

Specification

ASH DISCHARGER AND METHOD FOR MODIFYING ASH DISCHARGER

5 [Technical Field]

[0001]

The present invention relates to an ash discharger that cools and discharge ash and a method for modifying the ash discharger.

10 [Background Technique]

[0002]

In a typical waste disposal facility (incinerator plant) with an incinerator (e.g., stoker-type incinerator), an ash discharger has been commonly
15 arranged to cool and discharge the ash (incineration residue) after incineration. The ash discharger receives ash that falls through an ash chute connected to the incinerator at an inlet port and cools the ash with water stored in the ash discharger. The ash discharger
20 also discharges cooled ash from a discharge port with a scraper. In addition, the inside of the incinerator including the ash chute is with a negative pressure, but the ash discharger has a water-sealing structure, which cuts off the airflow from the discharge port to the
25 inlet port of the ash discharger. In order to maintain

the water-sealing structure of the ash discharger, water is supplied from a water pouring pipe on the basis of a water level gauge (see Patent Document 1).

[0003]

5 Incidentally, waste to be incinerated in the incinerator may contain metal aluminum. In addition, the main component of the ash exhibits alkalinity in a wet state. Chemically reacting an alkaline solution with metallic aluminum inside the ash discharger may generate
10 combustible gases such as hydrogen gas, which may be concerned to damage the ash discharger due to ignition. To avoid this, a technique has been developed which installs a gas vent pipe (a gas-ventilation pipe) that connects a portion close to the discharge port and the
15 ash chute, and sucks and exhausts combustible gas into the incinerator by utilizing the above negative pressure (see Patent Document 2).

[Prior Art Reference]

[Patent Document]

20 [0004]

[Patent Document 1] Japanese Patent No. 6752988

[Patent Document 2] Japanese Laid-open Utility model

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[Summary of Invention]

25 [Problems to be Solved by Invention]

[0005]

Since the ash introduced from the incinerator is hot, a large amount of vapor (water vapor) is generated when such ash falls into the water in the ash discharger. The vapor is exhausted from a large-diameter discharge port in the vicinity of the discharge port, and because the ash chute connected to the incinerator is with a negative pressure in the vicinity of the inlet port, the vapor is sucked and exhausted into the incinerator with a negative pressure through the ash chute. On the other hand, a drive chamber where a driving device of the scraper is installed does not have the above mechanism for exhaustion, so that a large amount of vapor may remain in the drive chamber in addition to combustible gases. If leaking out of partition gaps of the drive chamber to the outside of the ash discharger, this vapor may corrode walking corridors, plumbing, and other facilities located around the ash discharger.

20 [0006]

One of the conceivable solutions to the above problems is to install the gas vent pipe as described in Patent Document 2 between the drive chamber and the ash chute to suck and exhaust the vapor in the drive chamber. As a result, since the vapor in the drive

chamber is exhausted and the inside of the drive chamber becomes under a negative pressure, leakage of the vapor from the drive chamber to the surrounding area of the ash discharger can be avoided.

5 However, when ash falls through the ash chute from the incinerator, light and fine ash diffuses in the ash chute and the diffused ash may enter the gas vent pipe and solidify. Gradual increase in the amount of solidifying ash will eventually clog the gas vent pipe, 10 which may hinder the exhaustion of vapor and combustible gases generated in ash discharger.

[0007]

With the foregoing problems in view, one of the objects of the present invention is to provide an ash 15 discharger preferable in exhaustibility of vapor and combustible gases and a method for modifying the ash discharger.

[Solution to the Problem]

[0008]

20 An ash discharger of the present invention includes: a cooling basin including an inlet port that is connected to an ash chute through which ash is discharged from an incinerator with a negative pressure and a discharge port that discharges the ash 25 cooled by stored water; a scraper that is disposed

inside the cooling basin and that extrudes the ash toward the discharge port; a driving device that is disposed on a side opposite to the discharge port with respect to the inlet port and that drives the scraper in a driver chamber partitioned from an outside; a water level gauge that is arranged in the drive chamber and that detects a water level of the stored water in the cooling basin; a first pouring pipe that increases the stored water in the cooling basin based on the water level detected by the water level gauge; a first gas vent pipe connected to the ash chute and the driving chamber; and a first spray nozzle connected to a first end of the first pouring pipe and that is arranged close to a highest portion of the first gas vent pipe, wherein the first gas vent pipe has a shape that continuously rises from the drive chamber toward the ash chute or a shape that continuously rises from the drive chamber toward the ash chute and then continuously descends toward the ash chute.

