

SPECIFICATION

SANITARY WASHING APPARATUS

Technical Field

The present invention relates to a sanitary washing
5 apparatus for washing the body excretory parts of a person
at stool by spouting washing water at the body excretory
parts.

Background Art

The use of such sanitary washing apparatuses, applied
10 in various configurations, is rapidly spreading because
they make it possible for a person to wash the body
excretory part clean after stool. The washing water used
is usually water taken from a mains water pipe and is
spouted at the mains water supply pressure. Sanitary
15 washing apparatus configurations include toilet seats
having washing parts that use a spout of washing water to
wash the body excretory parts (sanitary toilet seats),
sanitary washing apparatuses having washing parts and a
toilet seat, and sanitary washing apparatuses having
20 washing parts configured separately from the toilet seat.

When washing the body excretory part by spouting with
washing water, any lowering of the washing waterspout flow
rate or flow velocity can result in an inadequate washing

effect. In order to provide a good washing force it is generally considered necessary to use a spout flow rate of around 2400 ml/min and a spout flow velocity of around 3.2 m/sec. It is considered that this type of sanitary washing apparatus is able to obtain a spout flow rate of around 2400 ml/min, and a spout flow velocity of around 3.2 m/sec, when the mains supply pressure is from around 0.26 to 0.3 MPa. That is, the ability to obtain the above spout rate and spout velocity is premised on the above supply pressure.

However, although the mains water pressure is normally thought of as being a set pressure, the pressure is not necessarily constant and unchanging, but may vary depending on the local government concerned as well as on national government policies and regional environmental conditions. In regions subject to adverse water conditions, including on a seasonal basis, such as, for example, outlying islands, mountainous regions and certain areas in Southeast Asia and elsewhere, it may not be possible to obtain the above supply pressure and velocity. In such regions and at such times, the washing effect of the body excretory part by the spouted washing water may be inadequate.

On the other hand, there are also regions and countries in which the mains water is supplied at a higher pressure than the above pressure of approximately 0.26 to

0.3 MPa. Thus, with respect to the introduction of sanitary washing apparatuses, it has been necessary to adjust the apparatus equipment specifications to the mains water pressure in each such area in which the apparatus is installed. For example, in the United States and Japan the water supply pressure is high, being approximately 0.862 MPa and 0.74 MPa, respectively, and spouting washing water at such a pressure to the body excretory part would be excessively discomforting. Thus, for such regions and countries, the sanitary washing apparatus incorporates a pressure adjustment mechanism to reduce the mains water supply pressure to around the above-mentioned required pressure. However, in outlying islands, mountainous regions and certain areas in Southeast Asia and elsewhere, it is not always possible to obtain the above high mains supply pressure. Since a sanitary washing apparatus that incorporates a pressure adjustment mechanism is not suitable for such regions, it has been necessary to use a sanitary washing apparatus having specifications adapted for such regions, increasing the structural complexity of the apparatus.

Furthermore, since the sanitary washing apparatus obtains the washing water from the mains supply, preventing reverse flow from the sanitary washing apparatus may be a regulatory requirement, necessitating the incorporation in

the sanitary washing apparatus of a reverse flow prevention mechanism. Needless to say, there are also regions in which there are no such regulations, and in which, therefore, a reverse flow prevention mechanism is not
5 required. In summary, there is a broad range of sanitary washing apparatus specifications, which tends to increase the structural complexity and the number of steps needed to assemble the apparatus, and to make it complex to handle.

Accordingly, an object of the present invention is to
10 provide a sanitary washing apparatus with a simplified structure that offers ideal washing capability even with a low water supply pressure.

Disclosure of the Invention

The above and other objects of the invention are
15 attained at least partly by a first sanitary washing toilet seat of the present invention comprising a nozzle portion that spouts washing water at the anal region of a person at stool. The nozzle portion includes a spout adjustment unit that ensures a nozzle flow rate of approximately 2400
20 ml/min even with a supply pressure from a water supply source of around 0.15 MPa.

The above object is also attained by a second sanitary washing toilet seat of the present invention comprising a nozzle portion that spouts washing water at

the anal region of a person at stool. The nozzle portion includes a spout adjustment unit that ensures a nozzle flow velocity of approximately 3.3 m/sec even with a supply pressure from a water supply source of around 0.15 MPa.

5 With the first and second sanitary washing toilet seats of the invention, it is possible to achieve the spout flow rate of approximately 2400 ml/min considered necessary to provide a good washing effect even with a supply pressure that is around half the supply pressure used by
10 existing sanitary washing toilet seats and existing sanitary washing apparatus. Similarly, with the second sanitary washing toilet seat of the invention, it is possible to achieve the spout flow velocity of approximately 3.2 m/sec considered necessary to provide a
15 good washing effect. This means that the body excretory part can be well washed even in areas, or seasons, in which the water supply source pressure is low.

The above-described first and second sanitary washing toilet seats of the present invention may adopt the
20 following aspects. In a first aspect, the sanitary washing toilet seat according to the present invention, the spout adjustment unit is provided with a washing water spout nozzle portion having a nozzle bore diameter of approximately 4 mm, and an orifice having a diameter of
25 approximately 2.5 mm provided upstream thereof.

In accordance with this first aspect, the increase in flow velocity and the setting of the orifice flow rate is effected at the nozzle portion, with washing water being spouted from a washing water spout nozzle having a larger bore diameter than that of the orifice so that there is little decrease in flow velocity or flow rate. When the water supply pressure is low, this configuration makes it possible to secure a sufficient washing water spout flow rate and flow velocity for effective washing of the body excretory part by means of a simple arrangement comprising adjusting the positioning of the orifice and adjusting the diameters of the orifice and nozzle. The orifice may be provided at a convenient location in the conduit pipe used to supply washing water to the nozzle portion. When the nozzle portion is provided with a tip portion having a washing water spout nozzle and a nozzle base portion through which washing water is supplied to the nozzle tip portion, the orifice may be provided in the vicinity of the junction between the nozzle tip portion and the nozzle base portion. This is preferable since it facilitates provision of the orifice at the tip of the nozzle base portion. In the case of this arrangement an appropriate length for the conduit pipe from the orifice to the washing water spout nozzle hole is in the order of approximately 10 to 25 mm, depending on the length of the nozzle tip portion. In

forming the orifice and nozzle, a range of error for the orifice diameter and nozzle bore diameter is permitted that is not greater than approximately 0.1 to 0.2 mm.

In a second aspect, the sanitary washing toilet seat
5 according to the sanitary washing toilet seats of the present invention or the first aspect, the nozzle portion has a washing water spout nozzle bore that, in spouting washing water toward the anal region, washes a body excretory part extending from the anal region to other body
10 excretory parts to the front of the anal region.

In accordance with the configuration of this second aspect, other body excretory parts to the front of the anal region can be washed at the same time as the anal region.

That is, a bidet function can be effected simultaneously
15 with washing of the anal region. This arrangement can also be applied to other sanitary washing apparatuses and sanitary toilet seats other than those having the above-described nozzle portion, as described below. With the sanitary toilet seat described below, too, a bidet function
20 can also be effected simultaneously with washing of the anal region.

That is, the above object is also attained by a sanitary toilet seat comprising a nozzle portion that spouts washing water at the anal region of a person at
25 stool. The nozzle portion is provided with a washing water

spout nozzle bore that, in spouting washing water toward the anal region, washes a body excretory part extending from the anal region to other body excretory parts to the front of the anal region.

5 In a third aspect, the sanitary washing toilet seat according to the sanitary washing toilet seats of the present invention or the above-described aspects, the nozzle portion can be moved between washing water spout position and a standby position to the rear of the washing
10 water spout position, whereby when the nozzle portion receives the pressure of washing water supplied from the water supply source the nozzle portion moves from the standby position to the spout position.

 This configuration of the third aspect makes it
15 possible to move the nozzle portion from the standby position to the spout position by an arrangement that is simplified by not involving the need to use any electrical drive devices such as motors or actuators to effect such movement.

20 In a fourth aspect, the sanitary washing toilet seat according to the sanitary washing toilet seats of the present invention or one of the first through third aspects, the nozzle portion is provided with a water supply unit to supply washing water from the water supply source, the
25 water supply unit is equipped with at least one of a

plurality of detachable conduit pipe members used to supply the washing water, and the pipe member is provided with a water pressure control unit that reduces the pressure of washing water supplied to the nozzle portion to or below a
5 prescribed pressure.

With this configuration according to the fourth aspect in which the pipe member is detachable and can therefore be replaced, even when the water supply source pressure is high, the supply pressure of the washing water
10 can be reduced to the prescribed nozzle pressure of approximately 0.15 MPa by replacing the pipe member with one having a water pressure control unit. This makes it possible to apply a uniform specification to the sanitary washing toilet seat, including the nozzle portion, based on
15 an assumed supply pressure of approximately 0.15 MPa, thus enabling the structure to be simplified. The simpler structure means fewer steps are needed to assemble it, so the cost is also reduced, and handling is easier. Moreover, the fact that replacing the pipe member at a location
20 separated from the sanitary washing toilet seat can reduce the supply pressure helps to improve work efficiency.

In a fifth aspect, the sanitary washing toilet seat according to the sanitary washing toilet seats of the present invention or one of the first through third aspects,
25 the nozzle portion is provided with a water supply unit to

supply washing water from the water supply source, the water supply unit is equipped with at least one of a plurality of detachable pipe members used to supply the washing water, and the pipe member is provided with a
5 reverse flow prevention unit that prevents the reverse flow of washing water supplied to the nozzle portion.

