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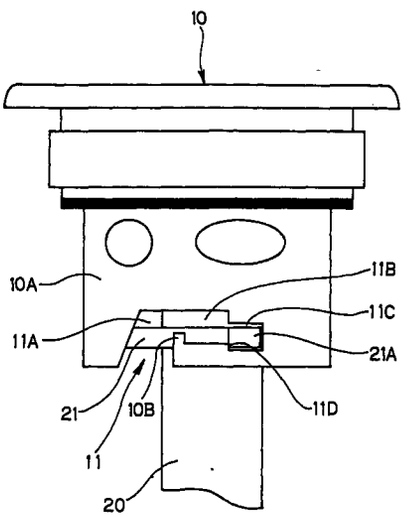
(54) Valve for pressure vessel

(57) A valve for a pressure vessel comprises a hollow housing member (10), a tubular member (10A), a sealing member and a spring member. The housing member has connecting portions (11) each provided with a groove (11A,11B) and a stopping projection. The groove has the vertical (11A) and transverse (11B) groove portions. The stopping projection (10B) extends upward from the bottom of the transverse groove portion. The tubular member has engaging projections (11C) extending outward, which are to be inserted into the transverse groove portions. The second groove portion has at its opposite side to the stopping projection an engaging groove portion. The engaging projection of the tubular member is engageable with the engaging groove portion. The engaging groove portion has a width smaller than the width of the transverse groove portion.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a valve for a pressure vessel, which is to be fitted to the pressure vessel such as a barrel for draft beer or the like to maintain a tight sealing condition of the pressure vessel and to open or close the vessel in order to fill it with a beverage or to pour out the beverage from the vessel.

Description of the Related Art

In general, a valve for a pressure vessel is fitted into an opening of the pressure vessel, which is used for transporting a beverage such as beer, wine, a clear liquor, a soft drink, mineral water or the like. Such a valve has a function of opening or closing the vessel in order to fill it with the beverage or to pour out the beverage from the vessel.

The pressure vessel filled with the beverage such as beer is connected to a dispenser and a gas cylinder for pushing out the beverage by fitting a dispensing head to the valve for a pressure vessel, which has been fitted into the opening of the pressure vessel.

The valve for a pressure vessel can be opened by operating the dispensing head so that a gas such as carbon dioxide can be introduced into the pressure vessel from the gas cylinder for pushing out the beverage through the dispensing head. The beverage received in the pressure vessel is pushed out under the function of pressure of the gas to be supplied to the dispenser through the dispensing head. The beverage is poured into a beer mug or the like in this manner.

Such a valve to be fitted to the pressure vessel is described in British Patent No. 2188040A.

The conventional valve for a pressure vessel has a mechanism for preventing the sudden jump of the valve from the pressure vessel, when the valve is removed therefrom. A high pressure is maintained in the pressure vessel. During removal operation of the valve for a pressure vessel from the pressure vessel in order to make an inspection of the valve or to exchange the old gasket for a new one, release of engagement of a screw portion for securing the valve to the pressure vessel may cause the valve to jump suddenly from the pressure vessel under the function of inside pressure of the pressure vessel, thus leading to occurrence of unfavorable problems. The above-mentioned conventional valve has been proposed in view of prevention of sudden jump of the valve.

The conventional valve for a pressure vessel comprises as shown in FIG. 5 a valve housing 1 having on its outer periphery a screwed portion 1a, a siphon tube 2 coaxially secured to the valve housing 1, a connecting disk 3 fixed to the siphon tube 2, a main sealing gasket 4 for opening or closing an opening 1b formed on the top end of the valve housing 1, a washer 5 for supporting the main sealing gasket 4 and a spring 6 arranged between the washer 5 and the connecting disk 3 so as to push the main sealing gasket 4 to close the opening of the valve housing 1. The screwed portion 1a of the valve is screwed into the opening of the pressure vessel T so that the tight sealing condition of the pressure vessel T can be maintained. The valve can be opened or closed by moving the main sealing gasket 4 up or down through the operation of the dispensing head, which is connected to the valve.

Projecting pieces 3A are formed on three portions of the outer periphery of the connecting disk 3 fixed to the siphon tube 2 so as to project outward in the radius direction of the connecting disk 3. These projecting pieces 3A are engaged respectively with connecting portion 1B formed on three portions of the lower of a skirt 1A of the valve housing 1 so that the siphon tube 2 and the valve housing 1 are assembled into the valve for a pressure vessel.

With respect to the mechanism for preventing sudden jump of the valve, of the three projecting pieces 3A formed on the connecting disk 3, at least one projecting piece 3A' is longer than the other projecting pieces 3A. When the siphon tube 2 is connected to the valve housing 1, the projecting piece 3A' projects outward in the radius direction of the siphon tube 2 from the outer surface of the skirt 1A of the valve housing 1. As is clear from FIG. 5, when the valve is fitted to the pressure vessel T, the tip end of the projecting piece 3A' is located below an inner flange portion T' of the opening of the pressure vessel T. When the screw connection of the valve with the pressure vessel T is released, the tip end of the projecting piece 3A' is engaged with the lower surface of the inner flange portion T' of the pressure vessel T so as to prevent the sudden jump of the valve due to the inner pressure of the pressure vessel T.

The valve housing 1 and the siphon tube 2 are assembled into the valve for a pressure vessel by engaging the projecting pieces 3A, 3A' of the connecting disk 3 with the connecting portion 1B of the valve housing 1 so that the mechanism for preventing the sudden jump of the valve can be formed by means of the projecting piece 3A', which projects from the outer surface of the skirt 1A of the valve housing 1. In such a structure, the valve housing 1 and the siphon tube 2 can be disconnected so that the main sealing gasket 4 can easily be exchanged.

However, in the conventional valve for a pressure valve, when the valve is opened or closed by the operation of the dispensing head, which is connected to the valve, the siphon tube 2 can easily be moved relative to the valve housing 1 due to the construction in which the valve housing 1 and the siphon tube 2 can easily be disconnected. The central line "f" of the main sealing gasket 4 may therefore be get out of the central line "g" of the siphon tube 2 as shown in FIG. 6.

More specifically, as shown in an enlarged scale in FIG. 7, the connecting portion 1B, with which the projecting pieces 3A of the connecting disk 3 fixed to the siphon tube 2 are engaged has the first groove portion, which opens into the edge of the skirt 1A of the valve housing 1 and the second groove portion, which extends from the upper end of the first groove portion in a circumferential direction of the skirt 1A. The spring 6 (see FIG. 5) is kept compressed with the use of a tool (not shown), and the projecting pieces 3A of the connecting disk 3 are inserted into the connecting portion 1B from the lower side of the skirt 1A to cause these projecting pieces 3A to engage with recess portions 1Ba formed in the inner part of the connecting portion 1B. The siphon tube 2 is connected to the valve housing 1 in this manner. A gap S is formed between the projecting piece 3A and the upper surface of the connecting portion 1B in a condition that the projecting piece 3A is engaged with the recess portion 1Ba, in order to permit the projecting piece 3A to pass between a stopping projection 1Bb for preventing the projecting piece 3A from coming off the recess portion 1Ba and the upper surface of the connecting portion 1B.

The stopping projection 1Bb should have a prescribed projecting length in order to ensure the maintenance of the holding condition of the projecting piece 3A. The projecting length of the stopping projection 1Bb cannot be decreased under the above-mentioned prescribed length. There is therefore limitation of decrease in length of the gap S between the projecting piece 3A and the upper surface of the connecting portion 1B in a condition that the projecting piece 1A is engaged with the recess portion 1Ba.

When the main sealing gasket 4 is not arranged in a proper position as described above, the opening 1b of the valve housing 1 cannot tightly be closed, with the result that the valve for a pressure vessel loses its function of maintaining the tight sealing condition of the pressure vessel.

SUMMARY OF THE INVENTION

The present invention was made in order to solve the above-mentioned problems involved by the conventional valve for a pressure vessel.

An object of the present invention is therefore to provide a valve for a pressure vessel, which has a construction that a tubular member is combined with a housing member so as to be able to be disconnected therefrom, permits to prevent the improper setting of a sealing member due to a gap formed in the connecting portion of the housing member to the tubular member, and to ensure the tight sealing condition of the pressure vessel.