[0009]

A method for modifying an ash discharger of the present invention includes the steps of, in the ash discharger comprising a cooling basin including an inlet port that is connected to an ash chute through

which ash is discharged from an incinerator with a negative pressure and a discharge port that discharges the ash cooled by stored water, a scraper that is disposed inside the cooling basin and that

5 extrudes the ash toward the discharge port, a driving device that is disposed on a side opposite to the discharge port with respect to the inlet port and that drives the scraper in a driver chamber

partitioned from an outside, a water level gauge that

10 is arranged in the drive chamber and that detects a water level of the stored water in the cooling basin, and a pouring pipe that increases the stored water in the cooling basin based on the water level detected by the water level gauge, installing a first end of a

15 gas vent pipe at the ash chute and installing a second end of the gas vent pipe at one of a portion close to the discharge port or the drive chamber; and arranging a spray nozzle close to a highest portion of the first gas vent pipe to directly or indirectly

20 connect the spray nozzle to the pouring pipe, wherein the vent pipe has a shape that continuously rises from the second end of the gas vent pipe toward the ash chute or a shape that continuously rises from the second end of the gas vent pipe toward the ash chute

25 and then continuously descends toward the ash chute.

[Effect of Invention]

[0010]

According to the ash discharger of the present invention, providing a simple-shaped first gas vent pipe makes it possible to suck and exhaust vapor and combustible gases generated in the facility to the incinerator with a negative pressure. In addition, arranging a first spray nozzle close to the highest portion of the first gas vent pipe makes it possible to increase the amount of stored water in the cooling basin and avoid clogging of the gas vent pipe. Therefore, it is possible to provide a ash discharger having a gas vent pipe is less likely to clog and having excellent exhaustibility of vapor and combustible gases. Further, according to the method for modifying an ash discharger of the present invention, the ash discharger of the present invention can be easily and inexpensively implemented without changing the main components of a typical ash discharger.

[Brief Description of Drawings]

[0011]

FIG. 1 is a cross-sectional diagram schematically showing the configuration of an ash discharger 1 according to an embodiment; and

FIG. 2 is a cross-sectional diagram schematically

showing the configuration of an ash discharger 1
according to a modification.

[Embodiment to Carry out Invention]

[0012]

5 With the aid of FIG. 1 to FIG. 2, a description of
the present invention is made in relation to an ash
discharger according to an embodiment and a
modification, and also a method for modifying an ash
discharger. Each of the following embodiment and
10 modification is illustrative only and is not intended to
preclude the application of various modifications and
techniques not explicitly stated in the present
examples. The configurations of the present invention
can be variously modified without departing from the
15 scope thereof. In addition, the configurations of the
present invention can be selected and omitted as needed,
or can be combined appropriately.

[0013]

1. ash discharger

20 FIG. 1 is a cross-sectional diagram schematically
showing the configuration of an ash discharger 1
according to an embodiment. The ash discharger 1 is a
device for cooling ash 5 (incineration residue), which
is generated in an incinerator (not shown), in a cooling
25 basin 6 and discharging the ash 5 from the cooling basin

6 with a scraper 8 driven by a driving device 9. The ash
discharger 1 is provided below an ash chute 2 connected
to the incinerator. The ash discharger 1 includes the
cooling basin 6 having an inlet port 3 and a discharge
5 port 4.

[0014]

The cooling basin 6 is a water basin in which the
stored water (cooling water) for cooling the ash 5 is
stored. Available examples of the stored water include
10 tap water (clean water, water-supply water) or reused
water (recycled water, industrial water treated after
being used in plants). The shape of the bottom surface
from the bottom of the cooling basin 6 to the discharge
port 4 is formed into a smooth curved shape in order to
15 enhance the dischargeability of the ash 5. The two-dot
dashed line in FIG. 1 represents the standard water
level WL, which is a standard liquid level height of the
stored water. The inlet port 3 and the discharge port 4
are formed at positions above the standard water level
20 WL.

[0015]

The inlet port 3 is an opening for introducing the
ash 5 generated in the incinerator into the cooling
basin 6. The inlet port 3 is formed of a wall face
25 having the substantially same cross-section (e.g.,

rectangular) as that of the ash chute 2. The lower end portion of the cuboid ash chute 2 which is extended vertically is joined to the wall face forming the inlet port 3. An incinerator is connected to the upper end of ash chute 2. Generally, since the inside of the incinerator is controlled to be a negative pressure (pressure lower than the atmospheric pressure), the inside of ash chute 2 is also a negative pressure.

[0016]

10 The ash 5 generated in the incinerator falls through the ash chute 2 and is introduced into the cooling basin 6 from the inlet port 3. The lower end of the wall face forming the inlet port 3 is suspended below the standard water level WL and embedded in the water to form a water-sealing structure. This structure cuts off the airflow from the discharge port 4 into the incinerator.

