

DESCRIPTION

TITLE OF INVENTION: LIQUID LEAKAGE TREATMENT FACILITY AND
LIQUEFIED GAS TANK FACILITY

5 TECHNICAL FIELD

[0001]

The present disclosure relates to a liquid leakage treatment facility and a
liquefied gas tank facility.

Priority is claimed on Japanese Patent Application No. 2024-002036, filed
10 January 10, 2024, the content of which is incorporated herein by reference.

BACKGROUND ART

[0002]

For example, Patent Document 1 discloses a liquefied gas storage tank. The
liquefied gas storage tank disclosed in Patent Document 1 is a double-shell tank having
15 an inner shell and an outer shell. A rectangular containment dike is provided on an
outer periphery of such a double-shell tank. In a tank facility including such a
containment dike, even in a case where a liquefied gas leaks from the double-shell tank, a
leakage range of the liquefied gas can be limited to the range surrounded by the
containment dike.

20 Citation List

Patent Document

[0003]

Patent Document 1: Japanese Unexamined Patent Application, First Publication
No. 2021-17920

25 SUMMARY OF INVENTION

Technical Problem

[0004]

In the related art, as a liquefied gas, liquefied natural gas (LNG) or liquefied petroleum gas (LPG) is often used. LNG and LPG have low toxicity as vaporized
5 gases. Therefore, the liquefied gas that leaks and is stored inside the containment dike can be released into the atmosphere. However, in recent years, liquefied ammonia has sometimes been used as a fuel. Since ammonia gas generated by vaporization of liquefied ammonia has higher toxicity than LNG or LPG, it is required to suppress a release amount into the atmosphere in a case where the liquefied ammonia leaks. In
10 addition, even in the case of LNG or LPG, it is preferable to suppress the release amount into the atmosphere in the case of leakage.

[0005]

The present disclosure has been made in view of the above-described problems, and an object of the present disclosure is to suppress a release amount of a vaporized gas
15 into the atmosphere in a case where a liquefied gas leaks.

Solution to Problem

[0006]

As a means for achieving the above-described object, the present disclosure adopts the following configurations.

20 [0007]

A first aspect of the present disclosure is a liquid leakage treatment facility including a containment dike that is capable of retaining leaked liquefied gas and that is open upward, a plurality of thermally insulative coated floats that are laid to cover a bottom portion of the containment dike and that are caused to float by the liquefied gas

retained in the containment dike, and a drainage section configured to deliver the liquefied gas retained in the containment dike to an outside of the containment dike.

[0008]

5 In addition, a second aspect of the present disclosure is a liquefied gas tank facility including a storage tank configured to store the liquefied gas, a connection pipe connected to the storage tank and configured to guide the liquefied gas, and the liquid leakage treatment facility according to the first aspect, that is capable of retaining the liquefied gas leaked from at least one of the storage tank or the connection pipe.

Advantageous Effects of Invention

10 [0009]

In the present disclosure, the thermally insulative coated floats are laid to cover the bottom portion of the containment dike. Therefore, in a case where the liquefied gas is retained in the containment dike, the thermally insulative coated floats float on a liquid surface of the liquefied gas, and volatilization of the liquefied gas is suppressed by the thermal insulation property of the covered floats. Therefore, according to the present disclosure, it is possible to suppress the release amount of the vaporized gas into the atmosphere in a case where the liquefied gas leaks.

BRIEF DESCRIPTION OF DRAWINGS

[0010]

20 [FIG. 1] A schematic configuration diagram of a liquefied ammonia facility according to a first embodiment of the present disclosure.

[FIG. 2] A schematic configuration diagram showing a liquid leakage treatment facility according to a second embodiment of the present disclosure.

DESCRIPTION OF EMBODIMENTS

25 [0011]

Hereinafter, an embodiment of a liquid leakage treatment facility and a liquefied gas tank facility according to the present disclosure will be described with reference to the drawings.

[0012]

5 (First embodiment)

In the present embodiment, an example in which the liquid leakage treatment facility of the present disclosure is applied to a liquefied ammonia facility that handles liquefied ammonia will be described. However, the liquid leakage treatment facility of the present disclosure is not limited to being applied to the liquefied ammonia facility,
10 and can also be applied to a facility that handles a liquefied gas different from liquefied ammonia, such as LNG or LPG.

