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(54) WESTERN WATER CLOSET

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(57) **ABSTRACT**

The present invention provides a sanitary western-style flush toilet in which stains are hardly adhered to a rim, and as a result, a nasty smell and the like are hardly generated. A western-style toilet body comprises a bowl portion and an open rim. The open rim has a rim channel in the inside thereof. At the rear of the western-style toilet body, a washing device which is capable of spouting water is formed. The bowl portion is washed by the water which is spouted from the washing device. An inward surface of an inner side wall portion of the open rim is an identical surface to a bowl face of the bowl portion.

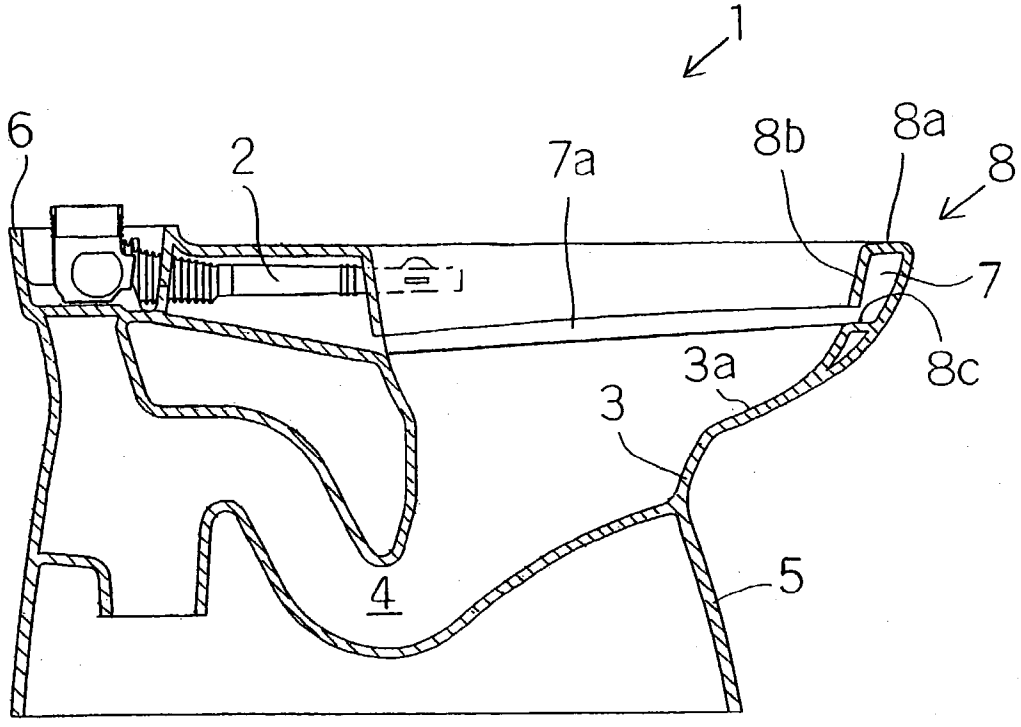


Fig. 1

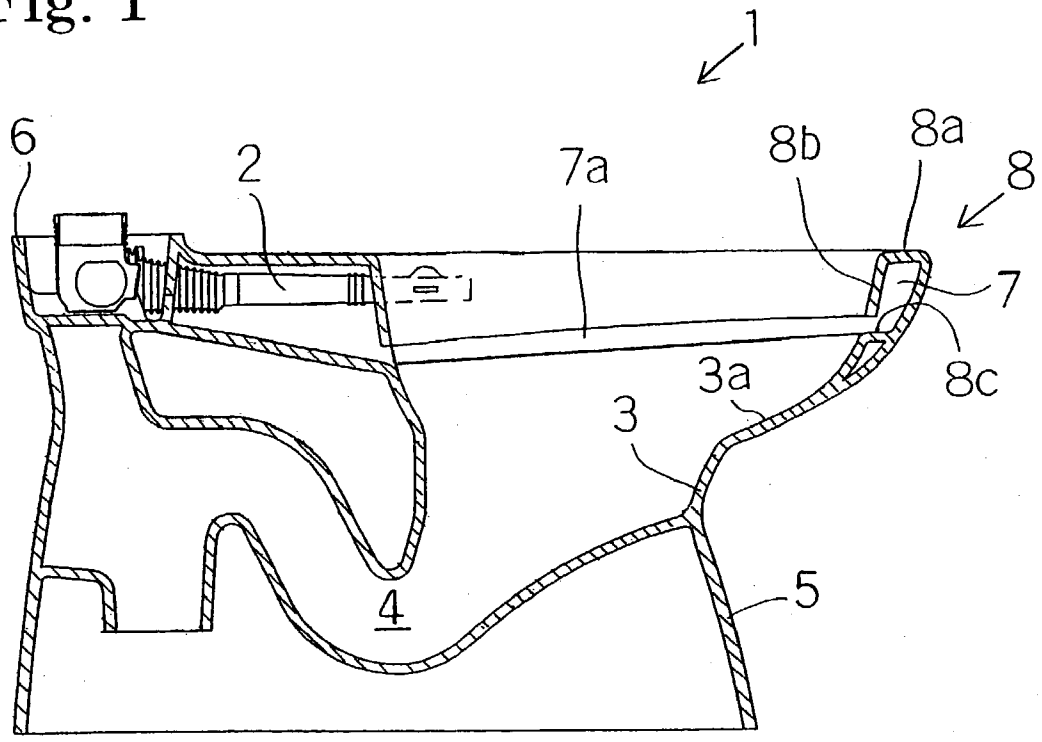


Fig. 2

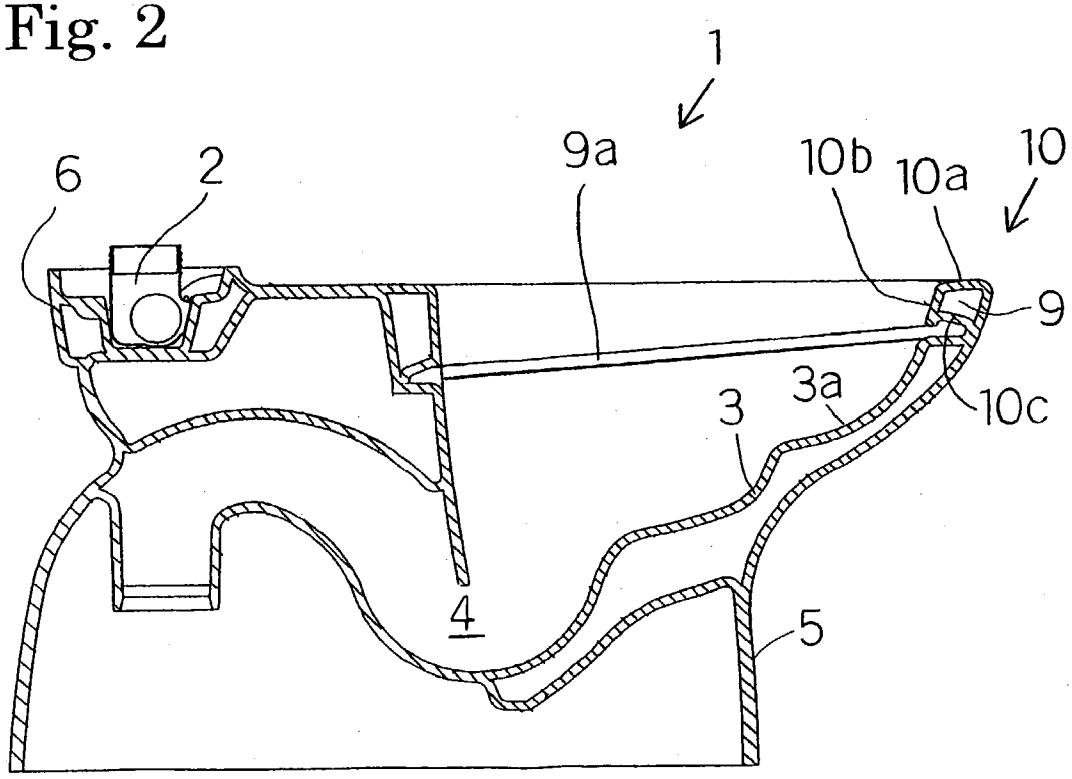
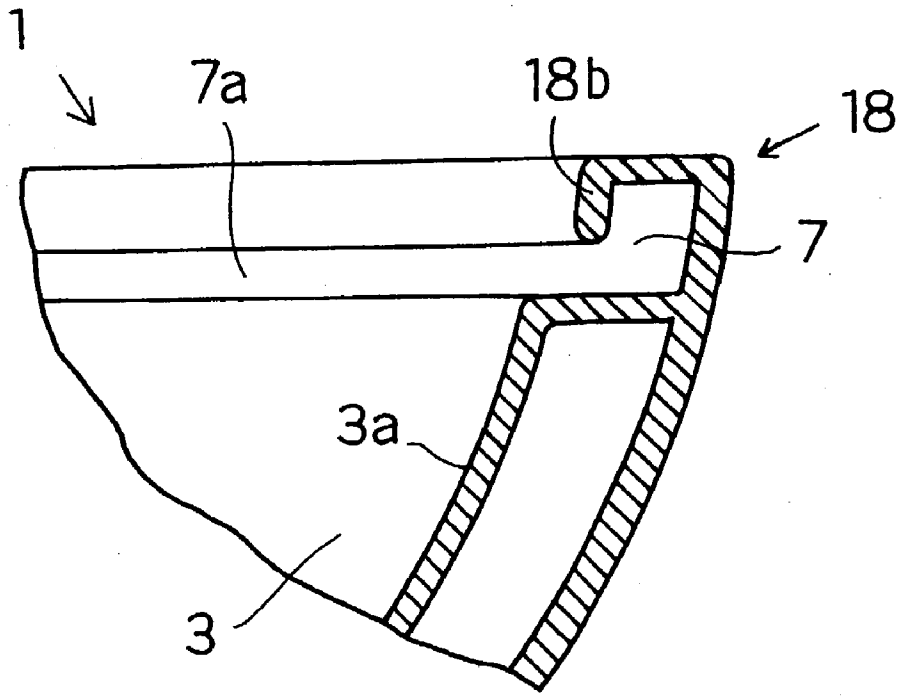


Fig. 3



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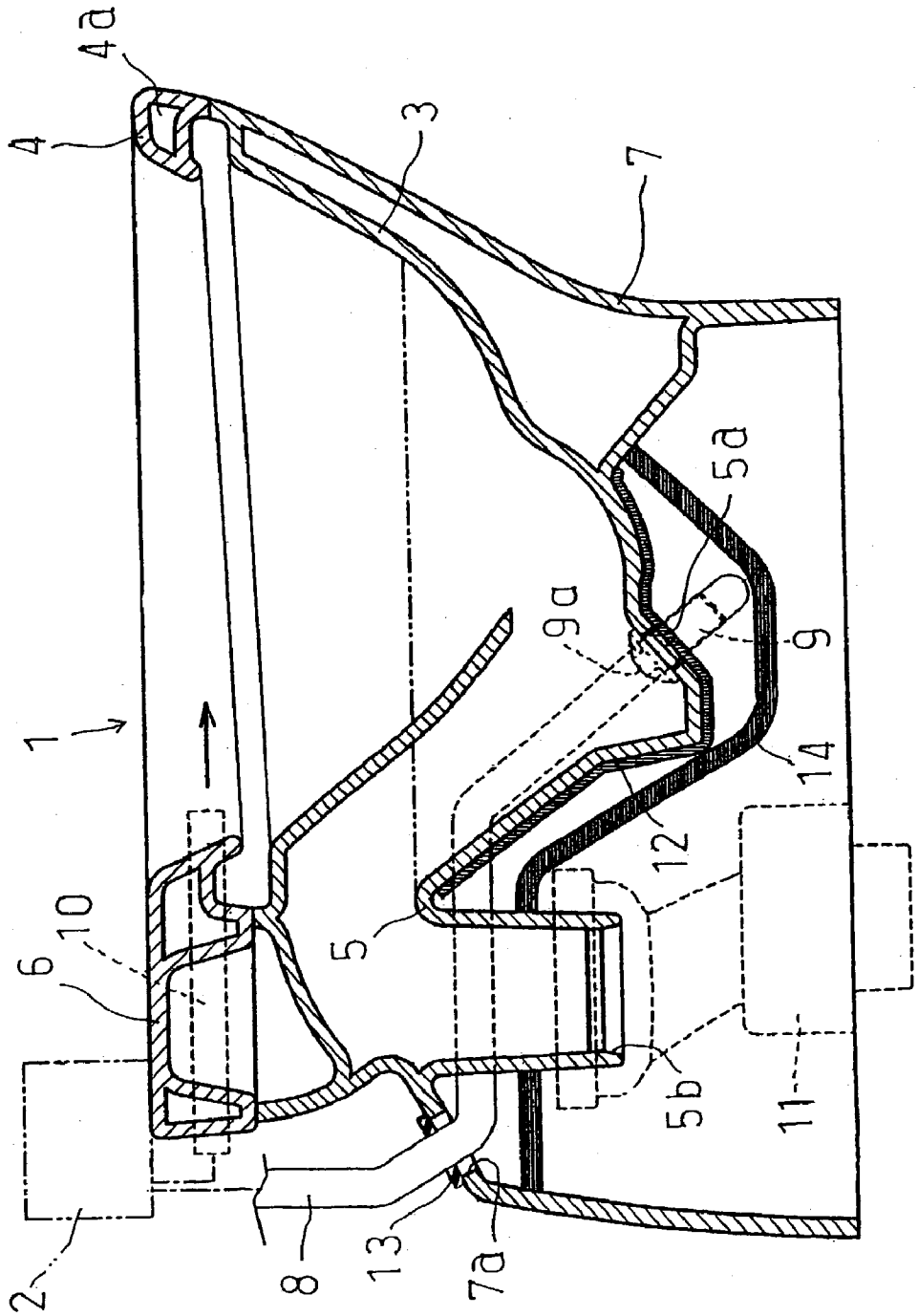
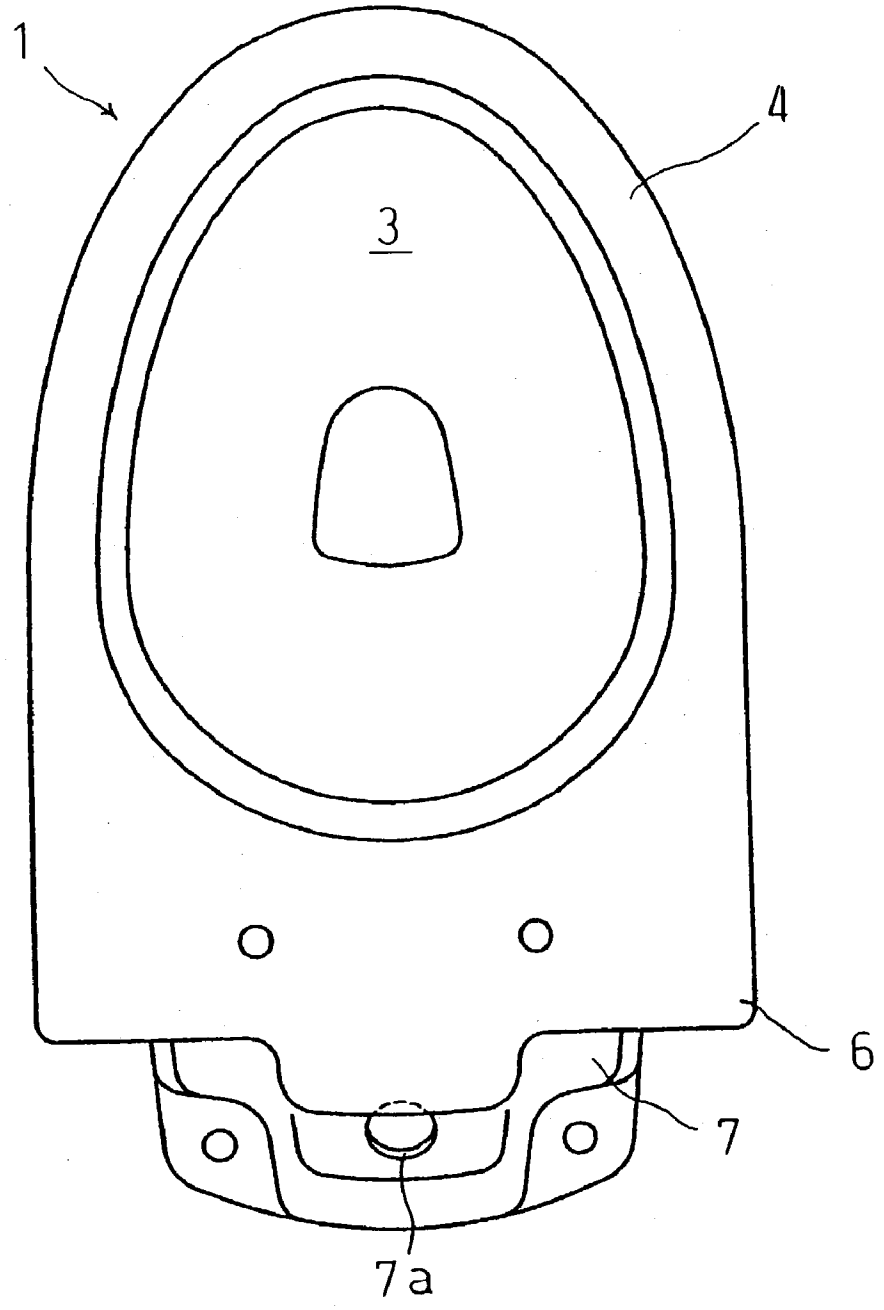


Fig. 5



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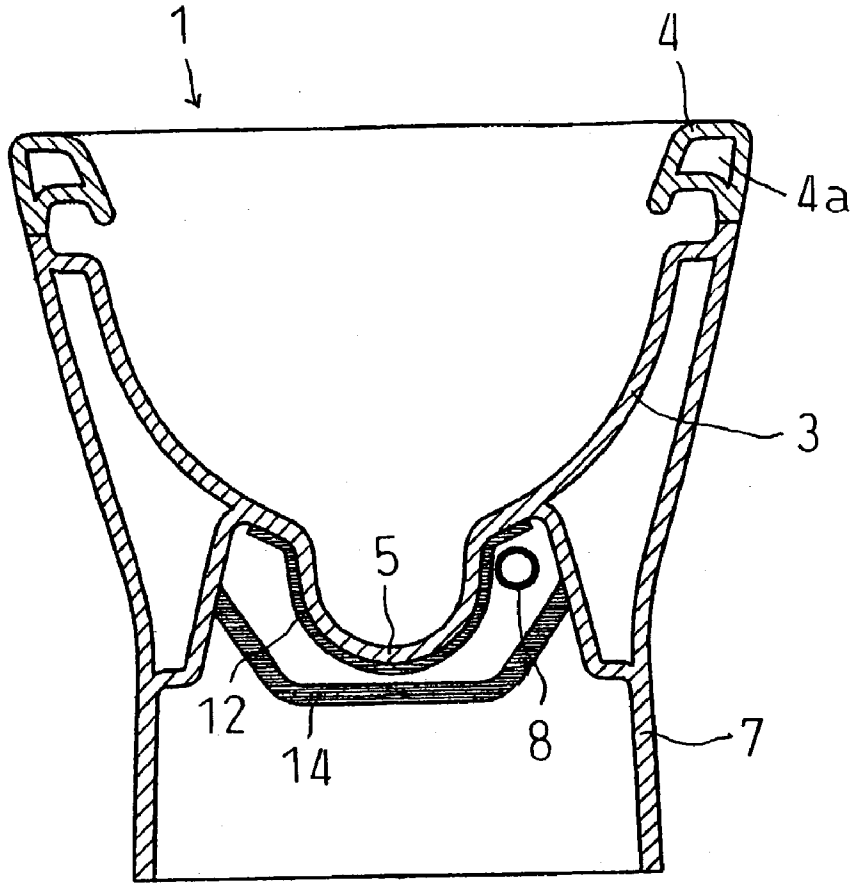
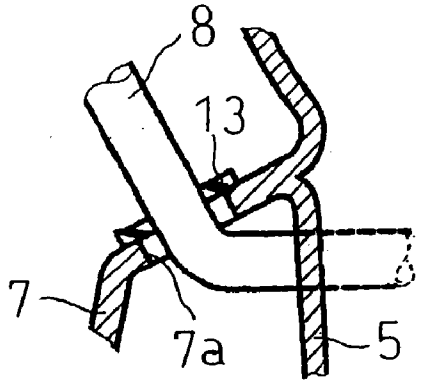


Fig. 7



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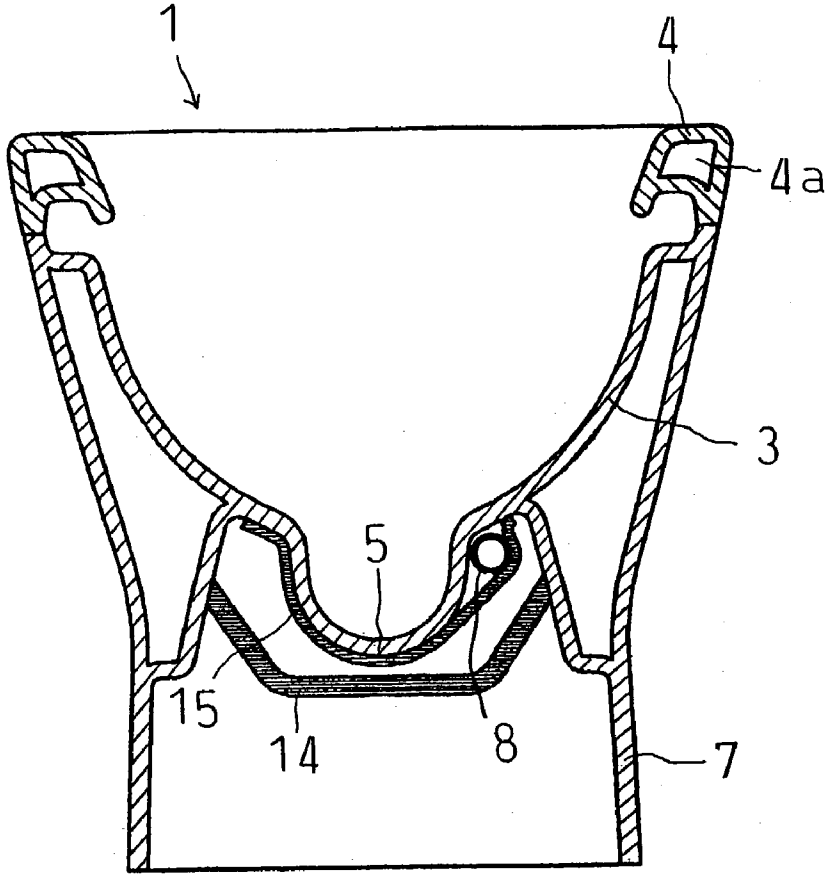
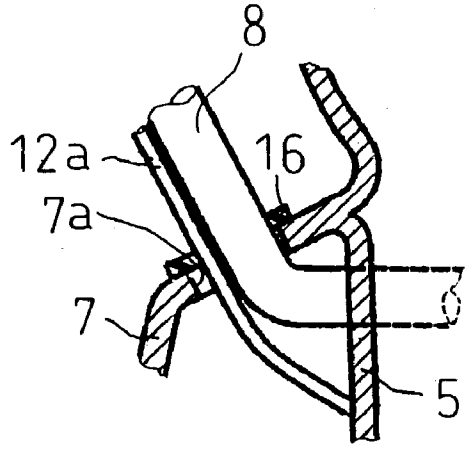


