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

(11) **EP 2 716 970 A1**

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

(43) Date of publication:
09.04.2014 Bulletin 2014/15

(21) Application number: **12789883.1**

(22) Date of filing: **23.05.2012**

(51) Int Cl.:
F23G 5/24 *(2006.01)*

(86) International application number:
PCT/JP2012/063116

(87) International publication number:
WO 2012/161203 (29.11.2012 Gazette 2012/48)

(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

(30) Priority: **23.05.2011 JP 2011114446**

(71) Applicants:
- **JFE Engineering Corporation**
  Tokyo 100-0005 (JP)
- **Kinki University**
  Osaka 577-8502 (JP)

(72) Inventors:
- **NAKAYAMA Takashi**
  Tokyo 100-0005 (JP)
- **UCHIYAMA Takeshi**
  Tokyo 100-0005 (JP)
- **AKIYAMA Hajime**
  Tokyo 100-0005 (JP)
- **YOSHIDA Tomohiro**
  Tokyo 100-0005 (JP)
- **IDA Tamio**
  Higashiosaka City
  Osaka 577-8502 (JP)

(74) Representative: **Sajda, Wolf E. et al**
Meissner, Bolte & Partner GbR
Postfach 86 06 24
81633 München (DE)

(54) WASTE-MELTING METHOD

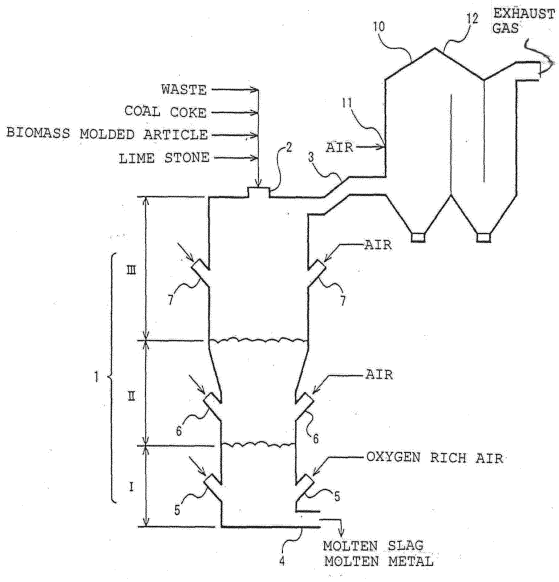
(57) Problem to be Solved

To provide a method of waste melting treatment which can reduce the quantity consumed of coal coke for use in a vertical type waste melting furnace to cut the carbon dioxide emission amount, and suppress the cost for operating the waste melting furnace from being increased; and which allows the combustion heat of the volatile components possessed by a biomass raw material to be effectively used, and more stable operation to be made.

Solution

A method of waste melting treatment performed by charging waste into a waste melting furnace (1), thermally decomposing and burning the waste, and melting a pyrolysis combustion residue charges coal coke and a biomass molded article produced by heating a biomass raw material at a temperature lower than the carbonization temperature thereof, while pressure molding it; forms a high temperature fire grate with the coal coke in a lower section of the melting furnace; and burns the coal coke and the biomass molded article to provide a melting heat source.

FIGURE 1



EP 2 716 970 A1

Description

Technical Field

[0001] The present invention relates to a method of waste melting treatment by thermally decomposing, burning, and melting waste in a shaft furnace type melting furnace.

Background Art

[0002] As the technology for treating waste, such as city garbage or shredder dust, the method of waste melting treatment that thermally decomposes and burns the waste, and melts the pyrolysis residue into slag, discharging it.

[0003] This treating method offers advantages that the waste can be thermally decomposed to be gasified, thereby allowing the combustion heat to be recovered, and after melting the pyrolysis residue and discharging it as slag, the volume of the waste to be finally disposed can be reduced by making land-filling disposal or other. Such a melting treatment method is available in several types, and as one of them, a method is available which uses a shaft furnace type waste gassification melting furnace, which is of a vertical type.

[0004] This shaft furnace type waste gassification melting furnace performs such a treatment as that in which the coke deposited in the lower section of the furnace is burned, and onto such coke at high temperature, the waste is charged to be thermally decomposed and partially oxidized for gasification, with the residue being melted into slag (refer to Patent Document 1).