In order to attain the aforementioned object, a valve for a pressure vessel of the present invention as claimed in Claim 1, comprises:

a hollow housing member having at the top end thereof an opening through which liquid is to be passed;

a tubular member inserted in said housing member and secured thereto;

a sealing member received in said housing member so as to be able to open or close tightly the opening of said housing member; and

a spring member arranged between said sealing member and said tubular member so as to push said sealing member from the inside of said housing member to close the opening of said housing member;

said housing member having a side wall in which at least one connecting portion is formed on a portion of said side wall, which is opposite to the top end of the housing member, said connecting portion being provided with a groove and a stopping projection, said groove having the first groove portion opening into the edge of said side wall and the second groove portion extending in a circumferential direction of said side wall, and said stopping projection extending from the bottom of the second groove portion toward the top end of said housing member; and

said tubular member having on the outer wall thereof at least one engaging projection extending in a radius direction of said tubular member, said engaging projection being inserted into said second groove portion of said groove and being pressed against the bottom of said second groove portion by means of said spring member, thereby connecting said tubular member to said housing member;

characterized in that:

said second groove portion of said groove (11B, 111B, 211B) has at its opposite side to said stopping projection (10B, 110B, 210B) an engaging groove portion (11C, 111C, 211C), which extends in the same direction as the second groove portion of said groove (11B, 111B, 211B); the engaging projection (21A, 121A, 221A) of said tubular member (20) being engageable with said engaging groove portion (11C, 111C, 211C); and

said engaging groove portion (11C, 111C, 211C) has a width in the axial direction of the housing member (10), which is smaller than the width of the second groove portion of said groove (11B, 111B, 211B) in the axial direction of the housing member (10).

With respect to the connection of the tubular member to the housing member in the valve for a pressure vessel according to the present invention as claimed in Claim 1, the sealing member and the spring member are combined to the tubular member, the tubular member is inserted into the housing member in a condition

that the spring member arranged between the sealing member and the tubular member is kept compressed, and the sealing member is pushed from the inside of the housing member against the opening formed at the top end of the housing member.

The engaging projection of the tubular member is inserted from the inlet of the first groove portion of the connecting portion. When the tubular member is turned relative to the housing member, the engaging projection passes over the stopping projection and is then inserted into the second groove portion of the connecting portion.

When the tubular member is further turned relative to the housing member, the engaging projection enters the engaging groove portion, which is formed so as to communicate with the second groove portion, and is then engaged with the engaging groove portion. After releasing the compression of the spring member, the engaging projection is pressed against the bottom of the engaging groove portion.

The tubular member is connected to the housing member in this manner.

When the tubular member is connected to the housing member, the displacement of the tubular member relative to the housing member in the axial direction of the tubular member is more strictly limited by means of the engaging groove portion having a width in the axial direction of the housing member, which is smaller than the width of the second groove portion of the groove in the axial direction of the housing member, in comparison with the case that the engaging projection is located in the second groove portion of the connecting portion.

When the tubular member is disconnected from the housing member, reverse steps to the steps mentioned above are carried out so that the engaging projection of the tubular member is removed from the connecting portion of the housing member, thus completing the disconnection of the tubular member from the housing member.

According to the present invention as claimed in Claim 1, the valve for a pressure vessel has the construction that the tubular member is combined with the housing member so as to be able to be disconnected therefrom, and there is formed the engaging groove portion having a width in the axial direction of the housing member, which is smaller than the width of the second groove portion of the groove in the axial direction of the housing member. When the tubular member is connected to the housing member, the engaging projection of the tubular member is engaged with the engaging groove portion mentioned above. The displacement of the tubular member relative to the housing member in the axial direction of the tubular member is more strictly limited in comparison with the case that the engaging projection is located in the second groove portion of the connecting portion as in the conventional valve for a pressure vessel. It is therefore possible to prevent the improper setting of the sealing member due to the gap formed in the connecting portion of the housing member to the tubular member, and to ensure the tight sealing condition of the pressure vessel.

In the above-mentioned valve for a pressure vessel of the present invention, the bottom of the engaging groove portion (11C, 111C, 211C) may be lower than the bottom of the second groove portion so as to form a drop (11D) between these bottoms, as claimed in Claim 2.

In the valve for a pressure vessel of the present invention claimed in Claim 2, the engaging projection of the tubular member is engaged, in the same manner as the present invention claimed in Claim 1, with the engaging groove portion formed in the housing member so as to communicate with the second groove portion of the connecting portion, with the result that the tubular member is connected to the housing member. The engaging projection engaged with the engaging groove portion comes into contact with the drop formed between the bottom of the engaging groove portion and the bottom of the second groove portion so as to prevent the engaging projection from being come off the engaging groove portion.

According to the present invention as claimed in Claim 2, the engaging projection of the tubular member is engaged, as in the same manner as in the present invention claimed in Claim 1, with the engaging groove portion having the width in the axial direction of the housing member, which is smaller than the width of the second groove portion of the groove in the axial direction of the housing member so that the displacement of the tubular member relative to the housing member in the axial direction of the tubular member is more strictly limited and the fitting condition of the tubular member to the housing member can be improved. Even when the force having the function of turning the tubular member in its circumferential direction relative to the housing member is applied to the tubular member, the engaging projection comes into contact with the drop formed between the bottom of the engaging groove portion and the bottom of the second groove portion so as to prevent the engaging projection from being come off the engaging groove portion.

The drop is formed between the bottom of the engaging portion and the bottom of the second groove portion in this manner. Even when the engaging projection of the tubular member comes off the engaging groove portion, the engaging projection comes into contact with the stopping projection so as to prevent the engaging projection from coming off the second groove portion. It is therefore possible to make the vertical length of the drop shorter than the vertical length of the stopping projection. Accordingly, it is also possible to make the width of the engaging groove portion in the axial direction of the housing member shorter than the width of the second groove portion in the same direction, thus improving the fitting condition of the tubular

member to the housing member.

The engaging projection of the tubular member is engaged with the engaging groove portion having the width in the axial direction of the housing member, which is smaller than the width of the second groove portion of the groove in the axial direction of the housing member so that the displacement of the tubular member relative to the housing member in the axial direction of the tubular member is more strictly limited and the engaging projection cannot easily be removed from the engaging groove portion. It is therefore possible to ensure the prevention of the improper setting of the sealing member in the opening of the housing, thus permitting the maintenance of the tightly sealing condition of the pressure vessel.

In the above-mentioned valve for a pressure vessel of the present invention, the bottom of said engaging groove portion (111C) may have a concave portion (111Cb); and said engaging projection (121A) of said tubular member (20) may have on the under surface thereof a convex portion (121Aa), which is engageable with said concave portion (111Cb), as claimed in Claim 3.

In the valve for a pressure vessel of the present invention claimed in Claim 3, the engaging projection of the tubular member is engaged, in the same manner as the present invention claimed in Claim 1, with the engaging groove portion formed in the housing member so as to communicate with the second groove portion of the connecting portion, with the result that the tubular member is connected to the housing member. The convex portion of the engaging projection of the tubular member received in the engaging groove portion of the housing member is engaged with the concave portion of the engaging groove portion.

According to the present invention as claimed in Claim 3, the engaging projection of the tubular member is engaged, as in the same manner as in the present invention claimed in Claim 1, with the engaging groove portion having the width in the axial direction of the housing member, which is smaller than the width of the second groove portion of the groove in the axial direction of the housing member so that the displacement of the tubular member relative to the housing member in the axial direction of the tubular member is more strictly limited and the fitting condition of the tubular member to the housing member can be improved. Even when the force having the function of turning the tubular member in its circumferential direction relative to the housing member is applied to the tubular member, the convex portion of the engaging projection of the tubular member received in the engaging groove portion of the housing member is engaged with the concave portion of the engaging groove portion so as to prevent the engaging projection from being come off the engaging groove portion.

The concave portion is formed on the bottom of the engaging groove portion and the convex portion is formed on the under surface of the engaging projection of the tubular member in this manner. Even when the concave portion comes off the convex portion, the engaging projection comes into contact with the stopping projection so as to prevent the engaging projection from coming off the second groove portion. It is therefore possible to make the vertical length of the drop shorter than the vertical length of the stopping projection. Accordingly, it is also possible to make the width of the engaging groove portion in the axial direction of the housing member shorter than the width of the second groove portion in the same direction, thus improving the fitting condition of the tubular member to the housing member.