Fig. 9



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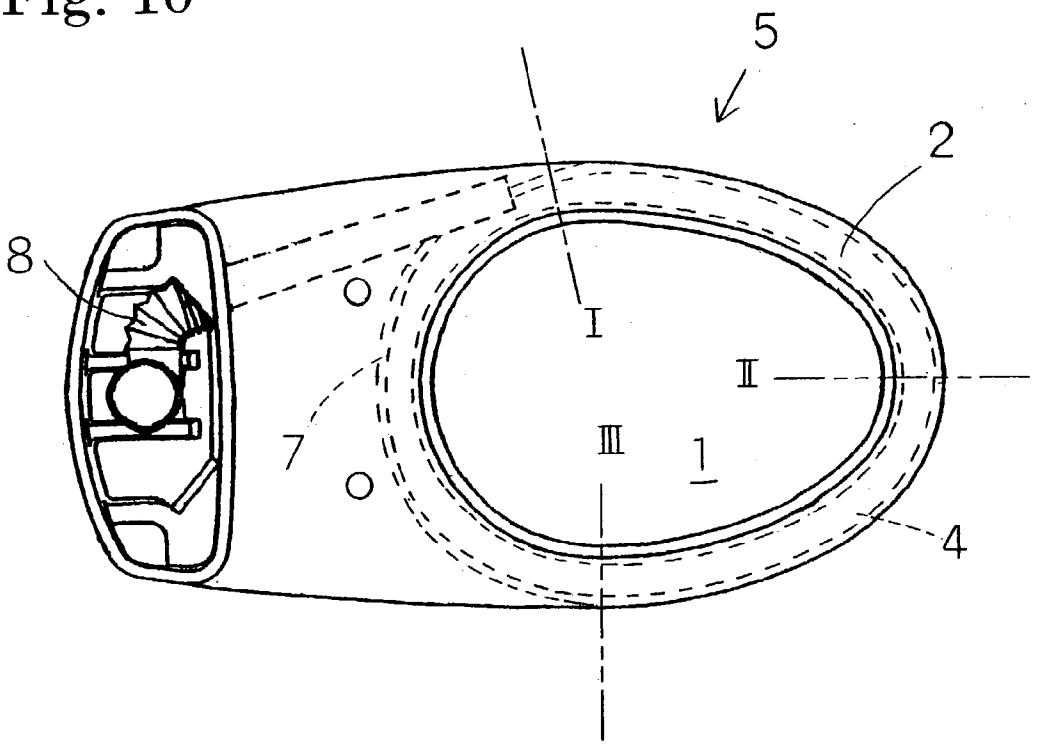

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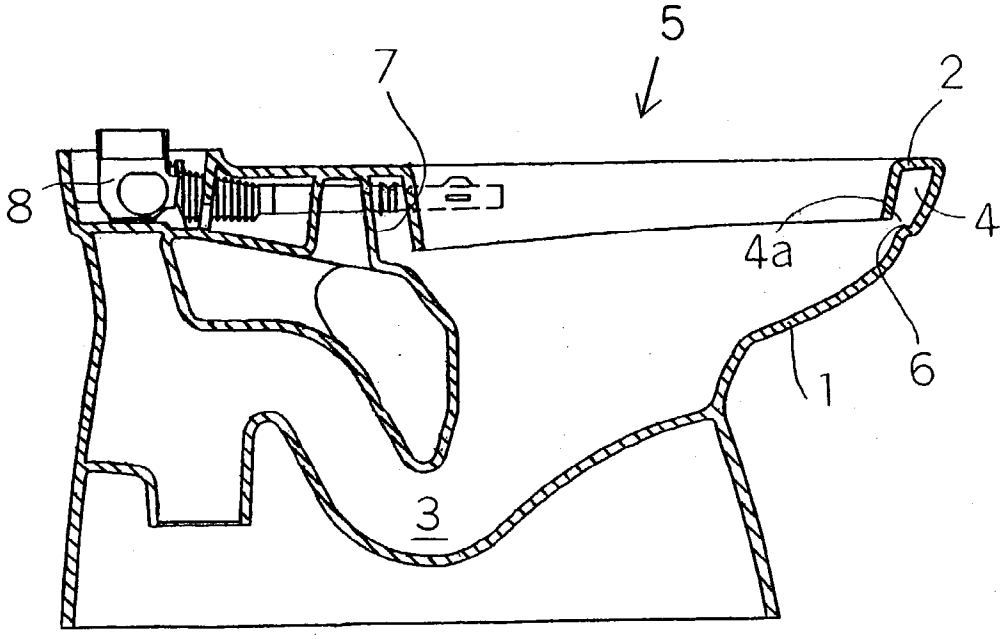

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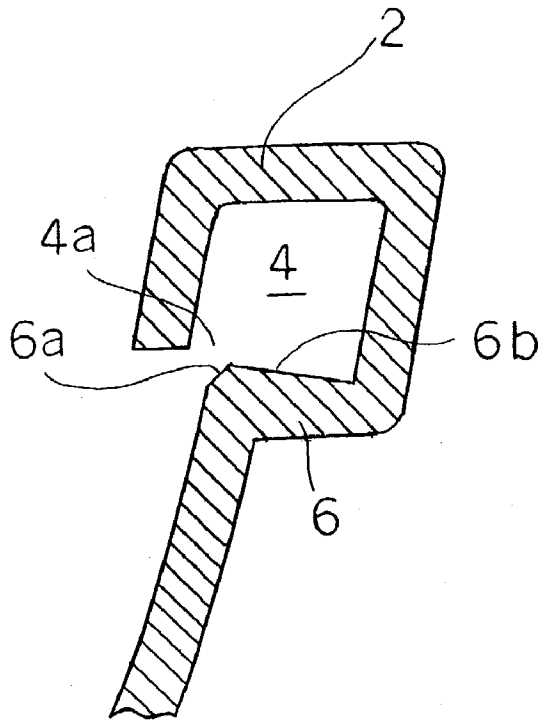

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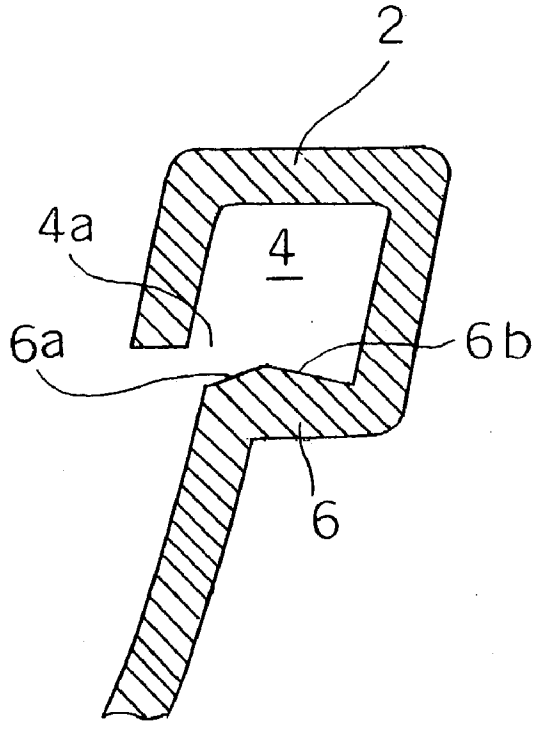

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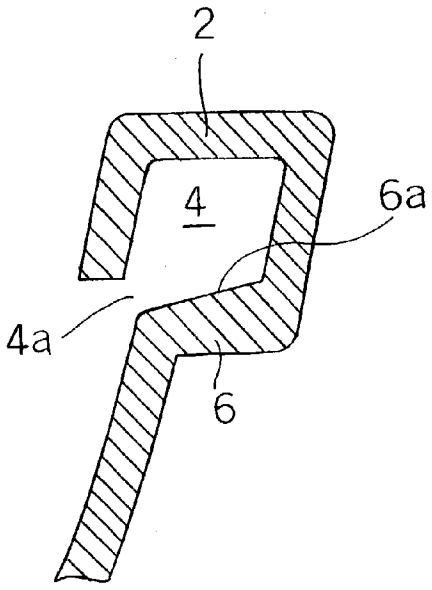

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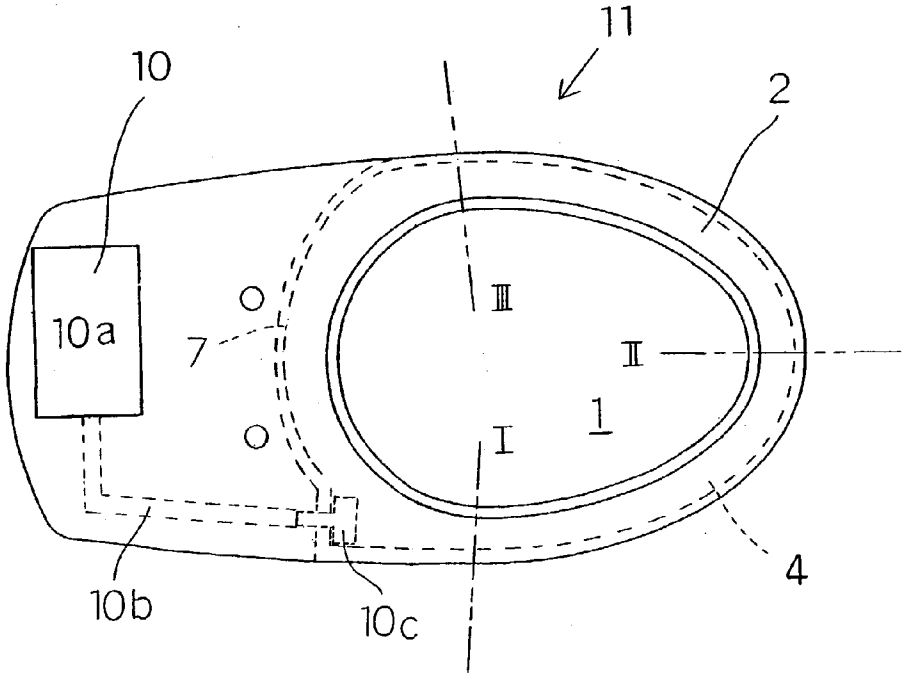

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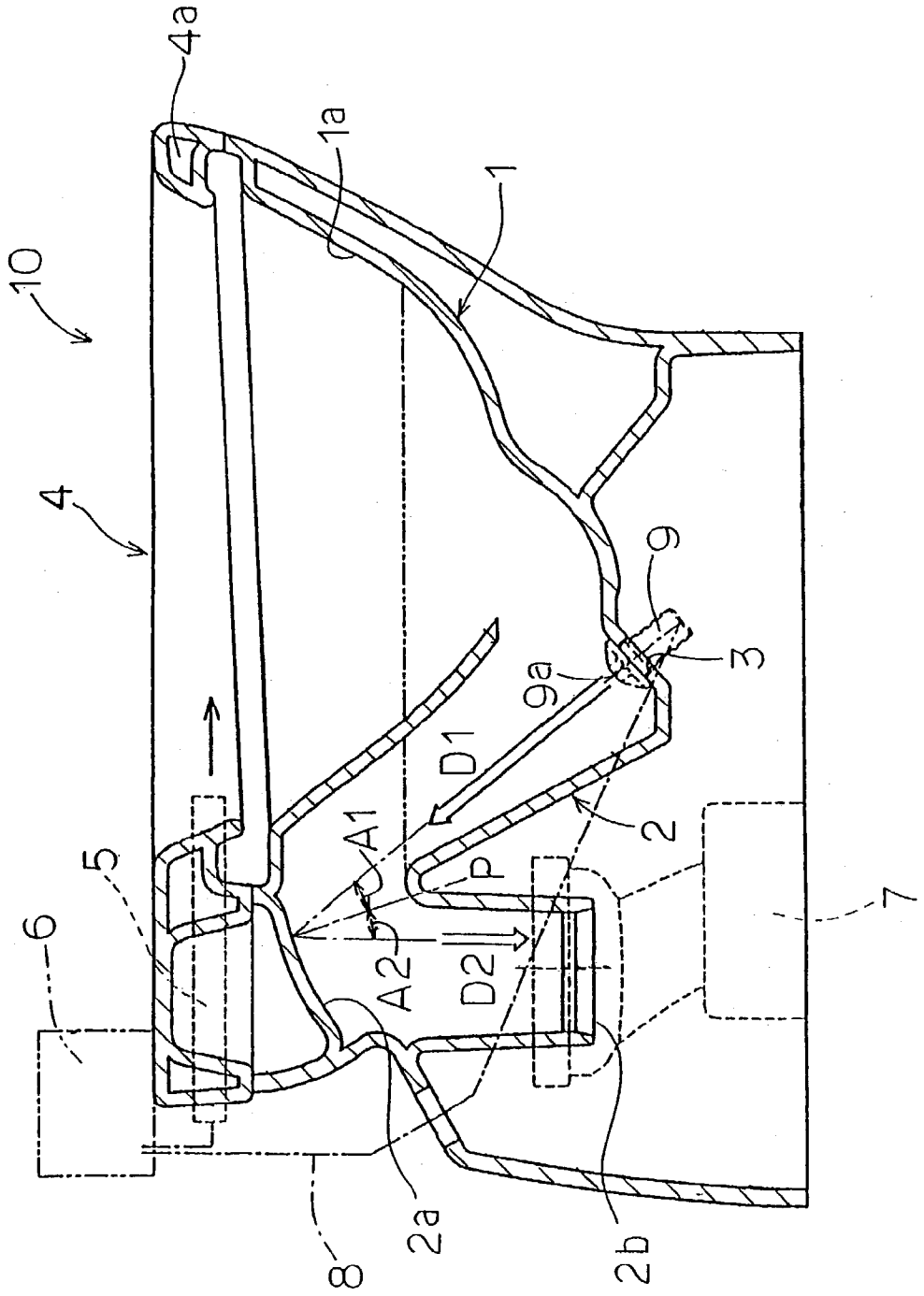

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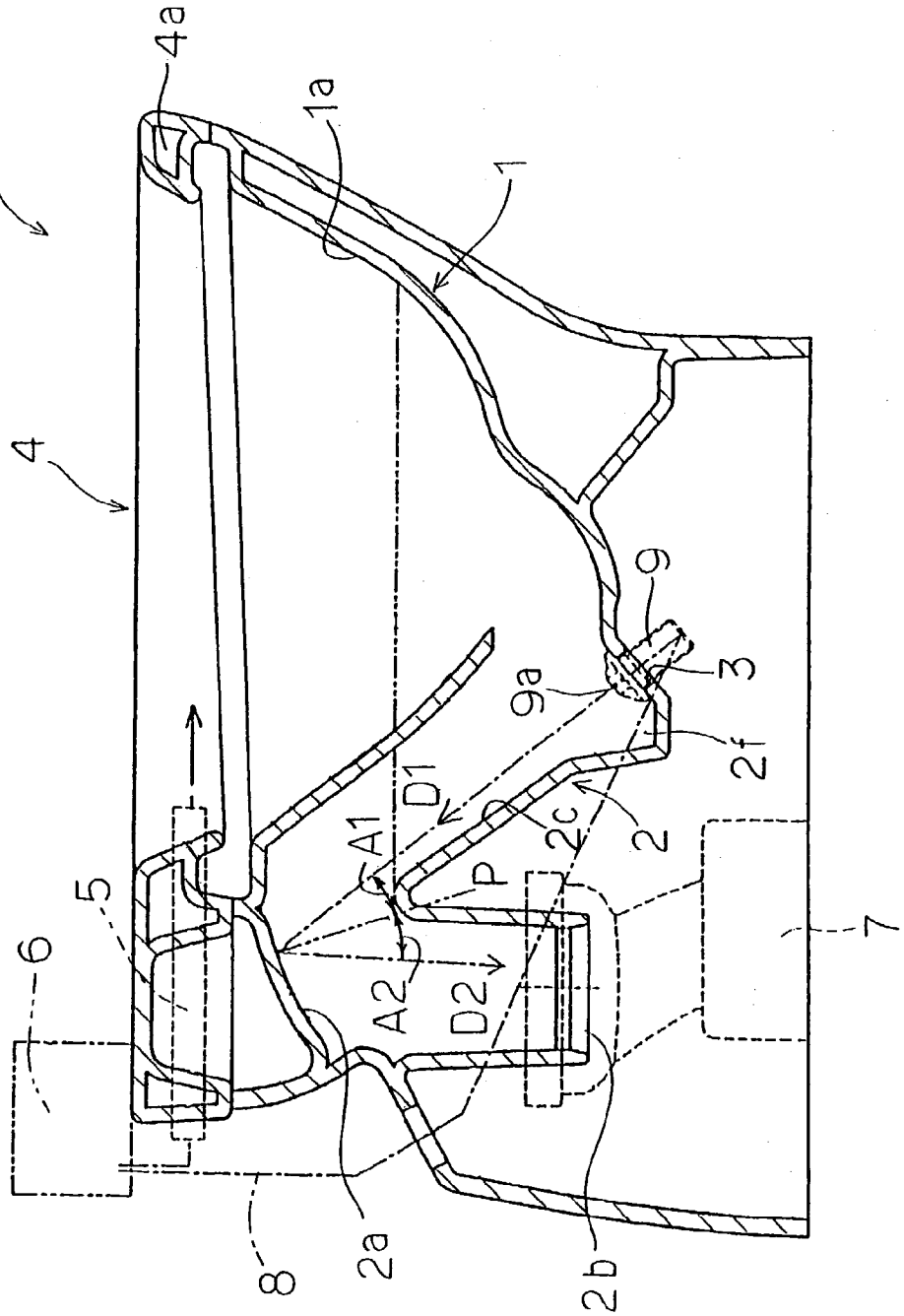

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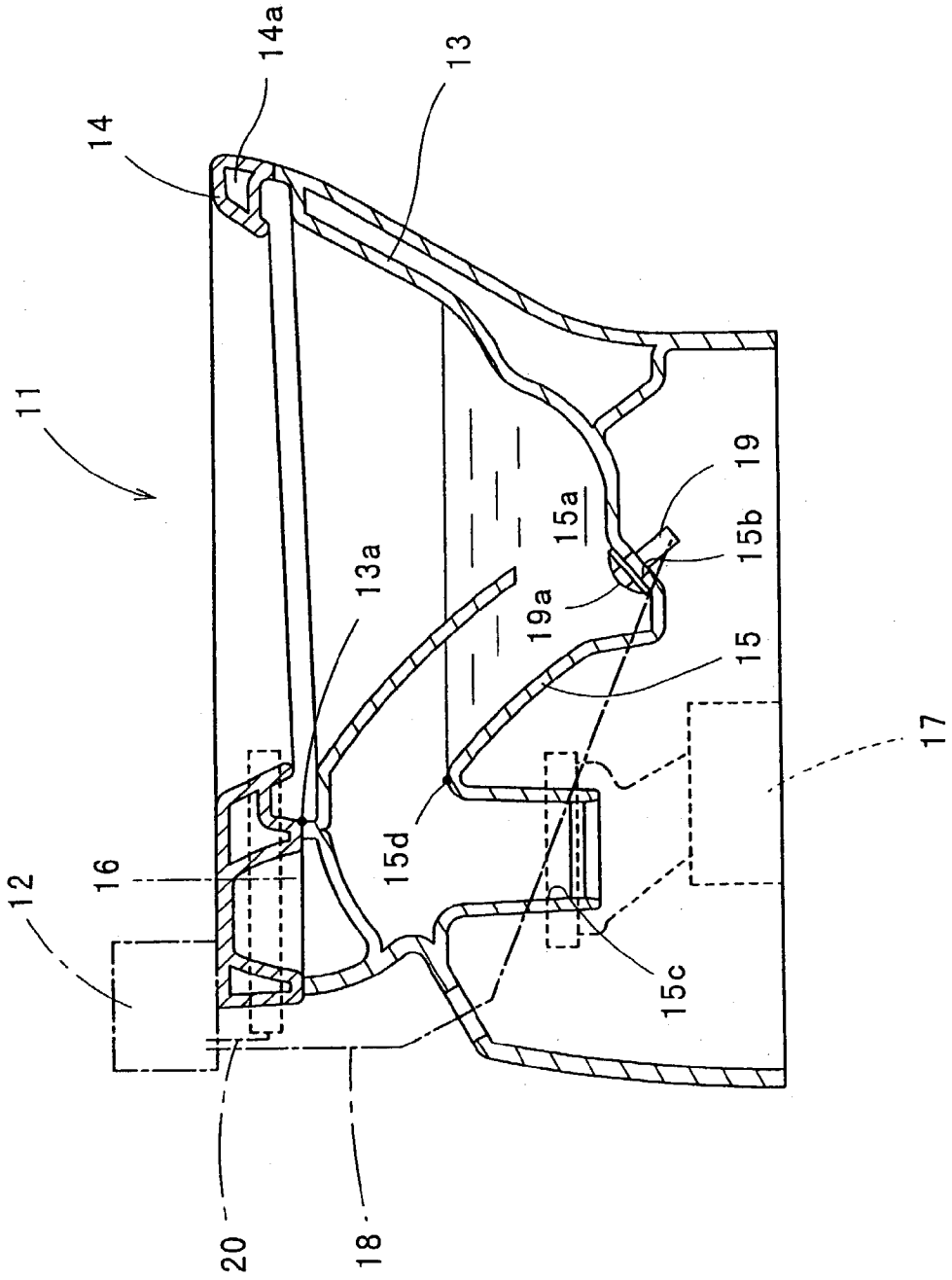