[0013]

FIG. 1 is a schematic configuration diagram of a liquefied ammonia facility 1 (liquefied gas tank facility) of the present embodiment. It is noted that FIG. 1 shows a
15 state in which liquefied ammonia X, which will be described later, leaks. As shown in FIG. 1, the liquefied ammonia facility 1 of the present embodiment includes a storage tank 2, an ammonia delivery section 3, a containment dike 4, thermally insulative coated floats 5, a drainage section 6, a strainer 7, a drainage liquid vaporization section 8, a rainwater discharge section 9, a return pipe 10, and a transfer pipe 11.

20 [0014]

The storage tank 2 is a tank that stores liquefied ammonia X (liquefied gas). The storage tank 2 is, for example, a metal double-shell tank including a metal inner shell and a metal outer shell. The storage tank 2 includes a thermal insulating material filled between the outer shell and the inner shell, and stores the liquefied ammonia X inside the

inner shell in a low temperature state. The storage tank 2 is provided on a bottom portion 4a of the containment dike 4, which will be described later.

[0015]

The ammonia delivery section 3 delivers the liquefied ammonia X from the storage tank 2 to an external supply destination. The ammonia delivery section 3 vaporizes the liquefied ammonia X and delivers an ammonia gas, which is a vaporized gas of the liquefied ammonia, to the supply destination. As shown in FIG. 1, the ammonia delivery section 3 includes a delivery pipe 3a (connection pipe), a delivery pump 3b, and a vaporizer 3c.

[0016]

The delivery pipe 3a is a pipe connected to the storage tank 2, and guides the liquefied ammonia X (or the ammonia gas) from the storage tank 2 to the supply destination. That is, the delivery pipe 3a is a supply pipe that guides the liquefied ammonia X stored in the storage tank 2 to the supply destination. It is noted that, in FIG. 1, the delivery pipe 3a is connected to the bottom portion of the storage tank 2. However, a connection position of the delivery pipe 3a with respect to the storage tank 2 is not limited.

[0017]

The delivery pump 3b is provided at an intermediate position of the delivery pipe 3a. The delivery pump 3b pumps the liquefied ammonia X from the storage tank 2 side to the supply destination side. The delivery pump 3b is installed, for example, on the bottom portion 4a of the containment dike 4. It is noted that the delivery pump 3b is protected by a suction pot or the like to quickly discharge the ammonia X from the storage tank 2.

[0018]

The vaporizer 3c is disposed at an intermediate position of the delivery pipe 3a and on a downstream side of the delivery pump 3b. The vaporizer 3c vaporizes the liquefied ammonia X supplied from the storage tank 2 side and discharges the liquefied ammonia X as ammonia gas. It is noted that a superheater may be provided

5 downstream of the vaporizer 3c.

[0019]

The containment dike 4 prevents the exposed liquefied ammonia X from flowing out to the outside in a case where the liquefied ammonia X leaks from at least one of the storage tank 2 and the delivery pipe 3a. That is, the containment dike 4 is capable of

10 retaining the leaked liquefied ammonia X.

[0020]

As shown in FIG. 1, the containment dike 4 includes the bottom portion 4a that supports the storage tank 2 and the like from below, and the surrounding wall 4b erected on the bottom portion 4a to surround the storage tank 2 when viewed from above, and

15 has a retention space that opens upward. The containment dike 4 is formed of, for example, concrete.

[0021]

A liquid collection recess portion 4c that is recessed downward is provided in the bottom portion 4a of the containment dike 4. The liquid collection recess portion 4c is located at the lowest position in the retention space of the containment dike 4 and is a portion where the liquefied ammonia X is most likely to accumulate. Therefore, in a case where the liquefied ammonia X leaks to the containment dike 4, the liquefied ammonia X accumulates in the liquid collection recess portion 4c at the earliest stage.

In addition, in a case where the liquefied ammonia X retained in the containment dike 4 is discharged, the liquefied ammonia X is accumulated in the liquid collection recess

25

portion 4c until the end. The position where the liquid collection recess portion 4c is provided is not particularly limited, but it is preferable to provide the liquid collection recess portion 4c near the surrounding wall 4b to shorten a path for discharging the retained liquefied ammonia X to the outside of the containment dike 4. It is noted that

5 an inclined surface that descends toward the liquid collection recess portion 4c may be provided on a part of the bottom portion 4a or the like to improve the collection of the liquefied ammonia X in the liquid collection recess portion 4c.

