



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.12.2009 Bulletin 2009/49

(51) Int Cl.:
E03D 1/26 (2006.01) E03D 1/01 (2006.01)

(21) Application number: **09161578.1**

(22) Date of filing: **29.05.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR

- **Suematsu, Masamichi**
Fukuoka 8028601 (JP)
- **Matsuda, Haruki**
Fukuoka 8028601 (JP)
- **Agarie, Shinji**
Fukuoka 8028601 (JP)

(30) Priority: **30.05.2008 JP 2008142989**
15.01.2009 JP 2009006782

(71) Applicant: **Toto Ltd.**
Fukuoka 802-8601 (JP)

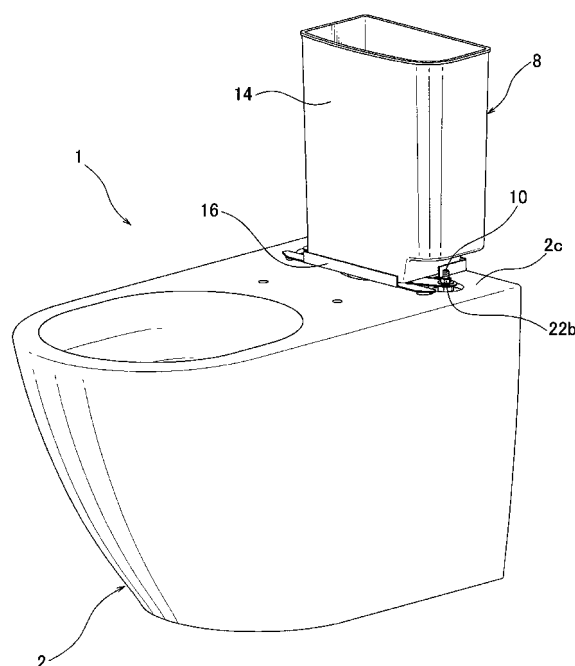
(74) Representative: **Zimmermann & Partner**
Isartorplatz 1
80331 München (DE)

(72) Inventors:
• **Kido, Tsutomu**
Fukuoka 8028601 (JP)

(54) **Holding tank and flush toilet provided therewith**

(57) Disclosed is a flush toilet holding tank (8) mounted on a flush toilet main body (2) and used by joining to the flush toilet main body, comprising: a tank bottom surface (14a) on which a tank drain opening is provided for causing flush water to flow to the flush toilet main body; a tank main body (14) furnished with a tank side surface (14b) extending upward from the tank bottom surface; a tank affixing portion (16) furnished with an projecting portion (16a) protruding outside of an area [defined by] vertically projecting a closed curve (C) at the outside perimeter of the tank bottom surface; and an affixing means (10, 22b) for joining the tank main body to the flush toilet main body via a tank affixing portion by affixing the projecting portion to the flush toilet main body by an operation from outside the flush toilet main body and the tank main body.

FIG.2



Description

Technical Field

[0001] The present invention relates to a holding tank, and in particular to a holding tank for a flush toilet used by connecting it to a flush toilet main body, and to a flush toilet equipped therewith.

Background Art

[0002] Unexamined Utility Model H04-89168 (Patent Document 1) sets forth a flush water holding tank affixing structure. In this flush water holding tank affixing structure, an engaging portion capable of detaching and attaching affixing bolts is provided on the bottom surface of the flush water tank. By means of this structure, the affixing bolts are affixed so as to protrude downward from the bottom surface of the flush water tank. Affixing bolts protruding downward from the flush water tank are inserted into attaching holes provided on the toilet, and the flush water tank is affixed to the toilet by screwing nuts onto the affixing bolts.

[0003] Published Utility Model H02-34284 (Patent Document 2) sets forth a structure for affixing the toilet and the tank. In this affixing structure, bolts are attached so as to protrude vertically upward from the toilet; the bolts penetrate holes formed in the bottom surface of the tank, and extend into the interior of the tank. Furthermore, the tank is affixed to the toilet by screwing nuts onto the bolts extending into the inside of the tank.

Summary of the Invention

[0004] However, in the affixing structure set forth in Published Utility Model H04-89168, the necessity for screwing a nut onto an affixing bolt protruding downward from the flush water tank results in a problem of poor workability when affixing same. That is, in a toilet with a structure in which the end of an affixing bolt attached to a flush water tank projects into the interior of the toilet, it becomes necessary to insert fingers into the toilet in order to screw the nut onto the affixing bolt. In general, the opening portion for inserting fingers is placed on the back surface of the toilet so as not to be visible. Therefore when removing a flush water tank affixed to a toilet, nuts screwed onto affixing bolts cannot be removed without first moving the entire toilet including the flush water tank to expose the opening portion on the back of the toilet.

[0005] In a toilet having a structure in which the ends of affixing bolts attached to a flush water tank protrude on the outside of the toilet, the affixing bolts and the nuts can be screwed together without moving the toilet, so that workability is reasonable, but a problem arises in that the external appearance of the toilet is compromised by the external exposure of the ends of the affixing bolts.

[0006] In the affixing structure set forth in Published Utility Model H02-34284, on the other hand, the nut can

be screwed onto the bolt from above through the opening portion at the top of the tank, affording good workability. However, because the bolt penetrates the tank and extends therein, a watertight seal must be secured between the bolt and the tank. This leads to the risk of water leaks due to poor installation, degradation of seals used to secure water tightness, and the like.

[0007] Therefore an object of the present invention is providing a flush water holding tank and flush toilet equipped therewith which can be joined to a flush toilet main body without the risk of water leaks with good workability.

[0008] The above-described problems of the state of the art are solved by providing the devices of claims 1 and 14. Further aspects, advantages and features of the present invention are apparent from the dependent claims, the description and the accompanying figures.

In order to resolve the above-described problems, the present invention according to one embodiment is a holding tank for a flush toilet, mountable or mounted on a flush toilet main body and usable or used by joining to said flush toilet main body, comprising: a tank main body including a tank bottom surface having a tank drain port for causing flush water to flow into the flush toilet main body, and a tank side surface extending upward from the tank bottom surface; a tank affixing portion including a projecting portion extending outside an area defined by the vertical projection of a closed curve at the perimeter of the tank bottom surface; and an affixing means, disposed outside an area defined by the vertical projection of the closed curve, for affixing the projecting portion to the flush toilet main body so as to join the tank main body to the flush toilet main body via the tank affixing portion by an operation performed outside the flush toilet main body and the tank main body.

[0009] In the embodiment of the present invention thus constituted, an projecting portion projecting to the outside of a region defined by the vertical projection of the closed curve of the tank bottom surface perimeter is affixed to the flush toilet main body by an affixing means disposed on the outside of the region defined by the vertical projection of the closed curve. The tank main body is connected to the toilet main body via the tank affixing portion.

[0010] In an embodiment of the present invention thus constituted, the tank main body is connected to the flush toilet main body by operating an affixing means from outside the flush toilet main body and the tank main body, therefore the holding tank can be connected to the flush toilet main body with good workability. Also, the projecting portion which protrudes further out than the region defined by vertically projecting the closed curve of the perimeter of the tank bottom surface is connected to the flush toilet main body by an affixing means, such that there is no need to provide through-holes on the tank main body for affixing to the holding tank, and water leaks can be reliably prevented.

[0011] In an embodiment of the present invention, the tank main body and the tank affixing portion are prefer-

ably integrally formed. In an embodiment of the present invention thus constituted, the tank main body and the tank affixing portion are formed as a single unit, therefore the number of parts can be reduced, and manufacturing costs can be controlled.

[0012] In another embodiment of the present invention, the tank main body and the tank affixing portion are preferably separately formed. Therefore they can be formed of differing materials, and materials appropriate to the tank main body and the tank affixing portion can be selected.

[0013] In an embodiment of the present invention, the tank main body is preferably formed of resin, and the tank affixing portion is preferably formed of metal. In the embodiment of the present invention thus constituted, the use of resin to form the flush water-contacting tank main body prevents degradation of the tank main body by corrosion or the like, and the use of metal to form the tank affixing portion, on which a large force acts when affixing the holding tank, prevents breakage of the tank affixing portion when affixing the holding tank.

[0014] In an embodiment of the present invention, the tank main body preferably includes an affixing portion affixing bolt formed integrally therewith and extending downward from the tank bottom surface, the affixing portion affixing bolt extends so as to penetrate the tank affixing portion, and the tank affixing portion is affixed to the tank main body by screwing a connecting nut onto the affixing portion affixing bolt.

[0015] In the embodiment of the present invention thus constituted, the tank main body and tank affixing portion are affixed by the affixing portion affixing bolts integrally formed in the tank main body, therefore the tank main body and the tank affixing portion can be bolted together without forming a hole in the tank main body, and water leakage from the tank main body can be securely prevented.

[0016] In an embodiment of the present invention, two of the affixing portion affixing bolts are preferably provided, and each of the affixing portion affixing bolts is disposed on an approximately diagonal line on the surface on which the tank main body and the tank affixing portions make contact.

[0017] In the embodiment of the present invention thus constituted, each of the affixing portion affixing bolts is disposed on an approximately diagonal line on the surface at which the tank main body and the tank affixing portion come in contact, therefore the tank main body can be strongly affixed to the tank affixing portion against the external force applied to the side wall of the tank main body.

[0018] In an embodiment of the present invention, the tank affixing portion preferably includes an elastically deformable flexible portion enabling the projecting portion to move in a vertical direction. In the embodiment of the present invention thus constituted, the tank affixing portion is provided with a flexible portion, therefore even if an excessive force from the affixing means acts on the

projecting portion, movement of the projecting portion is permitted due to the elastic deformation of the flexible portion, and deformation of the tank affixing portion as a whole can be avoided. This allows for the prevention of problems caused by deformation of the entire tank affixing portion.

[0019] In an embodiment of the present invention, the tank main body is preferably constituted to project out above the affixing means. In the embodiment of the present invention thus constituted, the tank main body is constituted to protrude above the affixing means, thereby enabling operation of the affixing means from outside the tank main body, while also increasing the internal volume of the tank main body.

