(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 584 526 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
25.12.2019 Bulletin 2019/52

(21) Application number: **17896847.5**

(22) Date of filing: **09.08.2017**

(51) Int Cl.:
F26B 17/18 *(2006.01)* ***F26B 21/00*** *(2006.01)*
F26B 3/24 *(2006.01)* ***F26B 23/10*** *(2006.01)*

(86) International application number:
PCT/CN2017/096535

(87) International publication number:
WO 2018/149099 (23.08.2018 Gazette 2018/34)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **14.02.2017 CN 201710079213**

(71) Applicant: **Bai, Hongmei**
Fo Tan Hong Kong N.T. (CN)

(72) Inventor: **Bai, Hongmei**
Fo Tan Hong Kong N.T. (CN)

(74) Representative: **Michalski Hüttermann & Partner Patentanwälte mbB**
Speditionstraße 21
40221 Düsseldorf (DE)

(54) ROASTING MACHINE

(57) Disclosed is a roasting machine (10) for roasting materials into fuel, the roasting machine (10) comprising a tank (100), a first rotary feeder (200), a second rotary feeder (300), a furnace (400), a roller (500), an air outlet pipe (600) and a drive assembly (700). The tank (100) is provided with a feeding cavity (110), the first rotary feeder (200) is arranged on the tank (100), the first rotary feeder (200) extends into the feeding cavity (110), and the first rotary feeder (200) is used for feeding in materials. The second rotary feeder (300) is arranged on the tank (100), the second rotary feeder (300) extends into the feeding cavity (110), and the second rotary feeder (300) is used for discharging fuel. The furnace (400) comprises a furnace body (410) and a delivery pipe (420), the furnace body (410) is connected to the air delivery pipe (420), and the furnace body (410) is used for generating hot air; the roller (500) is provided with a first ventilation duct (510), the first ventilation duct (510) is connected to the air delivery pipe (420), a power output end of the drive assembly (700) is connected to the roller (500), and the drive assembly (700) drives the roller (500) to rotate with respect to the tank (100), the air delivery pipe (420) and the air outlet pipe (600) respectively.

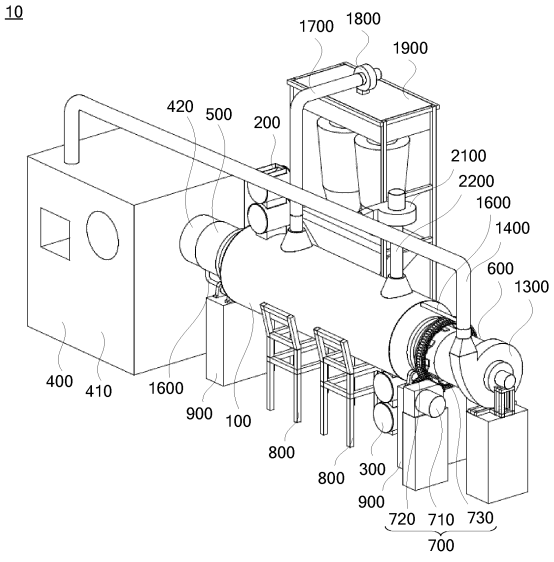

FIG. 1

EP 3 584 526 A1

Description

TECHNICAL FIELD

[0001] The present disclosure relates to the field of roasting device technology, and more particularly relates to a roasting machine.

BACKGROUND

[0002] Currently, the demand for coal for power generation boilers in global power plants is very large. However, coal and other fossil fuels, when burning, will emit a large amount of greenhouse gas and irremovable dust, therefore a new type of green energy "bio-forming fuel" is used to replace conventional coal and other fossil fuels such as coal. The bio-forming fuel is compressed and converted from residual waste plant fibers of common plants or cash crops such as straw, haulm, miscellaneous wood, palm shell, coconut shell and the like.

[0003] During the compression conversion process, the plants or cash crops are first crushed to form scraps, and then the scraps are sent into a dryer for drying to remove moisture in the scraps, and then the scraps are sent into a roasting machine for further removing moisture therein and being converted into the bio-forming fuels. However, a general roasting machine workflow is a circulation of a feeding action and a roasting action, and the feeding and roasting actions of the roasting machine are spaced, that is, a next feeding action needs to wait for a completion of a previous roasting action before proceeding. Therefore, the above-described roasting machine has a low efficiency.

SUMMARY

[0004] Accordingly, it is necessary to provide a more efficient roasting machine.

[0005] A roasting machine for roasting a material into a fuel includes:

a tank defining a feeding cavity;
a first rotary feeder extending into the feeding cavity, configured to input the material;
a second rotary feeder extending into the feeding cavity, configured to output the fuel;
a furnace comprising a furnace body and an air delivery pipe, the furnace body being communicated with the air delivery pipe, and the furnace body being configured to generate hot air;
a roller defining a first ventilation duct, wherein the first ventilation duct is communicated with the air delivery pipe; the roller is disposed in the feeding cavity and is rotatably connected to the tank and the air delivery pipe; and the roller is configured to push the material to move relative to the tank, and bake the material into the fuel;
an air outlet pipe rotatably connected to an end of the roller remote from the air delivery pipe and communicated with the first ventilation duct; and
a driving assembly, wherein a power output end of the drive assembly is connected to the roller, and the driving assembly drives the roller to rotate relative to the tank, the air delivery pipe, and the air outlet pipe, respectively.

[0006] Details of one or more embodiments of the present disclosure are set forth in the accompanying drawings and description below. Other features, objects, and advantages of the present disclosure will be apparent upon review of the specification, the drawings, and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] In order to describe the technical solutions in the embodiments of the present application or in the prior art more clearly, the following briefly introduces the accompanying drawings required for describing the embodiments or the prior art. Apparently, the accompanying drawings in the following description merely show some embodiments of the present application. For those of ordinary skill in the art, other drawings can be acquired based on these drawings without any creative work.

FIG.1 is a perspective view of a roasting machine in accordance with an embodiment;
FIG. 2 is a partial cross-sectional view of the roasting machine of FIG. 1;
FIG. 3 is a partial enlarged view of a portion A of the roasting machine of FIG. 2;
FIG. 4 is a partial enlarged view of a portion B of the roasting machine of FIG. 2;
FIG. 5 is a perspective view of a roller of the roasting machine of FIG. 2;
FIG. 6 is a front view of a first sealing member of the roasting machine of FIG. 2;
FIG. 7 is a cross-sectional view of the first sealing member of FIG. 6 taken along line C-C;
FIG. 8 is a cross-sectional view of the roller of the roasting machine of FIG. 2;
FIG. 9 is a cross-sectional view of a roller of a roasting machine in accordance with another embodiment;
FIG. 10 is a partial enlarged view of the roller of FIG. 9;
FIG. 11 is a partial enlarged view of a D portion of the roasting machine of FIG. 2;
FIG. 12 is a top view of the roasting machine of FIG.1.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0008] In order to facilitate understanding of the present disclosure, a more comprehensive description of a roasting machine will be provided below with reference to the accompanying drawings. A preferred embodiment of the roasting machine is given in the drawings.

However, the roasting machine can be implemented in many different forms and is not limited to the embodiments described in this disclosure. Rather, these embodiments are provided so that this disclosure of the roasting machine will be thorough and complete.

[0009] Unless the context clearly requires otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. The terms used in the description of the roasting machine in the present disclosure is merely for the purpose of describing specific embodiments and is not intended to limit the present disclosure. As used herein, the term "and / or" includes any and all combinations of one or more of the associated items in the list.

[0010] As shown in FIGS. 1 and 2, a roasting machine 10 of an embodiment is used for roasting a material into a fuel. The roasting machine 10 includes a tank 100, a first rotary feeder 200, a second rotary feeder 300, a furnace 400, and a roller 500, an air outlet pipe 600, and a driving assembly 700. The tank 100 defines a feeding cavity 110. The first rotary feeder 200 extends into the feeding cavity 110. The first rotary feeder 200 is used for inputting material. The second rotary feeder 300 extends into the feeding cavity 110. The second rotary feeder 300 is used for outputting fuel. The furnace 400 includes a furnace body 410 and an air delivery pipe 420. The furnace body 410 is communicated with the air delivery pipe 420. The furnace body 410 is used for generating hot air.