[0022]

The thermally insulative coated floats 5 are floats having a thermal insulation

10 property, and a plurality of the thermally insulative coated floats 5 are disposed to be laid to cover the bottom portion 4a of the containment dike 4. Each of the thermally insulative coated floats 5 is formed, for example, in a plate shape with front and back surfaces facing the up-down direction, and is formed of a material that floats on the liquefied ammonia X. It is noted that the shape of the thermally insulative coated float

15 5 is not particularly limited. For example, a block-shaped thermally insulative coated float 5 may be provided.

[0023]

Each of the thermally insulative coated floats 5 is connected to another thermally insulative coated float 5 disposed adjacent to the thermally insulative coated

20 float 5 by a connecting portion (not shown) in a state where a gap is provided between the thermally insulative coated floats 5. That is, a gap is provided between two adjacent thermally insulative coated floats 5. Even in a case where the liquefied ammonia X leaks above the thermally insulative coated float 5, the liquefied ammonia X flows into the lower side of the thermally insulative coated float 5 through the gap. In a state

25 where the liquefied ammonia X is retained in the containment dike 4, the thermally

insulative coated float 5 is floated by the liquefied ammonia X and remains floating on the liquid surface of the liquefied ammonia X.

[0024]

That is, the thermally insulative coated float 5 is placed on the bottom portion 4a of the containment dike 4 in a state where the liquefied ammonia X does not leak. On the other hand, the thermally insulative coated float 5 floats on the liquid surface of the liquefied ammonia X in a state where the liquefied ammonia X leaks. In this way, the thermally insulative coated float 5 covers the liquid surface of the leaked liquefied ammonia X, and the heat input from the atmosphere is attenuated, whereby the volatilization of the liquefied ammonia X is suppressed.

[0025]

It is noted that, in the present embodiment, a strainer 7 is installed in an upper portion of the liquid collection recess portion 4c as will be described later. Therefore, the thermally insulative coated float 5 located above the liquid collection recess portion 4c is placed on the strainer 7 in a state where the liquefied ammonia X does not leak. The strainer 7 has, for example, a mesh structure.

[0026]

The drainage section 6 delivers the liquefied ammonia X retained in the containment dike 4 to the outside of the containment dike 4. As shown in FIG. 1, the drainage section 6 includes a drainage pump 6a and a drainage guide pipe 6b (guide pipe).

[0027]

The drainage pump 6a is disposed inside the liquid collection recess portion 4c. The drainage pump 6a draws in the liquefied ammonia X while immersed in the liquefied ammonia X and discharges the liquefied ammonia X to the drainage guide pipe 6b. For

example, under the control of a control device (not shown), the drainage pump 6a is driven while immersed in the liquefied ammonia X and is stopped when not immersed in the liquefied ammonia X.

[0028]

5 The drainage guide pipe 6b is a pipe connected to the drainage pump 6a, and guides the liquefied ammonia X pumped by the drainage pump 6a to the outside of the containment dike 4. In the present embodiment, the drainage guide pipe 6b is connected to a drainage liquid vaporization section 8 outside the containment dike 4, and guides the liquefied ammonia X discharged from the drainage pump 6a to the drainage
10 liquid vaporization section 8. However, the drainage guide pipe 6b does not necessarily need to be connected to the drainage liquid vaporization section 8 outside the containment dike 4, and may be connected to other equipment or the like outside the containment dike 4.

[0029]

15 The strainer 7 is disposed above the liquid collection recess portion 4c, and prevents foreign matter from entering downward. With the strainer 7, it is possible to prevent foreign matter from entering the drainage pump 6a. As shown in FIG. 1, in the present embodiment, the strainer 7 is disposed at the uppermost portion of the liquid collection recess portion 4c, and is formed to cover the upper end opening of the liquid
20 collection recess portion 4c. However, the shape of the strainer 7 is not particularly limited, and may be, for example, a cage-like shape that covers the liquid suction port of the drainage pump 6a or the entirety of the drainage pump 6a.

[0030]

 The drainage liquid vaporization section 8 vaporizes the liquefied ammonia X
25 supplied from the drainage section 6. The drainage liquid vaporization section 8

includes a drainage tank 8a and an electric heater 8b (heater). The drainage tank 8a is connected to the drainage pump 6a via the drainage guide pipe 6b. Therefore, the liquefied ammonia X discharged from the drainage tank 8a is guided to the drainage guide pipe 6b and supplied to the drainage tank 8a. Such a drainage tank 8a is a container that temporarily retains the liquefied ammonia X supplied from the drainage section 6.

