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(54) INFLAMMABLE WASTE COMBUSTION AND DISPOSAL DEVICE

(57) The invention provides a combustible waste combustion treatment device, and belongs to the technical field of environmental protection equipment. According to the technical scheme adopted by the invention, a combustible waste combustion treatment device comprises a pressure container provided with a filling port and a matched oxygen supply system, wherein a combustion system, a combusted substance absorption tank and an absorption liquid supply system are provided in a cavity of the pressure container; a discharge port is provided at the bottom of the combusted substance absorption tank, and a circulating water cooling system is further provided outside the cavity of the pressure container. The combustible waste combustion treatment device has the beneficial effects that combustible wastes such as waste phosphorus, phosphorus-containing wastes and the like can be efficiently and quickly treated, zero waste gas discharge treatment is realized, and the treatment speed is controllable; the operation is in operation and easy to control, the substances to be treated and the alkaline solution can be added on line and the products are discharged on line, realizing a continuous operation; the device has the advantages of small occupied area, simple structure, easiness in operation and control; and it realizes automatic control in a further improved scheme, and has low cost and a high industrial application value.

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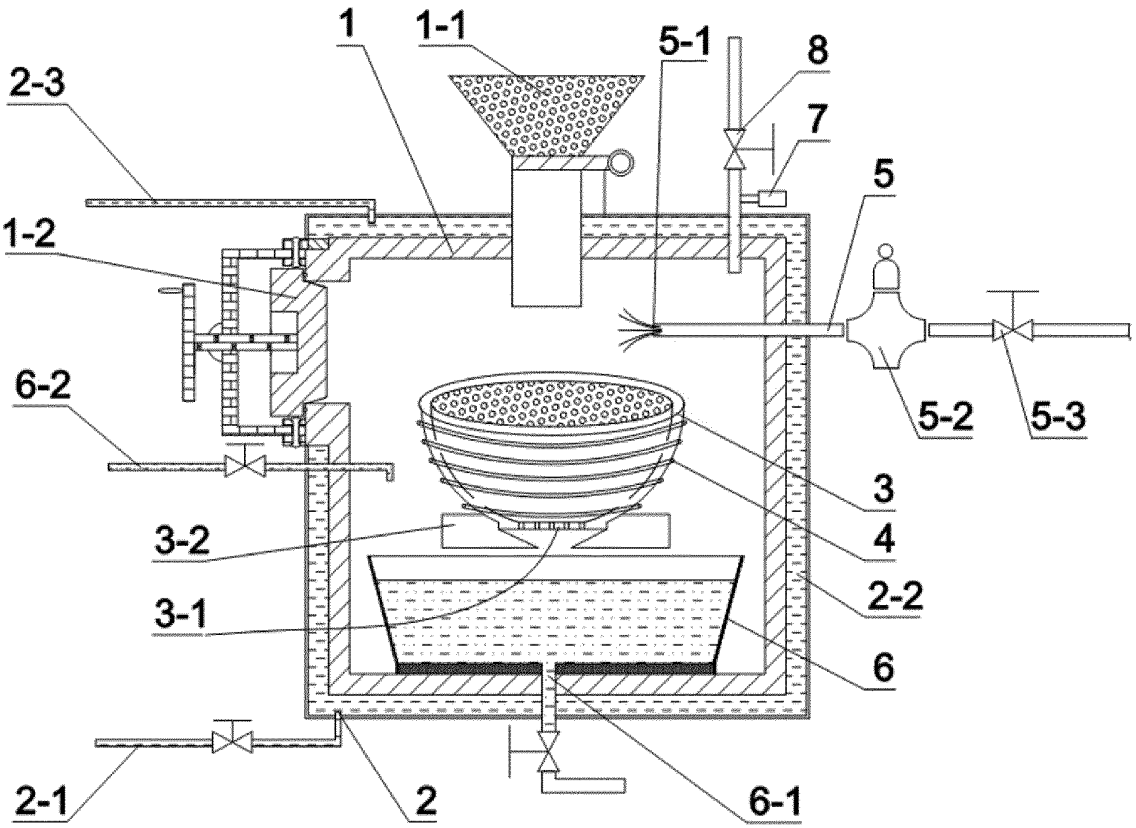

Fig. 1

Description

TECHNICAL FIELD

[0001] The invention relates to the technical field of environmental protection equipment, in particular to a combustible waste combustion treatment device.