With this configuration of the fifth aspect, the pipe member is provided with reverse flow prevention unit to prevent the reverse flow of washing water. In areas where
10 reverse flow prevention is not a regulatory requirement, a pipe member having no reverse flow prevention unit may be used, thereby making it possible to omit excessive functions.

A pipe member with a reverse flow prevention unit can
15 be used together with a pipe member having the water pressure control unit described with reference to the fourth aspect. Specifically, a pipe member having a reverse flow prevention unit can be fitted in tandem with a pipe member having a water pressure control unit. Such
20 a configuration allows washing water to be supplied at a reduced pressure while also preventing the reverse flow of the washing water.

In accordance with a sixth aspect, the sanitary washing toilet seat according to the present invention
25 comprises:

a seat on which a person at stool sits,
an apparatus body unit equipped with the nozzle
portion,

a water supply channel that supplies washing water to
5 the nozzle portion from the water supply source,

a valve that can change an effective flow area of the
water supply channel to zero, and

a control element that when operated by being gripped
and rotated by the person at stool sitting on the seat, the
10 operation is communicated to the valve to thereby change
the effective flow area of the water supply channel by an
amount corresponding to the amount of rotation of the
control element.

In accordance with this configuration of the sixth
15 aspect, turning the control element can manually control
the spout flow rate of the washing water. This arrangement
can also be applied to other sanitary washing apparatuses
and sanitary toilet seats other than those having the
above-described nozzle portion, as described below. In
20 such sanitary washing apparatuses, too, the spout flow rate
of the washing water can be controlled manually.

That is, a sanitary washing apparatus having a
washing unit that washes a body excretory part by spouting
washing water at the body excretory part, comprising:

25 an apparatus body unit equipped with the washing unit,

a water supply channel that supplies washing water to the washing unit from a water supply source,

a valve that can change an effective flow area of the water supply channel to zero,

5 a control element that when operated by being gripped by a person, the operation of the control element is communicated to the valve to thereby change the effective flow area of the water supply channel by an amount corresponding to the amount of operation of the control
10 element,

wherein the washing unit includes a nozzle portion that spouts washing water and can be moved between a washing water spout position and a standby position rearward of the washing water spout position.

15 In accordance with a seventh aspect based on the configuration of the sixth aspect, the valve is operated to reduce the effective flow area of the water supply channel by gripping the control element and rotating it by turning the hand so that the thumb is rotated toward the index
20 finger.

In accordance with the configuration of the seventh aspect, gripping the control element with a natural posture and then rotating the control element can decrease the spout flow rate of washing water.

25 In accordance with an eighth aspect based on the

configuration of the sixth aspect, the control element is located to a side of the seat.

In accordance with the configuration of the eighth aspect, the person seated on the seat can operate the control element without having to raise own hand when the person operates the control element, allowing the operation to be effected from a comfortable posture.

In accordance with a ninth aspect based on the configuration of the sixth aspect, the control element can be detached from the valve.

In accordance with the configuration of the ninth aspect, the control element may be fitted only when using the toilet, and removed at other times. This makes it possible to prevent the washing water being spouted by a child playing with the control.

In accordance with a tenth aspect based on the configuration of the ninth aspect, the control element can be detachably attached to the left or right side of the seat.

In accordance with the configuration of the tenth aspect, the person using the toilet can operate the control element using whichever hand the person is accustomed to using at stool.

A sanitary washing apparatus according to the present invention comprises:

a washing unit that washes a body excretory part by
spouting washing water at the body excretory part,

an apparatus body unit equipped with the washing unit,

a water supply unit that supplies washing water to
5 the washing unit from a water supply source,

the water supply unit is equipped with at least one
of a plurality of detachable pipe members used as a conduit
to supply the washing water, and the pipe member is
provided with a control unit for controlling washing water
10 flowing in the conduit.

In accordance with this configuration of the sanitary
washing apparatus according to the present invention, the
pipe member is detachable, allowing various control units
to be used. By making it possible to use a control unit
15 having a specification that matches the particular
characteristics of each region or country, a uniform
specification can be applied to the apparatus body unit,
thereby enabling the structure to be simplified. The
simpler structure means fewer steps are needed to assemble
20 it, so the cost is also reduced, and handling is easier.

Moreover, the fact that the apparatus can be adjusted for
the particular characteristics of a region or country by
changing the pipe member at a location separated from the
apparatus body also improves work efficiency.

25 The above-described sanitary washing toilet apparatus

of the present invention may adopt the following aspects.

In a first aspect, the sanitary washing apparatus according to the present invention, as the control unit the pipe member of the water supply unit is provided with a
5 water pressure control unit that reduces the pressure of washing water supplied to the washing unit to or below a prescribed pressure.

The sanitary washing apparatus according to this first aspect uses a pipe member having a water pressure
10 control unit to enable washing water to be spouted by adjusting the water pressure. By not using such a pipe member, washing water can also be emitted without adjusting the water pressure.

In a second aspect, the sanitary washing apparatus
15 according to the present invention, as the control unit the pipe member of the water supply unit can be provided with a reverse flow prevention unit that prevents the reverse flow of washing water supplied to the washing unit.

The apparatus in accordance with this second aspect
20 uses a pipe member having a reverse flow prevention unit to prevent the reverse flow of washing water. In areas where reverse flow prevention is not a regulatory requirement, a pipe member having no reverse flow prevention unit may be used, thereby making it possible to omit excessive
25 functions.

In the sanitary washing apparatus according to this second aspect, the reverse flow prevention unit may be arranged as a drainage conduit disposed in opposition to an opening formed between the upstream conduit, which is the side on which the water supply source is located, and the downstream conduit, which is the side on which the washing unit is located, whereby reverse flow of water in the downstream side of the conduit is drained out via the opening.

10 The apparatus in accordance with this third aspect, when the inflow of washing water from the upstream side of the conduit stops, the opening between the upstream and downstream conduit portions prevents the upstream and downstream conduit portions being connected by water filling the conduit portions. This makes it difficult for a syphon effect to arise extending along the upper and lower conduit portions, which serves to prevent reverse flow. It is preferable to use the drainage conduit to drain off reverse flow water from the downstream conduit.

15 Extending the drainage conduit to the toilet bowl, for example, enables reverse flow water to be guided into the bowl.

In the sanitary washing apparatus according to this second aspect, the reverse flow prevention unit may be comprised by the upstream conduit, the downstream conduit,

a float chamber into which the upstream and downstream conduits both flow, and an air inlet conduit that allows air to enter the float chamber. Inside the float chamber is a float arranged to close the air inlet conduit when washing water from the upstream conduit flows into the float chamber and open the air inlet conduit when the inflow of washing water from the upstream conduit stops.

In accordance with the configuration according to this fourth aspect, when the inflow of washing water from the upstream conduit stops the air inlet conduit is opened by the float, allowing air to flow into the float chamber.

The presence of air in the float chamber between the upstream and downstream conduits prevents the upstream and downstream conduits being connected by water filling the conduits. This makes it difficult for a syphon effect to arise extending along the upper and lower conduit portions, which serves to prevent reverse flow.

Brief Description of the Drawings

Figure 1 is a perspective external view of a sanitary washing toilet seat 10 according to a first embodiment of the present invention.

Figure 2 is a side view of the sanitary washing toilet seat 10.

Figure 3 is a perspective view of the principal parts

of a western-style toilet T prior to attaching the sanitary washing toilet seat 10.

Figure 4 is a view in the direction indicated by A in Figure 3.

5 Figure 5 is a general cutaway view of the principal parts of the water supply section in body unit 16 of the sanitary washing toilet seat 10.

Figure 6 is a general perspective view illustrating the junction between control element 18 and the spindle 18a.

10 Figure 7 is an enlarged view of the part where the pressure reduction member 62 is attached.

Figure 8 is a general perspective view in the vicinity of the connector 24.

15 Figure 9 illustrates the positioning of the nozzle 20 and the direction of the spout jet.

Figure 10 shows the nozzle tip 21 of the nozzle 20, with Figure 10 (a) being a transverse sectional view thereof and Figure 10 (b) a plan view thereof, while Figure 10 (c) is a transverse sectional view of another nozzle tip
20 21.

Figure 11 is a graph of the relationship between the supply pressure and flow rate of washing water spouted from the nozzle 20.

Figure 12 is a cross-sectional view of the nozzle
25 unit 70 provided with the nozzle 20.

Figure 13 is a general view showing the configuration of a sanitary washing apparatus according to a second embodiment.

Figure 14 is an external view of a western-style toilet fitted with a sanitary washing apparatus 10A according to a third embodiment of the invention.

Figure 15 is a cross-sectional view of a conduit member 134 used in the branch pipe 132 of the sanitary washing apparatus 10A.

Figure 16 is a view illustrating how the conduit member 134 is attached.

Figure 17 is a cross-sectional view of a conduit member 134A used in place of conduit member 134.

Figure 18 is a cross-sectional view of a conduit member 134B used in place of conduit member 134.

Figure 19 is a cross-sectional view of a conduit member 134C used in place of conduit member 134.

Figure 20 is a cross-sectional view taken along line 20-20 of Figure 19.

Figure 21 is a cross-sectional view of a conduit member 134D used in place of conduit member 134.

Figure 22 is a general perspective view of an arrangement in which the control element 18 is fitted on the top of the body unit 16.