The engaging projection of the tubular member is engaged with the engaging groove portion having the width in the axial direction of the housing member, which is smaller than the width of the second groove portion of the groove in the axial direction of the housing member so that the displacement of the tubular member relative to the housing member in the axial direction of the tubular member is more strictly limited and the engaging projection cannot easily be removed from the engaging groove portion. It is therefore possible to ensure the prevention of the improper setting of the sealing member in the opening of the housing, thus permitting the maintenance of the tightly sealing condition of the pressure vessel.

In the above-mentioned valve for a pressure vessel of the present invention, the bottom of said engaging groove portion (211C) may be flush with the bottom of said second groove portion; and said engaging groove portion (211C) has a width in the axial direction of the housing member (10), which is slightly larger than the width of the engaging projection (221A) of said tubular member (20) in the axial direction of the housing member (10), as claimed in Claim 4.

In the valve for a pressure vessel of the present invention claimed in Claim 4, the engaging projection of the tubular member is engaged, in the same manner as the present invention claimed in Claim 1, with the engaging groove portion formed in the housing member so as to communicate with the second groove portion of the connecting portion, with the result that the tubular member is connected to the housing member. The width of the engaging groove portion in the axial direction of the housing member is slightly larger than the width of the engaging projection of the tubular member in the axial direction of the housing member as mentioned above, and almost no gap is therefore formed between the upper surface of the engaging groove portion and the upper surface of the engaging projection received in the engaging groove portion, thus eliminating the displacing distance of the tubular member relative to the housing member in the axial direction thereof.

According to the present invention claimed in Claim 4, almost no gap is therefore formed between the upper surface of the engaging groove portion and the upper

surface of the engaging projection received in the engaging groove portion, as mentioned above. The displacement of the tubular member relative to the housing member in the axial direction thereof can completely be restricted so as to improve the fitting condition of the tubular member to the housing member. It is therefore possible to ensure the prevention of the improper setting of the sealing member in the opening of the housing, which may be caused by the opening or closing operation of the valve, thus permitting the maintenance of the tightly sealing condition of the pressure vessel.

Even if the tubular member is turned relative to the housing member in the circumferential direction thereof so that the engaging projection comes off the engaging groove portion, the engaging projection comes into contact with the stopping projection so as to prevent the engaging projection from coming off the second groove portion, thus avoiding the disconnection of the tubular member from the housing member.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view illustrating a valve for a pressure vessel of the first embodiment of the present invention;

FIG. 2 is an enlarged partial view illustrating a connecting portion of the valve as shown in FIG. 1;

FIG. 3 is an enlarged partial view illustrating a connecting portion of a valve for a pressure vessel of the second embodiment of the present invention;

FIG. 4 is an enlarged partial view illustrating a connecting portion of a valve for a pressure vessel of the third embodiment of the present invention;

FIG. 5 is a side view having a partially sectioned portion, illustrating the conventional valve for a pressure vessel;

FIG. 6 is a partial cross-sectional view illustrating the improper fitting condition of a main sealing gasket in the conventional valve; and

FIG. 7 is side view illustrating the conventional valve as shown in FIG. 5.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, embodiments of a valve for a pressure vessel of the present invention will be described in detail below with reference to the accompanying drawings.

FIG. 1 is a side view illustrating a valve for a pressure vessel of the first embodiment of the present invention and FIG. 2 is an enlarged partial view illustrating a connecting portion, which is formed on a skirt of a valve housing of the valve as shown in FIG. 1

In FIG. 1, the valve for a pressure vessel comprises a valve housing 10 as a valve housing member and a siphon tube 20 as a tubular member. A main sealing gasket, a washer and a spring are received in the siphon tube 20 as in the same manner as the conventional valve for a pressure shown in FIG. 5.

The valve housing 10 of the valve for a pressure vessel has a skirt 10A, on the lower end of which a plurality of connecting portions 11 are formed as shown in an enlarged size in FIG. 2.

The connecting portions 11 are formed on the lower portion of the skirt 10A as in the same manner as the conventional valve for a pressure vessel shown in FIGS. 5 and 7. A plurality of projecting pieces 21A formed as engaging projections on the outer periphery of a connecting disk 21, which is fixed to the siphon tube 2 are respectively received in the connecting portions 11 so as to connect the siphon tube 20 with the valve housing 10.

The connecting portion 11 is provided with a vertical groove 11A as the first groove portion, which extends upward from the lower edge of the skirt 10A and a transverse groove 11B as the second groove portion, which extends from the upper end of the vertical groove 11A in a circumferential direction of the skirt 10A. The vertical groove 11A has a larger width W than that of the projecting piece 21A.

A stopping projection 10B, which projects upward from the bottom 11Ba of the transverse groove 11B at the entrance thereof is formed integrally with the skirt 10A. The distance m1 between the upper surface 10Ba of the stopping projection 10B and the upper surface of the transverse groove 11B is substantially identical with or larger than the thickness "h" of the projecting piece 21A. The horizontal length of the bottom of the transverse groove 11B excluding the stopping projection 10B is substantially identical with or larger than the width "W" of the projecting piece 21A.

The combination structure of the vertical groove 11A, the transverse groove 11B and the stopping projection 10B of the connecting portion 11 is the same as that of the conventional valve for a pressure vessel shown in FIGS. 5 and 7.

The skirt 10A further has an engaging groove portion 11C for each of the connecting portions, which is formed on the side of the transverse groove 11B, opposite to the vertical groove 11A, so as to communicate with the transverse groove 11B and to extend in the circumferential direction of the skirt 10A. The bottom 11Ca of the engaging groove portion 11C is lower than the bottom 11Ba of the transverse groove 11B so as to form a drop 11D between these bottoms 11Ca and 11Ba.

The engaging groove portion 11C has a height m3, which is smaller than the height m2 of the transverse groove 11B. The distance m4 between the upper surface 11Cb of the engaging groove portion 11C and the bottom 11Ba of the transverse groove 11B is substan-

tially identical or slightly larger than the height "h" of the projecting piece 21A.

The height m5 of the drop 11D is smaller than the height m6 of the stopping projection 10B. The width "u" of the engaging groove portion 11C is substantially identical with or slightly larger than the width "w" of the projecting piece 21A.

The other constructional elements of the valve for a pressure vessel of the first embodiment of the present invention are identical with those of the conventional valve for a pressure vessel shown in FIGS. 5 and 7.

The siphon tube 20 and the valve housing 10 are assembled into the valve for a pressure vessel in the same manner as the conventional valve for a pressure vessel shown in FIGS. 5 and 7.

More specifically, the spring, the washer and the main sealing gasket are fitted to the siphon tube 20 (see FIG. 5). The siphon tube 20 is then inserted into the valve housing 10 from the lower end thereof and the projecting pieces 21A of the connecting disk 21 fixed to the siphon tube 20 are located so as to face the vertical grooves 11A of the connecting portions 11, respectively. While maintaining this condition, the spring is kept compressed with the use of an exclusive tool, and the projecting pieces 21A are inserted into the vertical grooves 11A.

After the projecting pieces 21A come into contact with the upper surface of the vertical groove 11A, the siphon tube 20 is turned clockwise in its circumferential direction relative to the valve housing 10. Such turn of the siphon tube 20 causes the projecting pieces 21A to move in the horizontal direction relative to the connecting portions 11 so as to enter the transverse groove 11B. The projecting pieces 21A slide on the upper surfaces 11Bb of the transverse grooves 11B to move.

After the projecting pieces 21A reach the upper and inner terminal wall of the transverse groove 11B, the projecting pieces 21A are moved downward to come into contact with the bottom 11Ba of the transverse groove 11B.

In this condition, the siphon tube 20 is further turned clockwise in the circumferential direction thereof relative to the valve housing 10 so that the projecting pieces 21A move from the transverse grooves 11B into the engaging groove portions 11C. Alter the projecting pieces 21A are completely received in the engaging groove portions 11C, the compressed condition of the spring is released so that the projecting pieces 21A are pressed on the bottoms 11Ca of the engaging groove portions 11C under the function of resilience of the spring.

The projecting pieces 21A received in the engaging groove portions 11C come into contact with the drops 11D formed between the engaging groove portions 11C and the transverse grooves 11B, so as to prevent the projecting pieces 21A from coming off the engaging groove portions 11C.

