liquid.

[0009]

In particular, for example, a large cleaning tank has the problem that a nozzle is often located in an area that is difficult to directly hit by a jet stream, and some area is often left unwashed.

In a case where some area is left unwashed, a large amount of cleaning liquid is required in order to eliminate the unwashed area by performing cleaning for a long time. However, there is a need to save the cleaning liquid.

[0010]

An object of the present invention is to provide a rotating spray unit capable of evenly cleaning the inside of a tank in a short time and saving a cleaning liquid.

Solution to Problem

[0011]

A rotating spray unit according to a first aspect of the present invention is

a rotating spray unit disposed in a tank and configured to clean an inside of the tank, the rotating spray unit comprising

a plurality of cleaning jet holes formed in a rotating unit main body that rotates, wherein

some or all of the plurality of cleaning jet holes have different jet angles in an elevation angle direction, wherein the cleaning jet holes include:

a plurality of high-angle jet holes configured to jet a water stream to a high-angle region;

a plurality of intermediate-angle jet holes configured to jet a water stream to an intermediate-angle region; and

a plurality of low-angle jet holes configured to jet a water stream to a low-angle region, and

with reference to an equator orthogonal to the rotation axis of the rotating unit main body,

an angle formed by the water stream jetted from each of the high-angle jet holes is more than 60° and 85° or less,

an angle formed by the water stream ejected from each of the intermediate-angle jet holes is more than 30° and 60° or less, and

an angle formed by the water stream ejected from each of the low-angle jet holes is 0° or more and 30° or less.

The cleaning jet holes are further opened in a side wall of the rotating unit main body to be inclined in a rotation direction at a predetermined angle with respect to a straight line orthogonal to the rotation axis in a plane centered on the rotation axis, and

when cleaning is performed with the rotating spray

unit rotated, a plurality of water streams jetted from the respective cleaning jet holes are dispersed in the elevation angle direction of an upper hemisphere in the tank.

[0012]

In this manner, by making the cleaning jet holes have different jet angles in the elevation angle direction, the inside of the tank can be evenly cleaned in a short time, and a cleaning liquid can be saved.

[0013]

[0014]

In this manner, by forming the high-angle jet holes, the intermediate-angle jet holes, and the low-angle jet holes in the rotating unit main body, an inner wall surface of the tank can be extensively cleaned. Therefore, the inside of the tank can be evenly cleaned in a short time, and the cleaning liquid can be saved.

[0015]

A rotating spray unit according to a second aspect of the present invention is

a rotating spray unit disposed in a tank and configured to clean an inside of the tank, the rotating spray unit comprising

a plurality of cleaning jet holes formed in a rotating unit main body that rotates, wherein

some or all of the plurality of cleaning jet holes have different jet angles in an elevation angle direction,

wherein a plurality of jet hole regions in each of which a jet hole group is formed in a line in a direction orthogonal to a rotation direction of the rotating unit main body are

disposed on a side wall of the rotating unit main body,

the jet hole regions include:

a high-angle jet hole region configured to jet a water stream to a high-angle region;

an intermediate-angle jet hole region configured to jet a water stream to an intermediate-angle region; and

a low-angle jet hole region configured to jet a water stream to a low-angle region, and

angles of the water streams jetted from the jet hole groups included in the respective jet hole regions are different from each other.

The high-angle jet hole region includes a high-angle jet hole group including a plurality of the cleaning jet holes,

an angle formed by an equator and a water stream jetted from the cleaning jet hole closest to the equator of the high-angle jet hole group is in a range of 50° or more, and an angle formed by the equator and a water stream jetted from the cleaning jet hole closest to a pole of the high-angle jet hole group is in a range of 85° or less,

the intermediate-angle jet hole region includes an intermediate-angle jet hole group including a plurality of the cleaning jet holes,

