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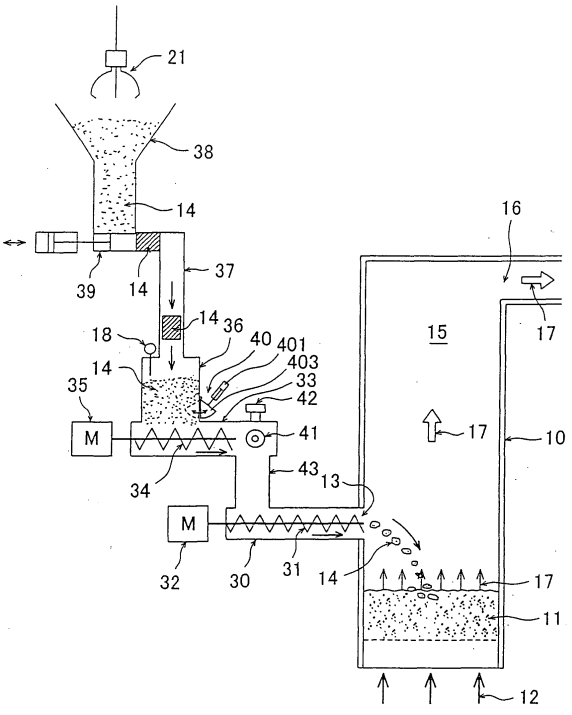
(54) METHOD AND DEVICE FOR FEEDING INFLAMMABLES TO GASIFYING FURNACE, AND GASIFICATION MELTING SYSTEM

(57) In a method of supplying combustibles to a gasification furnace for gasifying the combustibles, the combustibles (14) are supplied to a hopper (36) while external air is prevented from leaking into the gasification furnace (10) together with the combustibles (14). The combustibles (14) in the hopper (14) are supplied to the gasification furnace (10) in fixed quantity while an amount of combustibles (14) stored in the hopper (36) is controlled so as to be constant. Thus, external air can be prevented from leaking into the gasification furnace (10). Simultaneously, the combustible (14) in the hopper (36) are supplied to the gasification furnace (10) in fixed quantity so as to reduce a variation of a combustible gas produced in the gasification furnace (10) and facilitate stable operation of the gasification furnace (10).

Fig 2



EP 1 736 527 A1

Description

Technical Field

[0001] The present invention relates to a method and apparatus for supplying combustibles, such as municipal wastes, industrial wastes, biomass wastes, medical wastes, or automobile wastes including tire wastes, shredder dust, and the like, to a gasification furnace which gasifies the combustibles into a combustible gas, and to a gasification and slagging combustion system.

Background Art

[0002] In recent years, in order to treat combustibles, such as municipal wastes, industrial wastes, biomass wastes, medical wastes, or automobile wastes including tire wastes, shredder dust, and the like, there has been known a gasification and slagging combustion facility which gasifies the combustibles under a reducing atmosphere in a gasification furnace and combusts a combustible gas produced by the gasification at a high temperature in a slagging combustion furnace to combust an unburned combustible carbon content such as char accompanying the combustible gas, and simultaneously to melt ash content contained in the char into slag.

[0003] FIG 1 is a diagram showing a schematic arrangement example of a fluidized-bed gasification furnace and a combustible supplying apparatus for supplying combustibles into the fluidized-bed gasification furnace which are used in this type of gasification and slagging combustion facility. As shown in FIG 1, the fluidized-bed gasification furnace 10 holds a fluidized medium at a lower portion thereof, and a fluidized bed 11 of the fluidized medium is formed by supplying a fluidizing gas 12 from a lower portion of the furnace.

[0004] Combustibles 14 introduced through a combustible introduction port 13 are gasified by partial combustion under a reducing atmosphere in the fluidized bed 11. A produced combustible gas 17 flows upward in the fluidized bed 11, passes through a freeboard 15, is introduced through a combustible gas outlet port 16 into a slagging combustion furnace, which is not shown, and is combusted at a high temperature.