Figure 23 is a general perspective view of both the

western-style toilet T and toilet seat portion 210 of a sanitary washing apparatus 200 according to a fifth embodiment of the present invention.

Figure 24 is a view showing the sanitary washing
5 apparatus 200 attached to the western-style toilet T, the positioning of the nozzle 20 and the direction of the spout jet.

Figure 25 is a general perspective view of a sanitary washing apparatus 200A according to a variation of the
10 fifth embodiment.

Best Mode for Carrying out the Invention

Preferred embodiments of the sanitary washing apparatus according to the present invention will now be described, with reference to the drawings. Figure 1 is a
15 perspective external view of a sanitary washing toilet seat 10 according to a first embodiment of the present invention, and Figure 2 is a side view thereof.

The sanitary washing toilet seat 10 is disposed on a western-style toilet, not shown. The sanitary washing
20 toilet seat 10 is supported by a body unit 16 that also supports a seat 12 on which a person using the toilet sits and a lid 14 that covers the seat 12. The seat 12 is annular in shape and fits on the toilet bowl, facing the defecation hole. The upper surface of the seat 12 is

formed as a sitting surface 12d. The body unit 16 is attached to the top surface of the toilet, and supports ends 12a and 12b of the seat 12, and ends 14a and 14b of the lid 14. One side of the body unit 16 is provided with
5 a control element 18 and a connector 24. The control element 18 is used to open and close a passage 60a (shown in Figure 5) via which washing water from a water supply source flows to a nozzle, described later. The connector 24 provides a connection between a pipe supplying water
10 from the water supply source, and the passage 60a. The seat 12, lid 14 and body unit 16 are formed of ABS resin having good formability, or a material such as polypropylene having high resistance to acid and alkali cleansers.

15 As shown by Figure 2, the seat 12 pivots about a support shaft 17 in a support portion 16c of the body unit 16. The lid 14 also pivots about the support shaft 17. The lid 14 can be pivoted alone or together with the seat 12. The support portion 16c incorporates a stop member,
20 not shown, to prevent the seat 12 being rotated in the closing direction. This stop member comes into operation when the angle between the seat 12 and the body of the toilet is in the region of 50 degrees, at which point the stop member associates with the ends 14a and 14b of the lid
25 14 to stop the seat 12 pivoting in the closing direction.

The seat 12 is designed so that the vertical distance L1 from the support shaft 17 to the sitting surface 12d is around 30 mm and the vertical distance L2 from the top surface 14d of the lid 14 to the sitting surface 12d is
5 around 20 mm.

The body unit 16 is hollow and has an upper wall member 16a that forms the front and rear portions and a bottom wall member 16b that forms the bottom portion and the part that affixes to the toilet. The body unit 16 also
10 contains a nozzle 20 that can be extended and retracted.

In use, the nozzle 20 is moved from its standby position within the body unit 16 until the nozzle tip is outside the body unit 16 in the jet spout position shown in the drawing.

From that position, the nozzle 20 spouts washing water at
15 the body excretory part of the person sitting on the seat 12. The nozzle 20 is provided perpendicularly to the support shaft 17, with consideration being given to ensuring that there is no dead space between the support shaft 17 and the nozzle 20.

20 Before describing the arrangement whereby washing water is spouted from the nozzle 20, the arrangement whereby the body unit 16 is fixed to the toilet will be described. Figure 3 is a perspective view of the principal parts of a western-style toilet T prior to attaching the
25 sanitary washing toilet seat 10, and Figure 4 shows the

view in the direction indicated by A.

As shown by the drawings, fixing bolts 33 are used to affix a fixing member 32 onto the upper surface of the rear end 30 of western-style toilet T. The fixing member 32 is
5 formed of plate material bent into an L-shape, having a bottom plate 34 in contact with the upper surface of the rear end 30, and a vertical plate 36 extending upward from the rear edge of the bottom plate 34. The fixing member 32 is used to attach the sanitary washing toilet seat 10 to
10 the western-style toilet T. When the sanitary washing toilet seat 10 is fitted to the western-style toilet T, the bottom plate 34 is tucked into engagement under the bottom wall member 16b and the vertical plate 36 engages with back of the upper wall member 16a. Thus, the fixing member 32
15 is held in position by the rear of the body unit 16. To ensure the bottom plate 34 and vertical plate 36, as well as other members described below, have sufficient stiffness, and also to ensure that each member (such as floating plate 44 described later) has an appropriate degree of elasticity
20 and pliability for its purpose, the fixing member 32 is formed of metal plate, for example, or resin plate.

In shape, the bottom plate 34 is a narrow rectangle extending to each side, and has elongated claw plates 37 and 38, one at each side, that extend outward. The bottom
25 plate 34 also has tongues 39 and 40 that extend to the

sides and in which are formed slot-shaped bolt holes 41 and 42.

The bottom plate 34 has cutout portions that extend back nearly to the upper edge of the vertical plate 36, forming therebetween an L-shaped floating plate 44. Since only the base of the floating plate 44 is connected to the bottom plate 34, the floating plate 44 is able to pivot up and down slightly about its base. The upper end of both the floating plate 44 and the vertical plate 36 are bent back to form projections 45 and 46. Formed in these projections 45 and 46 are through holes 47 and 48. The through holes 47 and 48 each have an integrally-formed nut (not shown) having mutually opposite threads. As shown in Figure 4, a nut 49 may instead be integrally formed with just the lower through hole, that is, through hole 47. An adjusting screw 50 is then inserted down through the through holes 47 and 48 and screwed into the nuts thereof.

Turning the adjusting screw 50 in one prescribed direction (clockwise, for example) reduces the space between the projections 45 and 46 by bringing the floating plate 44 up higher than the bottom plate 34. The degree of lift is controlled by the amount by which the adjusting screw 50 is turned.

With reference to Figure 4, attaching this fixing member 32 to a western-style toilet T starts by inserting

rubber bushes 52 each containing a nut 51 into through holes (not shown) in the upper surface of the rear end 30.

The fixing member 32 is positioned on the rear end 30 with the bolt holes 41 and 42 aligned with the through holes of the rear end 30. The fixing bolts 33 are then inserted down into the bolt holes 41 and 42 and screwed into engagement with the nuts 51. The elongated shape of the bolt holes 41 and 42 allows the fixing member 32 to be attached to western-style toilets T in which the distance between the through holes is from a minimum of 140 mm to a maximum of 170 mm. The fore-and-aft elongated shape of the claw plates 37 and 38 allows the fixing position of the sanitary washing toilet seat 10 to be adjusted forward and backward with respect to the fixing member 32, to match the dimensions of the toilet concerned. When the fixing bolts 33 are finally tightened, the nuts 51 are drawn upward, compressing the rubber bushes 52. The elasticity of the bushes and the frictional force thus produced keeps the fixing member 32 fixed closely to the rear end 30. With respect to the shape and form of the fixing bolts 33 and nuts 51, use thereof is not limited to the rubber bushes 52 described above. Instead, a more general arrangement may be used such as one comprising using bolts that project out from the underside of the rear end 30 and are screwed into nuts.

After the fixing member 32 has thus been affixed on the rear end 30, the sanitary washing toilet seat 10 is connected to the fixing member 32 and the sanitary washing toilet seat 10 affixed to the western-style toilet T. Specifically, the sanitary washing toilet seat 10 is slid from front to back along the upper surface of the western-style toilet T. This brings grooves 53 and 54 formed in the bottom wall member 16b into engagement with the claw plates 37 and 38 of the fixing member 32, coupling the sanitary washing toilet seat 10 and fixing member 32 together and thereby affixing the sanitary washing toilet seat 10 to the western-style toilet T. When this is done, outer claw plates 55 and 56 extending fore and aft along the outer side of the grooves 53 and 54 come into engagement with the fixing member 32 by entering into the space between the claw plates 37 and 38 and the upper surface of the rear end 30. The upper wall member 16a has cutout portions (not shown) formed on the rear surface thereof to ensure that when the sanitary washing toilet seat 10 is slid into position on the toilet, there is no interference between the claw plates 37 and 38 and the rear surface of the upper wall member 16a.

In the state of engagement shown in Figure 4, the fixing member 32 is solidly affixed to the western-style toilet T provided the fixing bolts 33 are sufficiently

tightened. As can also be seen with reference to Figure 4, the outer claw plates 55 and 56 can be strongly clamped and a large frictional force obtained by appropriately reducing the spacing between the top surface of the toilet and the claw plates 37 and 38. The result is to strongly affix the sanitary washing toilet seat 10 to the western-style toilet T.

However, bolts that are not tight enough or dimensional variation among parts (especially the flatness of the upper surface of the toilet) that is too great to be ignored may, after extended periods of use, cause wear and degradation of materials, resulting in excessive play. In such a case, the adjusting screw 50 is turned clockwise to pull the floating plate 44 higher. This increases the frictional force between the back of the upper wall member 16a and the floating plate 44, and between the upper surface of the bottom wall member 16b and the floating plate 44, and at the same time also increases the frictional force between the outer claw plates 55 and 56 of the sanitary washing toilet seat 10 and the claw plates 37 and 38 of the fixing member 32, thereby strongly fixing the sanitary washing toilet seat 10 to the fixing member 32.

In addition, an upward force is applied to the center of the bottom plate 34 as a reaction to the upward pressure of the floating plate 44 against the bottom wall member 16b.

