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(71) Applicant: **Kuo, Chien-Chih**
Pei Dist., Taichung City (TW)

(72) Inventor: **Kuo, Chien-Chih**
Pei Dist., Taichung City (TW)

(74) Representative: **SERJEANTS**
25, The Crescent
King Street
Leicester, LE1 6RX (GB)

(54) **Refuse incinerating furnace**

(57) A refuse incinerating furnace includes a furnace body (21) having an annular surrounding wall (210) which confines a combustion chamber (27) and which has a lower section formed with a plurality of mounting holes (215) that are arranged around the combustion chamber (27). Each of a plurality of plugs (22), which are inserted into the mounting holes (215), is formed with a tapered air passage hole (221). A wind box (23) encloses the lower section of the surrounding wall (210), and defines an annular air channel (231) around the lower section of the surrounding wall (210). The air channel (231) is communicated with the combustion chamber (27) via the air passage holes (221). An air supplying member (25) is mounted on the wind box (23) , and is communicated with the air channel (231) for supplying air into the combustion chamber (27).

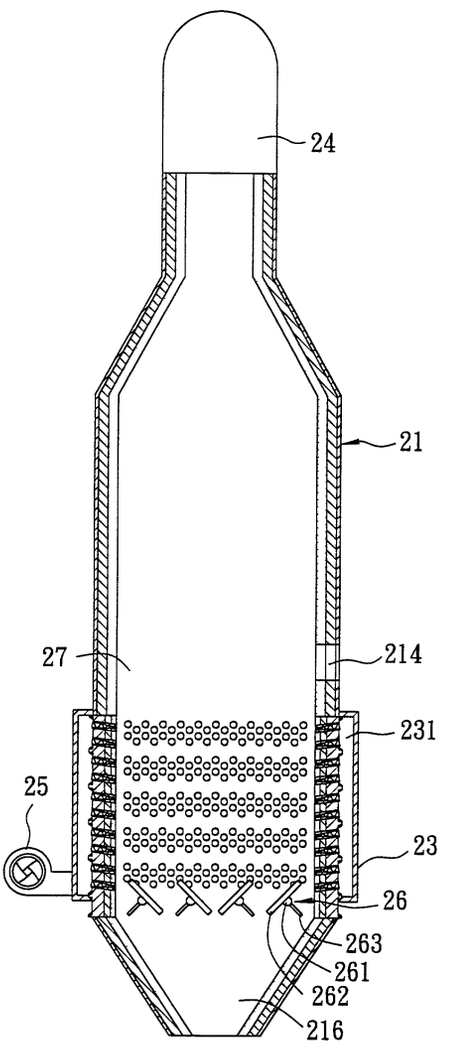

FIG. 6

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Description

[0001] The present invention relates to a refuse incinerating furnace, more particularly to a refuse incinerating furnace provided with tapered air passage holes to permit high velocity air flow into a combustion chamber to facilitate complete combustion of refuse in the combustion chamber.

[0002] Figures 1 and 2 illustrate a conventional refuse incinerating furnace 1 which includes a cylindrical furnace body 10 having an inner surrounding wall 12 that defines a combustion chamber within the furnace body 10, and an outer surrounding wall 11 disposed around the inner surrounding wall 12 so as to define an annular air channel 13 between the inner and outer surrounding walls 12, 11. A plurality of air blowers 14 are mounted on the outer surrounding wall 11, and extend along tangential lines of the outer surrounding wall 11. The inner surrounding wall 12 is formed with a plurality of air passage holes 121 which communicate the air channel 13 with the combustion chamber inside the furnace body 10. A loading pipe 15 extends into the furnace body 10 to permit loading of refuse into the combustion chamber. An exhaust pipe 16 is mounted on top of the furnace body 10 for venting of combustion gas therefrom. An ash collecting tray 17 is mounted below the furnace body 10, and is installed with an ash discharge unit 18.

[0003] When refuse is loaded into the combustion chamber via the loading pipe 15, a flame is lighted in the combustion chamber, and the air blowers 14 are activated for blowing air into the combustion chamber via the annular channel 13 and the air passage holes 121.

[0004] However, it was found that the refuse loaded in the aforementioned refuse incinerating furnace does not completely burn because the velocity of the air that is blown into the combustion chamber is relatively slow, and because the air is not directed toward the refuse in the combustion chamber. It is desirable to provide a refuse incinerating furnace which facilitates complete burning of refuse loaded therein.