[0011] The roller 500 defines a first ventilation duct 510. The first ventilation duct 510 is communicated with the air delivery pipe 420. The hot air enters the first ventilation duct 510 via the air delivery pipe 420. The roller 500 is disposed in the feeding cavity 110 and is rotatably connected to the tank 100 and the air delivery pipe 420. The roller 500 pushes the material to move relative to the tank 100 and bakes the material into the fuel. Further referring to FIG. 3, the air outlet pipe 600 is rotatably connected to an end of the roller 500 remote from the air delivery pipe 420, and the air outlet pipe 600 is communicated with the first ventilation ducts 510. A power outlet end of the driving assembly 700 is connected to the roller 500. The driving assembly 700 drives the roller 500 to rotate relative to the tank 100, the air delivery pipe 420, and the air outlet pipe 600, respectively.

[0012] In this embodiment, the tank 100 has a cylindrical shape. The feeding cavity 110 is defined along an axial direction of the tank 100. The roller 500 is located within the feeding cavity 110, and two ends of the roller 500 extend outwardly from the tank 100, respectively. The two ends of the roller 500 are rotatably connected to the air delivery pipe 420 and the air outlet pipe 600, respectively. The furnace body 410 is a hot air furnace. The hot air generated by the furnace body 410 is introduced into the first ventilation duct 510 through the air delivery pipe 420, so that the hot air can heat the roller 500. After the first ventilation duct 510 of the roller 500 is introduced into the hot air, the roller 500 is heated, and the high temperature roller 500 bakes the material into the fuel. The first rotary feeder 200 and the second rotary feeder 300 are both disposed on the tank 100 and both extend into the feeding cavity 110. In other embodiments, the first rotary feeder 200 and the second rotary feeder 300 can also be communicated with the feeding cavity 110 via a pipeline (not shown).

[0013] Referring again to FIG. 1, the first rotary feeder 200 is provided at the top of the tank 100 and adjacent to the air delivery pipe 420. The second rotary feeder 300 is provided at the bottom of the tank 100 and adjacent to the air outlet pipe 600. Further referring to FIG. 2, the material enters the feeding cavity 110 from the first rotary feeder 200. The fuel in the feeding cavity 110 is discharged from the second rotary feeder 300. Both the first rotary feeder 200 and the second rotary feeder 300 are capable of preventing outside air from entering the feeding cavity 110, thereby improving the roasting efficiency of the roasting machine. In one of the embodiments, the number of the first rotary feeder 200 and the second rotary feeder 300 are both two, which can further prevent outside air from entering the feeding cavity 110. In other embodiments, the number of the first rotary feeders 200 and the second rotary feeders 300 can also be multiple.

[0014] As shown in FIG. 1, in one of the embodiments, the roasting machine 10 further includes a first base 800 and a second base 900. The tank 100 is disposed on the first base 800. The number of the second base 900 is at least two, and the roller 500 is rolled connected to the two second bases 900 respectively. In this embodiment, the number of the first base 800 and the second base 900 are both two. The two first bases 800 are arranged side by side and are located between the two second bases 900. The roller 500 is rolled connected to the two second bases 900 respectively.

[0015] As shown in FIGS. 2, 4, and 5, in one of the embodiments, the roasting machine 10 further includes a first sealing member 1100 and a second sealing member 1200. A first boss 520 and a second boss 530 are provided on the roller 500. Both of the first boss 520 and the second boss 530 extend along a circumferential direction of the roller 500, and the first boss 520 and the second boss 530 are both located in the feeding cavity 110. The first sealing member 1100 and the second sealing member 1200 are both sleeved on the roller 500, two sides of the first sealing member 1100 abut against end surfaces of the first boss 520 and the tank 100 respectively, and two sides of the second sealing member 1200 abut against end surfaces of the second boss 530 and the tank 100 remote from the first sealing member 1100 (as show in Fig. 4). When the hot air passes through the first ventilation duct 510 to heat the roller 500, the first sealing member 1100 and the second sealing member 1200 are thermally expanded and sealed to two ends between the roller 500 and the tank 100 respectively, which ensures the sealing of the feeding cavity 110 to make the roasting machine 10 with a good roasting effect.

[0016] As shown in FIGS. 2, 6, and 7, in this embodi-

ment, the first sealing member 1100 and the second sealing member 1200 are both elastic labyrinth seals. The first sealing member 1100 and the second sealing member 1200 have the same structure. Referring again to FIG. 5, the first boss 520 and the second boss 530 are both annular bosses and both extend along the circumferential direction of the roller 500. In other embodiments, both of the first boss 520 and the second boss 530 are not limited to annular bosses. In one of the embodiments, the first boss 520 includes a plurality of first boss units (not shown), and the plurality of first boss units are uniformly distributed along the circumferential direction of the roller 500. The first sealing members 1100 abut against the plurality of first boss units respectively. The second boss 530 includes a plurality of second boss units (not shown), and the plurality of second boss units are uniformly distributed along the circumferential direction of the roller 500. The second sealing members 1200 abut against the plurality of second boss units respectively.

[0017] As shown in FIGS. 2 and 5, in one of the embodiments, the roller 500 includes a roller body 500a and a spiral portion 500b. The roller body 500a is disposed in the feeding cavity 110 and rotatably connected to the tank 100, and two ends of the roller body 500a are rotatably connected to the air delivery pipe 420 and the air outlet pipe 600 respectively. The first ventilation duct 510 is defined in the roller body 500a. The first boss 520 and the second boss 530 are both disposed on the roller body 500a. The spiral portion 500b surrounds the roller body 500a and is connected to the roller body 500a. The spiral portion 500b is used for pushing the material to move relative to the tank 100. The spiral portion 500b pushes the material to move relative to the tank 100 as the spiral portion 500b pushes the roller body 500a to rotate relative to the tank 100. Since the spiral portion 500b surrounds the roller body 500a, the contact area between the material and the roller 500 is large, therefore a better effect of the roller 500 roasting material is achieved. In this embodiment, the roller body 500 has a cylindrical structure. The spiral portion 500b surrounds an outer wall of the roller body 500a, and the spiral portion 500b is attached to the outer wall of roller body 500a by welding. In other embodiments, the spiral portion 500b and the roller body 500a can also be integrally formed.

[0018] As shown in FIG. 8, in one of the embodiments, the spiral portion 500b defines a second ventilation duct 540 extending in a spiral direction of the spiral portion 500b. The second ventilation duct 540 is communicated with the first ventilation duct 510. The hot air can pass through the first ventilation duct 510 to heat the roller body 500a. The hot air can also pass through the second ventilation duct 540 to heat the spiral portion 500b. In this embodiment, both the entrance and the exit of the second ventilation duct 540 are communicated with the first ventilation duct 510, and the intermediate portion of the second ventilation duct 540 is spaced apart from the first ventilation duct 510 via the roller body 500a.

[0019] In other embodiments, the roller body 500a between the second ventilation duct 540 and the first ventilation duct 510 can also be removed. As shown in FIG. 9 and FIG. 10, in one of the embodiments, the roller body 500a further defines a first connection groove 514 communicated with the first ventilation duct 510, and the spiral portion 500b further defines a second connection groove 542 communicated with the second ventilation duct 540. Both of the first connection groove 514 and the second connection groove 542 extend in the spiral direction of the spiral portion 500b. The first connection groove 514 is communicated with the second connection groove 542 to reduce the weight of the roller 500.