[0020] In another embodiment, the present invention further preferably comprises a water supply means for supplying flush water, wherein a water supply means affixing portion for affixing the water supply means is provided with the projecting portion of the tank affixing portion. In the the embodiment of the present invention thus constituted, the water supply means can be affixed to the tank main body without providing a through hole or the like for attaching the water supply means, therefore the risk of water leakage or the like associated with attaching a water supply means can be avoided. Also, because the water supply means is attached to the tank affixing portion, the water supply means can be detached together with the tank main body, and interference from the water supply means and the tank main body when attaching and detaching, as well as difficulties imposed in order to avoid such interference, can be avoided.

[0021] In another embodiment, the present invention further preferably comprises a water supply means affixing plate, and a water supply means affixing means for affixing the water supply means to the water supply means affixing plate, whereby the water supply means is affixed to the water supply means affixing portion via the water supply means affixing plate. In the embodiment of the present invention thus constituted, the water supply means is affixed to the water supply means affixing portion via a water supply means affixing plate, therefore the water supply means can be easily affixed. Also, in the embodiment of the present invention thus constituted, various types of water supply means can be attached to the same water supply means affixing portion by changing the water supply means affixing plate.

[0022] In an embodiment of the present invention, the water supply means affixing means preferably has a specified width, and is an affixing band for affixing the water supply means to the water supply means affixing plate by holding down the perimeter of the water supply means. In the embodiment of the present invention thus constituted, the water supply means is affixed by the affixing band, therefore a general purpose product can be used as the affixing band. Also, compared to the use of a water supply means affixing means covered and hidden from above, use of an affixing band affords better installability.

[0023] In another embodiment, the present invention further preferably comprises an affixing position adjustment means for adjusting the affixing position of the water supply means affixing plate relative to the water supply means affixing portion. In the embodiment of the present invention thus constituted, the position at which the water supply means affixing plate is affixed is adjusted by an affixing position adjustment means, therefore shape variances in the flush water toilet main body and the like can be absorbed, and the water supply means can be affixed in an appropriate position.

[0024] The flush toilet of an embodiment of the present invention comprises a flush toilet main body including a bowl portion, a drain trap pipe, and a tank mounting surface for mounting a holding tank; and the holding tank according to the present invention, mounted on a tank mounting surface.

[0025] In the flush toilet of an embodiment of the present invention, the flush toilet main body is formed of ceramic, and the holding tank is mounted on at least three support protuberances formed on the tank mounting surface. In the embodiment of the present invention thus constituted, the holding tank is mounted on at least three support protuberances, therefore even when there are manufacturing variances in the flush toilet main body, the holding tank can be securely supported without looseness.

[0026] The flush toilet holding tank and flush toilet provided therewith of the embodiment of the present invention permits the joining of the holding tank to the flush toilet main body without the risk of water leakage and with good workability.

Brief Explanation of Figures

[0027]

Fig. 1 A perspective view showing an entire flush toilet according to a first embodiment of the present invention.

Fig. 2 A perspective view showing a flush toilet according to a first embodiment of the present invention with the holding tank cover removed.

Fig. 3 A perspective view showing a flush toilet according to a first embodiment of the present invention with the holding tank removed.

Fig. 4 A perspective view of a holding tank according to a first embodiment of the present invention.

Fig. 5 An exploded perspective view of a holding tank according to a first embodiment of the present invention.

Fig. 6 Across-sectional view showing the attachment of a holding tank to a flush toilet.

Fig. 7 A sectional view showing a variation of an affixing means.

Fig. 8 A perspective view showing an entire flush toilet according to a second embodiment of the present invention.

Fig. 9 A perspective view showing a flush toilet according to a second embodiment of the present invention with the holding tank cover removed, in which the flush toilet portion is enlarged.

Fig. 10 A perspective view showing a water supply means affixing plate for attaching a stopcock to an affixing plate.

Fig. 11 An exploded perspective view showing the attachment of the stopcock to the affixing plate.

[0028] Next, preferred embodiments of the present invention are discussed, referring to the attached figures. First, referring to Figs. 1 through 6, a flush toilet according to the first embodiment of the present invention is discussed. Fig. 1 is a perspective view showing an entire flush toilet according to a first embodiment of the present invention. Fig. 2 is a perspective view showing a flush toilet according to a first embodiment of the present invention with the holding tank cover removed. Fig. 3 is a perspective view showing a flush toilet according to a first embodiment of the present invention with the holding tank removed. Fig. 4 is a perspective view of a holding tank according to a first embodiment of the present invention. Fig. 5 is an exploded perspective view of a holding tank according to a first embodiment of the present invention. Fig. 6 is a cross-section showing the attachment of a holding tank to a flush toilet.

[0029] As shown in Fig. 1, a flush toilet 1 according to a first embodiment of the present invention has a flush toilet main body 2 and a holding tank 8 mounted on the flush toilet main body 2 (Fig. 2). The holding tank 8 mounted on the flush toilet main body 2 is covered by a holding tank cover 4. In the present embodiment, the flush toilet main body 2 and the holding tank cover 4 are made of a ceramic. Because the inner holding tank 8 is covered by the holding tank cover 4, there is no external exposure of the bolt connecting to the holding tank 8 and the flush toilet main body 2, thereby improving the external appearance of the flush toilet 1. Removal of the holding tank cover 4, as described below, permits the holding tank 8 to be easily attached to and detached from the flush toilet main body 2.

[0030] The flush toilet main body 2 has a bowl portion 2a for receiving waste, and a drain trap pipe 2b extending from the bottom portion of the bowl portion 2a. A cleaning switch 6 is provided on the top end surface of the slider, and flush water in the holding tank 8 is spouted into the bowl portion 2a by an operation of this cleaning switch 6, enabling the bowl portion 2a to be cleaned.

[0031] As shown in Fig. 2, removing the flush toilet 1 holding tank cover 4 exposes the holding tank 8 covered thereby. The holding tank 8 is mounted on a tank mounting surface 2c on the flush toilet main body 2. In the present embodiment, the top end surface of the flush toilet main body 2 is formed to be essentially planar, and the tank mounting surface 2c comprises the top end surface rear portion of the flush toilet main body 2. Note that the top end surface of the flush toilet main body 2 and the tank mounting surface 2c do not necessarily have to be coplanar.

[0032] As shown in Fig. 3, a tank connecting hole 2d for causing flush water to flow into the holding tank 8 is formed on the flush toilet main body 2 tank mounting surface 2c, and two stud bolts 10 as well as three support protuberances 12 for supporting the holding tank 8 are also provided thereon.

[0033] The tank connecting hole 2d is a circular hole provided at approximately the center of the tank mounting surface 2c, and the holding tank 8 is connected to this tank connecting hole 2d. Flush water caused to flow from this tank connecting hole 2d into the flush toilet main body 2 is spouted from the rim spout opening (not shown) provided on the upper portion of the bowl portion 2a, and from the jet spout opening (not shown) provided so as to oppose the drain trap pipe 2b, thereby cleaning the bowl portion 2a.

[0034] The stud bolts 10 are arranged in approximately laterally symmetrical positions on both sides of the tank connecting hole 2d, and are attached to the flush toilet main body 2 so as to project vertically upward from the tank mounting surface 2c.

[0035] The support protuberances 12 are formed integrally with the flush toilet main body 2, and project upward from the tank mounting surface 2c. Of the three support protuberances 12, two are disposed in the forward vicinity of the stud bolts 10; the remaining one is formed in the rear vicinity of the tank connecting hole 2d. In the present embodiment, after the ceramic flush toilet main body 2 is formed, each of the support protuberances 12 are ground so that their respective top surfaces are positioned on the same horizontal plane. The holding tank 8 can thus be accurately supported in the horizontal direction, even if there are manufacturing variances in the shape of the flush toilet main body 2 as formed.

[0036] Next we discuss the constitution of the holding tank 8, referring to Figs. 4 and 5. As shown in Figs. 4 and 5, the holding tank 8 has a tank main body 14, an affixing plate 16 serving as the tank affixing portion attached to the bottom portion of the tank main body 14, and a drain valve 18 (Fig. 5) housed inside the tank main body 14.

[0037] The tank main body 14 is a resin receptacle, open at the top end and furnished with a tank bottom surface 14a, a tank side surface 14b extending approximately vertically upward from the tank bottom surface 14a, and a tank shelf portion 14c extending approximately horizontally above the tank bottom surface 14a. A tank drain opening 14e for causing flush water to flow out is

formed at approximately the center of the tank bottom surface 14a. Two plate affixing bolts 14d extending downward from the tank bottom surface 14a are also integrally formed on the tank bottom surface 14a. These two plate affixing bolts 14d are disposed on both sides of the tank drain opening 14e, on an approximately diagonal line on an approximately rectangular surface contacted by the tank main body 14 and the affixing plate 16.

[0038] The affixing plate 16 is an approximately rectangular metal plate, on which are formed two arm portions 16a, which are projecting portions extending from the short sides on both sides; tank affixing holes 16b are respectively provided at the end portions of the arm portions 16a. When the holding tank 8 is disposed at a specified position on the flush toilet main body 2 tank mounting surface 2c, these tank affixing holes 16b are provided in positions respectively corresponding to each of the stud bolts 10. Furthermore, the tank affixing holes 16b are disposed on the outside of the region defined by the vertical projection of the closed curve C on the outer perimeter of the tank bottom surface 14a (shown by the thick solid line in Fig. 5). A flexible portion 16c constituted to be able to easily narrow and elastically deform the width of the arm portions 16a is also disposed at the base portion of each of the arm portions 16a. This enables the arm portions 16a to be easily turned in the vertical direction, and the position of the tank affixing holes 16b to be moved vertically.

[0039] The plate affixing holes 16d are respectively provided at positions corresponding to each of the plate affixing bolts 14d on the affixing plate 16. The affixing plate 16 can be affixed to the tank main body 14 by inserting each of the plate affixing bolts 14d respectively into the plate affixing holes 16d and screwing the connecting nuts 20 onto the plate affixing bolts 14d. Plate drain hole 16e (Fig. 5) is provided at positions corresponding to the tank drain opening 14e on the affixing plate 16.