[0005] Therefore, the main object of the present invention is to provide to provide a refuse incinerating furnace which facilitates complete combustion of refuse therein.

[0006] Accordingly, the refuse incinerating furnace of the present invention includes a furnace body, a plurality of plugs, a wind box, and an air supplying member. The furnace body has an annular surrounding wall which confines a combustion chamber and which has inner and outer wall surfaces and a lower section formed with a plurality of mounting holes that are arranged around the combustion chamber and that extend through the inner and outer wall surfaces. The plugs are inserted into the mounting holes, respectively. Each of the plugs is formed with a tapered air passage hole which extends along an axis of a respective one of the mounting holes through the plug and which tapers in a direction from the outer wall surface to the inner wall surface. The wind box encloses the lower section of the surrounding wall, and defines an annular air channel around the lower section of the surrounding wall. The air channel is communicated with the combustion chamber via the air passage holes in the plugs. The air supplying member is mounted on the wind box, and is communicated with the air channel for supplying air into the combustion chamber via the air channel and the air passage holes.

[0007] Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiment with reference to the accompanying drawings, of which:

Figure 1 is a partly sectional, schematic view of a conventional refuse incinerating furnace;
Figure 2 is a cross-sectional view of the conventional refuse incinerating furnace;
Figure 3 is a perspective view of a preferred embodiment of the refuse incinerating furnace of the present invention;
Figure 4 is a vertical sectional view of the preferred embodiment, where a grating unit is disposed in a first position;
Figure 5 is a fragmentary sectional view of the preferred embodiment, illustrating a furnace body and plugs mounted on the furnace body; and
Figure 6 is a vertical sectional view of the preferred embodiment, where the grating unit is disposed in an ash-emptying position.

[0008] Referring to Figures 3 and 4, the preferred embodiment of the refuse incinerating furnace of this invention is shown to include an upright furnace body 21, a plurality of plugs 22, a wind box 23, a plurality of air supplying members 25, an exhaust pipe 24, and a grating unit 26.

[0009] The furnace body 21 has an annular surrounding wall 210 that confines a combustion chamber 27. The surrounding wall 210 includes a heat-resistant lining 211 having an inner wall surface facing the combustion chamber 27, an outer wall layer 212 having an outer wall surface, and a heat-insulating layer 213 disposed between the outer wall layer 212 and the heat-resistant lining 211. During manufacture of the furnace body 21, the outer wall layer 212 is formed at first. Thereafter, the heat-insulating layer 213 is attached to an inner side of the outer wall layer 212, and the heat-resistant lining 211, in turn, is attached to the heat-insulating layer 213. After the furnace body 21 has been in use for a period of time, only the heat-resistant lining 211 has to be replaced for the maintenance of the furnace body 21. The surrounding wall 210 has a refuse inlet 214 formed through the inner and outer wall surfaces for loading of refuse into the combustion chamber 27. The surrounding wall 210 has a lower section below the refuse inlet 214 and formed with a plurality of mounting holes 215 which are arranged around the combustion chamber 27 and which extend through the inner and outer wall sur-

faces. Each of the mounting holes 215 has an axis which is inclined relative to a vertical axis of the surrounding wall 210 such that portions of the mounting holes 215 adjacent to the outer wall surface are disposed at a higher elevation than portions of the mounting holes 215 adjacent to the inner wall surface of the surrounding wall 210. The mounting holes 215 may be circular, rectangular or hexagonal in cross-section.

[0010] Referring to Figures 4 and 5, the outer wall layer 212 of the surrounding wall 210 is formed with a plurality of annular rims 218 at the lower section, and a plurality of reinforcing ribs 217 perpendicular and adjacent to the annular rims 218 for reinforcing the lower section of the surrounding wall 21 so as to prevent deforming of the lower section due to the formation of the mounting holes 215. The plugs 22 have cross-sections conforming with those of the mounting holes 215, and are inserted respectively into the mounting holes 215 and are welded to the surrounding wall 210 of the furnace body 21. The plugs 22 may also be secured to the furnace body 21 via screw fasteners. Each of the plugs 22 is formed with a tapered air passage hole 221 which is generally conical in shape. The air passage hole 221 extends along the axis of the respective one of the mounting holes 215 and through the respective plug 22, and tapers in a direction from the outer wall surface toward the inner wall surface of the surrounding wall 210. Each of the plugs 22 has a hole defining wall which defines the tapered air passage hole 221 and which is provided with a spiral guiding unit 222 that may be a spiral groove or a spiral protrusion formed around the air passage hole 221.