[0005] With the shaft furnace type waste gassification melting furnace disclosed in Patent Document 1, the functions of the furnace body with a vertical and cylindrical shape are basically divided into three regions along the vertical direction from the viewpoint of function. In other words, in the lower section of the furnace, there is formed a high temperature combustion zone having a coke bed in which the coke is deposited; above this high temperature combustion zone, a waste layer is formed; and in the upper section of the furnace body above the waste layer, a freeboard section having a large space is provided.

[0006] With such a gassification melting furnace, in the respective three regions mentioned above, oxygen-containing gas is blown into the furnace. The high temperature combustion zone in the furnace lower section is provided with a main tuyere, and therethrough oxygen rich air is blown in order to obtain a melting heat source for burning the coke charged and deposited in the coke bed to melt the pyrolysis residue of the waste.

[0007] In addition, the waste layer is provided with a sub-tuyere for slowly fluidizing the waste which has been charged and deposited, and blowing air to thermally decompose and partially oxidize the waste. Further, the freeboard section is provided with a third-level tuyere for blowing air to partially burn the pyrolysis gas (combustible gas) generated with the waste being thermally decomposed, and thus to maintain the inside of the furnace at a prescribed temperature.

[0008] Thus, the shaft furnace type waste gassification melting furnace is a provision which, within a single furnace, can perform both the pyrolysis gassification treatment and the melting treatment of the waste as it falls in the furnace. The charged waste is thermally decomposed, thereby gas and residue being generated. By blowing oxygen rich air from the main tuyere, the coke in the coke bed is burned, a high temperature combustion zone being formed, and the pyrolysis residue of the waste is melted to be discharged as slag and metal.

[0009] The high temperature gas generated by the coke combustion in the high temperature combustion zone heats the waste in the waste layer formed above the high temperature combustion zone, the waste being thermally decomposed with the air being blown from the sub-tuyere, and the gas containing combustible gas generated by such pyrolysis rises in the waste layer, passing through the freeboard section, to be discharged from a discharge flue provided in the upper section of the furnace into a secondary combustion chamber outside the furnace. The gas, containing a large quantity of combustible gas, is burned in the secondary combustion chamber, the heat being recovered at a boiler to generate steam, which is used for electric power generation, or the like.

[0010] The gas discharged from the boiler is removed of relatively coarse dust particles by means of a cyclone separator; then is cooled by a temperature lowering apparatus; is removed of noxious gas through reaction with a harmful substance removing agent; and is subjected to an exhaust gas treatment, such as that for dust removal with a dust collector, being dissipated to the atmosphere from a smoke stack.

[0011] With such a waste gassification melting furnace, a coke bed in which coke is deposited is formed in the furnace bottom section, and the coke is burned to provide a heat source for melting the pyrolysis residue, however, in recent years, there has been a demand for reducing the quantity consumed of coal coke originating from the fossil fuel to cut the carbon dioxide emission amount.

[0012] Then, in order to cut the quantity consumed of coke, there have been proposed a waste melting method which, as an alternative to coal coke, utilizes lumpy biomass, such as a carbide produced by heating and pressure molding of sawdust available as a building waste material for carbonizing it, or charcoal (refer to Patent Document 2), and another method which charges a biomass solid substance, such as a briquette produced by pressure molding of biomass, into

a waste gassification melting furnace for converting it into a carbide within the furnace to form a carbide layer (refer to Patent Document 3).

Citation List

Patent Literature

[0013]

Patent Document 1: Japanese Unexamined Patent Application Publication JP-A-09-060 830

Patent Document 2: Japanese Unexamined Patent Application Publication JP-A-2005-249 310

Patent Document 3: Japanese Unexamined Patent Application Publication JP-A-2005-274 122

Disclosure of the Invention

Problems to be Solved by the Invention

[0014] Even if, as an alternative to coke, lumpy biomass of a carbide or a biomass solid substance is utilized as proposed in Patent Document 2 or 3 for reducing the quantity consumed of coke in the waste melting furnace to thereby cut the carbon dioxide emission amount and reduce the cost for operating the waste melting furnace, there will be presented the following problems.