BACKGROUND ART

[0002] In industrial production, it is inevitable to produce lots of combustible wastes, such as phosphorus, arsenic, sulfur, carbon and so on. The generation of combustible wastes has a great threat to safe production in some production lines, and its treatment is a difficult matter. In the production of semiconductors, the treatment of phosphorus and phosphorus-containing wastes has always been a difficulty. Now the phosphorus and phosphorus-containing wastes are put in a combustion tower for combustion treatment in the main treatment method. Due to the generation of a large amount of smoke and dust particles in a short time in the combustion process, the adsorption and dust removal treatment is generally followed after the combustion, and the smoke and dust particles are passed through an activated carbon or spray type offgas treatment system. At present, the treatment method has the following disadvantages: firstly, the phosphorus-containing substances are intensely combusted to generate a large amount of smoke and dust instantaneously, so that the activated carbon and the spraying system are difficult to completely adsorb them in a short time, and the treated offgas is difficult to reach the emission standard and pollutes the environment; secondly, the combustion tower of the treatment equipment occupies a large area and should be matched for treatment with the discharge air and offgas treatment systems, causing a high cost. There is therefore a need for more efficient treatment devices.

SUMMARY OF THE INVENTION

[0003] In order to solve the technical problems that the existing combustible waste treatment equipment has high cost, large occupied space and heavy offgas pollution, the invention provides a combustible waste combustion treatment device, which adopts the technical scheme that combustion is controlled in a closed pressure container and then the combusted products are collected into an absorption tank so as to discharge a neutral salt solution. The invention realizes efficient and rapid treatment of combustible wastes, and has a simple equipment structure, and it is easy to control and environment-friendly.

[0004] According to the technical scheme adopted by the invention, a combustible waste combustion treatment device comprises a pressure container provided with a filling port, and a matched oxygen supply system, wherein a combustion system, a combusted substance absorption tank positioned on the bottom surface and an absorption liquid supply system are provided in a cavity of the pressure container; a discharge port is provided at the bottom of the combusted substance absorption tank, and a circulating water cooling system is further provided outside the cavity of the pressure container.

[0005] Further, the combustion system comprises a crucible positioned by means of the support frame, and a heating system by means of the periphery of the crucible, wherein an air outlet of the oxygen supply system is located above the crucible.

[0006] Further, the bottom of the crucible is provided with a liquid leakage hole which is in communication with the combusted substance absorption tank.

[0007] Further, the oxygen supply control system comprises an oxygen supply pipeline connected with an air source, an air outlet of the oxygen supply pipeline extends into the cavity of the pressure container, and the oxygen supply pipeline is provided with a pressure reducing valve and a shut-off valve.

[0008] Further, the device is provided with an integrated control system, the support frame is provided with a weight sensor, the combusted substance absorption tank is provided with a matched liquid level detector and acidity detector, the integrated control system collects signals from the weight sensor, the liquid level detector and the acidity detector and controls corresponding valve opening for the filling port, the absorption liquid supply system and the oxygen supply system so as to realize automatic treatment.

[0009] Further, the device is also provided with a pressure control system comprising a safety valve and a release valve.

[0010] Further, a movable gate is provided at one side of the pressure container, and when the movable gate is closed, the pressure container is sealed by a snap and seal assembly. Further, the pressure container is made from an acid and alkali corrosion-resistant material or the inner surface thereof is coated with an acid and alkali corrosion-resistant protective layer.

[0011] Further, the circulating water cooling system comprises a circulating water inlet pipe, a water cooling area provided around the cavity of the pressure container, and a circulating water return pipe which are sequentially connected with a water source at a temperature of $\leq 40°C$.

