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CERTIFICATE OF GRANT INNOVATION PATENT

Patent number: 2020102207

The Commissioner of Patents has granted the above patent on 7 October 2020, and certifies that the below particulars have been registered in the Register of Patents.

Name and address of patentee(s):

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Title of invention:

Device and method for eliminating or reducing air pollutants emitted from industrial chimneys

Name of inventor(s):

Sarhan, Mazin M. S. and Al-Zwainy, Faiq

Term of Patent:

Eight years from 10 September 2020

NOTE: This Innovation Patent cannot be enforced unless and until it has been examined by the Commissioner of Patents and a Certificate of Examination has been issued. See sections 120(1A) and 129A of the Patents Act 1990, set out on the reverse of this document.



Dated this 7th day of October 2020

Commissioner of Patents

PATENTS ACT 1990

The Australian Patents Register is the official record and should be referred to for the full details pertaining to this IP Right.

Extracts from the Patents Act, 1990

Sect 120(1A) Infringement proceedings in respect of an innovation patent cannot be started unless the patent has been certified.

Sec 128 **Application for relief from unjustified threats**

- (1) Where a person, by means of circulars, advertisements or otherwise, threatens a person with infringement proceedings or other similar proceedings a person aggrieved may apply to a prescribed court, or to another court having jurisdiction to hear and determine the application, for:
- (a) a declaration that the threats are unjustifiable; and
 - (b) an injunction against the continuance of the threats; and
 - (c) the recovery of any damages sustained by the applicant as a result of the threats.
- (2) Subsection (1) applies whether or not the person who made the threats is entitled to, or interested in, the patent or a patent application.

Sec 129A **Threats related to an innovation patent application or innovation patent and courts power to grant relief.**

Certain threats of infringement proceedings are always unjustifiable.

- (1) If:
- (a) a person:
 - (i) has applied for an innovation patent, but the application has not been determined; or
 - (ii) has an innovation patent that has not been certified; and
 - (b) the person, by means of circulars, advertisements or otherwise, threatens a person with infringement proceedings or other similar proceedings in respect of the patent applied for, or the patent, as the case may be; then, for the purposes of an application for relief under section 128 by the person threatened, the threats are unjustifiable.

Courts power to grant relief in respect of threats made by the applicant for an innovation patent or the patentee of an uncertified innovation patent

- (2) If an application under section 128 for relief relates to threats made in respect of an innovation patent that has not been certified or an application for an innovation patent, the court may grant the application the relief applied for.

Courts power to grant relief in respect of threats made by the patentee of certified innovation patent

- (3) If an application under section 128 for relief relates to threats made in respect of a certified innovation patent, the court may grant the applicant the relief applied for unless the respondent satisfies the court that the acts about which the threats were made infringed, or would infringe, a claim that is not shown by the applicant to be invalid.

Schedule 1 **Dictionary**

certified, in respect of an innovation patent other than in section 19, means a certificate of examination issued by the Commissioner under paragraph 101E(e) in respect of the patent

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ABSTRACT

The present invention discloses a device and method for eliminating or significantly reducing air pollutants emitted from chimneys, flues, flares or smokestacks. The device is mainly comprised of: a hollow inlet member which includes water tanks obtaining water from an associated automatic water pump. Water from the tanks is provided to one or more mist pumps via an interconnecting pipe which then supply one or more mist nozzle heads connected to the said mist pump(s) via further pipes. The resulting spray of pressured tiny water droplets delivers pollutants toward the said hollow inlet member. A drain channel located around the lower edge of the said hollow inlet member gathers the polluted water droplets and delivers them downward through a lead-away pipe to a collecting storage tank. Complementary means including electronic sensors and metal supports may also be used. The invention can be operated in an automatic or semi-automatic way. The device's design has some flexibility, and its size can be adjustable to fit the required chimney.