[0015] In other words, in the case where, as is disclosed in Patent Document 2, lumpy biomass of a carbide is utilized, or as is disclosed in Patent Document 3, a biomass solid substance is charged into the waste melting furnace to convert it into a carbide within the furnace, the combustion heat of the volatile components possessed by a biomass raw material is consumed in the course of carbonization, the thermal energy corresponding to the fixed carbon in the biomass raw material being used as a melting heat source as an alternative to the melting heat source given by the coke.

[0016] Therefore, for the quantity of coal coke that is to be cut, it becomes necessary to charge a large quantity of lumpy biomass of a carbide or a biomass solid substance, and since these are expensive, as compared to the coal coke, the expense required for cutting the quantity consumed of coal coke is increased, thereby the cost for operating the waste melting furnace being increased, which is a problem. Another problem is that the combustion heat of the volatile components possessed by the biomass raw material could have not been effectively utilized.

[0017] Another problem is that the lumpy biomass of a carbide or the carbide produced by the biomass solid substance being carbonized within the furnace is poor in stability as a high temperature fire grate, compared to the coal coke, thereby a temperature decrease in the lower section of the melting furnace or a discharge failure of molten slag is caused and thus the operation becomes unstable.

[0018] In view of the above-mentioned problems, the present invention has been made, and it is an object thereof to provide a method of waste melting treatment that can reduce the quantity consumed of coal coke in a waste melting furnace to cut a carbon dioxide emission amount, suppressing the cost for operating the waste melting furnace from being increased, and allowing the combustion heat of the volatile components possessed by a biomass raw material to be effectively utilized, and a more stable operation to be performed.

Means for Solving the Problems

[0019] The method of waste melting treatment in accordance with the present invention charges waste into a shaft furnace type waste melting furnace for thermally decomposing, burning, and melting the waste.

[0020] Specifically, the method of waste melting treatment in accordance with the present invention charges coal coke, and a biomass molded article produced by heating a biomass raw material at a temperature lower than the carbonization temperature thereof while pressure molding it; forms a high temperature fire grate in a lower section of the melting furnace with the coal coke; and burns the coal coke and the biomass molded article to provide a melting heat source.

[0021] Biomass resources have been classified by FAO (Food and Agriculture Organization of the United Nations), and the biomass resources include woody biomass, such as forest remaining wood, thinned wood, unutilized tree materials, lumber sawing remaining materials, and construction scraps; herbaceous biomass, such as straw, and rice hulls; and further, papermaking biomass; agricultural residues; and unutilized biomass resources, such as livestock excreta, and food waste.

[0022] The present invention uses a biomass molded article produced by heating such a biomass resource as a raw material (to be called a biomass raw material) at a temperature lower than the carbonization temperature thereof while

pressure molding it.

[0023] In the present specification, the term "carbonization temperature" refers to a temperature at which the volatile components of a biomass raw material starts volatilization, which is also a temperature at which dry distillation is started.

[0024] The biomass molded article, which is produced by heating a biomass raw material at a temperature lower than the carbonization temperature thereof while pressure molding it, contains volatile components, and therefore, by charging such biomass molded article into a melting furnace to be burned in the lower section thereof for use as a melting heat source, the combustion heat of the volatile components possessed by the biomass raw material can be effectively utilized.

[0025] In accordance with the present invention having such a configuration, the coal coke forming a high temperature fire grate provides a function which assures passing of gas and liquid through the high temperature fire grate, by creating voids between lumps of coke, on the basis of its inherent lumpy geometry, and a function which serves as a heat source for melting. On the other hand, the biomass molded article can be used regardless of its high temperature strength, geometry, and dimensions, having a function as a melting heat source which supplements the heat quantity of the coal coke for melting.

[0026] Therefore, as the required quantity of coal coke, a minimum quantity required for forming a high temperature fire grate will suffice, and the shortage as the melting heat source can be supplemented with the above-mentioned biomass molded article, whereby both can secure a sufficient melting heat source, while, with a minimum quantity of coal coke, a high temperature fire grate layer can be formed.

