

GROUNDING DEVICE FOR FLOATING ROOF TANK

BACKGROUND OF THE INVENTION

5 Field of the Invention

[0001]

The present invention relates to a grounding device for a floating roof tank.

10 Description of the Related Art

[0002]

A background art of the invention is disclosed by JP 2008-213886 A (Patent Document 1). In this publication, there is a description 'A floating-roof type liquid storage tank includes a tank main body 2 for storing liquid 1, a floating roof 3 disposed floating on the liquid surface in the tank main
15 body, and a sloshing reducing device 5 provided at the floating roof to reduce sloshing of the liquid. The sloshing reducing device 5 includes a first reducing member 51 disposed in a form along the liquid surface of the liquid 1 at the bottom portion of the floating roof 3, and a second reducing member
20 52 disposed in a form being hung from the floating roof 3, wherein the first reducing member 51 and the second reducing member 52 are formed by a porous material that causes fluid resistance necessary for reducing the sloshing of liquid by relative motion to the liquid 1 (see Abstract).

25 SUMMARY OF THE INVENTION

[0004]

The above-described Patent Document 1 discloses a floating roof tank. However, the floating roof tank has a gap between the floating roof and the side wall of the tank main body, and electrical contact between
30 these is not guaranteed. Consequently, if these are not in contact with each

other, sparks may be caused between these by static electricity or the like.
In this situation, installation of a grounding device for a floating roof tank
on the floating roof tank is considered to enable prevention of generation of
sparks, by electrically connecting the floating roof and the side wall of the
5 tank.

[0005]

However, such a grounding device for a floating roof tank is to be
installed on a floating roof tank installed outdoors, and accordingly tends to
be exposed to rain water and foreign matters and thus deteriorate with
10 corrosion and the like.

In this situation, an object of the present invention is to provide a
grounding device, for a floating roof tank, that can be used for a long time,
being protected from deterioration with corrosion and the like.

[0006]

15 In order to attain the above-described object, in an embodiment of
the present invention, a grounding device for a floating roof tank includes a
drum that is covered by a housing and supported rotatably along a
circumferential direction in the housing, a conductor being wound around
the drum, and an urging member provided inside the inner circumferential
20 portion of the drum to urge the drum along a direction in which the
conductor is wound back.

[0007]

According to the present invention, it is possible to provide a
grounding device, for a floating roof tank, that can be used for a long time,
25 being protected from deterioration with corrosion and the like.

Objects, arrangements, and advantages other than the above will be
made clear by the below-described embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

30 [0008]

FIG. 1 is an illustration showing an example of installation of a grounding device for a floating roof tank, in a floating roof tank, in an embodiment of the present invention;

5 FIG. 2 is a side view of the grounding device for a floating roof tank in the embodiment of the invention;

FIG. 3 is a perspective view of the grounding device for a floating roof tank in the embodiment of the invention;

FIG. 4 is a perspective exploded view of the grounding device for a floating roof tank in the embodiment of the invention;

10 FIG. 5 is an enlarged vertical cross-sectional-view of the entrance-exit portion of the grounding device for a floating roof tank in the embodiment of the invention;

FIG. 6 is an enlarged vertical cross-sectional view of another example of the entrance-exit portion of the grounding device for a floating roof tank in another embodiment of the invention;

15 FIGS. 7A-7C show an illustration showing other examples of structure of the connecting members of the grounding device for a floating roof tank in embodiments of the invention, wherein the side view in FIG. 7A and the front view in FIG. 7B, and the perspective view in FIG. 7C show different embodiments; and

FIGS. 8A-8D are enlarged partial perspective views of a conductive member of a grounding device for a floating roof tank in embodiments of the invention, wherein FIGS. 8A-8D show respective different embodiments.

25 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009]

Preferred embodiments of the present invention will be described below with reference to the drawings.

FIG. 1 is an illustration showing an example of installation of a grounding device for a floating roof tank 10, in a floating roof tank 100, in an embodiment of the present invention.

First, as shown in FIG. 1, a floating roof tank 100 for storing liquid such as crude oil outdoors has a structure where a floating roof 102 provided with a float 101 called a pontoon is floated on crude oil or the like stored in a container main body 103, and the floating roof 102 moves up and down, accompanying an increase and decrease in the crude oil or the like.

