

Description

Title of the Invention

ASH DISCHARGER

5 Field of the Invention

[0001]

The present invention relates to an ash discharger that cools and discharges incinerated ash.

10 Background of the Invention

[0002]

An incinerator plant is known as a plant for incinerating such as waste. In an incinerator (e.g., a stoker incinerator) in the plant, ash (i.e., incinerated ash) generated by burning an object is dropped from an ash chute to an ash
15 discharger through an introduction port, cooled by stored water in a cooling tank of the ash discharger, and then discharged from the ash discharger to a conveyance device. The ash discharger is provided with a scraper (also called a "pusher") that pushes out, toward the discharge port, the incinerated ash cooled by the stored water. The scraper reciprocates in a forward
20 direction toward the discharge port and in a backward direction opposite to the forward direction, by the drive device to push out the incinerated ash in the stored water toward the discharge port.

[0003]

When the incinerated ash is pushed out and discharged, the discharged
25 incinerated ash contains moisture. Therefore, for example, in Patent Document 1, a water level of stored water is constantly measured by a water level gauge during operations of a scraper, and a water supply operation to supply water to the predetermined water level is performed, when the water level falls below a predetermined water level.

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Citation List

Patent Literature

[0004]

Patent Document 1: JP 2007-170685 A

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Summary of the Invention

Issue to be solved by the Invention

[0005]

Because the scraper generally operates slowly, the water level of the stored water is usually kept substantially constant, even when the scraper moves reciprocally. However, depending on the amount and properties of the stored incinerated ash, when the scraper performs a pushing operation to push out the incinerated ash toward the discharge port, the water level of the stored water in a drive room where a drive device is installed, may be temporarily significantly lowered relative to the predetermined water level.

[0006]

However, even in such a case, when the scraper is drawn toward the drive room after the pushing operation, the water level of the stored water in the drive room substantially returns to the predetermined water level.

Nevertheless, when the water level of the stored water in the drive room is thus significantly lowered, if the water supply operation is performed based on the lowered water level, the water level rises toward the predetermined water level when the scraper is drawn toward the drive room, and as a result, water is excessively supplied, and the stored water overflows a drainpipe and is drained. The drained water is purified by drainage treatment inside the plant and then discharged to the outside of the plant.

[0007]

In other words, according to a conventional water supply operation, supplying water and draining water may be repeated in each reciprocation of the scraper.

Therefore, there are possibilities for improvements to enhance cost effectiveness from the viewpoints of the cost related to the excessive water supply operation and of the cost related to drainage treatments by chemicals or the like for purifying drain increased due to the excessive water supply operation.

Therefore, an object of the present invention is to provide an ash discharger that can appropriately control water supply operation into the ash discharger and enhance cost effectiveness regarding the water supply operation and the drainage.

Solution to the Issue

[0008]

An ash discharger of the present invention includes a cooling tank including an introduction port through which incinerated ash is introduced and a discharge port through which the incinerated ash cooled by stored water is discharged,

a drive device that is installed in a drive room disposed on an opposite side to the discharge port with respect to the introduction port in the cooling tank, and that makes a scraper perform reciprocating motions for pushing out the incinerated ash toward the discharge port,

5 a supply pipe that is installed in the drive room and that supplies water to the cooling tank,

a solenoid valve installed in the supply pipe,

a water level gauge that is disposed in a vicinity of the supply pipe and that measures a water level of the stored water, and

10 a control device that controls the drive device to sequentially repeat three operations, that are a pushing operation for making the scraper push out the incinerated ash toward the discharge port, a drawing operation for making the scraper drawn toward the drive room, and a stopping operation for making the scraper stop during a first predetermined time.

15 The control device performs a first water supply operation for supplying water from the supply pipe during the stopping operation, when the water level is lower than the predetermined water level, by opening the solenoid valve until the water level reaches a predetermined water level, based on information regarding the water level received from the water level gauge, and the control
20 device does not perform the first water supply operation during the pushing operation and during the drawing operation.