[0027] If only the biomass molded article is to be used to form a high temperature fire grate, it will be required to provide a biomass molded article having a high temperature strength and a size larger than a prescribed one, the cost of which is high. In addition, the stability thereof as a high temperature fire grate will be poor as compared to the coal coke.

[0028] On the other hand, if the biomass molded article is required to play a role only as a source for supplying melting heat, in other words, a melting heat source, it is not required to have a high temperature strength. Therefore, there is no need for using an expensive biomass carbide, whereby the cost for operating the waste melting furnace can be suppressed from being increased.

[0029] Then, if the coal coke is used to form a high temperature fire grate, the coal coke and the biomass molded article are burned with the air for combustion being fed from the main tuyere, the combustion gas well rising and passing through the high temperature fire grate for heating and thermally decomposing the waste to burn and melt it, and the melt well falling and flowing through the above-mentioned high temperature fire grate.

[0030] In the present invention, the biomass molded article is preferably a molded article containing the volatile components by 50 weight percent or more. By heating the biomass raw material while pressure molding it so as to provide a molded article containing the volatile components by 50 weight percent or more, the combustion heat of the volatile components possessed by the biomass raw material can be effectively utilized.

[0031] In the present invention, it is preferable that the biomass molded article be a molded article which is produced by heating the biomass raw material at a temperature of 115 °C to 230 °C while pressure molding it. By heating the biomass raw material at a temperature of 115 °C to 230 °C while pressure molding it, a biomass molded article with which the volatile components possessed by the biomass raw material are left can be obtained, whereby the combustion heat of the volatile components possessed by the biomass raw material can be effectively utilized.

[0032] In the present invention, it is preferable that the biomass molded article be a prismatic body one side of which has a length of 50 mm or longer, or a cylindrical body having a diameter of 50 mm or larger and a length of 50 mm or longer. By using a biomass molded article having such dimensions and a geometry, the biomass molded article, after having been charged into the melting furnace, can reach the lower section of the furnace, while the volatile components being suppressed from being thermally decomposed and burned in the furnace, whereby the combustion heat of the volatile components possessed by the biomass raw material can be effectively utilized as a melting heat source.

[0033] In the present invention, it is preferable that the quantity of coal coke to be charged into the furnace be at least a quantity required for forming a high temperature fire grate, and the heat quantity required to provide a melting heat source be supplemented by the biomass molded article.

Advantages of the Invention

[0034] As described above, the present invention can provide a method of waste melting treatment with which, upon making a melting treatment of waste in a shaft furnace type melting furnace, coal coke and a biomass molded article are charged, and therefore, in the furnace, a high temperature fire grate is formed by the coal coke, whereby, in the state in which the combustion gas rising and passing through the high temperature fire grate and the melt falling and flowing through the same are well maintained, the melting heat source can be secured with a minimum quantity of coal coke required for forming a high temperature fire grate and the biomass molded article supplementing the coal coke; the quantity consumed of coal coke can be reduced to cut the carbon dioxide emission amount with the cost for operating the waste melting furnace being reduced; in addition, the combustion heat of the volatile components possessed by the biomass raw material can be effectively utilized, and a more stable operation can be carried out.

Brief Description of the Drawing

[0035] Figure 1 is a diagrammatic view showing a schematic configuration of an apparatus of an embodiment of the present invention.

Best Mode for Carrying Out the Invention

[0036] Hereinbelow, an embodiment of the present invention will be explained with reference to the attached drawing, i.e., Figure 1. In the present embodiment, coal coke and a biomass molded article are supplied to a shaft furnace type waste gassification melting furnace as fuel, however, prior to explaining such a feature, the schematic configuration of the shaft furnace type waste gassification melting furnace will be explained.

[0037] With the shaft furnace type waste gassification melting furnace shown in Figure 1 in one embodiment of the present invention, the upper section of the gassification melting furnace 1 is provided with a charging port 2 for charging waste as an object to be treated, coal coke and a biomass molded article as fuel, and lime stone as a material for adjusting the slag composition into the furnace, and the side of the upper section is provided with a gas discharge port 3 for discharging the gas in the furnace to the outside thereof. In addition, the bottom section of the gassification melting furnace 1 is provided with a residue discharge port 4 for discharging the molten slag and the molten metal.