[0020] As shown in FIGS. 5 and 11, in one of the embodiments, the spiral portion 500b includes a spiral body 550 and a feed sheet 560. The spiral body 550 surrounds the roller body 500a, and the spiral body 550 is connected to the roller body 500a. The second ventilation duct 540 is defined on the spiral body 550. The feed sheet 560 is provided on the spiral body 550. Providing the feed sheet 560 on the spiral body 550 allows the spiral portion 500b to better push the material and prevent the material from remaining on the inner wall of the feeding cavity 110. In this embodiment, the feed sheet 560 is attached to the spiral body 550 by welding. In other embodiments, the feed sheet 560 can also be connected the spiral body 550 via screw connection or other connection. In one of the embodiments, the number of the feed sheets 560 is multiple. The multiple feed sheets 560 are disposed on the spiral body 550 and spaced apart from each other.

[0021] It will be appreciated that in other embodiments, the spiral portion 500b can be replaced with multiple protrusions (not shown). In one of the embodiments, the roller 500 includes multiple projections disposed on the roller body 500a. The multiple protrusions are disposed on the outer wall of the roller body 500a and spaced apart from each other. The distribution of the multiple protrusions is spiral.

[0022] As shown in FIGS. 1, 2 and 3, in one embodiment, the roasting machine 10 further includes a first exhaust fan 1300 and a hot gas recovery pipeline 1400. The first exhaust fan 1300 is connected to the air outlet pipe 600 and the hot gas recovery pipeline 1400, respectively. An end of the hot gas recovery pipeline 1400 remote from the first exhaust fan 1300 is communicated with the furnace body 410. The hot gas after heating the roller 500 passes through the hot gas recovery pipeline 1400 to return to the furnace body 410, which can reduce the energy loss of the roasting machine 10. In this embodiment, the first exhaust fan 1300 is disposed on an end of the air outlet pipe 600 remote from the roller 500.

[0023] Referring again to FIG. 2, in one of the embodiments, the tank 100 includes a tank body 100a and an inner cylinder 100b. The tank body 100a is sleeved on the inner cylinder 100b, and a gap 100c exists between the tank body 100a and the inner cylinder 100b. The feeding cavity 110 is defined on the inner cylinder 100b. The peripheries of the first sealing member 1100 and the second sealing member 1200 abut against the inner cylinder

100b. Since the gap 100c exists between the tank body 100a and the inner cylinder 100b and the feeding cavity 110 is defined on the inner cylinder 100b, the inner wall of the feeding cavity 110 is spaced from the outer wall of the tank body 100a, which can reduce heat loss during the roller 500 bakes the material. In this embodiment, the tank body 100a and the inner cylinder 100b are both cylinders. The gap 100c exists between the tank body 100a and the inner cylinder 100b. The axis of the tank body 100a coincides with the axis of the inner cylinder 100b. In other embodiments, the axis of the tank body 100a and the axis of the inner cylinder 100b may not coincide with each other.

[0024] As shown in FIGS. 1 and 2, in one of the embodiments, the roasting machine 10 further includes a first pipeline 1500 and a second pipeline 1600. Two ends of the first pipeline 1500 extend into the air delivery pipe 420 and the tank body 100a respectively to make the air delivery pipe 420 communicated with the gap 100c. Two ends of the second pipeline 1600 extend into the tank body 100a and the air outlet pipe 600 respectively to make the gap 100c communicated with the air outlet pipe 600. The hot air generated by the furnace body 410 is introduced into the gap 100c through the air delivery pipe 420. The hot air passes through the gap 100c and heats the inner cylinder 100b, then passes through the second pipeline 1600 and is discharged into the air outlet pipe 600, so that the temperature of the inner cylinder 100b is maintained constant, which ensures the effect of the roller 500 roasting material.

[0025] Referring again to FIG. 1, in one of the embodiments, the roasting machine 10 further includes an exhaust pipeline 1700, a second exhaust fan 1800, and a dust removing assembly 1900. The exhaust pipeline 1700 extends into the inner cylinder 100b to be communicated with the feeding cavity 110. The second exhaust fan 1800 is connected to the exhaust pipeline 1700 and the dust removing assembly 1900 respectively, to draw the gas in the feeding cavity 110 into the dust removing assembly 1900. The dust removing assembly 1900 is used for removing dust in the gas. The roller 500 produces a dust-containing gas during the roasting of the material. The second exhaust fan 1800 draws the gas in the feeding cavity 110 into the dust removing assembly 1900 for dust removal, thereby avoiding air pollution caused by direct discharge into the air. In this embodiment, the exhaust pipeline 1700 extends into the inner cylinder 100b from the top of the tank body 100a to be communicated with the feeding cavity 110, and the exhaust pipeline 1700 is adjacent to the first rotary feeder 200. The dust removing assembly 1900 is cyclone separator.

[0026] During the roasting process, a gas containing dust and moisture is generated in the feeding cavity 110. Since the material enters the feeding cavity 110 via the first rotary feeder 200 and is pushed and baked by the high temperature roller 500, the material is finally converted into fuel, which is discharged from the second rotary feeder 300. When the roller 500 pushes the material to move relative to the feeding cavity 110, the roller 500 bakes the material simultaneously. The moisture in the material is continuously removed, which makes that the gas in the feeding cavity 110 and adjacent to the first rotary feeder 200 has a higher moisture content and a lower dust content, while the gas in the feeding cavity 110 and adjacent to the second rotary feeder 300 has a lower moisture content and a higher dust content.

[0027] As shown in FIGS. 1, 2, and 12, in one of the embodiments, the roasting machine 10 further includes a third exhaust fan 2100, a third pipeline 2200, and a fourth pipeline 2300. The third pipeline 2200 extends into the feeding cavity 110 from the outer wall of the tank body 100a, and the third pipeline 2200 is remote from the first rotary feeder 200. The fourth pipeline 2300 is communicated with the hot gas recovery pipeline 1400. The third exhaust fan 2100 is connected to the third pipeline 2200 and the fourth pipeline 2300, respectively. The third exhaust fan 2100 draws the gas in the feeding cavity 110 into the hot gas recovery pipeline 1400. The gas is discharged into the furnace body 410 for burning via the hot gas recovery pipeline 1400, therefore saving energy losses in the furnace body 410. In this embodiment, the third pipeline 2200 extends into the feeding cavity 110 from the top of the tank body 100a and is adjacent to the air outlet pipe 600. In one of the embodiments, the third pipeline 2200 and the second rotary feeder 300 are both disposed on the same circumference of the tank body 100a.

[0028] For example, the roasting machine 10 includes the tank 100, the first rotary feeder 200, the second rotary feeder 300, the furnace 400, the roller 500, the air outlet pipe 600, the driving assembly 700, the exhaust fan 1300, the hot gas recovery pipeline 1400, the first pipe 1500, and the second pipeline 1600. The tank 100 defines the feeding cavity 110. The first rotary feeder 200 extends into the feeding cavity 110 and inputs material. The second rotary feeder 300 extends into the feeding cavity 110 and outputs fuel. The furnace 400 includes the furnace body 410 and the air delivery pipe 420. The furnace body 410 is connected to the air delivery pipe 420. The furnace body 410 generates hot air.

[0029] The roller 500 defines the first ventilation duct 510. The first ventilation duct 510 is communicated with the air delivery pipe 420. The hot air enters the first ventilation duct 510 through the air delivery pipe 420. The roller 500 is disposed in the feeding cavity 110 and is rotatably connected to the tank 100. The roller 500 is rotatably connected to the air delivery pipe 420 to enable hot air to heat the roller 500. The roller 500 pushes the material to move relative to the tank 100 and bakes the material into the fuel. Further referring to FIG. 3, the air outlet pipe 600 is rotatably connected to the end of the roller 500 remote from the air delivery pipe 420, and the air outlet pipe 600 is communicated with the first Ventilation ducts 510. The power outlet end of the driving assembly 700 is connected to the roller 500. The driving assembly 700 drives the roller 500 to rotate relative to the tank 100, the air delivery pipe 420, and the air outlet

pipe 600, respectively. The hot air is discharged from the air outlet pipe 600 after heating the roller 500, such that the roller 500 pushes the material to move relative to the tank 100 and bakes the material to be converted to the fuel at the same time. Since the material to be baked can continue to be fed into the feeding cavity 110 via the first rotary feeder 200, the roller 500 can also continuously push and bake the material, and the fuel formed after roasting can also be continuously output via the second rotary feeder 300, thereby achieving a continuous roasting operation. Therefore, the above-described roasting machine 10 has a high work efficiency.