Advantageous Effects of the Invention

[0009]

25 According to the ash discharger of the present invention, only in the stopping operation for making the scraper stop during a first predetermined time, a first water supply operation is performed, which is supplying water from the supply pipe by opening the solenoid valve until the water level reaches a predetermined water level, when the water level is lower than the
30 predetermined water level, based on information regarding the water level received from the water level gauge. On the other hand, the first water supply operation is not performed, during the pushing operation for making the scraper push out the incinerated ash toward the discharge port and during the drawing operation for making the scraper drawn toward the drive room.

35 As described above, because the first water supply operation can be performed only during the stopping operation in which the water level of the stored water is stable, the water supply in the ash discharger is appropriately controlled without being excessively supplied, and there is no increase in the

drained water amount from the ash discharger due to the excessive water supply. As a result, it is possible to enhance cost effectiveness regarding the water supply operation and the drainage.

5 Brief Description of Drawings

[0010]

FIG. 1 is a cross-sectional view of an ash discharger according to an embodiment.

FIG. 2 is a treatment flow for describing a control example of first water
10 supply operation by a control device.

Description of Embodiments of the Invention

[0011]

An ash discharger that is an embodiment of the present invention will be
15 described below with reference to the drawings. In FIG. 1, for convenience, explanations will be appropriately made by using an orthogonal coordinate system including an X axis and a Y axis.

The embodiment is merely an example, and not intended to exclude various modifications and applications of technologies that are not explicitly
20 described. Except for essential elements to the present invention, any elements can be selected or modified in various ways as necessary.

[0012]

An overall configuration of an ash discharger 1 of an embodiment will be described with reference to FIG. 1.

25 The ash discharger 1 includes a cooling tank 2 in which stored water for cooling incinerated ash is stored at a predetermined water level (i.e., a broken line in FIG. 1), a scraper 4 disposed in the cooling tank 2, and a drive device 5 disposed inside a drive room 2a in the cooling tank 2. The cooling tank 2 is provided with an introduction port 6 through which the incinerated ash is
30 introduced and a discharge port 7 through which the cooled incinerated ash is discharged. The drive room 2a is a space where the drive device 5 is disposed in the cooling tank 2 and is located on the opposite side of the discharge port 7 with respect to the introduction port 6.

35 The stored water and a liquid used for spraying in a supply pipe 11 described later may have a main component that is water, and may be tap water, industrial water, or recycled water (e.g., water used in the plant and then treated), or mixed water neutralized by mixing hydrochloric acid or the like.

Hereinafter, these liquids used for the stored water will be simply described as "water".

[0013]

The introduction port 6 of the cooling tank 2 is formed of a wall surface 8 having a tubular shape (e.g., a rectangular tubular shape). The wall surface 8 having a tubular shape is directly connected to an ash chute not illustrated. The upper end of the ash chute is connected to an incinerator (e.g., a post-combustion stage of a stoker incinerator) not illustrated.

In order to achieve a so-called "water seal" configuration, the lower end of the wall surface 8 is located lower than a predetermined water level of the stored water in the cooling tank 2. The predetermined water level is a position (i.e., a reference line of the water level) set in advance as a water level at which the water amount of the stored water in the cooling tank 2 becomes a predetermined amount.

[0014]

The scraper 4 is a device that pushes out cooled incinerated ash toward the discharge port 7. The scraper 4 includes an upper plate 4a facing upward, a push out plate 4b facing the discharge port 7, and both side plates connected to the upper plate 4a and the push out plate 4b (i.e., FIG. 1 illustrates a side plate 4c which is one of the both side plates). Because the lower surface corresponding to the upper plate 4a is not disposed, the scraper 4 has a box shape open to a bottom plate 9 of the cooling tank 2.

The scraper 4 is connected to an arm 5b described later, and the scraper 4 goes in forward direction and in backward direction repeatedly along the bottom plate 9, while the entire width of the lower end of the push out plate 4b (i.e., a tip end 4d of the scraper 4) is in contact with the bottom plate 9 of the cooling tank 2.

Here, the "forward direction" of the scraper 4 means that the scraper 4 moves in a direction (i.e., toward +X axis direction, toward forward direction Df in FIG. 1) in which the scraper 4 pushes out the incinerated ash toward the discharge port 7. The "backward direction" of the scraper 4 means that the scraper 4 moves in the opposite direction (i.e., toward -X axis direction, toward backward direction Dr in FIG. 1) to the "forward direction". Furthermore, the "entire width" of the bottom plate 9 of the cooling tank 2 means size in a width direction (i.e., a direction orthogonal to the paper surface of FIG. 1) inside the cooling tank 2.