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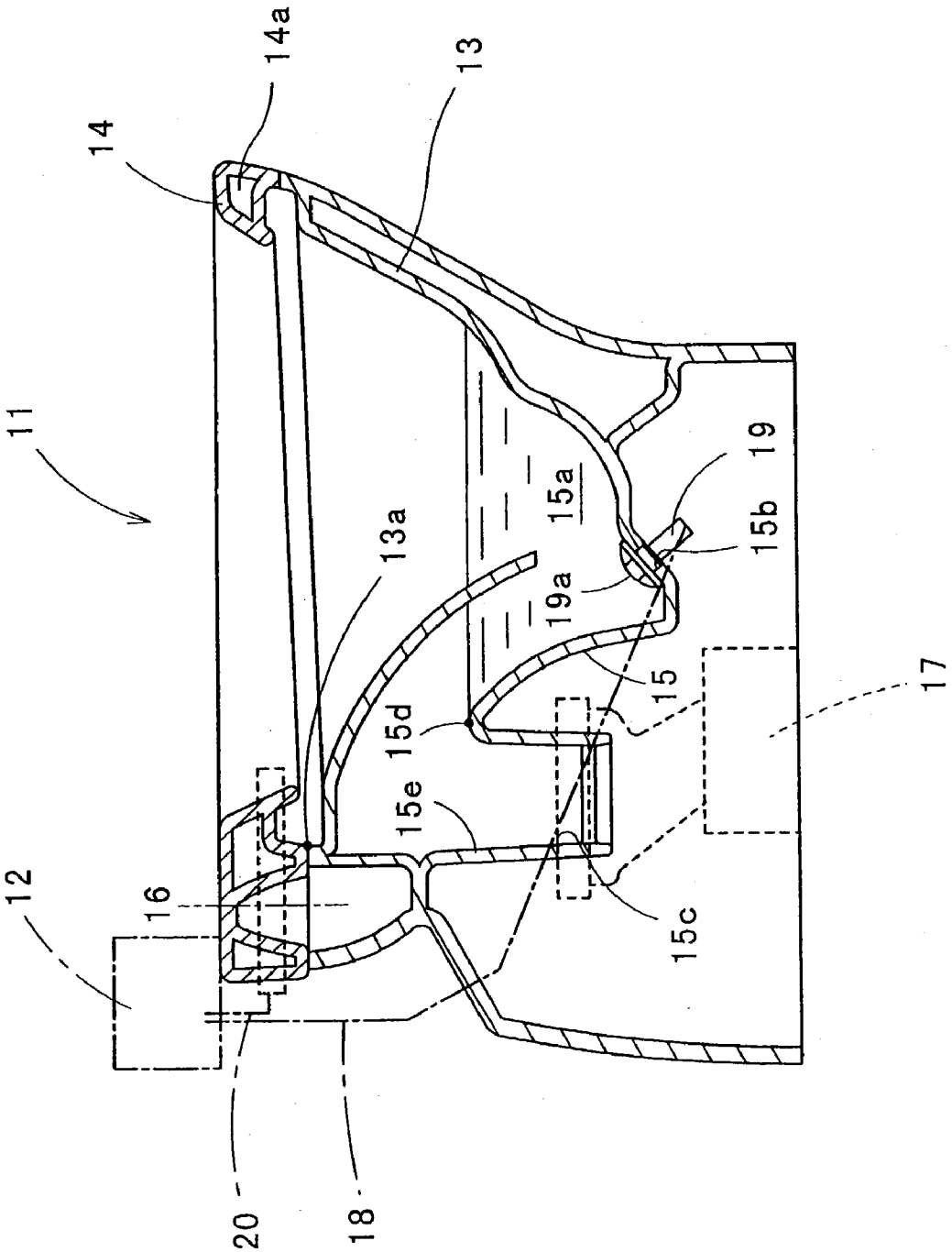

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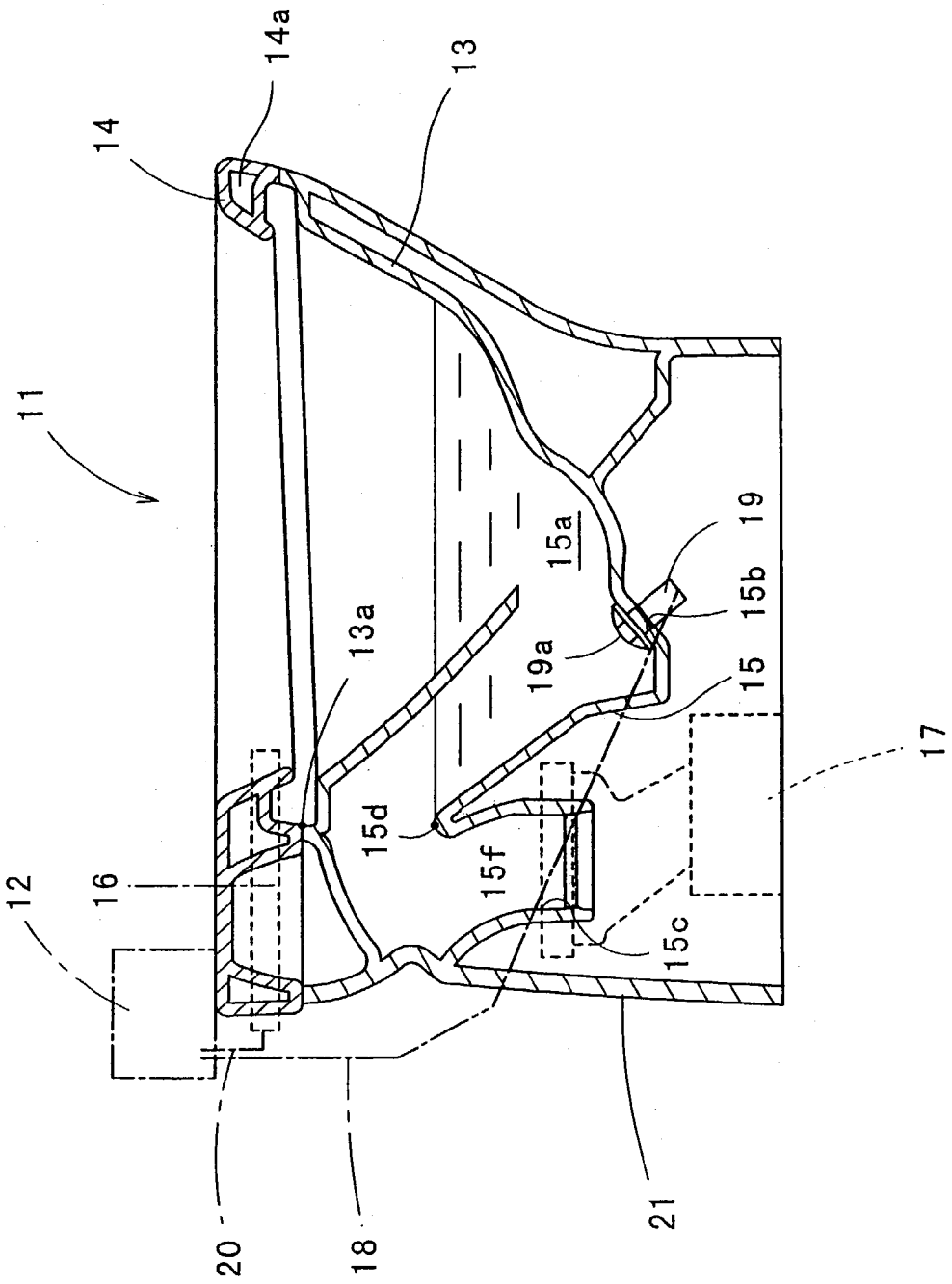

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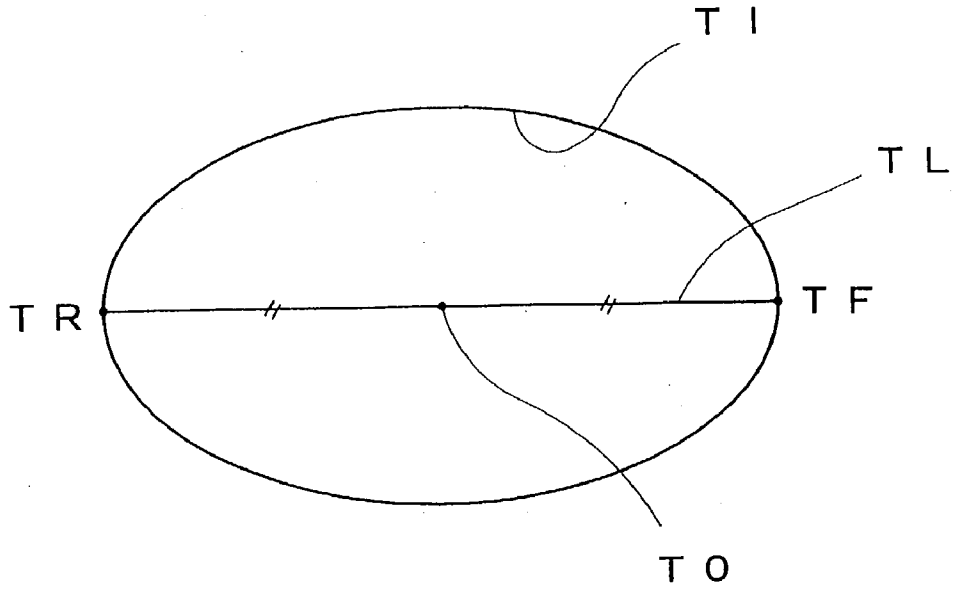

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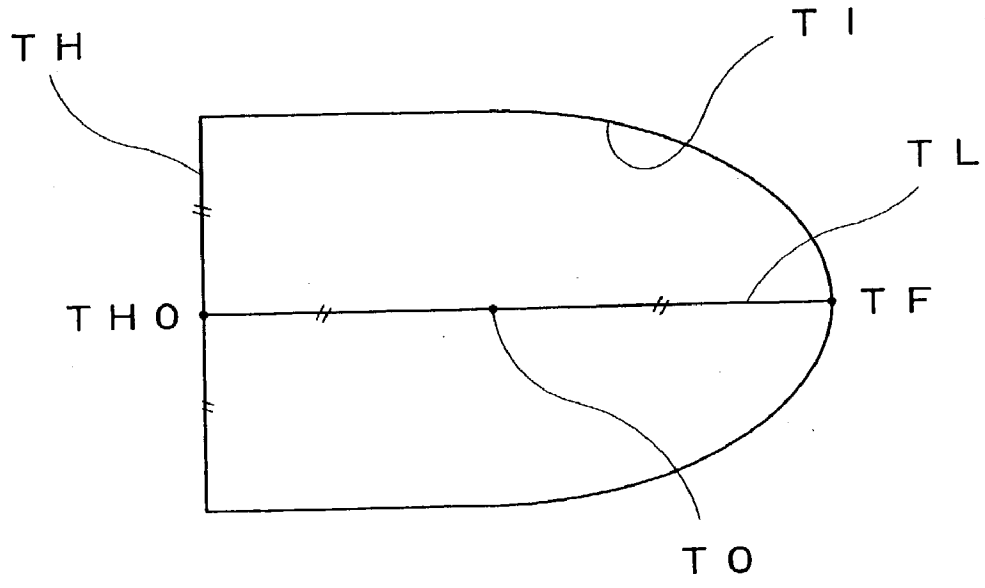

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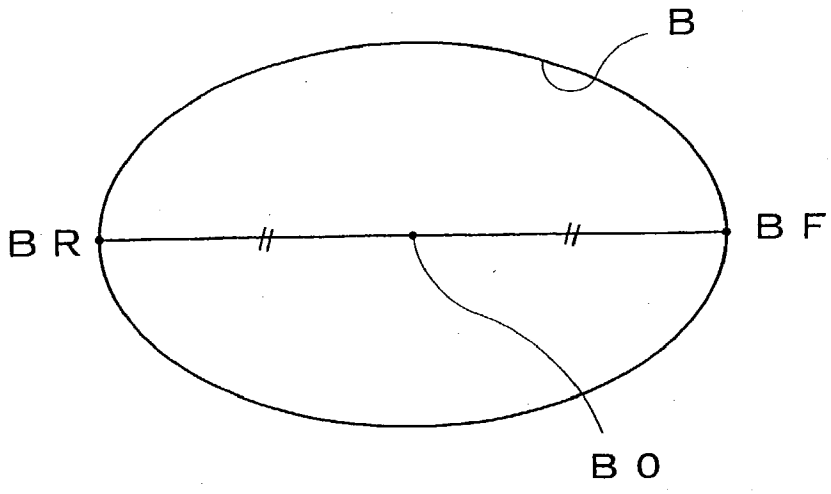
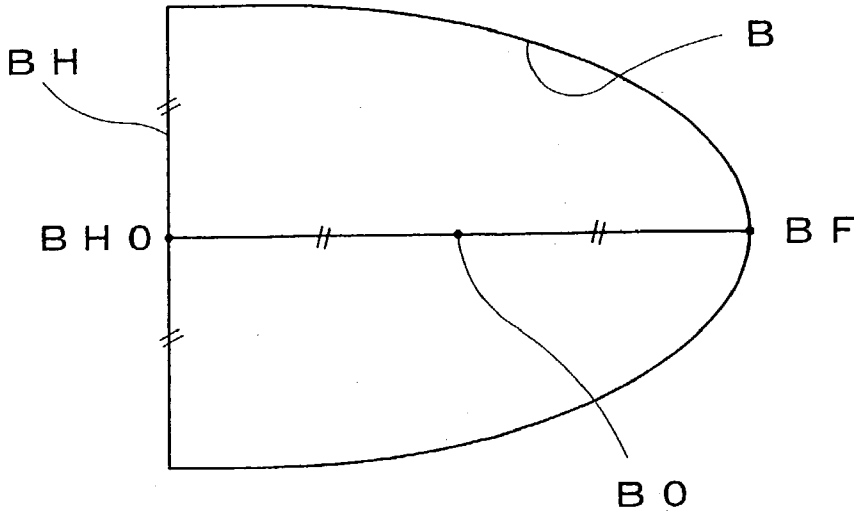


Fig. 24



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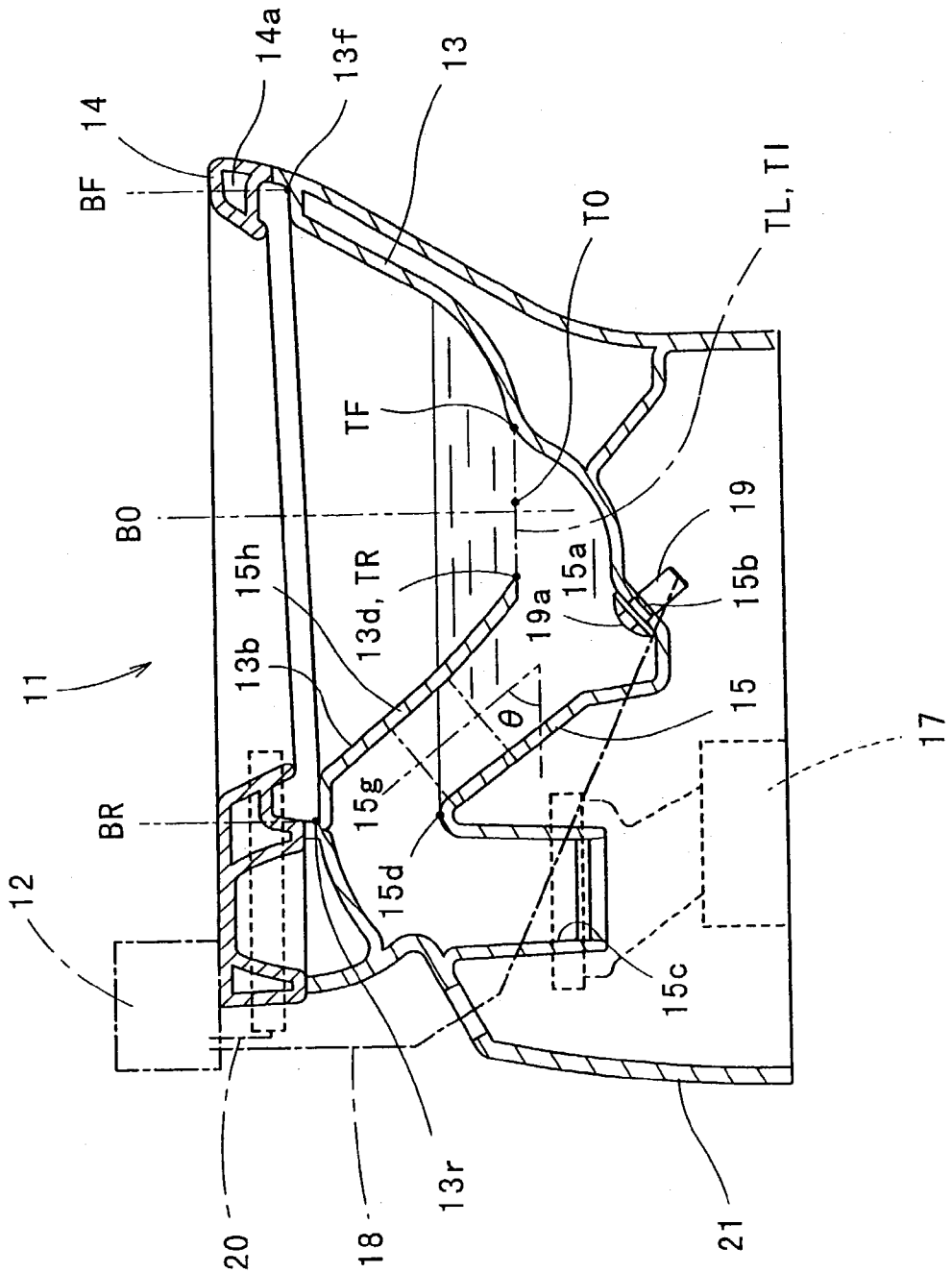
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Fig. 26

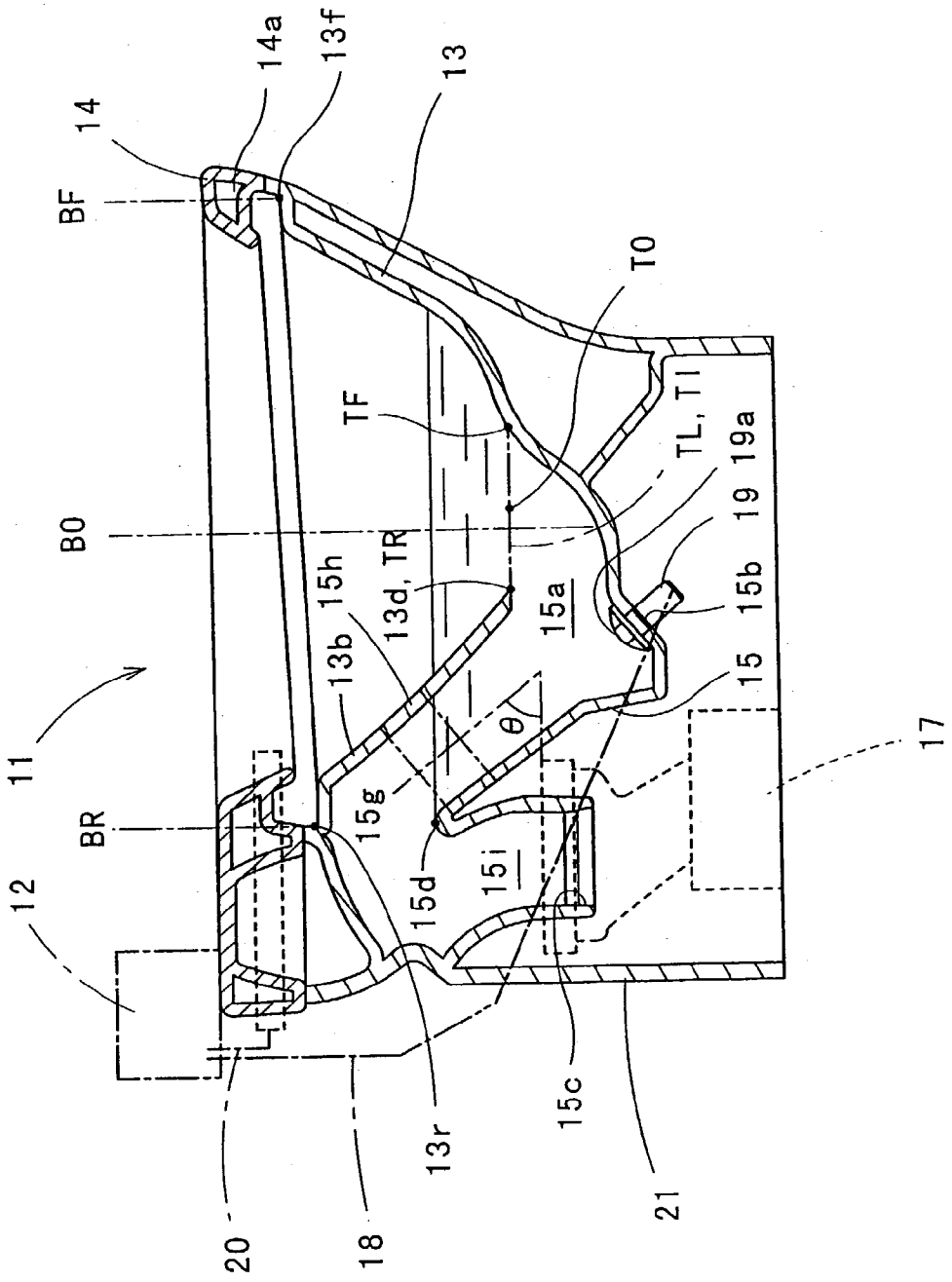
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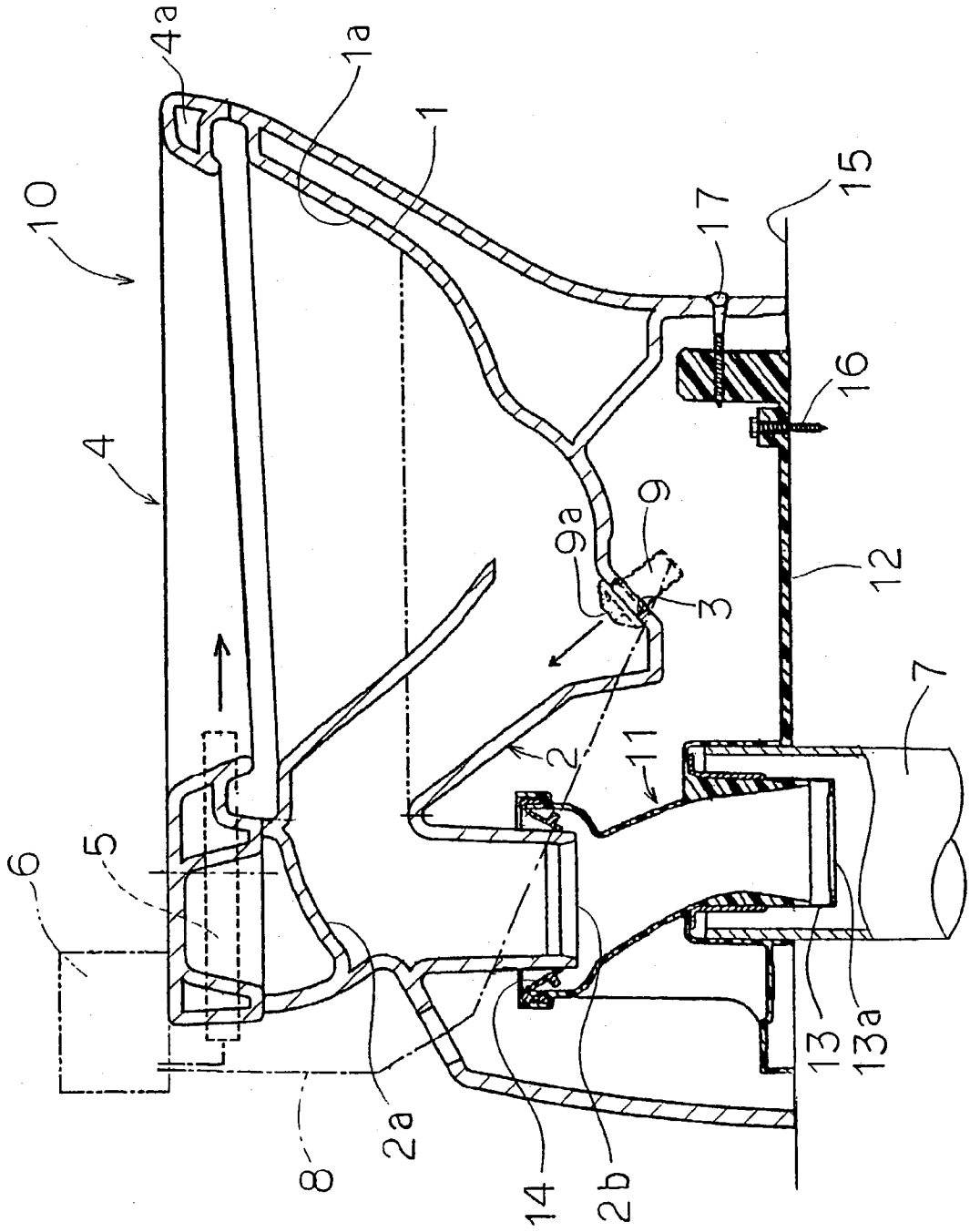
Fig. 27