[0030] The roasting machine 10 also includes the first sealing member 1100 and the second sealing member 1200. The roller 500 includes the roller body 500a and the spiral portion 500b. The roller body 500a is disposed in the feeding cavity 110 and is rotatably connected to the tank 100. Two ends of the roller body 500a are rotatably connected to the air delivery pipe 420 and the air outlet pipe 600 respectively. The first ventilation duct 510 is defined in the roller body 500a. The first boss 520 and the second boss 530 are both disposed on the roller body 500a. The spiral portion 500b surrounds the roller body 500a and is connected to the roller body 500a. The spiral portion 500b is used for pushing the material to move relative to the tank 100. When the spiral portion 500b rotates relative to the tank 100 with the roller body 500a, the spiral portion 500b pushes the material to move relative to the tank 100. Since the spiral portion 500b surrounds the roller body 500a, the contact area between the material and the roller 500 is large, which achieves a better effect of the roller 500 roasting material.

[0031] Both of the first boss 520 and the second boss 530 extend in the circumferential direction of the roller body 500a. The first boss 520 and the second boss 530 are located in the feeding cavity 110. The first sealing member 1100 and the second sealing member 1200 are respectively sleeved on the roller 500. Two sides of the first sealing member 1100 abut against end surfaces of the first boss 520 and the tank 100 respectively. Two sides of the second sealing member 1200 abut against end surfaces of the second boss 530 and the tank 100 remote from the first sealing member 1100 respectively (shown in Fig. 4).

[0032] When the hot air passes through the first ventilation duct 510 to heat the roller 500, the first sealing member 1100 and the second sealing member 1200 are thermally expanded and seal two ends between the roller 500 and the tank 100 respectively, thereby ensuring the sealing of the feeding cavity 110, which makes that the roasting machine 10 has a good roasting effect. The spiral portion 500b defines the second ventilation duct 540 extending in the spiral direction of the spiral portion 500b. The second ventilation duct 540 is communicated with the first ventilation duct 510. The hot air can pass through the first ventilation duct 510 to heat the roller body 500a. The hot air can also pass through the second ventilation duct 540 to heat the spiral portion 500b.

[0033] The first exhaust fan 1300 is connected to the air outlet pipe 600 and the hot gas recovery pipeline 1400, respectively. The end of the hot gas recovery pipeline 1400 remote from the first exhaust fan 1300 is communicated with the furnace body 410. The hot gas after heating the roller 500 passes through the hot gas recovery pipe 1400 to return to the furnace body 410, which can reduce the energy loss of the roasting machine 10.

[0034] Two ends of the first pipeline 1500 extend into the air delivery pipe 420 and the tank body 100a respectively, so that the air delivery pipe 420 is communicated with the gap 100c. Two ends of the second pipeline 1600 extend into the tank body 100a and the air outlet pipe 600 respectively, so that the gap 100c is communicated with the air outlet pipe 600. The hot air generated by the furnace body 410 is introduced into the gap 100c via the air delivery pipe 420. The hot air passes through the gap 100c and heats the inner cylinder 100b, then passes through the second pipeline 1600 and is discharged into the air outlet pipe 600, so that the temperature of the inner cylinder 100b is maintained constant, which ensures the effect of the roller 500 roasting material.

[0035] Referring again to FIG. 1, in one of the embodiments, the driving assembly 700 includes the motor 710, the first gear 720, and the second gear 730. The first gear 720 is disposed on the power outlet end of the motor 710. The second gear 730 is sleeved on the roller body 500a. The first gear 720 is meshed with the second gear 730, to make the driving assembly 700 to drive the roller body 500a to rotate relative to the tank 100, the air delivery pipe 420, and the air outlet pipe 600, respectively. In one of the embodiments, the driving assembly 700 further includes a frequency converter (not shown) which is communicatively connected to a control end of the motor 710. The frequency converter is used for controlling the speed of the motor 710. Both of the tank 100 and the roller body 500a are horizontally disposed. The user can adjust the speed of the motor 710 through the frequency converter.

[0036] In the above-described roasting machine 10, the roller 500 is disposed in the feeding cavity 110 and is rotatably connected to a tank 100; the driving assembly 700 drives the roller 500 to rotate relative to the tank 100, the air delivery pipe 420, and the air outlet pipe 600, respectively. The material to be baked is fed into the feeding cavity 110 from the first rotary feeder 200. The roller 500 pushes the material to move relative to the tank 100, and bakes the material into fuel. The fuel is finally output from the second rotary feeder 300. Since the roller 500 defines the first ventilation duct 510 and the first ventilation duct 510 is respectively communicated with the air delivery pipe 420 and the air outlet pipe 600, the hot air generated by the furnace body 410 is input into the first ventilation duct 510 via the air delivery pipe 420 to heat the roller 500 and is discharged from the air output pipe 600 after heating the roller 500, such that the roller 500 pushes the material to move relative to the tank 100 and bakes the material to convert the material into fuel at the same. Since the material to be baked can be continuously fed

into the feeding cavity 110 via the first rotary feeder 200, the roller 500 can also continuously push and bake the material, and the fuel formed after roasting can also be continuously output via the second rotary feeder 300, thereby achieving a continuous roasting operation. Therefore, the above-described roasting machine 10 has a high work efficiency.

[0037] The technical features of the foregoing embodiments can be combined arbitrarily. For the sake of brevity of description, all possible combinations of the technical features in the above embodiments are not described. However, as long as there is no collision between the combinations of these technical features, all combinations should be considered as the scope of this manual.

[0038] The foregoing implementations are merely specific embodiments of the present disclosure, and are not intended to limit the protection scope of the present disclosure. It should be noted that any variation or replacement readily figured out by persons skilled in the art within the technical scope disclosed in the present disclosure shall all fall into the protection scope of the present disclosure. Therefore, the protection scope of the present disclosure shall be subject to the protection scope of the claims.

Claims

1. A roasting machine for roasting a material into a fuel, comprising:

   a tank defining a feeding cavity;
   a first rotary feeder extending into the feeding cavity, configured to input the material;
   a second rotary feeder extending into the feeding cavity, configured to output the fuel;
   a furnace comprising a furnace body and an air delivery pipe, the furnace body being communicated with the air delivery pipe, and the furnace body being configured to generate hot air;
   a roller defining a first ventilation duct, wherein the first ventilation duct is communicated with the air delivery pipe; the roller is disposed in the feeding cavity and is rotatably connected to the tank and the air delivery pipe; and the roller is configured to push the material to move relative to the tank, and bake the material into the fuel;
   an air outlet pipe rotatably connected to an end of the roller remote from the air delivery pipe and communicated with the first ventilation duct; and
   a driving assembly, wherein a power output end of the drive assembly is connected to the roller, and the driving assembly drives the roller to rotate relative to the tank, the air delivery pipe, and the air outlet pipe, respectively.

2. The roasting machine according to claim 1, further comprising a first sealing member and a second sealing member; wherein the roller is provided with a first boss and a second boss, both of the first boss and the second bosses extend along a circumferential direction of the roller, the first boss and the second boss are both located in the feeding cavity; the first sealing member and the second sealing member are both sleeved on the roller, two sides of the first sealing member are respectively abutted on end surfaces of the first boss and the tank, and two sides of the second sealing member are respectively abutted on end surfaces of the second boss and the tank remote from the first sealing member.

3. The roasting machine according to claim 2, wherein the roller comprises a roller body and a spiral portion; the roller body is disposed in the feeding cavity and rotatably connected to the tank, two ends of the roller body are respectively rotatably connected to the air delivery pipe and the air outlet pipe; the first ventilation duct is defined in the roller body; the first boss and the second boss are both provided on the roller body; the spiral portion surrounds the roller body, the spiral portion is connected to the roller body, and the spiral portion is configured to push the material to move relative to the tank.