The projecting pieces 21A are thus engaged with the engaging groove portions 11C as shown by dotted lines in FIG. 2, with the result that the siphon tube 20 is connected to the valve housing 10 through the connecting disk 21 so that the siphon tube 20 can not easily be separated from the valve housing 10.

In a condition that the siphon tube 20 is connected to the valve housing 10, the height m3 of the engaging groove portion 11C is smaller than the height m2 of the transverse groove 11B. The distance between the upper surface of the projecting piece 21A engaged with the engaging groove portion 11C and the upper surface 11Cb of the engaging groove portion 11C is therefore shorter than the distance between the upper surface of the projecting piece 21A engaged with the engaging groove portion 11C and the upper surface 11Bb of the transverse groove 11B.

The stopping projection 10B formed on the entrance of the transverse groove 11B should have the prescribed height m6 in order to ensure the sufficient strength to prevent the projecting piece 21A from coming off the transverse groove 11B. Even when the projecting piece 21A is disengaged from the drop 11D so as to come off the engaging groove portion 11C, the projecting piece 21A comes into contact with the stopping projection 10B, thus preventing the projecting piece 21A from coming off the transverse groove 11B. Accordingly, the siphon tube 20 may not be separated from the valve housing 10. The above-mentioned effects can be provided by making the height m5 of the drop 11D of the engaging groove portion 11C smaller than the height m6 of the stopping projection 10B.

There can thus be maintained the small distance between the upper surface 11Cb of the engaging groove portion 11C and the upper surface of the projecting piece 21A received in the engaging groove portion 11C. It is therefore possible to more strictly limit the up and down movement of the projecting piece 21A in the connecting portion 11, i.e., the displacement of the siphon tube 20 relative to the valve housing 10 in the axial direction of the siphon tube 20 in comparison with the case that the projecting piece 21A is received in the transverse groove 11B.

As a result, it is possible to effectively improve the fitting of the siphon tube 20 to the valve housing 10. The problems can therefore be solved that the improper fitting of the main sealing gasket in the opening of the valve housing occurs to deteriorate the tight sealing property when the valve for a pressure vessel is opened or closed by the operation of the dispensing head, which is connected to the valve.

In the above-mentioned valve for a pressure vessel, the siphon tube 20 can be disconnected from the valve housing 10 in the manner described below. The spring is kept compressed with the use of the tool. The siphon tube 20 is then turned counterclockwise in the circumferential direction of the siphon tube 20 relative to the valve housing 10 so that the projecting pieces 21A come off the engaging groove portions 11C and the

transverse grooves 11B. The projecting pieces 21A are then removed from the vertical grooves 11A, thus completing the removal of the siphon tube 20 from the valve housing 10.

FIG. 3 illustrates a connecting portion formed on a skirt of a valve housing, in an enlarged size as in FIG. 2, of a valve for a pressure vessel of the second embodiment of the present invention.

As shown in FIG. 3, the connecting portion 111 are formed on the lower portion of the skirt 110A of the valve housing 110, as in the valve for a pressure vessel shown in FIGS. 1 and 2.

The connecting portion 111 is provided with a vertical groove 111A as the first groove portion, which extends upward from the lower edge of the skirt 110A and a transverse groove 111B as the second groove portion, which extends from the upper end of the vertical groove 111A in a circumferential direction of the skirt 110A. A stopping projection 110B, which projects upward from the bottom 111Ba of the transverse groove 111B at the entrance thereof is formed integrally with the skirt 110A.

The combination structure of the vertical groove 111A, the transverse groove 111B and the stopping projection 110B of the connecting portion 111 is the same as that of the conventional valve for a pressure vessel shown in FIGS. 5 and 7.

The skirt 110A further has an engaging groove portion 111C for each of the connecting portions, which is formed on the side of the transverse groove 111B, opposite to the vertical groove 111A, so as to communicate with the transverse groove 111B and to extend in the circumferential direction of the skirt 110A. The bottom 111Ca of the engaging groove portion 111C is flush with the bottom 111Ba of the transverse groove 111B. A concave portion 111Cb is formed on the middle portion of the bottom 111Ca of the engaging groove portion 111C.

The projecting piece 121Aa as an engaging projection of the connecting disk 121A has a convex portion 121Aa formed on the under surface of the projecting piece 121Aa. The convex portion 121Aa has a size, which is engageable with the concave portion 111Cb formed on the bottom 111Ba of the transverse groove 111B.

The distance m11 between the upper surface 110Ba of the stopping projection 110B and the upper surface 111Bb of the transverse groove 111B is substantially identical with or larger than the total length of the height "h" of the projecting piece 121A and the vertical length "v" of the convex portion 121Aa. The horizontal length of the bottom of the transverse groove 111B excluding the stopping projection 110B is substantially identical with or larger than the width "w" of the projecting piece 121A.

The engaging groove portion 111C has a height m12, which is substantially identical with or slightly larger than the total length of the height "h" of the projecting piece 121A and the vertical length "v" of the convex portion 121Aa. The width "u" of the engaging groove portion 111C is substantially identical with or slightly larger than the width "w" of the projecting piece 121A.

The other constructional elements of the valve for a pressure vessel of the second embodiment of the present invention are identical with those of the conventional valve for a pressure vessel shown in FIGS. 5 and 7.

The siphon tube and the valve housing are assembled into the valve for a pressure vessel in the same manner as the valve for a pressure vessel of the first embodiment of the present invention as shown in FIG. 1.

More specifically, the spring, the washer and the main sealing gasket are fitted to the siphon tube. The siphon tube is then inserted into the valve housing from the lower end thereof and the projecting pieces 121A of the connecting disk fixed to the siphon tube are located so as to face the vertical grooves 111A of the connecting portions 111, respectively. While maintaining this condition, the spring is kept compressed with the use of an exclusive tool, and the projecting pieces 121A are inserted into the vertical grooves 111A.

After the projecting pieces 121A come into contact with the upper surface of the vertical groove 111A, the siphon tube is turned clockwise in its circumferential direction relative to the valve housing. Such turn of the siphon tube causes the projecting pieces 121A to move in the horizontal direction relative to the connecting portions 111 so as to enter the transverse groove 111B. The projecting pieces 121A slide on the upper surfaces 111Bb of the transverse grooves 111B to move.

After the projecting pieces 121A reach the upper and inner terminal wall of the transverse groove 111B, the projecting pieces 121A are moved downward to come into contact with the bottom 111Ba of the transverse groove 111B.

In this condition, the siphon tube is further turned clockwise in the circumferential direction thereof relative to the valve housing so that the projecting pieces 121A move from the transverse grooves 111B into the engaging groove portions 111C. When the movement of the projecting pieces 121A into the engaging groove portions 111C is completed so that the convex portions 121Aa of the projecting pieces 121A face the concave portions 111Cb formed on the bottom 111Ca of the engaging groove portions 111C, the compressed condition of the spring is released so that the convex portions 121Aa are engaged with the concave portions 111Cb under the function of resilience of the spring (as shown by dotted lines in FIG. 3).

The convex portions 121Aa are engaged with the concave portions 111Cb so as to prevent the projecting pieces 121A from coming off the engaging groove portions 111C.

The projecting pieces 121A are thus engaged with

the engaging groove portions 111C, with the result that the siphon tube is connected to the valve housing through the connecting disk so that the siphon tube can not easily be separated from the valve housing, as in the above-described first embodiment of the present invention.

In a condition that the siphon tube is connected to the valve housing, the distance between the upper surface 111Cc of the engaging groove portion 111C and the upper surface of the projecting piece 121A received therein is substantially identical with, and more specifically, slightly larger than the vertical length "v" of the convex portion 121Aa.

The stopping projection 110B formed on the entrance of the transverse groove 111B should have the prescribed height in order to ensure the sufficient strength to prevent the projecting piece 121A from coming off the transverse groove 111B. Even when the convex portion 121Aa comes off the concave portion 111Cb, the projecting piece 121A comes into contact with the stopping projection 110B, thus preventing the projecting piece 121A from coming off the transverse groove 111B. It is therefore possible to make the vertical length of the convex portion 121Aa (i.e., the depth of the concave portion 111Cb) smaller than the height of the stopping projection 110B.