[0005] This type of fluidized-bed gasification furnace 10 is generally operated so that the pressure in the furnace is a negative pressure of about -50 mm Aq. Accordingly, a large amount of external air which has not been preheated leaks through the combustible introduction port 13 into the furnace. The leaked air which has not been preheated is consumed by combustion at the freeboard 15 in the fluidized-bed gasification furnace 10. The combustible gas combusted in part by the leaked air is introduced through the combustible gas outlet port 16 into the slagging combustion furnace. Combustion air to be supplied to the slagging combustion furnace is generally preheated so as to increase the temperature of the slagging combustion furnace. However, if the aforementioned leaked air is introduced into the slagging combustion furnace, the amount of preheated air supplied to the slagging combustion furnace is reduced. As a result, the melting temperature is lowered. Further, when the pressure in the fluidized-bed gasification furnace 10 becomes a positive pressure for some reasons, it is necessary to prevent the combustible gas in the fluidized-bed gasification furnace 10 from leaking to the combustible supplying apparatus. Therefore, for example, dampers having a sealing function (so-called double damper) are doubly provided in a chute connected to the combustible introduction port 13 (which corresponds to a portion between a combustible supplying means 30 and a combustible supplying means 33 connected to an upper stage of the combustible supplying means 30 in FIG 1) and combustibles 14 introduced into a hopper 38 by a crane 21 are supplied through the double damper 19 into the combustible supplying means 30 by a screw 34 while external air is prevented from entering the fluidized-bed gasification furnace 10 through the combustible introduction port 13 by sealing effects of the double damper 19.

[0006] However, with a method of intermittently supplying combustibles 14 into the fluidized-bed gasification furnace 10 as described above, because heat is extremely promptly transferred to the supplied combustibles 14 in the fluidized bed 11, the amount of combustible gas 17 produced in the fluidized-bed gasification furnace 10 is greatly varied under the influence of intermittent supply of the combustibles 14. Thus, stable operation of the fluidized-bed gasification furnace 10 is hindered, and operational control for the subsequent slagging combustion furnace to receive a produced gas from the fluidized-bed gasification furnace 10 and combust the produced gas under a high temperature at a low excess air ratio is also hindered.

[0007] Further, since the hopper 38 is intermittently supplied with combustibles 14, the amount of combustibles 14 stored in the hopper 38 has large variations. Furthermore, combustibles 14 themselves have variations in quality. Therefore, fixed quantity supply cannot necessarily be achieved by the screw 34.

[0008] The present invention has been made in view of the above drawbacks, and it is, therefore, an object of the present invention to provide a method and apparatus for supplying combustibles to a gasification furnace and to a gasification and slagging combustion system which can prevent leakage of external air into the gasification furnace, reduce a variation of a produced gas, and facilitate operational control for stable gasification.

Disclosure of Invention

[0009] According to the present invention, there is provided a method of supplying combustibles to a gasification furnace for gasifying the combustibles, and the method is characterized by comprising supplying the combustibles to a hopper while preventing external air from leaking into the gasification furnace by the combustibles

themselves, and supplying the combustibles in the hopper to the gasification furnace in fixed quantity while controlling an amount of combustibles stored in the hopper so as to be constant. As described above, combustibles are supplied to a hopper while external air is prevented from leaking into the gasification furnace together with the combustibles by the combustibles. Thus, external air can be prevented from leaking into the gasification furnace, and it is not necessary to provide any special sealing mechanisms such as a double damper. Simultaneously, the combustibles in the hopper are supplied to the gasification furnace in fixed quantity while an amount of combustibles stored in the hopper is controlled so as to be constant. Accordingly, it is possible to reduce a variation of a combustible gas produced in the gasification furnace and facilitate stable operation of the gasification furnace. Further, since a variation of a combustible gas produced is thus reduced, it is also possible to facilitate stable operation of a slagging combustion furnace subsequent to the gasification furnace.