[0017]

20 The discharge port 4 is an opening for discharging the ash 5 after being cooled to the outside of the cooling basin 6. The discharge port 4 is formed into a shape opened obliquely upward. The upper end of a cuboid exhaust chute 27 which is extended vertically is connected to the discharge port 4. The lower end of the exhaust chute 27 is opened toward a conveying device 28

such as a vibrating conveyor or a belt conveyor. The cooled ash 5 extruded from the cooling basin 6 falls onto the conveying device 28 through the discharge chute 27, and is conveyed to a non-illustrated post-stage facility (for example, an ash pit) by the conveying device 28.

[0018]

The scraper 8 is a member for pushing and extruding the ash 5 in the cooling basin 6 toward the discharge port 4. The tip end portion of the scraper 8 (left end in FIG. 1) is provided with a planar member (extrusion plate) erected at a predetermined angle with respect to the bottom surface of the cooling basin 6. The basal end portion of the scraper 8 (right end portion in FIG. 1) is connected to a driving device 9 to be described below via, for example, a linking member.

[0019]

The driving device 9 is a device for causing the scraper 8 to reciprocate forward and rearward.

As shown by a broken line in FIG. 1, by the driving device 9 driving the linking member of the scraper 8 in the rotation direction, the planar member of the scraper 8 is moved to the left in FIG. 1. Thereby, the planar member of the scraper 8 slides along the bottom surface of the cooling basin 6 and

consequently the ash 5 is extruded toward discharge port 4, so that part of the ash 5 is discharged from the discharge port 4. The discharged ash 5 falls through the exhaust chute 27 onto the conveying device 28 disposed below.

[0020]

The driving device 9 is accommodated in a drive chamber 7 which is located opposite side (right side in FIG. 1) to the discharge port 4 with respect to the inlet port 3 and is located above the standard water level WL. The perimeter of the drive chamber 7 is covered with a partition wall and is partitioned from the outside of the ash discharger 1. On the other hand, the partition wall of the drive chamber 7 has an openable inspection port for the purpose of maintenance of the driving device 9. The inside of the drive chamber 7 can be accessed from the outside of the ash discharger 1 by opening the inspection port. For example, a walking corridor and plumbing are arranged on the outside of the ash discharger 1. The walking corridor gives a passage of operators for the maintenance of other devices arranged around the ash discharger 1.

[0021]

The water level gauge 10 is a device for detecting a water level (actual liquid level) of the stored water.

The water level gauge 10 is placed inside the drive chamber 7. The data of the water level detected by the water level gauge 10 is transmitted to the control device 16.

5 [0022]

The control device 16 controls the driving device 9, and also controls the opening and closing state (degree of opening) of an electromagnetic valve 15 to be described below. Specifically, the control device 16 controls the driving device 9 to cause the scraper 8 to reciprocate continuously or intermittently. In addition, when the water level detected by the water level gauge 10 is lower than the predetermined water level (when the water level is less than a threshold), the control device 16 opens the electromagnetic valve 15 and pours water into the cooling basin 6. On the other hand, when the water level is equal to or higher than the predetermined water level (when the water level is equal to or higher than the threshold), the control device 16 closes the electromagnetic valve 15 and stops the pouring of water into the cooling basin 6.

Here, the description assumes that the control device 16 controls the electromagnetic valve 15. Alternatively, the data of the water level detected by the water level gauge 10 may be displayed on a monitor

or the like, and an operator may control the opening of the electromagnetic valve 15 on the basis of the data.

[0023]

The drainage pipe 11 is an overflow pipe for
5 discharging surplus stored water when the water level of the stored water exceeds the standard water level WL. The drainage pipe 11 is provided such that the height of its upper end corresponds to the standard water level WL. This configuration automatically maintains the level
10 of the stored water at the standard water level WL or less.

[0024]

Hereinafter, description will now be made in relation to a configuration that the control device 16
15 increases the stored water in the ash discharger 1 shown in FIG. 1.

The water pipe 14 is connected at one end to the water tank 13 or to water supply appointments (e.g., waterworks for clean water or recycled water). The
20 electromagnetic valve 15 is interposed in the middle of the water pipe 14.

The main pouring pipe 12 has one end connected to either the other end of the water pipe 14 or a portion of the water pipe 14 which portion is downstream portion
25 from the electromagnetic valve 15. The other end of the

main pouring pipe 12 is connected to the drive chamber
7.

[0025]

A No.1 (first) pouring pipe 20 has one end
5 connected to either the other end of the water pipe 14
or a portion of the water pipe 14 which portion is a
downstream portion from the electromagnetic valve 15 in
a direction of water flow that the water pipe 14
supplies. The one end of the No.1 pouring pipe 20 may be
10 connected to a portion of the water pipe 14 which
portion is a downstream portion from the electromagnetic
valve 15 or may be connected to the main pouring pipe 12
(also in this case, "downstream portion from the
electromagnetic valve 15 in a direction of water flow
15 that the water pipe 14 supplies"). The other end of the
No.1 pouring pipe 20 is connected to a No.1 (first)
spray nozzle 21. The No.1 spray nozzle 21 is arranged
close to the highest portion of a No.1 (first) gas vent
pipe 17 to be described below.