[0038] With the shaft furnace type waste gassification melting furnace, the internal space of the gassification melting furnace 1 is basically divided into three regions along the vertical direction; from bottom, the three regions providing a lower shaft section I, which is formed in the lower section of the furnace, a middle shaft section II, which is located above the lower shaft section I, and a freeboard section III, which is formed in the upper section. These sections I, II, and III are regions having the following functions, respectively.

[0039] In other words, the lower section shaft section I is a region where the coal coke and biomass molded article deposited are burned to form a high temperature combustion zone; the middle shaft section II is a region where the waste in the waste layer, which is formed by the deposition of the waste charged onto the high temperature combustion zone, is thermally decomposed; and the freeboard section III is a region where the combustible gas generated is partially burned.

[0040] Above the waste gassification melting furnace 1, there is disposed a supply apparatus (not shown) which supplies waste, such as municipal waste, coal coke, biomass molded article, and lime stone for use as a material for adjusting the composition of slag generated, respectively. The waste, the coal coke and biomass molded article, and the lime stone are conveyed by a carrying conveyor (not shown), and charged into the furnace from the above-mentioned charging port 2 in the furnace upper section.

[0041] On the furnace wall, there are provided tuyeres for blowing oxygen-containing gas into the respective lower shaft section I, middle shaft section II, and freeboard section III mentioned above, which are formed in the waste gassification melting furnace.

[0042] In other words, in the lower shaft section I, there is provided a main tuyere 5 through which oxygen rich air is blown to burn the coal coke and biomass molded article which have been deposited in the lower shaft section I for forming a high temperature combustion zone to melt the pyrolysis residue; in the middle shaft section II, there is provided a sub-tuyere 6 through which air is blown to partially burn the charged and deposited waste, and slowly fluidizing the waste while thermally decomposing and burning it; and in the freeboard section III, there is provided a third-level tuyere 7 for blowing air to partially burn the combustible gas generated by thermally decomposing the waste for maintaining the inside of the furnace at a prescribed temperature.

[0043] The gas discharge port 3 is connected to a secondary combustion chamber 10 for burning the combustible gas generated by thermally decomposing the waste. For secondary combustion, an air blowing port 11 is provided through which air is blown. In addition, adjacent to this secondary combustion chamber 10, a boiler 12 is provided in order to recover the heat from the combustion gas produced by burning the combustible gas in the secondary combustion chamber 10.

[0044] On the other hand, the biomass molded article is of the type produced as a prismatic body one side of which has a length of 50 mm or longer, or a cylindrical body having a diameter of 50 mm or larger and a length of 50 mm or longer, by filling a molding container with a pulverized biomass raw material, and heating it at a temperature of 115 °C to 230 °C, while pressure molding it.

[0045] By heating and pressure molding under such a heating condition, the biomass raw material can be provided as a biomass molded article without being carbonized, and containing the volatile components by 50 weight percent or more. The pressure for pressure molding may be 8 to 25 MPa. As the method for biomass molded article manufacturing, the manufacturing method disclosed in Domestic Re-publication of PCT International Application WO2006/078023 A may be applied.

[0046] By performing molding under the above-mentioned heating and pressure conditions, the biomass molded article can be provided with a surface which is extremely dense and free from pores. By using a biomass molded article produced

as a prismatic body one side of which has a length of 50 mm or longer, or a cylindrical body having a diameter of 50 mm or larger and a length of 50 mm or longer, and having a surface which is extremely dense and free from pores, the biomass molded article, after having been charged into the melting furnace, can reach the lower section of the furnace, while the volatile components being suppressed from being thermally decomposed and burned in the furnace, the combustion heat of the volatile components possessed by the biomass raw material can be effectively utilized as a melting heat source.

[0047] With the present embodiment apparatus configured as thus, gasified melting treatment of the waste is performed in the following manner.