The incinerated ash discharged from the discharge port 7 is conveyed to a predetermined storage place by a conveyance device 3 such as a conveyor.

[0015]

The drive device 5 is a device that drives the scraper 4, and the drive device 5 is disposed on the opposite side of the discharge port 7 with respect to the introduction port 6. The drive device 5 is disposed above a second
 5 inclined surface 9b described later and at a position (i.e., above the "predetermined water level") where the drive device 5 is not immersed in the stored water. The drive device 5 includes a drive shaft 5a that is rotatable in two directions, and the arm 5b connecting the scraper 4 and the drive shaft 5a. The drive device 5 drives the arm 5b by rotating the drive shaft 5a, and as a
 10 result, causes the scraper 4 connected to the arm 5b to perform reciprocation going forward and backward.

[0016]

The bottom plate 9 in the cooling tank 2 includes a first inclined surface 9a that is inclined upward from immediately below the introduction port 6
 15 toward the discharge port 7 (specifically, a vertical and downward end part of the discharge port 7), and the second inclined surface 9b that is inclined upward from immediately below the introduction port 6 toward the opposite side of first inclined surface 9a.

The first inclined surface 9a is formed to increase gradually in height toward a forward direction Df. The second inclined surface 9b is formed to
 20 increase gradually in height in a backward direction Dr.

In the cooling tank 2, the bottom plate part (hereinafter, called a "lowermost surface 9c") immediately below the introduction port 6 is the lowest, and the bottom plate 9 has a convex curved surface shape downwardly.
 25 The cross-sectional shape of the cooling tank 2 is uniform in the width direction, and all of the width size (i.e., the size in the direction orthogonal to the paper surface of FIG. 1) of the first inclined surface 9a, the lowermost surface 9c, and the second inclined surface 9b are the same.

[0017]

The ash discharger 1 includes a water level gauge 10 that detects the water level of the stored water in the cooling tank 2, and a supply pipe (i.e., a water supplying pipe) 11 that supplies water into the cooling tank 2, based on the water level detected by the water level gauge 10. The supply pipe 11 is installed in the drive room 2a, and the water level gauge 10 is disposed in the
 30 vicinity of the supply pipe 11. Specifically, the water level gauge 10 and the supply pipe 11 are disposed to penetrate a ceiling plate 12 for the drive room disposed above the second inclined surface 9b and above the drive device 5 in the drive room 2a, and are fixed to the ceiling plate 12.

[0018]

In the cooling tank 2, a drainpipe 13 is disposed for draining the stored water when the water level of the stored water exceeds a predetermined water level. The position (i.e., the overflow level) of an opening at the upper end of drainpipe 13 is disposed above and in the vicinity of the predetermined water level (e.g., about 10 cm above the predetermined water level). Therefore, the excessive stored water is automatically overflowed and discharged from the drainpipe 13 without valve control.

[0019]

The water level gauge 10 measures the water level of the water stored in the cooling tank 2 and transmits measurement data to a control device 14.

The supply pipe 11 is connected to a water source not illustrated, for example, to a water storage tank. The supply pipe 11 includes a nozzle 11a at a tip end thereof and supplies water to the cooling tank 2. The supply pipe 11 is provided with a solenoid valve 15 between the water source (not illustrated) and the nozzle 11a, and water supply from the supply pipe 11 and stopping the water supply are controlled by opening and closing the solenoid valve 15.

The nozzle 11a is disposed in the vicinity of the water level gauge 10, and therefore, the water level gauge 10 can be automatically cleaned by an entirety or at least a part of the water sprayed from the nozzle 11a of the supply pipe 11.

[0020]

Because the nozzle 11a is often installed with its spray port facing vertically (i.e., Y axis direction) and downwardly, it is desirable to use a nozzle that spreads in a wide range, as the spray pattern moves away from the spray port such as a full-conical nozzle, a hollow conical nozzle, or a fan-shaped nozzle, for the water level gauge 10 to be automatically cleaned. When the nozzle 11a is installed with the spray port of the nozzle 11a facing the water level gauge 10, it is also possible to use a nozzle in which the spray pattern is a straight pattern depending on design. In this case, it is possible to automatically clean the water level gauge 10 by using the entire water sprayed from the nozzle 11a.