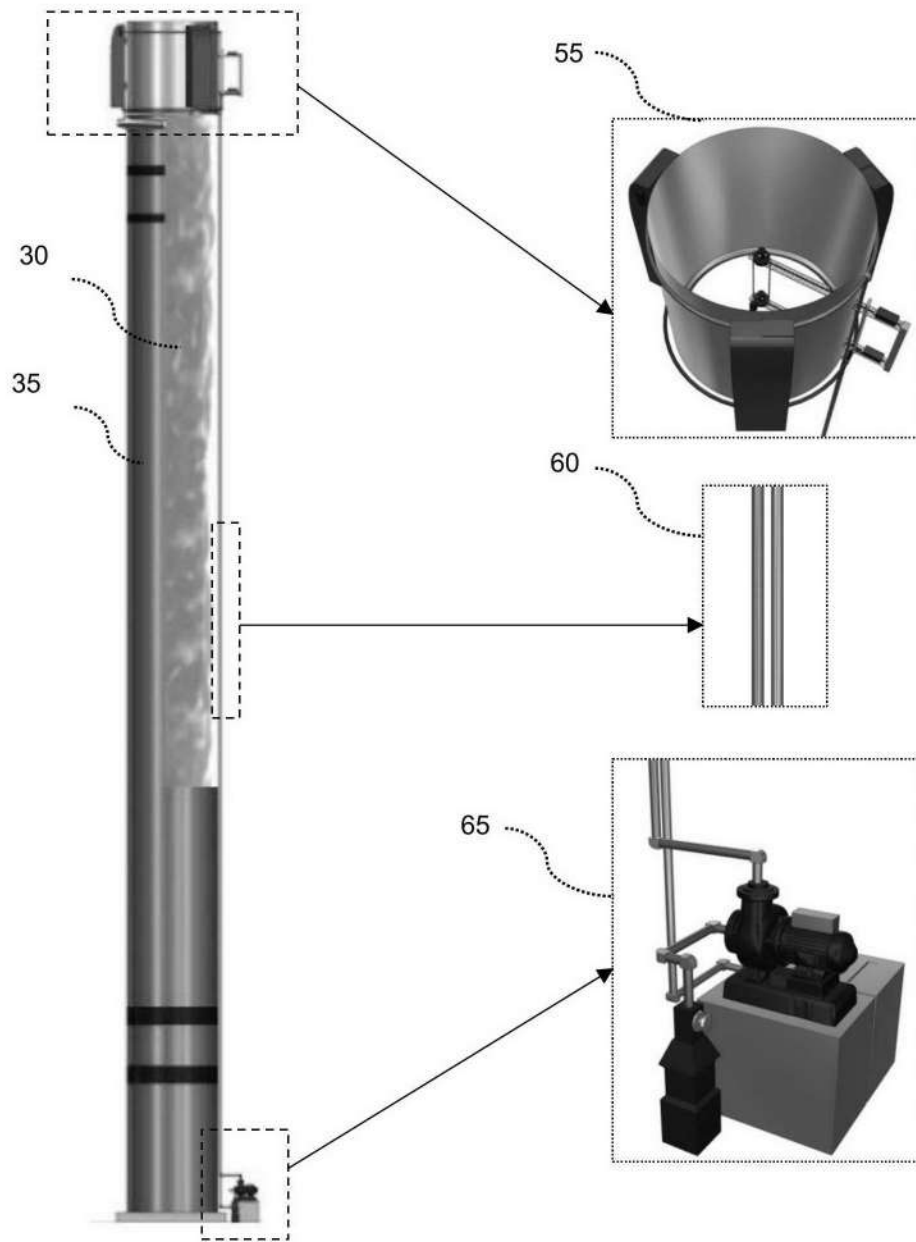


Figure 2

**DEVICE AND METHOD FOR ELIMINATING OR REDUCING AIR POLLUTANTS
EMITTED FROM INDUSTRIAL CHIMNEYS**

By:

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FIELD

[0001] This invention relates to the field of health and environmental protection, and it involves a device and method for eliminating or significantly reducing air pollutants emitted from industrial chimneys or smokestacks.

BACKGROUND

[0002] Air pollutants may damage the natural or built structural environments; this may also cause harm to animals and food crops and may cause diseases such as allergies and even death in humans. In March 2014, the World Health Organization (WHO) reported that around 7 million people died as a result of both indoor and outdoor air pollution exposure. In urban and rural areas worldwide, the WHO estimated there were 3.7 million deaths in 2012 due to outdoor air pollution. Eliminating or reducing air pollution can thus considerably save millions of lives and protect the environment.

[0003] Air pollution consists of harmful levels of gases or excessive quantities of particles in the air. Carbon dioxide, sulfur dioxide, soot, smoke, mold spores, methane, PM2.5, and PM10 particles are a just few examples of common pollutants. Smoke combined with fog (smog) is an intensive type of air pollution. Man-made smog can be produced from coal combustion emissions, vehicular emissions and other industrial emissions. Its high-level percentage in industrial areas and cities is a serious physical and social problem due to difficulties that can be caused in daily life. Chimney smoke is an important contributor to the smog because it contains a high percentage of particles, soot, the products of combustion processes.

[0004] Efficient methods and apparatuses are significant for the elimination or reduction of pollution of the air. One way to help in this matter is to have a simple and inexpensive invention to control the polluted materials emitted from flue gas stacks. The present invention provides an

efficient and inexpensive device and methods to use the device for eliminating or decreasing air pollutants emitted from new or existing smokestacks formed from concrete, brick, or metal.