[0011] Referring again to Figures 3 and 4, the wind box 23 is formed from a heat-resistant steel material or a stainless steel material, and is disposed around and encloses the lower section of the surrounding wall 210 of the furnace body 21. The wind box 23 defines an annular air channel 231 around the lower section of the surrounding wall 210. The air channel 231 is communicated with the combustion chamber 27 via the air passage holes 221 in the plugs 22.

[0012] The exhaust pipe 24 is mounted on top of the furnace body 21 to permit venting of combustion gas from the combustion chamber 27.

[0013] The air supplying members 25 are in the form of air blowers, and are disposed outwardly of the wind box 23. Each of the air supplying members 25 has an air pipe 251 which extends along a tangential line of the wind box 23 and which is connected to the wind box 23. The air pipe 251 of each of the air supplying members 25 is communicated with the air channel 231 within the wind box 23.

[0014] The grating unit 26 includes a plurality of flat grating members 262 which are disposed in the lower section of the surrounding wall 210 above an ash collecting tray 216 for delimiting a bottom of the combustion chamber 27 . A plurality of horizontal rotary axles 261 are mounted securely on bottom sides of the grating members 262 and are coupled to a driving source unit (not shown) for driving pivoting movement of the grating members 262 such that the grating members 262 are movable in the combustion chamber 27 between a first position, in which a top side of each of the grating members 262 is disposed in a horizontal orientation so as to be adapted to permit placing of refuse thereon, and a second position, in which the top side of each of the grating members 262 is inclined so as to be adapted to empty the ash into the ash collecting tray 216 after combustion. A reinforcing frame 263 is mounted on and extends along a respective one of the rotary axles 261 to help resist deformation of the respective rotary axle 261 due to the heat in the combustion chamber 27. The ash collecting tray 216 may be installed with an ash discharge unit (not shown) for discharging the ash collected thereon.

[0015] In use, refuse is loaded into the combustion chamber 27 via the refuse inlet 214 so as to be supported on the grating members 262 of the grating unit 26 which are initially disposed in the first position. A flame is lighted in the combustion chamber 27, and the air supplying members 25 are activated for supplying air into the air channel 231. Since the air passage holes 221 in the plugs 22 are tapered in an inward direction from the air channel 231 toward the combustion chamber 27, the air flows through the air passage holes 221 at a higher velocity and can mix thoroughly with the refuse loaded in the combustion chamber 27 due to increased air turbulence in the combustion chamber 27. During combustion, hot combustion gas is vented through the exhaust pipe 24. After combustion, most of the ash accumulates on the top sides of the grating members 262. At this time, the rotary axles 261 can be driven by the driving source unit to move the grating members 262 to the second position, as shown in Figure 6, so as to empty the ash into the ash collecting tray 216. The ash is then cleared and discharged by means of the ash discharge unit (not shown).

[0016] It should be noted that, in the present invention, the plugs 22 are formed separately from the furnace body 21 and are inserted into the mounting holes 215 in the furnace body 21. This simplifies the manufacturing process of the furnace body 21. Moreover, the tapered shape of the air passage holes 221 and the spiral guiding units 222 provided in the air passage holes 221 enable the air to flow into the combustion chamber 27 at a higher velocity and in a manner that facilitates thorough mixing with the refuse in the combustion chamber 27 due to increased air turbulence in the combustion chamber 27, thereby facilitating complete combustion of the refuse.

Claims

1. A refuse incinerating furnace, **characterized by**:

a furnace body (21) having an annular surrounding wall (210) which confines a combustion chamber (27), said surrounding wall (210) having inner and outer wall surfaces and a lower section formed with a plurality of mounting holes (215) which are arranged around said combustion chamber (27) and which extend through said inner and outer wall surfaces;
a plurality of plugs (22) inserted into said mounting holes (215), respectively, each of said plugs (22) being formed with a tapered air passage hole (221) which extends along an axis of a respective one of said mounting holes (215) through said plug (22) and which tapers in a direction from said outer wall surface to said inner wall surface;
a wind box (23) enclosing said lower section of said surrounding wall (210), and defining an annular air channel (231) around said lower section of said surrounding wall (210), said air channel (231) being communicated with said combustion chamber (27) via said air passage holes (221) in said plugs (22); and
an air supplying member (25) mounted on said wind box (23) and communicated with said air channel (231) for supplying air into said combustion chamber (27) via said air channel (231) and said air passage holes (221).