[0021]

The control device 14 receives measurement data (i.e., information) related to the water level from the water level gauge 10 during a "stopping operation" for a predetermined time described later. In other words, the control device 14 can reduce the power consumption of the water level gauge 10, by starting (i.e., turning on the power) the water level gauge 10 to measure the stored water level during the "stopping operation for a predetermined time"

and by stopping (i.e., turning off the power) the water level gauge 10 not to measure the stored water level during a "pushing operation" and during a "drawing operation" described later.

The measurement data is, for example, information indicating an actual
5 water level (i.e., water level X) of the stored water stored in the cooling tank 2.

The control device 14 transmits an operating control signal to the drive device 5 to drive the drive device 5, and transmits an opening/closing control signal to the solenoid valve 15 to open or to close the solenoid valve 15.

[0022]

10 The control device 14 performs to control the scraper 4 and the control device 14 performs to supply water through the supply pipe 11.

First, the control for the scraper 4 will be described.

The control for the scraper 4 is pushing out the incinerated ash in the cooling tank 2 toward the discharge port 7, by reciprocating the scraper 4 along
15 the forward direction Df (i.e., +X axis direction in FIG. 1) and the backward direction Dr (i.e., -X axis direction in FIG. 1).

The control device 14 controls the drive device 5 to sequentially repeat three operations of the "pushing operation", the "drawing operation", and the "stopping operation" for the scraper 4. The pushing operation is an operation
20 of causing the scraper 4 to push out the incinerated ash toward the discharge port 7. The drawing operation is an operation of drawing the scraper 4, which has been pushed out, in and toward the drive room 2a. The stopping operation for a predetermined time is an operation of stopping the scraper 4, which has been drawn in the drive room 2a, for a first predetermined time. The first
25 predetermined time is, for example, three minutes.

[0023]

Regarding the reciprocation of the scraper 4, in a forward path toward the forward direction Df, the scraper 4 is moved from the drive room 2a toward the discharge port 7, and is pushed out the incinerated ash in the cooling tank 2
30 toward the discharge port 7 (i.e., the pushing operation). In a backward path toward the backward direction Dr, the scraper 4, which has been moved to the discharge port 7, is drawn in the drive room 2a (i.e., the drawing operation).

Once the reciprocation about the scraper 4 is performed (i.e., after the pushing operation is performed once and the drawing operation is performed
35 immediately thereafter), the control device 14 stops the rotation of the drive shaft 5a for a first predetermined time, and therefore, the control device 14 temporarily stops the scraper 4 in the drive room 2a (i.e., the stopping operation).

Then, after the stopping operation, the pushing operation for the scraper 4 is performed again.

The first predetermined time t ($0 < t$) is counted by a timer (i.e., a first timer) included in the control device 14 and can be appropriately set by a worker. The first timer is reset when the stopping operation is completed and the pushing operation is started.

[0024]

Next, the control for the water supply with using the supply pipe 11 will be described.

The operations for the control of the water supply with the supply pipe 11 are an operation of opening the solenoid valve 15 installed in the supply pipe 11 to supply water to the cooling tank 2 or an operation of closing the solenoid valve 15 to stop the supply of water.

The operations for the water supply with the supply pipe 11 includes a water supply operation (i.e., a first water supply operation) for adjusting the water amount of the stored water in the cooling tank 2 to the predetermined water level, and a water supply operation (i.e., a second water supply operation) to clean the water level gauge 10.

The water level gauge 10 is cleaned also during the first water supply operation.

[0025]

In order to prevent unnecessary water supply operations due to changes of the water level caused by reciprocation of the scraper 4, the control device 14 performs the first water supply operation when the water level of the stored water is lower than the predetermined water level, based on the information regarding the water level received from the water level gauge 10, during the stopping operation, in other words, when the water level of the stored water in the cooling tank 2 is stabilized. On the other hand, during the pushing operation or the drawing operation, even if the water level of the stored water is lower than the predetermined water level, the control device 14 cannot perform the first water supply operation.