[0010]

In such a structure, there is a gap between a side wall 104 of the container main body 103, for example, in a cylindrical shape storing crude oil or the like and the floating roof 102 floating on the crude oil or the like inside the side wall 104, and electrical contact between these is not always guaranteed. Consequently, if the floating roof 102 is charged with static electricity, when the side wall 104 and the floating roof 102 come in contact with each other, discharge of the charged static electricity may cause sparks. Further, when lightning has occurred, lightning surge may cause spark discharge between the side wall 104 and the floating roof 102.

[0011]

In order to prevent occurrence of such sparks, it is necessary to install a grounding device 10 for a floating roof tank, as a device that electrically connects the floating roof 102 and the side wall 104, matching with up-down movement of the floating roof 102 that accompanies increase and decrease in crude oil or the like, so as to maintain these at the same potential.

[0012]

However, as the floating roof tank 100 is installed outdoors, the grounding device 10 for a floating roof tank is often exposed to wind or rain, and faces a danger of breaking by corrosion due to rain water and adhesion of various foreign matters.

Particularly, the crude oil inside the floating roof tank 100 may contain hydrogen sulfide, depending on the production area of the crude oil. Hydrogen sulfide (H_2S) is a gas with a larger specific gravity than that of air with a specific gravity of 1.1905. Aqueous solution of hydrogen sulfide (hydrosulfuric acid) ionizes into hydrogen sulfide ions (HS^-) and hydrogen ions (H^+) and is weakly-acidic. As the floating roof tank 100 is installed outdoors, hydrogen sulfide easily merges into rain water to produce aqueous solution of hydrogen sulfide. As metal or the like is used for the grounding device 10 for a floating roof tank to ensure conductivity, the floating roof tank 100 has a problem of being exposed to a danger of corrosion by the aqueous solution of hydrogen sulfide.

[0013]

In this situation, for a floating roof tank, a grounding device 10 that is protected from deterioration of such corrosion or the like and thus enables a use for a long time will be described below.

[0014]

FIG. 2 is a side view of the grounding device 10 for a floating roof tank in the present embodiment, FIG. 3 is a perspective of the same, and FIG. 4 is a perspective exploded view of the same. Incidentally, directions X, Y, Z are shown, as appropriate, in the respective figures. Direction X is the vertical (upper-lower) direction wherein the grounding device 10 for a floating roof tank is installed as shown in FIG. 1; direction Y is the direction perpendicular to direction X and the sheet of FIG. 2; and direction Z is the direction perpendicular to direction X and direction Y.

[0015]

As shown in FIGs. 2-4, the grounding device 10 for a floating roof tank includes a housing 11 in a box shape. As shown in FIG. 4, the housing 11 has a housing member 11a and a housing member 11b. One end portion of a shaft 13 is fixed to the inner surface 12 of the housing member 11b, and the other end side of the shaft 13 extends in direction Y toward the front

side of the sheet of FIG. 2. A drum 15 is fitted to the shaft 13 through a pair of bearing mechanisms 14, forward-reverse rotatably along the circumferential direction. The drum 15 includes a disc 16 fitted to the bearing mechanisms 14 and a frame 17 in a reel shape formed on the outer circumference of the disc 16. The inner circumferential portion 18 of the drum 15 enclosed by the disc 16 and the frame 17 forms a space.

[0016]

A flat spiral spring 21 serving as an urging member is provided in the inner circumferential portion 18. A pin 22 extending in direction Y toward the front side of the sheet of FIG. 2 is formed in the vicinity of the frame 17 for the disc 16 of the drum 15. The end portion on the outermost circumference of the spiral shape of the flat spiral spring 21 is fixed to the pin 22, and the end portion on the innermost circumference is fixed to the shaft 13. A circular lid 20 is fitted to the inner circumferential portion 18 in which the flat spiral spring 21 is housed. Symbol 26 represents a member for preventing the drum 15 and the like from getting off from the shaft. An elongated conductor 23 is wound in the reel shape portion of the frame 17. Below one of the both ends of the frame 17 with respect to direction Z, the one being lower with respect to direction X, an entrance-exit portion 24 for entrance and exit of the conductor 23 to the inside and the outside of the housing 11 is formed at (an entrance-exit plate 28 of) the housing 11. Thus, the flat spiral spring 21 urges the drum 15 in the direction for winding back the conductor 23 by the frame 17 of the drum 15.