[0048] The waste, the coal coke and biomass molded article, and the lime stone from the supply apparatus are charged into the furnace by a prescribed quantity, respectively, through the charging port 2 provided in the upper section of the gassification melting furnace 1, and from the main tuyere 5, the sub-tuyere 6, and the third-level tuyere 7, oxygen rich air or air is blown into the furnace, respectively.

[0049] The waste which has been charged from the above-mentioned charging port 2 is deposited in the middle shaft section II in the furnace to form a waste layer, being dried by the high temperature gas rising from the high temperature combustion zone in the lower shaft section I and the air blown from the sub-tuyere before being thermally decomposed.

[0050] The combustible gas generated by the pyrolysis is burned in the freeboard section III with the air blown from the third-level tuyere, being maintained at a temperature of 850 °C or higher, and after being subjected to a treatment for decomposing the harmful gas and the tar component, is fed to the secondary combustion chamber provided outside the furnace, the heat of the combustion gas being recovered by the boiler.

[0051] The coal coke falls to the lower shaft section I; the biomass molded article falls to the lower section shaft section I, while the volatile components being suppressed from being thermally decomposed and burned on the way of falling, as a result, a high temperature combustion zone is formed, the coal coke and biomass molded article being burned; the pyrolysis residue which has been produced as a result of thermal decomposition of the waste in the waste layer in the middle shaft section II falls and reaches the lower section shaft section I, where a high temperature combustion zone is formed, the coal coke and biomass molded article being burned; and in the lower section shaft section I, the volatile components in the biomass molded article, and the fixed carbon in the coal coke and biomass molded article are burned, the noncombustibles being melted to be changed into molten slag and molten metal.

[0052] The molten slag and the molten metal are discharged from the residue discharge port 4 to be fed to a water granulating apparatus provided outside of the furnace, and cooled and solidified, the cooled and solidified water granulated slag and the water granulated metal being recovered.

[0053] Thus, the coal coke and biomass molded article are charged into the waste gassification melting furnace; the coal coke forms a high temperature fire grate in the lower section of the gassification melting furnace 1; and the coal coke and biomass molded article are burned to provide a melting heat source for melting the pyrolysis residue (ash) of the waste, and the noncombustibles.

[0054] The quantity of coal coke to be charged into the furnace is a quantity required for forming a high temperature fire grate, and the heat quantity necessary as the melting heat source is supplemented by the biomass molded article, a prescribed quantity being charged, respectively.

[0055] In such a course of gasified melting treatment of waste, the coal coke of the coal coke and biomass molded article as fuel has a lumpy geometry at the beginning of being charged into the furnace, and in the high temperature combustion zone in the lower shaft section I, the voids between coal cokes form a high temperature fire grate.

[0056] The top face of the layer of the high temperature fire grate is located above the main tuyere 5; the oxygen rich air or air from the main tuyere 5 rises and passes through the above-mentioned voids, the combustion of the coal coke and biomass molded article being well carried out; and a sufficient quantity of the combustion gas reaches the waste layer.

[0057] On the other hand, in the high temperature combustion zone, the noncombustibles and ash of the waste are sufficiently melted by the quantity of heat obtained by the combustion of the coal coke and biomass molded article, thereby molten slag and molten metal being produced. The molten slag and the molten metal well fall and pass through the above-mentioned voids of the high temperature fire grate, reaching the residue discharge port 4.

[0058] According to such a gasified melting treatment method for waste, the coal coke forming a high temperature fire grate provides a function which assures passing of gas and liquid through the high temperature fire grate, by creating voids between lumps of coke, on the basis of its inherent lumpy geometry, and a function which serves as a heat source for melting.

[0059] On the other hand, the biomass molded article can be used regardless of its high temperature strength, geometry, and dimensions, providing a function as a melting heat source which supplements the heat quantity of the coal coke for melting.

[0060] Therefore, as the required quantity of coal coke, a minimum quantity required for forming a high temperature fire grate will suffice, and the shortage as the melting heat source can be supplemented with the above-mentioned biomass molded article, whereby both can secure a sufficient melting heat source, while, with a minimum quantity of coal coke, a high temperature fire grate layer can be formed.

[0061] If the biomass molded article is required to play a role only as a source for supplying melting heat, in other words, a melting heat source, it is not required to have a high temperature strength. Accordingly, inexpensive biomass molded article can be used, whereby the cost for operating the waste melting furnace can be reduced.