[0010] According to the present invention, there is provided a method characterized in that a combustible gas which leaks from the gasification furnace to a combustible supplying side is released to a waste pit. A combustible gas which leaks from the gasification furnace to a combustible supplying side can be treated safely by releasing the combustible gas to a waste pit because air is continuously drawn from the waste pit for deodorization and used for combustion.

[0011] According to the present invention, there is provided a combustible supplying apparatus for supplying combustibles to a gasification furnace for gasifying the combustibles, and the combustible supplying apparatus is characterized by comprising a first combustible supplying mechanism for supplying the combustibles while preventing external air from leaking into the gasification furnace, a hopper for storing the combustibles supplied through the first combustible supplying mechanism, and a second combustible supplying mechanism for supplying the combustibles in the hopper to the gasification furnace in fixed quantity while controlling an amount of combustibles stored in the hopper so as to be constant. As described above, combustibles are supplied to a hopper by the first combustible supplying mechanism while external air is prevented from leaking into the gasification furnace. Thus, external air can be prevented from leaking into the gasification furnace, and it is not necessary to provide any special sealing mechanisms such as a double damper. Simultaneously, the combustibles in the hopper are supplied to the gasification furnace in fixed quantity by the second combustible supplying mechanism while an amount of combustibles stored in the hopper is controlled so as to be constant. Accordingly, it is possible to reduce a variation of a combustible gas produced in the gasification furnace and facilitate stable operation of the gasification furnace. Further, since a variation of a combustible gas produced is thus reduced, it is also possible to facilitate stable operation of a slagging combustion furnace subsequent to the gasification furnace.

[0012] According to the present invention, there is provided a combustible supplying apparatus characterized by comprising a relief valve for releasing a combustible gas which leaks from the gasification furnace to a second combustible supplying mechanism side, and supplying means for supplying the combustible gas released through the relief valve to a waste pit. With a relief valve thus provided, a combustible gas which leaks from the gasification furnace when the gasification furnace has a positive pressure can be released through a relief valve, and the combustible gas can be introduced to a waste pit by supplying means. Air is continuously drawn from the waste pit for deodorization and used for combustion, so that a combustible gas can be treated safely.

[0013] According to the present invention, there is provided a gasification and slagging combustion system having a gasification furnace for gasifying combustibles and a slagging combustion furnace for melting a product produced in the gasification furnace, and the gasification and slagging combustion system is characterized by comprising a first combustible supplying mechanism for supplying the combustibles while preventing external air from leaking into the gasification furnace together with the combustibles, a hopper for storing the combustibles supplied through the first combustible supplying mechanism, and a second combustible supplying mechanism for supplying the combustibles in the hopper to the gasification furnace in fixed quantity while controlling an amount of combustibles stored in the hopper so as to be constant.

[0014] According to the present invention, there is provided a gasification and slagging combustion system characterized by comprising a relief valve for releasing a combustible gas which leaks from the gasification furnace to a second combustible supplying mechanism side, and supplying means for supplying the combustible gas released through the relief valve to a waste pit.

Brief Description of Drawings

[0015]

FIG 1 is a diagram showing a schematic arrangement example of a conventional fluidized-bed gasification furnace and a conventional combustible supplying apparatus;

FIG 2 is a diagram showing a schematic arrangement example of a fluidized-bed gasification furnace and a combustible supplying apparatus according to an embodiment of the present invention;

FIG 3 is a diagram showing a schematic arrangement example of a fluidized-bed gasification furnace and a combustible supplying apparatus according to another embodiment of the present invention;

FIG 4 is a diagram showing a schematic arrangement example of a fluidized-bed gasification furnace and a combustible supplying apparatus according to

another embodiment of the present invention; and FIG 5 is a schematic diagram showing an example of an entire system in which a combustible supplying apparatus according to the present invention is applied to a gasification and slagging combustion system.