[0012] Further, the combustible wastes are phosphorus, phosphorus-containing wastes, arsenic, arsenic-containing wastes, sulfur and/or sulfur-containing wastes, and the combusted substance absorption tank is filled with an alkaline solution.

[0013] According to the above technical scheme, it provides a combustible waste combustion treatment device comprising a pressure container which is a main body for treating combustible wastes, wherein the pressure container is provided with a filling port and a matched oxygen supply system; as a key design of the invention, a circulating water cooling system is matched with the

pressure container, a combustion system, a combusted substance absorption tank and an absorption liquid supply system are provided in the cavity of the pressure container, and the absorption liquid is contained in the combusted substance absorption tank and used for absorbing the combusted substances; and the circulating water cooling system is configured for removing the heat generated by the combustion reaction and reducing the temperature for the pressure container. When in use, the circulating water cooling system is started, and combustible wastes enter the combustion system in the pressure container from the filling port for combustion under the cooperation of the oxygen supply system; smoke and dust particles generated by combustion are sealed in the pressure container, or subjected to gravity settling or in combination with water vapor in the cavity of the pressure container, and finally sink into the combusted substance absorption tank; a discharge port is provided at the bottom of the combusted substance absorption tank, and the smoke and dust particles can be discharged through the discharge port when the absorption effect of absorption liquid is insufficient, and the absorption liquid is then replenished by the absorption liquid supply system.

[0014] The invention has the beneficial effects that the combustible waste combustion treatment device provided by the invention can efficiently and quickly treat combustible wastes such as waste phosphorus and phosphorus-containing wastes and realize discharge treatment with zero waste gas; the treatment speed of the wastes is controllable by the oxygen supply pressure; the device is stable in operation and easy to control in the treatment process, the substances to be treated and the alkaline solution can be added on line and the generated salt solution is discharged on line, realizing a continuous operation; the device has the advantages of small occupied area, simple structure, easiness in operation and control; and it realizes automatic control in a further improved scheme, and has low cost and a high industrial application value.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Fig. 1 is a structurally schematic view of a combustible waste combustion treatment device according to the present invention;

In the figure: 1, a pressure container, 1-1, a filling port, 1-2, a movable gate, 2, a circulating water cooling system, 2-1, a circulating water inlet pipe, 2-2, a water cooling area, 2-3, a circulating water return pipe, 3, a crucible, 3-1, a liquid leakage hole, 3-2, a support frame, 4, a heating system, 5, an oxygen supply pipeline, 5-1, an air outlet, 5-2, a pressure reducing valve, 5-3, a shut-off valve, 6, a combusted substance absorption tank, 6-1, a discharge port, 6-2, an absorption liquid supply system, 7, a safety valve, 8 and a release valve.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Hereinafter, the structure and use method of a combustible waste combustion treatment device provided by the present invention will be described in detail with specific examples, but the scope of the present invention is not limited in any way.

Example 1

[0017] The example provides a combustible waste combustion treatment device; as shown in Fig. 1, the treatment device includes a pressure container 1, wherein the pressure container is provided with a filling port 1-1 and a matched oxygen supply system; the oxygen supply system includes an oxygen supply pipeline 5 connected with an oxygen source, the oxygen supply pipeline 5 is provided with a pressure reducing valve 5-2 and a shut-off valve 5-3, and the pressure reducing valve 5-2 is configured for controlling and stabilizing the oxygen pressure in the pressure container 1, so that the combustion rate is controlled; and an air outlet 5-1 of the oxygen supply pipeline 5 extends into the cavity of the pressure container 1. A combustion system is provided in the cavity of the pressure container 1, and the combustion system includes a crucible 3 positioned by means of a support frame 3-2 and a heating system 4 provided at the periphery of the crucible 3; an air outlet 5-1 of an oxygen supply pipeline 5 is located above the crucible 3; and the heating system 4 is configured for heating the crucible 3, so that combustible wastes in the crucible 3 can reach an ignition point, and the combustion state is maintained under the combustion supporting of oxygen. A combusted substance absorption tank 6 is provided below the crucible 3, absorption liquid is contained in the combusted substance absorption tank and used for absorbing combusted substances, and a discharge port 6-1 is provided at the bottom of the combusted substance absorption tank 6; when the absorption liquid absorbs the combusted substances until the effectiveness thereof is insufficient, the absorption liquid can be discharged through the discharge port 6-1, and an absorption liquid supply system is matched with the combusted substance absorption tank 6 and configured for replenishing the absorption liquid. In order to reduce the excessive heat generated by the combustion reaction in the pressure container 1 and decrease the temperature of the pressure container 1, a circulating water cooling system is provided outside the cavity of the pressure container 1 and includes a circulating water inlet pipe 2-1, a water cooling area 2-2 provided around the cavity of the pressure container 1, and a circulating water return pipe 2-3 which are sequentially connected with a water source at a temperature of $\leq$ 40°C.

