A check valve that allows opening of the fluid path by hand alone, that is capable of passing a fluid in a simple and quick manner, that keeps the appearance of the check valve unaffected, and that are unlikely to result in accidental fluid leakages, and a bag equipped with the check valve are provided. The check valve comprises handling portions with less flexibility than the exterior sheets, the handling portions being formed at an opening portion on the manual opening side of the fluid path, wherein the fluid path can be manually opened by pinching and squeezing the handling portions to come close each other.
FIG. 7

PRIOR ART

101, 109, 102, 103
CHECK VALVE AND BAG HAVING THE SAME

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to improvement of a check valve made of plastic film capable of blocking the circulation of a fluid such as gas or liquid, and to a bag having the check valve.

[0003] 2. Description of the Related Art

[0004] There have been compression bags capable of storing clothes, bedding, etc., and of reducing the volume by discharging air from inside the bag, and bags with which a fluid such as gas or liquid can be filled.

[0005] These bags are often equipped with a check valve made of plastic film capable of blocking the circulation of such fluid between the inside and outside of the bag.

[0006] As a check valve of this kind, various types are available. Among them is a check valve 101, shown in FIGS. 7 and 8(A), in Japanese Patent Application Laid-Open Publication No. H07-38772 by the applicant of the present invention. The check valve comprises a flat circulation tube 102 of plastic film and a valve portion 103 provided within the circulation tube 102, with the valve portion 103 made of pieces of plastic film, in which both sides of the valve portion 103 are bonded to both sides of the circulation tube 102, in which a closed portion 104 and an open portion 105a are formed by bonding, in the fluid circulating direction, the side edge at one end of the valve portion 103 to the inner surface of either of the two flat surfaces of the circulation tube 102, with the side edge at the other end of the valve portion 103 left unbonded and the spaces between the side edge and the two flat surfaces of the circulation tube 102 left open, in which the fluid can circulate through a fluid path 105 formed between an open portion 105b at the other end thereof and the open portion 105a at one end thereof, and in which a contact preventing portion 108 is provided on the surface at the other end of the valve portion 103 facing the side of the closed portion 104 to prevent the surface from contact the inner surface of the circulation tube 102.

[0007] The check valve 101 is simple in structure and inexpensive to manufacture, while the contact preventing portion 108 for preventing the surface from contacting the inner surface of the circulation tube 102 is provided on the surface of the valve portion 103, which ensures sealing of the fluid path 105 and achieves a checking effect.

[0008] In the check valve 101, however, when a fluid is circulated, for example, for air discharging, a bar-shaped object or straw has to be inserted into the fluid path 105 because the check valve 101 itself does not have inflexibility and the fluid path 105 cannot be manually left open. Moreover, at this time, insertion of the bar-shaped object is achieved while spreading the opening portion of the fluid path 105 by holding a tongue piece 109 formed by elongating either one of the two flat surfaces of the circulation tube 102, rendering simple and quick passage of the fluid impossible.

[0009] It is to be noted that the fluid path 105 can be spread without inserting a bar-shaped object or something similar thereto by providing a tongue piece 110 formed by elongating the two flat surfaces of the circulation tube 102 of the check valve 101 and pinching the tongue piece 110 manually, as shown in FIG. 8(B). However, this results in the tongue piece 110 being exposed from the check valve 101, making the check valve 101 unattractive in appearance. Besides, the fluid path 105 may accidentally open in case the tongue piece 110 is pulled, posing a problem particularly when this check valve is attached to a bag for being filled with a liquid.

SUMMARY OF THE INVENTION

[0010] In light of the above, it is an object of the present invention to provide a check valve that allows opening of the fluid path by hand alone, that is capable of passing a fluid in a simple and quick manner, that keeps the appearance of the check valve unaffected, and that is unlikely to result in accidental fluid leakages, and a bag equipped with the check valve.