Best Mode for Carrying Out the Invention

[0016] FIG 2 is a diagram showing a schematic arrangement of a fluidized-bed gasification furnace and a combustible supplying apparatus for supplying combustibles into the fluidized-bed gasification furnace according to the present invention. In FIG 2, parts designated by the same reference numerals as those in FIG 1 denote the same or corresponding parts. This also holds true in other drawings. In FIG 2, a combustible supplying means 30 having a screw conveyor 31 operated by a motor 32 is connected to a combustible introduction port 13. A combustible supplying means 33 having a screw conveyor 34 operated by a motor 35 is connected to the combustible supplying means 30. A hopper 36 is provided so as to be connected to the combustible supplying means 33. A chute 37 is provided so as to be connected to the hopper 36. A hopper 38 is provided so as to be connected to the chute 37. A pusher 39 is provided at a junction between the chute 37 and the hopper 38.

[0017] Combustibles 14, such as municipal wastes, industrial wastes, biomass wastes, medical wastes, or automobile wastes including tire wastes, shredder dust, and the like, are introduced into the hopper 38 by a crane 21 or the like. Material sealing is effectively performed by consolidated combustibles 14, which have been pushed at a lower feeding portion of the hopper by the pusher 39. Combustibles 14 are fed each time in a predetermined amount by the pusher 39 and received by the hopper 36. A level sensor 18 is provided in the hopper 36. The pusher 39 is operated so that the amount of combustibles held in the hopper 36 is maintained to be substantially constant. Material sealing effects provided by the consolidated combustibles 14 at the lower portion of the hopper 38 can prevent leakage of external air. Sealing effects provided by the combustibles 14 piled in the hopper 36 can also prevent entry of external air.

[0018] A pusher 40 is provided at a lower portion of the hopper 36. A pusher portion 403 is pushed into the hopper 36 by a driving portion 401 of the pusher 40 to press the combustibles 14 against the screw 34. Thus, local consolidation of the combustibles 14 is prevented, and the combustibles 14 can reliably be discharged by the screw 34. A scraping device 41 is provided at a tip portion of the screw 34. The combustibles 14 pushed by the screw 34 are mechanically scraped to smoothen supply of the combustibles 14 to the screw conveyor 31.

[0019] The combustibles 14 supplied from the combustible supplying means 33 to the combustible supplying means 30 at a constant rate are supplied by the screw conveyor 31 through the combustible introduction port 13 into the fluidized-bed gasification furnace 10. Thus, since the combustibles 14 can be supplied at a constant rate, it is possible to remarkably facilitate stable operation of the fluidized-bed gasification furnace 10 with control of the amount of fluidizing gas 12 to be supplied and control of temperature in the furnace.

[0020] It is desirable that a relief valve 42 is provided in the combustible supplying means 33. When the fluidized-bed gasification furnace 10 has a positive pressure (a pressure higher than an atmospheric pressure), a combustible gas leaking from the fluidized-bed gasification furnace 10 can be released through the relief valve 42 and introduced to a waste pit by a supplying means having pipes, which is not shown. Since air is continuously drawn from the waste pit for deodorization and used for combustion, the combustible gas can be treated safely. A cutoff damper, which is not shown, is provided on a chute 43, which interconnects the combustible supplying means 33 and the combustible supplying means 30. The cutoff damper is closed at the beginning of operation or at the time of emergency. Thus, a combustible gas 17 in the fluidized-bed gasification furnace 10 is prevented from being released through the combustible supplying apparatus to an atmosphere, and the safety of the fluidized-bed gasification furnace 10 can be enhanced.

[0021] In the combustible supplying apparatus shown in FIG 2, the filling density of the combustibles 14 to be received is enhanced by a first combustible supplying mechanism including the hopper 38, the pusher 39, and the chute 37 so as to provide sealing effects to prevent leakage of external air. Simultaneously, the combustibles 14 intermittently supplied are supplied into the fluidized-bed gasification furnace 10 at a predetermined rate by a second combustible supplying mechanism including the hopper 36, the combustible supplying means 33, and the combustible supplying means 30 while the sealing effects provided by the combustibles 14 are maintained. Further, since leakage of external air into the fluidized-bed gasification furnace 10 is prevented by the above material sealing, it is not necessary to provide a special sealing mechanism such as a damper.