SUMMARY OF THE INVENTION

[0005] The purpose of this invention is to provide an effective and economical way to eliminate or reduce outdoor pollutants (30) released from smokestacks (35). The invention may be summarised as an automatic or semi-automatic device and operation method for eliminating or significantly reducing pollutants (30) emitted from industrial chimneys (35). Conceptually, it consists of three main parts (40, 45, and 50) which are mutually interconnected to cooperate as a single integrated system, as shown in Figure 1(b), with more explanations described in the next section. The device's design is flexible and can be adjusted to fit satisfactorily and safely onto a new or existing chimney to permit convenient and highly efficient operation and access for periodic maintenance.

DESCRIPTION OF THE INVENTION:

[0006] The invention is described by reference to the accompanying illustrations of embodiments of the invention.

[0007] Figure 1 shows an embodiment of the inventive device being installed on an industrial chimney. Fig. 1(a) shows an industrial chimney (35) having a round cross-section with emitted pollutants (30), Fig. 1(b) is the inventive device only, and Fig. 1(c) shows a complete structure with the inventive device installed on the said chimney to reduce or eliminate pollutants emitted by the chimney.

[0008] Figure 2 is a non-limiting embodiment of the inventive device installed on a chimney, showing a general view of the invention. The 1st part (item 40 in Fig. 1) is shown as an isometric illustration (55). Similarly, the 2nd and 3rd parts (45 & 50 of Fig. 1 respectively) are also shown in isometric illustrations (items 60 and 65, respectively).

[0009] Figure 3 is an isometric embodiment of the 1st part of the invention, showing the key features of the "the 1st part" section of the invention. The isometric embodiment is depicted as a top-down view.

[0010] Figure 4 is an isometric view, also of the “the 1st part” section of an exemplary embodiment of the invention, but depicted from a bottom-up viewpoint. It shows the remaining key features of the “the 1st part” section of the invention. This isometric view further indicates an embodiment of the invention whereby the “the 1st part” assembly connects with the pipes/tubing which comprise “the 2nd part” of the invention.

[0011] Figure 5 is an isometric embodiment of “the 3rd part” of the invention, showing key features comprising embodiments of the invention. A zone of “the 2nd part pipes/tubing is illustrated in this figure to show an exemplary but by no means limiting arrangement for how the 2nd part connects to the 3rd part.

[0012] Figure 6 is a top-down view of a typical but non-limiting embodiment of the invention, showing key features of the invention.

[0013] Figure 7 is a cut-away isometric view of an embodiment of the invention being used, showing a spreading mist of water (70) which collects pollutants (30) in the chimney emissions.

[0014] As shown in Figure 1 (b), the inventive device basically consists of three parts (40, 45, and 50). The three parts working together as one integrated system during operation. The 1st part is the main section working to reduce or eliminate pollutants. The 2nd part is the fluid transporter section between the 1st part and the 3rd part, transferring pumped water from the 3rd part to the 1st part and polluted water/suspension from the 1st part to the 3rd part.

[0015] In Figure 2, a longitudinal portion of the chimney has been removed to allow a visual depiction of the pollutants before they reach up to the ‘the 1st part’ section of the device. Three-dimensional zoomed views invention (55 and 65) are provided for the 1st part and the 3rd part of the inventive device to provide isometric general views of typical and exemplary embodiments of the.

[0016] Figures 3 and 4 show the “the 1st part” section of the inventive device isometrically depicted from a top-down viewpoint as well as from a bottom-up viewpoint to demonstrate the key features of this part of the invention in a clear way.

[0017] Based on Figures 3 to 6, the invention can be comprised from but not limited to:

- A hollow inlet member (1): this would have a diameter approximately equivalent to the circular cross-section diameter of the chimney to which it will be fitted. The height of this member depends on its diameter and the amount of the emitted pollutants. This member may be made of any material suitable for operation in the chimney environment. A light and strong metal (for instance, thin-gauge stainless-steel) can be utilized to reduce the weight applied on the chimney and be able to resist high temperature smoke; the material must easily allow the pollutants to slide down into the drain channel. This member (1) is a main contributor to the size of the invention, but if desired this hollow inlet member can be made from several pieces and then combined on-site to ease the device construction process.
- Water tanks (2): three water tanks are shown as an exemplary but non-limiting example; their capacity depends on the size of the said hollow inlet member (1). The number of tanks can be varied based on the size of the said hollow inlet member (1) and the chimney's circumstances, so as to obtain an acceptable weight applied on the chimney. These tanks may be made of any suitable light and strong metal for the same reason as mentioned for the hollow inlet member (1) above, and the tanks are mounted to the said hollow inlet member (1), with gaps allowed for cooling and air resistance purposes.
- Mist pumps (3): two mist water pumps are typically shown here; but the number of pumps can be varied based on the required performance. These pumps are provided with electricity from a suitable power supply line. The pressure and/or flowrate of the mist water is controlled in the invention according to the concentration or amount of emitted pollutants and the size of the said hollow inlet member (1).
- Multi-mist nozzle heads (4): one high-pressure multi-mist nozzle head is used for each mist pump (3); shown here, each head has four nozzles, but the number of nozzles can be varied without departing from the invention. The multi-mist nozzle heads may be made from metal to resist high temperature and corrosive fumes, and they may be auto-rotated by the water pressured from mist pumps (3). The purpose of using more than one multi-mist nozzle head is to make sure that the sprayed water covers all of the regions inside the said hollow inlet member (1) cross-sectionally and longitudinally.
- Top-water tank pipe (5): this pipe or tube is connected to the water tanks (2) at the top of the inventive structure to provide them with water.
- Water level sensor(s) (6): the purpose of these sensor(s) is to measure the level of water inside the tanks (2) and then send a signal below to stop providing water when the tanks (2) reaches its capacity.

- Bottom-water tank pipe (7): this pipe or tube connects the water tanks (2) to provide mist pumps (3) with water.
- A metal drain channel (8) having an approximately semi-circular or “U” shape is located at the bottom edge of the hollow inlet member (1). Its purpose is to collect the polluted water (sprayed water mixed with pollutants) and then deliver it down a transfer pipe or tube (16).
- Perforated metal members (9), as shown in Figure (6): these members carry the multi-mist nozzle heads (4) and the mist pumps (3). The purpose of the perforated pattern is to provide strength and rigidity with reduced weight and to allow flow-through of pollutants vertically through the hollow inlet member (1).
- Metal pipes for conveying pressured water (10), as shown in Figure (6): these pipes transfer the pressured water from the mist pumps (3) to the multi-mist nozzle heads (4).
- Smoke detector sensor(s) (11): the purpose of these sensor(s) is to send signals to indicate pollutant concentration. The system of the invention then operates the mist pumps when the pollutant concentration reaches a pre-determined “trigger” level.
- Structural supports (12): these supports mechanically secures part 1 of this invention to the top of a chimney. Three supports are shown by way of exemplary but non-limiting example here; however, their number and shape will depend on the required installation location and chimney material.
- Heat-resistant channel (13): This box contains a pipe to transfer water from the tanks (2) to the mist pumps (3) and electrical power and signal wires. It may also work as a support between the perforated metal members (9).
- Metal barrier (14): this barrier protects the mist pumps (3) from hot temperatures inside the hollow inlet member (1) and also functions as a mechanical support between the metal members (9).
- Water transfer pipe (15): this pipe or tube transfers water upwardly from the 3rd part to the 1st part of the invention.
- Lead-away pipe (16): this metal pipe transfers polluted water from the drain channel (8) in the 1st part to a collecting storage tank (19) shown in the 3rd part.
- Automatic water pump (17): this pump pressurises water from a water source (18) to the tanks (2) via the above-mentioned pipe (15). This pump may be operated by receiving, processing and responding to a signal from the water level sensors (6). This pump may be placed on a concrete base (20).

[0018] When the invention is installed on a chimney and operating, smoke traveling up the chimney is detected by smoke detector sensor(s) (11) whereby a signal is sent which may operate the mist pumps (3) to send pressurised water to the multi-mist nozzle heads (4) via the pipes of pressurised water (10). The tiny water droplets that sprinkle from the nozzles come into contact with the pollutants (particles), carrying them toward the wall of the hollow inlet member (1). Then the polluted water droplets move downwardly to the drain channel (8) and finally to the collecting storage tank (19) via the lead-away pipe (16). The collected solids may be recycled for other uses.

[0019] As seen in the above description, adjustments can be made to the invention for functional convenience to the user without departing from the spirit or scope of the invention.