[0017]

At the tip end portion 25 of the conductor 23, the tip end portion 25 being on the pulling-out side from the entrance-exit portion 24, there are provided connecting members 31 for connecting the tip end portion 25 to the upper portion 105 (FIG. 1) of the floating roof 102 of the floating roof tank 100. Further, the outer wall surface 19 of the housing 11 is provided

with a fixing member 32 for fixing the grounding device 10 for a floating roof tank to the side wall 104 (FIG. 1) of the floating roof tank 100.

[0018]

5 The drum 15 is made from metal and electrically connected with the housing 11 made from metal (stainless steel such as SUS304 or the like) through the bearing mechanisms 14. The flat spiral spring 21 is also made from metal such as spring steel, stainless steel, or the like and electrically connected with the drum 15 and the pin 22. Thus, an electrical path is formed from the tip end portion 25 of the conductor 23 (from the connecting members 31) to the housing 11 (fixing member 32), the electrical path being formed by connecting respective members of conductors. Accordingly, by connecting the connecting members 31 to the floating roof 102 and fixing the fixing member 32 to the side wall 104 of the floating roof tank 100, the floating roof 102 and the side wall 104 are electrically connected with each other through the conductor 23 pulled out from the housing 11.

[0019]

Further, the electrical connection path of the drum 15, the bearing mechanisms 14 supporting the drum 15, and the housing 11, and the path electrically connected to the housing 11 by the pin 22 through the drum 15, the pin 22, and the flat spiral spring 21, are connected electrically in parallel. This contributes to reduction in electrical resistance and the redundancy of the connected path in a case that the connection temporarily becomes unstable due to contact failure.

25 In such a manner, the floating roof 102 and the side wall 104 are electrically connected by the grounding device 10 for a floating roof tank so that these are maintained at the same potential. Accordingly, it is possible to prevent occurrence of sparks between the floating roof 102 and the side wall 104 caused by the above-described static electricity, lightning surge, or the like.

30 [0020]

Further, when the position of the floating roof 102 drops by a decrease in the crude oil or the like in the container main body 103, the conductor 23 is drawn out from the housing 11 against the urging force of the flat spiral spring 21, by the own weight of the floating roof 102. When the position of the floating roof 102 rises by an increase in the crude oil or the like in the container main body 103, the drum 15 winds back the conductor 23 by the urging force of the flat spiral spring 21. Accordingly, as the length of the conductor 23 drawn out from the housing 11 varies, corresponding to fluctuation in the height of the floating roof 102, the floating roof 102 and the side wall 104 are always electrically connected in a state of the shortest distance with the conductor 23 being linearly tensioned, regardless of the fluctuation in the height of the floating roof 102.

[0021]

The structures and the operational effects of the respective parts of the above-described grounding device 10 for a floating roof tank will be described below.

First, as shown in FIGs. 2-4, the flat spiral spring 21 is enclosed by the disc 16, the frame 17, and the lid 20 and arranged in the inner circumferential portion 18 of the drum 15. In this state, the drum 15 is entirely covered by the housing 11 and is almost tightly closed except the entrance-exit portion 24.

[0022]

In such a manner, the flat spiral spring 21 is housed in the inner circumferential portion 18 of the drum 15 enclosed by the disc 16, the frame 17, and the lid 20 and protected by the drum 15, and is further doubly protected such that the outside of the drum 15 is covered by the housing 11. Accordingly, the flat spiral spring 21 can be used for a long time, being protected from intrusion of rain water and foreign matters from outside and protected from deterioration such as corrosion caused by aqueous solution of hydrogen sulfide or the like.

[0023]

FIG. 5 is an enlarged vertical cross-sectional-view of the entrance-exit portion 24. As shown in FIG. 4 and FIG. 5, guide plates 42, which serve as a pair of foreign-matter removing members sandwiching the conductor 23, are provided at the entrance-exit portion 24 on the lower surface 41 side of the housing 11. The respective guide plates 42 are in contact with the both surfaces of the conductor 23, which is wound back by the drum 15, in a state of hitting against the both surfaces, and remove foreign matters on the surfaces of the conductor 23. Thus, when the drum 15 winds back the conductor 23, the guide plates 42 wipe rain water deposited on the conductor 23 and removes foreign matters to prevent intrusion into the housing 11. As the material of the guide plates 42, fluorine resin with little friction and excellent abrasion resistance, inexpensive polyacetal resin, or the like is suitable. The entrance-exit portion 24 in a slit shape is formed at an entrance-exit plate 28, and this entrance-exit plate 28 is fixed by a bolt to an entrance-exit portion 46 in a rectangular shape formed at the lower surface 41 of the housing 11. The paired guide plates 42 are respectively fixed to the entrance-exit plate 28 by bolts.

