushed down and the deformable portion 113 may be sunk to be elastically transformed (see FIG. 4B).

[0063] Referring to FIG. 4B, when external air is introduced into the storage container 1 due to the generated air pressure difference, the external air may be introduced into the storage container 1 through the air holes 113a of the deformable portion 113. When the internal air pressure of the storage container 1 increases appropriately in response to the introduction of the external air, the opening/closing portion 111 may be moved by the elastic restoring force of the movable member 110 and the elastic member 130 to airtightly close the through hole 103 again.

[0064] As such, when the internal air pressure of the storage container 1 is lowered below the predetermined air pressure, the external air may be introduced by the air pressure adjusting apparatus in accordance with the one exemplary embodiment, so as to maintain a predetermined air pressure based on the elastic coefficients.

[0065] For example, when desiring to maintain internal air pressure of the storage container at about 0.8 atm, the movable member 110 and the elastic member 130 may be designed to have elastic restoring forces due to an air pressure difference between atmospheric pressure (1 atm) and the air pressure of 0.8 atm by way of appropriately combining the elastic coefficient of the movable member 110 and the elastic coefficient of the elastic member 130.

[0066] Since the elastic member 130 is implemented as a spring, an elastic restoring force F_k may be computed by calculating a spring constant ($F_k = k$ (spring constant) * x (spaced distance)).

[0067] Referring to FIGS. 3 and 4, the supporting member 150 may include an elastic member fixing portion 151 to fix the elastic member 130, and a plurality of air holes 153 formed through the supporting member 150 in a thickness direction of the supporting member 150.

[0068] The supporting member 150 may be made of plastic or the like with rigidity, which is as strong as being unable to be moved up and down. The supporting member 150 may be fixed onto the second contact portion 105b of the inner circumferential surface of the casing.

[0069] The third inner space C below the supporting

member 150 may be connected to the inner space of the storage container 1. When the opening/closing portion 111 opens the through hole 103, external air may pass through the first inner space A to be introduced into the inner space of the storage container 1 through the air holes 113a of the movable member 110 and the air holes 153 of the supporting member 150.

[0070] In accordance with another exemplary embodiment illustrated in FIG. 6, the supporting member 150 may include a frame 151a fixedly adhered onto the second contact portion 105b of the casing, and a plurality of support beams 151b extending from the frame 151a to a central portion of the supporting member 150. With the structure, the supporting member 150 may fixedly support the elastic member fixing portion 151 on the inner circumferential surface of the casing.

[0071] In the state that each supporting leg 151b extends and is connected to the elastic member fixing portion 151, a space between the adjacent supporting legs 151b may form the air hole 153.

[0072] When the air holes 153 are great in size, the external air introduced into the second inner space B may smoothly flow into the storage container 1 as the third inner space C. Therefore, the supporting member 150 may be implemented by the frame 151a and the supporting legs 151b.

[0073] Consequently, in order to prevent the internal air pressure of the storage container 1 from being excessively lowered rather than external atmospheric pressure, the internal air pressure of the storage container 1 may be appropriately raised by using the external atmospheric pressure, and maintained in a desired air pressure state.

[0074] The air pressure adjusting apparatus 100 may be installed on an outer wall of the storage container 1 to be exposed to external air, thereby preventing the internal air pressure of the storage container 1 from being abnormally lowered. Also, when the air pressure is continuously lowered due to breakdown of a vacuum pump, an error and the like, the risk of breakage of the storage container 1 may be prevented in advance.

[0075] In addition, the elastic coefficient of the elastic member 130 of the air pressure adjusting apparatus 100, namely, a spring constant of the spring may be adjusted to prevent the internal air pressure of the storage container 1 from being lowered below a predetermined air pressure.

[0076] In accordance with another exemplary embodiment of the present disclosure, an air pressure adjusting apparatus 100 may include a casing formed in a shape of a hollow tube, and having an upper surface with a through hole 103 formed through the upper surface to allow for an introduction of external air and an open lower surface, a movable member 110 installed in the casing and movable up and down, to selectively close and open the through hole 103 based on a difference between internal air pressure in a weak vacuum state and external atmospheric pressure, a supporting member 150 fixedly

installed in the casing with being spaced apart from a lower portion of the movable member 110, and an elastic member 130 fixedly installed between the movable member 110 and the supporting member 150.