On the other hand, the control device 14 periodically performs the second water supply operation, regardless of the operations for the scraper 4 and the water level of the stored water.

[0026]

Now, the first water supply operation for the water level adjustment will be described.

First, the reason for performing the first water supply operation during the stopping operation will be described.

Although the scraper 4 operates slowly, the water level of the stored water in the cooling tank 2 is likely to fluctuate during the pushing operation or the drawing operation, that is, while the scraper 4 is moving. In particular, depending on the amount and the properties of the incinerated ash, the water level of the stored water in the cooling tank 2 may greatly fluctuate due to the movement of the scraper 4. On the other hand, the water level of the stored water in the cooling tank 2 does not fluctuate and is stabilized during the stopping operation in which the scraper 4 is temporarily stopped. During the stopping operation in which the water level is stabilized, the water level of the stored water in the cooling tank 2 can be accurately measured. Therefore, the control device 14 performs the first water supply operation during the stopping operation in which the water level is stabilized.

[0027]

Next, details of the first water supply operation will be described.

Hereinafter, the predetermined water level is denoted by the reference sign S.

The control device 14 opens the solenoid valve 15 and sprays water from the nozzle 11a of the supply pipe 11 to supply water into the cooling tank 2 during the stopping operation and when the measurement data (i.e., measurement data corresponding to the water level X of the stored water) received from the water level gauge 10 is lower than the predetermined water level S. The control device 14 opens the solenoid valve 15 and continues to supply water until the water level X reaches the predetermined water level S.

The amount of the water supply per unit time is set in advance to allow the water level X to be increased to the predetermined water level S during the stopping operation.

[0028]

Whether or not the water level X of the stored water is lower than the predetermined water level S may be determined literally based on (1) whether or not the water level X is lower than the predetermined water level S. Alternatively, the determination may be made based on (2) whether or not the water level X is lower than the predetermined water level S by a predetermined value T or more, that is, whether or not $S - T \geq X$. The predetermined value T is a value used for setting the threshold for determining the start of the first water supply operation to a water level lower than the predetermined water level S, and the predetermined value T can be set to, for example, "10 cm" according to design or specifications.

[0029]

Using either the condition (1) or (2), the control device 14 determines whether or not the water level X of the stored water indicated by the measurement data is lower than the predetermined water level S. Either the
 5 condition (1) or (2) is set in advance.

When the water level X of the stored water is equal to or higher than the predetermined water level S, based on the measurement data, the control device 14 closes the solenoid valve 15 to stop the water supplying into the cooling tank 2. Excessive stored water is automatically overflowed and discharged
 10 from the drainpipe 13. That is, the water level X of the stored water in the cooling tank 2 is adjusted by the control device 14 and the drainpipe 13 to be kept at the "predetermined water level S".

[0030]

FIG. 2 is a flow diagram for describing an example of the first water
 15 supply operation performed by the control device 14. The control device 14 repeats operations in the flow diagram of FIG. 2.

In step S1, the control device 14 determines whether or not the operation (i.e., the operation at the current time) for the scraper 4 is the stopping operation. The control device 14 can determine whether or not the scraper 4
 20 is in the stopping operation, based on a status (i.e., the control signal to be transmitted to the drive device 5) of the scraper 4 performed by the control device itself.

[0031]

When it is not in the stopping operation, that is, when the pushing
 25 operation or the drawing operation is being performed (i.e., NO in step S1), the control device 14 ends the operations in this cycle (i.e., return).

When it is in the stopping operation (i.e., YES in step S1), in step S2, the control device 14 starts (i.e., power on) the water level gauge 10 and receives measurement data from the water level gauge 10.

30 [0032]

In step S3, the control device 14 determines whether or not the water level X of the stored water is lower than the predetermined water level S, based on the measurement data received from the water level gauge 10. The information indicating the predetermined water level S is stored in advance in a
 35 storage device of the control device 14, for example. The control device 14 determines whether or not the water level X of the stored water is lower than the predetermined water level S, by using the condition (1) or (2) set in advance.

When the water level X of the stored water indicated by the measurement data is equal to or higher than the predetermined water level S (i.e., NO in step S3), the control device 14 ends the operations in this cycle (i.e., return).