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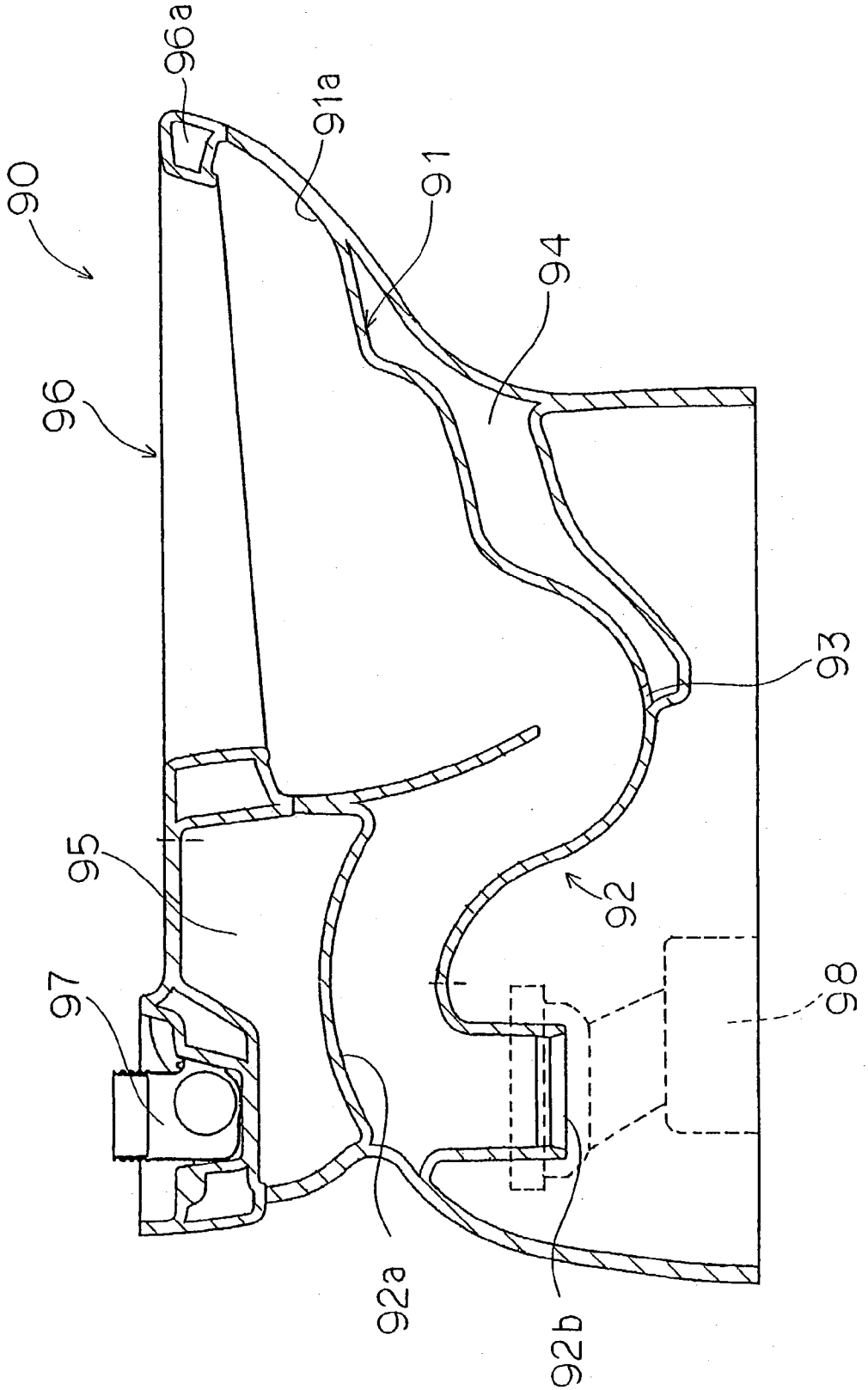

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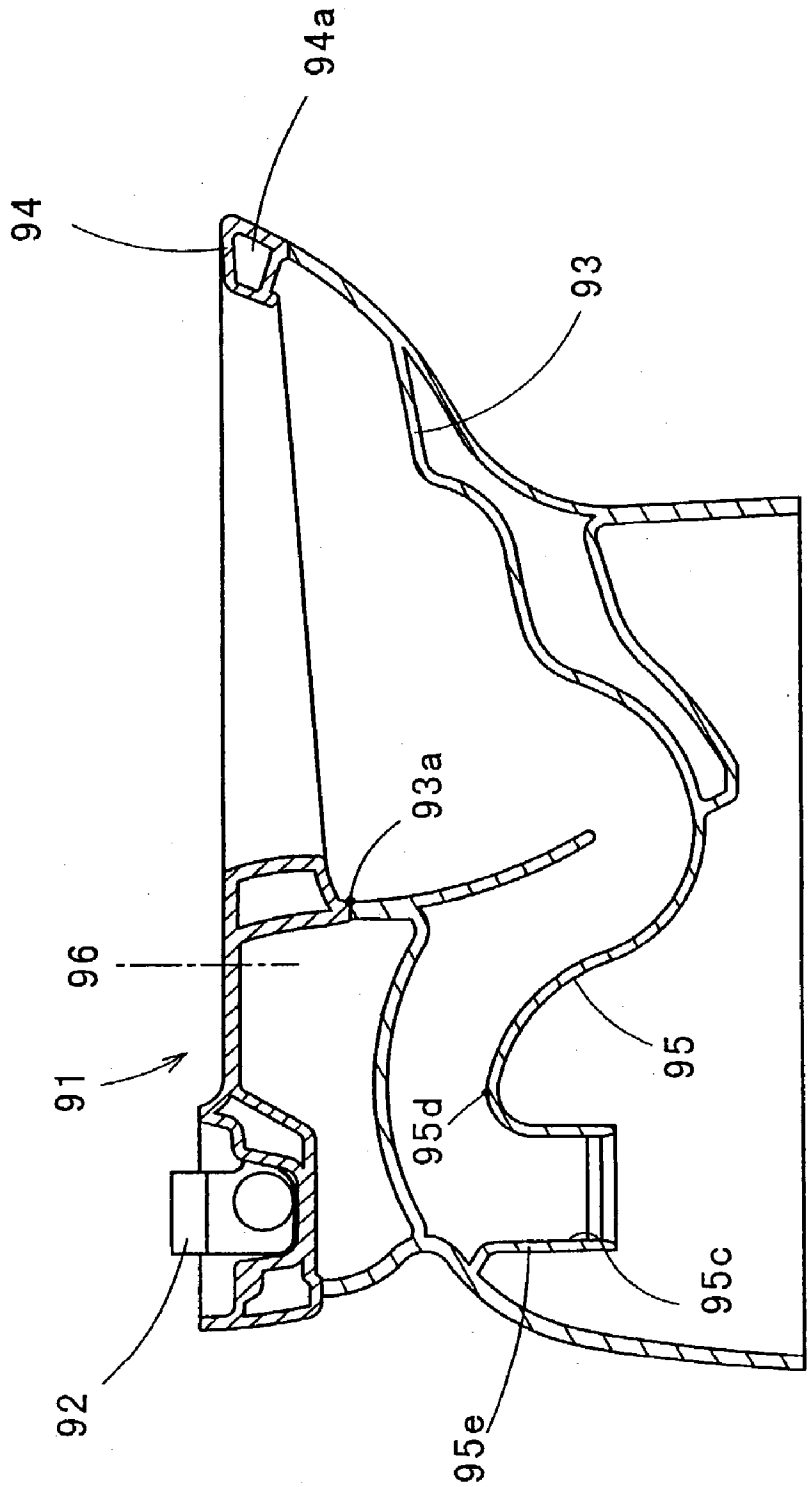
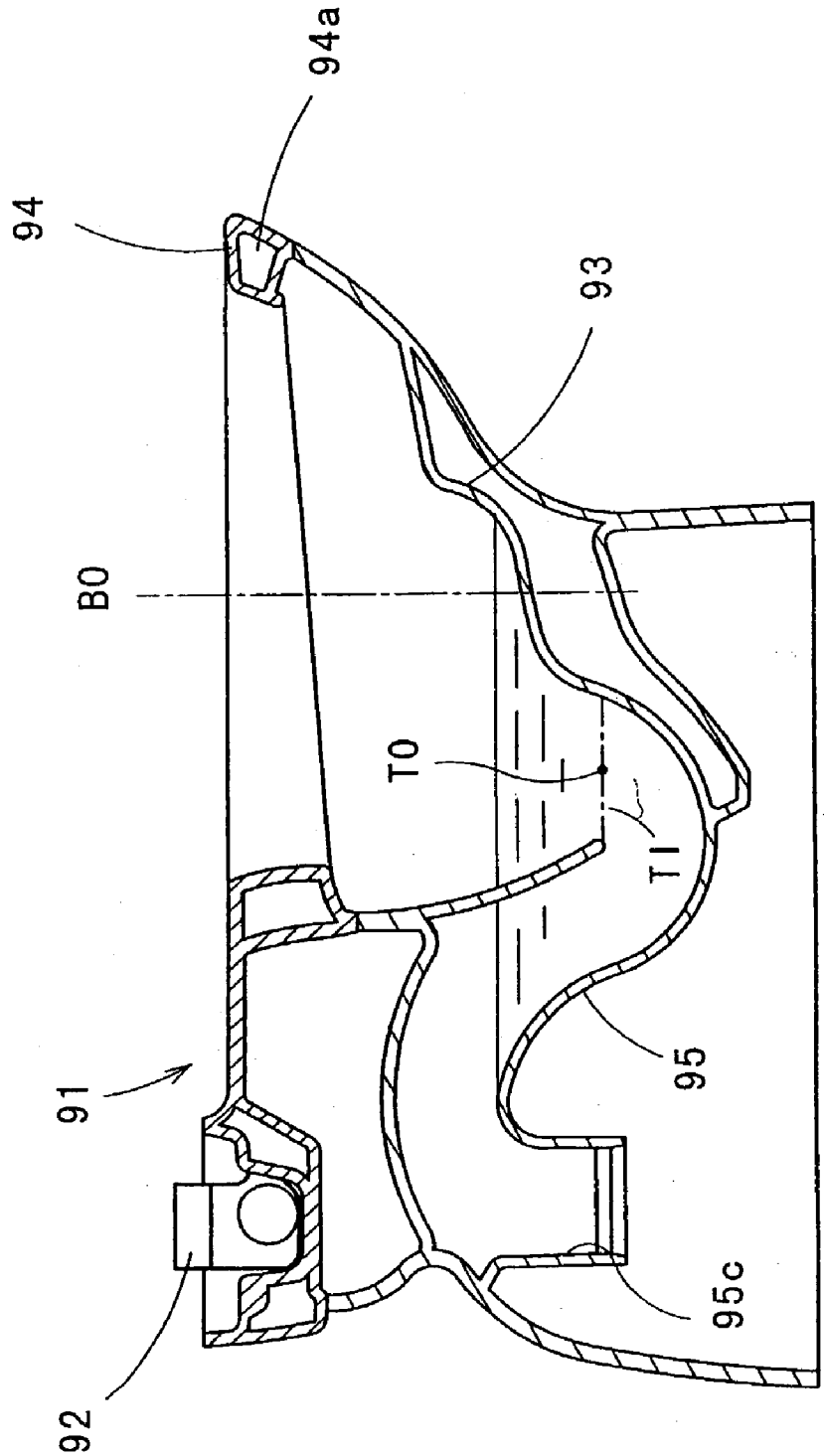


Fig. 30



WESTERN WATER CLOSET

TECHNICAL FIELD

[0001] First to ninth inventions relate to a western-style flush toilet.

BACKGROUND ART

[0002] Conventionally, there has been known a western-style flush toilet which includes a western-style toilet body made of porcelain and a washing device having a water tank such as a low tank which is mounted at the rear of the western-style toilet body and which is capable of spouting water. The western-style toilet body comprises a bowl portion, a rim which is formed at an upper periphery of the bowl portion and which has a rim channel capable of flowing water downward to the bowl portion in the inside thereof and a trap portion which is connected to a lower edge of the bowl portion. The trap portion has a jet opening for spouting water along the trap portion. In the washing device, the water tank is connected to a water supply pipe such as a city water service pipe for supplying water, and the water reserved in the water tank which is capable of being spouted to the rim channel.

[0003] A rim in which a rim channel is exposed to a bowl portion, so-called "an open rim" comprises an upper side wall portion which is protruded inwardly from an upper periphery of the bowl portion in an approximately horizontal direction and an inner side wall portion which is extended from an inner edge of the upper side wall portion in an approximately vertical direction. A rim channel for guiding the water which is spouted from a washing device is formed in the inside of the open rim. In the open rim, the water in the rim channel is spouted to the bowl portion by way of an opening which is formed by the inner side wall portion and the bowl portion.

[0004] A rim in which a rim channel is not exposed to a bowl portion, so-called "a closed rim" comprises an upper side wall portion which is protruded inwardly from an upper periphery of the bowl portion in an approximately horizontal direction, an inner side wall portion which is extended from an inner edge of the upper side wall portion in an approximately vertical direction and a lower side wall portion for connecting a lower edge of the inner side wall portion to the bowl portion. The same rim channel as that of the open rim is formed in the inside of the closed rim. In the closed rim, plural water spout openings which open toward the bowl portion are mounted in the lower side wall portion, and the water in the rim channel is spouted to the bowl portion by way of these water spout openings.

[0005] As a result, in the conventional western-style flush toilet, the bowl portion is washed by the water which is spouted from the washing device.

[0006] Furthermore, in the conventional western-style flush toilet, the bowl portion and the trap portion are constituted by the western-style toilet body made of porcelain, and the jet opening is constituted by a jet nozzle which is separated from the western-style toilet body. The jet nozzle is connected to the washing device by way of a jet pipe.

[0007] In such a western-style flush toilet, the water which is spouted from the washing device is supplied to the rim channel, and due to this, the bowl portion is washed and the reserved water is ensured. Furthermore, the water is also supplied to the jet opening by way of the jet pipe, and this forcibly generates a siphon effect so that the discharge of filth can be performed even by a small amount of water. Accordingly, in the western-style flush toilet, the reduction of the running cost can be realized by saving water. Besides, in the western-style flush toilet, the western-style toilet body made of porcelain has a relatively simple configuration so that the reduction of the manufacturing cost can be realized.

[0008] In addition, there have been known other modifying western-style flush toilets such as the western-style flush toilet in which an anticondensation material is arranged below a trap portion, and the western-style flush toilet in which a jet pipe is surrounded by the other anticondensation material.

[0009] In such western-style flush toilets, even if they are used under the condition that the difference between the water temperature and the room temperature is large and the moisture is high, the trap portion and the jet pipe can be prevented from the heat mainly by the anticondensation material. As a result, it is possible to prevent the trap portion and an outer surface of the jet pipe from a dew drop.

[0010] For example, the western-style flush toilet shown in **FIG. 28** includes a bowl portion **91** which has a bowl face **91***a* and a trap portion **92** which is connected to a bottom portion of the bowl portion **91** by means of a western-style toilet body **90** made of porcelain. The uppermost portion of the trap portion **92** is an upper side wall face **92***a* which is constituted by a curved surface, and the upper side wall face **92***a* is connected downward to a water discharge opening **92***b*. The water discharge opening **92***b* is connected to a water discharge pipe not shown in the drawing by way of a water discharge socket **98**.

[0011] Furthermore, at the bottom portion of the bowl portion **91**, a jet room **94** which is connected to a jet channel not shown in the drawing is formed, and a jet opening **93** which is communicated with the lowermost portion of the jet room **94** is mounted in a bottom portion of a reserved water portion of the trap portion **92** for ensuring the reserved water. In addition, at a rear upper portion of the bowl portion **91**, a water supply room **95** is formed, and the water supply room **95** is connected to a low tank not shown in the drawing by way of a distributor **97** which is a part of a washing device. Besides, a rim **96** which has a rim channel **96***a* in the inside thereof is formed at an upper portion of the bowl portion **91**.

[0012] In such a western-style flush toilet, water is supplied from the law tank to the jet room **94** and the rim channel **96***a*by way of the distributor **97** and the water supply room **95**. The water supplied to the jet room **94** is spouted from the jet opening **93** toward the trap portion **92**. On the while, the water supplied to the rim channel **96***a* flows out from plural water spout openings, which are mounted in a lower edge of the rim **96** and which are not shown in the drawing, to wash the bowl face **91***a* of the bowl portion **91**. At this time, in the western-style flush toilet, the water which is spouted from the jet opening **93** forcibly generates a siphon effect so that the filth discharging ability is large.

[0013] Furthermore, the western-style flush toilet shown in **FIGS. 29 and 30** includes a western-style toilet body **91**

made of porcelain, a water tank which supplies water to the western-style toilet body **91** and which is not shown in the drawing and a washing device such as a distributor **92** or the like. The western-style toilet body **91** comprises a bowl portion **93**, a rim **94** which is formed at the whole of the upper periphery of the bowl portion **93** and which has a rim channel **94***a* capable of flowing water downward to the bowl portion **93** in the inside thereof and a trap portion **95** which is connected to a lower edge of the bowl portion **93**. A water discharge socket which extends upward and downward and which is not shown in the drawing is connected to a water discharge opening **95***c* of the trap portion **95**, and the water discharge socket is connected to a water discharge pipe which is protruded from a floor surface and which is not shown in the drawing.

[**0014**] In such a western-style flush toilet, the water reserved in the water tank is supplied to the rim channel **94***a* by way of the distributor **92**, and then, the water flows downward to the bowl portion **93**. After washing the bowl portion **93**, the water generates a siphon effect by means of the trap portion **95**, and the water together with filth is discharged to the rear side along the trap portion **95**.

[**0015**] Moreover, in the common western-style flush toilet, a water discharge flange made of metal is connected to a water discharge pipe which is protruded from a floor surface, and a discharge opening of a trap portion is connected to the water discharge flange made of metal.

[**0016**] In such a western-style flush toilet, a bowl portion is washed by the water which is supplied from a water tank. When the filth water containing the water and filth is discharged by way of a trap portion, the filth water is partly cut off by a stepped portion which is formed in the trap portion, and as a result, the turbulence is generated to form a water screen. Because of the function of such a water screen, the trap portion is filled with the filth water, and after that, the filled filth water is discharged to the water discharge pipe by breaking the water screen in such a manner that the filth water is dragged into the side of the water discharge pipe.