Accordingly, the distance between the upper surface 111Cc of the engaging groove portion 111C and the upper surface of the projecting piece 121A received therein is smaller than the distance between the upper surface 111Bb of the transverse groove 111B and the upper surface of the projecting piece 121A received therein. It is therefore possible to more strictly limit the up and down movement of the projecting piece 121A in the connecting portion 111, i.e., the displacement of the siphon tube relative to the valve housing in the axial direction of the siphon tube in comparison with the case that the projecting piece 121A is received in the transverse groove 111B.

As a result, it is possible to effectively improve the fitting of the siphon tube to the valve housing. The problems can therefore be solved that the improper fitting of the main sealing gasket in the opening of the valve housing occurs to deteriorate the tight sealing property when the valve for a pressure vessel is opened or closed by the operation of the dispensing head, which is connected to the valve.

In the above-mentioned valve for a pressure vessel, the siphon tube can be disconnected from the valve housing in the manner described below. The spring is kept compressed with the use of the tool. The siphon tube is then turned counterclockwise in the circumferential direction of the siphon tube relative to the valve housing so that the projecting pieces 121A come off the engaging groove portions 111C and the transverse grooves 111B. The projecting pieces 121A are then removed from the vertical grooves 111A, thus completing the removal of the siphon tube from the valve housing.

FIG. 4 illustrates a connecting portion formed on a skirt of a valve housing, in an enlarged size as in FIG. 2, of a valve for a pressure vessel of the third embodiment of the present invention.

As shown in FIG. 4, the connecting portion 211 are formed on the lower portion of the skirt 210A of the valve housing 210, as in the valve for a pressure vessel shown in FIGS. 1 and 2.

The connecting portion 211 is provided with a vertical groove 211A as the first groove portion, which extends upward from the lower edge of the skirt 210A and a transverse groove 211B as the second groove portion, which extends from the upper end of the vertical groove 211A in a circumferential direction of the skirt 210A. A stopping projection 210B, which projects upward from the bottom 211Ba of the transverse groove 211B at the entrance thereof is formed integrally with the skirt 210A.

The combination structure of the vertical groove 211A, the transverse groove 211B and the stopping projection 210B of the connecting portion 211 is the same as that of the conventional valve for a pressure vessel shown in FIGS. 5 and 7.

The skirt 210A further has an engaging groove portion 211C for each of the connecting portions, which is formed on the side of the transverse groove 211B, opposite to the vertical groove 211A, so as to communicate with the transverse groove 211B and to extend in the circumferential direction of the skirt 210A. The bottom 211Ca of the engaging groove portion 211C is flush with the bottom 211Ba of the transverse groove 211B.

The distance m21 between the upper surface 210Ba of the stopping projection 210B and the upper surface 211Bb of the transverse groove 211B is substantially identical with or larger than the height "h" of the projecting piece 221A. The horizontal length of the bottom of the transverse groove 211B excluding the stopping projection 210B is substantially identical with or larger than the width "w" of the projecting piece 221A.

The engaging groove portion 211C has a height m22, which is substantially identical with or slightly larger than the height "h" of the projecting piece 221A. The width "u" of the engaging groove portion 211C Is substantially identical with or slightly larger than the width "w" of the projecting piece 221A.

The other constructional elements of the valve for a pressure vessel of the third embodiment of the present invention are identical with those of the conventional valve for a pressure vessel shown in FIGS. 5 and 7.

The siphon tube and the valve housing are assembled into the valve for a pressure vessel in the same manner as the valve for a pressure vessel of the first embodiment of the present invention as shown in FIG. 1.

More specifically, the spring, the washer and the main sealing gasket are fitted to the siphon tube. The siphon tube is then inserted into the valve housing from

the lower end thereof and the projecting pieces 221A of the connecting disk fixed to the siphon tube are located so as to face the vertical grooves 211A of the connecting portions 211, respectively. While maintaining this condition, the spring is kept compressed with the use of an exclusive tool, and the projecting pieces 221A are inserted into the vertical grooves 211A.

After the projecting pieces 221A come into contact with the upper surface of the vertical groove 211A, the siphon tube is turned clockwise in its circumferential direction relative to the valve housing. Such turn of the siphon tube causes the projecting pieces 221A to move in the horizontal direction relative to the connecting portions 211 so as to enter the transverse groove 211B. The projecting pieces 221A slide on the upper surfaces 211Bb of the transverse grooves 211B to move.

After the projecting pieces 221A reach the upper and inner terminal wall of the transverse groove 211B, the projecting pieces 221A are moved downward to come into contact with the bottom 211Ba of the transverse groove 211B.

In this condition, the siphon tube is further turned clockwise in the circumferential direction thereof relative to the valve housing so that the projecting pieces 221A move from the transverse grooves 211B into the engaging groove portions 211C to make a complete engagement of the projecting pieces 221A with the engaging groove portions 211C as shown by dotted lines in FIG. 4.

When the compressed condition of the spring is released, the projecting pieces 221A are urged against the bottoms 211Ca of the engaging groove portions 211C under the function of resilience of the spring.

The projecting pieces 221A are thus engaged with the engaging groove portions 211C, with the result that the siphon tube is connected to the valve housing through the connecting disk so that the siphon tube can not easily be separated from the valve hosing, as in the above-described first embodiment of the present invention.

In a condition that the siphon tube is connected to the valve housing, the height m22 of the engaging groove portion 211C is substantially identical with or slightly larger than the height "h" of the projecting piece 221A. Almost no gap is therefore formed between the upper surface 211Cb of the engaging groove portion 211C and the upper surface of the projecting piece 221A received therein.

It is therefore possible to more strictly limit the up and down movement of the projecting piece 221A in the connecting portion 211, i.e., the displacement of the siphon tube relative to the valve housing in the axial direction of the siphon tube, when the projecting piece 221A is received in the engaging groove portion 211C.

As a result, it is possible to effectively improve the fitting of the siphon tube to the valve housing. The problems can therefore be solved that the improper fitting of the main sealing gasket in the opening of the valve housing occurs to deteriorate the tight sealing property when the valve for a pressure vessel is opened or closed by the operation of the dispensing head, which is connected to the valve.

The valve for a pressure vessel of the third embodiment of the present invention has no mechanism for holding the projecting piece 221A in the engaging groove portion 211C. Even when the projecting piece 221A comes off the engaging groove portion 211C, the projecting piece 221A however comes into contact with the stopping projection 210B, thus preventing the projecting piece 221A from coming off the transverse groove 211B so that the siphon tube is disconnected from the valve housing.

In the above-mentioned valve for a pressure vessel, the siphon tube can be disconnected from the valve housing in the manner described below. The spring is kept compressed with the use of the tool. The siphon tube is then turned counterclockwise in the circumferential direction of the siphon tube relative to the valve housing so that the projecting pieces 221A come off the engaging groove portions 211C and the transverse grooves 211B. The projecting pieces 221A are then removed from the vertical grooves 211A, thus completing the removal of the siphon tube from the valve housing.

It is possible to modify the valves for a pressure vessel of the first to third embodiments described above of the present invention to increase the length of any one of the projecting pieces formed on the periphery of the connecting disk, so as to project below the mouth ring fitted into the opening of the pressure vessel, thereby preventing the sudden jump of the valve.

According to the present invention as described in detail, it is possible to provide the valve for a pressure vessel, which has a construction that the tubular member is combined with the housing member so as to be able to be disconnected therefrom, permits to prevent the improper setting of the sealing member due to a gap formed in the connecting portion of the housing member to the tubular member, and to ensure the tight sealing condition of the pressure vessel.

Claims

1. A valve for a pressure vessel, which comprises:

   a hollow housing member having at the top end thereof an opening through which liquid is to be passed;
   a tubular member inserted in said housing member and secured thereto;
   a sealing member received in said housing member so as to be able to open or close tightly the opening of said housing member; and
   a spring member arranged between said sealing member and said tubular member so as to

push said sealing member from the inside of said housing member to close the opening of said housing member;

said housing member having a side wall in which at least one connecting portion is formed on a portion of said side wall, which is opposite to the top end of the housing member, said connecting portion being provided with a groove and a stopping projection, said groove having the first groove portion opening into the edge of said side wall and the second groove portion extending in a circumferential direction of said side wall, and said stopping projection extending from the bottom of the second groove portion toward the top end of said housing member; and

said tubular member having on the outer wall thereof at least one engaging projection extending in a radius direction of said tubular member, said engaging projection being inserted into said second groove portion of said groove and being pressed against the bottom of said second groove portion by means of said spring member, thereby connecting said tubular member to said housing member;

characterized in that:

said second groove portion of said groove (11B, 111B, 211B) has at its opposite side to said stopping projection (10B, 110B, 210B) an engaging groove portion (11C, 111C, 211C), which extends in the same direction as the second groove portion of said groove (11B, 111B, 211B); the engaging projection (21A, 121A, 221A) of said tubular member (20) being engageable with said engaging groove portion (11C, 111C, 211C); and

said engaging groove portion (11C, 111C, 211C) has a width in the axial direction of the housing member (10), which is smaller than the width of the second groove portion of said groove (11B, 111B, 211B) in the axial direction of the housing member (10).