This causes the bottom plate 34 to bow downward about pivot points formed by the claw plates 37 and 38, strongly pressing the center portion onto the top of the western-style toilet T.

5 To remove the sanitary washing toilet seat 10 from the western-style toilet T for cleaning or the like, the adjusting screw 50 is loosened, allowing the sanitary washing toilet seat 10 to be slid forward for removal. Thus, the sanitary washing toilet seat 10 can be readily
10 removed. After it is cleaned, it can be readily reattached by reversing the above procedure.

The arrangement whereby washing water is spouted from the nozzle 20 will now be described, starting with how water is supplied to the nozzle 20. Figure 5 is a general
15 cutaway cross-sectional view of the principal parts of the water supply section in the body unit 16.

As shown in Figure 5, the water supply section, meaning flow adjustment unit 60, is attached to the bottom wall member 16b at one side of the body unit 16. The flow
20 adjustment unit 60 is formed of resin and is provided with a connector 24 and control element 18, which are arranged on the outside. It is to be understood that the flow adjustment unit 60 may instead be formed of metal.

The control element 18 is in engagement with a
25 spindle 18a that can be moved into and out of a passage 60a

in the flow adjustment unit 60 by rotating the control
element 18. The spindle 18a is moved in a direction and by
an amount that correspond to the direction and amount of
rotation of the control element 18. The effective flow
5 area S1 of the passage 60a is altered by this movement of
the spindle. Thus, the flow rate of washing water supplied
from the flow adjustment unit 60 to the nozzle 20 is
adjusted by the rotational operation of the control element
18. The control element 18 can be used to reduce the flow
10 rate to zero. To use, as shown in Figure 1 the control
element 18 is gripped naturally with the back of the hand
facing to the side, or upward, and the element is rotated
by turning the hand so the thumb rotates toward the first
finger, as indicated by the arrow. This reduces the
15 effective flow area S1, thereby decreasing the flow rate.

The spindle 18a is a watertight fit in the passage 60a.

Like a water supply faucet handle, the control element
18 stops at the position it is rotated to, so that even
when the control element 18 is released, washing water is
20 still supplied at a flow rate that is determined by the
amount by which the control element 18 has been rotated.

To stop the water, that is, to stop the washing of
excretory parts, the control element 18 is returned to the
position at which the flow rate is zero. A configuration
25 may be used in which a spring or the like is employed that

urges the control element 18 to the position of zero flow rate. With such an arrangement the control element 18 would revert to the zero flow rate position when the user released the control element 18, making it possible to stop
5 the washing of excretory parts by just releasing the control element 18.

As shown by Figure 6, at its tip the control element 18 has a square insertion shaft 19a and the end of the spindle 18a has a square insertion hole 19b, with the hole
10 being formed to allow the shaft to be inserted therein without forcing. This arrangement makes it possible to remove the control element 18.

The connector 24, on the water supply side of the flow adjustment unit 60, has a bush 61 fitted therein. The
15 pressure reduction member 62, which is formed of rubber or other such resilient material, is held in the connector 24 by the bush 61. As also shown by Figure 7, the washing water flows downstream via the through hole 62a of the ring-shaped pressure reduction member 62. The supply
20 pressure of the water passing through the pressure reduction member 62 deforms the unit as shown in Figure 7 (b). This deformation of the pressure reduction member 62 also serves to reduce the pressure by reducing the effective flow area of the through hole 62a. This will now
25 be explained in specific detail.

As shown by Figure 7 (a), when the water supply pressure is around the same as the prescribed pressure required of the pressure reduction member 62, the pressure reduction member 62 undergoes almost no change in shape.

5 In that state, the effective flow area has an initial value S_2 that corresponds to the diameter of the through hole 62a. On the other hand, as shown by Figure 7 (b), a supply pressure that is higher than the prescribed pressure deforms the pressure reduction member 62 toward the

10 downstream side, reducing the size of the through hole 62a on the upstream side. Thus, the effective flow area is reduced to a value S_3 that is smaller than initial value S_2 , the effect being that the supply pressure is reduced by the pressure reduction member 62. In the configuration of this

15 embodiment, the pressure reduction member 62 can be used to reduce the supply pressure to around 0.15 to 0.2 MPa. That is, pluralities of pressure reduction members 62 are prepared, each having a different degree of elasticity. This allows a pressure reduction member 62 to be selected

20 that is appropriate to the supply pressure of the region in which the sanitary washing toilet seat 10 is to be used, meaning that when fitted to the connector 24 it can reduce the supply pressure to around 0.15 to 0.2 MPa. That is, although the mains water pressure is normally thought of as

25 always being the same, it is not so, but varies depending

on the local government concerned as well as on national government policies and the regional environmental. Thus, the pressure can vary quite widely. In the United States, for example, the pressure ranges from around 0.147 to 0.862 MPa, and in Japan it ranges from about 0.05 to 0.74 MPa.

Thus, an optimum pressure reduction member 62 is selected to enable the above water supply pressure of around 0.15 to 0.2 MPa.

The flow adjustment unit 60 provided on the sanitary washing toilet seat 10 enables the source supply pressure of the washing water to be reduced to the prescribed pressure of 0.15 to 0.2 MPa by the pressure reduction member 62, by using the control element 18 to adjust the flow rate. This washing water then passes through the flow adjustment unit 60 in the direction indicated in Figure 5 by the solid black arrow, to be supplied to the nozzle 20.

In the sanitary washing toilet seat 10 of this embodiment, the following arrangement is used to supply washing water to the flow adjustment unit 60. Figure 8 is a general perspective view of the portion around the connector 24. As shown by Figure 8, a box nut 66 containing a packing 65 with a strainer to remove dirt and foreign matter in the washing water is attached to the connector 24, forming a watertight seal, and an antibacterial cartridge 67 is attached watertightly to the

box nut 66. A box nut 69 on the end of a flexible hose 68 connected to the source water supply is used to attach the hose 68 watertightly to the antibacterial cartridge 67. The antibacterial cartridge 67 is packed with antibacterial pellets 67a. As the washing water passes through the antibacterial cartridge 67, the antibacterial pellets ensure that coli and other bacteria are destroyed or the growth thereof inhibited. Various compounds having bactericidal or antibacterial properties may be used to form the antibacterial pellets 67a. Examples include silver ion compounds (compounds in which silver ions are chemically bound), chlorine ion compounds (compounds in which chlorine ions are chemically bound) and iodine ion compounds (compounds in which iodine ions are chemically bound). Of these, it is preferable to use a compound having chemically bound triiodide compound ions (I_3^-), which has powerful bactericidal properties.

How the nozzle 20 spouts washing water received from the flow adjustment unit 60 will now be described. Figure 9 illustrates the positional aspect of the nozzle 20 and the direction of the spout jet. Figure 10 shows the nozzle tip 21 of the nozzle 20, with Figure 10 (a) being a transverse sectional view thereof and Figure 10 (b) a plan view thereof, and Figure 10 (c) is a transverse sectional view of another nozzle tip 21.

With reference to Figure 9, to spout the jet of washing water, the nozzle 20 moves forward a distance of about 71.5 mm from the standby position (point A), indicated by the solid line, to the spout position (point B), indicated by the broken line. As shown by Figure 10, the spout hole 22, which is about 4 mm in diameter, is inclined forward by about 17 degrees from the vertical. When this is added to the angle of the nozzle 20 itself, the result is that the washing water is spouted from the spout hole 22 at an angle of 43 degrees relative to the seat 12.

The nozzle tip 21 has an orifice 23 of approximately 2.5 mm in diameter that extends from the upstream side to the spout hole 22, and an air inlet hole 25 that communicates with the exterior. This arrangement increases the velocity of the washing water as it passes through the orifice 23 and spouts from the spout hole 22 at a constant flow rate. As the increase in the velocity of the water produces a negative pressure condition in the conduit, air is drawn in through the air inlet hole 25 and spouted out from the spout hole 22 with the water. The mixing in of the air with the water increases the forward spread of the spout. Specifically, when the nozzle 20 is at the spout position, the spout hole 22 is oriented to spout washing water toward the main washing body excretory part, which is

the anal region, a point indicated in Figure 9 as OP. However, the expanded spread of the washing spout described above makes it possible to also wash the region to the front of the OP, termed the BP, for bidet point, washing.

5 Since the orifice 23 is located at the tip of nozzle base portion 21a that is fixed by insertion into the nozzle tip 21, this arrangement facilitates the provision of the orifice 23. In this embodiment, the length of the conduit from the orifice 23 to the spout hole 22 is set at
10 approximately 15 mm, but if required the position of the orifice may be changed.

With respect to the provision of the orifice 23 as described above, as shown in Figure 10 (a), the conduit upstream of the nozzle base portion 21a has a relatively
15 large diameter compared to the small-diameter conduit portion immediately upstream of the orifice 23. However, the type of arrangement shown in Figure 10 (c) can be used.

That is, the upstream conduit of orifice 23 can be adapted according to the design of the nozzle base portion 21a, by
20 giving the conduit portion immediately upstream of the orifice 23 a taper that tapers down toward the orifice 23.

Moreover, the orifice 23 can be slightly lengthened, as shown in Figure 10 (c). Also, as shown in Figures 10 (a) and 10 (c), the conduit downstream of the orifice 23 can be
25 formed as a conduit having a diameter that, from the

junction with the nozzle base portion 21a, gradually tapers down until at the spout hole 22 the conduit diameter is about 4 mm.