[0077] The movable member 110 may include an opening/closing portion 111 to open and close the through hole 103, a deformable portion 113 having a plurality of air holes 113a formed through the movable member 110 in a thickness direction of the movable member 110, and allowing for up and down movements of the opening/closing portion 111, and an elastic member fixing portion 115 to fix the elastic member 130. The deformable portion 113 may be made of rubber to allow for the up and down movements of the opening/closing portion 111.

[0078] The elastic member 130 may be implemented as a spring. The supporting member 150 may include an elastic member fixing portion 151 to fix the spring, and a plurality of air holes 153 formed through the elastic member 130 in a thickness direction of the elastic member 130.

[0079] The air pressure adjusting apparatus 100 in accordance with the another exemplary embodiment may be an apparatus functioning as a valve, which operates when internal air pressure of the storage container 1 is below a predetermined air pressure. The air pressure adjusting apparatus 100 may be mounted on a place, on which it is conveniently installed, among an upper portion, a side portion or a rear portion of a drawer-type or 1-box type storage container.

[0080] When the elastic member 130 of the air pressure adjusting apparatus 100 is a spring, a spring constant may be adjusted to allow for opening or closing of the valve (i.e., the air pressure adjusting apparatus 100) at a predetermined level of pressure. In addition, it may be possible to implement an apparatus which is open under pressure when the spring constant differs by taking into account a predetermined air pressure which is desired to be maintained in the storage container 1.

[0081] For example, when the internal air pressure of the storage container 1 is lowered below a reference air pressure of 0.8 atm, the air pressure adjusting apparatus 100 may be open to allow for an introduction of external air. This may prevent the internal air pressure from being lowered below the predetermined air pressure, which is desired to be maintained, and avoid in advance damages such as spoiling, drying and the like of stuffs stored in the storage container 1.

[0082] In addition, in order to prevent the internal air pressure of the storage container from being lowered below the predetermined air pressure and keeping stuff stored in the storage container under an appropriate air pressure state, the spring constant may be adjusted so as to maintain the predetermined air pressure.

[0083] The air pressure adjusting apparatus 100 according to the present disclosure may be configured to open and close the through hole 103 by moving the elastic member 130 as a spring and the opening/closing portion 111 (rubber button) of the movable member 110.

[0084] That is, under an appropriate internal air pressure state of the storage container 1, the opening/closing portion 111 (rubber button) may be pushed up by the force of the spring, namely, the elastic member 130, to airtightly close the through hole 103, thereby maintaining the airtight state of the storage container 1. However, in the state that the internal air pressure of the storage container 1 is lowered below the predetermined air pressure (for example, 0.8 atm), the movable member 110 may be concavely transformed (downwardly curved) by a force of a pressure difference which is greater than the elastic restoring force of the spring, namely, the elastic member 130, and the opening/closing portion 111 may move downwardly. Accordingly, the through hole 103 may be open to allow for an introduction of external air. Here, the predetermined internal air pressure of the storage container 1 may be set by adjusting the spring constant value.

[0085] Referring to FIG. 4A, when the difference between the internal air pressure of the storage container 1 and external atmospheric pressure is within the predetermined air pressure range, the spring as the elastic member 130 may press up the opening/closing portion 111 by its elastic restoring force, so as to close the through hole 103.

[0086] On the other hand, referring to FIG. 4B, when the internal air pressure of the storage container 1 is lowered below the predetermined air pressure, the deformable portion 113 may be concavely transformed (or downwardly curved) due to the difference between the internal air pressure and the atmospheric pressure. Accordingly, the opening/closing portion 111 may move down to press the elastic member 130, allowing the elastic member 130 to have an elastic restoring force F_{k1} .