[0040] The drain valve 18 is an approximately cylindrical on-off valve housed within the tank main body 14; it is left open for a specified time by an operation of the cleaning switch 6, causing flush water in the tank main body 14 to flow out to the flush toilet main body 2. The bottom end portion of the drain valve 18 penetrates the tank main body 14 tank drain opening 14e and the affixing plate 16 plate drain hole 16e, and projects downward from the affixing plate 16. A drain valve affixing nut 18a is screwed onto the bottom end portion projecting out from the drain valve 18, and the drain valve 18 is affixed to the tank main body 14. Furthermore, the drain valve 18 bottom end portion is fit into a packing 18b, so that water tightness is secured in conjunction with the flush toilet main body 2.

[0041] Next, referring to Fig. 6, we discuss the procedure for attaching the holding tank 8 to the flush toilet main body 2. First, the stud bolts 10 are caused to project upward from the bottom side of the flush toilet main body 2 tank mounting surface 2c; washers 10a are passed

over the stud bolts 10 from the top of the tank mounting surface 2c, and stud bolt affixing nuts 10b are screwed thereon. The stud bolts 10 are thus affixed so as to project upward from the tank mounting surface 2c.

[0042] At the same time, the affixing plate 16 is affixed to the tank bottom surface 14a on the tank main body 14 by connecting nuts 20. In addition, the drain valve 18 is affixed to the tank main body 14 by the drain valve affixing nut 18a.

[0043] The holding tank 8 assembled in this way is disposed on the flush toilet main body 2 tank mounting surface 2c. At this point, the holding tank 8 is disposed so that the end portion of the drain valve 18 extending from the bottom of the holding tank 8 is inserted into the tank connecting hole 2d, and the end portion of the two stud bolts 10 extending from the flush toilet main body 2 are respectively inserted into the affixing plate 16 tank affixing holes 16b. By this means, the packing 18b disposed at the end portion of the drain valve 18 is sandwiched between the tank main body 14 tank bottom surface 14a and the perimeter portion of the tank connecting hole 2d, assuring water tightness between the holding tank 8 and the flush toilet main body 2.

[0044] The holding tank 8 mounted on the tank mounting surface 2c is supported by three support protuberances 12 (Fig. 3) formed on the tank mounting surface 2c. As described above, the three support protuberances 12 are made coplanar so as to be located on the same horizontal plane, therefore the holding tank 8 supported by each of the support protuberances 12 is accurately oriented on the horizontal.

[0045] Next, washers 22a are disposed on each stud bolt 10 projecting upward from the affixing plate 16 tank affixing holes 16b, and tank affixing nuts 22b are screwed thereon, joining the holding tank 8 to the flush toilet main body 2. The stud bolts 10 and the tank affixing nuts 22b thus comprise an affixing means.

[0046] As shown in Fig. 6, in the present embodiment, even when the tank affixing nuts 22b are affixed to the holding tank 8 the reverse side of the affixing plate 16 is separated from the top end surfaces of the stud bolt affixing nuts 10b. Since there is thus a gap between the affixing plate 16 and the tank mounting surface 2c (the top end surfaces of the stud bolt affixing nuts 10b), any manufacturing variances in the height of the flush toilet main body 2 support protuberances 12 can be absorbed by the gap.

[0047] Because the affixing plate 16 is separated from the stud bolt affixing nuts 10b, tightening the stud bolt affixing nuts 10b with an even greater torque causes the affixing plate 16 to elastically deform. At this point, flexible portions 16c, which easily flexibly deform, are formed on the base ends of the affixing plate 16 arm portions 16a, therefore the affixing plate 16 is deformed at the flexible portion 16c. Thus elastic deformation of the entire affixing plate 16 when the stud bolt affixing nuts 10b are excessively tightened at a high torque can be prevented. When the entire affixing plate 16 elastically deforms, a force

operates to pull the connecting nuts 20, which link the tank main body 14 and the affixing plate 16, away from the tank main body 14, therefore although there is a risk of damage to the resin plate affixing bolts 14d formed on the tank main body 14, that can be avoided in the present embodiment.

[0048] In the first embodiment flush toilet of the present invention, the tank main body is joined to the flush toilet main body by tightening tank affixing nuts from the outside of the flush toilet main body and the tank main body, therefore the holding tank can be joined to the flush toilet main body with good workability.

[0049] In the flush toilet of the present embodiment, the tank main body and the affixing plate are formed as separate units, therefore they can be formed of differing materials, and appropriate materials can be respectively selected for the tank main body and the tank affixing portion.

[0050] Furthermore, in the flush toilet of the present embodiment, the use of resin to form the flush water-contacting tank main body prevents degradation of the tank main body by rust and the like, and the use of metal to form the tank affixing portion, on which a large force acts when affixing the holding tank, prevents breakage of the affixing plate when affixing the holding tank.

[0051] In the flush toilet of the present embodiment, the tank main body and the affixing plate are affixed by plate affixing bolts integrally formed in the tank main body, therefore the tank main body and the affixing plate can be bolted together without forming a hole in the tank main body, and leakage of water from the tank main body can be securely prevented.

[0052] Furthermore, in the flush toilet of the present embodiment each plate affixing bolt is disposed on approximately diagonal lines on an essentially rectangular plane contacted by the tank main body and the affixing plate, therefore the tank main body side surface can effectively resist an external force pressing in the direction of the short sides of said rectangle, and the tank main body can be strongly affixed to the affixing plate.

[0053] In the flush toilet of the present embodiment, the affixing plate is furnished with a flexible portion, therefore even when an excessive force operates on the arm portion due to the tank affixing nuts, elastic deformation of the flexible portion allows movement of the arm portion, thereby avoiding deformation of the entire affixing plate. This allows the prevention of problems such as plate affixing bolt damage caused by deformation of the entire affixing plate. When the affixing plate is mounted on the tank mounting surface on the flush toilet main body or on the support protuberances, deformation of the entire affixing plate can be avoided by the elastic deformation of the flexible portion, even if there is dimensional variability in the vertical direction due to manufacturing variances or the like.

[0054] Furthermore, in the flush toilet of the present embodiment a tank shelf portion is provided on the tank main body so as to protrude above the tank affixing nut,

therefore the tank main body internal volume can be enlarged while enabling the tank affixing nut to be tightened from outside the tank main body.

[0055] In the flush toilet of the present embodiment, the holding tank is mounted on three support protuberances, therefore the holding tank can be securely supported without any looseness even when there are manufacturing variances in the shape of the flush toilet main body. By finishing the top end surface of the three support protuberances to a high level of accuracy, the holding tank can be accurately horizontally supported.

[0056] In the first embodiment described above, the affixing means for joining the affixing plate and the flush toilet main body comprised stud bolts and tank affixing nuts, but other means may also be used to effect this joining. Moreover, in the first embodiment described above, the tank main body and the plate affixing bolts were comprised as a single integral unit, but the tank main body and the plate affixing bolts can also be separately comprised such that the plate affixing bolts can also be attached and removed on the outside of the bottom surface of the tank main body.

[0057] Fig. 7 is a cross-section showing a variation of the affixing means. In this variation, the affixing means comprises tank affixing bolt 30, a cylindrical elastically deforming member 32 through which the tank affixing bolt 30 passes, and an elastic deformation nut 34.

[0058] The tank affixing bolts 30 are inserted from the top side of the affixing plate 16 tank affixing holes 16b. The outside perimeter of the elastic deformation nuts 34 are affixed to the inside wall surface at the lower portion of the cylindrical elastically deforming members 32. The elastically deforming members 32 are placed on top of the tank affixing bolts 30 projecting from the bottom side of the affixing plate 16, and the elastic deformation nuts 34 are screwed onto the tank affixing bolts 30. The elastically deforming members 32 are thus attached to the affixing plate 16.

[0059] Next, the elastically deforming members 32 attached to the affixing plate 16 are inserted into holes formed in the flush toilet main body 2 tank mounting surface 2c. When the tank affixing bolts 30 are rotated in this state, the elastic deformation nuts 34 are pulled up by screw action. At the same time, the elastically deforming member 32 deform as shown by the imaginary lines in Fig. 7, and the tank affixing bolts 30 can no longer be pulled out from the flush toilet main body 2. The affixing plate 16 is thus affixed to the flush toilet main body 2.

[0060] In the variation above, the elastically deforming members 32 were expanded on the back side of the tank mounting surface 2c to affix the tank affixing bolts 30, but when the tank mounting surface 2c is thick, the elastically deforming members 32 can also be caused to expand inside the holes in the tank mounting surface 2c. In that case, the tank affixing bolts 30 are affixed by friction between the expanded elastically deforming members 32 and the inner wall surface of the holes. In addition to the variations above, the snap fasteners, split pins, or the

like may be used as affixing means.

[0061] Next, referring to Figs. 8 through 11, we discuss a flush toilet according to second embodiment of the present invention. In the flush toilet of the present embodiment, the attachment of a stop cock for stopping the supply of water to a bidet such as washlet® (not shown) differs from the above-described first embodiment. Therefore we will here discuss only points of difference with the first embodiment.

[0062] Fig. 8 is a perspective view showing an entire flush toilet according to a second embodiment of the present invention. Fig. 9 is a perspective view showing an expanded view of the holding tank with the holding tank cover removed in a flush toilet according to the present embodiment. Fig. 10 is a perspective view showing a water supply means affixing plate for attaching the stop cock to the affixing plate. Fig. 11 is a partial perspective view showing the attachment of the stop cock to the affixing plate.

[0063] As shown in Fig. 8, the flush toilet 100 according to the second embodiment of the present invention comprises a flush toilet main body 102 and a holding tank 108 (Fig. 9). The holding tank 108 is covered by a holding tank cover 104. A stop cock 105 serving as a water supply means is also attached so as to project out from the lower portion of the holding tank cover 104 side surface.

[0064] As shown in Fig. 9, the holding tank 108 has a tank main body 114, an affixing plate 116 serving as a tank affixing portion attached at the lower portion of the tank main body 114, and a drain valve 118 housed inside the tank main body 114. A water supply means affixing plate 138 for attaching the stop cock 105 is also attached to the affixing plate 116.

[0065] The affixing plate 116 is essentially a rectangular metal plate, on which are formed two projecting portion or arm portions 116a (only one of which is shown in Fig. 9) extending from the short ends on both sides of the rectangle. These arm portions 116a are affixed to the flush toilet main body 102 by each of the stud bolts and nuts.