[0018] In order to avoid that the combusted substances or the liquid drops formed by the combusted substances combined with the water vapor in the cavity of the pressure container 1 settle into the crucible 3 to cover the

wastes to be combusted, so that the treatment is interrupted, the bottom of the crucible 3 is provided with a liquid leakage hole 3-1 which is in communication with the combusted substance absorption tank 6.

[0019] In order to prevent danger caused by accidental excessive pressure in the pressure container 1, the device is further provided with a pressure control system including a safety valve 7 and a release valve 8.

[0020] A movable gate 1-2 is provided at one side of the pressure container 1, and when the movable gate 1-2 is closed, the pressure container 1 is sealed by a snap and seal assembly, so that substances such as particles generated after combustion will not overflow to the environment to generate pollution, danger and the like; besides, due to the arrangement of the movable gate 1-2, it facilitates the operation of cleaning the crucible 3 and the like.

[0021] A compression-resistant material and a thickness are selected for the pressure container 1 according to the treatment capacity and the material performance parameters; and in order to ensure the use safety and the service life of the treatment device, the pressure container 1 is made of an acid and alkali resistant and corrosion-resistant material or the inner surface thereof is coated with a protective layer with acid and alkali resistant and corrosion-resistant properties.

[0022] The treatment device is mainly used for treating combustible wastes such as phosphorus, phosphorus-containing wastes, arsenic, arsenic-containing wastes, arsenic, arsenic-containing wastes, sulfur and/or sulfur-containing wastes and the like, the combusted substances formed after the wastes are combusted settle into the combusted substance absorption tank, or the combusted substances and the water vapor in the pressure container 1 are combined to form liquid drops and settle into the combusted substance absorption tank so as to realize harmless collection treatment. The application method of the treatment device is illustrated by taking waste phosphorus and phosphorus-containing wastes as examples.

(1) Filling: opening a movable gate 1-2 of a pressure container 1 under a common atmospheric pressure environment, opening a plate valve on a filling port 17, pouring phosphorus-containing wastes for combustion treatment into a crucible 3 from the filling port 17, and closing the plate valve after the filling is completed;

(2) Liquid adding: opening a valve on an absorption liquid supply system 6-2, injecting an alkaline solution such as ammonium hydroxide and limewater into the combusted substance absorption tank 6, and stopping injection after reaching a specified liquid level;

(3) Pressurizing: closing the movable gate 1-2, opening a shut-off valve 5-3 on an oxygen supply pipeline 5, adjusting the pressure reducing valve 5-2 to the required pressure, generally requiring 0.1-0.5MPa, and controlling the pressure to 0.1 MPa in the example;

(4) Circulating water: opening a circulating water cooling system;

(5) Combusting: starting a heating system 4, and burning the phosphorus when the temperature in the crucible 3 reaches the ignition point of the phosphorus;

(6) Adsorbing and settling: the product from phosphorus combustion is diffused in the pressure container 1, but no emission exists; part of the combusted substance particles settle to the combusted substance absorption tank 6 under the action of gravity; and in addition, due to the fact that the temperature in the pressure container 1 is high and the water vapor pressure is high, part of the combusted substances can be combined with the water vapor to form acid liquid drops and then also settle to the combusted substance absorption tank 6 for acid-base neutralization with the absorption liquid in the combusted substance absorption tank 6 to form phosphate;