CLAIMS

The claims defining the invention are as follows:

1. A device for eliminating or reducing of air pollutants emitted from industrial chimneys, flues, flares or smokestacks. The device comprises several cooperating parts, including a main hollow inlet member installed on the top of a smokestack or chimney. Water tanks are fixed to the said hollow inlet member and connectable to a pipe from the top portion of the device, to obtain water from an automatic water pump via a suitable transfer pipe. When required, mist pumps obtain water from the tanks via a further interconnecting pipe and provide pressurised water via metal pipes to one or more mist nozzle heads. An internal drain channel is located at a lower end of the said hollow inlet member and collects the polluted water droplets and delivers them to a collecting storage tank via a lead-away pipe.
2. A device for eliminating or reducing of air pollutants emitted from industrial chimneys as claimed in claim 1, further comprising complementary means including water level sensor(s), smoke detector sensor(s), metal members supporting the said multiple mist nozzle heads and the said mist pumps, a heat-resistant channel, a heat-resistant barrier and metal supports to fix the said hollow inlet member to the top of a chimney.
3. A device for eliminating or reducing air pollutants emitted from industrial chimneys as claimed in claim 1 or 2, wherein critical components on the upper section of the device (especially the main envelope of the hollow inlet member) are formed using a heat-resistant metal or alloy and this inlet member may be made from multiple portions to ease the construction of the device at the installation site. Also, the device's components cooperate in such a way that it works automatically or semi-automatically.
4. A method for operating a device for eliminating or reducing of air pollutants emitted from industrial chimneys, flues, flares or smokestacks. The method coordinates the functions of several cooperating parts, including a main hollow inlet member installed on the top of a smokestack or chimney or similar. Water tanks are fixed to the said hollow inlet member and connect to a pipe from the upper side of the device to obtain water from an automatic water pump via a transfer pipe. When required, mist pumps obtain water from the tanks via an interconnecting pipe and provide pressured water via metal pipes connecting to one or more mist nozzle heads. An internal drain channel located at a lower end of the said hollow inlet member collects the polluted water droplets and delivers them to a collecting storage tank via a lead-away pipe.

5. A method for operating a device for eliminating or reducing of air pollutants emitted from industrial chimneys as claimed in claim 4, further comprising complementary means including water level sensor(s), smoke detector sensor(s), heat-resistant members supporting the said one or more mist nozzle heads and the said mist pumps, a heat-resistant channel, a heat-resistant barrier, and metal supports to fix the said hollow inlet member to the top of a chimney. The method controls the function of the device in such a way that it works in an automatic or semi-automatic way.

