(12) STANDARD PATENT (11) Application No. **AU 2010295138 B2**
(19) AUSTRALIAN PATENT OFFICE

(54) Title
External combustion and internal heating type coal retort furnace

(51) International Patent Classification(s)
C10B 53/04 (2006.01) ***C10B 47/00*** (2006.01)

(21) Application No: **2010295138** (22) Date of Filing: **2010.09.10**

(87) WIPO No: **WO11/032354**

(30) Priority Data

(31) Number	(32) Date	(33) Country
200910092456.4	**2009.09.15**	**CN**

(43) Publication Date: **2011.03.24**
(44) Accepted Journal Date: **2015.02.26**

(71) Applicant(s)
Beijing Guodian Futong Science and Technology Development Co., Ltd.

(72) Inventor(s)
Liu, Zhenqiang;Zhang, Yi;Miao, Wenhua;Zhang, Xuhui;Shi, Changjiang;Bai, Zhonghua;Yu, Qian

(74) Agent / Attorney
Shelston IP, L 21 60 Margaret St, Sydney, NSW, 2000

(56) Related Art
CN 101381609 A
US 3573194 A

(12) 按照专利合作条约所公布的国际申请

(19) 世界知识产权组织
国 际 局

(43) 国际公布日
2011 年 3 月 24 日 (24.03.2011)

PCT

(10) 国际公布号
WO 2011/032354 A1

(51) 国际专利分类号:
C10B 53/04 (2006.01) *C10B 47/00* (2006.01)

(21) 国际申请号: PCT/CN2010/001393

(22) 国际申请日: 2010 年 9 月 10 日 (10.09.2010)

(25) 申请语言: 中文

(26) 公布语言: 中文

(30) 优先权:
200910092456.4 2009 年 9 月 15 日 (15.09.2009) CN

(71) 申请人 (对除美国外的所有指定国): **北京国电富通科技发展有限责任公司 (BEIJING GUODIAN FUTONG SCIENCE AND TECHNOLOGY DEVELOPMENT CO., LTD.)** [CN/CN]; 中国北京市丰台区南四环西路 188 号总部基地六区 13 号楼, Beijing 100070 (CN)。

(72) 发明人; 及

(75) 发明人/申请人 (仅对美国): **刘振强 (LIU, Zhenqiang)** [CN/CN]; 中国北京市丰台区南四环西路 188 号总部基地六区 13 号楼, Beijing 100070 (CN)。 **张毅 (ZHANG, Yi)** [CN/CN]; 中国北京市丰台区南四环西路 188 号总部基地六区 13 号楼, Beijing 100070 (CN)。 **苗文华 (MIAO, Wenhua)** [CN/CN]; 中国北京市丰台区南四环西路 188 号总部基地六区 13 号楼, Beijing 100070 (CN)。 **张旭辉 (ZHANG, Xuhui)** [CN/CN]; 中国北京市丰台区南四环西路 188 号总部基地六区 13 号楼, Beijing 100070 (CN)。 **石长江 (SHI, Changjiang)** [CN/CN]; 中国北京市丰台区南四环西路 188 号总部基地六区 13 号楼, Beijing 100070 (CN)。 **白中华 (BAI, Zhonghua)** [CN/CN]; 中国北京市丰台区南四环西路 188 号总部基地六区 13 号楼, Beijing 100070 (CN)。

(74) 代理人: **北京三聚阳光知识产权代理有限公司 (SUNSHINE INTELLECTUAL PROPERTY INTERNATIONAL CO., LTD.)**; 中国北京市海淀区彩和坊路 11 号华一控股大厦 11 层 1103 室, Beijing 100080 (CN)。

(81) 指定国 (除另有指明，要求每一种可提供的国家保护): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP,

[见续页]