[0011] In order to achieve the above object, the present invention provides a check valve comprising exterior sheets 1 and a valve portion sheet 2, both of which are made of flexible resin sheets and placed one on top of another such that the valve portion sheet is sandwiched between the exterior sheets, and side seals 3 that are formed by bonding opposing exterior sheets 1a and 1b of the exterior sheets 1 along both sides thereof, whereby a fluid path P being flat and substantially cylindrical in cross section is provided therein. The valve portion sheet 2 has a mounting surface 21 on one side and a contacting surface 22 on the other side. The mounting surface 21 includes a bonding portion 21a that is attached to the exterior sheet 1a. The contacting surface 22 is movable toward or away from the other exterior sheet 1b that is opposite thereto or a valve portion sheet 2 that is attached to the exterior sheet 1b. The fluid path P is closed by the contacting surface 22 in close contact with said sheets 1b or 2 opposing the contacting surface. The checking valve V has handling portions 4 that are formed at an opening 12 on the manual opening side of both opening portions and have less flexibility than the respective exterior sheets 1. The path P can be opened in such a manner as to manually pinch the handling portions 4 and squeeze them toward the exterior sheets 1 in order to come close each other.

[0012] Further, the present invention provides a bag with said check valve. The bag is constituted of bag sheets that are made of flexible resin sheets 6a and 6b, and capable of blocking the circulation of fluids between the inside and outside the bag. The check valve has a closable fluid path that communicates between the inside and outside of the bag.

[0013] In a first aspect of the present invention, a fluid path P can be manually opened in such a manner as to pinch the handling portions 4 and squeeze them toward the exterior sheets 1 in order to come close each other, thus enabling to provide a check valve V that allows opening of the fluid path P by hand alone, that is capable of passing a fluid in a simple and quick manner, that keeps the appearance of the check valve unaffected and that is unlikely to result in accidental fluid leakages.

[0014] In addition to the aforementioned effect, the exterior sheets 1 are designed to be equally thick or thinner than the valve portion sheet 2, wherein the valve portion sheet 2
is easy to follow the exterior sheets 1 when the fluid path P is manually opened by pinching and squeezing the handling portions 4 to come close each other.

[0015] In addition to the aforementioned effects, a contact preventing portion 5 provided on the mounting surface 21 of the valve portion sheet 2 prevents close contact between the valve portion sheet 2 and the exterior sheet 1 where the valve portion sheet is attached in order to avoid a decline in the checking action, whereby the valve portion sheet 2 is sure to cause a checking effect.

[0016] In addition to the aforementioned effects, as for the length in width of the handling portions 4 at the opening P2 on the manual opening side being defined from the edge neighboring the opening P2 to the other edge, the sum of the length of the handling portions 4 is equal to or more than 5 mm, thus making the handling portions 4 easy for manual opening of the fluid path P.

[0017] In the second aspect of the present invention, a bag equipped with the checking valve V according to the first aspect of the present invention can be provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The above and other objects, aspects, features and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings, in which:

[0019] FIG. 1(A) is a perspective view showing a check valve according to this embodiment, and FIG. 1(B) is an end view taken along line A-A of FIG. 1(A);

[0020] FIG. 2 is a plan view showing the check valve according to this embodiment as attached to a compression bag;

[0021] FIG. 3(A) is an end view showing the check valve according to another embodiment of the present invention, and FIG. 3(B) is an end view showing the check valve according to further embodiment of the present invention;

[0022] FIG. 4 is a perspective view showing an air path in an open condition of the check valve according to this embodiment;

[0023] FIG. 5(A) is a plan view showing the check valve according to another embodiment of the present invention, and FIG. 5(B) is a plan view showing the check valve according to further embodiment of the present invention;

[0024] FIG. 6(A) is a plan view showing the check valve according to another embodiment of the present invention as attached to the compression bag, and FIG. 6(B) is an enlarged plan view of major parts showing the check valve according to further embodiment of the present invention as attached to the compression bag;

[0025] FIG. 7 is a plan view showing a bag equipped with a conventional check valve; and

[0026] FIG. 8(A) is an end view showing the conventional check valve, and FIG. 8(B) is an enlarged plan view of major parts showing a bag equipped with the conventional check valve according to another embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] Description will be given below of an embodiment of the present invention with reference to the drawings.

[0028] A check valve V according to this embodiment, which comprises exterior sheets 1 and a valve portion sheet 2 and is disposed in a compression bag 6 as shown in FIG. 2, functions to discharge air from inside the bag. The compression bag 6 will be described later.

[0029] For the exterior sheets 1 and the valve portion sheet 2, resin sheets made of a flexible and nonbreathable material such as polyethylene film-laminated sheet are exemplified.