[0031]

The electric heater 8b is provided inside the drainage tank 8a, and generates heat by being supplied with power from the outside. Such an electric heater 8b vaporizes the retained liquefied ammonia X inside the drainage tank 8a by heating the liquefied ammonia X, and converts the liquefied ammonia X into ammonia gas. It is noted that, instead of the electric heater 8b, a heater using seawater, steam, or the like may be installed.

[0032]

In the present embodiment, the drainage liquid vaporization section 8 supplies the ammonia gas generated by vaporizing the liquefied ammonia X to the flare stack F. In the flare stack F, the ammonia gas is subjected to a combustion treatment. However, the destination to which the drainage liquid vaporization section 8 supplies the ammonia gas is not limited to the flare stack F. The destination to which the drainage liquid vaporization section 8 supplies the ammonia gas may be any facility that detoxifies the ammonia gas, and may be, for example, a dilution device or the like.

[0033]

The rainwater discharge section 9 discharges the rainwater accumulated in the liquid collection recess portion 4c to the outside of the containment dike 4. The rainwater discharge section 9 includes a rainwater pump 9a, a rainwater guide pipe 9b,

and a rainwater gutter 9c. As shown in FIG. 1, in the present embodiment, a rainwater recess portion 4d that is recessed downward is provided in a part of the bottom portion of the liquid collection recess portion 4c. In general, the amount of rainwater accumulated inside the containment dike 4 is small compared to the amount of the leaked liquefied ammonia X. Therefore, by providing the rainwater recess portion 4d in the liquid collection recess portion 4c, the water level of the accumulated rainwater is increased, which allows the rainwater pump 9a to easily draw in rainwater.

[0034]

The rainwater pump 9a is disposed in the rainwater recess portion 4d, draws in the rainwater accumulated in the rainwater recess portion 4d, and discharges the rainwater to the rainwater guide pipe 9b. For example, under the control of a control device (not shown), the rainwater pump 9a is driven when the water level is a level at which the rainwater can be sucked and is stopped when the water level is a level at which the rainwater cannot be sucked.

[0035]

The rainwater guide pipe 9b is a pipe connected to the rainwater pump 9a, and guides the rainwater pumped by the rainwater pump 9a to the outside of the containment dike 4. The rainwater gutter 9c is provided outside the containment dike 4, and guides the rainwater discharged from the rainwater guide pipe 9b to a predetermined place (a drainage channel or the like).

[0036]

It is noted that, in the present embodiment, the containment dike 4, the thermally insulative coated floats 5, the drainage section 6, the strainer 7, the drainage liquid vaporization section 8, and the rainwater discharge section 9 constitute a liquid leakage treatment facility 20. In a case where the liquefied ammonia X leaks, the liquid leakage

treatment facility 20 temporarily retains the liquefied ammonia X while suppressing the volatilization of the leaked liquefied ammonia X, and further delivers the retained liquefied ammonia X to the outside of the containment dike 4.

[0037]

5 The return pipe 10 is a pipe that connects the drainage guide pipe 6b of the drainage section 6 and the delivery pipe 3a of the ammonia delivery section 3. The return pipe 10 is connected to a portion of the delivery pipe 3a on the upstream side of the vaporizer 3c. The return pipe 10 returns the liquefied ammonia X delivered from the drainage section 6 to the delivery pipe 3a.

10 [0038]

 It is noted that a valve (not shown) is provided in the return pipe 10. With such a valve, the return pipe 10 is switchable between an open state and a closed state. In a case where the return pipe 10 is open, some or all of the liquefied ammonia X pumped by the drainage pump 6a of the drainage section 6 is supplied to the delivery pipe 3a via the
15 return pipe 10. Therefore, some or all of the leaked liquefied ammonia X can be supplied to the supply destination.

[0039]

 The transfer pipe 11 is a pipe that connects the drainage guide pipe 6b of the drainage section 6 and another storage tank. For example, the liquefied ammonia
20 facility 1 of the present embodiment may include a plurality of storage tanks 2. In such a case, another storage tank is the storage tank 2 in which the leakage of the liquefied ammonia X has not occurred. In addition, the transfer pipe 11 may be connected to another storage tank provided separately from the liquefied ammonia facility 1 of the present embodiment.