(7) Discharging: when the phosphorus-containing wastes to be treated are treated completely or the absorption effect of the absorption liquid is insufficient, the pressure of the pressure reducing valve 5-2 is adjusted to 0.1 MPa; after the pressure in the pressure container 1 is stabilized, the discharge port 6-1 is opened to discharge the phosphate solution, the absorption liquid is replenished by the absorption liquid replenishing system 6-2, and the treatment is finished.

[0023] The pressure maintaining process in the treatment process is as follows: oxygen consumed by combustion is continuously supplied by an oxygen supply system under the accurate control of the pressure reducing valve so as to ensure the continuous combustion; besides, since the pressure container 1 stays in a normal pressure state before being closed, nitrogen in the air is always in the container, and no nitrogen is consumed in the combustion process, so that the atmosphere in the pressure container 1 is safe;

[0024] The adding process of waste adding and alkaline absorption liquid on line in the process of batch treatment of phosphorus-containing wastes includes the following steps: the pressure of the pressure reducing valve 5-2 is to 0.1 MPa; after the pressure in the pressure container 1 is stable, the release valve 8 is opened; then the plate valve on the filling port 1-1 is opened, wastes are added to the crucible 3 through the filling port 1-1, and then the plate valve is closed, so that the wastes to be treated are added on line; meanwhile, the absorption liq-

uid can be added on line by opening a valve of the absorption liquid supply system 6-2;

Example 2

[0025] On the basis of the example 1, an integrated control system is provided in the combustible waste combustion treatment device of the example, a weight sensor is provided on the support frame 3-2 of the crucible 3 to weigh the wastes to be treated in the crucible 3; a matched liquid level detector and an acidity detector are provided in the combusted substance absorption tank 6, and a signal acquisition end of the integrated control system is respectively connected with the weight sensor, the liquid level detector and the acidity detector; a signal output end thereof is respectively connected with a plate valve on the filling port 1-1 and a valve on the absorption liquid supply system 6-2; when the weight of the crucible 3 is lower than a set low limit value, the integrated control system controls the plate valve on the filling port 1-1 to open the filling to a set range or a high limit value; when the liquid level detector detects that the liquid level is too low or the acidity detector detects that the pH value is greater than a set value, the integrated control system controls to open a valve on the absorption liquid supply system 6-2 for replenishing the absorption liquid to a high liquid level so as to ensure higher absorption efficiency.

[0026] The treatment device is further provided with a pressure sensor for detecting the pressure in the cavity, a signal acquisition end of the integrated control system is connected with the pressure sensor, and a signal output end thereof is respectively connected with a shut-off valve 5-3 and a pressure reducing valve 5-2 on an oxygen supply pipeline 5, so that the pressure container 1 is controlled under a constant pressure.

[0027] According to the combustible waste combustion treatment device, the characteristics that phosphorus, arsenic, sulfur and the like are easy to combust and products dissolve in water easily are utilized, so that the waste phosphorus, the phosphorus-containing wastes and the like are subjected to combustion reaction with oxygen at a constant pressure and proportion in the pressure container 1, and the products are further settled and absorbed until being safely and harmlessly discharged, realizing the high-efficiency and zero-waste gas and dust treatment, and greatly improving the safety. It realizes the automatic control treatment, and can be applied for industrial application easily.

[0028] Finally, it should be noted that the above examples are only intended to illustrate the technical solution of the present invention and not to limit the same; although the present invention has been described in detail with reference to preferred examples, those skilled in the art will appreciate that modifications may be made to the specific embodiments of the invention or equivalents may be substituted for some of the technical features, which should all be included in the scope of the technical solution claimed by the present invention, without departing from the spirit of the technical solution of the present invention.