DRAWINGS

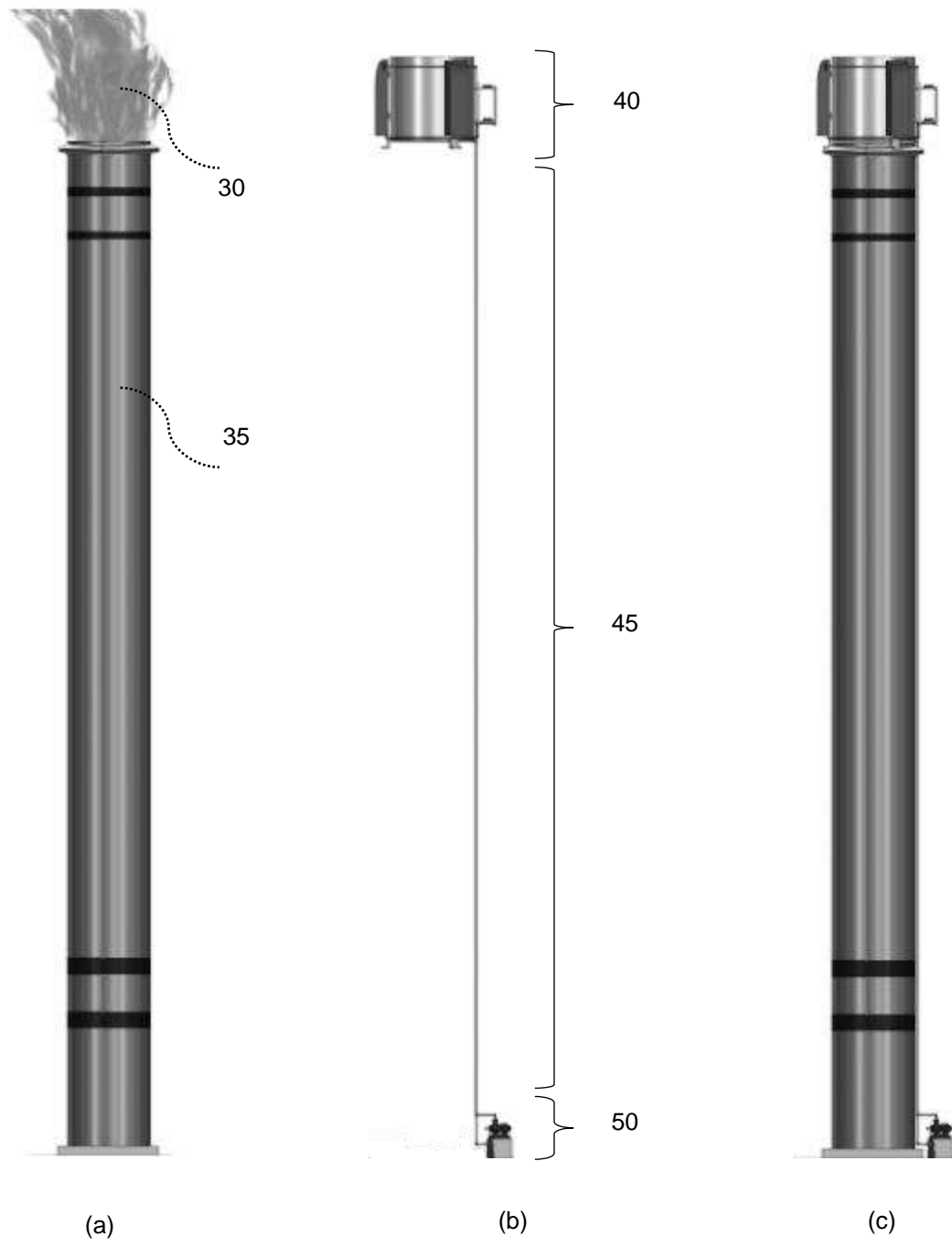


Figure 1

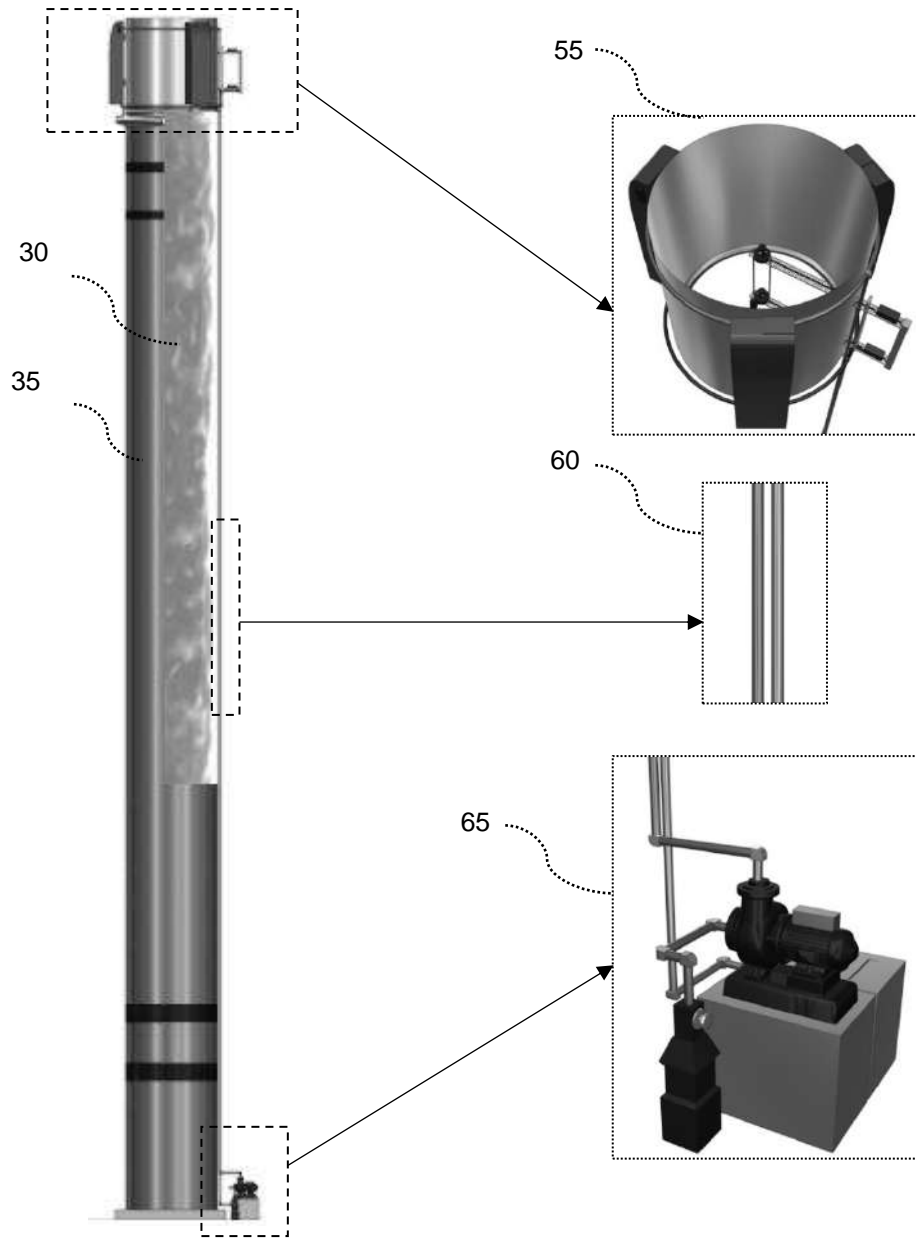


Figure 2