[0030] In this embodiment, rectangular sheets of the same shape in plan view are used for the exterior sheets 1 and the valve portion sheet 2, which are placed one on top of another such that the valve portion sheet 2 is sandwiched between the two exterior sheets 1. Longer sides of the sheets 1 and 2 are bonded, for example, by heat-sealing, whereby side seals 3 are formed. Part of the side seals 3 in this embodiment respectively serves as a handling portion 4, which is described later. The bonding is not limited to heat-sealing and may be made by an adhesive.

[0031] Meanwhile, no bonding is made on the shorter sides orthogonal to the above two sides. Thus an air path P that is flat and substantially cylindrical in cross section is formed as a fluid path where fluid (air in this embodiment) can pass in the longitudinal direction. Both ends of the air path P are defined as openings P1 and P2.

[0032] In this embodiment, the valve portion sheet 2 is constituted of a single piece. As shown in FIG. 3(A), two opposing pieces of the valve portion sheets 2 may be available.

[0033] As shown in FIG. 1(B), the valve portion sheet 2 is attached to the lower exterior sheet 1a at the bonding portion 21a on the mounting surface 21 side (underside) of the sheet 2, the surface 21 opposing to the inner face of the sheet 1a. In relation to an airflow F1 during air discharge, the bonding portion 21a is situated in an upstream end 2a of the valve portion sheet 2 in which no other portions except for the bonding portion 21a, such as a downstream end 2b, are attached to each of the exterior sheets 1a and 1b. Thus, a contacting surface (upper side) 22 of the reverse side of the mounting surface 21 is movable toward or away from the upper exterior sheet 1b. That is, the valve portion sheet 2 can flap from the position (closed position) shown by a solid line in FIG. 1(B) where the valve portion sheet 2 is in close contact with the upper exterior sheet 1b to the position (open position) shown by a broken line in FIG. 1(B) where the valve portion sheet 2 is in close contact with the lower exterior sheet 1a. In the open position, the airflow F1 can pass through the air path P from inside the compression bag 6 in FIG. 2 to outside thereof. In the closed position, an airflow F2 in the opposite direction of the airflow F1 stagnates in a dead-end portion P3 between the lower exterior sheet 1b and the valve portion sheet 2. The stagnant airflow F2 presses the valve portion sheet 2, the contacting surface 22 thereof moving further toward the inner surface of the upper exterior sheet 1b, thereby causing a checking effect and preventing the airflow F2 from passing through the air path P.

[0034] Here, on the mounting surface 21 other than the bonding portion 21a of the valve portion sheet 2, a contact preventing portion 5 is partially provided for preventing close contact between the valve portion sheet 2 and the lower exterior sheet 1a. This ensures a checking action of the
valve portion sheet 2 because the contacting surface 22 can flap smoothly against the lower exterior sheet 1a. As for the contact preventing portion 5, a highly separable resin such as a silicon resin is applied, but it is not limited thereto. A laminated resin film with high separatability may be available, and various modifications are possible.

As shown in FIG. 3(A), when the valve portion sheets 2 consist of two pieces, the lower and upper valve portion sheets 2 and 2’ are respectively attached to the lower and upper exterior sheets 1a and 1b, with the air path P provided between the valve portion sheets 2 and 2’. The contacting surfaces 22 of the valve portion sheets 2 and 2’ are movable toward or away from their respective counterparts. The air path P is closed when the contacting surfaces 22 are in close contact with their own counterparts.

In this embodiment, side seals 3 beside the opening P2, which is outside the compression bag 6 and on the manual opening side, are made as handling portions 4. The handling portions 4, a portion where the exterior sheets 1 are bonded together, have less flexibility than the respective exterior sheets 1. Therefore, the path P can be manually opened in such a manner as to pinch the handling portions 4 and squeeze them toward the exterior sheets 1 (direction of an arrow X in FIG. 4) in order to come close each other.

Thus, a mere manual operation makes the path P open easily, getting rig of a cylindrical or bar-shaped object such as a straw for inserting and opening the path as is conventionally done. And a tongue piece 110 shown in FIG. 8(B), which may accidentally lead to open the path, can be removed.

Here, as for the check valve V according to the present invention, the exterior sheet 1 is designed to be equally thick or thicker than the valve portion sheet 2. In manual opening of the path P, the valve portion sheet 2 is easy to follow the exterior sheet 1, and the path P is sure to be opened.