2. The refuse incinerating furnace as claimed in Claim 1, **characterized in that** said air passage hole (221) in each of said plugs (22) is defined by a hole defining wall which is provided with a spiral guiding unit (222) around said air passage hole (221)for guiding air flow through said air passage hole (221).

3. The refuse incinerating furnace as claimed in Claim 2, further **characterized in that** said spiral guiding unit (222) is a spiral groove.

4. The refuse incinerating furnace as claimed in Claim 2, further **characterized in that** said spiral guiding unit (222) is a spiral projection.

5. The refuse incinerating furnace as claimed in any preceding Claim **characterized in that** said annular surrounding wall (210) of said furnace body (21) includes a heat-resistant lining (211) formed with said inner wall surface, and an outer wall layer (212) formed with said outer wall surface.

6. The refuse incinerating furnace as claimed in Claim 5, further **characterized in that** said surrounding wall (210) of said furnace body (21) includes a heat-insulating layer (213) disposed between said heat-resistant lining (211) and said outer wall layer (212).

7. The refuse incinerating furnace as claimed in any preceding Claim, further **characterized by**:

a grating unit (26) disposed in said lower section of said surrounding wall (210) for delimiting a bottom of said combustion chamber (27), said grating unit (26) being adapted to permit placing of refuse thereon; and
an ash collecting tray (216) mounted on said surrounding wall (210) and disposed below said grating unit (26).

8. The refuse incinerating furnace as claimed in Claim 7, **characterized in that** said grating unit (26) includes a plurality of grating members (262), and a plurality of horizontal rotary axles (261) disposed below and mounted securely on said grating members (262), said rotary axles (261) being pivotable relative to said furnace body (21) to enable said grating members (262) to move in said combustion chamber (27) about axes of said rotary axles (261) between a first position, in which each of said grating members (262) has a top side disposed in a horizontal orientation so as to be adapted to permit placing of refuse thereon, and a second position, in which said top side of each of said grating members (262) is inclined so as to be adapted to empty ash into said ash collecting tray (216).

9. The refuse incinerating furnace as claimed in Claim 8, further **characterized in that** said grating unit (26) includes a plurality of reinforcing frames (263) mounted on and extending along a respective one of said rotary axles (261) to help resist deformation of said rotary axles (261).

10. The refuse incinerating furnace as claimed in any preceding Claim, **characterized in that** said air passage hole (221) in each of said plugs (22) is generally conical in shape.

11. The refuse incinerating furnace as claimed in any preceding Claim, **characterized in that** the axis of each of said mounting holes (215) is inclined relative to a vertical axis of said surrounding wall (210) such that portions of said mounting holes (215) adjacent to said outer wall surface of said surrounding wall (210) are disposed at a higher elevation than portions of said mounting holes (215) adjacent to said inner wall surface of said surrounding wall (210).

12. The refuse incinerating furnace as claimed in any preceding Claim, **characterized in that** said surrounding wall (210) is further formed with a refuse inlet (214) above said lower section.