[0066] As shown in Fig. 10, a water supply means affixing portion 116b serving as a second projecting portion is formed on the affixing plate 116. The water supply means affixing portion 116b is formed to project as a single piece with the affixing plate 116 into the same plane as the arm portions 116a, behind one of the arm portions 116a.

[0067] The water supply means affixing plate 138 is a metal plate bent into an approximately L shape; the long side of the L shape is screw-fastened to the water supply means affixing portion 116b to overlap the affixing plate 116. In addition, two long holes 138a serving as affixing position adjustment means are formed on the water supply means affixing plate 138 in order to attach the water supply means affixing plate 138 to the water supply means affixing portion 116b in a position-adjustable manner. These long holes 138a allow for adjustment of the position at which the water supply means affixing plate

138 is screw-fastened to the water supply means affixing portion 116b, in the horizontal direction of the flush toilet.

[0068] There are also four female screw holes 138b on the water supply means affixing plate 138 for affixing two affixing bands 140a and 140b, which are water supply means affixing means for attaching the stop cock 105. The stop cock 105 is affixed at its base end to the short side of L-shaped water supply means affixing plate 138 by the affixing band 140a; the end portion thereof is affixed to the long side of the water supply means affixing plate 138 by the affixing band 140. These affixing bands 140a and 140b comprise a thin metal plate having a specified width, bent into an approximately U shape; tightening around the stop cock 105 affixes the stop cock 105 to the water supply means affixing plate 138. A general purpose product suited to the type of the stop cock 105 may be used for these affixing bands.

[0069] As shown in Fig. 8, main water guided from a flush water guide portion 130 is branched by a T pipe 132; one of those branches is sent to the stop cock 105 via a water supply pipe 134; the other is guided into the tank main body 114 via a water supply pipe 136. Flush water sent to the stop cock 105 is supplied to a local flush device (not shown) via a flexible hose (105) connected to the stop cock 105. The stop cock 105 is left open during normal use, and is closed during maintenance of the local flush device or the like.

[0070] Next, referring to Fig. 11, we discuss an example of the procedure for attaching the stop cock 105. First, the stop cock 105 is affixed to the water supply means affixing plate 138 by affixing bands 140a and 140b. Next, two screws 142 are passed through each of the long holes 138a in the water supply means affixing plate 138 and screwed into each of the female screw holes 116c provided in the water supply means affixing portion 116b. The water supply means affixing plate 138 is thus temporarily affixed to the water supply means affixing portion 116b. In this temporary affixing, each of the screws 142 is lightly tightened, and the water supply means affixing plate 138 is allowed to slide along the long holes 138a.

[0071] Next, a flexible hose 105a is connected to a flexible hose attaching portion 105b on the stop cock 105, and the water supply pipe 134 is connected to a water supply pipe attachment portion 105c thereon. Furthermore, the water supply means affixing plate 138 is slid along the long holes 138a to position the stop cock 105 at a specified position. Finally, each of the screws 142 is tightened, and the water supply means affixing plate 138 is affixed to the water supply means affixing portion 116b. Note that the process by which the flexible hose 105a is connected to the stop cock 105 may also be implemented after positioning the stop cock 105 at a specified position and fully tightening each of the screws 142.

[0072] By sliding the water supply means affixing plate 138 along the long holes 138a, any dimensional manufacturing variances in the flush toilet main body 102 or the like can be absorbed, and the stop cock 105 can be positioned at the correct position. Also, the position of

the stop cock 105 is adjusted after the flexible hose 105a has been connected to the stop cock 105, therefore the stop cock 105 can be positioned even in a location where the cap nut 105d (Fig. 9) for affixing the flexible hose 105a to the stop cock 105 is extremely close to the side surface of the flush toilet main body 102, such that tightening the cap nut 105d is difficult.

[0073] In the flush toilet of the second embodiment of the present invention, a stop cock is attached to an affixing plate, therefore the stop cock can be affixed without providing through holes or the like in the tank main body for attaching the stop cock, and the risk of leakage or the like associated with attaching the stop cock can be avoided.

[0074] In the flush toilet of the present embodiment, the stop cock is attached to an affixing plate, therefore the stop cock can be removed together with the tank main body, thus avoiding interference by the stop cock and the tank main body when attaching or removing same. In addition, the stop cock in the flush toilet of the present embodiment is affixed to a water supply means affixing portion via a water supply means affixing plate, therefore the stop cock can be easily affixed.

[0075] In the flush toilet of the present embodiment, various types of stop cock and the like can be attached to the same water supply means affixing portion by changing the water supply means affixing plate. Also, in the flush toilet of the present embodiment, the stop cock is affixed by an affixing band, therefore a general purpose product can be used for this purpose.

[0076] In the flush toilet of the present embodiment, affixing using an affixing band can improve ease of installation compared to using a water supply means affixing means which covers and hides the water supply means from above.

[0077] Furthermore, in the flush toilet of the present embodiment the position at which the water supply means plate is affixed is adjusted using long holes, therefore shape variances in the flush toilet main body and the like can be absorbed, and the stop cock can be affixed at the correct position.

[0078] In the above-described second embodiment of the present invention, a stop cock was attached as a water supply means to the holding tank, but a valve unit such as a constant flow valve, water supply piping, or various water supply means can also be attached to the holding tank in lieu of a stop cock.

[0079] In the above-described second embodiment the water supply means affixing plate was positionally adjustable on the side of the flush toilet, but it may also be constituted as a position adjustment means able to slide or rotate in any desired direction.

One embodiment of the present invention refers to a flush toilet holding tank (8) mounted on a flush toilet main body (2) and used by joining to the flush toilet main body, comprising: a tank bottom surface (14a) on which a tank drain opening is provided for causing flush water to flow to the flush toilet main body; a tank main body (14) furnished

with a tank side surface (14b) extending upward from the tank bottom surface; a tank affixing portion (16) furnished with an projecting portion (16a) protruding outside of an area [defined by] vertically projecting a closed curve (C) at the outside perimeter of the tank bottom surface; and an affixing means (10, 22b) for joining the tank main body to the flush toilet main body via a tank affixing portion by affixing the projecting portion to the flush toilet main body by an operation from outside the flush toilet main body and the tank main body.

[0080] Herein, preferred embodiments of the present invention were discussed above, but various changes can be applied to the embodiments described. In particular, the embodiments described above comprise a separate tank main body and affixing plate serving as a tank affixing portion, but these may also be constituted as a single piece.

Explanation of Reference Numerals

[0081]

1	Flush toilet
2	Flush toilet main body
2a	Bowl portion
2c	Tank mounting surface
2d	Tank connecting hole
4	Holding tank cover
6	Flush switch
8	Holding tank
10	Stud bolt
10a	Washer
10b	Stud bolt affixing nut
12	Support protuberance
14	Tank main body
14a	Tank bottom surface
14b	Tank side surface
14c	Tank shelf portion
14d	Plate affixing bolt (affixing portion affixing bolt)
14e	Tank drain opening
16	Affixing plate (tank affixing portion)
16a	Arm portion (projecting portion)
16b	Tank affixing hole
16c	Flexible portion
16d	Plate affixing hole
16e	Plate drain hole
18	Drain valve
18a	Drain valve affixing nut
18b	Packing
20	Connecting nut
22a	Washer
22b	Tank affixing nut
100	Flush toilet according to a second embodiment of the present invention
102	Flush toilet main body
104	Holding tank cover
105	Stop cock (water supply means)

105a	Flexible hose
105b	Flexible hose attaching portion
105c	Water supply pipe attaching portion
105d	Cap nut
5 108	Holding tank
114	Tank main body
116	Affixing plate (tank affixing portion)
116a	Arm portion (projecting portion)
116b	Water supply means affixing portion (projecting portion)
10 118	Drain valve
130	Flush water guide portion
132	T pipe
134	Water supply pipe
15 136	Water supply pipe
138	Water supply means affixing plate
138a	Long hole (affixing position adjustment means)
140a, 140b	Affixing bands (water supply means affixing means)
20 42	Screw

Claims

- 25 1. A holding tank (8) for a flush toilet, mountable on a flush toilet main body (2) and usable by joining to said flush toilet main body, comprising:
 - 30 a tank main body (14) including a tank bottom surface (14a) having a tank drain port (14e) for causing flush water to flow into the flush toilet main body, and a tank side surface (14b) extending upward from the tank bottom surface;
 - 35 a tank affixing portion (16) including a projecting portion (16a) extending outside an area defined by the vertical projection of a closed curve (C) at the perimeter of the tank bottom surface; and an affixing means (10, 22a), disposed outside an area defined by the vertical projection of the closed curve, for affixing the projecting portion to the flush toilet main body so as to join the tank main body to the flush toilet main body via the tank affixing portion by an operation performed outside the flush toilet main body and the tank main body.
- 45 2. The holding tank according to Claim 1, wherein the holding tank is mounted on a flush toilet main body and is used by joining to said flush toilet main body.
- 50 3. The holding tank according to Claim 1 or 2, wherein the tank main body and the tank affixing portion are integrally formed.
- 55 4. The holding tank according to Claim 1 or 2, wherein the tank main body and the tank affixing portion are separately formed.