[0022] FIG 3 shows an embodiment in which the combustible supplying means 30 in FIG 2 is replaced with a chute 43. A constant amount of combustibles supplied is achieved by the pusher 40, the screw conveyor 34, and the scraping device 41 of the combustible supplying means 33. Accordingly, the combustible supplying means 30 does not need to supply combustibles at a constant rate. Therefore, in the embodiment shown in FIG 3, the combustible supplying means 30 is eliminated so as to supply combustibles 14 from the combustible supplying means 33 through the chute 43 directly into the fluidized-bed gasification furnace 10. With the structure shown in FIG 3, the chute 43 needs to have a proper inclination angle. Therefore, the entire combustible supplying facility is inevitably located at a high position.

[0023] FIG 4 is a diagram showing a schematic arrangement example of another fluidized-bed gasification

furnace and another combustible supplying apparatus according to the present invention. In this embodiment, the same or corresponding parts are designated by the same reference numerals as those in FIGS. 2 and 3, and details thereof will be omitted. In this embodiment, details of structures of a waste pit 501, which supplies combustibles 14 into a hopper 38, are illustrated. Specifically, combustibles 14 are delivered through a waste introduction door 502 into the waste pit 501 while outside air is blocked. The combustibles 14 delivered into the waste pit 501 are introduced into the hopper 38 by a crane 21 or the like. The internal pressure of the waste pit 501 is maintained to be a negative pressure, so that a gas in the waste pit 501 does not flow out the waste pit 501 (this holds true in the embodiments shown in FIGS. 2 and 3). Material sealing is effectively performed to the combustibles 14 in the hopper 38 by consolidated combustibles 14, which have been pushed at a lower portion of the hopper 38 by the pusher 39. External air or a gas in the waste pit 501 can be prevented from flowing into the fluidized-bed gasification furnace 10 by material sealing provided by the combustibles 14 consolidated at the lower portion of the hopper 38. A predetermined amount of combustibles 14 is fed and introduced into the hopper 36 by the pusher 39. So-called spilled wastes produced when the pusher 39 is retracted are delivered and returned to the waste pit 501 by a dedicated conveyor, which is not shown. Since a level sensor 18 is provided in the hopper 36, the pusher 39 can be operated so that the amount of combustibles 14 in the hopper 36 is maintained to a constant value. Material sealing provided by the combustibles 14 in the hopper 36 can also prevent external air from flowing into the fluidized-bed gasification furnace 10.

[0024] With regard to effects of the pusher 40, a pusher portion 403 is pushed into the hopper 36 by a driving portion 401 of the pusher 40 to press the combustibles 14 against the screw 34, as with the effects of the pusher 40 shown in FIG 2. Thus, local consolidation of the combustibles 14 is prevented, and constant supply into the screw 34 can be maintained. A scraping device 41 is provided at an outlet of the screw 34. The combustibles 14 pushed by the screw 34 are mechanically scraped to make supply of the screw 34 constant more effectively. The combustibles 14 which have passed the scraping device 41 are supplied through the chute 43 into the fluidized-bed gasification furnace 10.

[0025] Further, a relief valve 42 is provided in the combustible supplying means 33 so that a combustible gas leaking from the fluidized-bed gasification furnace 10 is released from the relief valve 42 through a pipe (supplying means) 500 into the waste pit 501 when the interior of the fluidized-bed gasification furnace 10 has a positive pressure. There may be provided a path such that the combustible gas leaking from the fluidized-bed gasification furnace 10 is drawn from the relief valve 42 by a blower and introduced directly into a combustion gas pipe 700. A gas in the waste pit 501 is continuously drawn by a forced draft blower 504. The amount of gas drawn can be adjusted by a valve 503. It is desirable that the gas introduced into the combustion gas pipe 700 is mixed with air separately introduced from an external space and then used as combustion air for the fluidized-bed gasification furnace 10 and/or a slagging combustion furnace in a gasification and slagging combustion system.