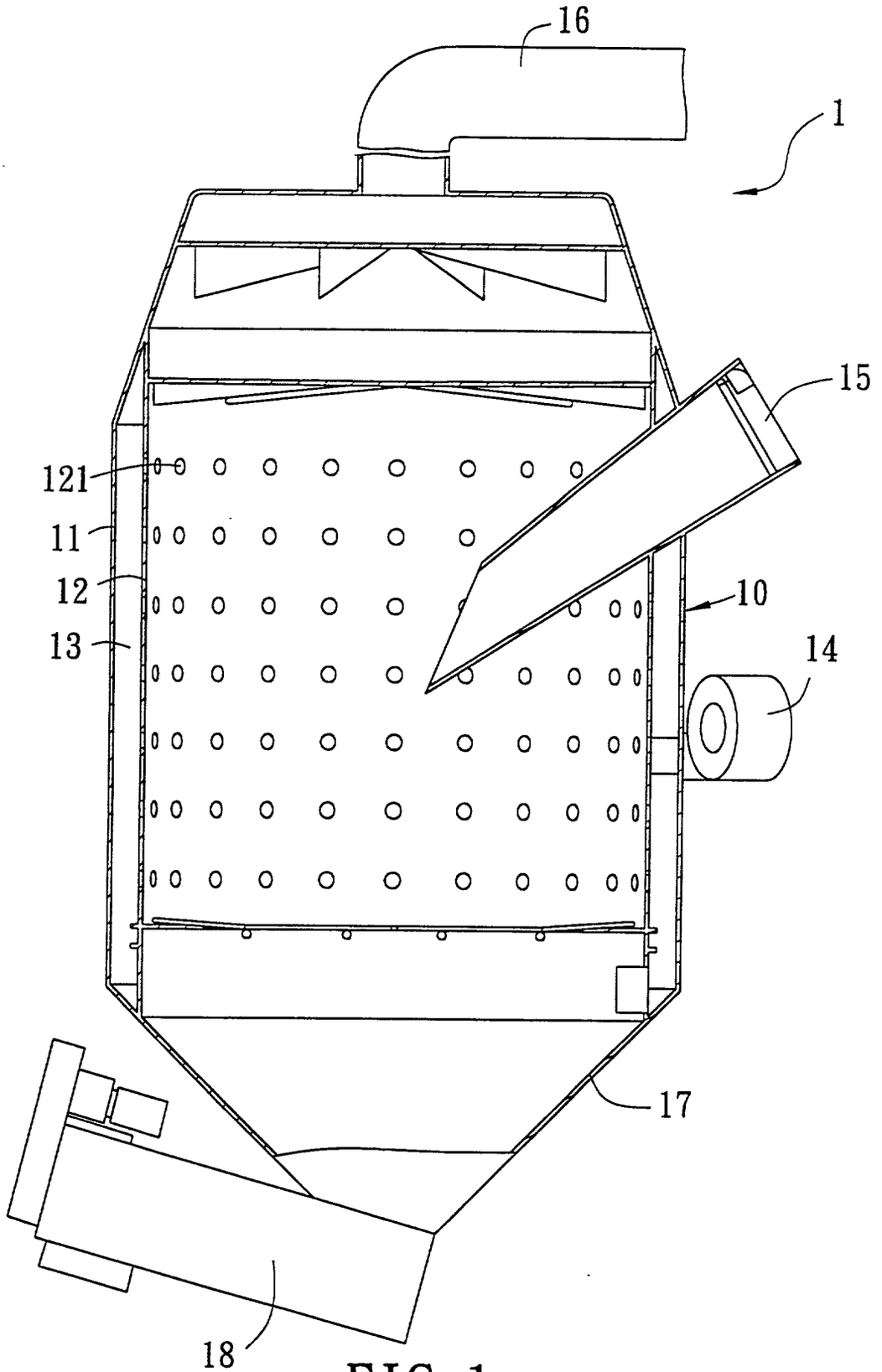

FIG. 1
PRIOR ART

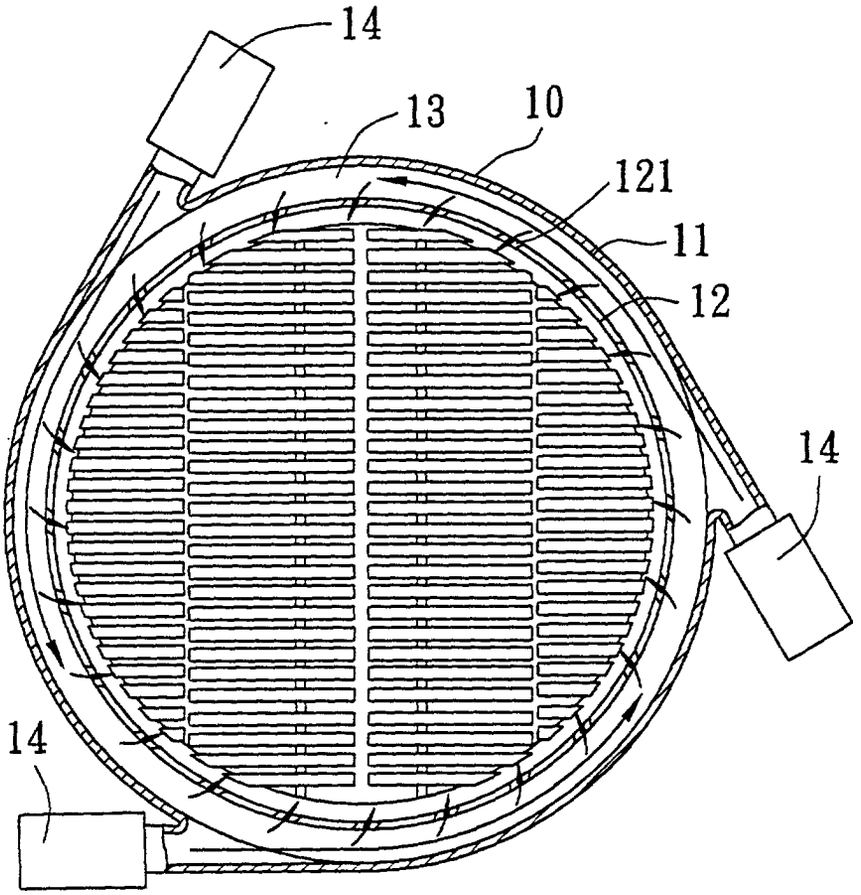

FIG. 2
PRIOR ART

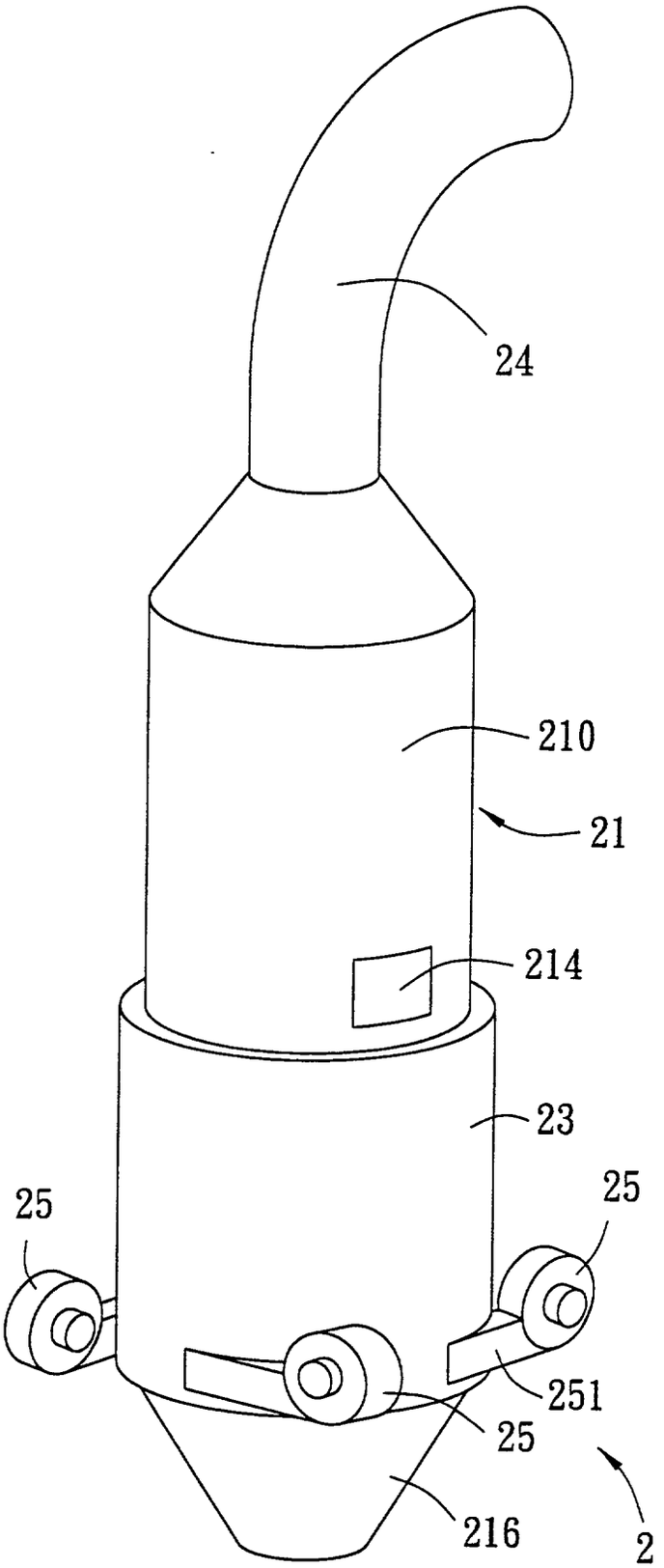

FIG. 3