(54) **Title**: EXTERNAL COMBUSTION AND INTERNAL HEATING TYPE COAL RETORT FURNACE

(54) **发明名称** : 一种外燃内热式煤干馏炉

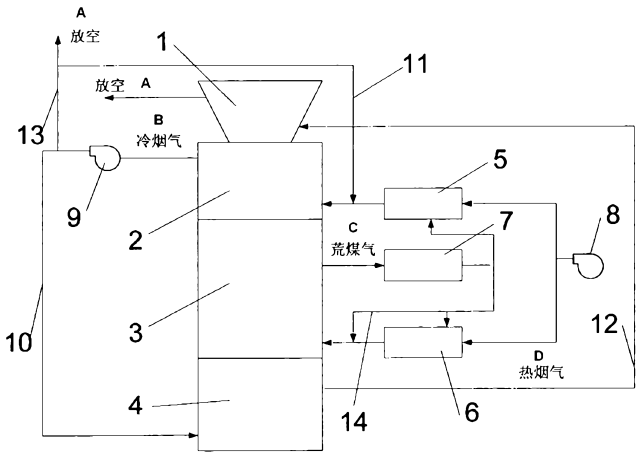

图 2 / **Fig.** 2

A: GAS BLOW-OFF
B: COLD FLUE GAS
C: RAW GAS
D: HOT FLUE GAS

(57) **Abstract**: An external combustion and internal heating type coal retort furnace comprises a drying section used for drying raw coal material, a retort section used for retorting the dried raw coal material, a cooling section used for cooling the retorted products from the retort section, and a cold flue gas pipeline used for ducting the cold flue gas produced in the drying section into the cooling section. The said coal retort furnace is energy saving and environmental friendly, and ensures improved retorting efficiency on the whole.

(57) **摘要**:

一种外燃内热式煤干馏炉，包括:用来对原料煤进行干燥处理的干燥段;用来对经过干燥处理的原料煤进行干馏处理的干馏段;用来对干馏段中产出的干馏产品进行冷却处理的冷却段;以及将所述干燥段产生的冷烟气导通至冷却段的冷烟气管道。该外燃内热式煤干馏炉节能环保，并提高了整体的干馏效率。

WO 2011/032354 A1

KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW。

(84) **指定国** (除另有指明，要求每一种可提供的地区保护): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), 欧亚 (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), 欧洲 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)。

根据细则 4.17 的声明:

— 关于申请人有权申请并被授予专利(细则 4.17(ii))

— 关于申请人有权要求在先申请的优先权(细则 4.17(iii))

— 发明人资格(细则 4.17(iv))

本国际公布:

— 包括国际检索报告(条约第 21 条(3))。

— 包括经修改的权利要求(条约第 19 条(1))。

201029513 8 08 Oct 2014

EXTERNAL BURNING AND INTERNAL HEATING TYPED COAL CARBONIZATION FURNACE

FIELD OF THE INVENTION

This invention relates to a coal carbonization furnace, especially relates to an external burning and internal heating typed coal carbonization furnace.

BACKGROUND OF THE INVENTION

Carbonization refers to heating and decomposing solid or organics under the condition of air isolation. The products after carbonization can be gas, steam and solid residue. Gas and liquid are produced after the mixture of the gas and the steam is cooled.

Carbonization has been familiar to people for many years. For example, woods are carbonized for producing charcoal, meanwhile, the products such as methanol and pyroligneous acid are produced. In the chemical processing of coal, carbonization is a very important step. After carbonization, the composition of raw coal and the aggregating state thereof will be changed. And the products after carbonization comprise solid, gaseous and liquid substances, such as semi-coke, tar oil, ammonia liquor and coke-oven gas.

Carbonization is generally operated intermittently, but the types of carbonization devices may vary in terms of types of raw materials and purpose, such as external burning typed device and spontaneous burning device. The external burning refers to externally providing heat to the enclosed carbonization furnace made of metals or fireproof materials, in

which the raw materials are provided. Nowadays, carbonization devices are mostly external burning typed. The spontaneous burning refers to introducing a certain amount of air into carbonization furnace in the process of carbonization so as to allow partial raw materials for carbonization to burn and release heat, which may lead to low utilization rate of the raw materials and may further result in the small scale of use of the spontaneous burning typed carbonization device.

In the prior art, most of the external burning typed coal carbonization furnaces used refers to the Lurgi furnace of 1930s of 20th century and the improved furnaces based on it.