[0024]

Incidentally, bolt holes for fixing a bolt are elongated holes, and when the guide plates 42 of resin have been abraded, the gap between the guide plates 42 can be adjusted. Accordingly, it does not occur that the gap between the paired guide plates 42 becomes wider by abrasion to inhibit wiping of water and removing foreign matters.

In such a manner, as the guide plates 42 prevent intrusion of rain water and foreign matters into the housing 11, respective members such as the drum 15 and the flat spiral spring 21 are protected from deterioration such as corrosion by aqueous solution of hydrogen sulfide and can be used for a long time.

[0025]

Further, as shown in FIG. 6, a pair of roller 43 serving as foreign-matter removing members may be used instead of the guide plates 42. The respective rollers 43 are rotatably supported by the housing 11 through the entrance-exit plate 28, contact with the both surfaces of the conductor 23 wound back by the drum 15, in a state of hitting against the both surfaces, and remove foreign matters on the surfaces of the conductor 23. The rollers 43 may be urged by springs, not shown, which are urging members, so that the respective rollers 43 contact the both surfaces of the conductor 23, in a state of hitting against the both surfaces of the conductor 23.

As the rollers 43 are rotatable, the rollers 43 are hardly abraded by friction with the conductor 23 that enters and exits the inside of the housing 11, and can maintain for a long time a function to wipe water and remove foreign matters on the conductor 23.

Further, by adopting a conductive material such as metal or carbon resin for the rollers 43 and the entrance-exit plate 28, another conductive path extending from the conductor 23, through the rollers 43, the entrance-exit plate 28, and the entrance-exit portion 46 is formed so that the conductive path is dispersed. Thus, the current value flowing in an individual part is reduced, and reduction in the DC resistance and the AC impedance can be expected.

[0026]

FIGs. 7A-7C are illustrations showing other examples of the connecting members 31. The side view in FIG. 7A and the front view in FIG. 7B, and the perspective view in FIG. 7C show different embodiments.

In the embodiment in FIGs. 7A and 7B, the connecting members 31 include upper members 51 fixed to the tip end portion 25, on the drawn-out side, of the conductor 23 and disposed on the upper side of direction X, a lower member 52 fixed to the floating roof 102 and disposed on the lower side of direction X, coil springs 53 as elastic members connecting the upper

members 51 and the lower member 52, and a conductive wire 54 electrically connecting the upper members 51 and the lower member 52.

[0027]

With such a structure, the lower member 52 fixed to the floating roof 102 is movable relative to the upper members 51 in all directions (all directions perpendicular to the longitudinal direction of the conductor 23) that are perpendicular to direction X through the coil springs 53.

Further, in the embodiment in FIG. 7C, the connecting members 31 are formed by two plate-shaped members one of which is an elastic body longitudinal along direction X and has a structure twisted by 90 degrees at a middle part 56, which is in the middle in the longitudinal direction (direction X). Accordingly, the corresponding connecting member 31 is movable such as to be deformable both in direction Z and direction Y (the thickness direction and the width direction of the conductor 23).

[0028]

In both the embodiment in FIGs. 7A and 7B and the embodiment in FIG. 7C, the conductor 23 is movable at the tip end portion 25 on the side drawn-out from the entrance-exit portion 24, in at least two directions perpendicular to the longitudinal direction of the conductor 23. Thus, the connecting members 31 can have bending movement accompanying the up-down movement of the floating roof 102 to reduce stress concentration at the tip end portion 25 of the conductor 23 and reduce the danger of breaking of the conductor 23 caused by usage for a long time.

Further, in both the embodiment in FIGs. 7A and 7B and the embodiment in FIG. 7C, by swinging of the floating roof 102 due to sloshing phenomenon in an earthquake or the like, stress concentration in direction Y and direction Z on the conductor 23 can be reduced and braking of the conductor 23 can be prevented.

[0029]

In the embodiment in FIGs. 2-4, in the embodiment in FIGs. 7A and 7B, and also in the embodiment in FIG. 7C, connecting members 31 in two plates are fitted such as to sandwich the conductor 23 from both sides at the tip end portion 25, on the side drawn-out from the entrance-exit portion 24, of the conductor 23. The connecting members 31 are bent at the upper end portions 61 thereof, in other words, at the end thereof with respect to the longitudinal direction (direction X) of the conductor 23, such as to warp outward of the conductor 23.