25 [0040]

It is noted that a valve (not shown) is provided in the transfer pipe 11. With such a valve, the transfer pipe 11 is switchable between an open state and a closed state. In a case where the transfer pipe 11 is open, some or all of the liquefied ammonia X pumped by the drainage pump 6a of the drainage section 6 is supplied to the other storage tank via the transfer pipe 11. Therefore, some or all of the leaked liquefied ammonia X can be transferred to the other storage tank.

[0041]

In the liquefied ammonia facility 1 of the present embodiment, in a case where the leakage of the liquefied ammonia X has not occurred, the liquefied ammonia X stored in the storage tank 2 is discharged from the storage tank 2 by the delivery pump 3b. The liquefied ammonia X discharged from the storage tank 2 is guided to the delivery pipe 3a, vaporized by the vaporizer 3c, and supplied to the supply destination as ammonia gas.

[0042]

On the other hand, in the liquefied ammonia facility 1 of the present embodiment, in a case where the leakage of the liquefied ammonia X has occurred, the leaked liquefied ammonia X flows out to the retention space of the containment dike 4. The liquefied ammonia X flowing out to the retention space of the containment dike 4 is accumulated on the bottom portion 4a of the containment dike 4 and floats the thermally insulative coated float 5. As a result, the liquid surface of the liquefied ammonia X retained in the containment dike 4 is covered with the thermally insulative coated float 5, and the volatilization of the liquefied ammonia X is suppressed.

[0043]

In addition, the liquefied ammonia X retained in the containment dike 4 is delivered to the outside of the containment dike 4 via the drainage guide pipe 6b by the

drainage pump 6a inside the liquid collection recess portion 4c. The liquefied ammonia X delivered to the outside of the containment dike 4 is supplied to the ammonia delivery section 3 via, for example, the return pipe 10, and is further supplied to the supply destination as ammonia gas. In addition, the liquefied ammonia X delivered to the outside of the containment dike 4 is supplied to the other storage tank via, for example, the transfer pipe 11 and is stored.

[0044]

In addition, the liquefied ammonia X delivered to the outside of the containment dike 4 is supplied to, for example, the drainage liquid vaporization section 8. The liquefied ammonia X supplied to the drainage liquid vaporization section 8 is heated and vaporized by the electric heater 8b inside the drainage tank 8a. The ammonia gas generated by being vaporized by the electric heater 8b is supplied to the flare stack F and is incinerated in the present embodiment.

[0045]

The liquid leakage treatment facility 20 of the present embodiment as described above includes the containment dike 4, the thermally insulative coated floats 5, and the drainage section 6. The containment dike 4 is capable of retaining the leaked liquefied ammonia X and is open upward. The thermally insulative coated floats 5 are laid to cover the bottom portion 4a of the containment dike 4 and are floated by the liquefied ammonia X retained in the containment dike 4. The drainage section 6 delivers the liquefied ammonia X retained in the containment dike 4 to the outside of the containment dike 4.

[0046]

In the liquid leakage treatment facility 20 of the present embodiment, the thermally insulative coated floats 5 are laid to cover the bottom portion 4a of the

containment dike 4. Therefore, when the liquefied ammonia X is retained in the containment dike 4, the thermally insulative coated floats 5 float on the liquid surface of the liquefied ammonia X, and the volatilization of the liquefied ammonia X is suppressed. Therefore, according to the liquid leakage treatment facility 20 of the present embodiment, it is possible to suppress the release amount of the vaporized gas (ammonia gas in the present embodiment) into the atmosphere in a case where the liquefied ammonia X leaks.

[0047]

In addition, in the liquid leakage treatment facility 20 of the present embodiment, the plurality of thermally insulative coated floats 5 are disposed with gaps therebetween. According to the liquid leakage treatment facility 20 of the present embodiment, even when the leakage location of the liquefied ammonia X is the upper portion of the thermally insulative coated floats 5, the leaked liquefied ammonia X flows into the lower portion of the thermally insulative coated floats 5 through the gaps between the thermally insulative coated floats 5. Therefore, even when the leakage location of the liquefied ammonia X is the upper portion of the thermally insulative coated floats 5, the volatilization of the liquefied ammonia X can be suppressed.

[0048]

In addition, in the liquid leakage treatment facility 20 of the present embodiment, the containment dike 4 has a liquid collection recess portion 4c. The liquid collection recess portion 4c is provided in a portion of the bottom portion 4a and is formed to be recessed downward. In addition, the drainage section 6 includes a drainage pump 6a and a drainage guide pipe 6b. The drainage pump 6a is disposed inside the liquid collection recess portion 4c. The drainage guide pipe 6b guides the

liquefied ammonia X pumped from the drainage pump 6a to the outside of the containment dike 4.