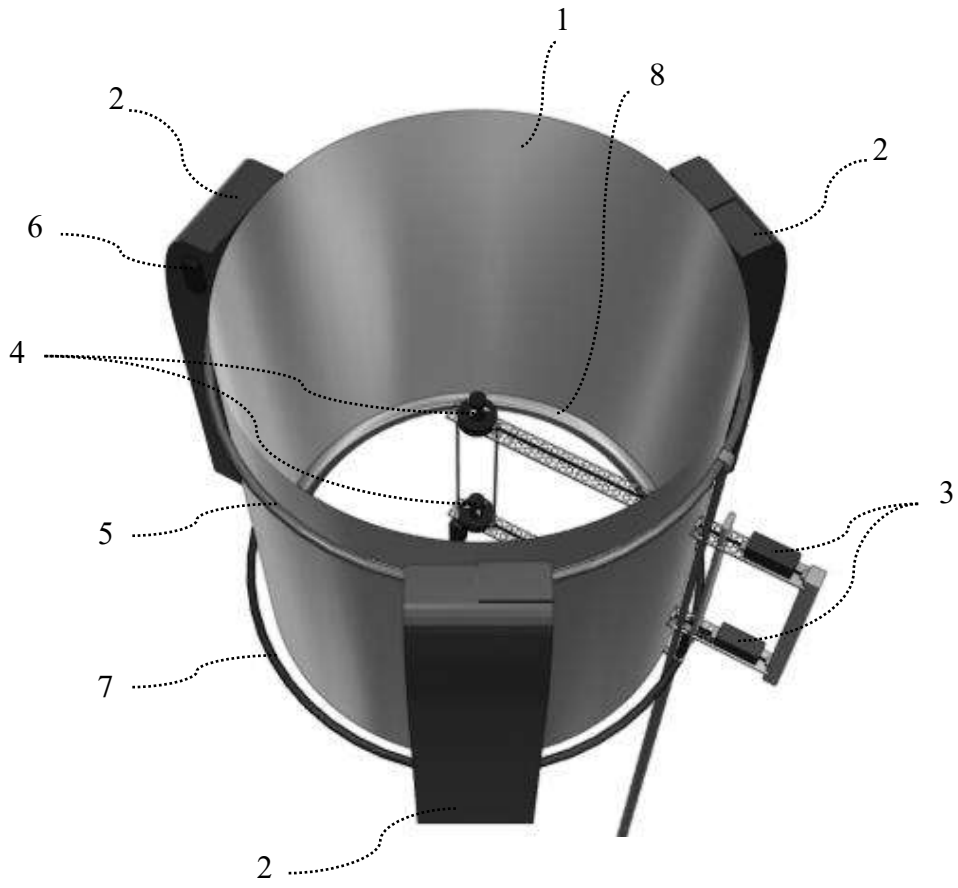


Figure 3

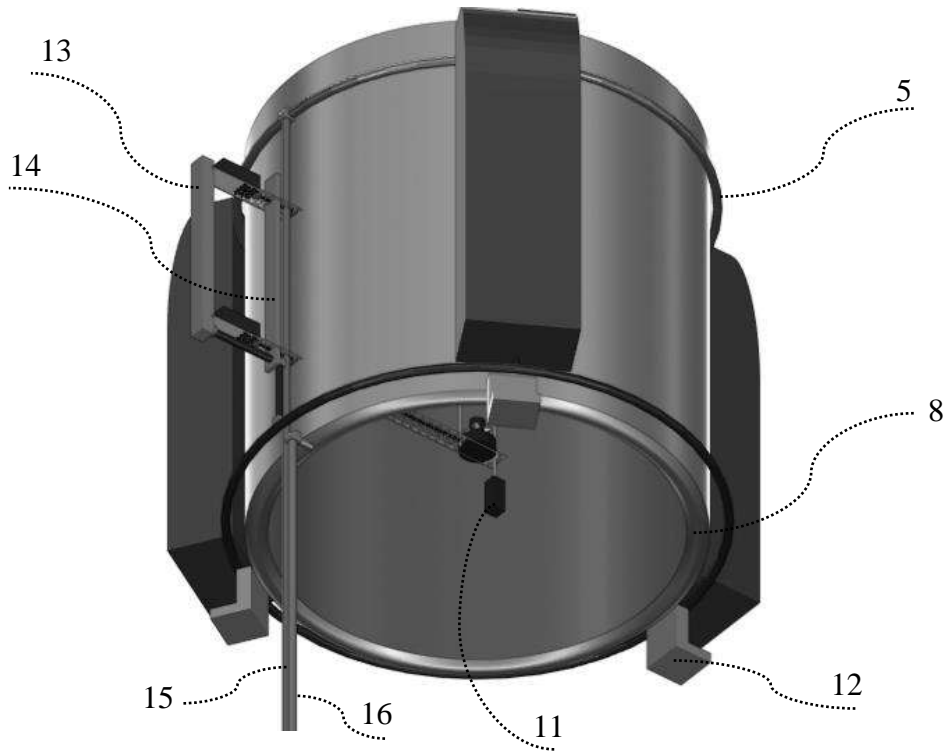


Figure 4