20 [0026]

A No.2 (second) pouring pipe 25 has one end
connected to either the other end of the water pipe 14
or a portion of the water pipe 14 which portion is a
downstream portion from the electromagnetic valve 15 in
25 a direction of water flow that the water pipe 14

supplies. The one end of the No.2 pouring pipe 25 may be connected to a portion of the water pipe 14 which portion is a downstream portion from the electromagnetic valve 15 or may be connected to the main pouring pipe 12 (also in this case, "downstream portion from the electromagnetic valve 15 in a direction of water flow that the water pipe 14 supplies"). The other end of the No.2 pouring pipe 25 is connected to a No.2 (second) spray nozzle 26. The No.2 spray nozzle 26 is arranged close to the highest portion of a No.2 (second) gas vent pipe 22 to be described below.

[0027]

When the control device 16 opens the electromagnetic valve 15, water in the water tank 13 or water supply appointments flows through the water pipe 14, and then through the main pouring pipe 12, the No.1 pouring pipe 20, and the No.2 pouring pipe 25. Then, the water flowing through the main pouring pipe 12 is poured into the drive chamber 7. Water flowing through the No.1 pouring pipe 20 is sprayed or injected from the No.1 spray nozzle 21 to the No.1 gas vent pipe 17 to be described below, and then poured into the drive chamber 7 via the No.1 gas vent pipe 17. Water flowing through the No.2 pouring pipe 25 is sprayed or injected from the No.2 spray nozzle 26 to the No.2 gas vent pipe 22 to be

described below, and then poured into the cooling basin 6 from a portion close to the discharge port 4 via the No.2 gas vent pipe 22.

This configuration allows the control device 16 to increase the stored water in the cooling basin 6.

[0028]

Here, description will now be made in relation to the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22.

As described above, the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22 serve as not only part of a configuration that increases the stored water in the cooling basin 6 in the ash discharger 1, but also serve as a configuration to suck combustible gases and vapor that can be generated in the cooling basin 6 from the ash chute 2 with a negative pressure into the incinerator and then discharge the gases and vapor to the outside of the ash discharger 1. Each of the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22 may be formed of a single pipe or multiple connected pipes.

[0029]

The No.1 gas vent pipe 17 has one end connected to the ash chute 2 and the other end connected to the drive chamber 7. This means that the No.1 gas vent pipe 17 is provided such that the ash chute 2 and the drive chamber 7 are communicated with each other. The No.1 gas vent

pipe 17 is formed in a shape that continuously rises from the drive chamber 7 toward the No.1 spray nozzle 21 as shown in FIG. 1. In other words, the No.1 gas vent pipe 17 is formed into a shape not having a horizontal portion but continuously descending from the No.1 spray nozzle 21 arranged at the No.1 gas vent pipe 17 toward the drive chamber 7 (a shape not having a portion at which a gradient reverses, i.e., not having a U-shaped or V-shaped portion at which downward inclination switches to an upward inclination).

[0030]

Similarly, the No.2 gas vent pipe 22 has one end connected to the ash chute 2 and the other end connected to a portion close to the discharge port 4. This means that the No.2 gas vent pipe 22 is provided such that the ash chute 2 and a portion close to the discharge port 4 communicate with each other. The No.2 gas vent pipe 22 is formed into a shape that continuously rises from a portion close to the discharge port 4 toward the No.2 spray nozzle 26 as shown in FIG. 1. In other words, the No.2 gas vent pipe 22 is formed into a shape not having a horizontal portion but continuously descending from the No.2 spray nozzle 26 arranged at the No.2 gas vent pipe 22 toward a portion close to the discharge port 4 (a shape not having a portion at which a gradient

reverses, i.e., not having a U-shaped or V-shaped portion at which downward inclination switches to an upward inclination).

[0031]

5 The No.1 gas vent pipe 17 may take a linear or curved shape, and the No.2 gas vent pipe 22 may take a linear or curved shape likewise. The No.1 gas vent pipe 17 makes it possible to suck and exhaust combustible gases and vapor staying in the drive chamber 7 into the
10 incinerator with its negative pressure. In addition, the No.2 gas vent pipe 22 makes it possible to suck and exhaust combustible gases and vapor staying at a portion close to the discharge port 4 into the incinerator with its negative pressure.

15 [0032]

 It is feared that the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22 may be clogged, because fine ashes diffusing while falling from the incinerator toward the ash discharger 1 through the ash chute 2
20 break into the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22 and solidify in the interior. However, since the control device 16 actually opens the electromagnetic valve 15 every few minutes on the basis of the data of the water level transmitted by the water
25 level gauge 10, ash in the No.1 gas vent pipe 17 and the

No.2 gas vent pipe 22 is washed off with the water flowing through the pipes without any time to solidify.