[0049]

In the liquid leakage treatment facility 20 of the present embodiment, the leaked
5 liquefied ammonia X can be collected in the liquid collection recess portion 4c. In
addition, the liquefied ammonia X collected in the liquid collection recess portion 4c can
be delivered to the outside of the containment dike 4 by using the drainage pump 6a.
Therefore, according to the liquid leakage treatment facility 20 of the present
embodiment, it is possible to prevent the leaked liquefied ammonia X from remaining
10 inside the containment dike 4.

[0050]

In addition, the liquid leakage treatment facility 20 of the present embodiment
includes a strainer 7. The strainer 7 is disposed in the liquid collection recess portion 4c
and suppresses the entry of foreign matter into the drainage pump 6a. According to the
15 liquid leakage treatment facility 20 of the present embodiment, it is possible to prevent
the leaked liquefied ammonia X from being unable to be delivered to the outside of the
containment dike 4 due to the entry of foreign matter into the drainage pump 6a.

[0051]

In addition, the liquid leakage treatment facility 20 of the present embodiment
20 includes a rainwater discharge section 9. The rainwater discharge section 9 discharges
the rainwater accumulated in the liquid collection recess portion 4c to the outside of the
containment dike 4. According to the liquid leakage treatment facility 20 of the present
embodiment, it is possible to suppress the presence of rainwater inside the containment
dike 4. Therefore, it is possible to prevent the leaked liquefied ammonia X from
25 coming into contact with rainwater and vaporizing. Therefore, according to the liquid

leakage treatment facility 20 of the present embodiment, it is possible to more reliably suppress the volatilization of the liquefied ammonia X.

[0052]

In addition, the liquid leakage treatment facility 20 of the present embodiment
5 includes a drainage tank 8a and an electric heater 8b. The drainage tank 8a is supplied with the liquefied ammonia X delivered from the drainage section 6. The electric heater 8b is disposed inside the drainage tank 8a. According to the liquid leakage treatment facility 20 of the present embodiment, it is possible to vaporize the leaked liquefied ammonia X and then treat the liquefied ammonia X. Therefore, for example, it is
10 possible to treat the leaked liquefied ammonia X with abatement equipment such as the flare stack F or the dilution device.

[0053]

In addition, the liquefied ammonia facility 1 of the present embodiment includes a storage tank 2, a delivery pipe 3a, and the liquid leakage treatment facility 20. The
15 storage tank 2 stores the liquefied ammonia X. The delivery pipe 3a is connected to the storage tank 2 to guide the liquefied ammonia X. The liquid leakage treatment facility 20 is capable of retaining the liquefied ammonia X leaked from any of the storage tank 2 and the delivery pipe 3a.

[0054]

20 According to the liquefied ammonia facility 1 of the present embodiment, even in a case where the liquefied ammonia X leaks from any of the storage tank 2 and the delivery pipe 3a, it is possible to treat the liquefied ammonia X with the liquid leakage treatment facility 20.

[0055]

In addition, in the liquefied ammonia facility 1 of the present embodiment, the delivery pipe 3a guides the liquefied ammonia X stored in the storage tank 2 toward the supply destination. In addition, in the liquefied ammonia facility 1 of the present embodiment, the delivery pipe 3a includes a return pipe 10. The return pipe 10 returns the liquefied ammonia X delivered from the drainage section 6 to the delivery pipe 3a.

[0056]

According to the liquefied ammonia facility 1 of the present embodiment, some or all of the liquefied ammonia X pumped by the drainage pump 6a of the drainage section 6 can be supplied to the supply destination via the return pipe 10. Therefore, it is possible to effectively use the leaked liquefied ammonia X.

[0057]

In addition, the liquefied ammonia facility 1 of the present embodiment includes a transfer pipe 11. The transfer pipe 11 guides the liquefied ammonia X delivered from the drainage section 6 to another storage tank. According to the liquefied ammonia facility 1 of the present embodiment, some or all of the liquefied ammonia X pumped by the drainage pump 6a of the drainage section 6 can be supplied to another storage tank via the transfer pipe 11. Therefore, it is possible to effectively use the leaked liquefied ammonia X.

[0058]

20 (Second embodiment)

Next, a second embodiment of the present disclosure will be described with reference to FIG. 2. In the description of the present embodiment, the description of the same parts as in the first embodiment will be omitted or simplified.