4. The roasting machine according to claim 3, wherein the spiral portion defines a second ventilation duct extending in a spiral direction of the spiral portion, and the second ventilation duct is communicated with the first ventilation duct.

5. The roasting machine according to claim 3 or 4, wherein the spiral portion comprises a spiral body and a feed sheet, the spiral body surrounds the roller body, and the spiral body is connected to the roller body; the second ventilation duct is defined on the spiral body; and the feed sheet is disposed on the spiral body.

6. The roasting machine according to any one of claims 2 to 4, further comprising a first exhaust fan and a hot gas recovery pipeline; the first exhaust fan is connected to the air outlet pipe and the hot gas recovery pipeline respectively; an end of the hot gas recovery pipeline remote from the first exhaust fan is communicated with the furnace body.

7. The roasting machine according to claim 6, wherein the tank comprises a tank body and an inner cylinder, the tank body is sleeved on the inner cylinder, and a gap exists between the tank body and the inner cylinder; the feeding cavity is defined on the inner cylinder; peripheries of the first and second seal members abut on the inner cylinder.

8. The roasting machine according to claim 7, further comprising a first pipeline and a second pipeline;

wherein two ends of the first pipeline extend into the air delivery pipe and the tank body respectively, so that the air delivery pipe is communicated with the gap; two ends of the second pipeline extend into the tank body and the air outlet pipe respectively, so that the gap is communicated with the air outlet pipe.

9. The roasting machine according to claim 7, further comprising an exhaust pipeline, a second exhaust fan, and a dust removing assembly; wherein the exhaust pipeline extends into the inner cylinder to be communicated with the feeding cavity, the second exhaust fan is communicated with the exhaust pipeline and the dust removing assembly respectively to draw gas in the feeding cavity into the dust removing assembly; and the dust removing assembly is configured to remove dust in the gas.

10. The roasting machine according to claims 3 or 4, wherein the driving assembly comprises a motor, a first gear and a second gear, the first gear is disposed on the power output end of the motor, the second gear is sleeved on the roller body, the first gear meshes with the second gear to drive the driving assembly to drive the roller body to rotate relative to the tank, the air delivery pipe, and the air outlet pipe respectively.

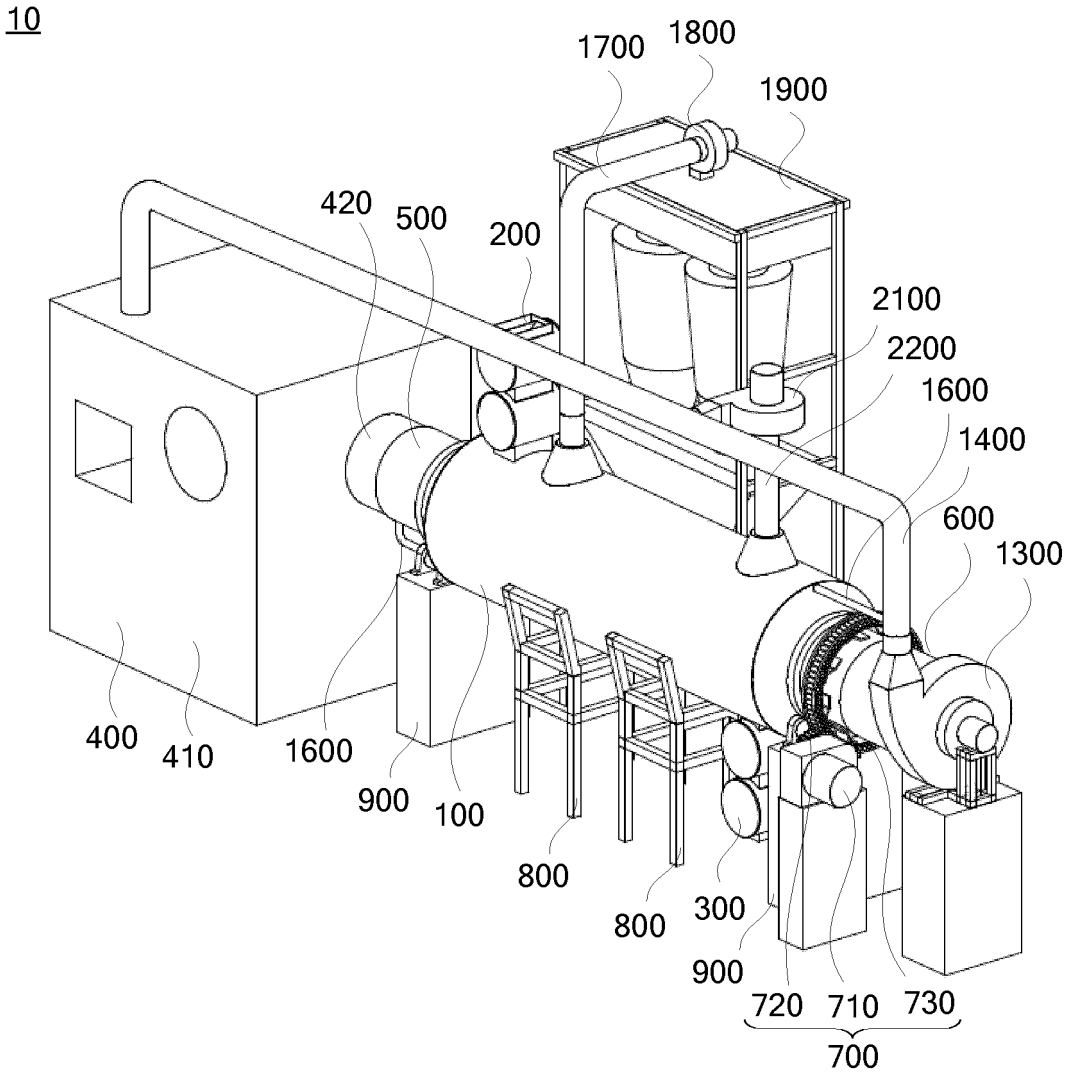
10
1700
1800
1900
420
500
200
2100
2200
1600
1400
600
1300
400
410
1600
900
100
800
800
300
900
720
710
730
700

FIG. 1

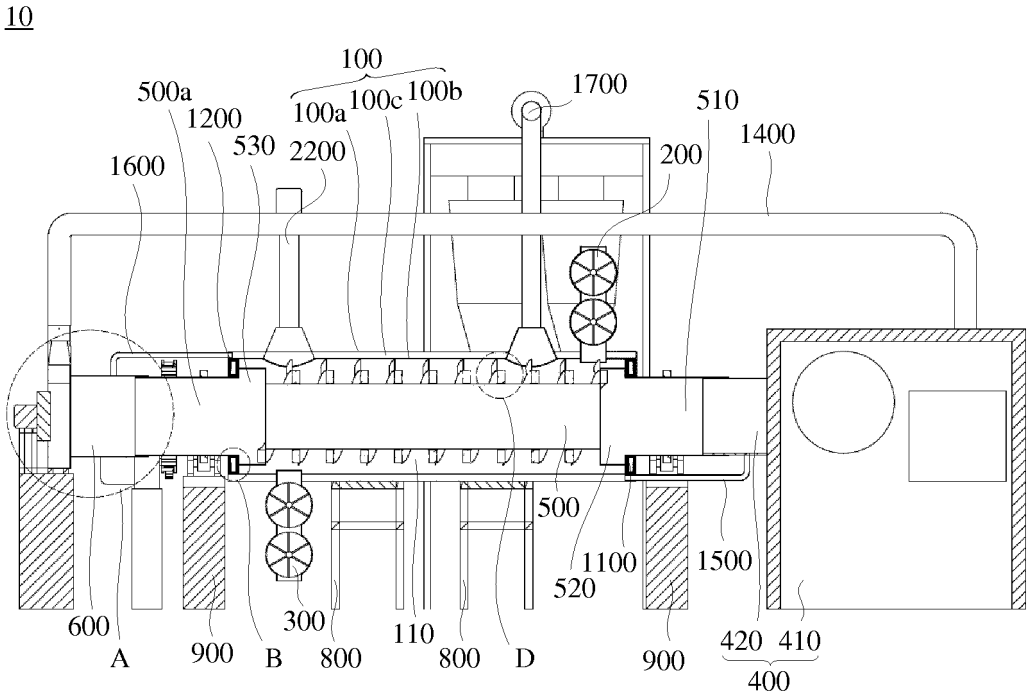
10
100
500a
1200
530
2200
100a
100c
100b
1700
510
1400
1600
200
500
1100
520
1500
600
A
900
B
300
800
110
800
D
900
420
410
400