The relationship between the flow rate of the water
5 spouted from the nozzle 20 and the supply pressure will now be explained. Figure 11 is a graph of the relationship between the supply pressure and washing water flow rate.

The graph was plotted using the maximum values within the range of flow rate adjustment that is possible using the
10 control element 18. That means if the user so wishes, he or she can use the control element 18 to reduce the flow rate to less than the flow rate shown in the graph.

In this sanitary washing toilet seat 10, as described above, the orifice 23 was given a diameter of approximately
15 2.5 mm and the spout hole 22 was given a diameter of approximately 4 mm, and the pressure reduction member 62 was used to set the supply pressure to a prescribed pressure beforehand. As shown by the graph of Figure 11, even at a supply pressure of around 0.15 MPa the sanitary
20 washing toilet seat 10 produced a washing spout at the flow rate of 2400 ml/min considered necessary to wash the body excretory part. Also, even if the sanitary washing toilet seat 10 is used in a region having a relatively high supply pressure, as a result of the presence of the orifice 23 and
25 the pressure reduction provided by the pressure reduction

member 62, the supply pressure used was still around 0.15 MPa, and resulted in a washing water spout with a flow rate of 2400 ml/min. Based on the spout hole 22 diameter of 4 mm, if d is the flow rate for hole diameter Q , velocity V (m/sec) can be expressed as $V = Q / (60 \cdot \pi \cdot (d/2)^2)$, meaning that at a flow rate of 2400 ml/min velocity V will be 3.2 m/sec.

The arrangement whereby the nozzle 20 is moved from the standby position to the spout position will now be described. Figure 12 is a cross-sectional view of the nozzle unit 70 provided with the nozzle 20. The nozzle unit 70 is connected to the pressure reduction member 62 to be supplied with washing water. The nozzle unit 70 is configured so that when it is supplied with the washing water, it washes the vicinity of the spout hole 22 and spouts washing water from the spout hole 22.

As shown in Figure 12, the nozzle 20 can move axially inside a nozzle cylinder 71 in the nozzle unit 70. Via a jaw piece 20a, the nozzle 20 is constantly subjected to the urging force of a spring 72, which normally keeps the nozzle 20 in the position shown in the drawing, with the nozzle tip 21 protruding out from the nozzle cylinder 71.

A cap 74 having a water supply fitting 73 is watertightly attached to the open end of the nozzle cylinder 71. The nozzle 20 is prevented from rotating axially in the

cylinder 71.

When the control element 18 is operated in the opposite direction from that indicated in Figure 1 by the arrow, the nozzle unit 70 is supplied with water from the flow adjustment unit 60. Water therefore flows in via the water supply fitting 73, and the pressure of this water pushes the nozzle 20 to the right, with respect to the drawing, against the force of the spring 72. In the course of this movement, water passes between the jaw piece 20a and the inside wall of the cylinder 71 and flows out from the nozzle opening 75 at the front of the cylinder 71, thereby washing the vicinity around the spout hole 22.

The further movement of the nozzle 20 brings a watertight ring 20b of the jaw piece 20a into abutment with the inside wall of the nozzle opening 75, sealing the nozzle opening 75 and bringing the nozzle 20 to a stop. It is arranged so that this position is the spout position (Figure 9) from which washing water is spouted at the target anal region. When the nozzle 20 reaches the spout position, the washing water supplied all passes through the passage in the nozzle 20 and is spouted out from the spout hole 22 toward the anal region. This spout of washing water continues until terminated by the control element 18 being turned in the direction indicated in Figure 1 by the arrow to reduce the flow rate to zero, which also causes

the spring 72 to urge the nozzle 20 back to the standby position.

As described above, the washing water is supplied via an orifice 23 with a diameter of approximately 2.5 mm and
5 a spout hole 22 with a diameter of approximately 4 mm. Also, the pressure reduction member 62 was used to reduce the supply pressure beforehand to around 0.15 MPa. As a result, as shown by the graph of Figure 11, even at the low supply pressure of around 0.15 MPa, which is about half the
10 supply pressure used by existing sanitary washing apparatuses, it was possible to obtain a washing spout having the flow rate of around 2400 ml/min and spout jet flow velocity of around 3.2 m/sec considered necessary to provide a good washing effect. This means that even if the
15 sanitary washing toilet seat 10 is used in a region or season in which the source supply pressure is low, the sanitary washing toilet seat 10 is still capable of providing a good body excretory part washing performance.

Moreover, since there is the water pressure to reduce
20 the pressure reduction member 62, even if the sanitary washing toilet seat 10 is used in a region having a relatively high source water supply pressure, water to wash the anal region can still be spouted from the spout hole 22 at the low pressure of around 0.15 MPa at a flow rate of
25 around 2400 ml/min and flow velocity of around 3.2 m/sec.

This enables a uniform specification to be applied to the sanitary washing apparatus and nozzle 20 that assumes a supply pressure of around 0.15 MPa. This enables the structure to be simplified, which also means fewer assembly
5 steps are required, so costs are also reduced and handling is made easier. Moreover, the fact that it is possible to select a pressure reduction member 62 to match the supply water pressure of the region in which the sanitary washing toilet seat 10 is to be used further enhances the general
10 utility of the apparatus.

Furthermore, when a supply pressure is low, the washing water spout flow rate and velocity needed to provide effective washing of the body excretory part can be readily ensured by using specific diameters for the orifice
15 and spout hole.

In addition to washing of the anal region, the washing range of the sanitary washing toilet seat 10 can also be extended to include a bidet washing function by providing a washing spout that also extends to the front of
20 the anal region. Thus, the sanitary washing toilet seat 10 of this invention enables simultaneous washing of both the anal region and bidet washing at a flow rate of around 2400 ml/min and flow velocity of around 3.2 m/sec obtained using a low supply pressure of around 0.15 MPa

25 With this sanitary washing toilet seat 10, moreover,

the water supply pressure is used to move the nozzle 20 from the standby position to the spout position, eliminating any need to use electrical drive devices such as motors and actuators. This enables the structure to be
5 simplified and makes it possible to use the sanitary washing toilet seat 10 even in regions where it is difficult to obtain a stable supply of electricity or where it is not customary to locate electrical equipment in a toilet environment.

10 Thus, while with the sanitary washing toilet seat 10 a low supply pressure of around 0.15 MPa can be used to provide a washing spout having a flow rate of around 2400 ml/min and a flow velocity of around 3.2 m/sec, the control element 18 can still be used to manually reduce the flow
15 rate of the washing spray. This makes it possible for users to each use a favored flow rate, and the control element 18 can be operated using a natural, comfortable posture, without having to lift the hand.

It is also possible to fit the control element 18
20 only when the toilet is being used, by fitting the control element 18 onto the spindle 18a, and leaving it off at other times. This makes it possible to prevent washing water being spouted by a child playing with the control.

A second embodiment of the invention will now be
25 described. In this embodiment, the control element 18 can

be operated from either side of the body unit 16. Figure 13 is a general view showing the main parts of the sanitary washing apparatus according to this second embodiment.

As shown, the sanitary washing apparatus according to the second embodiment has a flow adjustment unit 60A arranged below nozzle unit 70. As with the flow adjustment unit 60 of the first embodiment, in the flow adjustment unit 60A the flow rate can be adjusted by using a spindle to alter the flow area. The flow adjustment unit 60A is supplied with washing water via a flexible hose 80 and connector 24A. After pressure reduction by a pressure reduction member 62 (not shown) provided in the flexible hose 80 connection, the washing water is fed through a flexible hose 81 to the nozzle unit 70.

The flow adjustment unit 60A is provided with right and left spindles 82 and 83 for adjusting the effective flow area. Each spindle can pivot about a pivot member (not shown), and extend to the vicinity of the surface on each side of the body unit 16. Rotating one spindle also rotates the other. Thus, rotating spindle 82 in the direction indicated in the drawing by A1 causes the other spindle 83 to also rotate in the direction indicated by A2.

Each spindle is fitted with a control element 18, and each of these control elements 18 can be removed from its spindle.

In accordance with this sanitary washing apparatus according to the second embodiment, a person using the toilet can use either hand to operate the control element 18 to adjust the flow rate. The ability to remove both of
5 the spindles 82 and 83 makes it possible to prevent young children playing with the spout apparatus. The apparatus of the second embodiment is also provided with a nozzle 20 and a nozzle unit 70. Thus, the nozzle 20 can be moved by the water pressure, and a low pressure of around 0.15 MPa
10 used to produce a spout of having a flow rate of around 2400 ml/min and a flow velocity of around 3.2 m/sec.

A third embodiment of the invention will now be described. The apparatus of this third embodiment is characterized by the pressure reduction member being
15 located in a conduit running to the sanitary washing apparatus. Figure 14 is an external view of a western-style toilet fitted with a sanitary washing apparatus 10A according to the third embodiment. As in the first embodiment, this apparatus 10A has a nozzle 20, a nozzle
20 unit 70, a control element 18, a body unit 16, and so forth.

As shown in Figure 14, arranged between a low silhouette tank 130 in which the water to flush the toilet is collected, and the sanitary washing apparatus 10A, is a branch pipe 132 that branches from a supply pipe 131 that
25 supplies water to the low silhouette tank 130. The branch

pipe 132 comprises a conduit member 134 connected to a branch plug 133 located in the supply pipe 131, and a flexible hose 136 connected to the apparatus 10A side of the connector 24. Thus, the sanitary washing apparatus 10A
5 is supplied with water from the supply pipe 131 via the branch plug 133 and branch pipe 132; washing water is spouted from the nozzle 20 using the water supply pressure.