In other words, the inside of the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22 are washed each time the

5 control device 16 opens the electromagnetic valve 15 and thereby increases the stored water on the basis of the data of the water level of the water level gauge 10.

[0033]

Incidentally, the above shapes of the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22 makes water 10 sprayed or injected to the respective corresponding nozzles (the No.1 spray nozzle 21 and the No.2 spray nozzle 26) possible to be surely discharged from these pipes, not remaining in the respective pipes.

15 Accordingly, since ash does not solidify and water does not remain in the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22, the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22 can maintain functions of sucking and exhausting combustible gases and vapor staying in 20 the cooling basin 6 and of increasing the store water for a long time. Consequently, the ash discharger 1 can undergo the maintenance operation less frequently.

[0034]

The above description explains that the ash 25 discharger 1 has three water passages to increase the

stored water of: (1) the main pouring pipe 12; (2) the No.1 pouring pipe 20, the No.1 spray nozzle 21, and the No.1 gas vent pipe 17; and (3) the No.2 pouring pipe 25, the No.2 spray nozzle 26, and the No.2 gas vent pipe 22.

5 However, depending on the design, the ash discharger 1 may be appropriately modified to arrange only the passages (1) and (2), arrange only the passages (1) and (3), have only the passage (2), or have only the passage (3), for example.

10 [0035]

For example, in FIG. 1, the exhaust chute 27 is configured to cover the entire discharge port 4 and the connecting part between the discharge port 4 and the exhaust chute 27 is not opened to the outside air and is
15 integrally formed. However, if the configuration is modified such that the connection between the discharge port 4 and the exhaust chute 27 is opened to the outside air, the passage (3) may be omitted.

The description made with reference to FIG. 1
20 regards the passages (2) and (3) as auxiliary means to the passage (1), which means the No.1 pouring pipe 20 in the passage (2) and the No.2 pouring pipe 25 in the passage (3) are assumed to have pipe diameters smaller than that of the main pouring pipe 12 of the passage
25 (1). However, if the passage (1) is not arranged, it is

desirable to appropriately set the pipe diameter of the No.1 pouring pipe 20 in the passage (2) and the No.2 pouring pipe 25 to be large.

[0036]

5 Preferably, water level gauge 10 in the drive chamber 7 is arranged at a position on which the main pouring pipe 12 or the No.1 gas vent pipe 17 scatters water. This structure can clean the water level gauge 10 by washing off ash and scum adhering to the water level
10 gauge 10 with the poured water, so that the exact data of the water level gauge 10 can be detected.

 Incidentally, although the water supplied from No.1 spray nozzle 21 is water having been used to wash off the ash adhering to the inside of No.1 gas vent pipe
15 17 and is therefore dirtier than the water supplied from the main pouring pipe 12, the detectability of the data of the water level by the water level gauge 10 is also improved as compared with the case where the water level gauge 10 is not cleaned.

20 [0037]

 The "portion close to the discharge port 4" to which the other end of the No.2 gas vent pipe 22 connected represents a position where water sprayed or injected from the No.2 spray nozzle 26 passes through
25 the No.2 gas vent pipe 22 and then does not directly

fall into the exhaust chute 27. Accordingly, the water supplied from the No.2 spray nozzle 26 is poured onto the ash 5 that is present at a portion above the standard water level WL and close to the end of the discharge port 4 and that would easily solidify because not being soaked in the stored water. This configuration allows the scraper 8 to easily discharge the ash 5 to the exhaust chute 27 with low power.

[0038]

10 The water sprayed by the No.1 spray nozzle 21 may have directivity or may be sprinkled around the entire circumference like a sprinkler. If the sprayed water has directivity, the No.1 spray nozzle 21 preferably sprays water to the downstream of the No.1 gas vent pipe 17.

15 Similarly, the water sprayed by the No.2 spray nozzle 26 may have directivity or may be sprinkled around the entire circumference like a sprinkler. If the sprayed water has directivity, the No.2 spray nozzle 26 preferably sprays water to the downstream of the No.2 gas vent pipe 22.

[0039]

2. effect

In the ash discharger 1, vapor and combustible gases that stay in the drive chamber 7 are sucked and exhausted to the negative-pressure ash chute 2 through a

25

simply-shaped No.1 gas vent pipe 17. This configuration avoids ignition of combustible gases in the drive chamber 7.

In addition, since the drive chamber 7 becomes a negative pressure and therefore leakage of vapor to the outside of the ash discharger 1 can be avoided, pollution and corrosion of the surrounding corridor and the plumping arranged around ash discharger 1 can be avoided.

The No.1 spray nozzle 21 is arranged at a portion close to the highest portion of the No.1 gas vent pipe 17. Even if light and fine ash enters inside the No.1 gas vent pipe 17, this arrangement makes it possible to wash of the ash to keep the No.1 gas vent pipe 17 to be the communicating state. The water containing the washed ash will be stored inside cooling basin 6 and will be used without waste.