FIG. 2

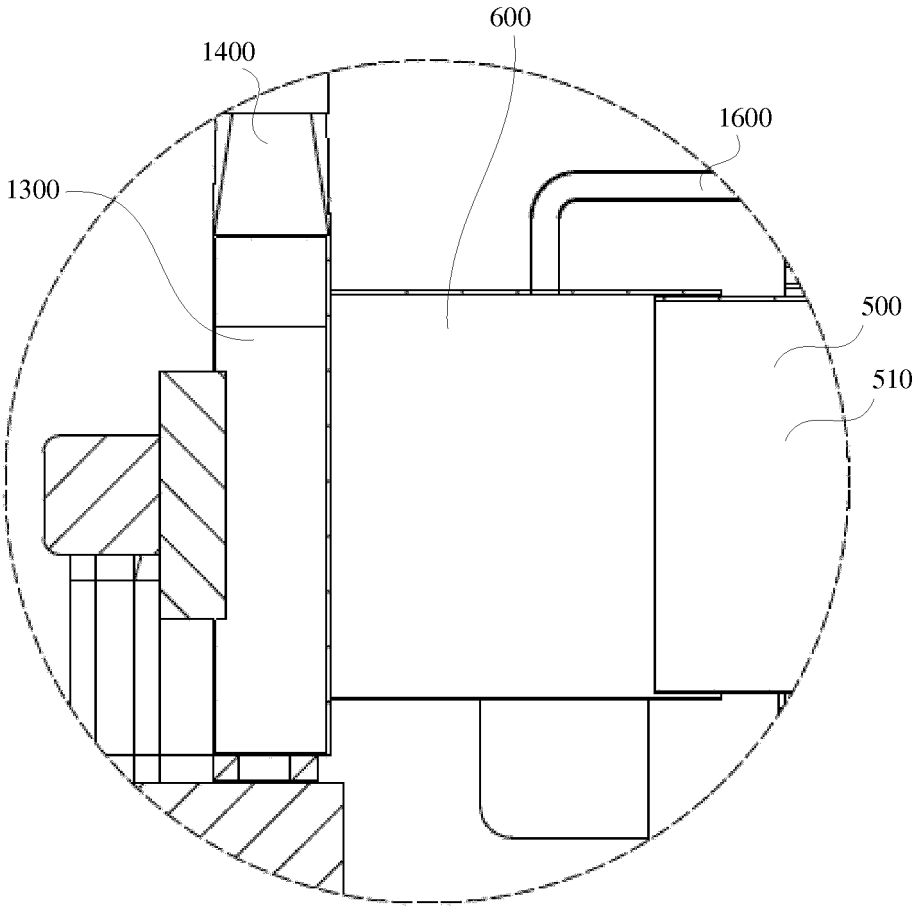

FIG. 3

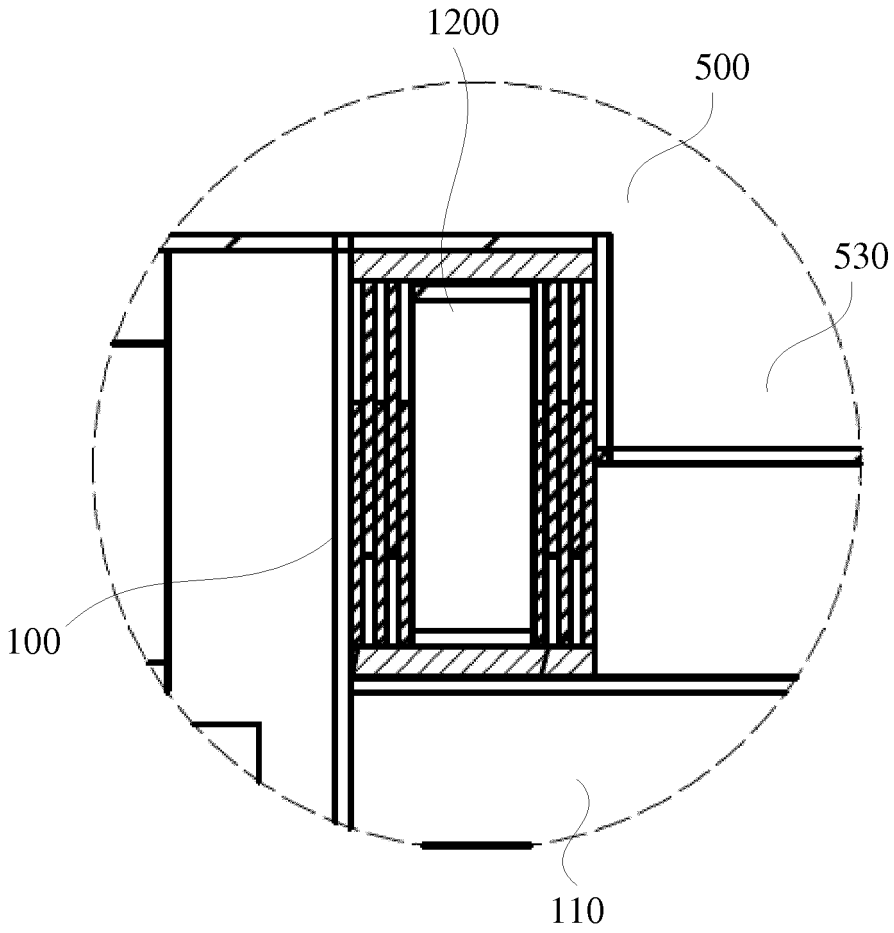

FIG. 4

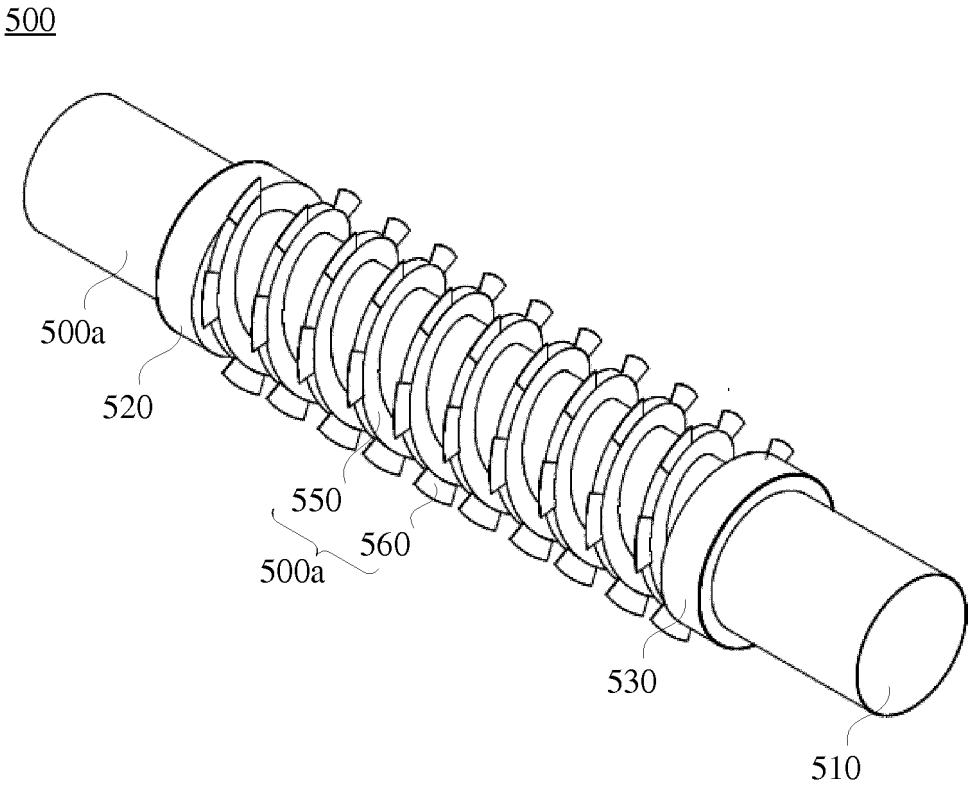

FIG. 5

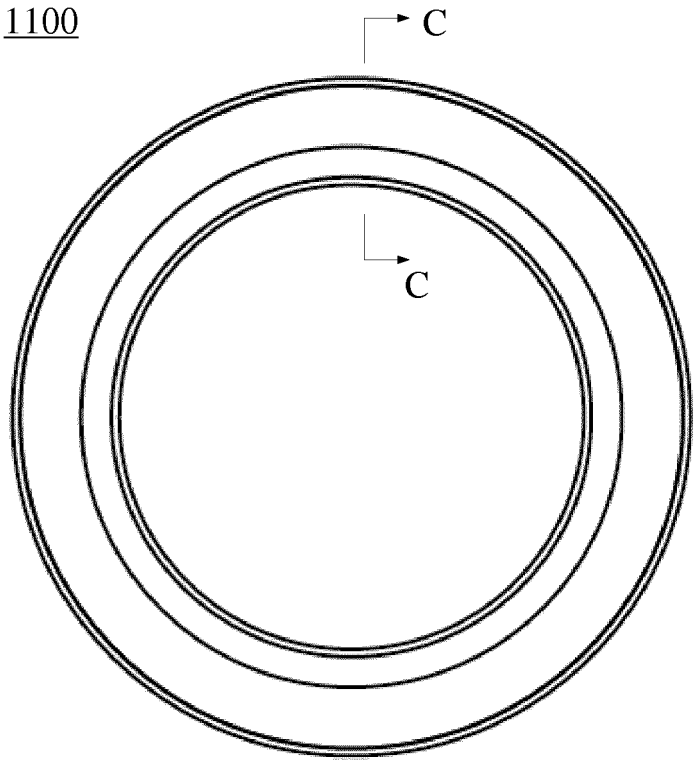

FIG. 6

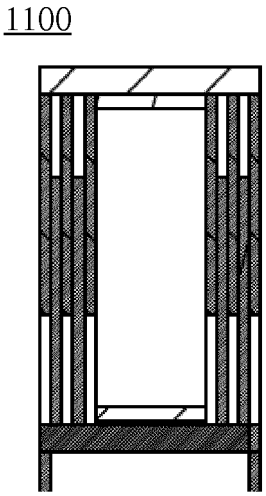

FIG. 7

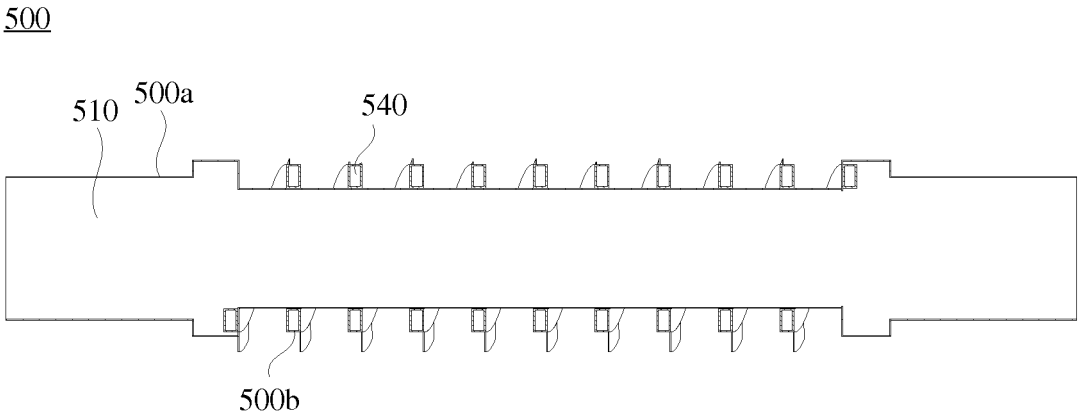

FIG. 8

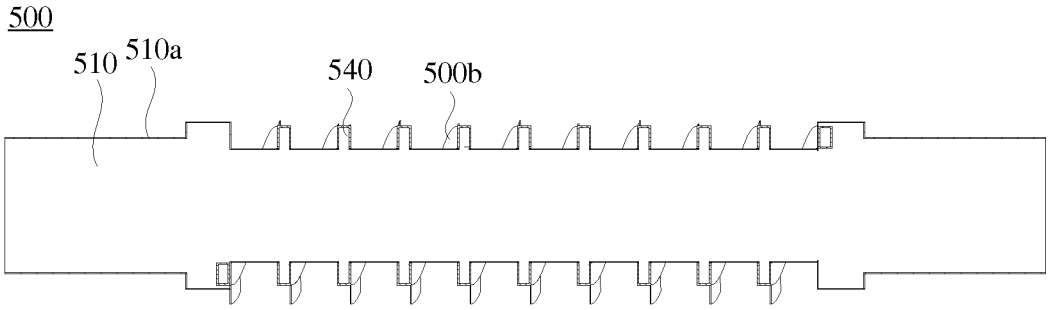

FIG. 9

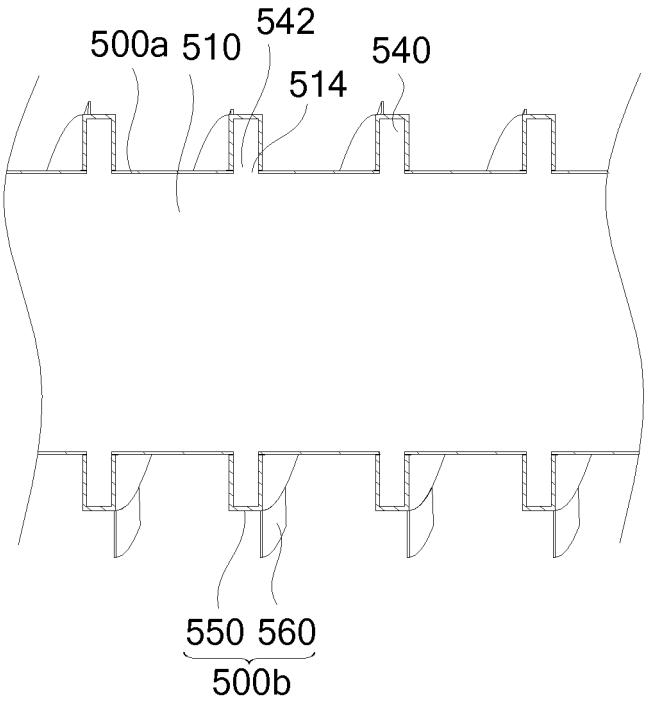

FIG. 10

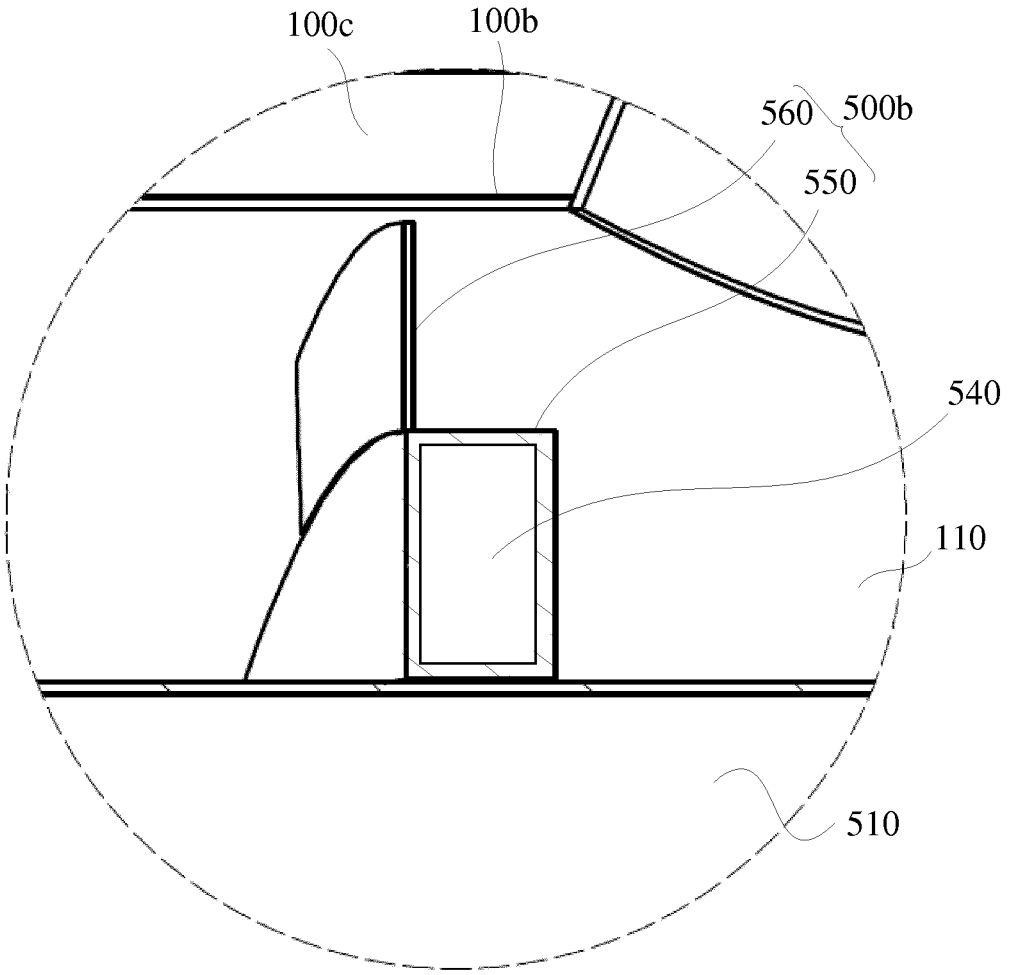

FIG. 11

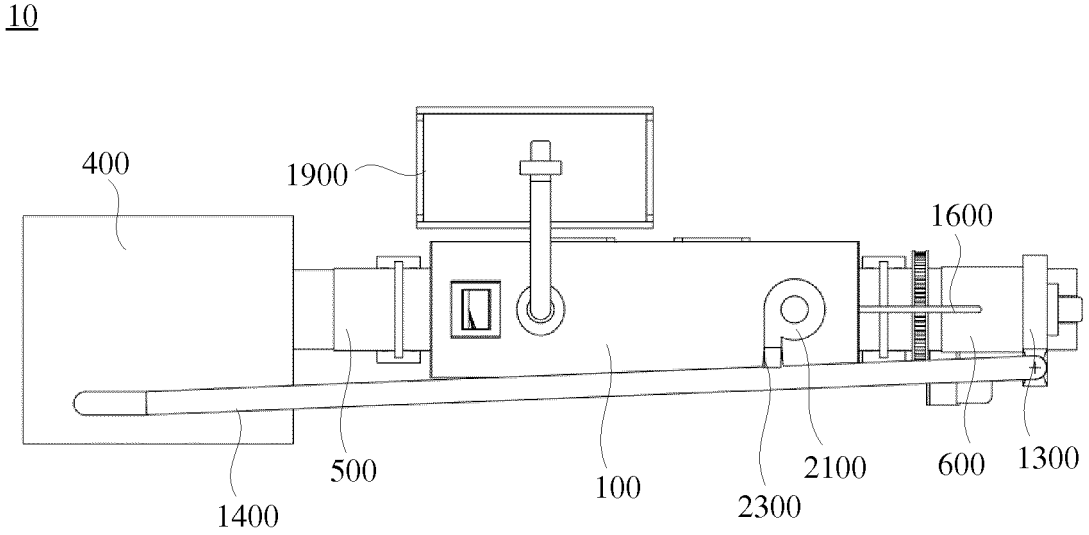

FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/096535

A. CLASSIFICATION OF SUBJECT MATTER

F26B 17/18 (2006.01) i; F26B 21/00 (2006.01) i; F26B 3/24 (2006.01) i; F26B 23/10 (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)

F26B; C10L; F23G; F28F

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)

EPODOC, VEN, CNTXT, CNABS, CNKI: 干燥, 烘焙, 物料, 燃料, 螺旋, 热风, 换热, 旋转, 转动, 滚筒, dry, bake, materiel, fuel, solid, biomass, screw, spiral, helix, hot, wind, air, heat, exchange, rotat+, rotary, kiln, drum, roller

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2017019449 A1 (ARTISAN IND.), 02 February 2017 (02.02.2017), description, paragraphs [0104]-[0145], and figures 3-17	1-10