With reference to the drawing, the branch pipe 132
10 descends from the branch plug 133 and curves around to the sanitary washing apparatus 10A; the flexible hose 136 is used to form the curved part. The flexible hose 136 has a three-layer structure, comprising a hose formed of EPDM (a copolymer of ethylene, propylene and diene) covered with a
15 stainless-steel braid, which has a covering of PVC or other such resin. The upper end of the flexible hose 136 has a steel pipe section 136a for attaching the conduit member 134.

The branch plug 133 and the conduit member 134
20 connected to the flexible hose 136 are formed of steel or resin. As shown by the sectional view of Figure 15, an inside bore member 134a keeps the conduit member 134 straight, and the conduit member 134 has upper and lower fixing flanges 140 and 141 at the top and bottom. The
25 conduit member 134 also has bosses 142 and 143 extending

from the flanges. The upper and lower fixing flanges 140 and 141 have the same outside diameter, thickness and shape, and the bosses 142 and 143 also have the same outside diameter and extend the same length. The boss 142 fits
5 into insertion hole 133a provided at the lower end of the branch plug 133, the boss 143 fits into insertion hole 136b provided in the steel pipe section 136a at the upper end of the flexible hose 136, and the flanges 140 and 141 abut lower flange 133b of the branch plug 133 and upper flange
10 136c of the steel pipe section 136a. The insertion of the bosses into the insertion holes connects the conduit member 134 to the branch plug 133 and flexible hose 136, forming a conduit that runs from the branch plug 133 to the flexible hose 136. The conduit member 134 can be removed
15 by withdrawing the bosses from the insertion holes. To ensure the watertightness of the conduit, the bosses 142 and 143 are each provided with an O-ring 144.

As shown by the perspective view of Figure 16 showing a connection portion, the conduit member 134 thus connected
20 is attached by a fixing bracket 145. The fixing bracket 145 is press-formed of a highly resilient sheet material such as spring steel, so when a force holding the ends apart is removed, the ends spring back to their original position. On each side of the bracket 145 is a fixing
25 groove 146 formed to hold the lower flange 33b and the

fixing flange 140. To fit the fixing bracket 145, the ends of the bracket are spread apart to allow the flanges 133b and 140 to be fitted into the grooves 146, and the ends of the bracket 145 are then released, allowing the conduit member 134 to be affixed to the branch plug 133. The same procedure is followed at the flexible hose 136 end.

The following conduit members 134A are prepared for use in place of the conduit member 134. As shown in Figure 17, the inside bore member 134a is provided with an orifice 134b that reduces the area of the conduit. The passage of a fluid (washing water in this case) through the orifice 134b is accompanied by a loss of pressure corresponding to the amount by which the conduit area is reduced, so the pressure of the water flowing on the downstream side of the orifice is reduced by that amount. The size of the orifice 134b is set in accordance with the mains water pressure in the area in which the sanitary washing apparatus 10A is to be used, so that after the adjustment provided by the pressure reduction member 62, a water supply pressure of around 0.15 to 0.2 MPa is obtained. While Figure 17 shows the orifice 134b as being located approximately in the middle of the conduit member 134, it is to be understood that the conduit member 134 may be provided at the upper or lower end or any other point. The orifice may be formed of rubber and the deformation produced by the water pressure

utilized to enable the orifice to function as a constant flow valve.

With respect to the pressure of washing water supplied from a flow adjustment unit 60, not shown, and
5 spouted from the nozzle 20, the design assumes the use of a low water supply pressure (from 0.15 to less than 0.2 MPa) to supply the water via the branch plug 133 and the branch pipe 132. Thus, to enable the sanitary washing apparatus 10A to be used in a region where the mains water
10 supply pressure is low, such as Southeast Asia, the simple type of conduit member 134 shown in Figure 15 can be used as the conduit member 134 of the branch pipe 132. On the other hand, when the apparatus is to be used in areas having a higher mains water supply pressure such as Japan,
15 Europe and the United States, for example, the conduit member 134A having the orifice 134b as shown in Figure 17 is used. In such a case, an orifice 134b may be used having a diameter adjusted to produce the pressure differential between the mains pressure in such a region
20 and the above-described low mains pressure, and the loss of pressure imparted by the orifice 134b used to adjust the pressure.

With the sanitary washing apparatus 10A according to this third embodiment, the branch pipe 132 can be used to
25 adjust the pressure of the washing water supplied to the

sanitary washing apparatus 10A by changing the conduit members 134 and 134A. This enables the sanitary washing apparatus 10A to be given specifications that match the mains supply pressure in the region in which the sanitary washing apparatus 10A is to be used. By making it possible to apply a uniform set of specifications to the apparatus, the structure can be simplified, decreasing the number of assembly steps, reducing the cost and making handling easier. Moreover, the fact that the tasks required to adjust the water pressure can be carried out by changing conduit members 134 / 134A at a location away from the body unit 16 helps to improve work efficiency.

In accordance with this embodiment the flanges 140 and 141 and bosses 142 and 143 have the same shapes. This simplifies the replacement procedure by making it possible to fit the conduit members 134 and 134A without worrying about which end is which. Securing the conduit members is also easy, involving just spreading the ends of the fixing bracket 145, slipping the bracket into position and releasing the ends.

Next, using the sanitary washing apparatus 10A in areas where preventing a reverse flow from the apparatus is a regulatory requirement will be described. In such a case, conduit member 134B is used instead of conduit member 134. As shown in Figure 18, which is a cross-sectional view,

the conduit member 134B has a closed internal region 151,
and an upstream conduit 152 that passes through boss 142 to
the closed region 151. Inside the conduit 152 is a
solenoid valve 156 controlled by a control unit, not shown,
5 located inside the body unit 16. Washing water is fed into
the closed space 151 via the conduit 152 and solenoid valve
156. The conduit member 134B has a cylindrical portion 153
that extends up into the closed region 151 from the boss
143 attached to flexible hose 136, and a downstream conduit
10 154 that connects with the closed region 151 via the boss
143 and the cylindrical portion 153. The openings of the
upstream conduit 152 and downstream conduit 154 are formed
so that the axes thereof coincide. The cylindrical portion
153 only extends upward to roughly the center of the closed
15 region 151, so the upstream conduit 152 and downstream
conduit 154 are in opposition with a space therebetween.
The conduit member 134B has a drainage conduit 155 in
association with the base of the cylindrical portion 153
and the closed region 151, via which fluid (washing water)
20 is drained out from the closed region 151.

With the conduit member 134B incorporated between the
branch plug 133 and the flexible hose 136, washing water is
supplied and the reverse flow thereof prevented as follows.

If, for example, the solenoid valve 156 is opened, washing
25 water (running water) flows in from the branch plug 133

into the upstream conduit 152, then into the downstream conduit 154, and passes through the flexible hose 136 to the sanitary washing apparatus 10A, and is spouted out from the nozzle 20. When the solenoid valve 156 is closed,
5 shutting off the inflow of washing water from the upstream conduit 152, the presence of air in the space between the upstream and downstream conduits 152 and 154 prevents the two conduits becoming filled with water. This makes it difficult for a syphon effect to arise that extends across
10 the space between the upstream and downstream conduits 152 and 154, and thereby serves to prevent the water reversing its flow. Any water that does flow back from the downstream conduit 154 into the closed region 151 can be drained out via the drainage conduit 155. If the toilet is
15 a western style and the drainage conduit 155 is extended to reach the toilet bowl, the reverse flow water can be guided into the toilet bowl.

Thus, the use of the conduit member 134B enables reverse flow to be prevented without making any change to
20 the specifications of the sanitary washing apparatus 10A.

When the sanitary washing apparatus 10A is to be used where reverse flow prevention is not a regulatory requirement, the conduit member 134B can be replaced by the conduit member 134. This helps to reduce costs by omitting
25 superfluous function (reverse flow prevention).

Reverse flow prevention using other conduit members 134C and 134D will now be described. As shown by the cross-sectional view of Figure 19, the conduit member 134C has a float chamber 161 above the boss 143 at the end to which the flexible hose 136 is connected, and a downstream conduit 162 in association with the float chamber 161 via the boss 143. The conduit member 134C also has an upstream conduit 163 that is connected with the float chamber 161 via the boss 142 at the end to which the branch plug 133 is attached. That is, the conduit member 134C is provided with a float chamber 161 that merges the flows from the upstream and downstream conduits 163 and 162. The upstream conduit 163 is comprised of a cylindrical conduit portion 163a at the boss 142 end, a differently-shaped conduit portion 163b that is connected with the cylindrical portion 163a, and a lower conduit portion 163c below the float chamber 161. As shown by Figure 20, which is a cross-sectional view along line 20-20 of Figure 19, conduit portion 163b has an arcuate cross-section and has been given about the same flow area as the cylindrical conduit portion 163a. Similarly, the lower conduit portion 163c has been given about the same flow area as the cylindrical conduit portion 163a. Also, the conduit member 134C has been divided vertically and watertightly bonded.

Inside the float chamber 161 is a float 164 that

floats at a level corresponding to the amount of water in the float chamber 161. The arrangement is such that the upper edge of the lower conduit portion 163c constitutes a lower valve seat 165 that abuts against the float 164 when
5 the float 164 descends. The conduit member 134C has an air inlet 166 via which air enters into the float chamber 161 from the top thereof. The opening at the float chamber 161 end of the air inlet 166 forms an upper valve seat 167 against which the float 164 abuts when the float rises.