[0087] After the through hole 103 is open by the movements of the opening/closing portion 111, external air may be introduced into the storage container 1 via the air holes 113a of the movable member 110 and the air holes 153 of the supporting member 150, thereby raising the internal air pressure of the storage container 1. When the internal air pressure reaches the predetermined air pressure, the opening/closing portion 111 may then move upwardly by the elastic restoring force of the elastic member 130 to close the through hole 103, thereby airtightly closing the storage container 1.

[0088] As described above, the air pressure adjusting apparatus according to one exemplary embodiment may prevent the lowering of the internal air pressure of the storage container below the predetermined air pressure, thereby improving freshness of vegetables stored in the storage container.

[0089] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present disclosure. The present teachings can be readily applied to other types of apparatuses. This description is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art.

The features, structures, methods, and other characteristics of the exemplary embodiments described herein may be combined in various ways to obtain additional and/or alternative exemplary embodiments.

[0090] As the present features may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds are therefore intended to be embraced by the appended claims.

Claims

1. A refrigerator comprising:

a storage container (1) having an inner accommodating space to store stuff therein; and
an air pressure adjusting apparatus (100) to allow external air to be introduced into the storage container (1) based on internal air pressure of the storage container (1), so as to increase the internal air pressure.

2. The refrigerator of claim 1, wherein the air pressure adjusting apparatus (100) selectively allows the external air to be introduced into the storage container (1) based on a difference between the internal air pressure of the storage container (1) and external air pressure.

3. The refrigerator of claim 1 or 2, further comprising a vacuum pump to suck internal air of the storage container (1), wherein the air pressure adjusting apparatus (100) allows the external air to be introduced into the storage container (1) when the internal air pressure of the storage container (1) is lowered below a predetermined air pressure by the vacuum pump.

4. The refrigerator of one of the claims 1 to 3, wherein the air pressure adjusting apparatus (100) comprises:

a casing having a through hole (103) formed through the casing to allow for an introduction of external air therethrough; and
a movable member (110) installed in the casing to be movable toward and away from the through hole (103) so as to selectively open and close the through hole (103) based on a difference between the internal air pressure of the storage container (1) and the external air pres-

sure.

5. The refrigerator of claim 4, wherein the casing is formed in a shape of a hollow tube (105), the casing having an upper portion with the through hole (103) formed therethrough, and a lower portion open and inserted into the storage container (1).

6. The refrigerator of claim 4 or 5, wherein the movable member (110) is formed of rubber.

7. The refrigerator of one of the claims 4 to 6, wherein the air pressure adjusting apparatus (100) further comprises:

a supporting member (150) fixedly installed within the casing with being spaced apart from the movable member (110); and
an elastic member (130) fixedly installed between the movable member (110) and the supporting member (150).

8. The refrigerator of claim 7, wherein the casing comprises a cylindrical part (105) formed in a shape of a hollow circular pipe, and wherein an inner circumferential surface of the cylindrical part (105) comprises a first contact portion (105a) onto which the movable member (110) is adhered, and a second contact portion (105b) onto which the supporting member (150) is adhered.

9. The refrigerator of claim 7 or 8, wherein the movable member (110) comprises:

an opening/closing portion (111) to open and close the through hole (103);
a deformable portion (113) to allow for movements of the opening/closing portion (111); and
an elastic member fixing portion (115) to fix the elastic member (130).

10. The refrigerator of claim 9, wherein the deformable portion (113) comprises:

a plurality of air holes (113a) formed through the deformable portion (113) in a thickness direction of the deformable portion (113).

11. The refrigerator of claim 9 or 10, wherein the deformable portion (113) is formed as a circular rubber member adhered onto an inner circumferential surface of the cylindrical casing (105), and wherein the deformable portion (113) is concavely transformed and restored in the thickness direction thereof in response to the movements of the opening/closing portion (111) formed on a central portion of the casing, with an outer circumference of the deformable portion (113) being fixedly adhered onto

the casing.