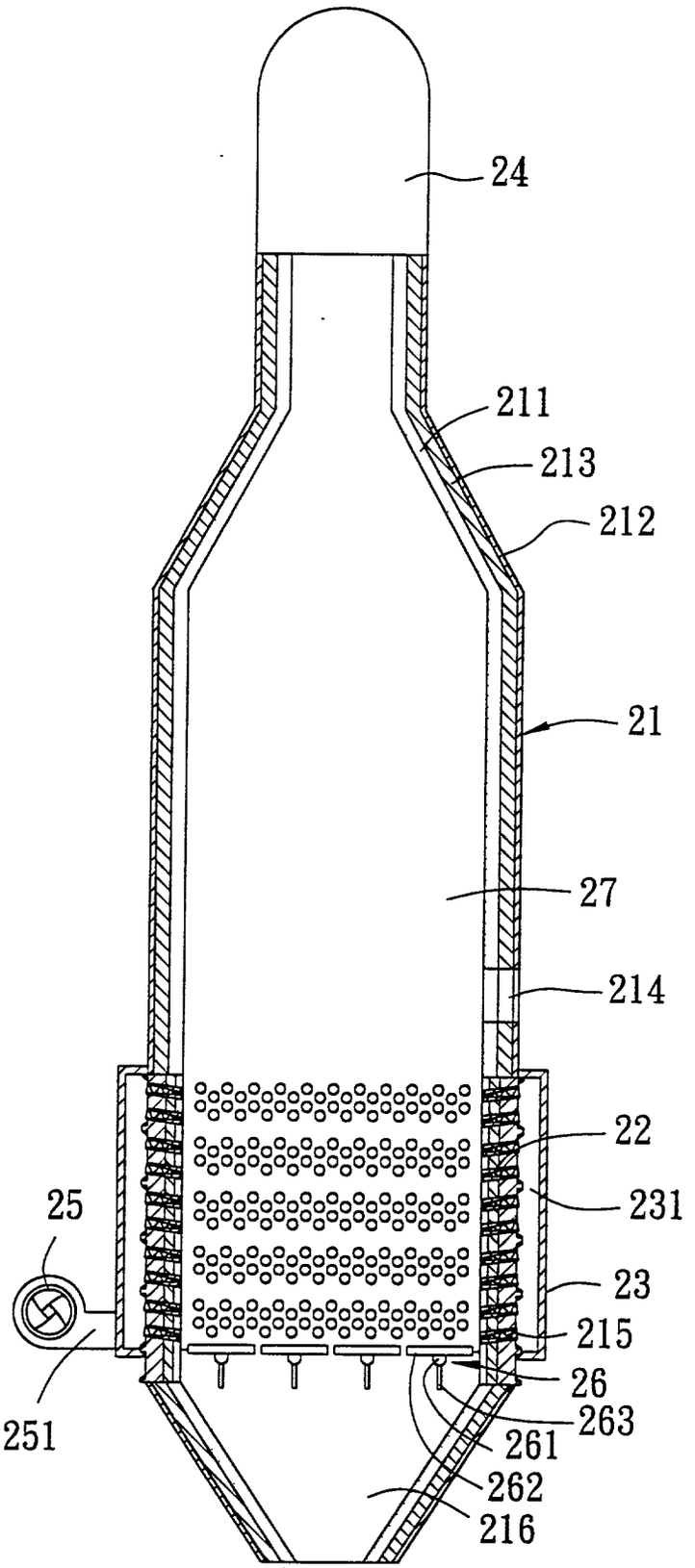

FIG. 4

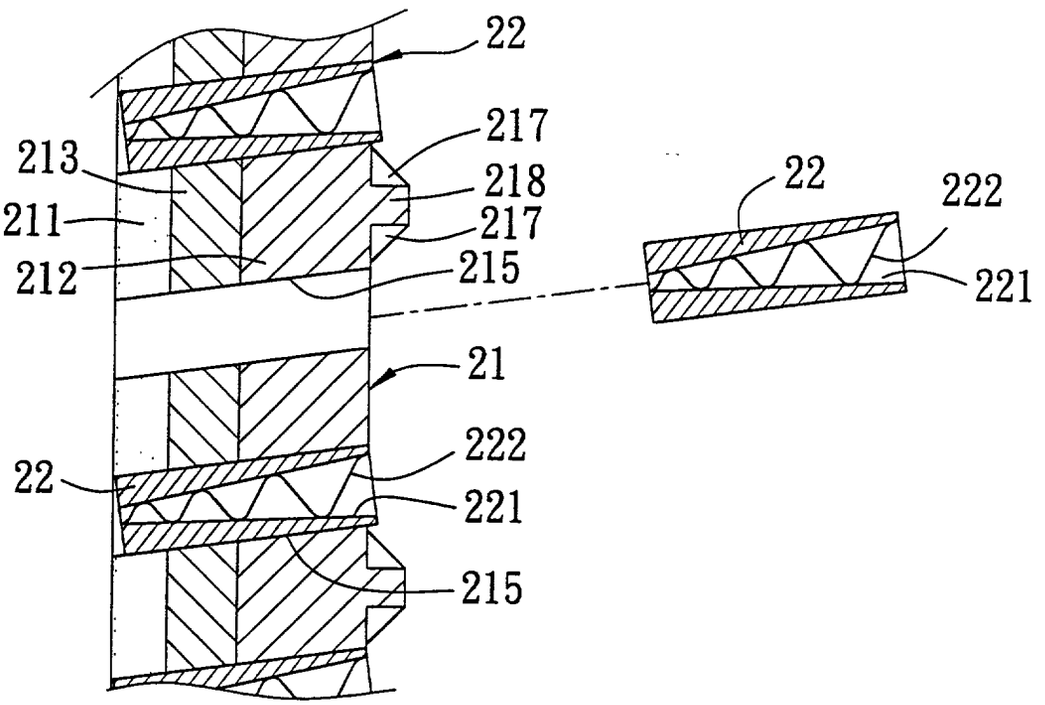

FIG. 5

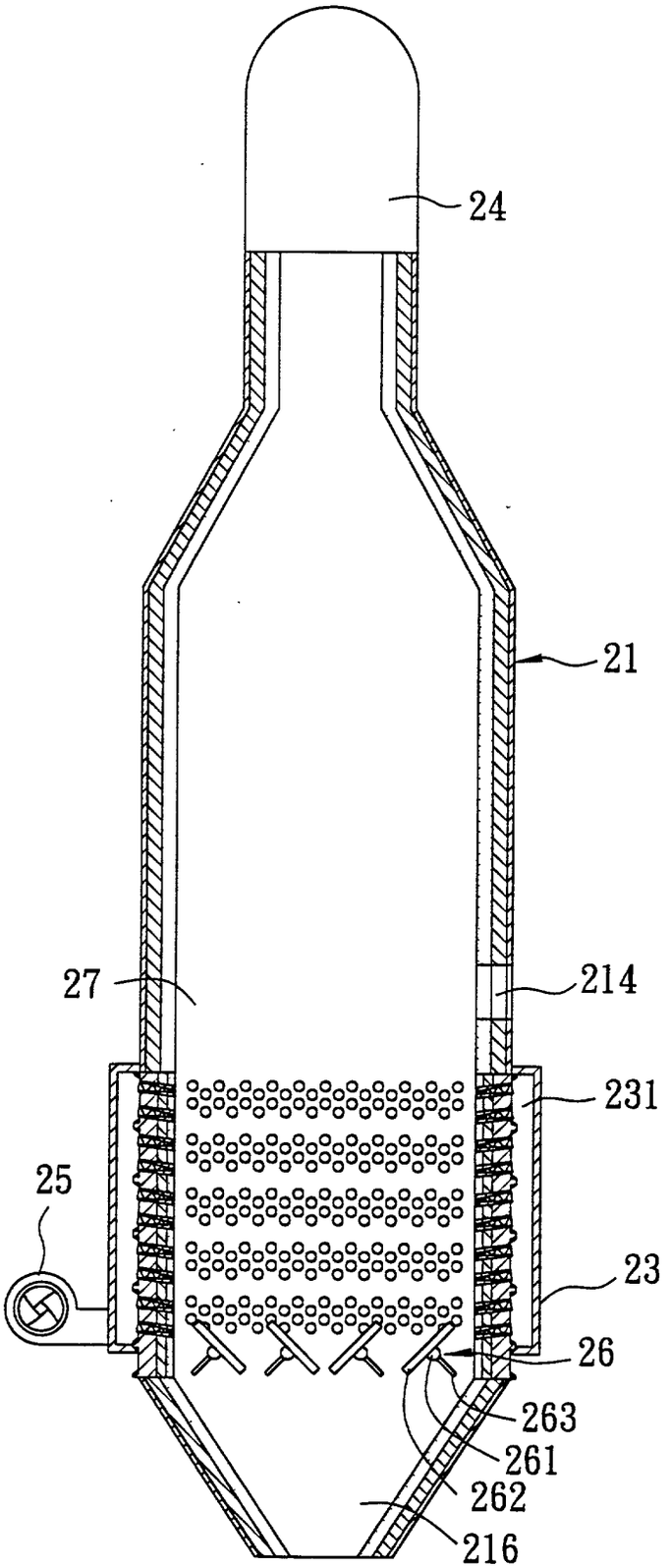

FIG. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 20 3801

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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

F23L
F23G
F23C
F23H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 March 2001	Mougey, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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