Not shown in the figure, a portion serving same as the contact preventing portion 5 may be provided on the contacting surface 22 at the upstream end 2a of the valve portion sheet 2 so as to prevent the valve portion sheet 2 from contacting the upper exterior sheet 1b.

Regarding the handling portions 4, side seals 3 at the opening P2 on the manual opening side function in this embodiment. Other heat seal aside from the side seals 3 may be formed. Further, attaching thin plastic plate or something like that to the exterior sheets 1 may be also applied, and various modifications are possible.

As shown in FIG. 5(A), with the valve portion sheet 2 configured smaller in width than the exterior sheet 1, when side seals 3 are constituted of outer side seals 31 formed by sealing both of the exterior sheets 1 and inner side seals 32 formed by sealing at least one of the exterior sheets 1 and the valve portion sheet 2, the respective seals 31 and 32 at the opening P2 on the manual opening side function as handling portions 4. Alternatively, as shown in FIG. 5(B), side seals 3 and expanding seals 33 formed in such a manner as to expand from the side seals 3 into the air path P can function as handling portions 4.

Further, handling portions 4 may be also formed in the compression bag 6 instead of being formed in the check valve V. For example, as shown in FIG. 6(A), handling seals 63 formed by bonding bag sheets 6a and 6b that constitute the compression bag 6 in such a manner as to spread from the outer edges of the check valve V to the inflatable area of the bag, can serve as handling portions 4. As shown in FIG. 6(B), without forming the handling seals 63, heat seals 61 of the edges of the check valve V can be replaced as handling portions 4. Here, in the case the handling portions 4 are provided in the compression bag 6, it is preferred that the opening P2 of the check valve V on the manual opening side is substantially aligned with the width side (lower side in the example illustrated) of the compression bag 6 in order for the air path P to be opened easily.

As described above, handling portions 4 can be modified in various ways as long as the air path P can be forced to be manually opened.

Handling portions 4 are in a size easy for finger pinching. Specifically, the width of the portions at the opening P2 is respectively defined as length L from the edge neighboring the opening P2 to the other edge. The sum of the lengths L1 of one of the handling portions 4 and L2 of the other handling portion 4 shown in FIG. 1(A) is equal to or more than 3 mm, preferably 10 mm or more.

Due to the check valve V for use in the compression bag 6, an opening P2 on the downstream end in the check valve V is treated as an opening portion on the manual opening side. When the bag is used for being filled with a fluid such as air or water, an opening P1 on the upstream end in the check valve V may be conversely treated as an opening portion on the manual opening side.

Next, description will be given for a compression bag 6 equipped with the aforementioned check valve V.

As shown in FIG. 2, the compression bag 6 in this embodiment, which is constituted of bag sheets 6a and 6b made of a flexible and nonbreathable material, has an opening portion 62 along one side where a closing member 62a such as a fastener is provided, and closed portion of heat seals 61 that closes the sides of the bag sheets 6a and 6b except for the opening portion side. The closing member 62a, when closed, can block circulation of a fluid between the inside and outside of the compression bag 6. The air in the compression bag 6 can flow to the outside thereof only through the opening portion 62 and the air path P of the check valve V, which is attached at the bottom of the compression bag 6 in this embodiment as shown in FIG. 2.

As for usage of the compression bag 6, clothes and other items to be stored are packed in the bag. Then, the opening 62 of the bag is closed by the closing member 62a such as a sealing fastener. In this condition, air is still remains in the bag. Next, the bag is pressed externally, thus discharging the air from inside the bag to the outside through the check valve V.

In the check valve V, the valve portion sheet 2 as described above is movable toward and away from the upper exterior sheet 1b, permitting the airflow F1 to pass from inside the compression bag 6 to the outside thereof through the air path P and preventing the airflow F2 in the opposite direction from passing therethrough. This ensures efficient discharge of the air inside the bag and blocks a reverse flow thereof, keeping the inside of the compression bag 6 deaerated.
A check valve according to the present invention is not limited to the above-described examples, and various modifications are possible.

As for the number of the exterior sheets, for example, they are configured with two sheets in this embodiment. They may be constituted of one folded sheet or of two or more sheets being placed one on top of another on either side.

In this embodiment, the check valve V in plan view shapes a rectangle with its longer side situated following the airflow P. The present invention is not limited thereto, and various modifications such as a horizontally long rectangle, square, or trapezoidal shape are possible.