[0059]

FIG. 2 is a schematic configuration diagram showing a liquid leakage treatment facility 20A of the present embodiment. As shown in this figure, the liquid leakage treatment facility 20A of the present embodiment is disposed below an ammonia pipe H through which the liquefied ammonia X flows. In addition, the storage tank 2 as in the first embodiment is not provided on the bottom portion 4a of the containment dike 4 of the liquid leakage treatment facility 20A.

[0060]

In the liquid leakage treatment facility 20A of the present embodiment, in a case where the liquefied ammonia X leaks from the ammonia pipe H, the leaked liquefied ammonia X can be retained in the containment dike 4. The liquefied ammonia X retained in the containment dike 4 is delivered to the outside of the containment dike 4 by the drainage section 6.

[0061]

In the liquid leakage treatment facility 20A of the present embodiment, similarly to the liquid leakage treatment facility 20 of the first embodiment, the thermally insulative coated floats 5 are laid to cover the bottom portion 4a of the containment dike 4. Therefore, when the liquefied ammonia X is retained in the containment dike 4, the thermally insulative coated floats 5 float on the liquid surface of the liquefied ammonia X, and the volatilization of the liquefied ammonia X is suppressed. Therefore, according to the liquid leakage treatment facility 20A of the present embodiment, it is possible to suppress the release amount of the vaporized gas (ammonia gas in the present embodiment) into the atmosphere in a case where the liquefied ammonia X leaks.

[0062]

Although the preferred embodiments of the present disclosure have been described above with reference to the accompanying drawings, it goes without saying

that the present disclosure is not limited to the above-described embodiments. The various shapes, combinations, and the like of each constituent member shown in the embodiments described above are merely examples, and can be variously changed on the basis of design requirements and the like without departing from the gist of the present disclosure.

[0063]

For example, in the above-described embodiment, a configuration in which the return pipe 10 and the transfer pipe 11 are provided has been described. However, the present disclosure is not limited thereto. For example, it is also possible to adopt a configuration in which any one or both of the return pipe 10 and the transfer pipe 11 are not provided.

[0064]

It is noted that the embodiments described above can also be described as, for example, the following supplementary notes.

[0065]

(Supplementary Note 1)

A liquid leakage treatment facility comprising:

a containment dike that is capable of retaining leaked liquefied gas and that is open upward;

a plurality of thermally insulative coated floats that are laid to cover a bottom portion of the containment dike and that are caused to float by the liquefied gas retained in the containment dike; and

a drainage section configured to deliver the liquefied gas retained in the containment dike to the outside of the containment dike.

[0066]

(Supplementary Note 2)

The liquid leakage treatment facility according to Supplementary Note 1,
wherein the plurality of thermally insulative coated floats are arranged with gaps
between the thermally insulative coated floats.

5 [0067]

(Supplementary Note 3)

The liquid leakage treatment facility according to Supplementary Note 1 or 2,
wherein the containment dike has a liquid collection recess portion that is
provided in a part of the bottom portion and that is recessed downward, and

10 the drainage section includes

a drainage pump disposed inside the liquid collection recess portion, and

a guide pipe configured to guide the liquefied gas pumped by the drainage pump
to the outside of the containment dike.

[0068]

15 (Supplementary Note 4)

The liquid leakage treatment facility according to Supplementary Note 3, further
comprising:

a strainer disposed in the liquid collection recess portion and configured to
suppress entry of foreign matter into the drainage pump.

20 [0069]

(Supplementary Note 5)

The liquid leakage treatment facility according to Supplementary Note 3 or 4,
further comprising:

a rainwater discharge section configured to discharge rainwater accumulated in
25 the liquid collection recess portion to the outside of the containment dike.

[0070]

(Supplementary Note 6)

The liquid leakage treatment facility according to any one of Supplementary Notes 1 to 5, further comprising:

- 5 a drainage tank to which the liquefied gas delivered from the drainage section is supplied; and
- a heater disposed inside the drainage tank.

[0071]

(Supplementary Note 7)

- 10 A liquefied gas tank facility comprising:
 - a storage tank configured to store the liquefied gas;
 - a connection pipe connected to the storage tank and configured to guide the liquefied gas; and
 - the liquid leakage treatment facility according to any one of Supplementary
- 15 Notes 1 to 6, that is capable of retaining the liquefied gas leaked from at least one of the storage tank or the connection pipe.