In such a manner, as the connecting members 31 are bent such as to warp at the upper end portions 61, on the longitudinally (in direction X) upper side, outward of the conductor 23, even when the tip end portion 25 of the conductor 23 is bent by bending movement accompanying the up-down movement of the floating roof 102, it is possible to prevent damaging the conductor 23 by the connecting members 31 and reduce a danger of breaking of the conductor 23 caused by usage for a long time.

[0030]

Further, as the upper end portions 61 are bent such as to warp outward of the conductor 23, it is possible to prevent that the tip end portion 25 of the conductor 23 is wound into the housing 11 and the conductor 23 cannot be drawn out from inside the housing 11.

The conductor 23 is in a band and thin plate shape. Accordingly, the conductor 23 has a large surface area for a cross-sectional area, and in order to cope with concentration of current density on the vicinity of the surface of the conductor 23 by skin effect, by making the conductor 23 thin in thickness, it is possible to make the difference small in the current density between the central portion and the vicinity of the surface of the conductor 23, and reduce increase in the high-frequency impedance.

Further, if the conductor 23 is in a band and thin plate shape, as the surface area is not excessively large compared with a mesh shape, it is

possible to maintain a high anticorrosion performance against hydrogen sulfide.

If the conductor 23 is formed in a mesh shape, rain water intrudes into the gap of mesh after rainfall, and a state that the conductor 23 is wet continues for a comparatively long time until the conductor 23 becomes completely dry free from the rain water. A defect in this situation is known that corrosive gas such as hydrogen sulfide filling the inside of the floating roof tank 100 merges into water and acidic hydrosulfuric acid corrodes the conductor 23 so that the conductor 23 gets broken. If the conductor 23 is in a thin plate shape as in the present embodiment, as the surface even with water deposited thereon is dried in a comparatively short time, and such a defect hardly occurs.

[0031]

FIGs. 8A-8D are enlarged partial perspective views of conductive members 23 of respective kinds of examples. While the conductor 23 in the embodiment in FIG. 8A is in a flat plate shape, the conductors 23 in FIGs. 8B-8D have a curved surface forming a convex shape (or a concave shape) on one side in the thickness direction (direction Z) thereof.

That is, in the embodiment in FIG. 8B, embossing is continuously performed along direction X, and convex portions 61, which are longitudinal in direction X and form convex shapes on the upper side of direction X in FIG. 8B, are formed continuously along direction X.

[0032]

Further, in the embodiment in FIG. 8C, a bent shape is formed such that the cross-section obtained by cutting the conductor 23 by a line in the lateral direction (direction Y), the cutting being done along direction Z, forms a gentle arc shape (a convex shape on the upper side of direction Z).

Still further, in the embodiment in FIG. 8D, a bent shape is formed such that the cross-section obtained by cutting the conductor 23 by a line in the lateral direction (direction Y), the cutting being done along direction Z,

forms a gentle chevron shape (a convex shape on the upper side of direction Z in FIG. 8).

In such a manner, as in the respective embodiments in FIGs. 8B-8D, if a curve is formed such as to form a convex shape on one side of the thickness direction (direction Z), it is possible to prevent the conductor 23, drawn out from the housing 11, from twisting in a curl and curvature shape, compared with the embodiment in FIG. 8A.

[0033]

As the material of the conductor 23, phosphor bronze, brass, or the like with high anticorrosion performance against corrosive gas, such as hydrogen sulfide, is suitable. Phosphor bronze particularly is a material excellent in the springiness and has a low electrical resistivity. Accordingly, by making the conductor 23 in the above-described thin plate shape with a large aspect ratio, the conductor 23 can have a large surface area for a cross-sectional area. In order to cope with concentration of current density on the vicinity of the surface of the conductor 23 by skin effect, the thickness of the conductor 23 can be made small. Accordingly, it is possible to make the difference small in the current density between the central portion and the vicinity of the surface of the conductor 23, and reduce increase in the high-frequency impedance.

[0034]

Further, although phosphor bronze itself has a high anticorrosion performance against hydrogen sulfide, nickel plating or tin plating may be performed on the surface of the conductor 23 for an even higher anticorrosion performance. Or, painting may be performed on the conductor 23 to protect the conductor 23.