2. A valve for a pressure vessel, as claimed in Claim 1, wherein:

the bottom of said engaging groove portion (11C, 111C, 211C) is lower than the bottom of said second groove portion so as to form a drop (11D) between these bottoms.

3. A valve for a pressure vessel, as claimed in Claim 1, wherein:

the bottom of said engaging groove portion (111C) has a concave portion (111Cb); and

said engaging projection (121A) of said tubular member (20) has on the under surface thereof a convex portion (121Aa), which is engageable with said concave portion (111Cb).

4. A valve for a pressure vessel, as claimed in Claim 1, wherein:

the bottom of said engaging groove portion (211C) is flush with the bottom of said second groove portion; and

said engaging groove portion (211C) has a width in the axial direction of the housing member (10), which is slightly larger than the width of the engaging projection (221A) of said tubular member (20) in the axial direction of the housing member (10).

FIG. 1

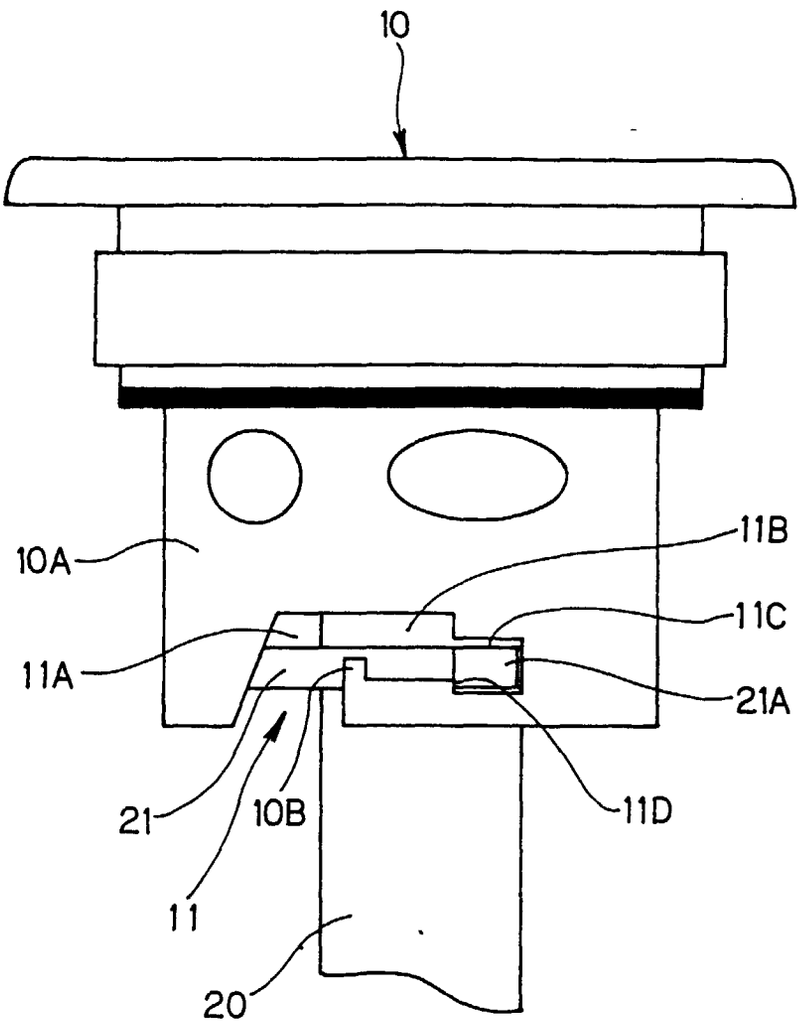
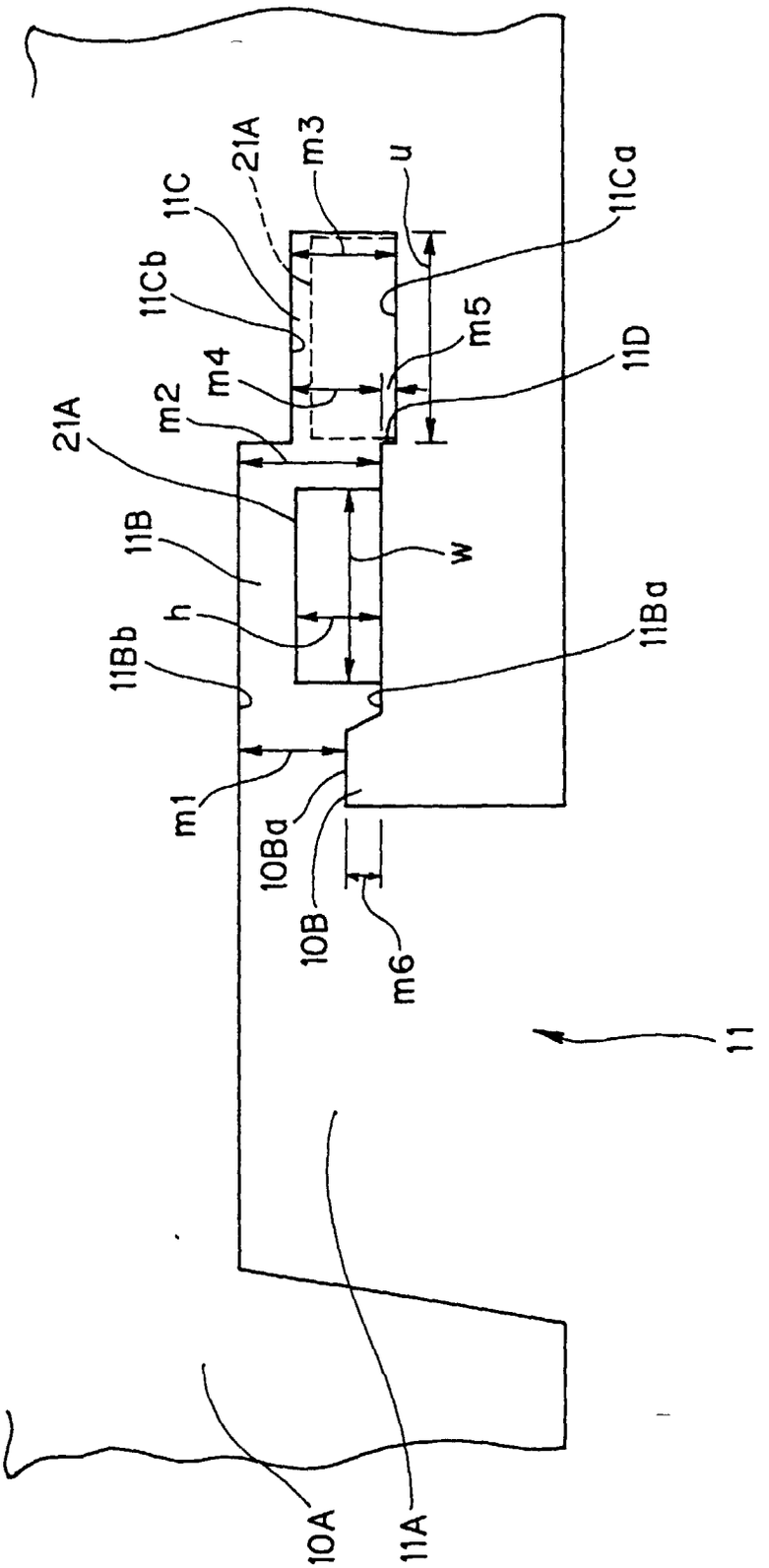