Thus, by positively utilizing the function of keeping the water level of the stored water that a typical ash discharger has and the point that the incinerator is with a negative pressure, it is possible to provide an ash discharger 1 that less clogs the No.1 gas vent pipe 17 and that is preferable in exhaustibility of vapor and combustible gases.

In the ash discharger 1, the amount of water supply from the No.1 spray nozzle 21 is automatically controlled by the control device 16. Therefore, in addition to the function of cleaning the inside of No.1 gas vent pipe 17, the function of properly maintaining the water level of the stored water in the cooling basin 6 can be easily achieved.

[0041]

In the ash discharger 1, the main pouring pipe 12 is arranged such that the water poured from the main pouring pipe 12 falls onto the water level gauge 10. Thus, water injected from the main pouring pipe 12 when the electromagnetic valve 15 opens hits the water level gauge 10, and ash and scum adhering to the water level gauge 10 can be washed off. Therefore, it is possible to maintain the function and sensitivity of the water level gauge 10 satisfactorily. This configuration also eliminates the need for additional equipment to clean water level gauge 10 and reduces the cost of manufacturing and operating the ash discharger 1.

[0042]

In the ash discharger 1, vapor and combustible gases that stay in the vicinity of the discharge port 4 are sucked and exhausted to the negative-pressure ash chute 2 through a simple-shaped No.2 gas vent pipe 22.

This configuration can enhance the effect of avoiding leakage of vapor and exhaustibility of combustible gasses. Further, since the No.2 spray nozzle 26 is arranged close to the highest portion of the No.2 gas vent pipe 22, ash entering inside the No.2 gas vent pipe 22 can be washed off and the communicating state of the No.2 gas vent pipe 22 can be maintained. In the portion close to the discharge port 4, the ash 5 containing water tends to solidify and has difficulty in being discharged. As a solution to the above problem, arranging the No.2 gas vent pipe 22 and No.2 spray nozzle 26 makes it possible to supply water in vicinity of the discharge port 4 to soften the ash 5 so that the ash 5 can be exhausted with ease.

15 [0043]

3. modification

FIG. 2 is a cross-sectional diagram schematically showing the configuration of an ash discharger 1' according to a modification. Same reference numbers designate identical or substantially identical components and elements of the above embodiment, so repetitious description of the configuration and effect is omitted here. When comparing the ash discharger 1 according to the embodiment with the ash discharger 1' according to the modification, the shapes of both No.1

gas vent pipe and No.2 gas vent pipe of the ash discharger 1 are different from those of the ash discharger 1'.

[0044]

5 The No.1 gas vent pipe 17' is formed into a shape that continuously rises from the drive chamber 7 toward the ash chute 2 and then continuously descends. Like the ash discharger 1 of the embodiment, the No.1 spray nozzle 21 is arranged close to the highest portion of
10 the No.1 gas vent pipe 17'. Of the No.1 gas vent pipe 17', a portion on the side of the drive chamber 7 from the No.1 spray nozzle 21 is referred to as a No.1 (first) passage 18 and a portion on the side of the ash chute 2 from the No.1 spray nozzle 21 is referred to as
15 a No.2 (second) passage 19.

[0045]

 The No.1 passage 18 has a shape that continuously descends from the No.1 spray nozzle 21 toward the drive chamber 7. The No.2 passage 19 has a shape that
20 continuously descends from the No.1 spray nozzle 21 toward the ash chute 2.

 The No.1 passage 18 and the No.2 passage 19 may each be a straight-line shape or a curved-line shape as far as not having a horizontal shape and also not having
25 a U-shaped or V-shaped portion at which a gradient

reverses (which means the absence of a portion at which a downward inclination switches an upward inclination).

In the modification, the No.1 spray nozzle 21 sprays or injects water in the respective two directions toward the downstream sides of the No.1 passage 18 and the No.2 passage 19. At this time, the water sprayed by the No.1 spray nozzle 21 may have directivity or may be sprinkled around the entire circumference like a sprinkler.

10 [0046]

The No.2 gas vent pipe 22' is formed into a shape that continuously rises from a portion close to the discharge port 4 toward the ash chute 2 and then continuously descends. Like the ash discharger 1 of the above embodiment, the No.2 spray nozzle 26 is arranged close to the highest portion of the No.2 gas vent pipe 22'. Of the No.2 gas vent pipe 22', a portion on the side of the discharge port 4 from the No.2 spray nozzle 26 is referred to as a No.3 (third) passage 23 and a portion on the side of the ash chute 2 from the No.2 spray nozzle 26 is referred to as a No.4 (fourth) passage 24.