Lurgi furnace is also called three-zone furnace. Referring to Fig. 1, the three-zone furnace comprises drying zone, carbonization zone and cooling zone. Solid raw materials are conveyed into coal bunker by the conveyor belt arranged at the top of the furnace, and evenly arranged in the drying zone 100; combustible gas is mixed with air and then combust in the burning chamber 500 of the drying zone, after that the recycle drying gas from an archway is introduced for mixing so as to produce the heat carrier, and a circulation air fan for drying is used for blowing the heat carrier to the drying zone 200 through the archway provided underneath the drying zone 200, in order to dry the raw coal materials.

Tail gases are evacuated from a chimney through the archway provided above the drying zone 200. The dried coal is conveyed to the carbonization zone 300. The temperature of the hot gases produced after the combustible gases are burnt with air in the burning chamber 600 of the carbonization zone reaches 1100℃, and the hot gases are then mixed with secondary coal gas to produce a heat carrier at 700-800℃, and then the heat carrier contacts with coal so as to carbonize it at 450-500°C and steam out

oil and gas. The waste coal gas produced from the carbonization zone is introduced into the post-treating system 700 for removing tar oil. After the coal cubes are burnt into semi-cokes, the semi-cokes are then conveyed into cooling zone 400, and then after cooled with tertiary coal gas, after that, the cooled semi-cokes are conveyed into coke hopper, and then drop on the convey belt , finally, the semi-cokes are conveyed out .

Regarding the improvement of the Lurgi furnace, it mainly refers to evenly arranging the raw materials, reducing the resistance of recycle gas, improving heat-supply condition, improving the ash discharging device, and simplifying the structure of device, and so on. But there are still some shortcomings with the improved Lurgi furnace as bellow:

Firstly, the efficiency of carbonization is very low, because most of the cold flue gases are evacuated directly without being utilized;

secondly, the coal in the drying zone contains a great amount of water, which results in the fact that the coal still contains a great amount of water (above 1wt%(weight percentage)) when entering the carbonization zone, and this may significantly affect the efficiency of carbonization;

thirdly, the waste coal gases are processed before being introduced to the cooling zone for quenching coke, then the tail gases pass by the coal cube layer and are finally evacuated from the chimney, therefore, the waste heat of the coal gases heated in the cooling zone is not utilized, thereby causing a waste of heat energy.

SUMMARY OF INVENTION

In view of the above-described problems, it is one objective of the invention to provide an external burning and internal heating typed coal

carbonization furnace that may allow the waste heat of the coal gases after passing by the cooling layer to preheat the coal layer which is not dried, so as to improve the efficiency of coal carbonization.

To achieve the above objective, in accordance with one embodiment of the invention, there is provided:

An external burning and internal heating typed carbonization furnace for coal, wherein from top to bottom, comprising: a preheating zone, for preheating raw coals; and a drying zone, for drying the raw coals and producing cold flue gas at the same time; and a carbonization zone, for carbonizing the dried raw coals into carbonized products; and a cooling zone, for cooling the carbonized products with the cold flue gas; and the cold flue gas produced from the drying zone are introduced into a cold flue gas pipe of the cooling zone; the cold flue gas is heated into hot flue gas after passing through the cooling zone for cooling, and the coal carbonization furnace further comprises a tail gas pipe for introducing the hot flue gas to the preheating zone.

The cold flue gas pipe is connected to a cycle power device, which allows the cold flue gas in the drying zone to flow from the cold flue gas pipe to the cooling zone, and then flow from the tail gas pipe to the preheating zone.

The cycle power device is circulation fan.

The cold flue-gas pipe is connected to a ventilation pipe which is used for evacuating surplus cold flue gas from the cooling zone.

Waste coal gas outlet of the carbonization zone is connected with a post-treating system for removing the tar oil in the waste coal gas produced

in the process of carbonizing the raw coal in the carbonization zone.

A drying burner is respectively connected with the flue gas outlet of the post-treating system and the drying zone and arranged therebetween, for burning partial coal gas produced by the post-treating system, so as to produce drying flue gas for drying in the drying zone.

A drying pipe is respectively connected with the cold flue gas pipe and the flue-gas outlet of the drying burner and arranged therebetween, for mixing partial cold flue gas produced from the drying zone with the drying flue gas, in order to adjust the temperature for drying in the drying zone.

A carbonization burner is respectively connected with the flue gas outlet of the post-treating system and the carbonization zone and arranged therebetween, for burning partial coal gas produced by the post-treating system so as to produce carbonization flue gas for carbonization in the carbonization zone.