As for the valve portion sheet, the present invention is not limited to an arrangement where the air path P is closed at a single location of close contact between the sheets and , which is achieved by one valve portion sheet as shown in FIG. 1(B), or by a pair of two opposite valve portion sheets as shown in FIG. 3(A). The air path P may be closed at two or more locations of close contact between the sheets and , as two valve portion sheets are arranged in series side by side shown in FIG. 3(B).

Contrary to the compression bag described above, the check valve V is also applied to a bag for being filled with a fluid such as gas or liquid thereinto. Even in this case, a fluid-filled state can be maintained because the check valve V effectively closes the path P. Meanwhile, a fluid can be easily introduced into or discharged out of the bag through the check valve V because the check valve V can be manually opened by pinching and squeezing the valve inward as described above.

While the illustrative and presently preferred embodiments of the present invention have been described in detail herein, it is to be understood that the inventive concepts may be otherwise variously embodied and employed and that the appended claims are intended to be construed to include such variations except insofar as limited by the prior art.

1. A check valve comprising exterior sheets and a valve portion sheet, both of which are made of flexible resin sheets and placed one on top of another such that the valve portion sheet is sandwiched between the exterior sheets, and side seals that are formed by bonding the opposing exterior sheets along both sides thereof, whereby a fluid path being flat and substantially cylindrical in cross section is provided thereinside, the valve portion sheet having a mounting surface on one side and a contacting surface on the other side, the mounting surface including a bonding portion that is attached to one of the exterior sheet, the contacting surface being movable toward or away from the other exterior sheet that is opposite thereto or a valve portion sheet that is attached to the other exterior sheet, the fluid path being closed by the contacting surface in close contact with the other exterior sheet or the valve portion sheet opposing the contacting surface, wherein the handling portions are formed at an opening on the manual opening side of both opening portions and have less flexibility than the respective exterior sheets, whereby the fluid path can be opened in such a manner as to manually pinch the handling portions and squeeze them toward the exterior sheets in order to come close each other.

2. The check valve of claim 1, wherein the exterior sheets are designed to be equally thick or thicker than the valve portion sheet.

3. The check valve of claim 1, wherein a contact preventing portion is provided on at least part of the portion other than the bonding portion on the mounting surface of the valve portion sheet to prevent close contact between the valve portion sheet and the exterior sheet where the valve portion sheet is attached in order to avoid a decline in the checking action.

4. The check valve of claim 1, wherein the sum of the length in width of the handling portions at an opening on the manual opening side being defined from the edge neighboring the opening to the other edge is equal to or more than 5 mm.

5. A bag with a check valve, the bag being constituted of bag sheets that are made of flexible resin sheets and capable of blocking the circulation of fluid between the inside and outside thereof, the check valve having a closable fluid path that communicates between the inside and outside the bag, wherein the check valve comprises exterior sheets and a valve portion sheet, both of which are made of flexible resin sheets and placed one on top of another such that the valve portion sheet is sandwiched between the exterior sheets, and side seals that are formed by bonding the opposing exterior sheets along both sides thereof, whereby said fluid path being flat and substantially cylindrical in cross section is provided thereinside, the valve portion sheet having a mounting surface on one side and a contacting surface on the other side, the mounting surface including a bonding portion that is attached to one of the exterior sheet, the contacting surface being movable toward or away from the other exterior sheet that is opposite thereto or a valve portion sheet that is attached to the other exterior sheet, the fluid path being closed by the contacting surface in close contact with the other exterior sheet or the valve portion sheet opposing the contacting surface, wherein the handling portions are formed at an opening on the manual opening side of both opening portions and have less flexibility than the respective exterior sheets, whereby the fluid path can be opened in such a manner as to manually pinch the handling portions and squeeze them toward the exterior sheets in order to come close each other.

6. The check valve of claim 2, wherein a contact preventing portion is provided on at least part of the portion other than the bonding portion on the mounting surface of the valve portion sheet to prevent close contact between the
valve portion sheet and the exterior sheet where the valve portion sheet is attached in order to avoid a decline in the checking action.

7. The check valve of claim 2, wherein the sum of the length in width of the handling portions at an opening on the manual opening side being defined from the edge neighboring the opening to the other edge is equal to or more than 5 mm.

8. The check valve of claim 3, wherein the sum of the length in width of the handling portions at an opening on the manual opening side being defined from the edge neighboring the opening to the other edge is equal to or more than 5 mm.