10 With the conduit member 134C incorporated between the branch plug 133 and the flexible hose 136, washing water is supplied and the reverse flow thereof prevented as follows.

Prior to the inflow of washing water (running water), the float 164 is down under its own weight, in abutment with
15 the lower valve seat 165. When water flows in from branch plug 133 end, the water flows through the upstream conduit 163 and, from the lower conduit portion 163c, pushes the float 164 slightly upward into the float chamber 161. As the float chamber 161 fills up with the water, the float
20 164 floats up from the lower valve seat 165. This connects the upstream and downstream conduits 163 and 162 together via the float chamber 161, allowing the washing water to flow out of the downstream conduit 162 and through the flexible hose 136 to the sanitary washing apparatus 10A,
25 from where it is spouted out from the nozzle 20. While

this is happening, the float 164 is in abutment with the upper valve seat 167, closing the air inlet 166.

When the inflow of washing water from the upstream conduit 163 stops, the water in the float chamber 161 flows
5 out through the downstream conduit 162. As the amount of water in the float chamber 161 decreases, the float 164 descends, which opens the air inlet 166 to the float chamber 161, allowing air to flow into the float chamber 161 and the upper opening of the downstream conduit 162.
10 The presence of air in the float chamber 161 and upper opening of the downstream conduit 162 prevents the water filling the two conduits. This makes it difficult for a syphon effect to arise across the upstream and downstream conduits 163 and 162, and thereby helps to prevent reverse
15 flow.

Thus, the use of the conduit member 134C enables reverse flow to be prevented without making any change to the specifications of the sanitary washing apparatus 10A.

When the sanitary washing apparatus 10A is to be used
20 where reverse flow prevention is not a regulatory requirement, the conduit member 134C can be replaced by the conduit member 134, which helps to reduce costs by omitting superfluous function (reverse flow prevention).

As shown by the cross-sectional view of Figure 21,
25 the conduit member 134D has a closed internal region 171,

and an upstream conduit 172 that connects with the closed region 171 via boss 142. The conduit member 134D has a cylindrical portion 173 that extends up into the closed region 171 from the boss 143 that attaches to flexible hose 136, and a through hole 174 that connects with the closed region 171 via the boss 143 and the cylindrical portion 173.

The closed region 171 has a reverse flow prevention member 176 with a T-shaped cross-section. Flange 176a is used to fix the reverse flow prevention member 176 in the closed region 171 via a resilient ring 177. An inflow hole 176b with a floor is formed inside the reverse flow prevention member 176. Inflow openings 176c are formed at equal intervals around the inside wall of the inflow hole 176b.

The reverse flow prevention member 176 has a flared rubber sleeve 178, and both sleeve 178 and member 176 are fitted inside the closed region 171. In a radially expanded state the rubber sleeve 178 is in close contact with the reverse flow prevention member 176. The inflow openings 176c are normally closed by the rubber sleeve 178. The rubber sleeve 178 can be expanded radially to adjust the inside diameter of the through hole 174.

With the conduit member 134D incorporated between the branch plug 133 and the flexible hose 136, washing water is supplied and the reverse flow thereof prevented as follows.

When water flows in from the branch plug 133 end, the

water flows through the upstream conduit 172 and into the inflow hole 176b of the reverse flow prevention member 176.

The inflow hole 176b has a closed bottom end, so the pressure of the washing water inflow acts on the rubber sleeve 178 via the inflow openings 176c. This expands the rubber sleeve 178 radially, forming a space between the rubber sleeve 178 and the peripheral wall of the inflow hole 176b. The water that has flowed into the inflow hole 176b flows into this space via the inflow openings 176c, and out through the downstream conduit 175 in the direction indicated by the arrows. From there, the water passes through the flexible hose 136 to the sanitary washing apparatus 10A, and is spouted out as washing water from the nozzle 20.

When the inflow of washing water from the upstream conduit 172 stops, the force expanding the rubber sleeve 178 outward is lost, allowing the sleeve 178 to come back into close contact with the peripheral surface of the inflow hole 176b. This closes the inflow openings 176c and eliminates the space between the sleeve 178 and the inflow hole 176b. The result is that the rubber sleeve 178 prevents water flowing back from the downstream conduit 175 and into the upstream conduit 172.

Thus, the use of the conduit member 134D enables reverse flow to be prevented without making any change to

the specifications of the sanitary washing apparatus 10A.

When the sanitary washing apparatus 10A is to be used where reverse flow prevention is not a regulatory requirement, the conduit member 134D can be replaced by the
5 conduit member 134, which helps to reduce costs by omitting superfluous function (reverse flow prevention).

A fourth embodiment of the invention will now be described. In the embodiments already described, nozzles
20 having prescribed orifice and spout hole diameters were
10 used to ensure flow rate and flow velocity under low supply pressure conditions. The configuration of the fourth embodiment uses a nozzle unit with no nozzle 20. What characterizes the fourth embodiment is that pressure reduction and reverse flow prevention is effected in the
15 conduit to the sanitary washing apparatus. That is, this instead of the nozzle unit 70 of the third embodiment, this embodiment uses the branch pipe 132 described with reference to the third embodiment. Thus, the conduit member 134 can be replaced by conduit member 134A for
20 pressure reduction, or by conduit members 134B, 134C, 134D reverse flow prevention. The arrangement of this fourth embodiment also readily enables the spout pressure to be reduced and reverse flow prevented using a standard specification sanitary washing apparatus, thereby also
25 enabling the structure to be simplified.

A fifth embodiment of the invention will now be described. Each of the foregoing embodiments is provided with a nozzle unit 70 provided with a nozzle 20 having an orifice 23 and spout hole 22 the diameters of which have the relationships described above. Also, each of the preceding embodiments is a sanitary washing apparatus comprising the nozzle unit 70, a toilet seat and a lid. The apparatus of the fifth embodiment is characterized in that it has a nozzle unit 70 as a constituent part, a toilet seat or lid do not form constituent parts of the apparatus. Figure 23 is a general perspective view of the western-style toilet T and toilet seat portion 210 of a sanitary washing apparatus 200 according to the fifth embodiment of the present invention, and Figure 24 is a view showing the sanitary washing apparatus 200 attached to the western-style toilet T, the positioning of the nozzle 20 and the direction of the spout jet. Parts that are the same as parts of the embodiments already described having been given identical reference numerals, and further description thereof is omitted.

As shown in the drawings, the sanitary washing apparatus 200 is configured separately from the toilet seat portion 210. The sanitary washing apparatus 200 is affixed onto the upper surface of the rear end 30 of a western-style toilet T, between the toilet seat portion 210 and the

western-style toilet T. The sanitary washing apparatus 200 is provided with a fixing plate 201, a nozzle unit 70 and a flow rate control section 202. The fixing plate 201 is formed of metal or resin and has through-holes 203 that
5 overlay fixing holes TH of the western-style toilet T. As shown in Figure 23, one side of the fixing plate 201 projects out sideways from the western-style toilet T. The flow rate control section 202 is attached to that side of the fixing plate 201. The western-style toilet T may be of
10 a type in which a flush valve is used to flush the toilet bowl with washing water direct from the supply pipe, or it may be a type in which the toilet is flushed using water collected beforehand in a tank.

The flow rate control section 202 is provided with a
15 faucet fitting 204 affixed to the underside of the fixing plate 201, a supply pipe 205 that runs from the faucet fitting to the nozzle unit 70, and a faucet handle 206 rotatably supported on the upper surface of the fixing plate 201. The faucet handle 206 is an accessory part of
20 the faucet fitting 204. The faucet fitting 204 is connected to a branch pipe 207 that branches from a supply pipe, not shown. When the faucet handle 206 is turned, washing water from the supply pipe 205 is supplied to the nozzle unit 70 at a flow rate that corresponds to the
25 amount by which the faucet handle 206 is turned. The

faucet fitting 204 can control the flow rate from a flow rate of zero. Thus, the faucet fitting 204 corresponds to the flow adjustment units 60 and 60A described with reference to the preceding embodiments. By means of
5 support member 208, the nozzle unit 70 is fixed at an angle on the fixing plate 201. As shown in Figure 24, with the sanitary washing apparatus 200 attached to the western-style toilet T, the fixing plate 201 is attached sloping downward toward the nozzle tip 21. The pressure of the
10 washing water supplied from the flow rate control section 202 moves the nozzle tip 21 of the nozzle unit 70 forward to the spout position (point B). From the spout position, washing water is spouted to wash the anal region, point OP, and the bidet point BP in front of the OP. When the
15 apparatus is used in regions in which the water pressure has to be adjusted, the flow inlet portion of the faucet fitting 204 may be provided with a pressure reduction member 62 to reduce the water pressure.