A carbonization pipe is respectively connected with the flue gas outlet of the post-treating system and the flue gas outlet of the carbonization burner and arranged therebetween, for mixing partial coal gas produced by the post-treating system with the carbonization flue gas in order to adjust the temperature for carbonization in the carbonization zone.

A combustion-supporting air fan is connected with the flue gas inlet of the drying burner and/ or the gas inlet of the carbonization burner, for providing combustion-supporting air for the drying burner and/or the carbonization burner respectively.

Advantages of the invention are summarized below:

1. External burning and internal heating typed coal carbonization furnace of the invention sufficiently utilizes the cold coal gas produced to

cool the carbonized products, so as to improve the efficiency of carbonization; meanwhile, it also removes sulphur contained in the flue gas, so as to save energy and protect the environment.

2. the external burning and internal heating typed coal carbonization furnace of the invention, comprising preheating zone, drying zone, carbonization zone and cooling zone, allows the hot flue gas after passing by the cooling zone to preheat the raw coal, which not only sufficiently utilizes the waste heat of the flue gas, but also removes sulphur from the flue gas in the process of cooling the semi-coke, so as to save energy and make the furnace environmentally protective.

3. the external burning and internal heating typed coal carbonization furnace of the invention allows the raw coal cube to be preheated, so that the dried raw coal cubes may contain less than 1wt%(weight percentage) water, which may enhance the efficiency of carbonization.

4. In the prior art, waste coal gas, from which the tar oil is removed, is always used for the quenching and cooling process. As the main ingredient of quenched flue gas is carbon monoxide, it may probably cause explosion when air enters the chamber of the cooling zone. In the furnace of the invention, the cold flue gas containing steam, carbon dioxide and nitrogen may be used for the quenching and cooling process, instead of the waste coal gas produced in the process of carbonization. Due to high stability of the chemical property of the flue gas, it may significantly reduce the incidence of danger.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other features and advantages of this

invention, and the manner of attaining them, will become more apparent and the invention itself will be better understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

FIG. 1 shows a schematic view of a Lurgi furnace in the prior art;

FIG 2 shows a schematic view of one embodiment of the external burning and internal heating typed coal carbonization furnace of the invention.

LIST OF REFERENCE NUMERALS:

1-preheating zone; 2-drying zone; 3-carbonization zone; 4- cooling zone; 5-drying burner; 6-carbonization burner; 7-post-treating system;8-combustion-supporting air fan;9-circulation fan; 10-cold flue gas pipe; 11-drying pipe; 12-tail gas pipe; 13-ventilation pipe; 14-carbonization pipe; 100-coal bunker; 200-drying zone; 300-carbonization zone; 400-cooling zone;500-first burning chamber; 600- second burning chamber; 700- post-treating system。

EMBODIMENT

Referring to Fig. 2, it illustrates one embodiment of the external burning and internal heating typed coal carbonization furnace of the invention, which from top to bottom comprises a preheating zone 1, a drying zone 2, a carbonization zone 3 and a cooling zone 4.

The preheating zone is located above the drying zone and connected with the drying zone. In the preheating zone, raw coal is preheated, and in the drying zone 3, the raw coal is dried and the cold flue gas is produced at

the same.

In the carbonization zone 3, the dried raw coal is carbonized into semi-coke; and the cold flue gas is introduced to the cooling zone 4 to cool the semi-coke produced so as to produce hot flue gas at the same time.

The coal carbonization furnace is also equipped with a cold flue-gas pipe 10 for leading the cold flue gas from the drying zone 2 to the cooling zone 4, and is further equipped with a tail gas pipe 12 for leading the hot flue gas from the cooling zone 4 to the preheating zone.

The cold flue gas pipe 10 is connected with a circulation fan 9, which cause the cold flue gas from the drying zone 2 to enter the cooling zone through the cold flue gas pipe 10, after that it may enter the preheating zone 1 through the tail gas pipe 12.

The cold flue-gas pipe 10 is connected with a ventilation pipe 13 for evacuation of the surplus cold flue gas that is needless from the cooling zone 4.