[0062] Then, if the coal coke is used to form a high temperature fire grate, the coal coke in the high temperature fire grate and the biomass molded article deposited in the high temperature fire grate are burned with the air for combustion fed from the main tuyere, the combustion gas well rising and passing through the high temperature fire grate for heating and thermally decomposing the waste to burn and melt it, and the melt well falling and flowing through the above-mentioned high temperature fire grate.

[0063] In this way, with the high temperature fire grate, the combustion gas rising and passing therethrough and the molten slag and molten metal falling and flowing therethrough are well maintained, while the coal coke and the biomass molded article as fuel being burned.

[0064] Upon the combustion, as the quantity of coal coke to be charged, a minimum quantity required for forming a high temperature fire grate will suffice, and the shortage to the heat quantity required for gasification melting of the waste is supplemented with the biomass molded article. Further, the combustion heat of the volatile components possessed by the biomass raw material can be effectively utilized as the melting heat source.

[0065] Thus, the quantity consumed of coal coke can be minimized, while the biomass molded article can be charged regardless of its high temperature strength, geometry, and dimensions, and even an inexpensive biomass molded article can be used as fuel. In this way, the quantity consumed of coal coke can be reduced to cut the carbon dioxide emission amount with the cost for operating the waste melting furnace being reduced, whereby waste treatment allowing stable operation can be carried out.

[0066] Biomass is preferably molded under the above-mentioned heating and pressure conditions, and to the above-mentioned dimensions and geometry, however, heating and pressure molding of biomass may be performed under other conditions, provided that the volatile components of the biomass raw material are effectively left.

Description of Symbols

[0067] The symbol 1 denotes a gassification melting furnace.

Claims

1. A method of waste melting treatment performed by charging waste into a waste melting furnace, thermally decomposing and burning the waste, and melting a pyrolysis combustion residue,
comprising the following steps:

    - charging coal coke and a biomass molded article produced by heating a biomass raw material at a temperature lower than the carbonization temperature thereof, while pressure molding it;
    - forming a high temperature fire grate with the coal coke in a lower section of the melting furnace; and
    - burning the coal coke and the biomass molded article to provide a melting heat source.