5 When the water level X of the stored water indicated by the measurement data is lower than the predetermined water level S (i.e., YES in step S3), in step S4, the control device 14 opens the solenoid valve 15 and starts supplying water from the supply pipe 11. During the water supply, the control device 14 receives the measurement data from the water level gauge 10
10 (i.e., the operation in step S5), and continues the water supply and the operation of step S5, until the water level X of the stored water indicated by the measurement data becomes equal to or higher than the predetermined water level S (i.e., NO in step S6).

15 When the water level X of the stored water reaches a height equal to or higher than the predetermined water level S (i.e., YES in step S6), the control device 14 closes the solenoid valve 15 to stop supplying water into the supply pipe 11, stops the water level gauge 10 (i.e., power OFF) (in step S7), and ends the operation in this cycle (i.e., return).

20 When the flow in FIG. 2 reaches “return”, the control device 14 executes the flow again from the start in FIG. 2.

[0033]

As described above, the control device 14 can perform the first water supply operation only during the stopping operation of the three operations among the pushing operation, the drawing operation, and the stopping
25 operation. In the pushing operation or the drawing operation, the control device 14 does not perform the first water supply operation. The first water supply operation can be performed only during the stopping operation for the scraper 4, when the water level of the stored water in the cooling tank 2 is stabilized.

30 It is possible to prevent unnecessary water supply operation due to changes of water level caused by reciprocation of the scraper 4. Therefore, it is possible to appropriately control the water supply operation to the stored water and to enhance the cost effectiveness regarding the water supply in the ash discharger 1.

35 In a case that the first water supply operation is performed when the water level X is lower than the predetermined water level S by the predetermined value T or more by using the condition (2), an opportunity to

perform the first water supply operation is easily suppressed, and therefore it is possible to further enhance the cost effectiveness regarding the water supply.

Furthermore, in the first water supply operation, the water level gauge 10 is automatically cleaned with the water supplied from the supply pipe 11 in step S4. Because the supply pipe 11 of FIG. 1 is provided with the nozzle 11a at the tip end, the water level gauge 10 can be cleaned more effectively.

[0034]

By the way, if it is maintained that the water level X of the stored water is equal to or higher than the predetermined water level S (i.e., NO in step S3 of FIG. 2) , the first water supply operation is not performed, even if the three operations of the pushing operation, the drawing operation and the stopping operation are repeated with a plurality of cycles. In this case, there is a possibility that the water level cannot be accurately measured, because dirt may adhere to the water level gauge 10.

Therefore, the control device 14 may periodically perform the second water supply operation, regardless of the operations for the scraper 4 and the water level of the stored water.

In the second water supply operation, the control device 14 opens the solenoid valve 15 only for a predetermined short time, supplies water from the supply pipe 11, and cleans the water level gauge 10. Then, after a lapse of the predetermined short time, the solenoid valve 15 is immediately closed to stop supplying water into the supply pipe 11. The predetermined short time is a time set in advance as a time required for periodic cleaning of the water level gauge 10, and is set to, for example, "10 seconds". This time is usually shorter than the time required for the first water supply operation.

Hereinafter, details of the second water supply operation will be described.

[0035]

The start condition of the second water supply operation is set in advance. The start condition is, for example, (condition 1) that the number of times of reciprocation of the scraper 4 reaches a predetermined number of times, or (condition 2) that predetermined time (i.e., a second predetermined time) is counted.

The number of times of reciprocation of the scraper 4 is the number of times of performing one cycle of the three operations of the pushing operation, the drawing operation, and the stopping operation. For example, the predetermined number of times can be set to "10 times". The second predetermined time is a time appropriately set as a time when water cleaning is

required due to adhesion of dirt or the like to the water level gauge 10. For example, the second predetermined time can be set to "one hour".

[0036]

5 The control device 14 can count the number of reciprocations of the scraper 4 by a counter (not illustrated) included in the control device 14, and can count the second predetermined time by a timer (i.e., a second timer, not illustrated) included in the control device 14.