[0047]

The No.3 passage 23 has a shape that continuously descends from the No.2 spray nozzle 26 toward the

discharge port 4. The No.4 passage 4 has a shape that continuously descends from the No.2 spray nozzle 26 toward the ash chute 2.

The No.3 passage 23 and the No.4 passage 24 may each be a straight-line shape or a curved-line shape as far as not having a horizontal shape and also not having a U-shaped or V-shaped portion at which a gradient reverses (which means the absence of a portion at which a downward inclination switches an upward inclination).

10 In the modification, the No.2 spray nozzle 26 sprays or injects water in the respective two directions toward the downstream sides of the No.3 passage 23 and the No.4 passage 24. At this event, the water sprayed by the No.2 spray nozzle 26 may have directivity or may be
15 sprinkled around the entire circumference like a sprinkler.

[0048]

The ash discharger 1' of the modification can obtain the same advantages and effects as those of the
20 ash discharger 1 of the embodiment. In addition, the ash discharger 1' of the modification can further obtain the following effects that the ash discharger 1 of the embodiment does not attain.

In the ash discharger 1 of the embodiment, the
25 No.1 gas vent pipe 17 and the No.2 gas vent pipe 22 are

connected to ash chute 2, keeping upwardly inclined with respect to the ash chute 2. In other words, the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22 are connected to ash chute 2, keeping upward inclination toward the ash chute 2. Therefore, there is a possibility that not only fine ash falling through the ash chute 2 while scattering but also relatively larger bulky ash falling through the ash chute 2 directly enter the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22.

However, in ash discharger 1' of the modification, the No.1 gas vent pipe 17' and the No.2 gas vent pipe 22' are connected to ash chute 2, keeping downwardly inclined with respect to the ash chute 2. In other words, the No.1 gas vent pipe 17' and the No.2 gas vent pipe 22' are connected to ash chute 2, keeping downward inclination toward the ash chute 2. This configuration can prevent relatively larger bulky ash falling through the ash chute 2 from directly entering the No.1 gas vent pipe 17' and the No.2 gas vent pipe 22'.

Namely, more efficiently avoiding clogging of the respective gas vent pipes compared to the No.1 gas vent pipe 17 and the No.2 gas vent pipe 22 of the ash discharger 1 according to the embodiment, the No.1 gas vent pipe 17' and the No.2 gas vent pipe 22' of the ash discharger 1' according to the modification can more

preferably exert exhaustibility of vapor and combustible gasses.

[0049]

4. method for modifying

5 Finally, description will now be made in relation to a method for modifying a typical ash discharger to obtain the ash discharger 1, 1' of the embodiment or the modification. The typical ash discharger here is one including a cooling basin 6 with an inlet port 3 and a
10 discharge port 4, a scraper 8, a driving device 9, a water level gauge 10, and a main pouring pipe 12 which pours water supplied by a water tank 13 or water supply appointments into the cooling basin 6.

[0050]

15 A method for modifying a typical ash discharger modification involves two steps.

 The first step installs one end of the gas vent pipe 17 (17') at the ash chute 2 and installs the other end of the gas vent pipe 17 (17') at the drive chamber
20 7. Alternatively, the first step may install one end of the gas vent pipe 22 (22') at the ash chute 2 and install the other end of the gas vent pipe 22 (22') close to the discharge port 4.

 Either one of the No.1 gas vent pipe 17 (17') and
25 the No.2 gas vent pipe 22 (22') may be installed, or

both may be installed.

[0051]

The second step installs a spray nozzle (i.e., No.1 spray nozzle 21 or No.2 spray nozzle 26 at a portion close to the highest portion of the corresponding gas vent pipe 17, 17', 22, or 22', and connects between the spray nozzle and the main pouring pipe 12 directly or indirectly.

For example, if the No.1 gas vent pipe 17 (17') is installed, the No.1 spray nozzle 21 is arranged close to the highest portion of the No.1 gas vent pipe 17 (17') and the No.1 pouring pipe 20 is connected to the main pouring pipe 12 (or the water pipe 14 linked to the upstream side of the main pouring pipe 12). Further, if the No.2 gas vent pipe 22 (22') is installed, the No.2 spray nozzle 26 is arranged close to the highest portion of the No.2 gas vent pipe 22 (22') and the No.2 pouring pipe 25 is connected to the main pouring pipe 12 (or the water pipe 14 linked to the upstream side of the main pouring pipe 12).

[0052]

Such a method for modifying can easily and inexpensively achieve the ash discharger 1 of the embodiment or the ash discharger 1' of the modification without changing the main components of a typical ash

discharger. Accordingly, in a plant using a typical ash discharger can shortly modify the ash discharger without excessive cost and consequently can enhance exhaustibility of vapor and combustible gasses.