The waste coal-gas outlet of the carbonization zone 3 is further connected with a post-treating system 7 which is for removing the tar oil from the waste coal gas produced in the process of carbonization the raw coal in the carbonization zone 3.

A drying burner 5 is connected with the flue gas outlet of the post-treating system 7 and the drying zone 2 respectively, and arranged therebetween. A drying pipe 11 is connected with the cold flue-gas pipe 10 and a first flue-gas outlet of the drying burner 5 respectively, and arranged therebetween.

Partial coal gas produced from the post-treating system 7 is burnt in the drying burner 5, so as to produce the drying flue gas for drying process

in the drying zone 2; the drying pipe 11 allows partial cold flue gas produced from the drying zone 2 to be mixed with the drying flue gas in order to adjust the temperature for drying process in the drying zone 2.

Additionally, a carbonization burner 6 is connected with the flue-gas outlet of the post-treating system 7 and the carbonization zone 3, and arranged therebetween; a carbonization pipe 14 is connected with the flue gas outlet of the post-treatment system 7 and the flue-gas outlet of the carbonization burner 6, and arranged therebetween.

The carbonization burner 6 allows part of the coal gas produced from the post-treating system 7 to be burnt therein, so as to produce the carbonization flue gas for carbonization process in the carbonization zone 3; the carbonization pipe 14 allows part of the coal gas produced from the post-treating system 7 to be mixed with the carbonization flue gas, so as to adjust the temperature for carbonization process in the carbonization zone 3.

The flue-gas inlets of both the drying burner 5 and the carbonization burner 6 are connected with a combustion-supporting air fan 8, which is for providing combustion-supporting air for the drying burner 5 and the carbonization burner 6 respectively.

The process flow of the external burning and internal heating typed coal carbonization furnace comprises several recycling steps described as bellow:

Preheating the raw coal;

(a) drying the preheated raw coals and producing cold flue gas at the same time;

(b) carbonizing the dried raw coal, so as to produce semi-coke;

(c) leading the cold flue gas produced after the step (a) to the semi-coke produced after the carbonization process, and then quenching and cooling the semi-coke so as to produce hot flue gas at the same time; leading the hot flue gas to new raw coal to be treated, so as to preheat the same.

The main ingredients of the cold flue gas produced after the step (a) are 48-50% steam, 20-22% Nitrogen and 28-30% carbon dioxide (volume percentage).

The waste coal gases produced in the carbonization process of the step (b) is not used for the quenching and cooling process, but only for the drying process of the step (a) and/or carbonization process of the step (b).

Wherein, the drying flue gas produced after burning of the mixture of part of the waste coal gas and air is used for the drying process of the step (a).

Part of cold flue gas produced after the step (a) is mixed with the drying flue gas, in order to adjust the temperature for the drying process of the step (a).

The carbonization flue gas produced after part of waste coal gases and air are mixed together is used for the carbonization process of the step (b).

Part of cold flue gas produced after the step (b) is mixed with the carbonization flue gas, in order to adjust the temperature for the carbonization process of the step (b).

The temperature of the coal in the preheating process of the preheating step is 75°C.

The temperature of the coal in the drying process of the step (a) is

180°C, The temperature for the carbonization process of the step (b) is 530°C,

The temperature of the coal in the quenching and cooling process of the step (c) is 130°C.

The tar oil is removed from the waste coal gas for post-treatment before the waste coal gas is burnt.

In the normal working process, the preheating zone, the drying zone, the carbonization zone and the cooling zone of the external burning and internal heating typed coal carbonization furnace are filled with coal cubes or semi-coke respectively, the coal cubes move from top to down, and the semi-coke finished products are then produced.

Wherein, the raw coal is preheated in the preheating zone, the coal cubes are dried and carbonized in the drying zone and the carbonization zone respectively, and the semi-coke is to be cooled in the cooling zone.

The coke tar is removed by the post-treating system from the waste coal gases that is produced from the carbonization zone, so as to produce coal gas.

The drying burner allows part of coal gas produced by the post-treating system to be burnt therein, so as to produce high temperature drying flue gas; the drying flue gas is mixed with part of cold flue gas introduced through drying pipe 11, so as to the flue gas with appropriate temperature for the drying process in the drying zone.