DISCLOSURE OF THE INVENTION

[**0017**] {First and Second Inventions}

[**0018**] However, in the above-mentioned conventional western-style flush toilet, an inward surface of the rim is protruded inwardly with respect to the bowl face of the bowl portion so that stains are likely to be adhered to the rim. As a result, a nasty smell is easily generated, and the rim is apt to be insanitary.

[**0019**] Namely, in the open rim of the conventional western-style flush toilet, stains caused by a splash of urine generated at the time of using the toilet or a splash generated at the time of going to defecate are likely to be adhered to the rim channel such as a rear side of the upper side wall portion or a rear side of the inner side wall portion. Besides, in the closed rim of the conventional western-style flush toilet, the bove-mentioned stains are apt to be adhered to the inside of the rim channel through a front side of the lower side wall portion or the water spout openings. Such stains adhered to the rim exist at the position which a cleaning person hardly sees. So, it is difficult for the cleaning person to confirm whether or not the stains are adhered or removed, and this makes the cleaning incomplete. As a result, the stains easily remain at the position, and a nasty smell such as ammonia is generated. Accordingly, the person who uses the conventional western-style flush toilet feels uncomfortable, and the western-style flush toilet becomes insanitary.

[**0020**] The first and second inventions have been made in view of the above circumstances and it is the first and second tasks to be solved to provide a sanitary western-style flush toilet in which stains are difficult to be adhered to a rim, and a nasty smell is hardly generated.

[**0021**] With respect to the western-style flush toilet of the first invention, in a western-style flush toilet including a western-style toilet body comprising a bowl portion and a rim which is formed at an upper periphery of the bowl portion and which has a rim channel in the inside thereof, and

[**0022**] a washing device which is capable of spouting water to the rim channel, wherein the water which is spouted from the washing device is provided for washing the bowl portion by way of the rim channel,

[**0023**] the improvement is characterized in that an inward surface of the rim is an identical surface to a bowl face of the bowl portion at least at the front side.

[**0024**] In the western-style flush toilet of the first invention, the inward surface of the rim is an identical surface to the bowl face of the bowl portion at least at the front side, so stains are hardly adhered to the rim. For example, if the rim is an open rim, stains are hardly adhered to the rim channel such as a rear side of an upper side wall portion or a rear side of an inner side wall portion. Besides, if the rim is a closed rim, stains are hardly adhered to the inside of the rim channel through a front side of a lower side wall portion or water spout openings.

[**0025**] Furthermore, in the western-style flush toilet of the first invention, since the inward surface of the rim is an identical surface to the bowl face of the bowl portion, stains exist at the position which a cleaning person easily sees, and in addition, the stains are easily wiped out at one time. Accordingly, it is possible for the cleaning person to carry out the cleaning satisfactorily.

[**0026**] In the western-style flush toilet of the first invention, if the inward surface of the rim is an identical surface to the bowl face of the bowl portion at least at the front side, the minimum operation and effect of the first invention can be obtained. The reason of this is that stains caused by a splash of urine generated at the time of using the toilet or a splash generated at the time of going to defecate are likely to be positioned at the front side. In this respect, it is desirable that the inward surface of the rim is an identical surface to the bowl face of the bowl portion at the whole of the upper periphery of the bowl portion. With such a constitution, it is possible to prevent the stains which is caused by a splash of urine generated at the time of using the toilet or a splash generated at the time of going to defecate from being adhered to the rim at any position of the upper periphery of the bowl portion, and the operation and effect of the first invention can be surely achieved.

[**0027**] With respect to the western-style flush toilet of the second invention, in a western-style flush toilet including a

western-style toilet body comprising a bowl portion and a rim which is formed at an upper periphery of the bowl portion and which has a rim channel in the inside thereof, and

[0028] a washing device which is capable of spouting water to the rim channel, wherein the water which is spouted from the washing device is provided for washing the bowl portion by way of the rim channel,

[0029] the improvement is characterized in that an inward surface of the rim is positioned outwardly with respect to a bowl face of the bowl portion at least at the front side.

[0030] In the western-style flush toilet of the second invention, the inward surface of the rim is positioned outwardly with respect to the bowl face of the bowl portion at least at the front side, so stains are hardly adhered to the rim as well.

[0031] Furthermore, in the western-style flush toilet of the second invention, since the inward surface of the rim is positioned outwardly with respect to the bowl face of the bowl portion, stains exist at the position which a cleaning person easily sees, and it is possible for the cleaning person to carry out the cleaning satisfactorily. However, the ease of wiping out the stains is somewhat inferior as compared with the western-style flush toilet of the first invention.

[0032] In the western-style flush toilet of the second invention, if the inward surface of the rim is positioned outwardly with respect to the bowl face of the bowl portion at least at the front side, the minimum operation and effect of the second invention can be obtained. In addition, it is desirable that the inward surface of the rim is positioned outwardly with respect to the bowl face of the bowl portion at the whole of the upper periphery of the bowl portion.

[0033] In the western-style flush toilet of the first and second inventions, it is desirable that the western-style flush toilet has a stepped portion which forms the rim channel at a boundary between the bowl portion and the rim. With such a constitution, the water which is spouted from the washing device doesn't flow downward to the bowl portion immediately, and the water gradually flows downward to the bowl portion to be discharged while whirling satisfactorily in the rim channel. As a result, it is possible to improve the washing effect of the whole of the bowl portion.

[0034] Moreover, in the western-style flush toilet of the first and second inventions, the rim channel may open at the whole periphery between the inward surface of the rim and the bowl face of the bowl portion. It is so-called an open rim. With such a constitution, it is possible to obtain an advantage in the manufacturing cost.

[0035] On the other hand, in the western-style flush toilet of the first and second inventions, the rim channel may open by means of water spout openings between the inward surface of the rim and the bowl face of the bowl portion. It is so-called a closed rim. With such a constitution, although there is a disadvantage in the manufacturing cost, an amount of water which is spouted to the bowl portion is easily adjusted by the water spout openings so that the washing effect of the whole of the bowl portion can be improved.

[0036] {Third Invention}

[0037] However, in the above-mentioned conventional western-style flush toilet, provided that the western-style flush toilet is used in a cold area, water and the like in the trap portion would be frozen. As a result, there exists the possibility that the western-style flush toilet may not be used during the cold season, and that it may be damaged.

[0038] In this regard, a heater may bemounted below the trap portion. With such a constitution, even if the western-style flush toilet is used in a cold area, the trap portion can be heated by the heater. So, the water and the like in the trap portion is prevented from being freezing, and it is realized that the western-style flush toilet can be used during the cold season, and that the western-style flush toilet can be prevented from being damaged.

[0039] However, in such a western-style flush toilet, even if the heater is mounted below the trap portion, there is the case that water in the jet pipe is frozen. Especially, in the western-style flush toilet, since the jet pipe is separated from the western-style toilet body having the heater, there is more tendency that the water in the jet pipe is frozen as compared with the conventional western-style flush toilet in which a western-style toilet body has a jet channel. In this case, if the jet pipe is heated by the other heater except the heater for heating the trap portion, the manufacturing cost would be pushed up. In such a case, it is impossible to realize the reduction of the manufacturing cost and the running cost, simultaneously with the keeping of the condition that the western-style flush toilet can be used during the cold season and the prevention of the western-style flush toilet from being damaged.

[0040] The third invention has been made in view of the above circumstances and it is the third task to be solved to provide a western-style flush toilet which can realize the reduction of the manufacturing cost and the running cost, simultaneously with the keeping of the condition that the western-style flush toilet can be used during the cold season and the prevention of the western-style flush toilet from being damaged.

[0041] With respect to the western-style flush toilet of the third invention, in a western-style flush toilet including a bowl portion, a trap portion which is connected to a lower edge of the bowl portion and a jet opening which is mounted at the trap portion in order to spout water along the trap portion, wherein the bowl portion and the trap portion are constituted by a western-style toilet body made of porcelain, and the jet opening is constituted by a jet nozzle which is connected to a washing device capable of spouting the water by way of a jet pipe,

[0042] the improvement is characterized in that the jet pipe is heated by a heater which heats the trap portion.

[0043] In the western-style flush toilet of the third invention, since the jet pipe is heated by the heater which heats the trap portion, water in the jet pipe can be prevented from being freezing even if the western-style flush toilet is used in a cold area. Accordingly, it is possible to realize the reduction of the running cost by saving water, simultaneously with the keeping of the condition that the western-style flush toilet can be used during the cold season and the prevention of the western-style flush toilet from being

damaged. Besides, a unique heater for the jet pipe is unnecessary, and the reduction of the manufacturing cost can be realized.

[0044] It is preferable that an object having faces is adopted as the heater. Such a heater has been already known. The heater like this can easily surround the trap portion, and the operation and effect of the third invention can be realized by positioning the jet pipe near the heater. In addition, such a heater can easily surround the trap portion and the jet pipe so that the operation and effect of the third invention can be realized.

[0045] In the western-style toilet body, an opening for guiding the jet pipe toward the inside can be formed. On the other hand, it is general that a code which is connected to an external power source is formed at the heater. It is preferable that such a code opens at the opening in the western-style toilet body. Otherwise, an opening into which a code is inserted should be separately formed in the western-style toilet body so that it becomes cumbersome to manufacture the western-style toilet body. As a result, this pushes up the manufacturing cost, and furthermore, an appearance is deteriorated. The opening like this is preferably mounted in the position which is likely to be seen from the upper part. Due to this, an assembling of the western-style flush toilet is improved.

[0046] As the washing device, except the conventional water tank, it is possible to adopt a washing device which is directly connected to a water supply pipe such as a city water service pipe for supplying water from the outside, and which is capable of spouting water by opening and closing an open/close valve. In case such a latter washing device is adopted, the effect of the third invention is large because of the following situations. With respect to the prior party washing device, water is once reserved and then spouted. So, at the time of reserving the water, the reserved water is heated by other heater or the like, and it is relatively easy to prevent water in the jet pipe from being freezing. On the contrary, in the latter washing device, since fresh water is spouted from the water supply pipe of the outside from time to time, water existed in the outside flows in the jet pipe, and the water is likely to be frozen in the jet pipe during the cold season.

[0047] {Fourth Invention}

[0048] However, in the above-mentioned conventional western-style flush toilet, an anticondensation material of the trap portion is separated from an anticondensation material of the jet pipe. As a result, this pushes up the manufacturing cost.

[0049] The fourth invention has been made in view of the above circumstances and it is the fourth task to be solved to provide a western-style flush toilet which can realize the reduction of the manufacturing cost.

[0050] With respect to the western-style flush toilet of the fourth invention, in a western-style flush toilet including a bowl portion, a trap portion which is connected to a lower edge of the bowl portion and a jet opening which is mounted at the trap portion in order to spout water along the trap portion, wherein the bowl portion and the trap portion are constituted by a western-style toilet body made of porcelain, and the jet opening is constituted by a jet nozzle which is connected to a washing device capable of spouting the water by way of a jet pipe,

[0051] the improvement is characterized in that the jet pipe is prevented from a dew drop by means of the anticondensation material which prevents the trap portion from a dew drop.

[0052] In the western-style flush toilet of the fourth invention, the jet pipe is prevented from a dew drop by means of the anticondensation material which prevents the trap portion from a dew drop. Accordingly, a unique anticondensation material for the jet pipe is unnecessary, and the reduction of the manufacturing cost can be realized.

[0053] In the western-style toilet body, an opening for guiding the jet pipe toward the inside can be formed. In case such an opening is formed, the opening is required to be sealed. Otherwise, fresh air containing moisture is intruded into the inside including the trap portion and the jet pipe through the opening, so the anticondensation effect is deteriorated. The opening like this is preferably mounted in the position which is likely to be seen from the upper part. Due to this, an assembling of the western-style flush toilet is improved.

[0054] As the washing device, except the conventional water tank, it is possible to adopt a washing device which is directly connected to a water supply pipe such as a city water service pipe for supplying water from the outside, and which is capable of spouting water by opening and closing an open/close valve. In case such a latter washing device is adopted, the effect of the fourth invention is large because of the following situations With respect to the prior party washing device, water is once reserved and then spouted. At the time of reserving the water, the temperature of water in the jet pipe easily becomes the same level as the temperature of the inside of a toilet room. So, a dew drop is hardly generated at an outer surface of the jet pipe. On the contrary, in the latter washing device, since fresh water is spouted from the water supply pipe of the outside from time to time, water existed in the outside flows in the jet pipe, and the difference is easily to be generated between the temperature at the inside of the jet pipe and the temperature at the outside of the jet pipe. If an anticondensation material is not provided, a dew drop is likely to be generated in the jet pipe.

[0055] {Fifth Invention}

[0056] However, in the above-mentioned conventional western-style flush toilet, whether the rim is an open rim or a closed rim, in case the washing device is mounted in such a manner that water is spouted to the inside of the rim channel from both of right and left directions, the two flows of water from two directions come into collision in the rim channel and/or at the front side of the bowl portion. Accordingly, a noise is generated at the time of collision, and there is a lack of quietness. Besides, in such a western-style flush toilet, there exists the possibility that a floor surface gets wet because water is splashed on the floor surface and the like by means of the collision of the water at the front side of the bowl portion.

[0057] In this respect, when the western-style flush toilet adopts a closed rim, even if the washing device is mounted in such a manner that water is spouted to the inside of the rim channel from both of right and left directions, by slanting water spout openings which are mounted in the lower side wall portion, the water is made to whirl easily in the bowl portion to ensure the filth discharge ability. As a result, the

collision of the water at the front side of the bowl portion can be softened, and the quietness can be realized in some degree. At the same time, it is possible to prevent water from being splashed on the floor surface. However, with such a constitution, since the water spout openings should be mounted accurately, the constitution of the rim becomes complicated. So, the number of the manufacturing process increases, and accordingly, this pushes up the manufacturing cost. Furthermore, in such a western-style flush toilet, when the washing begins, water and air are mixed in the closed rim, and the mixed water is spouted from plural water spout openings. At this time, a noise is still generated easily, and there is a lack of quietness. Thus, as far as the closed rim is adopted, even if the washing device is mounted in such a manner that water is spouted to the inside of the rim channel from only one direction, there exists the possibility that problems such as the rising up of the manufacturing cost and the lack of the quietness remain.

[0058] The fifth invention has been made in view of the above circumstances and it is the fifth task to be solved to provide a western-style flush toilet which is excellent in the quietness, which has no possibility that the floor surface gets wet, which is excellent in the washing ability of the bowl portion and the filth discharging ability, and which can realize the reduction of the manufacturing cost.

[0059] With respect to the western-style flush toilet of the fifth invention, in a western-style flush toilet including a western-style toilet body comprising a bowl portion, a rim which is formed at an upper periphery of the bowl portion and which has a rim channel in the inside thereof and a trap portion which is connected to a lower edge of the bowl portion, and

[0060] a washing device which is capable of spouting water to the rim channel, wherein the water which is spouted from the washing device is provided for washing the bowl portion by way of the rim channel,

[0061] the improvement is characterized in that the rim channel is exposed to the bowl portion, and the washing device is mounted in such a manner that the water is spouted to the inside of the rim channel from only one direction.

[0062] In the western-style flush toilet of the fifth invention, the water is spouted toward the rim channel from the washing device. Since the water is spouted from only one direction, the water gradually flows downward to the bowl portion while being guided in one direction. Then, the water whirls in one direction (one-way whirling) at the bowl portion to be discharged by way of the trap portion. So, the water doesn't come into collision in the rim channel and/or at the front side of the bowl portion, and a noise is not generated. Besides, since the western-style flush toilet adopts an open rim in which the rim channel is exposed to the bowl portion, when the washing begins, water and air are not mixed, and the water is spouted from an opening which is broader than the water spout opening of the closed rim. Accordingly, at this time, a noise is not generated. Therefore, the western-style flush toilet of the fifth invention is excellent in the quietness.

[0063] In such a western-style flush toilet, the collision of the water at the front side of the bowl portion is not generated, so water is not splashed, and there is no possibility that a floor surface gets wet. Furthermore, in the western-style flush toilet, by strengthening water force, the washing ability of the bowl portion can be ensured. In addition, the water whirls in one direction (one-way whirling) at the bowl portion to be discharged, so the filth discharging ability is also excellent.

[0064] Moreover, the western-style flush toilet has no water spout openings, so the constitution of the rim is simple. As a result, the number of the manufacturing process is limited, and accordingly, the reduction of the manufacturing cost can be realized.

[0065] In the western-style flush toilet of the fifth invention, it is desirable to have a partition wall by which the rim channel is separated from the rear side. With such a constitution, water is never guided to the rear side, so water is not used in vain, and the effect of saving water is large.

[0066] Furthermore, it is desirable that the western-style flush toilet of the fifth invention has a stepped portion which forms the rim channel at a boundary between the bowl portion and the rim. With such a constitution, the stepped portion firmly forms the rim channel, so the water which is spouted from the washing device is likely to be guided toward a downstream side satisfactorily. As a result, the washing of the bowl portion is satisfactorily carried out, and the filth discharging ability becomes further excellent.

[0067] The stepped portion is desirably formed in such a manner that the water is guided to the bowl portion and the downstream side at an upstream side of the water which is spouted from the washing device, and that the water is guided only to the bowl portion at the most downstream side. With such a constitution, the water which is spouted from the washing device doesn't flow downward to the bowl portion immediately at the upstream side of the rim channel. Namely, the water is guided to the most downstream side, and it flows downward to the bowl portion. So, the washing of the bowl portion can be carried out satisfactorily. Besides, due to this, the water easily whirls in the bowl portion, and the filth discharging ability can be improved. In addition, since the water is guided only to the bowl portion at the most downstream side, the water is not circulated again, and it doesn't remain in the rim channel. Therefore, water is not used in vain, and the effect of saving water is large.

[0068] {Sixth Invention}

[0069] However, in the above-mentioned conventional western-style flush toilet as shown in **FIG. 28**, due to the position and the configuration of the upper side wall face **92***a* of the trap portion **92**, the water which is spouted from the washing device by way of the jet opening **93** is reflected toward various kinds of directions by means of the upper side wall face **92***a*. Accordingly, in case the water is not reflected toward the water discharge opening **92***b* of the trap portion **92** by means of the upper side wall face **92***a*, the water is subjected to the large resistance until it reaches the water discharge opening **92***b*. In addition, there exists the possibility that the water which is reflected toward various kinds of directions by means of the upper side wall face **92***a* comes into collision. As a result, the water discharging ability is deteriorated, and a siphon effect is also deteriorated. So, in order to make up such a deterioration of a siphon effect, namely, the deterioration of the filth discharging ability, a large amount of water cannot help being used.

[0070] The sixth invention has been made in view of the above circumstances and it is the sixth task to be solved to provide a western-style flush toilet which can discharge filth satisfactorily by a small amount of water.

[0071] With respect to the western-style flush toilet of the sixth invention, in a western-style flush toilet including a bowl portion, a trap portion which is connected to a lower edge of the bowl portion and a jet opening which is mounted at the trap portion in order to spout water along the trap portion,

[0072] the improvement is characterized in that the trap portion has a reflecting surface by which the water spouted from the jet opening is reflected toward a water discharge opening of the trap portion.

[0073] In the western-style flush toilet of the sixth invention, the trap portion has the reflecting surface by which the water spouted from the jet opening is reflected toward the water discharge opening of the trap portion. Due to this, the reflected water is discharged to the water discharge opening without being collided with a wall face at the downstream side from the reflecting surface, and there is little possibility that the reflected water comes into collision. Accordingly, the water discharging ability is improved, and a siphon effect is strengthened.

[0074] It is desirable that the water which is spouted from the jet opening is reflected toward the vertical direction by the reflecting surface. Due to this, the discharging speed of the reflected water is increased by the gravity. So, the water discharging ability is improved, and a siphon effect is strengthened. In addition, the filth discharging ability is increased.

[0075] Besides, as for the reflecting surface, it is desirable that an angle which is obtained by an imaginary line vertical to the reflecting surface and the spouting direction of the water spouted from the jet opening is equal to an angle which is obtained by the imaginary line and the central direction of the water discharge opening. In this manner, the water which is spouted from the jet opening is guided to the central direction of the water discharge opening with the water being reflected by the reflecting surface only one time. So, the water reaches the water discharge opening with maintaining its force and a siphon effect is strengthened by means of high water discharging ability. On the other hand, if the above two angles are not identical with each other, the water which is spouted from the jet opening comes into collision many times until it reaches the water discharge opening. So, the water shows the large resistance, and the discharging speed is decreased. In addition, the water discharging ability is poor, and a siphon effect is deteriorated.

[0076] It is desirable that the jet opening is mounted in such a manner that water is spouted along a lower side wall face of the trap portion. Filth which may remain in reserved water is sedimentated on the lower side wall face of the trap portion in accordance with the lapse of time. So, if the jet opening spouts water along the lower side wall face of the trap portion, the sediment can be discharged without remaining in the trap portion, and the filth can be surely discharged.

[0077] At a bottom portion of a reserved water portion of the trap portion which ensures the reserved water, it is desirable that a reserved portion which reserves a slurry as in a small amount as possible at the time of casting a sludge, and the lower side wall face which is connected to the reserved portion and which is extended in parallel to the spouting direction of the water spouted from the jet opening are formed. A western-style toilet body made of porcelain which constitutes the western-style flush toilet of the sixth invention has a complicated configuration, so it is generally formed by the casting of the sludge. In such a casting, it is convenient that the reserved portion which reserves the slurry to be discharged is mounted at the bottom portion of the reserved water portion of the trap portion which ensures the reserved water. If such a reserved portion reserves a large amount of slurry, the lower side wall face of the trap portion which is connected to the reserved portion cannot be extended in parallel to the spouting direction of the water spouted from the jet opening. In this case, the sediment which is sedimentated on the lower side wall face of the trap portion easily remains in the trap portion. On the contrary, if the reserved portion reserves the slurry as in a small amount as possible, the lower side wall face of the trap portion can be extended in parallel to the spouting direction of the water spouted from the jet opening. In this manner, the sediment which is sedimentated on the lower side wall face of the trap portion hardly remains in the trap portion.

[0078] As a washing device, except the conventional water tank such as a low tank, it is possible to adopt a washing device which is directly connected to a water supply pipe such as a city water service pipe for supplying water from the outside, and which is capable of spouting water by opening and closing an open/close valve. In case such a washing device is adopted, the effect of the sixth invention is large. In other words, if the jet opening is connected to such a latter washing device, water is likely to be spouted from the jet opening more powerfully as compared with the case in which the jet opening is connected to the prior party washing device.