10 The counting of the number of times of reciprocation by the counter under the condition 1 and the counting of the second predetermined time by the second timer under the condition 2 are started, for example, when the operation of the ash discharger 1 is started, and are reset and restarted, every time the second water supply operation is performed once. That is, the first second water supply operation after the start of the operation of the ash discharger 1 is performed when the condition 1 or the condition 2 is achieved from the start
15 time point of the operation of the ash discharger 1.

The second and subsequent second water supply operation after the first second water supply operation is performed, when the number of times of reciprocation is counted in ascending order from 1 by the counter immediately after the second water supply operation that has already been performed and the
20 number of times of reciprocation reaches a predetermined number, or when the second timer is started from 0 seconds immediately after the second water supply operation that has already been performed and the second predetermined time is counted.

25 Either the condition 1 or the condition 2 is set in advance to use as the start condition of the second water supply operation.

[0037]

30 As described above, the control device 14 can periodically perform the second water supply operation, even when the scraper 4 is in any operation among the pushing operation, the drawing operation, and the stopping operation. Therefore, even when the first water supply operation is not performed, although the three operations of the pushing operation, the drawing operation, and the stopping operation are repeated many times, the water level gauge 10 is appropriately cleaned by the second water supply operation periodically, and therefore, it is possible to prevent a measurement error due to
35 dirt adhesion to the water level gauge 10 or the like and to secure the accuracy of the water level measurement.

	[0038]
	1 Ash discharger
	2 Cooling tank
	2a Drive room
5	3 Conveyance device
	4 Scraper
	4a Upper plate
	4b Push out plate
	4c Side plate
10	4d Tip end
	5 Drive device
	5a Drive shaft
	5b Arm
	6 Introduction port
15	7 Discharge port
	8 Wall surface
	9 Bottom plate
	9a First inclined surface
	9b Second inclined surface
20	9c Lowermost surface
	10 Water level gauge
	11 Supply pipe (water supplying pipe)
	11a Nozzle
	12 Ceiling plate
25	13 Drainpipe
	14 Control device
	15 Solenoid valve
	Df Forward direction
	Dr Backward direction

Claims

[Claim 1]

An ash discharger comprising

5 a cooling tank including an introduction port through which incinerated ash is introduced and a discharge port through which the incinerated ash cooled by stored water is discharged,

a drive device that is installed in a drive room disposed on an opposite side to the discharge port with respect to the introduction port in the cooling

10 tank, and that makes a scraper perform reciprocating motions for pushing out the incinerated ash toward the discharge port,

a supply pipe that is installed in the drive room and that supplies water to the cooling tank,

a solenoid valve installed in the supply pipe,

15 a water level gauge that is disposed in a vicinity of the supply pipe and that measures a water level of the stored water, and

a control device that controls the drive device to sequentially repeat three operations, that are a pushing operation for making the scraper push out the incinerated ash toward the discharge port, a drawing operation for making

20 the scraper drawn toward the drive room, and a stopping operation for making the scraper stop during a first predetermined time,

wherein the control device performs a first water supply operation for supplying water from the supply pipe during the stopping operation, when the water level is lower than the predetermined water level, by opening the

25 solenoid valve until the water level reaches a predetermined water level, based on information regarding the water level received from the water level gauge, and

wherein the control device does not perform the first water supply operation during the pushing operation and during the drawing operation.

30

[Claim 2]

The ash discharger according to claim 1,

wherein the control device periodically opens the solenoid valve and performs a second water supply operation for supplying water from the supply

35 pipe to clean the water level gauge, while the control device sequentially repeating the three operations.

[Claim 3]

The ash discharger according to claim 2,
wherein the control device performs the second water supply operation,
when number of times of the reciprocating motions is counted and the number
5 reaches a predetermined number, or when a second predetermined time is
counted.

[Claim 4]

The ash discharger according to claim 3,
10 wherein the control device performs the first water supply operation
during the stopping operation, only when the water level is lower than the
predetermined water level by a predetermined value or more, based on the
information regarding the water level received from the water level gauge.

15 [Claim 5]

The ash discharger according to any one of claims 2 to 4,
wherein the supply pipe includes a nozzle at a tip end of the supply pipe,
and
wherein water is sprayed from the nozzle to clean the water level gauge
20 during the first water supply operation or during the second water supply
operation.