The carbonization burner 6 allows another part of coal gas produced by the post-treating system to be burnt therein, so as to produce high temperature carbonization flue gas; the carbonization flue gas is mixed with further another part of coal gas that is produced by the post-treating system

and introduced through the carbonization pipe, so as to produce the flue gas with appropriate temperature for the carbonization process in the carbonization zone.

The burning supporting air in both the drying burner 5 and the carbonization burner 6 is supplied by a burning supporting air fan.

The external burning and internal heating typed coal carbonization furnace comprising the preheating zone, the drying zone, the carbonization zone and the cooling zone allows the cold flue gas produced from the drying zone to be introduced to the cooling zone via the cold flue gas pipe, and then be introduced via the tail gas pipe to the preheating zone for preheating the raw coal in the preheating zone, which not only allows the waste heat of flue gas to be utilized, but also allows a great amount of sulphur to be removed from the flue gas in the process of cooling the semi-coke, so as to be energy saving and environmentally protective.

Additionally, because the raw coal is preheated, the water content of the dried raw coal is reduced to less than 1wt% (weight percentage), so as to guarantee the carbonization efficiency.

Furthermore, the waste coal gas containing carbon dioxide and nitrogen as the main ingredients is used for the quenching and cooling process, instead of the waste coal gas produced in the carbonization process, which highly reduces the incidence of danger, due to the stability of the chemical property of such flue gas.

The yield of semi-coke in the carbonization process of this invention reaches 50%; the semi-coke contains less than 8wt% (weight percentage) water; and the calorific value of the waste coal gas is higher than 1400KCal/Nm^3.

In another embodiment of the invention, the temperature of coal cubes in the preheating process may be with any other value of 50-100°C.

The temperature of coal cubes in the drying process of the step (a) may be with any other value of 150-220°C.

The temperature for the carbonization process of the step (b) may be with any other value of 500-570°C.

The temperature of the semi-coke in the quenching and cooling process of the step (c) may be any other value of 110-150 . The temperatures mentioned above may be the temperatures of the chambers of the preheating zone, the drying zone, the carbonization zone, and the cooling zone respectively.

The temperature with any values of the temperature range mentioned above can meet the requirement for continue production of semi-coke. The temperature values mentioned in the above embodiment may be the best mode, which may realize the peak efficiency of production and be adapted for continue production.

In another embodiment of the invention, besides semi-coke, the products after the carbonization process of the step (b) may be the ones with variable volatile contents, such as activated coke, and the types of the products produced are determined by the temperature.

Furthermore, in another embodiment, the preheating process is not necessary and can be omitted, so that most of the cold flue gas is introduced to the cooling zone for cooling the carbonized products, which sufficiently utilizes the produced cold flue gas to cool the carbonized products, so as to enhance the carbonization efficiency; in addition, in the cooling and the carbonization process, a great amount of sulphur is removed from the flue

gas, which makes the furnace energy saving and environmentally protective.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

2010295138 08 Oct 2014

CLAIMS

1. An external burning and internal heating typed carbonization furnace for coal, wherein from top to bottom, comprising:

a preheating zone (1), for preheating raw coals; and

a drying zone (2), for drying said raw coals and producing cold flue gas at the same time; and

a carbonization zone (3), for carbonizing the dried raw coals into carbonized products; and

a cooling zone (4), for cooling the carbonized products with said cold flue gas; and wherein

said cold flue gas produced from the drying zone (2) are introduced into a cold flue gas pipe (10) of said cooling zone (4);

wherein, said cold flue gas is heated into hot flue gas after passing through the cooling zone (4) for cooling, and said coal carbonization furnace further comprises a tail gas pipe (12) for introducing said hot flue gas to said preheating zone (1).

2. The coal carbonization furnace of claim 1 wherein the cold flue gas pipe (10) is connected to a cycle power device, which allows said cold flue gas in said drying zone (2) to flow from said cold flue gas pipe (10) to said cooling zone (4), and then flow from said tail gas pipe (12) to said preheating zone (1).

3. The coal carbonization furnace of claim 2, wherein said cycle power device is circulation fan (9).

4. The coal carbonization furnace of claim 1, wherein said cold flue-gas pipe (10) is connected to an ventilation pipe (13) which is used for evacuating surplus cold flue gas from said cooling zone (4).