[0079] {Seventh Invention}

[0080] However, in the above-mentioned conventional western-style flush toilet as shown in **FIG. 29**, it is not considered that the western-style toilet body **91** is miniaturized, so the western-style flush toilet as a whole is likely to be a large size. Due to this, the saving of spaces cannot be achieved at residences and the like in recent years, and a toilet room which cannot ensure a relatively large space becomes more and more narrow.

[0081] The seventh invention has been made in view of the above circumstances and it is the seventh task to be solved to provide a western-style flush toilet which can realize the miniaturization thereof.

[0082] In order to solve the above-mentioned task, the present inventor fully examined and paid attention to a top edge of the trap portion which forms the reserved water in the bowl portion, a rear wall of the trap portion and toilet seat mounting holes, and then, the inventor completed the seventh invention.

[0083] With respect to the western-style flush toilet of the seventh invention, in a western-style flush toilet including a western-style toilet body comprising a bowl portion and a trap portion which is connected to a lower edge of the bowl portion, wherein the bowl portion is washed by water, and the water is discharged to a rear side along the trap portion,

[0084] the improvement is characterized in that the top edge of the trap portion which forms the reserved

water in the bowl portion is positioned in front of a rear edge of the bowl portion.

[0085] As shown in **FIG. 29**, in the conventional western-style flush toilet, a top edge **95***d* of the trap portion **95** which forms the reserved water in the bowl portion **93** in the western-style toilet body **91** is necessarily positioned at the rear of a rear edge **93***a* of the bowl portion **93**. So, the whole length of the western-style toilet body **91** which is constituted by the bowl portion **93** and the trap portion **95** is necessarily long. On the contrary, in the western-style flush toilet of the seventh invention, the top edge of the trap portion is positioned in front of the rear edge of the bowl portion, and the whole length of the western-style toilet body is short.

[0086] In this western-style flush toilet, the top edge of the trap portion is the portion which forms the reserved water in the bowl portion, and at the same time, it is the uppermost position of an inner bottom surface which forms an inverted U-shaped water channel. The top edge of the trap portion is determined as a single point or a horizontal line on the basis of a cross-sectional form of the trap portion which crosses the discharging direction. The rear edge of the bowl portion is the most rear side portion of an opening of the bowl portion toward the upper part if a rim doesn't exist. If a rim exists, the rear edge of the bowl portion is the most rear side portion of a boundary between the bowl portion and the rim. The rear edge of the bowl portion is also determined as a single point or a horizontal line.

[0087] In the western-style flush toilet of the seventh invention, it is preferable that the rear wall of the trap portion is positioned in front of the rear edge of the bowl portion. As shown in **FIG. 29**, in the conventional western-style flush toilet, a rear wall **95***e* of the trap portion **95** is necessarily positioned at the rear of the rear edge **93***a* of the bowl portion **93**. So, the whole length of the western-style toilet body **91** is necessarily long. On the contrary, in the western-style flush toilet of the seventh invention in which the rear wall of the trap portion is positioned in front of the rear edge of the bowl portion, the whole length of the western-style toilet body is further short.

[0088] Normally, in the western-style flush toilet, a pair of toilet seat mounting holes for mounting a toilet seat, a toilet seat having a heating function, a toilet seat having a part washing function and the like is formed at the rear of the bowl portion. In the western-style flush toilet of the seventh invention, it is also preferable that the top edge of the trap portion is positioned in front of each of the toilet seat mounting holes. As shown in **FIG. 29**, in the conventional western-style flush toilet, the top edge **95***d* of the trap portion **95** is necessarily positioned at the rear of each of toilet seat mounting holes **96**. So, the whole length of the western-style toilet body **91** is necessarily long. On the contrary, in the western-style flush toilet of the seventh invention in which the top edge of the trap portion is positioned in front of each of the toilet seat mounting holes, the whole length of the western-style toilet body is further short.

[0089] In the western-style flush toilet of the seventh invention, it is preferable that a downstream side from the top edge of the trap portion is bent forwardly. If the whole length of the western-style toilet body is short, at least a base seat portion which conceals the trap portion can be also miniaturized. Thus, if the base seat portion is miniaturized, the discharge opening of the trap portion is easily close to a rear side wall face in the base seat portion, and there exists the possibility that the discharge opening is not preferably connected to the water discharge socket. In this respect, as far as the downstream side from the top edge of the trap portion is bent forwardly, even if the base seat portion is miniaturized, the discharge opening is far from the rear side wall face in the base seat portion, and the discharge opening is preferably connected to the water discharge socket.

[0090] As a washing device, except the conventional water tank, it is possible to adopt a washing device which is directly connected to a water supply pipe such as a city water service pipe for supplying water from the outside, and which is capable of spouting water by opening and closing an open/close valve. In case such a latter washing device is adopted, the effect of the seventh invention is large. With respect to the prior party washing device, water is once reserved and then spouted, so the device requires a relatively large volume. Accordingly, in order to widen a narrow toilet room, if the western-style toilet body of the seventh invention is adopted while the device which requires a relatively large volume is adopted, the effect of the seventh invention is decreased. In this regard, if the latter washing device is adopted, the prior party washing device is not required, so the effect of the seventh invention which achieves to widen a narrow toilet room is remarkably shown.

[0091] {Eighth Invention}

[0092] However, in the above-mentioned conventional western-style flush toilet as shown in **FIG. 30**, it is not considered that the western-style toilet body **91** is miniaturized, so the western-style flush toilet as a whole is likely to be a large size. Due to this, the saving of spaces cannot be achieved at residences and the like in recent years, and a toilet room which cannot ensure a relatively large space becomes more and more narrow.

[0093] The eighth invention has been made in view of the above circumstances and it is the eighth task to be solved to provide a western-style flush toilet which can realize the miniaturization thereof.

[0094] In order to solve the above-mentioned task, the present inventor fully examined and paid attention to the center of an inlet port which ranges from the bowl portion to the trap portion and which is extended in the horizontal direction, and then, the inventor completed the eighth invention.

[0095] With respect to the western-style flush toilet of the eighth invention, in a western-style flush toilet including a western-style toilet body comprising a bowl portion and a trap portion which is connected to a lower edge of the bowl portion, wherein the bowl portion is washed by water, and the water is discharged to a rear side along the trap portion,

[0096] the improvement is characterized in that the center of the inlet port which ranges from the bowl portion to the trap portion and which is extended in the horizontal direction of the trap portion is positioned in front of the center of the bowl portion in the horizontal direction.

[0097] As shown in **FIG. 30**, in the conventional western-style flush toilet, the center TO of an inlet port TI which ranges from the bowl portion **93** to the trap portion **95** and

which is extended in the horizontal direction of the trap portion **95** is necessarily positioned at the rear of the center BO of the bowl portion **93** in the horizontal direction. So, the whole length of the western-style toilet body **91** which is constituted by the bowl portion **93** and the trap portion **95** is necessarily long. On the contrary, in the western-style flush toilet of the eighth invention, the center of the inlet port of the trap portion is positioned in front of the center of the bowl portion, and the whole length of the western-style toilet body is short.

[**0098**] In this western-style flush toilet, the inlet port of the trap portion is the portion which ranges from the bowl portion to the trap portion, and it is extended in the horizontal direction. The portion which ranges from the bowl portion to the trap portion is determined by a lower edge of a rear wall of the bowl portion. As shown in **FIG. 21**, if each edge TR, TF which is positioned respectively in the front direction and the rear direction of the inlet port TI is a single point, the center TO of the inlet port TI of the trap portion is the middle point of a line segment TL which connects the rear edge TR and the front edge TF because the inlet port TI of the trap portion is formed in such a manner that the left portion and the right portion thereof is symmetrical in a normal western-style toilet body. Furthermore, as shown in **FIG. 22**, if at least one of two edges which are positioned in the front and rear directions of the inlet port TI is a horizontal line TH, the center TO of the inlet port TI of the trap portion is similarly determined by the middle point THO of the horizontal line TH.

[**0099**] As shown in **FIG. 23**, if each edge which is positioned respectively in the front direction and the rear direction of a bowl portion B is a single point, the center BO of the bowl portion B in the horizontal direction is determined by a perpendicular line which is assumed to be positioned at the center between a perpendicular line BR positioned at the rear edge and a perpendicular line BF positioned at the front edge because the bowl portion B is formed in such a manner that the left portion and the right portion thereof is symmetrical in a normal western-style toilet body. Furthermore, as shown in **FIG. 24**, if at least one of two edges which are positioned in the front and rear directions of the bowl portion B is a horizontal line BH, the center BO of the bowl portion B in the horizontal direction is similarly determined by a perpendicular line BHO which is positioned at the middle point of the horizontal line BH.

[**0100**] In the western-style flush toilet of the eighth invention, it is preferable that an upstream side from the top edge of the trap portion is formed by the rear wall of the bowl portion. If the upstream side is formed by a wall which is different from the rear wall of the bowl portion, the wall has the thickness in the front and rear directions, and at the same time, there arises a clearance having the thickness in the front and rear directions between the wall and the rear wall of the bowl portion. Due to such a dimension, the whole length of the western-style toilet body is long in the front and rear directions. On the contrary, if the upstream side is formed by the rear wall of the bowl portion, the dimension like this is not generated, and the whole length of the western-style toilet body is short in the front and rear directions.

[**0101**] In this western-style flush toilet, the top edge of the trap portion is the portion which forms the reserved water in the bowl portion, and at the same time, it is the uppermost position of an inner bottom surface which forms an inverted U-shaped water channel. The top edge of the trap portion is determined as a single point or a horizontal line on the basis of a cross-sectional form of the trap portion which crosses the discharging direction.

[**0102**] In the western-style flush toilet of the eighth invention, if the trap portion has a cylindrical portion whose inner surface is a cylindrical surface at the upstream side from the top edge thereof, it is preferable that a shaft center line of the cylindrical portion is extended in such a manner that it has an angle of not less than 45 degrees with respect to the horizontal line. With such a constitution, it is possible to realize that the whole length of the western-style toilet body in the front and rear directions is shortened by the trap portion while maintaining a water level of the reserved water.

[**0103**] In the western-style flush toilet of the eighth invention, it is preferable that a downstream side from the top edge of the trap portion is bent forwardly. If the whole length of the western-style toilet body is short, at least a base seat portion which conceals the trap portion can be also miniaturized. Thus, if the base seat portion is miniaturized, the discharge opening of the trap portion is easily close to a rear side wall face in the base seat portion, and there exists the possibility that the discharge opening is not preferably connected to the water discharge socket. In this respect, as far as the downstream side from the top edge of the trap portion is bent forwardly, even if the base seat portion is miniaturized, the discharge opening is far from the rear side wall face in the base seat portion, and the discharge opening is preferably connected to the water discharge socket.

[**0104**] As a washing device, except the conventional water tank, it is possible to adopt a washing device which is directly connected to a water supply pipe such as a city water service pipe for supplying water from the outside, and which is capable of spouting water by opening and closing an open/close valve. In case such a latter washing device is adopted, the effect of the eighth invention is large. With respect to the prior party washing device, water is once reserved and then spouted, so the device requires a relatively large volume. Accordingly, in order to widen a narrow toilet room, if the western-style toilet body of the eighth invention is adopted while the device which requires a relatively large volume is adopted, the effect of the eighth invention is decreased. In this regard, if the latter washing device is adopted, the prior party washing device is not required, so the effect of the eighth invention which achieves to widen a narrow toilet room is remarkably shown.

[**0105**] {Ninth Invention}

[**0106**] However, in the above-mentioned conventional western-style flush toilet, the water tank such as a low tank which reserves water once is adopted as the washing device, and simultaneously, a siphon effect is generated by the trap portion. Accordingly, the effect of saving water is not satisfactory.

[**0107**] In other words, the water tank hardly adjust an amount of water which is spouted therefrom finely. As a result, in the western-style flush toilet which adopts the water tank, much amount of water is likely to be used after all in order to discharge filth water satisfactorily.

[0108] The stepped portion of the trap portion which generates a siphon effect is a part of the western-style toilet body made of porcelain, and it is difficult to form the stepped portion with accuracy. Due to this, in this western-style flush toilet, a large amount of water cannot help being used for generating a siphon effect surely.

[0109] The ninth invention has been made in view of the above circumstances and it is the ninth task to be solved to provide a western-style flush toilet which can discharge filth water by a small amount of water satisfactorily.

[0110] With respect to the western-style flush toilet of the ninth invention, in a western-style flush toilet including a western-style toilet body comprising a bowl portion and a trap portion which is connected to a lower edge of the bowl portion, wherein the bowl portion is washed by water,

[0111] the improvement is characterized in that a washing device which is directly connected to a city water service pipe for supplying water from the outside and which is capable of spouting water under the city water pressure by opening and closing an open/close valve is provided, a water discharge socket made of resin which has an orifice for generating a siphon effect inside thereof is provided at a water discharge opening of the trap portion, and the water discharge socket is connected to a water discharge pipe which is protruded from a floor surface.

[0112] In the western-style flush toilet of the ninth invention, the washing device is directly connected to the city water service pipe for supplying water from the outside, and it is capable of spouting water under the city water pressure by opening and closing the open/close valve. So, the washing device is different from the conventional water tank such as a low tank which reserves water once, and it easily adjust an amount of water which is spouted therefrom finely by opening and closing the open/close valve. Due to this, in the western-style flush toilet which adopts such a washing device, it is possible to spout the smallest amount of water which is enough to discharge filth satisfactorily.

[0113] Furthermore, in the western-style flush toilet of the ninth invention, since the water discharge socket made of resin is adopted, the orifice can be formed accurately and easily. Due to this, in the western-style flush toilet which adopts the water discharge socket made of resin, even if the smallest amount of water is used, a siphon effect can be surely generated.

BRIEF DESCRIPTION OF DRAWINGS

[0114] **FIG. 1** is a cross-sectional view of a western-style flush toilet of an embodiment 1 in the first and second inventions.

[0115] **FIG. 2** is a cross-sectional view of a western-style flush toilet of an embodiment 2 in the first and second inventions.

[0116] **FIG. 3** is a cross-sectional view in an enlarge form of an essential portion of a western-style flush toilet of an embodiment 3 in the first and second inventions.

[0117] **FIG. 4** is a longitudinal cross-sectional view of a western-style flush toilet of an embodiment 1 in the third and fourth inventions.

[0118] **FIG. 5** is a plan view of a western-style flush toilet of an embodiment 1 in the third and fourth inventions.

[0119] **FIG. 6** is a horizontal cross-sectional view of a western-style flush toilet of an embodiment 1 in the third and fourth inventions.

[0120] **FIG. 7** is a longitudinal cross-sectional view of an essential portion of a western-style flush toilet of an embodiment 1 in the third and fourth inventions.

[0121] **FIG. 8** is a horizontal cross-sectional view of a western-style flush toilet of an embodiment 2 in the third and fourth inventions.

[0122] **FIG. 9** is a longitudinal cross-sectional view of an essential portion of a western-style flush toilet of an embodiment 3 in the third and fourth inventions.

[0123] **FIG. 10** is a plan view of a western-style flush toilet of an embodiment 1 in the fifth invention.

[0124] **FIG. 11** is across-sectional view of a western-style flush toilet of an embodiment 1 in the fifth invention.

[0125] **FIG. 12** is a cross-sectional view in an enlarge form of a stepped portion and the like at the position I in **FIG. 10** according to an embodiment 1 in the fifth invention.

[0126] **FIG. 13** is a cross-sectional view in an enlarge form of a stepped portion and the like at the position II in **FIG. 10** according to an embodiment 1 in the fifth invention.

[0127] **FIG. 14** is a cross-sectional view in an enlarge form of a stepped portion and the like at the position III in **FIG. 10** according to an embodiment 1 in the fifth invention.

[0128] **FIG. 15** is a plan view of a western-style flush toilet of an embodiment 2 in the fifth invention.

[0129] **FIG. 16** is a cross-sectional view of a western-style flush toilet of an embodiment 1 in the sixth invention.

[0130] **FIG. 17** is a cross-sectional view of a western-style flush toilet of an embodiment 2 in the sixth invention.

[0131] **FIG. 18** is a longitudinal cross-sectional view of a western-style flush toilet of an embodiment 1 in the seventh invention.

[0132] **FIG. 19** is a longitudinal cross-sectional view of a western-style flush toilet of an embodiment 2 in the seventh invention.

[0133] **FIG. 20** is a longitudinal cross-sectional view of a western-style flush toilet of an embodiment 3 in the seventh invention.

[0134] **FIG. 21** is a top view of an inlet port of a trap portion according to the eighth invention.

[0135] **FIG. 22** is a top view of an inlet port of other trap portion according to the eighth invention.

[0136] **FIG. 23** is a top view of a bowl portion according to the eighth invention.

[0137] **FIG. 24** is a top view of other bowl portion according to the eighth invention.

[0138] **FIG. 25** is a longitudinal cross-sectional view of a western-style flush toilet of an embodiment 1 in the eighth invention.

[0139] **FIG. 26** is a longitudinal cross-sectional view of a western-style flush toilet of an embodiment 2 in the eighth invention.

[0140] **FIG. 27** is a cross-sectional view of a western-style flush toilet of an embodiment in the ninth invention.

[0141] **FIG. 28** is a cross-sectional view of a conventional western-style flush toilet.

[0142] **FIG. 29** is a longitudinal cross-sectional view of a conventional western-style flush toilet.

[0143] **FIG. 30** is a longitudinal cross-sectional view of a conventional western-style flush toilet.

BEST MODE FOR CARRYING OUT THE INVENTION

[0144] {First and Second Inventions}

[0145] Embodiments 1 to 3 which embody the first and second inventions are explained hereinafter in conjunction with drawings.

[0146] (Embodiment 1)

[0147] As shown in **FIG. 1, a** western-style flush toilet of the embodiment 1 includes a western-style toilet body **1** made of porcelain and a distributor **2** which is a part of a washing device mounted at the rear of the western-style toilet body **1**. A water tank which constitute a part of the washing device, a toilet seat and a toilet lid are not shown in the drawing.

[0148] The western-style toilet body **1** has a bowl portion **3** which receives filth, a trap portion **4** which is connected to a lower edge of the bowl portion **3** and a base seat portion **5** which conceals the bowl portion **3** and the trap portion **4**. At the rear of the western-style toilet body **1**, an installation portion **6** on which the water tank is installed is formed, and the distributor **2** made of resin is provided in the installation portion **6**.

[0149] Besides, an open rim **8** is formed at the whole of an upper periphery of the bowl portion **3**. The open rim **8** comprises an upper side wall portion **8***a* which is protruded inwardly from the upper periphery of the bowl portion **3** in an approximately horizontal direction and an inner side wall portion **8***b* which is extended from an inner edge of the upper side wall portion **8***a* in an approximately vertical direction. In the inside of the open rim **8**, a stepped portion **8***c* is formed in such a manner that it is protruded in approximately parallel to the upper side wall portion **8***a*. Furthermore, a rim channel **7** for guiding water which is spouted from the distributor **2** along the stepped portion **8***c* is formed in the inside of the open rim **8**.

[0150] As the characterized constitution of the western-style flush toilet, an inward surface of the inner side wall portion **8***b* in the open rim **8** is an identical surface to a bowl face **3***a* of the bowl portion **3** at the whole of the upper periphery of the bowl portion **3**. Thus, the rim channel **7** opens at the whole periphery between the inner side wall portion **8***b* and the bowl face **3***a* by means of an opening **7***a*.

[0151] As above-mentioned, in the western-style flush toilet with such a constitution, water which is supplied from the water tank is spouted from the distributor **2** toward the rim channel **7**, and then, the water flows downward to the bowl portion **3** while whirling, and after that, the water is discharged by way of the trap portion **4** while washing the bowl face **3***a* of the bowl portion **3**.

[0152] In the western-style flush toilet, since the inward surface of the inner side wall portion **8***b* is an identical surface to the bowl face **3***a,* the splashed stains are hardly adhered to the rim channel **7** such as a rear side of the upper side wall portion **8***a* or a rear side of the inner sidewall portion **8***b*. As a result, a nasty smell such as ammonia is hardly generated, and the person who uses the western-style flush toilet doesn't feel uncomfortable. Besides, the western-style flush toilet is sanitary.

[0153] Furthermore, in this western-style flush toilet, stains adhered to the bowl portion **3** around the open rim **8** exist at the position which a cleaning person easily sees, and it is easy for the cleaning person to confirm whether or not the stains are adhered or removed. In addition, since the inward surface of the inner side wall portion **8***b* is an identical surface to the bowl face **3***a,* the stains are easily wiped out at one time. Accordingly, it is possible for the cleaning person to carry out the cleaning satisfactorily.

[0154] Moreover, the western-style flush toilet has the stepped portion **8***c* which forms the rim channel **7** at a boundary between the bowl portion **3** and the open rim **8**. With such a constitution, water doesn't flow downward immediately, and the water gradually flows downward to the bowl face **3***a* of the bowl portion **3** while whirling satisfactorily in the rim channel **7**. As a result, it is possible to improve the washing effect of the whole of the bowl portion **3** as compared with the western-style flush toilet which doesn't have the stepped portion **8***c*.

[0155] Therefore, in the western-style flush toilet, stains are hardly adhered to the open rim **8**. As a result, a nasty smell and the like are hardly generated, and the person who uses the western-style flush toilet feels comfortable. Besides, the western-style flush toilet is sanitary. In addition, in the western-style flush toilet, it is possible to obtain an advantage in the manufacturing cost.

[0156] (Embodiment 2)

[0157] As shown in **FIG. 2**, in a western-style flush toilet of the embodiment 2, a closed rim **10** is formed at the whole of an upper periphery of a bowl portion **3**. The closed rim **10** comprises an upper side wall portion **10***a* which is protruded inwardly from the upper periphery of the bowl portion **3** in an approximately horizontal direction, an inner side wall portion **10***b* which is extended from an inner edge of the upper side wall portion **10***a* in an approximately vertical direction and a lower side wall portion **10***c* for connecting a lower edge of the inner side wall portion **10***b* to the bowl portion **3**. In the inside of the closed rim **10**, the same rim channel **9** as that of the embodiment 1 is formed.