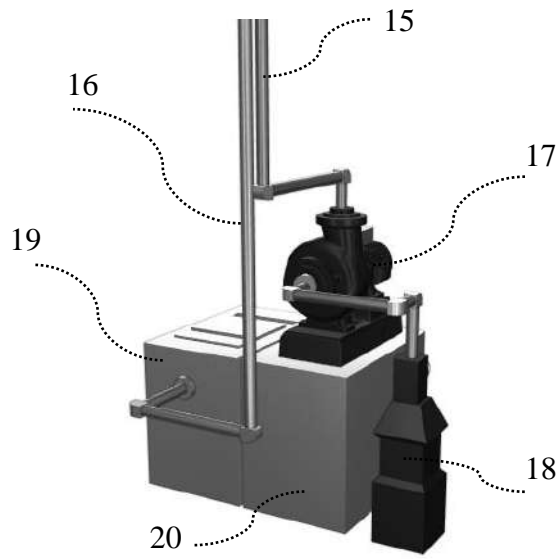


Figure 5

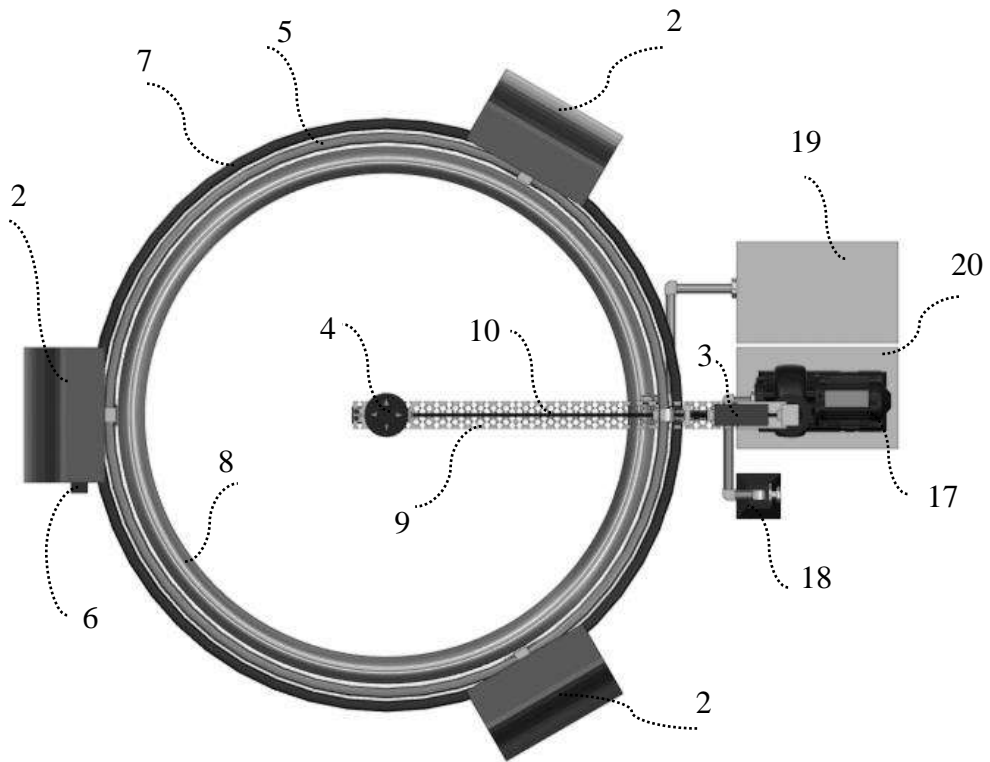


Figure 6



Figure 7