5. The coal carbonization furnace of claim 1, wherein waste coal gas outlet of said carbonization zone (3) is connected with a post-treating system (7) for removing the tar oil in the waste coal gas produced in the process of carbonizing the raw coal in said carbonization zone (3).

6. The coal carbonization furnace of claim 5, wherein a drying burner (5) is respectively connected with the flue gas outlet of the post-treating system (7) and the drying zone (2) and arranged therebetween, for burning partial coal gas produced by said post-treating system (7), so as to produce drying flue gas for drying in the drying zone (2).

7. The coal carbonization furnace of claim 6, wherein a drying pipe (11) is respectively connected with the cold flue gas pipe (10) and the flue-gas outlet of said drying burner (5) and arranged therebetween, for mixing partial cold flue gas produced from the drying zone (2) with said drying flue gas, in order to adjust the temperature for drying in said drying zone (2).

8. The coal carbonization furnace of claim 5, wherein a carbonization burner (6) is respectively connected with the flue gas outlet of the post-treating system (7) and the carbonization zone (3) and arranged therebetween, for burning partial coal gas produced by the post-treating system (7) so as to produce carbonization flue gas for carbonization in the carbonization zone (3).

9. The coal carbonization furnace of claim 8, wherein a carbonization pipe (14) is respectively connected with said flue gas outlet of the post-treating system (7) and the flue gas outlet of the carbonization burner (6) and arranged therebetween, for mixing partial coal gas produced by the post-treating system (7) with the carbonization flue gas in order to adjust the temperature for carbonization in the carbonization zone (3).

10. The coal carbonization furnace of any one of claims 6 to 9, wherein a combustion-supporting air fan (8) is connected with the flue gas inlet of the drying burner (5) and/ or the gas inlet of the carbonization burner (6), for providing combustion-supporting air for the drying burner (5) and/or the carbonization burner (6) respectively.