[0072]

(Supplementary Note 8)

- 20 The liquefied gas tank facility according to Supplementary Note 7, further comprising:
 - a supply pipe configured to guide the liquefied gas stored in the storage tank to a supply destination; and
 - a return pipe configured to return the liquefied gas delivered from the drainage section to the supply pipe.

25 [0073]

(Supplementary Note 9)

The liquefied gas tank facility according to Supplementary Note 7 or 8, further comprising:

- a transfer pipe configured to guide the liquefied gas delivered from the drainage
5 section to another storage tank.

INDUSTRIAL APPLICABILITY

[0074]

In the present disclosure, the thermally insulative coated floats are laid to cover the bottom portion of the containment dike. Therefore, in a case where the liquefied gas
10 is retained in the containment dike, the thermally insulative coated floats float on a liquid surface of the liquefied gas, and volatilization of the liquefied gas is suppressed by the thermal insulation property of the covered floats. Therefore, according to the present disclosure, it is possible to suppress the release amount of the vaporized gas into the atmosphere in a case where the liquefied gas leaks.

15 REFERENCE SIGNS LIST

[0075]

- 1 Liquefied ammonia facility (liquefied gas tank facility)
- 2 Storage tank
- 3 Ammonia delivery section
- 20 3a Delivery pipe (connection pipe, supply pipe)
- 3b Delivery pump
- 3c Vaporizer
- 4 Containment dike
- 4a Bottom portion
- 25 4b Surrounding wall

	4c Liquid collection recess portion
	4d Rainwater recess portion
	5 Thermally insulative coated float
	6 Drainage section
5	6a Drainage pump
	6b Drainage guide pipe (guide pipe)
	7 Strainer
	8 Drainage liquid vaporization section
	8a Drainage tank
10	8b Electric heater (heater)
	9 Rainwater discharge section
	9a Rainwater pump
	9b Rainwater guide pipe
	9c Rainwater gutter
15	10 Return pipe
	11 Transfer pipe
	20 Liquid leakage treatment facility
	20A Liquid leakage treatment facility
	F Flare stack
20	H Ammonia pipe
	X Liquefied ammonia (liquefied gas)

CLAIMS

[Claim 1] A liquid leakage treatment facility comprising:

a containment dike that is capable of retaining leaked liquefied gas and that is open upward;

5 a plurality of thermally insulative coated floats that are laid to cover a bottom portion of the containment dike and that are caused to float by the liquefied gas retained in the containment dike; and

a drainage section configured to deliver the liquefied gas retained in the containment dike to an outside of the containment dike.

10 [Claim 2] The liquid leakage treatment facility according to Claim 1,

wherein the plurality of thermally insulative coated floats are arranged with gaps between the thermally insulative coated floats.

[Claim 3] The liquid leakage treatment facility according to Claim 1 or 2,

15 wherein the containment dike has a liquid collection recess portion that is provided in a part of the bottom portion and that is recessed downward, and

the drainage section includes

a drainage pump disposed inside the liquid collection recess portion, and

a guide pipe configured to guide the liquefied gas pumped by the drainage pump to the outside of the containment dike.

20 [Claim 4] The liquid leakage treatment facility according to Claim 3, further comprising:

a strainer disposed in the liquid collection recess portion and configured to suppress entry of foreign matter into the drainage pump.

[Claim 5] The liquid leakage treatment facility according to Claim 3, further

25 comprising:

a rainwater discharge section configured to discharge rainwater accumulated in the liquid collection recess portion to the outside of the containment dike.

[Claim 6] The liquid leakage treatment facility according to Claim 1 or 2, further comprising:

5 a drainage tank to which the liquefied gas delivered from the drainage section is supplied; and

a heater disposed inside the drainage tank.

[Claim 7] A liquefied gas tank facility comprising:

a storage tank configured to store the liquefied gas;

10 a connection pipe connected to the storage tank and configured to guide the liquefied gas; and

the liquid leakage treatment facility according to Claim 1 or 2, that is capable of retaining the liquefied gas leaked from at least one of the storage tank or the connection pipe.

15 [Claim 8] The liquefied gas tank facility according to Claim 7, further comprising:

a supply pipe configured to guide the liquefied gas stored in the storage tank to a supply destination; and

a return pipe configured to return the liquefied gas delivered from the drainage section to the supply pipe.

20 [Claim 9] The liquefied gas tank facility according to Claim 7, further comprising:

a transfer pipe configured to guide the liquefied gas delivered from the drainage section to another storage tank.