5. The holding tank according to Claim 4, wherein the tank main body is formed of resin, and the tank affixing portion is formed of metal.
6. The holding tank according to Claim 4 or 5, wherein the tank main body includes an affixing portion affixing bolt (14d) formed integrally therewith and extending downward from the tank bottom surface, the affixing portion affixing bolt extends so as to penetrate the tank affixing portion, and the tank affixing portion is affixed to the tank main body by screwing a connecting nut (20) onto the affixing portion affixing bolt.
7. The holding tank according to Claim 6, wherein two of the affixing portion affixing bolts are provided, and each of the affixing portion affixing bolts is disposed on an approximately diagonal line on the surface on which the tank main body and the tank affixing portions make contact.
8. The holding tank according to any one of Claims 4 through 7, wherein the tank affixing portion includes an elastically deformable flexible portion (16c) enabling the projecting portion to move in a vertical direction.
9. The holding tank according to any one of Claims 1 through 8, wherein the tank main body is constituted to project out above the affixing means.
10. The holding tank according to any one of Claims 1 through 9, further comprising a water supply means (105) for supplying flush water, wherein a water supply means affixing portion (116b) for affixing the water supply means is provided with the projecting portion of the tank affixing portion.
11. The holding tank according to Claim 10, further comprising a water supply means affixing plate (138), and a water supply means affixing means for affixing the water supply means to the water supply means affixing plate, whereby the water supply means is affixed to the water supply means affixing portion via the water supply means affixing plate.
12. The holding tank according to Claim 11, wherein the water supply means affixing means has a specified width, and is an affixing band (140a, 140b) for affixing the water supply means to the water supply means affixing plate by holding down the perimeter of the water supply means.
13. The holding tank according to Claims 11 and 12, further comprising an affixing position adjustment means for adjusting the affixing position of the water supply means affixing plate relative to the water supply means affixing portion.

14. A flush toilet (1) comprising:

a flush toilet main body (2) including a bowl portion (2a), a drain trap pipe (2b), and a tank mounting surface (2c) for mounting a holding tank (8); and
the holding tank according to any one of Claims 1 through 13, mounted on a tank mounting surface.

15. The flush toilet according to Claim 14, wherein the flush toilet main body is formed of ceramic, and the holding tank is mounted on at least three support protuberances (12) formed on the tank mounting surface.