D r a w i n g s

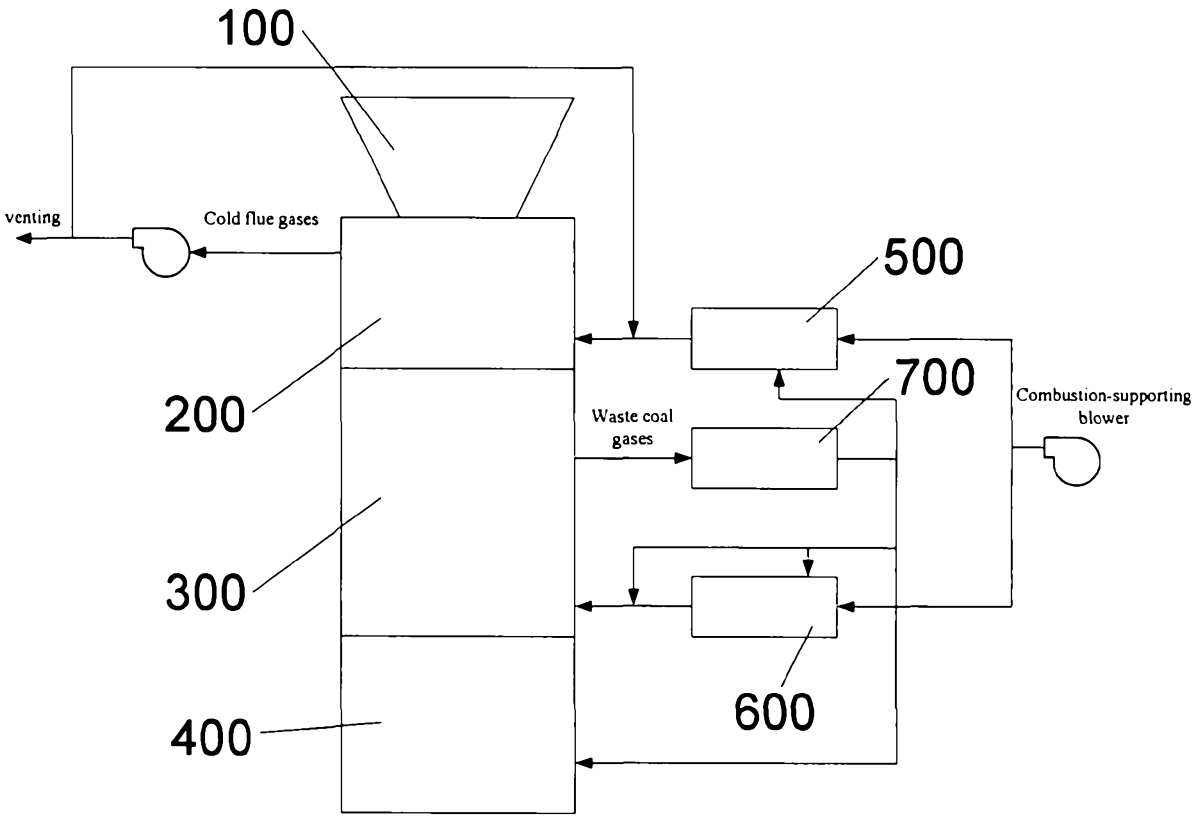

Figure 1

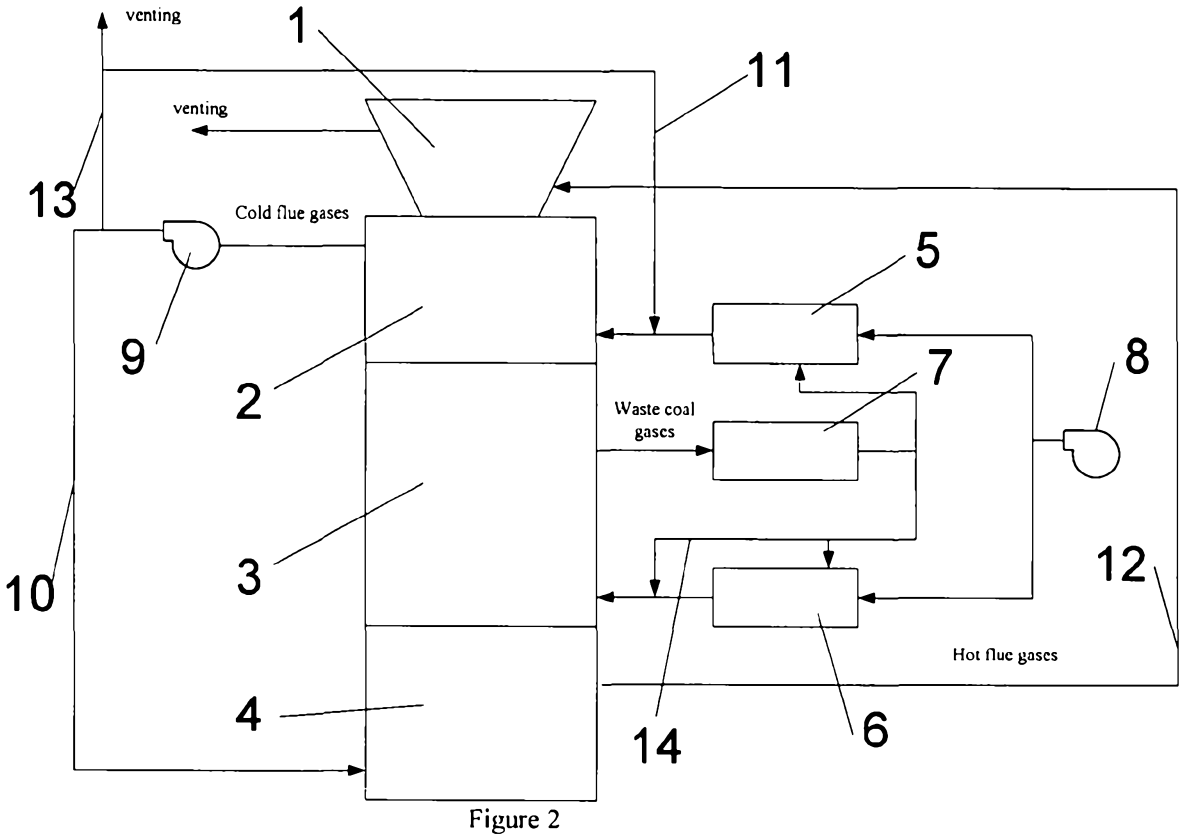

Figure 2