As the conductor 23 is installed with the tip end portion 25 on the lower side, rain water containing hydrogen sulfide or the like flows down along the conductor 23 to remain at the tip end portion 25, and accordingly,

the tip end portion 25 out of the entire conductor 23 particularly tends to become corrosive.

[0035]

In this situation, if it is desired to reduce the manufacturing cost of the grounding device 10 for a floating roof tank, only the tip end portion 25 out of the conductor 23 may be arranged to have a higher anticorrosion performance than the other portions. Concretely, only the tip end portion 25 is formed by phosphor bronze or brass and further subjected to nickel plating or tin plating, while the other portions out of the conductor 23 other than the tip end portion 25 are formed by a metal material with a lower cost than phosphor bronze or brass. Or, even when the portions out of the conductor 23 other than the tip end portion 25 are formed also by phosphor bronze or brass, arrangement may be made such as not to perform plating by nickel or tin on these portions.

[0036]

The grounding device 10 for a floating roof tank with the above-described structure is, as shown in FIG. 1, used in such a manner that the housing 11 is installed to the container main body 103 (for example the side wall 104 of the 103) of the floating roof tank 100, the conductor 23 is drawn out downward from inside of the housing 11, and the conductor 23 is connected to the floating roof 102 by the connecting members 31. More than one such grounding devices 10 for a floating roof tank are preferably installed for one floating roof tank 100, and depending on the scale of the floating roof tank 100, for example, four to eight grounding devices 10 are preferably installed at substantially equal intervals along the entire circumference of the floating roof tank 100.

[0037]

The present invention is not limited to the above-described embodiments, and includes various changes and modifications. For example, the above-described embodiments have been described in detail in order to

understandingly describe the invention, and the invention is not necessarily limited to embodiments including all the above-described structures.

Further, a part of the structure of a certain embodiment may be replaced by the structure of a different embodiment, and further, the structure in a

- 5 different embodiment may be added to the structure of a certain embodiment. Still further, adding, deleting, or replacing of a different structure may be performed on a part of the structures of respective embodiments.

What is claimed is:

1. A grounding device for a floating roof tank, comprising;
an elongated conductor;
5 a housing;
a drum that is covered by the housing and supported rotatably
along a circumferential direction in the housing, the conductor being wound
around the drum;
an urging member provided inside an inner circumferential portion
10 of the drum to urge the drum along a direction in which the conductor is
wound back; and
an entrance-exit portion formed, at the housing, for the conductor to
enter and exit the housing,
wherein the grounding device for a floating roof tank electrically
15 connects a container main body and a floating roof of a floating roof tank
through the conductor.
2. The grounding device for a floating roof tank according to claim 1,
wherein the entrance-exit portion is provided with a foreign matter
20 removing member for removing foreign matters on a surface of the
conductor wound back by the drum, in a state that the foreign matter
removing member hits against the surface of the conductor.
3. The grounding device for a floating roof tank according to claim 2,
25 wherein the foreign matter removing member comprises a rotatable roller.
4. The grounding device for a floating roof tank according to any of the
preceding claims, wherein the conductor is movable at a tip end portion
thereof on a side drawn out from the entrance-exit portion, at least in two
30 directions perpendicular to a longitudinal direction of the conductor.

5. The grounding device for a floating roof tank according to any of the preceding claims, further comprising:

connecting members that are formed such as to sandwich the conductor at a tip end portion, on a side drawn-out from the entrance-exit portion, of the conductor and connect the conductor to the floating roof,

wherein the connecting members are curved such as to warp outward of the conductor, at an end portion with respect to a longitudinal direction of the conductor.

6. The grounding device for a floating roof tank according to any of the preceding claims, wherein the conductor is in a band and thin plate shape.

7. The grounding device for a floating roof tank according to claim 6, wherein the conductor includes a curved shape that is a convex shape or a concave shape with respect to a thickness direction.

8. The grounding device for a floating roof tank according to any of the preceding claims, wherein the conductor is formed from phosphor bronze or brass and/or provided with nickel plating or tin plating on a surface thereof.

9. The grounding device for a floating roof tank according to any of the preceding claims, wherein the conductor has a higher anticorrosion performance at a tip end portion thereof on a side drawn out from the entrance-exit portion, than anticorrosion performance of the other portions thereof.

10. The grounding device for a floating roof tank according to claim 9, wherein the conductor is formed from phosphor bronze or brass and/or provided with nickel plating or tin plating on a surface, only at the tip end portion thereof.