5 [Description of Reference Sign]

[0053]

- 1,1': ash discharger
- 2: ash chute
- 3: inlet port
- 10 4: discharge port
- 5: ash
- 6: cooling basin
- 7: drive chamber
- 8: scraper
- 15 9: driving device
- 10: water level gauge
- 11: drainage pipe
- 12: main pouring pipe (pouring pipe)
- 13: water tank
- 20 14: water pipe
- 15: electromagnetic valve
- 16: control device
- 17,17': No.1 gas vent (ventilation) pipe (first gas vent pipe)
- 25 18: No.1 passage (first passage)

- 19: No.2 passage (second passage)
- 20: No.1 pouring pipe (first pouring pipe)
- 21: No.1 spray nozzle (first spray nozzle)
- 22,22' No.2 gas vent (ventilation) pipe (second
5 gas vent pipe)
- 23: No.3 passage (third passage)
- 24: No.4 passage (fourth passage)
- 25: No.2 pouring pipe (second pouring pipe)
- 26: No.2 spray nozzle (second spray nozzle)
- 10 27: exhaust chute
- 28: conveying device

CLAIMS

1. An ash discharger comprising:

a cooling basin including an inlet port that is
5 connected to an ash chute through which ash is
discharged from an incinerator with a negative
pressure and a discharge port that discharges the ash
cooled by stored water;

a scraper that is disposed inside the cooling
10 basin and that extrudes the ash toward the discharge
port;

a driving device that is disposed on a side
opposite to the discharge port with respect to the
inlet port and that drives the scraper in a driver
15 chamber partitioned from an outside;

a water level gauge that is arranged in the
drive chamber and that detects a water level of the
stored water in the cooling basin;

a first pouring pipe that increases the stored
20 water in the cooling basin based on the water level
detected by the water level gauge;

a first gas vent pipe connected to the ash
chute and the driving chamber; and

a first spray nozzle connected to a first end
25 of the first pouring pipe and that is arranged close

to a highest portion of the first gas vent pipe,
wherein

the first gas vent pipe has a shape that
continuously rises from the drive chamber toward the
5 ash chute or a shape that continuously rises from the
drive chamber toward the ash chute and then
continuously descends toward the ash chute.

2. The ash discharger according to claim 1,
10 further comprising:

a water pipe having a first end connected to a
water tank or a water supply;

an electromagnetic valve arranged at the water
pipe; and

15 a control device that controls a degree of
opening of the electromagnetic valve based on a water
level detected by the water level gauge, wherein

a second end of the first pouring pipe is
connected to one of a second end or a portion of the
20 water pipe, the portion being a downstream portion
from the electromagnetic valve, and

the control device closes the electromagnetic
when the water level is a threshold value or more,
and opens the electromagnetic when the water level is
25 less than the threshold value.

3. The ash discharger according to claim 2,
further comprising:

a main pouring pipe connected to one of the
5 second end or a portion of the water pipe, the
portion being a downstream portion from the
electromagnetic valve and also connected to the drive
chamber, wherein

water poured from the main pouring pipe is
10 poured onto the water level gauge by opening the
electromagnetic valve.

4. The ash discharger according to claim 2 or 3,
further comprising:

15 a second pouring pipe;

a second gas vent pipe connected to a portion
close to the discharge port and the ash chute; and

a second spray nozzle that is connected to a
first end of the second pouring pipe and that is
20 arranged close to a highest portion of the second gas
vent pipe, wherein

the second pouring pipe has a second end that
is connected to one of the second end of the water
pipe or a portion of the water pipe, the portion
25 being a downstream portion from the electromagnetic

valve, and

the second gas vent pipe has a shape that continuously rises from a portion close to the discharge port toward the ash chute or a shape that continuously rises from a portion close to the discharge port toward the ash chute and then continuously descends toward the ash chute.

5. A method for modifying an ash discharger, the ash discharger comprising a cooling basin including an inlet port that is connected to an ash chute through which ash is discharged from an incinerator with a negative pressure and a discharge port that discharges the ash cooled by stored water, a scraper that is disposed inside the cooling basin and that extrudes the ash toward the discharge port, a driving device that is disposed on a side opposite to the discharge port with respect to the inlet port and that drives the scraper in a driver chamber partitioned from an outside, a water level gauge that is arranged in the drive chamber and that detects a water level of the stored water in the cooling basin, and a pouring pipe that increases the stored water in the cooling basin based on the water level detected by the water level gauge, the method comprising the

steps of:

installing a first end of a gas vent pipe at
the ash chute and installing a second end of the gas
vent pipe at one of the drive chamber or a portion
5 close to the discharge port ; and

arranging a spray nozzle close to a highest
portion of the gas vent pipe to directly or
indirectly connect the spray nozzle to the pouring
pipe, wherein

10 the vent pipe has a shape that continuously
rises from the second end of the gas vent pipe toward
the ash chute or a shape that continuously rises from
the second end of the gas vent pipe toward the ash
chute and then continuously descends toward the ash
15 chute.