FIG.1

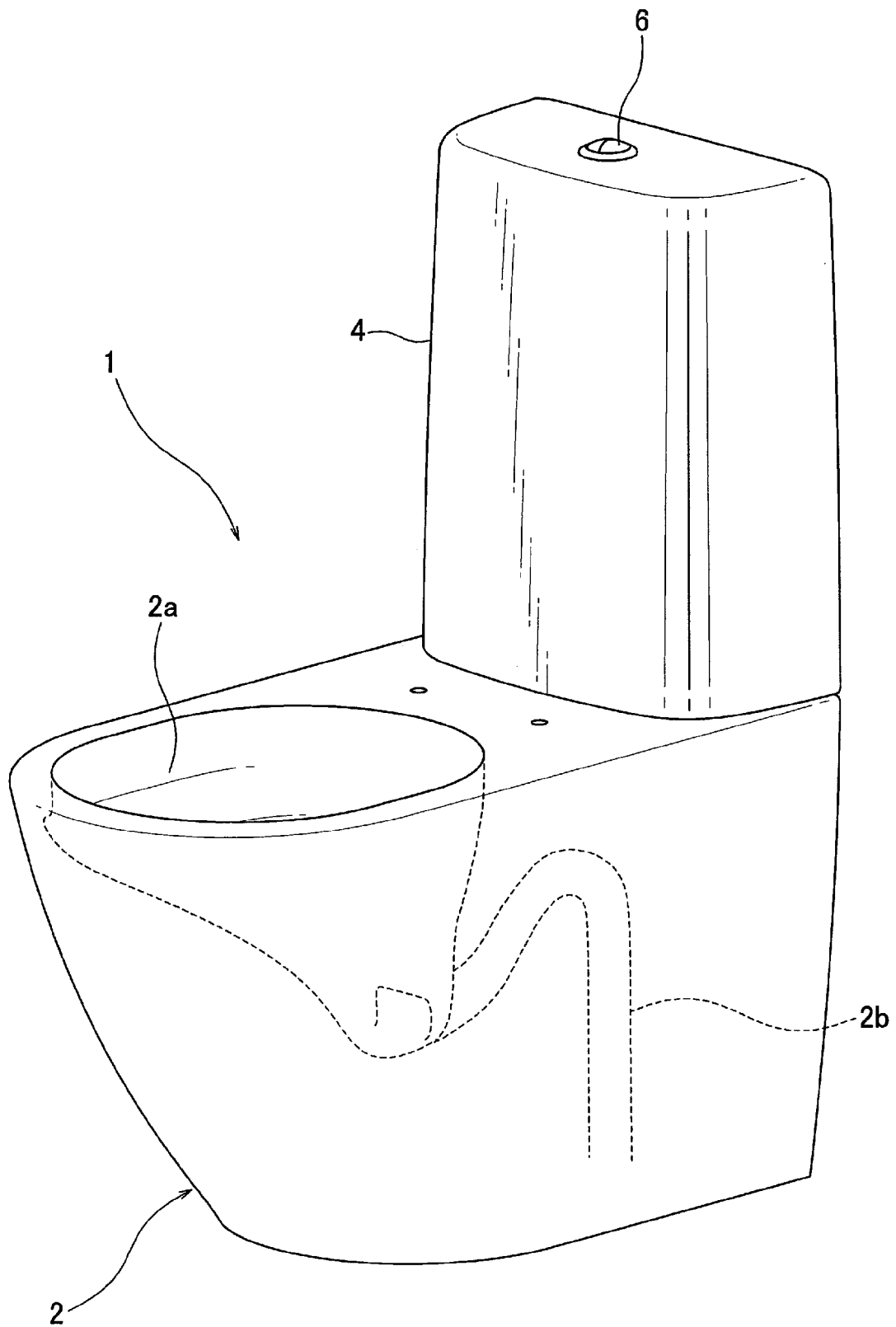


FIG.2

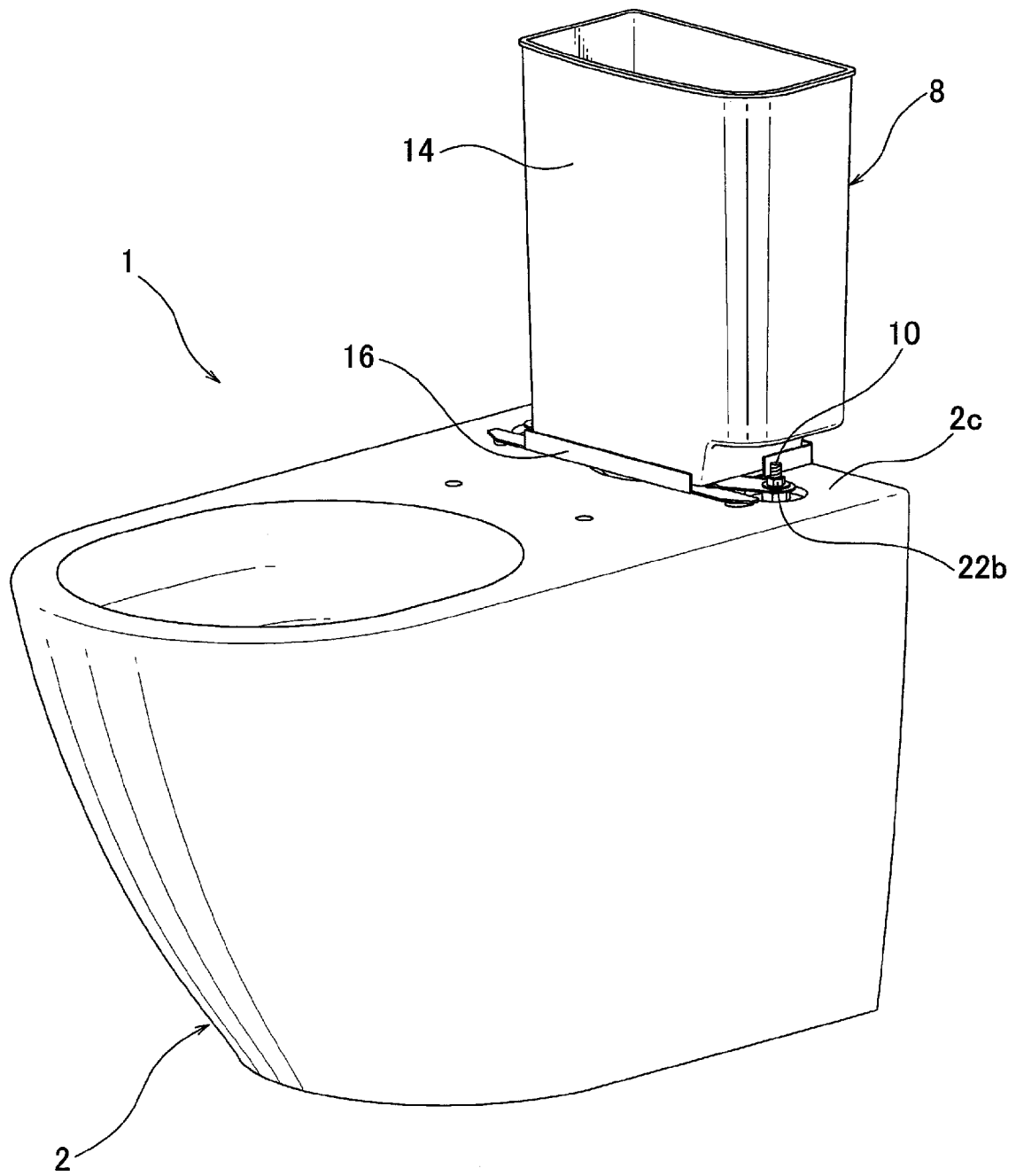


FIG.3

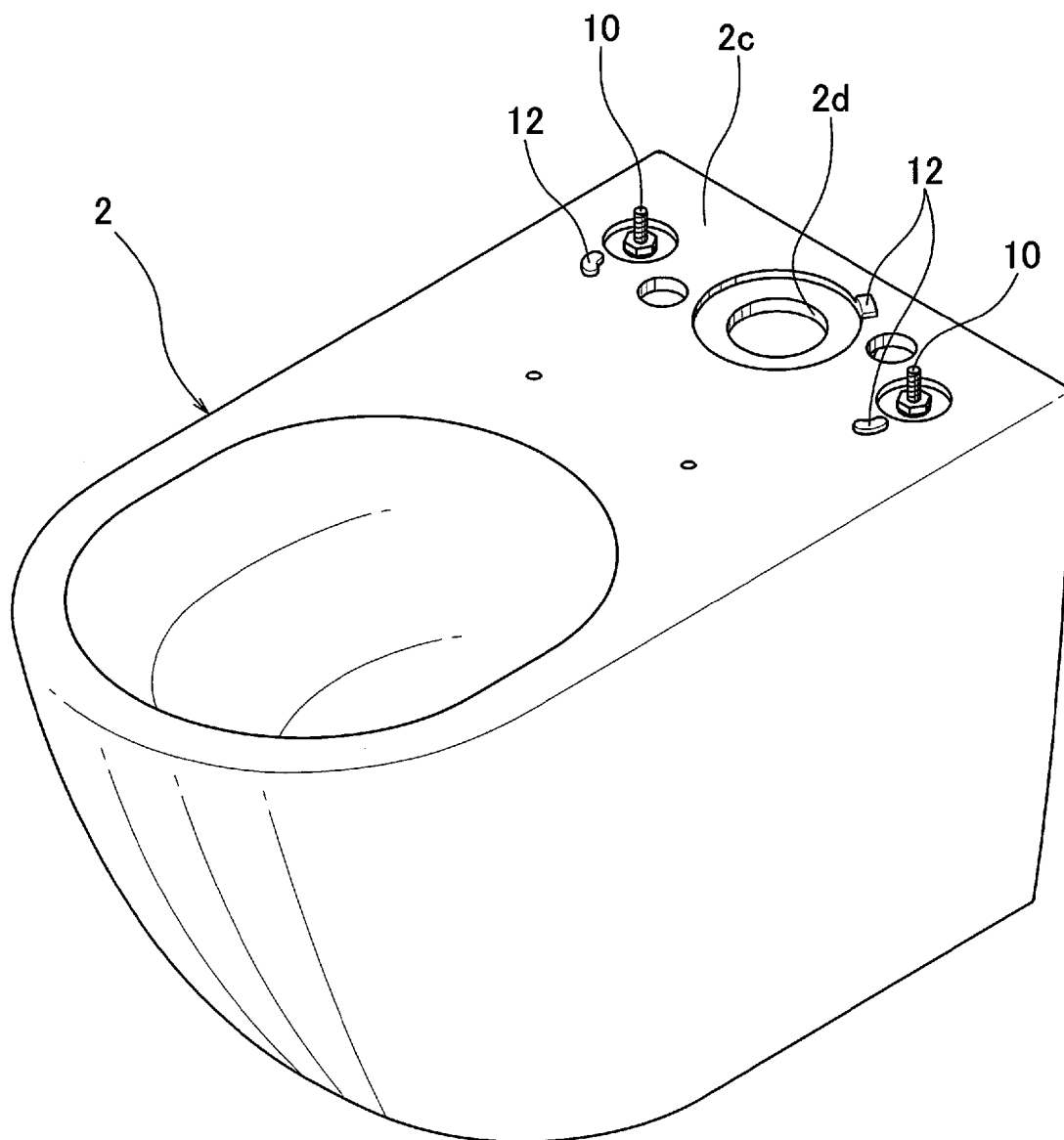


FIG.4

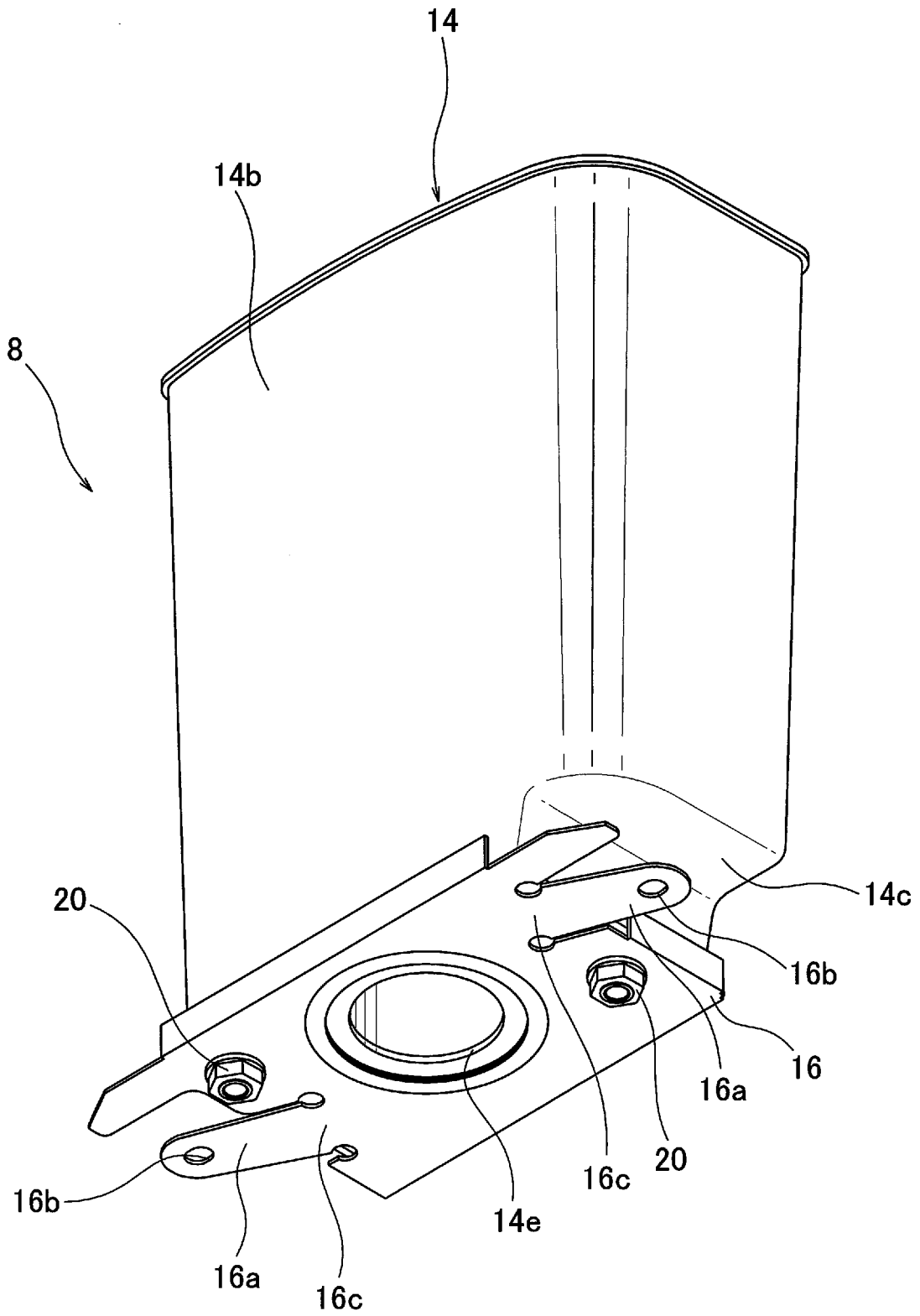


FIG.5