FIG. 2


21A
m3
u
11C
11Ca
11Cb
m5
11D
m4
m2
21A
11B
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h
11Ba
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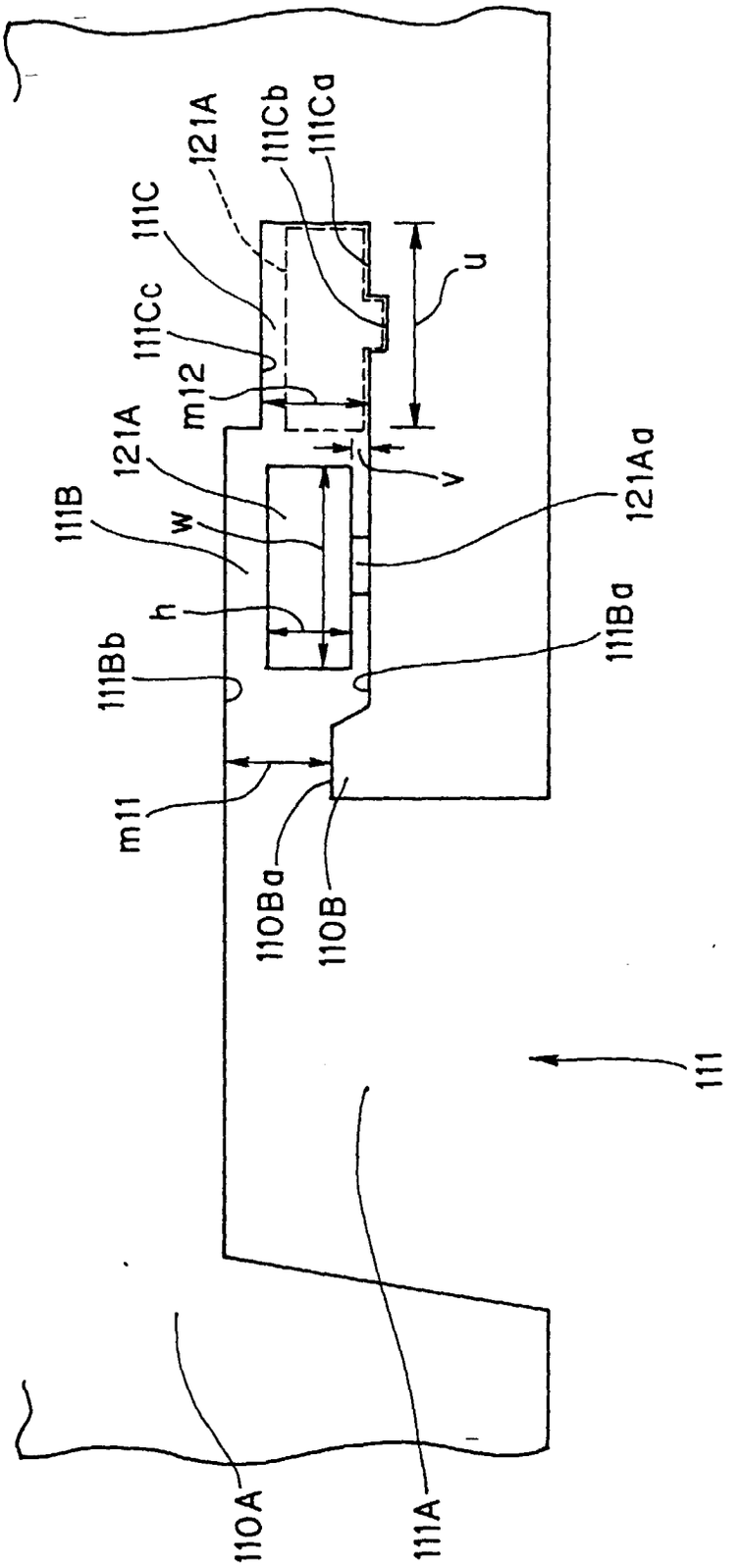
m1
10Ba
10B
m6
11
10A
11A

FIG. 3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111C
u
111Cc
m12
121A
v
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w
121Aa
h
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m11
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110B
111
110A
111A

FIG. 4

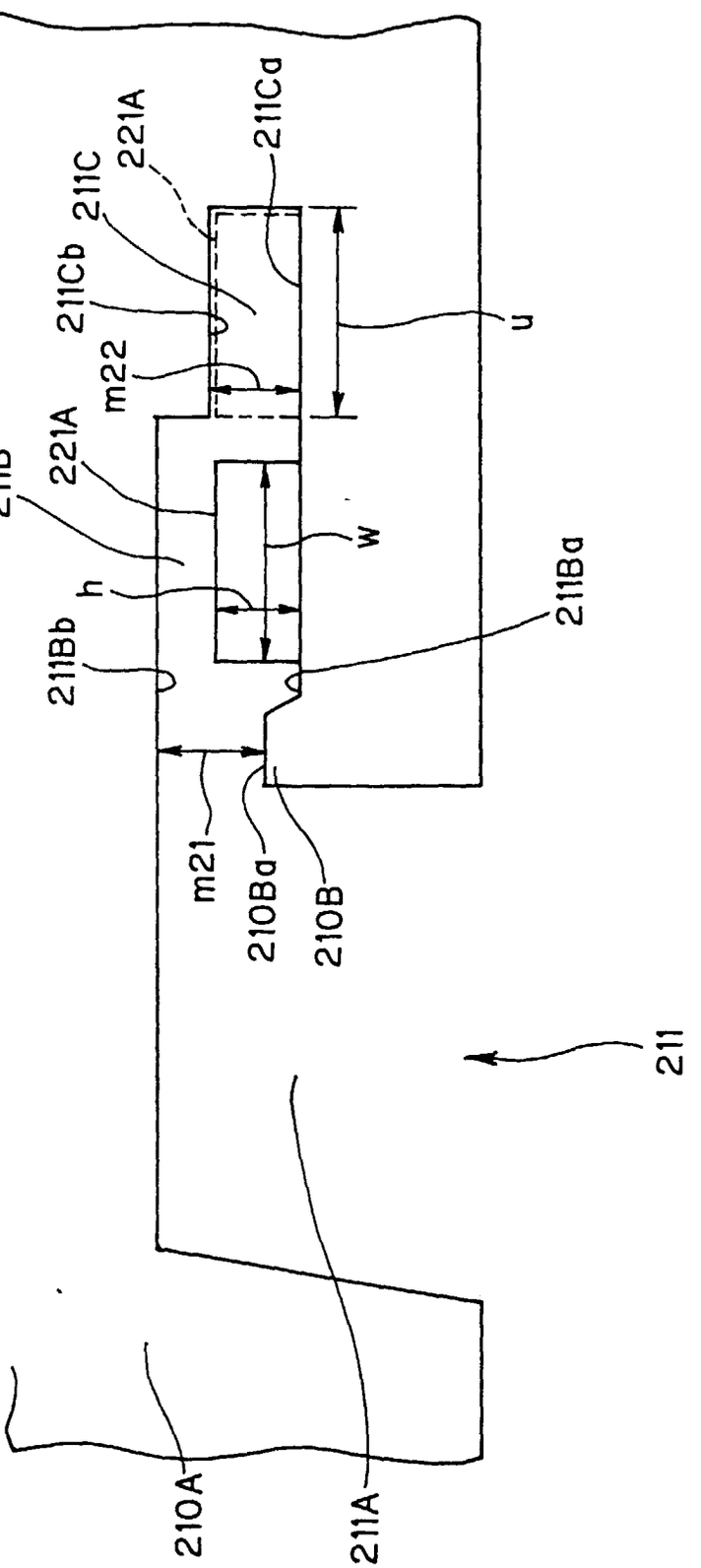

211Ca
221A
211C
211Cb
m22
u
221A
211B
w
h
211Bb
211Ba
m21
210Ba
210B
211
210A
211A