Y	CN 103249818 A (TEAL SALES INCORPORATED), 14 August 2013 (14.08.2013), description, paragraphs [0046]-[0080], and figures 2-11	1-10
Y	US 2008295356 A1 (THERMA FLITE INC.), 04 December 2008 (04.12.2008), description, paragraphs [0040]-[0047], and figures 1-3	4-5
A	CN 105115265 A (JIANG, Shijie), 02 December 2015 (02.12.2015), entire document	1-10
A	CN 203011096 U (WEIHUI XINCHANG MACHINERY MANUFACTURING FACTORY), 19 June 2013 (19.06.2013), entire document	1-10
A	US 4376343 A (WHITE, H.J. et al.), 15 March 1983 (15.03.1983), entire document	1-10
A	CN 102216720 A (THERMA-FLITE, INC.), 12 October 2011 (12.10.2011), 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

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 November 2017	20 November 2017
Name and mailing address of the ISA 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 CHANG, Mengyuan Telephone No. (86-10) 62084961

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/096535

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
WO 2017019449 A1	02 February 2017	None	
CN 103249818 A	14 August 2013	AU 2011311977 A1	11 April 2013
		CN 106595250 A	26 April 2017
		US 8246788 B2	21 August 2012
		US 9359556 B2	07 June 2016
		US 2012159842 A1	28 June 2012
		SG 192451 A1	30 August 2013
		WO 2012048146 A1	12 April 2012
		TW 201231900 A	01 August 2012
		CL 2013000932 A1	27 September 2013
		EA 201390492 A1	30 September 2013
		US 2013228444 A1	05 September 2013
		TW I577956 B	11 April 2017
		SG 189111 A1	31 May 2013
		US 2012085023 A1	12 April 2012
		US 8252966 B2	28 August 2012
		AU 2011311977 B2	22 January 2015
		KR 20140035866 A	24 March 2014
		CA 2812777 A1	12 April 2012
		EP 2625253 A1	14 August 2013
		CA 2812777 C	20 June 2017
		EA 026196 B1	31 March 2017
		SG 189111 B	31 July 2013
		BR 112013008504 A2	25 July 2017
		SG 192451 B	13 September 2013
		HK 1187944 A0	17 April 2014
		HK 1187945 A0	17 April 2014
		KR 1727967 B1	18 April 2017
		NZ 608923 A	30 April 2014
		IN 201303231 P4	25 July 2014
US 2008295356 A1	04 December 2008	None	
CN 105115265 A	02 December 2015	None	
CN 203011096 U	19 June 2013	None	
US 4376343 A	15 March 1983	None	
CN 102216720 A	12 October 2011	US 2010051233 A1	04 March 2010
		WO 2010028008 A1	11 March 2010
		KR 20110060918 A	08 June 2011

Form PCT/ISA/210 (patent family annex) (July 2009)