Claims

1. A combustible waste combustion treatment device comprising a pressure container (1) provided with a filling port (1-1) and a matched oxygen supply system, **characterized in that** a combustion system, a combusted substance absorption tank (6) positioned on the bottom surface and an absorption liquid supply system (6-2) are provided in a cavity of the pressure container (1); a discharge port (6-1) is provided at the bottom of the combusted substance absorption tank (6), and a circulating water cooling system is further provided outside the cavity of the pressure container (1).

2. The treatment device according to claim 1, **characterized in that** the combustion system comprises a crucible (3) positioned by means of a support frame (3-2), and a heating system (4) provided at the periphery of the crucible (3), wherein an air outlet (5-1) of the oxygen supply system is located above the crucible (3).

3. The treatment device according to claim 2, **characterized in that** the bottom of the crucible (3) is provided with a liquid leakage hole (3-1) which is in communication with the combusted substance absorption tank (6).

4. The treatment device according to claim 3, **characterized in that** the device is provided with an integrated control system, the support frame (3-2) is provided with a weight sensor, the combusted substance absorption tank (6) is provided with a matched liquid level detector and acidity detector, the integrated control system collects signals from the weight sensor, the liquid level detector and the acidity detector and controls corresponding valve opening for the filling port (1-1), the absorption liquid supply system (6-2) and the oxygen supply system so as to realize automatic treatment.

5. The treatment device according to claim 1, **characterized in that** the oxygen supply control system comprises an oxygen supply pipeline (5) connected with an air source, an air outlet (5-1) of the oxygen supply pipeline (5) extends into the cavity of the pressure container (1), and the oxygen supply pipeline (5) is provided with a pressure reducing valve (5-2) and a shut-off valve (5-3).

6. The treatment device according to claim 1, **characterized in that** the device is further provided with a pressure control system comprising a safety valve

(7) and a release valve (8).

7. The treatment device according to claim 1, **characterized in that** a movable gate (1-2) is provided at one side of the pressure container (1), and when the movable gate (1-2) is closed, the pressure container (1) is sealed by a snap and seal assembly.

8. The treatment device according to claim 1 or 7, **characterized in that** the pressure container (1) is made from an acid and alkali corrosion-resistant material or the inner surface thereof is coated with an acid and alkali corrosion-resistant protective layer.

9. The treatment device according to claim 1, **characterized in that** the circulating water cooling system comprises a circulating water inlet pipe (2-1), a water cooling area (2-2) provided around the cavity of the pressure container (1), and a circulating water return pipe (2-3) which are sequentially connected with a water source at a temperature of $\leq$ 40°C.

10. The treatment device according to claim 1, **characterized in that** the combustible wastes are phosphorus, phosphorus-containing wastes, arsenic, arsenic-containing wastes, sulfur and/or sulfur-containing wastes, and the combusted substance absorption tank is filled with an alkaline solution.