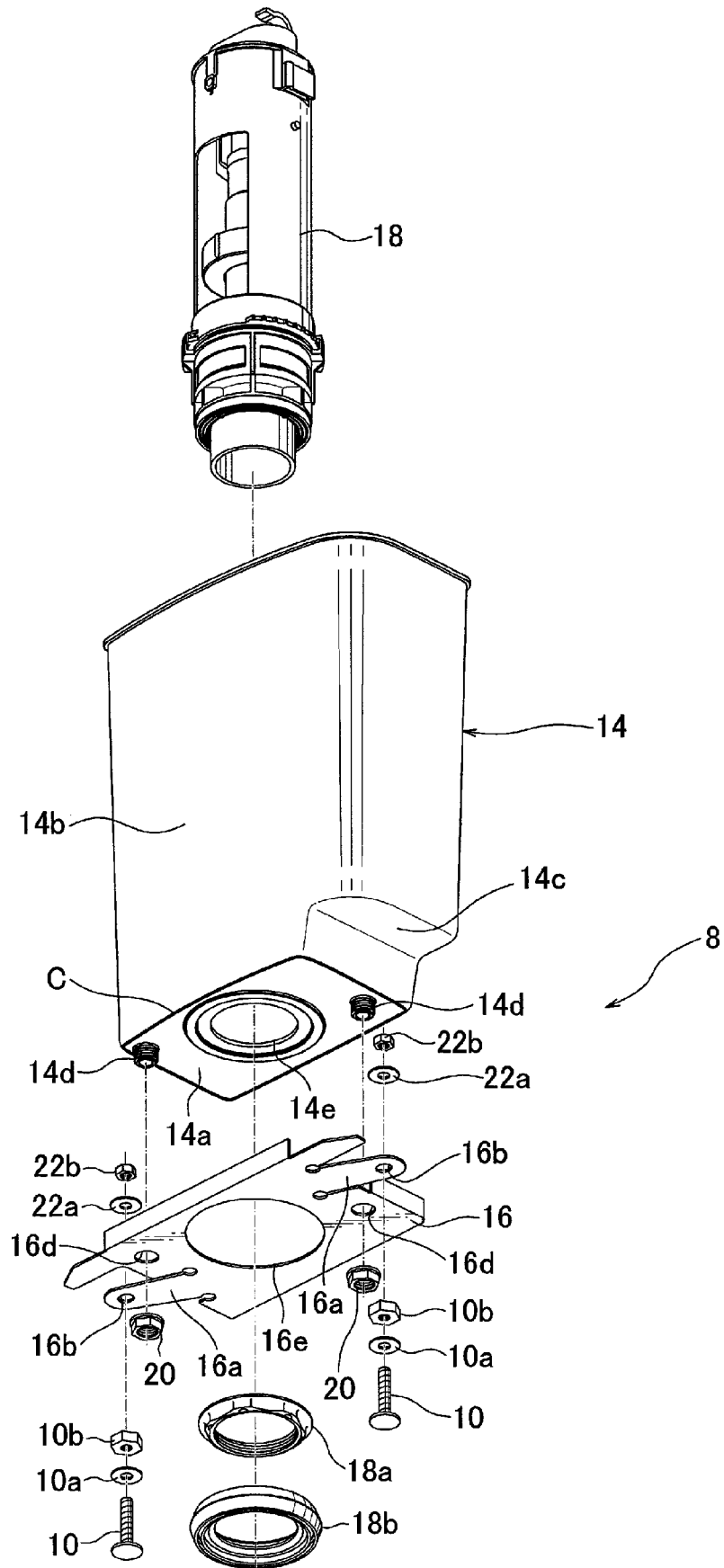


FIG.6

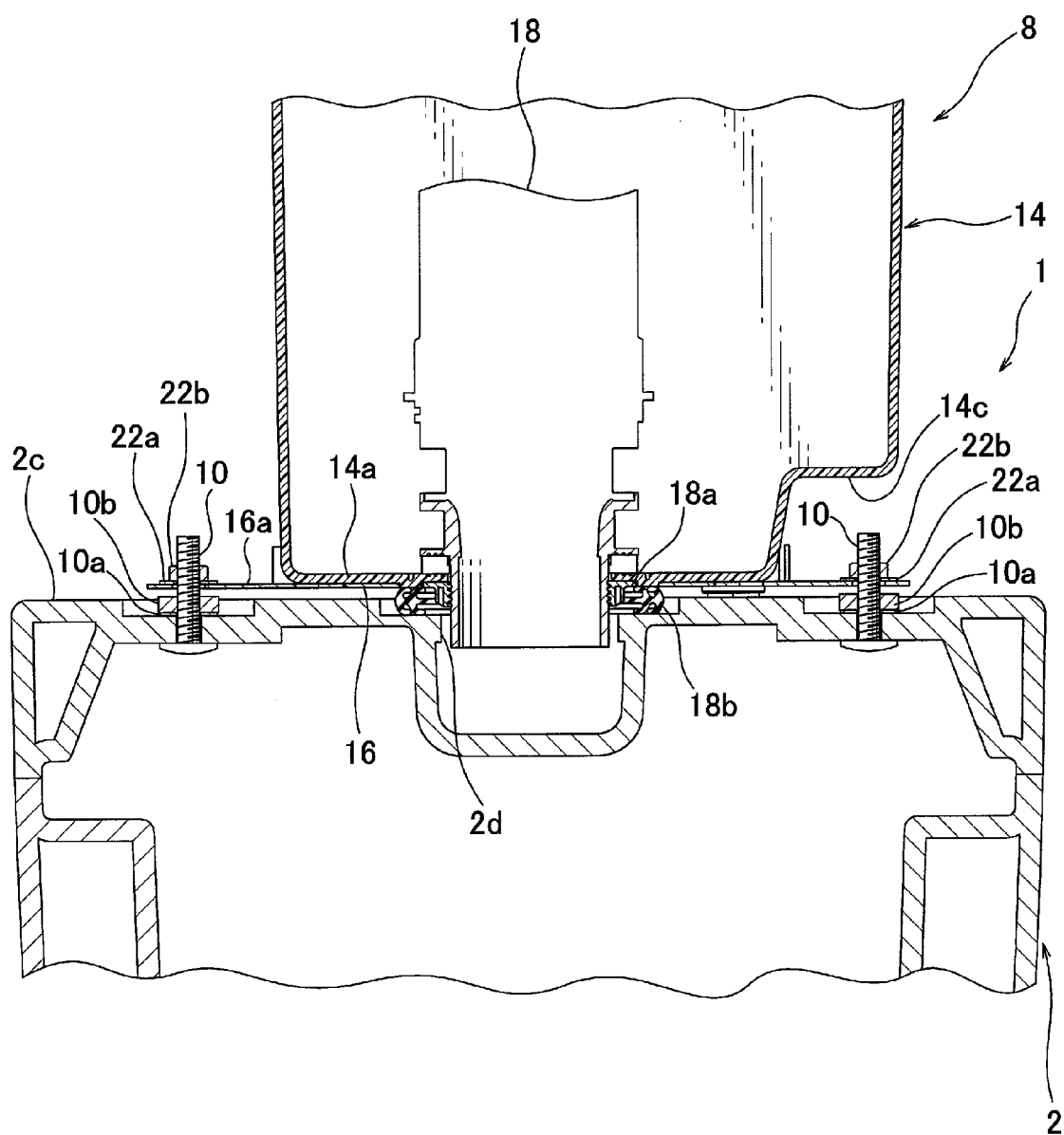


FIG.7

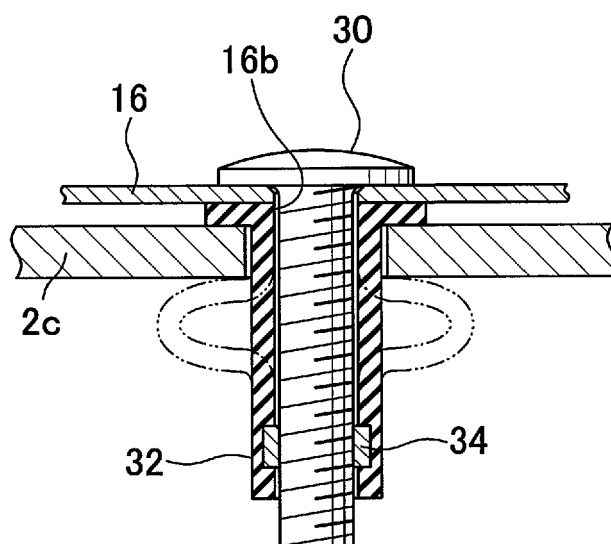


FIG.8

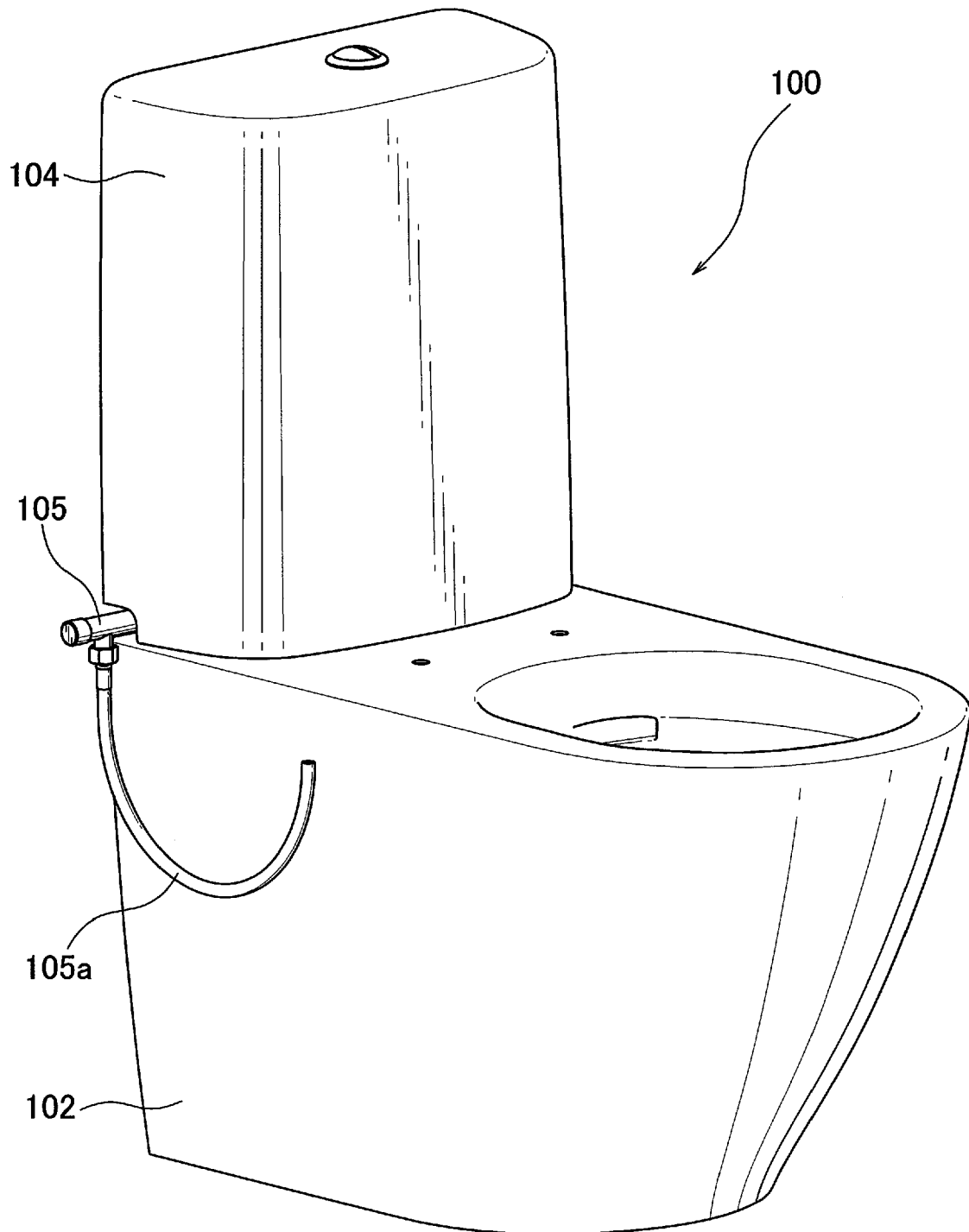


FIG.9

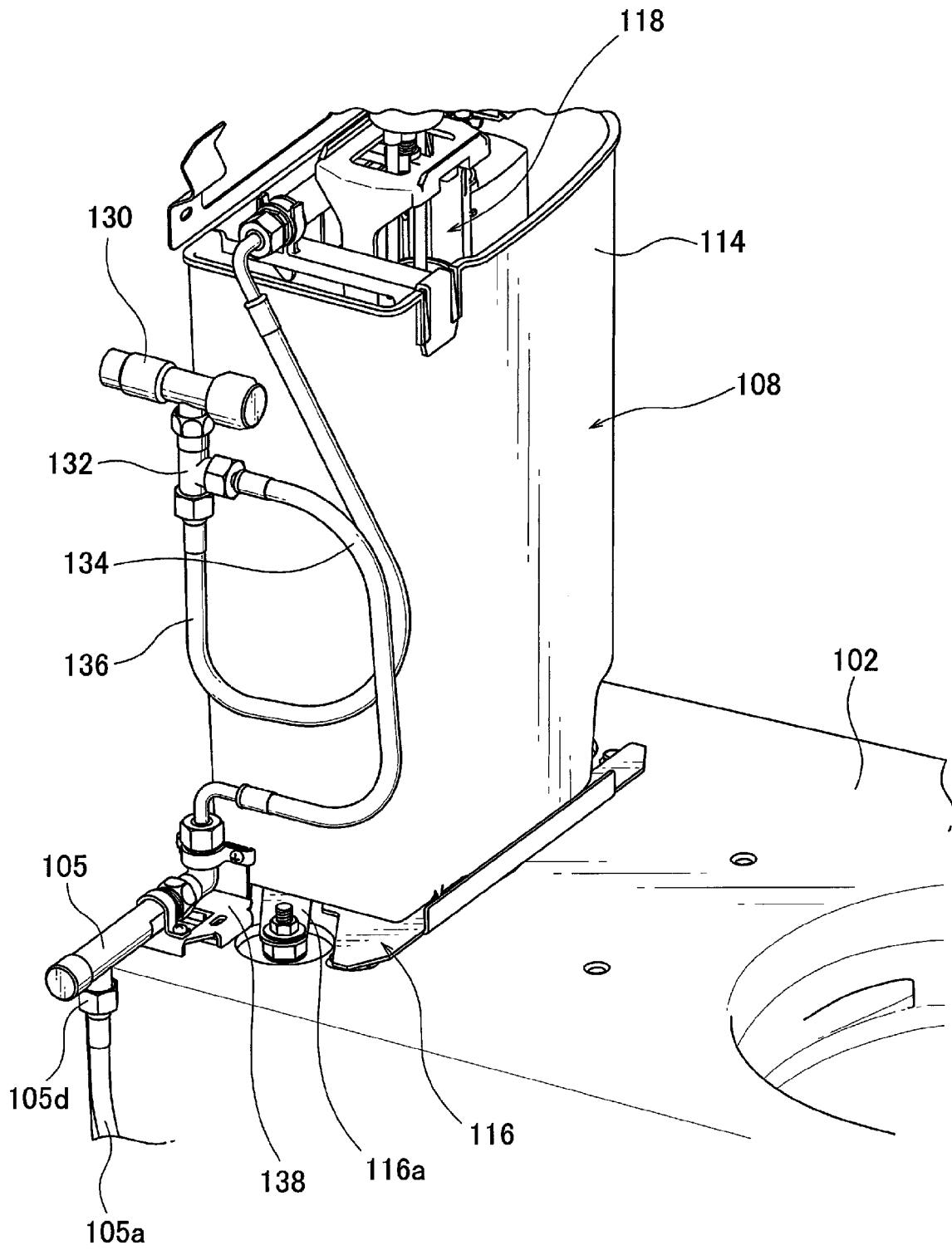