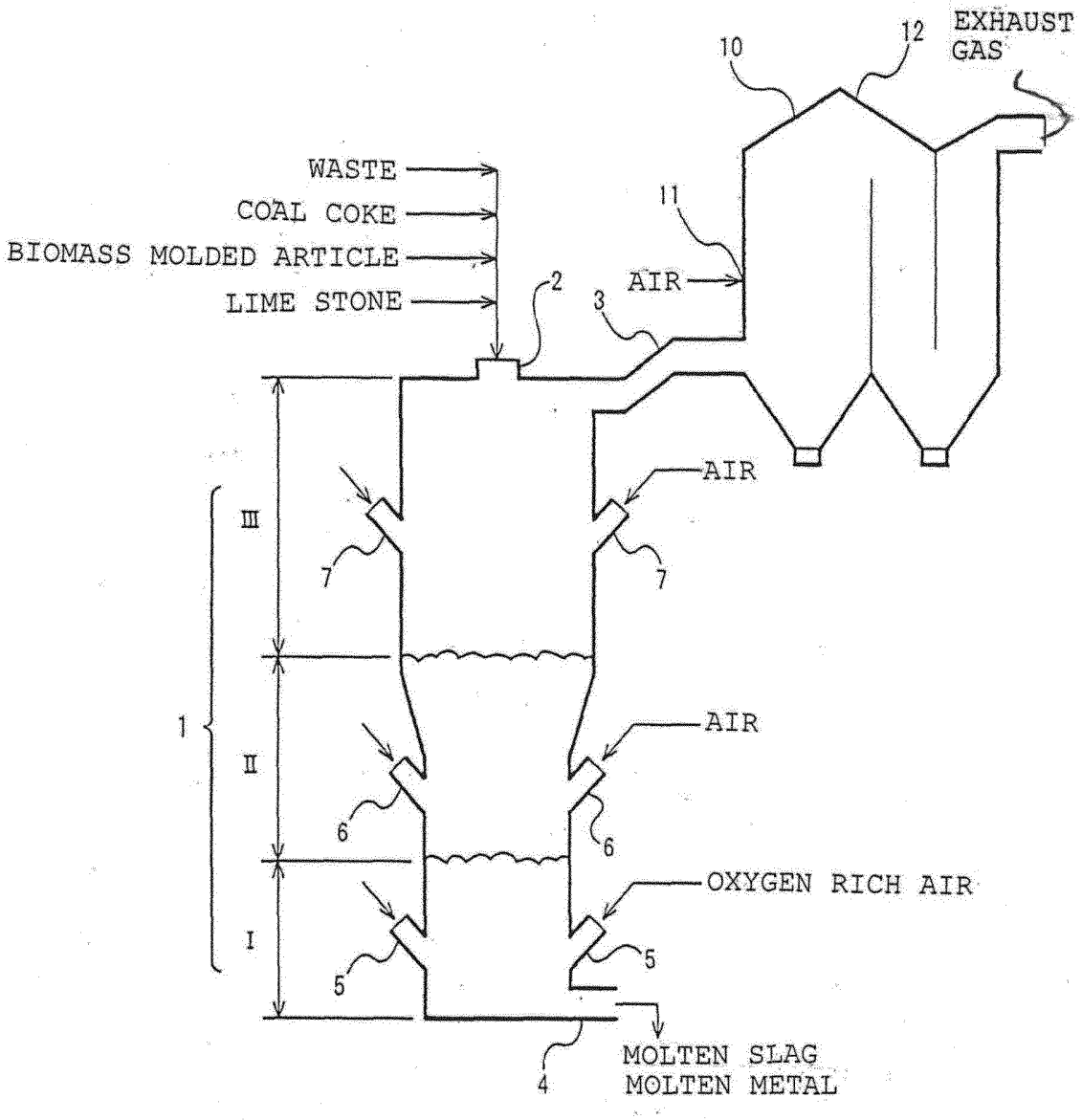
2. The method of waste melting treatment according to claim 1,
wherein the biomass molded article is a molded article containing volatile components by 50 weight percent or more.

3. The method of waste melting treatment according to claim 1 or 2,
wherein the biomass molded article is a molded article produced by heating a biomass raw material at a temperature of 115 °C to 230 °C while pressure molding it.

4. The method of waste melting treatment according to any one of claims 1 to 3,
wherein the biomass molded article is a prismatic body one side of which has a length of 50 mm or longer, or a cylindrical body having a diameter of 50 mm or larger and a length of 50 mm or longer.

5. The method of waste melting treatment according to any one of claims 1 to 4,
wherein the quantity of coal coke to be charged into the furnace is at least a quantity required to form a high temperature fire grate, the heat quantity required as a melting heat source being supplemented by the biomass molded article.

FIGURE 1


EXHAUST GAS
12
10
WASTE
COAL COKE
BIOMASS MOLDED ARTICLE
LIME STONE
11
AIR
2
3
AIR
III
7
7
1
II
AIR
6
6
OXYGEN RICH AIR
I
5
5
MOLTEN SLAG
MOLTEN METAL
4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/063116

A. CLASSIFICATION OF SUBJECT MATTER
F23G5/24(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)
F23G5/24

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2012
Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2005-249279 A (Nippon Steel Corp.), 15 September 2005 (15.09.2005), paragraphs [0013], [0023] (Family: none)	1-5
Y	JP 2005-274122 A (Nippon Steel Corp.), 06 October 2005 (06.10.2005), paragraphs [0024] to [0026] (Family: none)	1-5
A	JP 2003-213273 A (National Institute of Advanced Industrial Science and Technology), 30 July 2003 (30.07.2003), abstract; paragraphs [0002], [0004], [0018] (Family: none)	1

☐ 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
13 July, 2012 (13.07.12)	24 July, 2012 (24.07.12)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 9060830 A **[0013]**
- JP 2005249310 A **[0013]**
- JP 2005274122 A **[0013]**
- WO 2006078023 A **[0045]**