On the toilet seat portion 210, the toilet seat 211
20 and the lid 212 are supported by means of a support portion 213 that allows the seat 211 and lid 212 to be opened and closed. The support portion 213 is formed as a hollow member so as not to interfere with the nozzle unit 70. The base plate 214 (Figure 24) of the support portion 213 is
25 provided with bolt holes 215 that align with fixing holes

TH of the western-style toilet T and through-holes 203 of the fixing plate 201. To attach the toilet seat portion 210 and the sanitary washing apparatus 200 to the western-style toilet T, rubber bushes 52 (Figure 4) are inserted
5 into the fixing holes TH in the western-style toilet T, and fixing bolts 33 (Figure 4) are inserted into the through-holes 203 and the bolt holes 215 and used to affix the toilet seat portion 210 and the sanitary washing apparatus 200 to the upper surface of the rear end 30 of the western-
10 style toilet T. While this attaches the sanitary washing apparatus 200 together with the toilet seat portion 210, the sanitary washing apparatus 200 can instead be added after removing the toilet seat portion 210 that has already been fitted to the western-style toilet T. For this, the
15 fixing plate 201 can be provided with through-holes 203 at a spacing that corresponds to that of the fixing holes TH of the western-style toilet T, or the through-holes 203 may be formed as laterally elongated holes.

The above-described sanitary washing apparatus 200
20 according to the fifth embodiment incorporates a nozzle unit 70 provided with a nozzle 20 having an orifice 23 and spout hole 22, such as that shown in Figure 10. Thus, the same effect as that obtained with the foregoing embodiments can also be obtained with this sanitary washing apparatus
25 200 (securing of the necessary flow rate and flow velocity

under low supply pressure conditions, simultaneous anal and bidet washing, and so forth). Moreover, the sanitary washing apparatus 200 can be retrofitted to existing western-style toilets T, thereby enabling existing
5 equipment to be effectively utilized while allowing washing of excretory parts to be readily added.

A modified version of the apparatus of the fifth embodiment will now be described. Figure 25 is a general perspective view of the modified sanitary washing apparatus
10 200A. In this arrangement washing of the excretory parts can be effected by the user from either side, as in the second embodiment illustrated in Figure 13. Instead of the flow rate control section 202 the sanitary washing apparatus 200A is provided with a flow adjustment unit 60A
15 provided with spindles 82 and 83 projected from each side.

Each of the control elements 18 can be removed from its spindle, allowing washing of excretory parts to be effected in the same way as with the apparatus of the second embodiment. The sanitary washing apparatus 200A is
20 attached to the western-style toilet T in the same way as described with reference to the sanitary washing apparatus 200 of the fifth embodiment.

While in the foregoing the present invention has been described with reference to embodiments thereof, it is to
25 be understood that the invention is not limited to the

described embodiments, and that, instead, numerous modifications and variations that fall within the scope of the present invention are possible in light of the above teachings.

5 For example, while in the above embodiments the control element 18 is described as being provided on the left or right side of the body unit 16, it can also be arranged on the upper surface of the body unit 16. That is, as illustrated by Figure 22, a flexible shaft 186 comprised
10 of wire or coil can be connected to spindle 82 by means of a fastener 187 and the control element 18 provided on the flexible shaft 186. This would make it possible to arrange the control element 18 on the top of the body unit 16 and adjust the flow rate by rotating the control element 18.

15 **Industrial Applicability**

 The sanitary washing apparatus of the present invention used to wash the anal region of a person using a toilet by spouting washing water at the body excretory part is useful as an apparatus that can be used under low water
20 supply pressure conditions with a simplified structure.



WHAT IS CLAIMED IS:

1. A sanitary washing toilet seat comprising:
a nozzle portion that spouts washing water at the
anal region of a person at stool,
5 wherein the nozzle portion includes a spout
adjustment unit that ensures a nozzle flow rate of
approximately 2400 ml/min even with a supply pressure from
a water supply source of around 0.15 MPa.
2. A sanitary washing toilet seat comprising:
10 a nozzle portion that spouts washing water at the
anal region of a person at stool,
 wherein the nozzle portion includes a spout
adjustment unit that ensures a nozzle flow velocity of
approximately 3.3 m/sec even with a supply pressure from a
15 water supply source of around 0.15 MPa.
3. A sanitary washing toilet seat according to claim
1 or 2, wherein the spout adjustment unit comprises:
a washing water spout nozzle portion having a nozzle
bore diameter of approximately 4 mm, and
20 an orifice having a diameter of approximately 2.5 mm
provided upstream thereof.
4. A sanitary washing toilet seat according to
claims 1 to 3, wherein the nozzle portion has a washing



water spout nozzle bore that, in spouting washing water toward the anal region, washes a body excretory part extending from the anal region to other body excretory parts to the front of the anal region.

5 5. A sanitary washing toilet seat according to any of claims 1 to 4, wherein the nozzle portion can be moved between a washing water spout position and a standby position rearward of the washing water spout position, whereby when the nozzle portion receives a pressure of
10 washing water supplied from the water supply source the nozzle portion moves from the standby position to the spout position.

6. A sanitary washing toilet seat according to any of claims 1 to 5, wherein the nozzle portion is provided
15 with a water supply unit to supply washing water from the water supply source, the water supply unit is equipped with at least one of a plurality of detachable conduit pipe members used to supply the washing water, and the pipe member is provided with a water pressure control unit that
20 reduces a pressure of washing water supplied to the nozzle portion to or below a prescribed pressure.

7. A sanitary washing toilet seat according to any of claims 1 to 5, wherein the nozzle portion is provided



with a water supply unit to supply washing water from the water supply source, the water supply unit is equipped with at least one of a plurality of detachable pipe members used to supply the washing water, and the pipe member is
5 provided with a reverse flow prevention unit that prevents a reverse flow of washing water supplied to the nozzle portion.

8. A sanitary washing toilet seat according to claim 1 or 2, comprising:

10 a seat on which a person at stool sits,
an apparatus body unit equipped with a nozzle portion,
a water supply channel that supplies washing water to the nozzle portion from the water supply source,
a valve that can change an effective flow area of the
15 water supply channel to zero, and
a control element that when operated by being gripped and rotated by the person at stool sitting on the seat, the operation is communicated to the valve to thereby change the effective flow area of the water supply channel by an
20 amount corresponding to the amount of rotation of the control element.

9. A sanitary washing toilet seat according to claim 8, wherein the valve is operated to reduce the effective flow area of the water supply channel by gripping the



control element and rotating it by turning the hand so that the thumb is rotated toward the index finger.

10. A sanitary washing toilet seat according to claim 8, wherein the control element is located to a side
5 of the seat.

11. A sanitary washing toilet seat according to claim 8, wherein the control element can be detached from the valve.

12. A sanitary washing toilet seat according to
10 claim 11, wherein the control element can be detachably attached to a left or right side of the seat.

13. A sanitary washing apparatus having a washing unit that washes a body excretory part by spouting washing water at the body excretory part, comprising:

15 an apparatus body unit equipped with the washing unit,
a water supply unit that supplies washing water to the washing unit from a water supply source,

wherein the water supply unit is equipped with at least one of a plurality of detachable pipe members used as
20 a conduit to supply the washing water, and the pipe member is provided with a control unit for controlling flow of washing water in the conduit.

14. A sanitary washing apparatus according to claim



13, wherein as the control unit the pipe member of the water supply unit is provided with a water pressure control unit that reduces the pressure of washing water supplied to the washing unit to or below a prescribed pressure.

5 15. A sanitary washing apparatus according to claim 13, wherein as the control unit the pipe member of the water supply unit is provided with a reverse flow prevention unit that prevents a reverse flow of washing water supplied to the washing unit.

10 16. A sanitary washing apparatus according to claim 15, wherein the reverse flow prevention unit comprises a drainage conduit disposed in opposition to an opening formed between an upstream conduit on a water supply source side, and a downstream conduit on a washing unit side,
15 whereby reverse flow of water into the downstream conduit is drained out via the opening.

 17. A sanitary washing apparatus according to claim 15, wherein the reverse flow prevention unit comprises an upstream conduit on a water supply source side, a
20 downstream conduit on a washing unit side, a float chamber into which the upstream and downstream conduits flow, and an air inlet conduit that allows air to enter the float chamber,



wherein the float chamber contains a float that when washing water from the upstream conduit flows into the float chamber closes the air inlet conduit, and when the inflow of washing water from the upstream conduit stops
5 opens the air inlet conduit.

18. A sanitary washing apparatus having a washing unit that washes a body excretory part by spouting washing water at the body excretory part, comprising:

an apparatus body unit provided with the washing unit,
10 a water supply channel that supplies washing water to the washing unit from a water supply source,

a valve that can change an effective flow area of the water supply channel to zero,

a control element that when operated by being gripped
15 by a person, the operation of the control element is communicated to the valve to thereby change the effective flow area of the water supply channel by an amount corresponding to the amount of operation of the control element,

20 wherein the washing unit includes a nozzle portion that spouts washing water and can be moved between a washing water spout position and a standby position rearward of the washing water spout position.

19. A sanitary washing apparatus according to claim



18, wherein the valve is operated to reduce the effective flow area of the water supply channel by gripping the control element and rotating it by turning the hand so that the thumb is rotated toward the index finger.

5 20. A sanitary washing apparatus according to claim
18 further includes a seat on which a person at stool sits,
 wherein the control element is located to a side of
the seat.

 21. A sanitary washing apparatus according to claim
10 18, wherein the control element can be detached from the
valve.

 22. A sanitary washing apparatus according to claim
21 further includes a seat on which a person at stool sits,
 wherein the control element can be detachably
15 attached to a left or right side of the seat.

 23. A sanitary washing toilet seat comprising:
 a nozzle portion that spouts washing water at the
anal region of a person at stool,
 wherein the nozzle portion has a washing water spout
20 nozzle bore that, in spouting washing water toward the anal
region, washes a body excretory part extending from the
anal region to other body excretory parts to the front of
the anal region.