FIG. 5

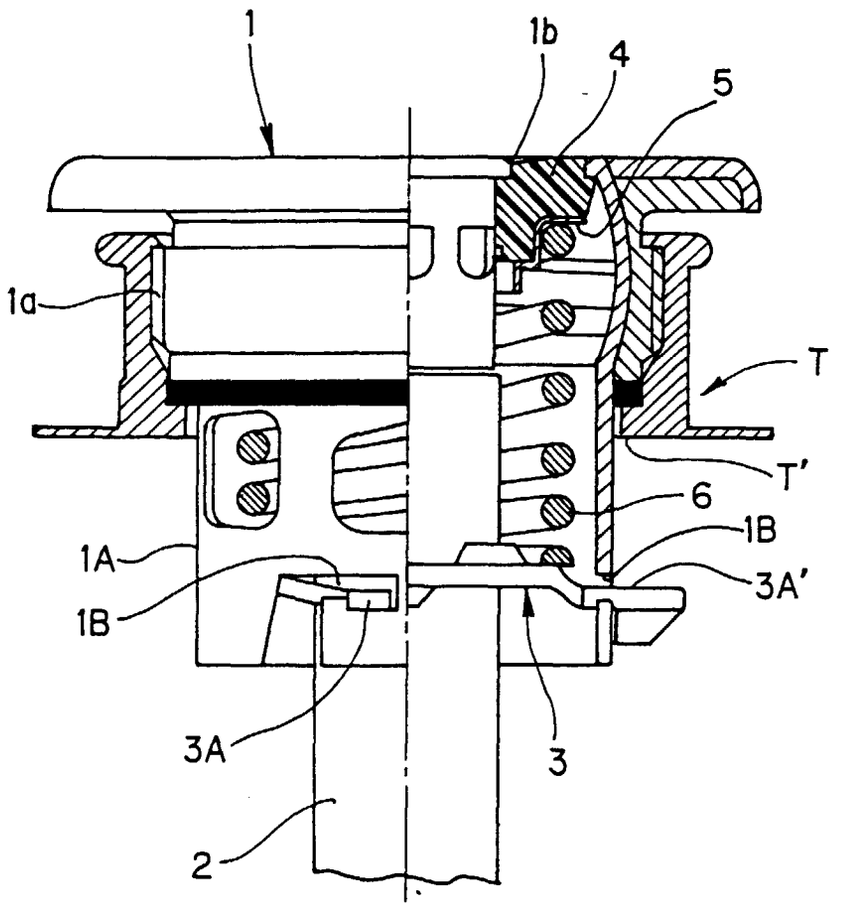


FIG. 6

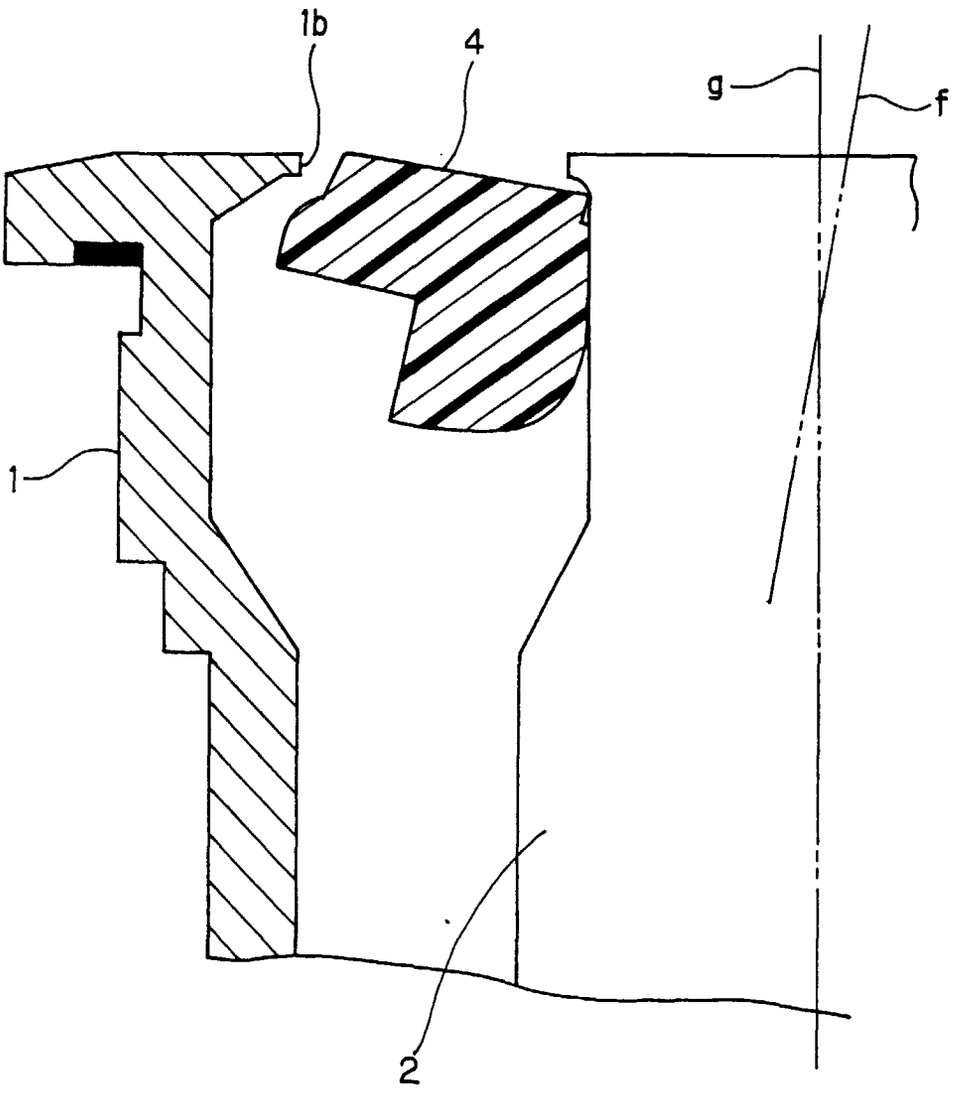
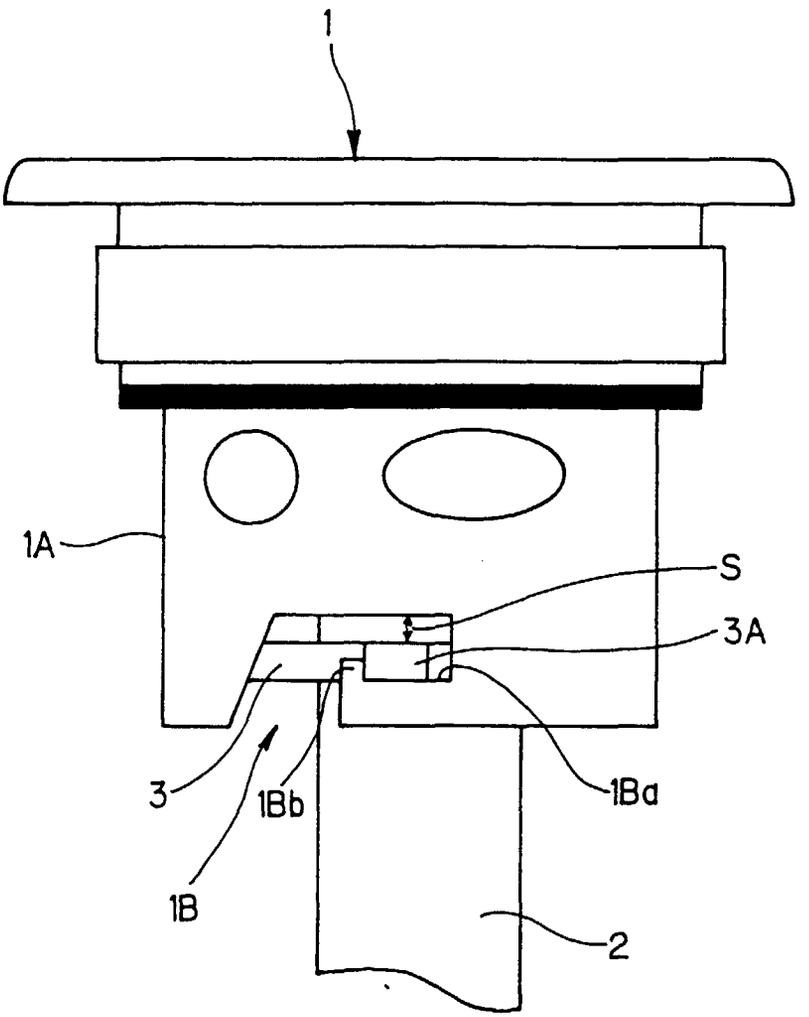


FIG. 7



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 11 1452

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,A	GB 2 188 040 A (MICRO MATIC A/S) 23 September 1987 * page 2, line 86 - line 126; claim 1; figures *	1	B67D1/08
A	EP 0 512 152 A (J. BREITWISCH & CO.) 11 November 1992		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B67D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	9 October 1998	Deutsch, J.-P.

CATEGORY OF CITED DOCUMENTS

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