[0158] As the characterized constitution of the western-style flush toilet, an inward surface of the inner side wall portion **10***b* in the closed rim **10** is an identical surface to a bowl face **3***a* of the bowl portion **3** at the whole of the upper periphery of the bowl portion **3**. In the lower side wall portion **10***c,* plural water spout openings which open downward and which are not shown in the drawing are mounted, and the rim channel **9** opens at the whole periphery between the inner side wall portion **10***b* and the bowl face **3***a* by way

of the water spout openings by means of an opening **9***a*. Other constitutions are the same as those of the embodiment 1.

[**0159**] As above-mentioned, in the western-style flush toilet with such a constitution, water in the rim channel **9** is spouted to the bowl portion **3** by way of the water spout openings and the opening **9***a*. Besides, stains are hardly adhered to the inside of the rim channel **9** through a front side of the lower side wall portion **10***c* or the water spout openings.

[**0160**] Furthermore, in this western-style flush toilet, although there is a disadvantage in the manufacturing cost, an amount of water which is spouted to the bowl portion **3** is easily adjusted by the water spout openings. So, it is possible to improve the washing ability of the whole of the bowl portion **3**. Other operations and effects are the same as those of the embodiment 1.

[**0161**] (Embodiment 3)

[**0162**] As shown in **FIG. 3**, in a western-style flush toilet of the embodiment 3, a western-style toilet body **1** has an open rim **18** in which an inner side wall portion **18***b* is formed at the further outside as compared with the western-style flush toilet of the embodiment 1. Accordingly, the inward surface of the inner side wall portion **18***b* is positioned outwardly with respect to a bowl face **3***a* of a bowl portion **3**. Other constitutions are the same as those of the embodiment 1.

[**0163**] As above-mentioned, in the western-style flush toilet with such a constitution, an inward surface of the inner side wall portion **18***b* is positioned outwardly with respect to the bowl face **3***a* of the bowl portion **3**, so the ease of wiping out the stains is somewhat inferior as compared with the western-style flush toilet of the first embodiment or the second embodiment. However, other operations and effects are the same as those of the first and second embodiments.

[**0164**] {Third and Fourth Inventions}

[**0165**] Embodiments 1 to 3 which embody the third and fourth inventions are explained hereinafter in conjunction with drawings.

[**0166**] (Embodiment 1)

[**0167**] As shown in **FIG. 4, a** western-style flush toilet of the embodiment 1 includes a western-style toilet body **1** made of porcelain and a washing device **2** which is directly connected to a city water service pipe not shown in the drawing for supplying water from the outside, and in which a valve is stored. A toilet seat and a toilet lid are not shown in the drawing.

[**0168**] The western-style toilet body **1**, as also shown in **FIG. 5**, has a bowl portion **3** which receives filth, a rim **4** which is formed at the whole of an upper periphery of the bowl portion **3** and which has a rim channel **4***a* capable of flowing water downward to the bowl portion **3** in the inside thereof and, as shown in **FIG. 4, a** trap portion **5** which is connected to a lower edge of the bowl portion **3**. A nozzle opening **5***a* is mounted in a bottom portion as a primary side of the trap portion **5**. At the rear of the rim **4**, an installation portion **6** which is extended in flat is formed, and the bowl portion **3** and the trap portion **5** are concealed by a base seat portion **7** which is extended downward from the rim **4** and the installation portion **6**. As shown in **FIGS. 4 and 5**, at the center of a rear side of the base seat portion **7**, an opening **7***a* which passes through the inside is formed.

[**0169**] As shown in **FIG. 4, a** jet pipe **8** is connected to the washing device **2**, and the jet pipe **8** is extended in the inside of the base seat portion **7** by way of the opening **7***a*. Besides, as shown in **FIG. 7**, at the outside of the opening **7***a*, a sealing material **13** which seals the jet pipe **8** is formed. The jet pipe **8** is connected to a jet nozzle **9** which is fixed to the nozzle opening **5***a*. A jet opening **9***a* of the jet nozzle **9** is formed in such a manner that water which is supplied from the washing device **2** is spouted along the trap portion **5**.

[**0170**] Further, at the rear side of the rim channel **4***a*, a rim pipe **10** which is connected to the washing device **2** is stored, and the rim pipe **10** is formed in such a manner that water which is supplied from the washing device **2** is spouted to the inside of the rim channel **4***a*. Besides, at a discharge opening **5***b* as a secondary side of the trap portion **5**, a discharge socket **11** for connecting the discharge opening **5***b* and a discharge pipe which is disposed under a floor of a toilet room and which is not shown in the drawing is formed.

[**0171**] In this western-style flush toilet, as the characterized constitution, the bottom portion of the bowl portion **3** and the primary side of the trap portion **5** in the western-style toilet body **1** are surrounded by a heater **12** having faces. As shown in **FIG. 6**, the jet pipe **8** is adjacent to the heater **12**. A code of the heater **12** not shown in the drawing is inserted into other opening which is mounted in the base seat portion **7** of the western-style toilet body **1** and which is not shown in the drawing, and a sealing material which seals the code and which is not shown in the drawing is mounted at the outside of the opening.

[**0172**] Moreover, as shown in **FIGS. 4 and 6**, in order to surround the trap portion **5** and the jet pipe **8**, an anticondensation material **13** having faces is formed below the heater **12** in such a manner that the periphery is fixed to an inner surface of the base seat portion **7** and the discharge opening **5***b* of the trap portion **5** is exposed.

[**0173**] As above-mentioned, in the western-style flush toilet with such a constitution, since the jet pipe **8** is also heated by the heater **12** which heats the trap portion **5**, water in the jet pipe **8** can be prevented from being freezing even if the western-style flush toilet is used in a cold area. Accordingly, it is possible to realize the reduction of the running cost by saving water, simultaneously with the keeping of the condition that the western-style flush toilet can be used during the cold season and the prevention of the western-style flush toilet from being damaged. Besides, a unique heater for the jet pipe **8** is unnecessary, and the reduction of the manufacturing cost can be realized.

[**0174**] Therefore, in the western-style flush toilet, it is possible to realize the reduction of the manufacturing cost and the running cost, simultaneously with the keeping of the condition that the western-style flush toilet can be used during the cold season and the prevention of the western-style flush toilet from being damaged. Besides, the opening **7***a* is mounted in the position which is likely to be seen from the upper part, so an assembling of the western-style flush toilet is improved.

[**0175**] In addition, in this western-style flush toilet, the opening **7***a* which is mounted in the western-style toilet

body **1** is sealed. As a result, fresh air containing moisture is not intruded into the inside of the base seat portion **7** including the trap portion **5** and the jet pipe **8** through the opening **7***a*, and the anticondensation effect is excellent. Then, the jet pipe **8** is prevented from a dew drop by means of the anticondensation material **13** which prevents the trap portion **5** from a dew drop. Accordingly, a unique anticondensation material for the jet pipe **8** is unnecessary, and the reduction of the manufacturing cost can be realized.

[**0176**] (Embodiment 2)

[**0177**] As shown in **FIG. 8**, in a western-style flush toilet of the embodiment 2, a bottom portion of a bowl portion **3**, a primary side of a trap portion **5** and a jet pipe **8** in a western-style toilet body **1** are surrounded by a heater **15** having faces. Other constitutions are the same as those of the embodiment 1.

[**0178**] In this western-style flush toilet, the same operations and effects as those of the embodiment 1 can be obtained.

[**0179**] (Embodiment 3)

[**0180**] As shown in **FIG. 9**, in a western-style flush toilet of the embodiment 3, a code **12***a* of a heater **12** together with a jet pipe **8** is inserted into an opening **7***a*. At the outside of the opening **7***a*, a sealing material **16** which seals the jet pipe **8** and the code **12***a* is formed. Other constitutions are the same as those of the embodiment 1 or the embodiment 2.

[**0181**] In this western-style flush toilet, the opening **7***a* into which the code **12***a* is inserted should not be separately formed in the western-style toilet body **1** so that it becomes easy to manufacture the western-style toilet body **1**. As a result, it is possible to realize the reduction of the manufacturing cost, and furthermore, a favorable appearance is obtained. Other operations and effects are the same as those of the embodiment 1 or the embodiment 2.

[**0182**] {Fifth Invention}

[**0183**] Embodiments 1 and 2 which embody the fifth invention are explained hereinafter in conjunction with drawings.

[**0184**] (Embodiment 1)

[**0185**] As shown in **FIGS. 10 and 11**, a western-style flush toilet of the embodiment 1 includes a western-style toilet body **5** made of porcelain and a washing device which is mounted on the western-style toilet body **5**. A toilet seat and a toilet lid are not shown in the drawing.

[**0186**] The western-style toilet body **5** has a bowl portion **1** which receives filth, an open rim **2** which is formed at the whole of an upper periphery of the bowl portion **1** and a trap portion **3** which is connected to a lower edge of the bowl portion **1**.

[**0187**] At the rear of the western-style toilet body **5**, a water tank which is a part of the washing device and which is not shown in the drawing is mounted, and the water tank is connected to a city water service pipe which is capable of supplying water by way of a pipe not shown in the drawing. Below the water tank, a hose **8** which is extended to the right side of the western-style toilet body **5** as you face it is formed as a part of the washing device.

[**0188**] At a boundary between the bowl portion **1** and the open rim **2**, a stepped portion **6** which is protruded inwardly is formed, and a rim channel **4** is formed by the stepped portion **6** in the inside of the open rim **2**. The rim channel **4** is exposed to the bowl portion **1**, and water is spouted to the bowl portion **1** by way of an opening **4***a* which is formed by an inner side wall portion of the open rim **2** and the bowl portion **1**. A top end of the hose **8** is positioned in the inside of the rim channel **4**.

[**0189**] As shown in FIGS. **12** to **14**, an upper surface of the stepped portion **6** is formed by an inward inclined surface **6***a* which is inclined inwardly and an outward inclined surface **6***b* which is inclined outwardly. As shown in **FIGS. 11 and 12**, at an upstream side of water which is spouted from the hose **8**, the inward inclined surface **6***a* has a small area, and the outward inclined surface **6***b* has a large area. As shown in **FIGS. 10 and 13**, toward a downstream side of the water which is spouted from the hose **8**, the inward inclined surface **6***a* has almost the same area as that of the outward inclined surface **6***b*. Then, as shown in **FIGS. 10 and 14**, at a further downstream side of the water which is spouted from the hose **8**, the inward inclined surface **6***a* has a large area, and the outward inclined surface **6***b* has a small area. At the most downstream side, only the inward inclined surface **6***a* is formed.

[**0190**] Furthermore, as shown in **FIGS. 10 and 11**, the western-style toilet body **5** has a circular arc-shaped partition wall **7** by which the rim channel **4** is separated from the rear side.

[**0191**] As above-described, in the western-style flush toilet with such a constitution, when the person who uses the toilet inputs a washing switch, water is spouted from the water tank to the rim channel **4** by way of the hose **8**. At this time, since the hose **8** is provided only at the right side of the western-style toilet body **5** as you face it, the water which is spouted from the water tank gradually flows downward to the bowl portion **1** while being guided in the right direction. Then, the water whirls in the bowl portion **1**. After that, the water together with filth is discharged by way of the trap portion **3**.

[**0192**] Thus, in this western-style flush toilet, the hose **8** is provided only at one side, so the water doesn't come into collision in the rim channel **4** and/or at the front side of the bowl portion **1**. As a result, a noise is not generated. Besides, in the western-style flush toilet, the rim channel **4** in the open rim **2** is exposed to the bowl portion **1**. Accordingly, when the washing begins, water and air are not mixed, and the water is spouted from the opening **4***a* which is broader than the water spout opening of the closed rim. At this time, a noise is not generated. Therefore, this western-style flush toilet is excellent in the quietness.

[**0193**] In such a western-style flush toilet, the collision of the water at the front side of the bowl portion **1** is not generated, so water is not splashed, and there is no possibility that a floor surface gets wet. Accordingly, the person who uses the western-style flush toilet doesn't feel uncomfortable. Furthermore, in the western-style flush toilet, by strengthening water force, the washing ability of the bowl portion **1** can be ensured. In addition, the water whirls in one direction (one-way whirling) at the bowl portion **1** to be discharged, so the filth discharging ability is also excellent.

[**0194**] Especially, in this western-style flush toilet, the upper surface of the stepped portion **6** is formed in the

above-mentioned manner, so the water which is spouted from the hose **8** doesn't flow downward to the bowl portion **1** immediately at the upstream side of the rim channel **4**. Namely, the water is guided to the most downstream side, and it flows downward to the bowl portion **1**. So, the washing of the bowl portion **1** can be carried out satisfactorily. Besides, due to this, the water easily whirls in the bowl portion **1**, and the filth discharging ability can be improved. In addition, since the water is guided only to the bowl portion **1** at the most downstream side, the water is not circulated again, and it doesn't remain in the rim channel. Therefore, water is not used in vain, and the effect of saving water is large.

[**0195**] Furthermore, in the western-style flush toilet, since the western-style toilet body **5** has the partition wall **7**, water is never guided to the rear side. Accordingly, water is not used in vain, and the effect of saving water is large.

[**0196**] Moreover, the western-style flush toilet has no water spout openings, so the constitution of the open rim **2** is simple. As a result, the number of the manufacturing process is limited, and accordingly, the reduction of the manufacturing cost can be realized.

[**0197**] Therefore, the western-style flush toilet is excellent in the quietness, and there is no possibility that the floor surface gets wet. In addition, the western-style flush toilet is excellent in the washing ability of the bowl portion **1** and the filth discharging ability. Simultaneously, the western-style flush toilet can realize the reduction of the manufacturing cost.

[**0198**] (Embodiment 2)

[**0199**] As shown in **FIG. 15**, in a western-style flush toilet of the embodiment 2, a washing device **10** which is directly connected to a city water service pipe is formed instead of the washing device in the embodiment 1. The washing device **10** has a device body **10***a* which is formed at a rear upper portion of a western-style toilet body **11** and which is directly connected to the city water service pipe, a pipe **10***b* which is connected to the device body **10***a* and which is extended in the left side of the western-style toilet body **11** as you face it and a nozzle **10***c* which is formed at a top end of the pipe **10***b* and which is protruded into the inside of a rim channel **4**. In the inside of the device body **10***a*, a valve not shown in the drawing for opening and closing a passage which is connected to the pipe **10***b* is stored. Other constitutions are the same as those of the embodiment 1.

[**0200**] As above-mentioned, in the western-style flush toilet with such a constitution, when the person who uses the toilet inputs a washing switch, water in the city water service pipe is spouted from the pipe **10***b* by the nozzle **10***c* to the rim channel **4** by way of the device body **10***a* of the washing device **10**. At this time, water force is strengthened by the nozzle **10***c*, so the water flows downward to a bowl portion **1** while being guided in the rim channel **4** with strong water force, and then whirls. Accordingly, the washing ability of the bowl portion **1** can be improved. Other operations and effects are the same as those of the embodiment 1.

[**0201**] {Sixth Invention}

[**0202**] Embodiments 1 and 2 which embody the sixth invention are explained hereinafter in conjunction with drawings.

[**0203**] (Embodiment 1)

[**0204**] As shown in **FIG. 16, a** western-style flush toilet of the embodiment 1 includes a bowl portion **1** which has a bowl face **1***a* by means of a western-style toilet body **10** made of porcelain and a trap portion **2** which is connected to a bottom portion of the bowl portion **1**. The uppermost portion of the trap portion **2** is a reflecting surface **2***a* which is constituted by an approximately flat surface, and the reflecting surface **2***a* is connected downward to a water discharge opening **2***b*. The water discharge opening **2***b* is connected to a water discharge pipe not shown in the drawing by way of a water discharge socket **7**. A toilet seat and a toilet lid are not shown in the drawing.

[**0205**] Furthermore, a nozzle opening **3** is mounted in a bottom portion of a reserved water portion of the trap portion **2** which ensures reserved water. At the nozzle opening **3**, a jet nozzle **9** which is connected to a jet pipe **8** is fixed. A top end of the jet nozzle **9** which is in the inside of the trap portion **2** is a jet opening **9***a*. Besides, a rim **4** which has a rim channel **4***a* in the inside thereof is formed at the whole of an upper periphery of the bowl portion **1**. At a rear upper portion of the bowl portion **1**, a rim pipe **5** whose top end opens toward the inside of the rim channel **4***a* is formed. The jet pipe **8** and the rim pipe **5** are connected to a washing device **6** in which two valves not shown in the drawing are stored, and the washing device **6** is directly connected to a city water service pipe which is not shown in the drawing.

[**0206**] In this western-style flush toilet, when the person who uses the toilet pushes a water discharge button switch of a body or a remote control not shown in the drawing, first of all, the washing device **6** opens one of two valves, and water flows toward only the rim channel **4***a* by way of the rim pipe **5**. Due to this, the water flows out from plural water spout openings which are mounted at a lower edge of the rim **4** and which is not shown in the drawing, and the bowl face **1***a* of the bowl portion **1** is washed. Then, the washing device **6** closes the one of two valves.

[**0207**] Secondly, the washing device **6** opens the other of two valves, and water flows toward only the jet nozzle **9** by way of the jet pipe **8**. Due to this, the water is spouted from the jet opening **9***a* toward the spouting direction D1 in the trap portion **2**. The water which is spouted from the jet opening **9***a* forcibly generates a siphon effect. So, the water containing filth is discharged to a discharge pipe by way of a water discharge socket **7**.

[**0208**] At this time, the water which is spouted from the jet opening **9***a* toward the spouting direction D1 is reflected toward the central direction D2 of the water discharge opening **2***b* by means of the reflecting surface **2***a*. Accordingly, the reflected water is discharged to the water discharge opening **2***b* without being collided with a wall face at the downstream side from the reflecting surface **2***a*, and there is little possibility that the reflected water comes into collision. Especially, in this western-style flush toilet, the central direction D2 is the vertical direction, so the discharging speed of the reflected water is increased by the gravity. Besides, in this western-style flush toilet, at the point where the water is collided with the reflecting surface **2***a*, an angle A1 which is obtained by an imaginary line P vertical to the reflecting surface **2***a* and the spouting direction D1 of the water is equal to an angle A2 which is obtained by the imaginary line P and the central direction D2 of the water

discharge opening **2***b*. Accordingly, the water which is spouted from the jet opening **9***a* is guided to the central direction D2 of the water discharge opening **2***b* with the water being reflected by the reflecting surface **2***a* only one time, so the water reaches the water discharge opening **2***b* with maintaining its force. Due to this, the water discharging ability is improved, and a siphon effect is strengthened. Then, the washing device **6** closes the other of two valves.

[**0209**] Finally, the washing device **6** opens the one of two valves again, and water flows toward only the rim channel **4***a* by way of the rim pipe **5**. Due to this, the water flows out from plural water spout openings which are mounted at the lower edge of the rim **4**, and water is reserved at the lower side of the bowl portion **1** and the reserved water portion of the trap portion **2**. Then, the washing device **6** closes the one of two valves to complete the whole operations.

[**0210**] Therefore, in the western-style flush toilet of the embodiment 1, the water can be used no uselessly and efficiently, and the discharge of filth can be performed even by a small amount of water.

[**0211**] (Embodiment 2)

[**0212**] As shown in **FIG. 17**, in a western-style flush toilet of the embodiment 2, at a bottom portion of a reserved water portion of a trap portion **2** which ensures the reserved water, a reserved portion **2***f* which reserves a slurry as in a small amount as possible at the time of casting a sludge is formed. Besides, a lower side wall face **2***c* which is connected to the reserved portion **2***f* and which is extended in parallel to the spouting direction D1 of the water spouted from a jet opening **9***a* is formed. With respect to the same constitutions as those of the western-style flush toilet of the embodiment 1 shown in **FIG. 16**, the same symbols as those of **FIG. 16** are used, and explanations thereof are omitted. As for a toilet seat and a toilet lid, they are not shown in the drawing, in the same way as **FIG. 16**.

[**0213**] In this western-style flush toilet, when the person who uses the toilet pushes a water discharge button switch of a body or a remote control not shown in the drawing, first of all, a washing device **6** opens one of two valves, and water flows toward only a rim channel **4***a* by way of a rim pipe **5**. Due to this, the water is spouted from plural water spout openings which are mounted at a lower edge of a rim **4** and which is not shown in the drawing, and a bowl face **1***a* of a bowl portion **1** is washed. Then, the washing device **6** closes the one of two valves.

[**0214**] Secondly, the washing device **6** opens the other of two valves, and water flows toward only a jet nozzle **9** by way of a jet pipe **8**. Due to this, the water is spouted from the jet opening **9***a* toward the spouting direction D1 in the trap portion **2**. The water which is spouted from the jet opening **9***a* forcibly generates a siphon effect. So, the water containing filth is discharged to a discharge pipe by way of a water discharge socket **7**.

[**0215**] At this time, the water is not spouted along a center line of the trap portion **2**, and it is spouted along the line which is close to the lower side wall face **2***c* by the center line. Especially, in this western-style flush toilet, the reserved portion **2***f* reserves the slurry as in a small amount as possible at the time of casting a sludge, and the lower side wall face **2***c* of the trap portion **2** is extended in parallel to the spouting direction D1 of the water spouted from the jet opening **9***a*. Due to this, the water is spouted in parallel near the lower side wall face **2***c*. Accordingly, the sediment which may remain on the lower side wall face **2***c* is discharged without remaining in the trap portion **2**, and filth can be surely discharged.

[**0216**] Finally, the washing device **6** opens the one of two valves again, and water flows toward only the rim channel **4***a* by way of the rim pipe **5**. Due to this, the water is spouted from plural water spout openings which are mounted at the lower edge of the rim **4**, and water is reserved at the lower side of the bowl portion **1** and the reserved water portion of the trap portion **2**. Then, the washing device **6** closes the one of two valves to complete the whole operations.

[**0217**] Therefore, in the western-style flush toilet of the embodiment 1, the water can be used no uselessly and efficiently, and the discharge of filth can be performed even by a small amount of water. Other operations and effects are the same as those of the embodiment 1.

[**0218**] {Seventh Invention}

[**0219**] Embodiments 1 to 3 which embody the seventh invention are explained hereinafter in conjunction with drawings.