an angle formed by the equator and a water stream

jetted from the cleaning jet hole closest to the equator of the intermediate-angle jet hole group is in a range of 10° or more, and an angle formed by the equator and a water stream jetted from the cleaning jet hole closest to the pole of the intermediate-angle jet hole group is in a range of 55° or less,

the low-angle jet hole region includes a low-angle jet hole group including a plurality of the cleaning jet holes, and

an angle formed by the equator and a water stream jetted from the cleaning jet hole closest to the equator of the low-angle jet hole group is in a range of 0° or more, and an angle formed by the equator and a water stream jetted from the cleaning jet hole closest to the pole of the low-angle jet hole group is in a range of 30° or less.

The cleaning jet holes are further opened in a side wall of the rotating unit main body to be inclined in a rotation direction at a predetermined angle with respect to a straight line orthogonal to a rotation axis in a plane centered on the rotation axis, and

when cleaning is performed with the rotating spray unit rotated, a plurality of water streams jetted from the respective cleaning jet holes are dispersed in the elevation angle direction of an upper hemisphere in the tank.

[0016]

In this manner, by forming the high-angle jet hole region, the intermediate-angle jet hole region, and the low-angle jet hole region in the rotating unit main body, an inner wall surface of the tank can be extensively cleaned. Therefore, the inside of the tank can be evenly cleaned in a short time, and the cleaning liquid can be saved.

[0017]

[0018]

In this manner, by setting the range of the angle formed by each water stream jetted from the cleaning jet hole, it is possible to accurately form the high-angle jet hole region, the intermediate-angle jet hole region, and the low-angle jet hole region.

[0019]

Optionally, in the rotating spray unit according to the second aspect of the present invention,

each of the jet hole groups includes two to ten of the cleaning jet holes.

[0020]

That is, by including the above-described number of cleaning jet holes in each jet hole group, the inner wall surface of the tank can be extensively cleaned.

[0021]

A rotating spray unit according to a third aspect of the present invention is a rotating spray unit disposed in a tank and configured to clean an inside of the tank, the rotating spray unit comprising

a plurality of cleaning jet holes formed in a rotating unit main body that rotates, wherein

some or all of the plurality of cleaning jet holes

have different jet angles in an elevation angle direction, and

the cleaning jet holes are further opened in a side wall of the rotating unit main body to be inclined in a rotation direction at a predetermined angle with respect to a straight line orthogonal to a rotation axis in a plane centered on the rotation axis.

The rotating unit main body includes: an upper rotating body including high-angle jet holes, intermediate-angle jet holes, and low-angle jet holes, or a high-angle jet hole region, an intermediate-angle jet hole region, and a low-angle jet hole region; and a lower rotating body that

rotates in a forward direction/a backward direction with respect to the upper rotating body, and the rotating unit main body is formed in a spherical shape by the upper rotating body and the lower rotating body.

The rotating jet holes for jetting the cleaning liquid in a tangential direction to rotate the lower rotating body are formed in the lower rotating body,

the sum of the number of the cleaning jet holes and the number of the rotating jet holes formed in the lower rotating body is less than the number of the cleaning jet holes formed in the upper rotating body, and

when cleaning is performed with the rotating spray unit rotated, a plurality of water streams jetted from the respective cleaning jet holes are dispersed in the elevation angle direction of an upper hemisphere in the tank.

[0022]

In this manner, a rotational speed of the upper rotating body can be reduced, and a part to be cleaned in the tank can be accurately cleaned. In addition, by making the rotating spray unit spherical, the angles of the water streams jetted from the cleaning jet holes can be appropriately dispersed in the elevation angle direction, and the inner wall surface of the tank can be extensively cleaned.

Advantageous Effects of Invention

[0023]

According to embodiments of the present invention, it is possible to provide the rotating spray unit capable of evenly cleaning the inside of the tank in a short time and saving the cleaning liquid.

Brief Description of Drawings

[0024]

Fig. 1 is a perspective view of a rotating spray unit