12. The refrigerator of one of the claims 7 to 11, wherein the elastic member (130) is implemented as a spring.

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13. The refrigerator of one of the claims 7 to 12, wherein the supporting member (150) comprises:

an elastic member fixing portion (151) to fix the elastic member (130); and
a plurality of air holes (153) formed through the supporting member (150) in a thickness direction of the supporting member (150).

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14. The refrigerator of one of the claims 7 to 12, wherein the supporting member (150) comprises:

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an elastic member fixing portion (151) formed on an upper surface of the supporting member (150) to fix the elastic member (130);
a plurality of air holes (153) formed through the supporting member (150) in a thickness direction of the supporting member (150);
a frame fixedly (151a) adhered onto a second contact portion (105b) of the casing; and
a plurality of supporting legs (151b) extending from the frame (151a) toward a central portion of the supporting member (150),
wherein the supporting member (150) fixedly supports the elastic member fixing portion (151) on an inner circumferential surface of the casing.

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15. The refrigerator of one of the claims 1 to 14, wherein the storage container (1) comprises:

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a box (213) having a front part and a main body, and forming an inner accommodating space, the box (213) being drawn out and inserted; and
a box receiving unit (211) to receive the box (213) therein in an airtight state.

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FIG. 1

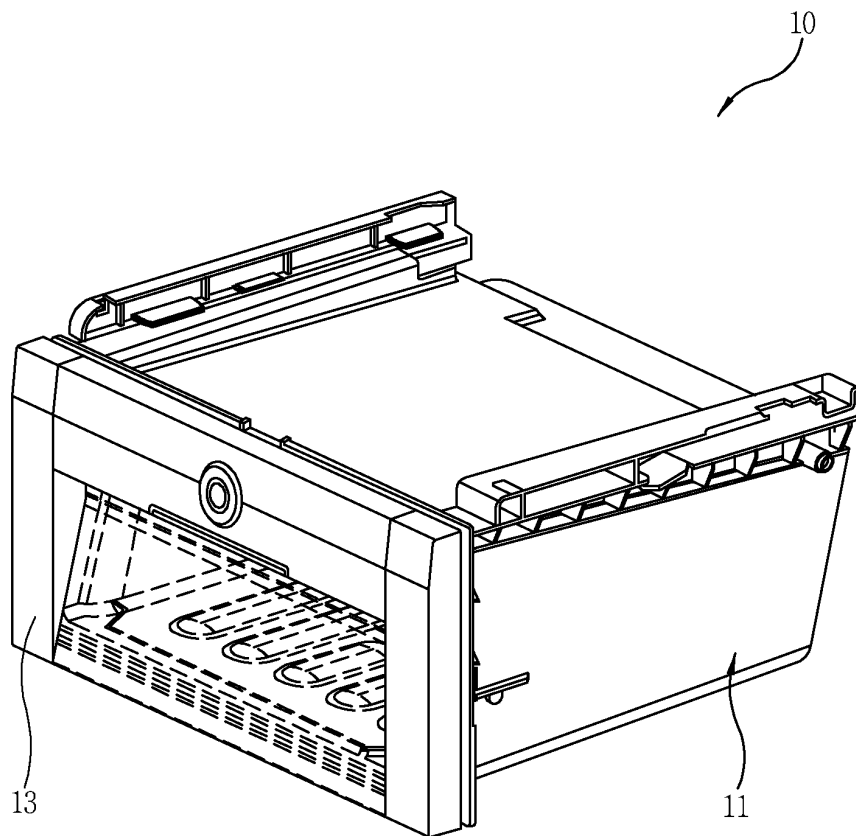


FIG. 2

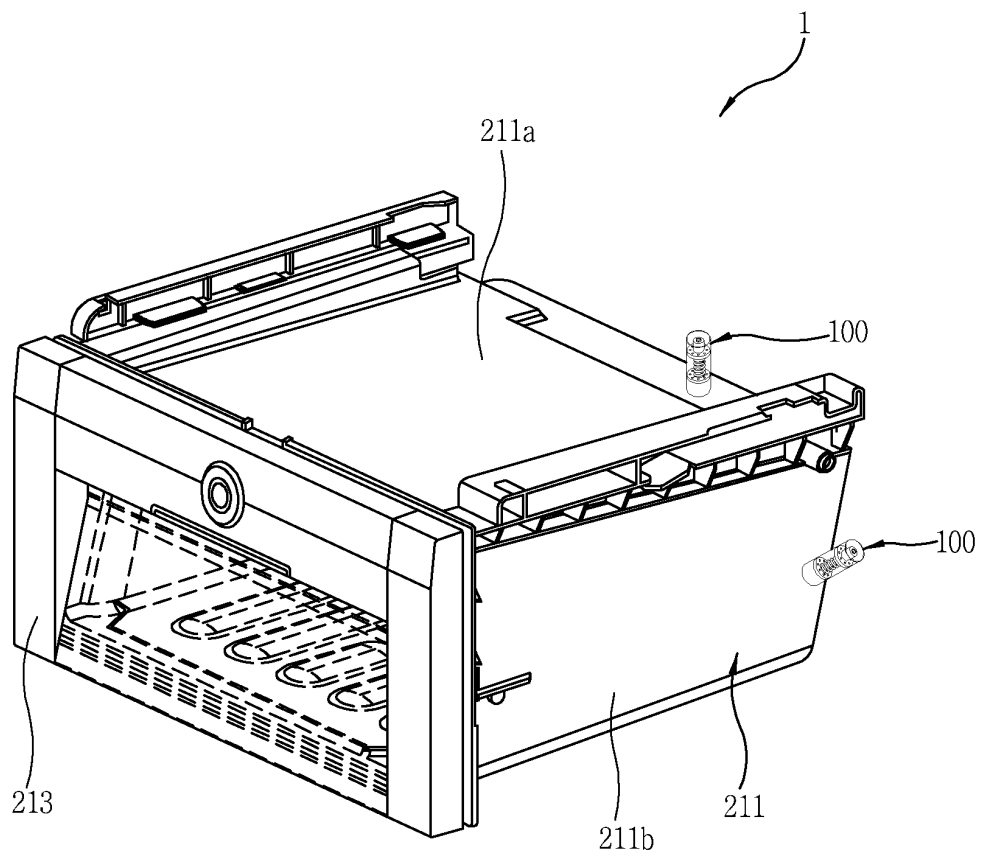


FIG. 3

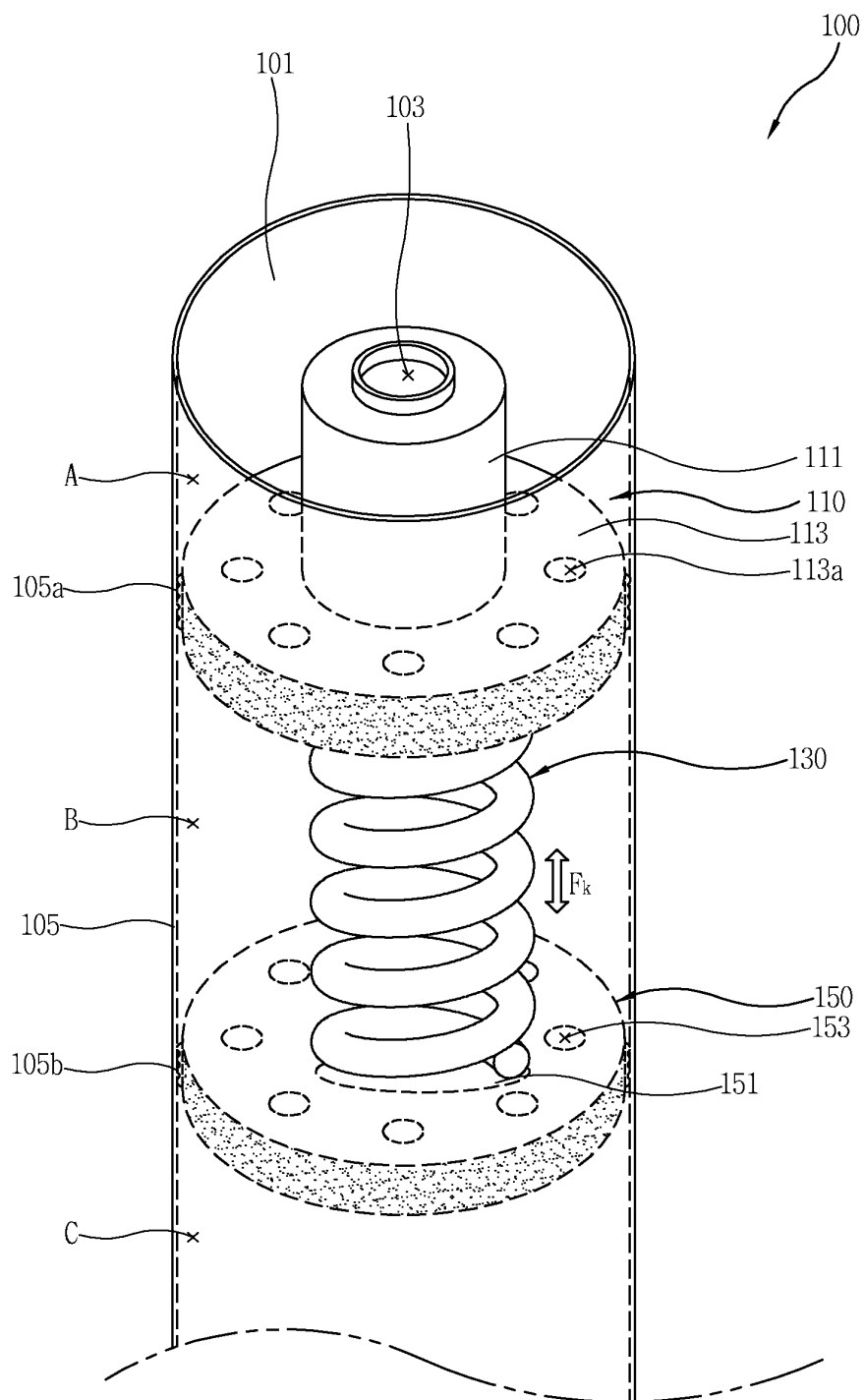


FIG. 4

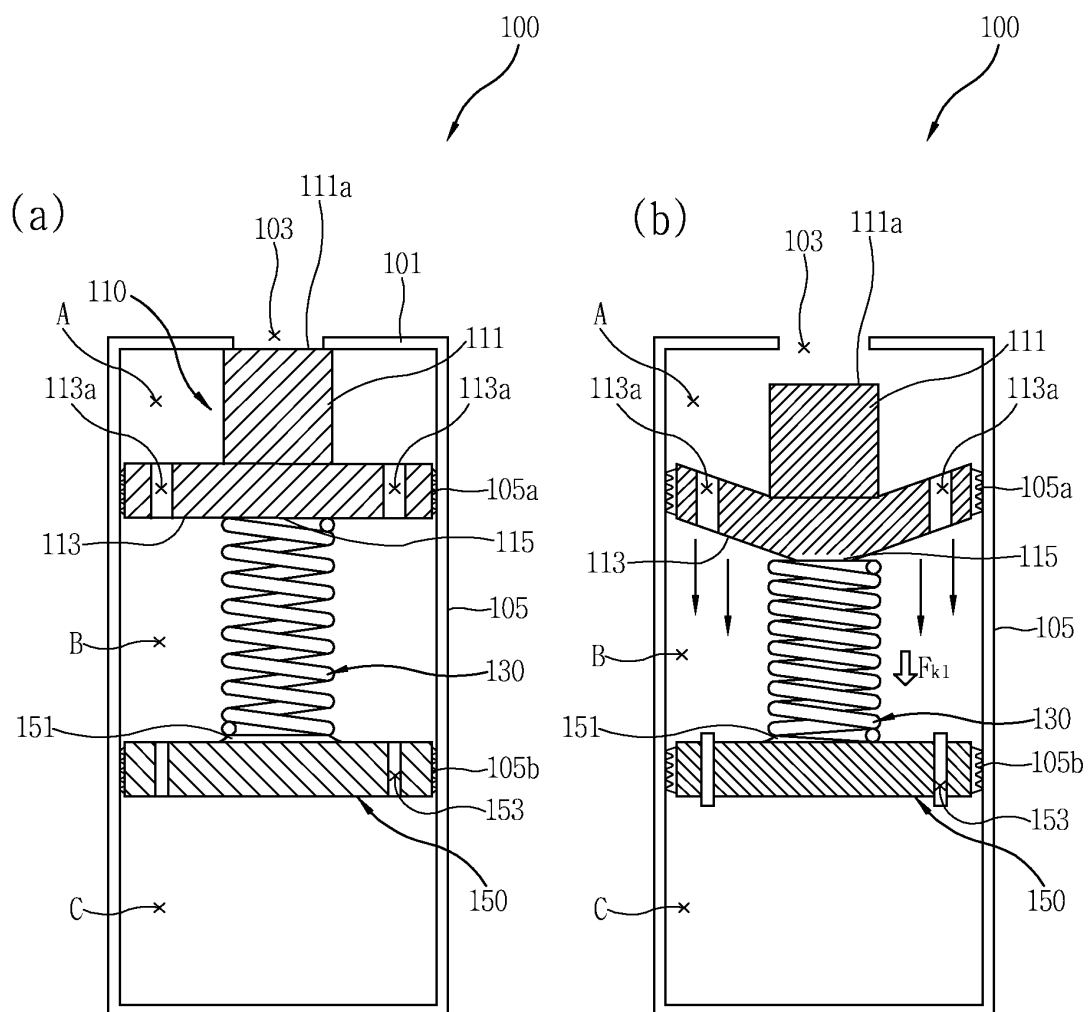


FIG. 5

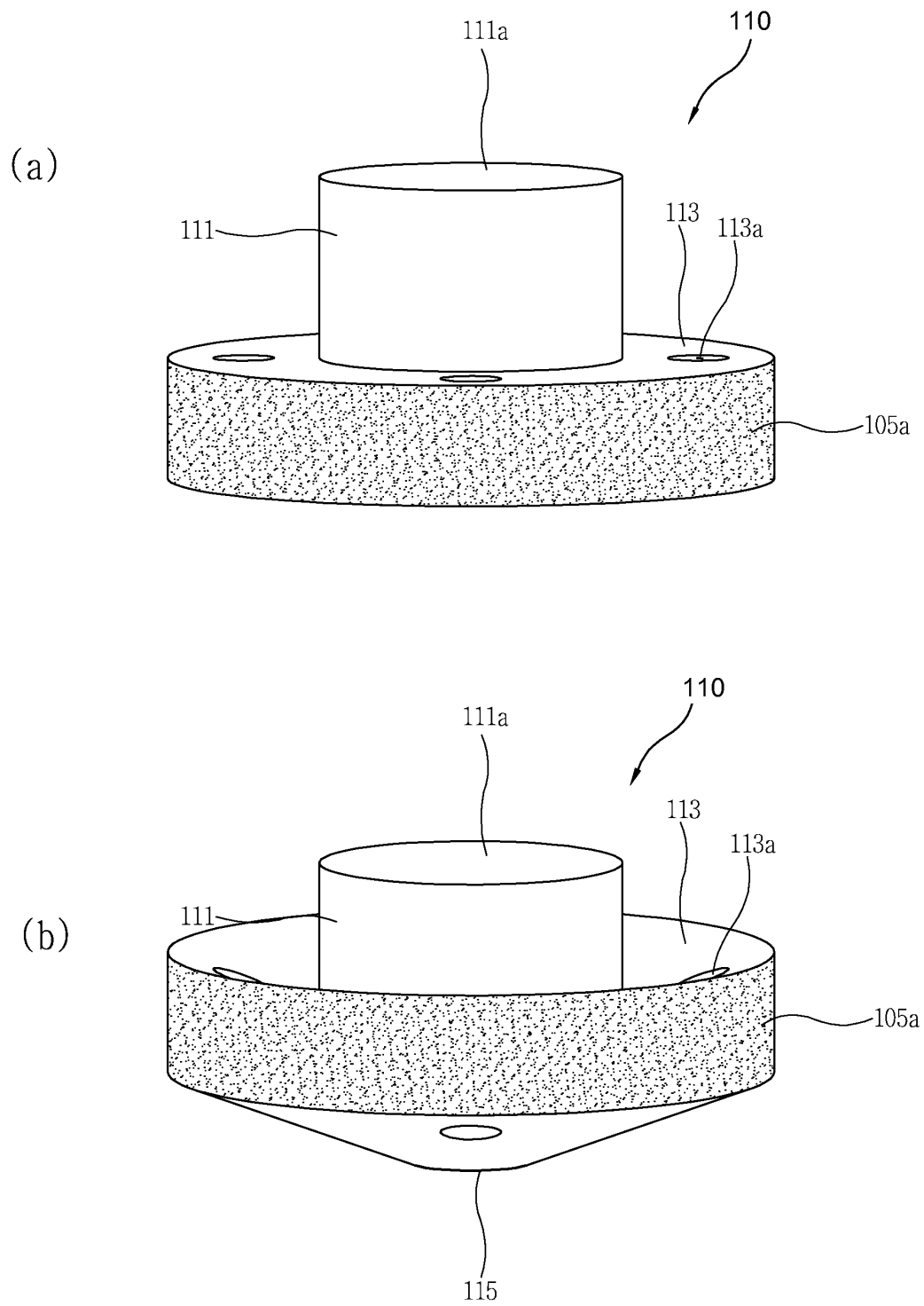
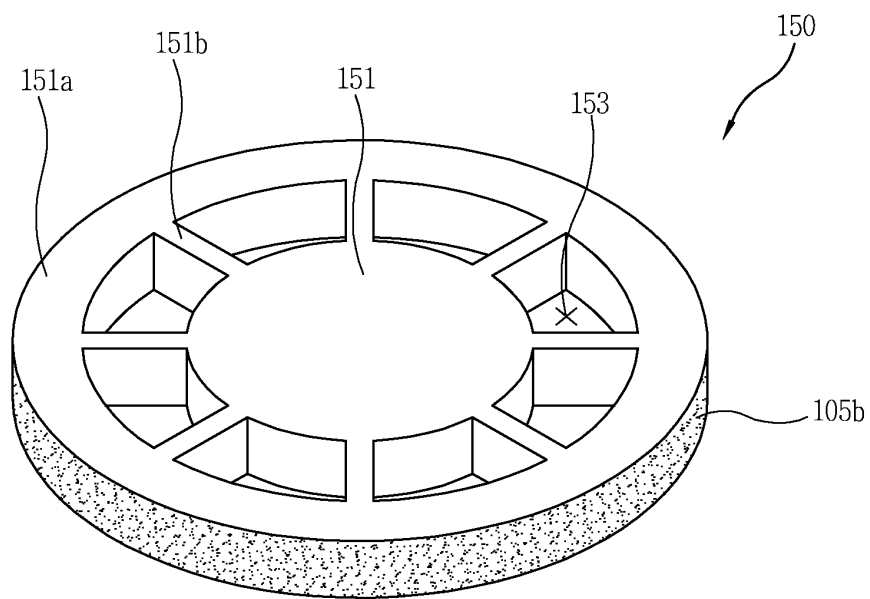


FIG. 6





EUROPEAN SEARCH REPORT

Application Number
EP 13 17 3209

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 271 240 A (DETRICK ROBERT P [US] ET AL) 21 December 1993 (1993-12-21) * column 2, line 37 - column 3, line 57; figures 4,6 *	1-15	INV. F25D17/04
X	US 6 090 422 A (TARAGAN ARIE [US] ET AL) 18 July 2000 (2000-07-18) * column 4, line 65 - column 5, line 17; figures 1,5,6 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 November 2013	Examiner Salaün, Eric
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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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 17 3209

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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04-11-2013

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		WO 0110250 A1	15-02-2001