[**0220**] (Embodiment 1)

[**0221**] As shown in **FIG. 18, a** western-style flush toilet of the embodiment 1 includes a western-style toilet body **11** made of porcelain and a washing device **12** which is directly connected to a water supply pipe not shown in the drawing for supplying water from the outside, and in which water is spouted by opening and closing a valve not shown in the drawing to supply the water to the western-style toilet body **11**.

[**0222**] The western-style toilet body **11** has a bowl portion **13**, a rim **14** which is formed at the whole of an upper periphery of the bowl portion **13** and which has a rim channel **14***a* capable of flowing water downward to the bowl portion **13** in the inside thereof and a trap portion **15** which is connected to a lower edge of the bowl portion **13**.

[**0223**] At the rear of the rim channel **14***a*, the washing device **12** and a rim pipe **20** are mounted. Besides, the trap portion **15** has a reserved water portion **15***a* for reserving water in the inside of the bowl portion **13** by means of a top edge **15***d*. The top edge **15***d* of the trap portion **15** is determined as a single point or a horizontal line on the basis of a cross-sectional form of the trap portion **15** which crosses the discharging direction. A nozzle opening **15***b* is mounted in the bottom of the reserved water portion **15***a*, and a jet nozzle **19** which is connected to the washing device **12** by way of the jet pipe **18** is mounted at the nozzle opening **15***b*. A jet opening **19***a* of the jet nozzle **19** points to the top edge **15***d*.

[**0224**] Furthermore, a rear edge **13***a* of the bowl portion **13** is positioned at the most rear side portion of a boundary between the bowl portion **13** and the rim **14**. Besides, at the rear of the bowl portion **13** and the rim **14**, a pair of toilet seat mounting holes **16** for mounting a toilet seat, a toilet seat having a heating function, a toilet seat having a part washing function and the like, all of which are not shown in the drawing, is formed. In this western-style flush toilet, the top edge **15***d* is positioned in front of each of toilet seat

mounting holes **16**, and further, it is positioned in front of the rear edge **13***a* of the bowl portion **13**.

[**0225**] A water discharge socket **17** which extends upward and downward is connected to a discharge opening **15***c* at a downstream side from the top edge **15***d* of the trap portion **15**. The water discharge socket **17** is connected to a water discharge pipe which is protruded from a floor surface and which is not shown in the drawing.

[**0226**] In the western-style flush toilet with such a constitution, water is supplied from the washing device **12** to the rim channel **14***a* by way of a rim pipe **20**, and then, the water flows downward to the bowl portion **13**. Besides, the water which is supplied from the washing device **12** is spouted from the jet opening **19***a* by way of the jet pipe **18** and the jet nozzle **19**, and this forcibly generates a siphon effect. Due to this, the water together with filth is discharged to the rear side along the trap portion **15**, and then, it is discharged to a water discharge pipe by way of the water discharge socket **17**.

[**0227**] Thus, in this western-style flush toilet, the top edge **15***d* is positioned in front of each of toilet seat mounting holes **16**, and further, it is positioned in front of the rear edge **13***a* of the bowl portion **13**. Accordingly, the whole length of the western-style toilet body **11** is short. Besides, the western-style flush toilet has no water tank which reserves water once, so the whole length of the western-style toilet body **11** is further short.

[**0228**] Accordingly, the western-style flush toilet as a whole is miniaturized, so the saving of spaces in a toilet room can be achieved. Even in the toilet room which cannot ensure a relatively large space, the person who uses the toilet feels a wide space. Besides, in this western-style flush toilet, the person who uses the toilet easily moves in the toilet room, and it is possible to utilize extra spaces for others. Furthermore, since the western-style flush toilet is miniaturized, the saving of materials for manufacturing the western-style flush toilet and the reduction of the cost can be realized.

[**0229**] (Embodiment 2)

[**0230**] As shown in **FIG. 19**, in a western-style flush toilet of the embodiment 2, a rear wall **15***e* of a trap portion **15** and a rear edge **13***a* of a bowl portion **13** are existed at the same position in the vertical direction. Due to this, a top edge **15***d* is positioned in front of each of toilet seat mounting holes **16**, and furthermore, it is positioned in front of the rear edge **13***a* of the bowl portion **13**. Other constitutions are the same as those of the embodiment 1.

[**0231**] In such a western-style flush toilet, the whole length of a western-style toilet body **11** is further short, so the effect of this invention can be further shown. Other operations and effects are the same as those of the embodiment 1.

[**0232**] Moreover, if the rear wall **15***e* of the trap portion **15** is positioned in front of the rear edge **13***a* of the bowl portion **13**, the effect of this invention can be remarkably shown.

[**0233**] (Embodiment 3)

[**0234**] As shown in **FIG. 20**, in a western-style flush toilet of the embodiment 3, a trap portion **15** is bent forwardly at a downstream side **15***f* from a top edge **15***d*. Other constitutions are the same as those of the embodiment 1.

[**0235**] In such a western-style flush toilet, even if a base seat portion **21** which conceals the trap portion **15** is miniaturized for miniaturizing a western-style toilet body **11**, a discharge opening **15***c* is far from a rear side wall face in the base seat portion **21**, and the discharge opening **15***c* is preferably connected to a water discharge socket **17**. Other operations and effects are the same as those of the embodiment 1.

[**0236**] {Eighth Invention}

[**0237**] Embodiments 1 and 2 which embody the eighth invention are explained hereinafter in conjunction with drawings.

[**0238**] (Embodiment 1)

[**0239**] As shown in **FIG. 25, a** western-style flush toilet of the embodiment 1 includes a western-style toilet body **11** made of porcelain and a washing device **12** which is directly connected to a water supply pipe not shown in the drawing for supplying water from the outside, and in which water is spouted by opening and closing a valve not shown in the drawing to supply the water to the western-style toilet body **11**. A toilet seat and a toilet lid are not shown in the drawing.

[**0240**] The western-style toilet body **11** has a bowl portion **13**, a rim **14** which is formed at the whole of an upper periphery of the bowl portion **13** and which has a rim channel **14***a* capable of flowing water downward to the bowl portion **13** in the inside thereof and a trap portion **15** which is connected to a lower edge of the bowl portion **13**.

[**0241**] At the rear of the rim channel **14***a*, a rim pipe **20** which is connected to the washing device **12** is mounted. Besides, the trap portion **15** has a reserved water portion **15***a* for reserving water in the inside of the bowl portion **13** by means of a top edge **15***d*. The top edge **15***d* of the trap portion **15** is determined as a single point or a horizontal line on the basis of a cross-sectional form of the trap portion **15** which crosses the discharging direction. A nozzle opening **15***b* is mounted in the bottom of the reserved water portion **15***a*, and a jet nozzle **19** which is connected to the washing device **12** by way of the jet pipe **18** is mounted at the nozzle opening **15***b*. A jet opening **19***a* of the jet nozzle **19** points to the top edge **15***d*.

[**0242**] Besides, the center TO of an inlet port TI of the trap portion **15** is positioned in front of the center BO of the bowl portion **13**. Here, the inlet port TI of the trap portion **15** is the portion which ranges from the bowl portion **13** to the trap portion **15**, and it is extended in the horizontal direction. The portion which ranges from the bowl portion **13** to the trap portion **15** is determined by a lower edge **13***d* (TR) of a rear wall **13***b* of the bowl portion **13**. The center TO of the inlet port TI is the middle point of a line segment TL which connects the lower edge **13***d* (TR) and the front edge TF of the inlet port TI.

[**0243**] Furthermore, the center BO of the bowl portion **13** in the horizontal direction is determined by a perpendicular line which is assumed to be positioned at the center between a perpendicular line BR positioned at a rear edge **13***r* of the bowl portion **13** and a perpendicular line BF positioned at a front edge **13***f* of the bowl portion **13**. Here, the rear edge **13***r* of the bowl portion **13** is the most rear side portion of a

boundary between the bowl portion **13** and the rim **14**, and the front edge **13***f* of the bowl portion **13** is the most front side portion of the boundary between the bowl portion **13** and the rim **14**.

[**0244**] Moreover, the trap portion **15** has a cylindrical portion **15***h* whose inner surface is a cylindrical surface at an upstream side from the top edge **15***d*. A shaft center line **15***g* of the cylindrical portion **15***h* is extended in such a manner that it has an angle θ (θ=45 degrees) with respect to the horizontal direction.

[**0245**] A water discharge socket **17** which extends upward and downward is connected to a discharge opening **15***c* at a downstream side from the top edge **15***d* of the trap portion **15**. The water discharge socket **17** is connected to a water discharge pipe which is protruded from a floor surface and which is not shown in the drawing.

[**0246**] In the western-style flush toilet with such a constitution, water is supplied from the washing device **12** to the rim channel **14***a* by way of a rim pipe **20**, and then, the water flows downward to the bowl portion **13**. Besides, the water which is supplied from the washing device **12** is spouted from the jet opening **19***a* by way of the jet pipe **18** and the jet nozzle **19**, and this forcibly generates a siphon effect. Due to this, the water together with filth is discharged to the rear side along the trap portion **15**, and then, it is discharged to a water discharge pipe by way of the water discharge socket **17**.

[**0247**] Thus, in this western-style flush toilet, the center TO of the inlet port TI which is extended in the horizontal direction of the trap portion **15** is positioned in front of the center BO of the bowl portion **13** in the horizontal direction. Accordingly, the whole length of the western-style toilet body **11** is short. Besides, the shaft center line **15***g* of the cylindrical portion **15***h* of the trap portion **15** is extended in such a manner that it has an angle of 45 degrees with respect to the horizontal line. So, the whole length of the western-style toilet body **11** in the front and rear directions is shortened by the trap portion **15** while maintaining a water level of the reserved water. Furthermore, the western-style flush toilet has no water tank which reserves water once, so the whole length of the western-style toilet body **11** is especially short.

[**0248**] Accordingly, the western-style flush toilet as a whole is miniaturized, so the saving of spaces in a toilet room can be achieved. Even in the toilet room which cannot ensure a relatively large space, the person who uses the toilet feels a wide space. Besides, in this western-style flush toilet, the person who uses the toilet easily moves in the toilet room, and it is possible to utilize extra spaces for others. Furthermore, since the western-style flush toilet is miniaturized, the saving of materials for manufacturing the western-style flush toilet and the reduction of the cost can be realized.

[**0249**] (Embodiment 2)

[**0250**] As shown in **FIG. 26**, in a western-style flush toilet of the embodiment 2, a downstream side **15***i* from a top edge **15***d* of a trap portion **15** is bent forwardly. Other constitutions are the same as those of the embodiment 1.

[**0251**] In such a western-style flush toilet, even if a base seat portion **21** which conceals the trap portion **15** is miniaturized for miniaturizing a western-style toilet body **11**, a discharge opening **15***c* is far from a rear side wall face in the base seat portion **21**, and the discharge opening **15***c* is preferably connected to a water discharge socket **17**. Other operations and effects are the same as those of the embodiment 1.

[**0252**] {Ninth Invention}

[**0253**] Embodiment which embodies the ninth invention is explained hereinafter in conjunction with the drawing.

[**0254**] (Embodiment)

[**0255**] As shown in **FIG. 27, a** western-style flush toilet of the embodiment includes a western-style toilet body **10** made of porcelain and a washing device **6** in which two valves not shown in the drawing are stored. A toilet seat and a toilet lid are not shown in the drawing.

[**0256**] The western-style toilet body **10** includes a bowl portion **1** which has a bowl face **1***a* and a trap portion **2** which is connected to a bottom portion of the bowl portion **1**. The uppermost portion of the trap portion **2** is a reflecting surface **2***a* which is constituted by an approximately flat surface, and the reflecting surface **2***a* is connected downward to a water discharge opening **2***b*.

[**0257**] The water discharge opening **2***b* of the western-style toilet body **10** is connected to a water discharge pipe **7** which is protruded from a floor surface **15** by way of a water discharge socket **11** made of resin. The water discharge socket **11** is constituted by a water discharge socket body **12** which is made of resin and which is formed integrally with the water discharge socket **11**, a cap **13** which is made of resin and which has an orifice **13***a* at a bottom surface thereof and a packing **14** made of rubber. The water discharge socket body **12** and the floor surface **15** are fixed by a screw **16**. The western-style toilet body **10** and the water discharge socket body **12** are fixed by a screw **17**.

[**0258**] Furthermore, a nozzle opening **3** is mounted in a bottom portion of a reserved water portion of the trap portion **2**. At the nozzle opening **3**, a jet nozzle **9** which is connected to the washing device **6** by way of a jet pipe **8** is fixed. A top end of the jet nozzle **9** which is in the inside of the trap portion **2** is a jet opening **9***a*. Besides, a rim **4** which has a rim channel **4***a* in the inside thereof is formed at an upper portion of the bowl portion **1**. At a rear upper portion of the bowl portion **1**, a rim pipe **5** which is connected to the washing device **6** and whose top end opens toward the inside of the rim channel **4***a* is formed. The washing device **6** is directly connected to a city water pipe which is not shown in the drawing.

[**0259**] In this western-style flush toilet, when the person who uses the toilet pushes a water discharge button switch of a body or a remote control not shown in the drawing, first of all, the washing device **6** opens one of two valves, and water flows toward only the rim channel **4***a* by way of the rim pipe **5**. Due to this, the water flows out from plural water spout openings which are mounted at a lower edge of the rim **4** and which is not shown in the drawing, and the bowl face **1***a* of the bowl portion **1** is washed. Then, the washing device **6** closes the one of two valves.

[**0260**] Secondly, the washing device **6** opens the other of two valves, and water flows toward only the jet nozzle **9** by way of the jet pipe **8**. Due to this, the water is spouted from

the jet opening **9***a* in the trap portion **2**. The water which is spouted from the jet opening **9***a* forcibly generates a siphon effect. So, filth water containing the water and filth is discharged to the discharge pipe **7** by way of the water discharge socket **11**.

[**0261**] When the filth water is discharged by way of the socket **11**, the filth water is partly cut off by the orifice **13***a* of the cap **13**, and as a result, the turbulence is generated to form a water screen. Because of the function of such a water screen, the trap portion **2** is filled with the filth water, and after that, the filled filth water is discharged to the water discharge pipe **7** by breaking the water screen in such a manner that the filth water is dragged into the side of the water discharge pipe **7** (a siphon effect).

[**0262**] At this time, the washing device **6** is directly connected to a city water service pipe for supplying water from the outside, and it is capable of spouting water under the city water pressure by opening and closing an open/close valve. So, the washing device **6** easily adjust an amount of water which is spouted therefrom finely by opening and closing the open/close valve. Due to this, it is possible to spout the smallest amount of water which is enough to discharge filth satisfactorily.

[**0263**] Moreover, in this western-style flush toilet, since the water discharge socket **11** made of resin is adopted, the orifice **13***a* can be formed accurately and easily. Due to this, even if the smallest amount of water is used, a siphon effect can be surely generated.

[**0264**] Finally, the washing device **6** opens the one of two valves again, and water flows toward only the rim channel **4***a* by way of the rim pipe **5**. Due to this, the water flows out from plural water spout openings which are mounted at the lower edge of the rim **4**, and water is reserved at the lower side of the bowl portion **1** and the reserved water portion of the trap portion **2**. Then, the washing device **6** closes the one of two valves to complete the whole operations.

[**0265**] Therefore, in the western-style flush toilet of this embodiment, the water can be used no uselessly and efficiently, and the discharge of filth can be performed even by a small amount of water.

[**0266**] The above-mentioned embodiments are only for illustrative purpose, and the first to ninth inventions can be carried out in modes including various modifications within a range without departing from the gist of the inventions.

Industrial Applicability

[**0267**] Accordingly, in the western-style flush toilet of the first and second inventions, stains are hardly adhered to a rim, and as a result, a nasty smell and the like are hardly generated. Furthermore, the person who uses the western-style flush toilet feels comfortable, and the western-style flush toilet is sanitary.

[**0268**] The western-style flush toilet of the third invention can realize the reduction of the manufacturing cost and the running cost, simultaneously with the keeping of the condition that the western-style flush toilet can be used during the cold season and the prevention of the western-style flush toilet from being damaged.

[**0269**] The western-style flush toilet of the fourth invention can realize the reduction of the manufacturing cost.

[**0270**] The western-style flush toilet of the fifth invention is excellent in the quietness, and there is no possibility that the floor surface gets wet. In addition, the western-style flush toilet is excellent in the washing ability of the bowl portion and the filth discharging ability, and it can realize the reduction of the manufacturing cost.

[**0271**] In the western-style flush toilet of the sixth invention, water can be used no uselessly and efficiently, so the discharge of filth can be performed even by a small amount of water.

[**0272**] The western-style flush toilet of the seventh and eighth inventions as a whole is miniaturized. When such a western-style flush toilet is adopted to residences and the like in recent years, the saving of spaces can be achieved. Even in the toilet room which cannot ensure a relatively large space, the person who uses the toilet feels a wide space. Besides, due to the saving of spaces, the person who uses the toilet easily moves in the toilet room, and it is possible to utilize extra spaces for others. Furthermore, since the western-style flush toilet is miniaturized, the saving of materials for manufacturing the western-style flush toilet and the reduction of the cost can be realized.

[**0273**] In the western-style flush toilet of the ninth invention, the discharge of filth water can be performed even by a small amount of water.

What is claimed is:

1. A western-style flush toilet including a western-style toilet body comprising a bowl portion and a rim which is formed at an upper periphery of said bowl portion and which has a rim channel in the inside thereof, and

a washing device which is capable of spouting water to said rim channel, wherein said water which is spouted from said washing device is provided for washing said bowl portion by way of said rim channel,

the improvement being characterized in that an inward surface of said rim is an identical surface to a bowl face of said bowl portion at least at the front side.

2. A western-style flush toilet including a western-style toilet body comprising a bowl portion and a rim which is formed at an upper periphery of said bowl portion and which has a rim channel in the inside thereof, and

a washing device which is capable of spouting water to said rim channel, wherein said water which is spouted from said washing device is provided for washing said bowl portion by way of said rim channel,

the improvement being characterized in that an inward surface of said rim is positioned outwardly with respect to a bowl face of said bowl portion at least at the front side.

3. A western-style flush toilet including a bowl portion, a trap portion which is connected to a lower edge of said bowl portion and a jet opening which is mounted at said trap portion in order to spout water along said trap portion, wherein said bowl portion and said trap portion are constituted by a western-style toilet body made of porcelain, and said jet opening is constituted by a jet nozzle which is connected to a washing device capable of spouting said water by way of a jet pipe,

the improvement being characterized in that said jet pipe is heated by a heater which heats said trap portion.

4. A western-style flush toilet according to claim 3, wherein said heater has faces and surrounds said trap portion, and said jet pipe is positioned near said heater.

5. A western-style flush toilet according to claim 3, wherein said heater has faces and surrounds said trap portion and said jet pipe.

6. A western-style flush toilet including a bowl portion, a trap portion which is connected to a lower edge of said bowl portion and a jet opening which is mounted at said trap portion in order to spout water along said trap portion, wherein said bowl portion and said trap portion are constituted by a western-style toilet body made of porcelain, and said jet opening is constituted by a jet nozzle which is connected to a washing device capable of spouting said water by way of a jet pipe,

the improvement being characterized in that said jet pipe is prevented from a dew drop by means of an anticondensation material which prevents said trap portion from a dew drop.

7. A western-style flush toilet including a western-style toilet body comprising a bowl portion, a rim which is formed at an upper periphery of said bowl portion and which has a rim channel in the inside thereof and a trap portion which is connected to a lower edge of said bowl portion, and

a washing device which is capable of spouting water to said rim channel, wherein said water which is spouted from said washing device is provided for washing said bowl portion by way of said rim channel,

the improvement being characterized in that said rim channel is exposed to said bowl portion, and said washing device is mounted in such a manner that said water is spouted to the inside of said rim channel from only one direction.

8. A western-style flush toilet including a bowl portion, a trap portion which is connected to a lower edge of said bowl portion and a jet opening which is mounted at said trap portion in order to spout water along said trap portion,

the improvement being characterized in that said trap portion has a reflecting surface by which said water spouted from said jet opening is reflected toward a water discharge opening of said trap portion.

9. A western-style flush toilet according to claim 8, wherein said water which is spouted from said jet opening is reflected toward the vertical direction by said reflecting surface.

10. A western-style flush toilet according to claim 8 or claim 9, wherein said jet opening is mounted in such a manner that said water is spouted along a lower side wall face of said trap portion.

11. A western-style flush toilet according to claim 10, wherein a reserved portion which reserves a slurry as in a small amount as possible at the time of casting a sludge, and said lower side wall face which is connected to said reserved portion and which is extended in parallel to the spouting direction of said water spouted from said jet opening are formed at a bottom portion of a reserved water portion of said trap portion which ensures reserved water.

12. A western-style flush toilet including a western-style toilet body comprising a bowl portion and a trap portion which is connected to a lower edge of said bowl portion, wherein said bowl portion is washed by water, and said water is discharged to a rear side along said trap portion,

the improvement being characterized in that a top edge of said trap portion which forms reserved water in said bowl portion is positioned in front of a rear edge of said bowl portion.

13. A western-style flush toilet according to claim 12, wherein a rear wall of said trap portion is positioned in front of the rear edge of said bowl portion.

14. A western-style flush toilet according to claim 12 or claim 13, wherein a pair of toilet seat mounting holes is formed at the rear of said bowl portion, and the top edge of said trap portion is positioned in front of each of said toilet seat mounting holes.

15. A western-style flush toilet including a western-style toilet body comprising a bowl portion and a trap portion which is connected to a lower edge of said bowl portion, wherein said bowl portion is washed by water, and said water is discharged to a rear side along said trap portion,

the improvement being characterized in that the center of an inlet port which ranges from said bowl portion to said trap portion and which is extended in the horizontal direction of said trap portion is positioned in front of the center of said bowl portion in the horizontal direction.

16. A western-style flush toilet including a western-style toilet body comprising a bowl portion and a trap portion which is connected to a lower edge of said bowl portion, wherein said bowl portion is washed by water,

the improvement being characterized in that a washing device which is directly connected to a city water service pipe for supplying water from the outside and which is capable of spouting said water under the city water pressure by opening and closing an open/close valve is provided, a water discharge socket made of resin which has an orifice for generating a siphon effect inside thereof is provided at a water discharge opening of said trap portion, and said water discharge socket is connected to a water discharge pipe which is protruded from a floor surface.

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