FIG.10

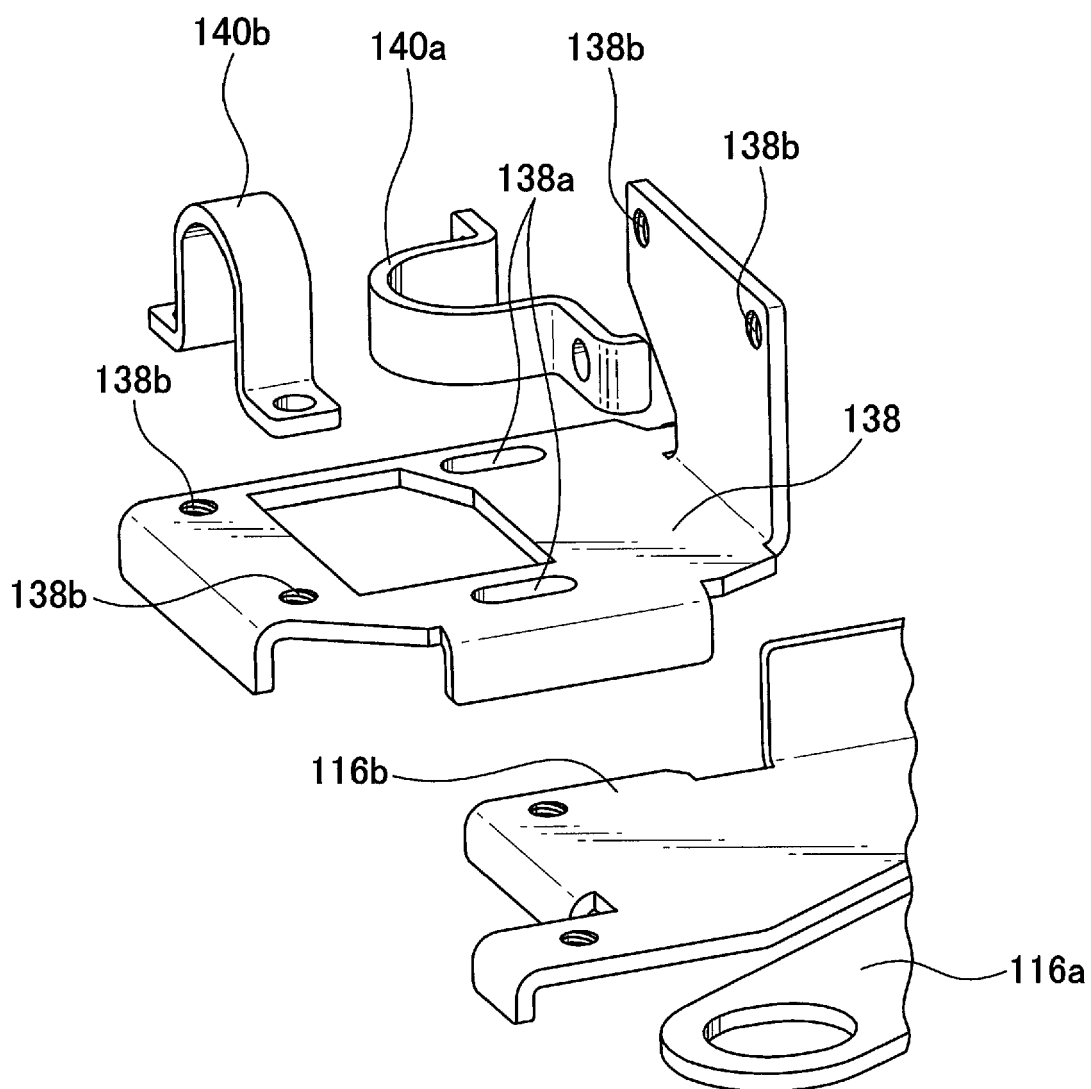
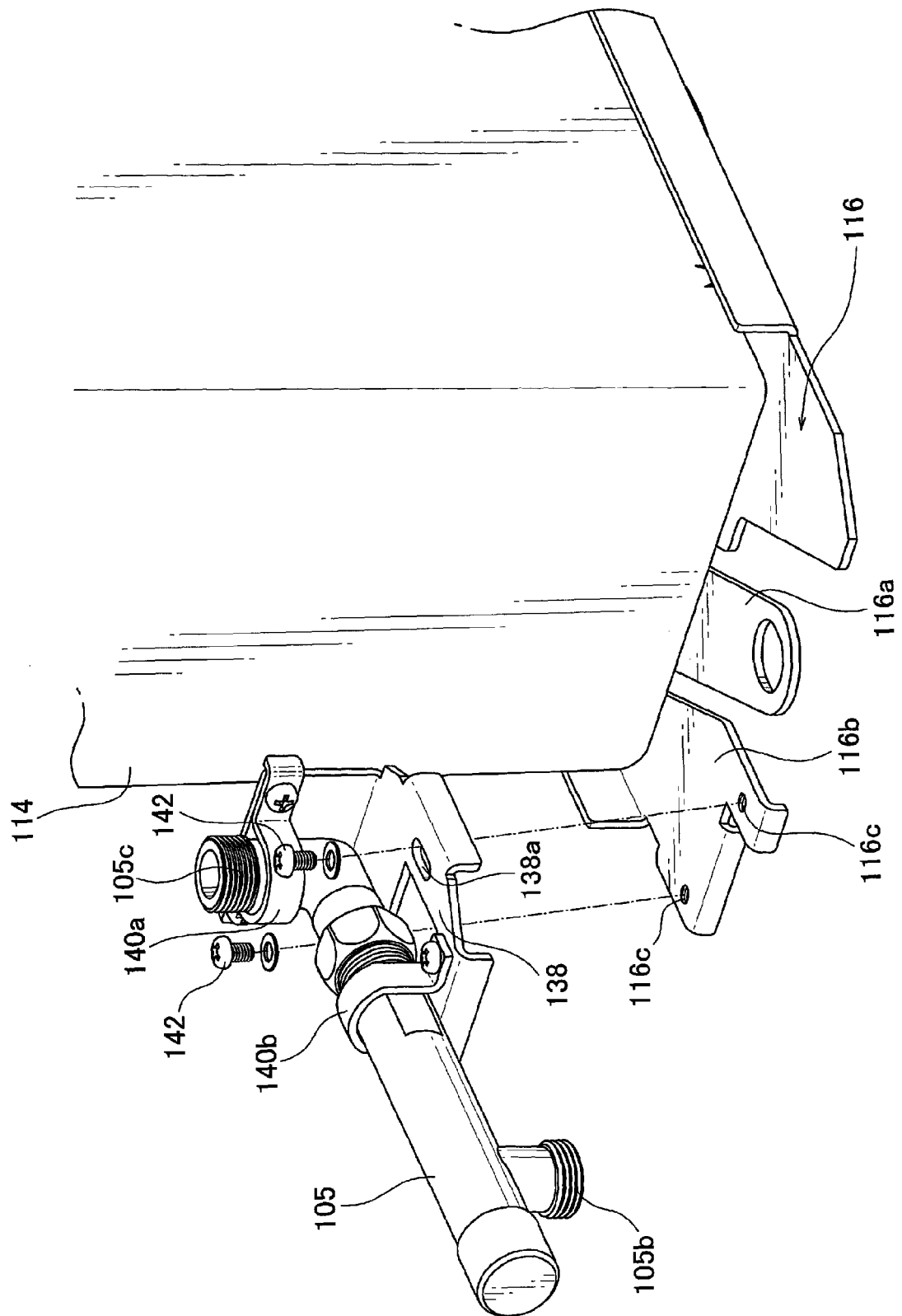


FIG. 11



REFERENCES CITED IN THE DESCRIPTION

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