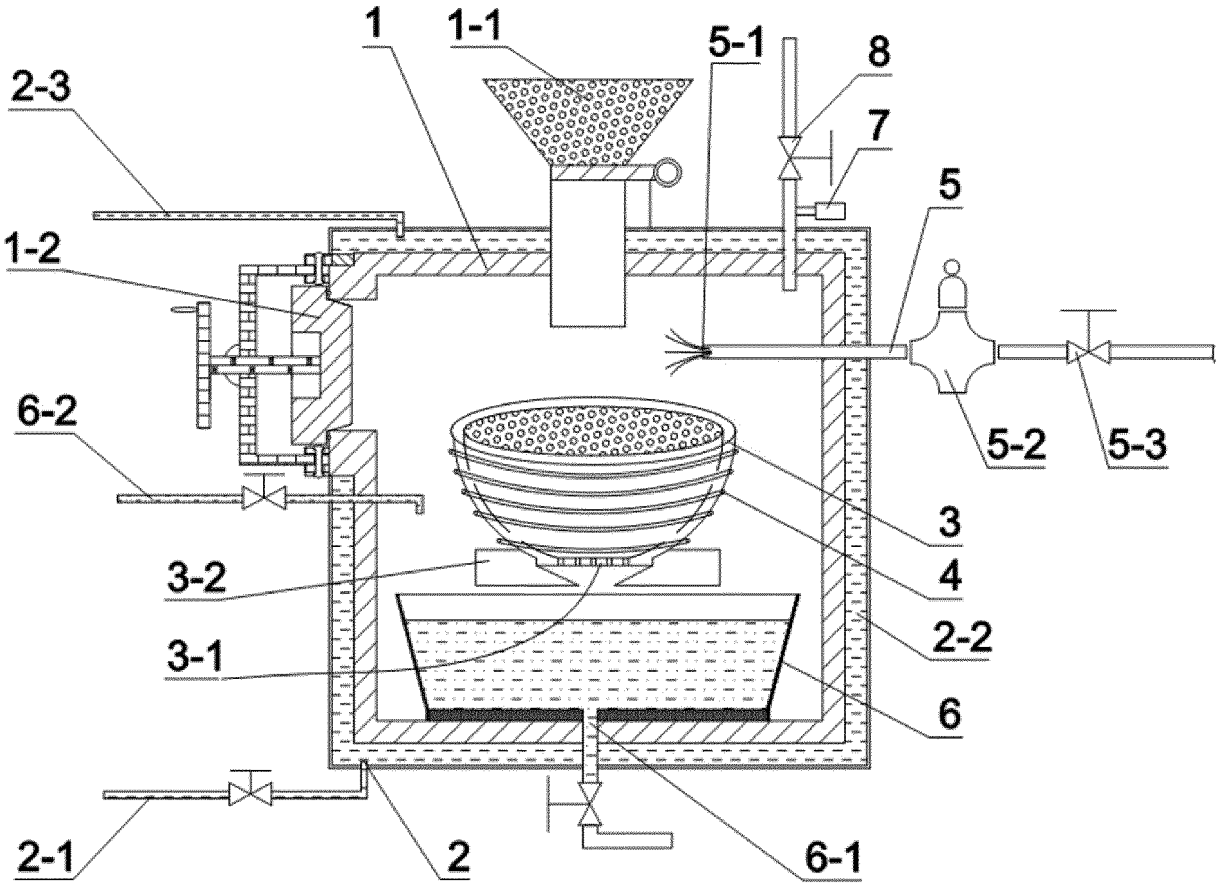

Fig. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2018/122629

A. CLASSIFICATION OF SUBJECT MATTER

F23G 5/50(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F23G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, SIPOABS, DWPI, 废弃物, 氧气, 碱液, 磷, 砷, 填料口, waste, rubbish, oxygen, alkaline, liquid, liquor, lye, phosphor +, arsenic, fill+, port

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 2861769 Y (WU, Tong) 24 January 2007 (2007-01-24) claims 1-6, particular embodiments, and figures 1-6	1-10
A	CN 101469866 A (TONGFANG ENVIRONMENT CO., LTD.) 01 July 2009 (2009-07-01) entire document	1-10
A	CN 102168852 A (BMEI CO., LTD.) 31 August 2011 (2011-08-31) entire document	1-10
A	CN 106838911 A (CHANGSHA HUIJU ENVIRONMENTAL TECHNOLOGY CO., LTD.) 13 June 2017 (2017-06-13) entire document	1-10
A	CN 106949477 A (HEXAGON TOWER (TIANJIN) TECHNOLOGY CO., LTD.) 14 July 2017 (2017-07-14) entire document	1-10
A	US 2017218274 A1 (YU, Shizheng et al.) 03 August 2017 (2017-08-03) entire document	1-10

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search	Date of mailing of the international search report
26 August 2019	**11 September 2019**
Name and mailing address of the ISA/CN **State Intellectual Property Office of the P. R. China** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2018/122629

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	2861769	Y	24 January 2007	None			
CN	101469866	A	01 July 2009	CN	101469866	B	29 September 2010
CN	102168852	A	31 August 2011	None			
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CN	106949477	A	14 July 2017	CN	106949477	B	02 March 2018
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