[0026] From the viewpoint of safety, it is desirable that an emergency shutoff valve 44 is provided in the chute 43, and that the emergency shutoff valve 44 is closed at the time of emergency or at the beginning of operation, because it is possible to prevent a combustible gas in the fluidized-bed gasification furnace 10 from leaking out through the combustible supplying apparatus to the exterior of the system.

[0027] FIG 5 is a schematic diagram showing an example of an entire system in which a combustible supplying apparatus according to the present invention is applied to a gasification and slagging combustion system. The gasification and slagging combustion system is defined as a system which gasifies combustibles in a gasification furnace, introduces products such as gas, char, tar produced in the gasification furnace into a slagging combustion furnace, and combusts the products at a high temperature in the slagging combustion furnace to melt ash content contained in the products into slag. The gasification and slagging combustion system will be described with reference to FIG 5. A combustible gas 17 as a product produced in a fluidized-bed gasification furnace 10 is introduced into a slagging combustion furnace 800 so as to form a circulating flow in the slagging combustion furnace 800. Combustion air 801 is introduced in tangential directions of the circulating flow to convert ash content into slag mist. The slag mist is trapped on furnace walls by circulating effect of the gas. The molten slag discharged through a slag discharge port 802 is converted into water granulated slag in a water chamber 803 and discharged to the exterior of the system by a conveyor 804. On the other hand, heat of a combustion exhaust gas produced in the slagging combustion furnace 800 is recovered as steam by a waste heat boiler 900, and the combustion exhaust gas is cooled in a gas cooling chamber 901. After fly ash is collected by a bag filter 902, the combustion exhaust gas is discharged to the exterior of the system. The entire gasification and slagging combustion system is maintained at a negative pressure by an induced draft fan 903.

[0028] Such a gasification and slagging combustion system may employ a combustible supplying apparatus shown in FIG 2 or 3.

[0029] With the above arrangement, the use of a combustible supplying apparatus which can prevent external air from leaking into a gasification furnace and does not require any mechanical sealing mechanisms such as a double damper can allow a gasification and slagging combustion system to be operated extremely safely. Furthermore, improvement of sealing and improvement of constant supply have heretofore been antinomic prob-

lems. However, the use of a supplying apparatus according to the present invention can achieve a combustible supplying method which is superior in sealing effects and constant supply. Further, even if a combustible gas leaks through the combustible supplying apparatus, the present system can treat the combustible gas safely.

Industrial Applicability

[0030] As described above, according to the present invention as recited in claims 1 and 2, combustibles are supplied to a hopper while external air is prevented from leaking into the gasification furnace together with the combustibles. Thus, it is possible to provide a method of supplying combustibles to a gasification furnace which can prevent external air from leaking into the gasification furnace and does not require any special sealing mechanisms such as a double damper. Simultaneously, the combustibles in the hopper are supplied to the gasification furnace in fixed quantity while an amount of stored combustibles supplied to the hopper is controlled so as to be constant. Accordingly, it is possible to reduce a variation of a combustible gas produced in the gasification furnace and facilitate stable operation of the gasification furnace. Further, since a variation of a combustible gas produced is thus reduced, it is also possible to facilitate stable operation of a slagging combustion furnace subsequent to the gasification furnace.

[0031] According to the present invention as recited in claim 2, it is possible to provide a method of supplying combustibles to a gasification furnace which can treat a combustible gas safely by releasing, to a waste pit, a combustible gas which leaks from the gasification furnace to a combustible supplying side because air is continuously drawn from the waste pit and used for combustion.

[0032] According to the present invention as recited in claims 3 and 5, combustibles are supplied to a hopper by a first combustible supplying mechanism while external air is prevented from leaking into the gasification furnace. Thus, it is possible to provide a combustible supplying apparatus for supplying combustibles to a gasification furnace and a gasification and slagging combustion system which can prevent external air from leaking into the gasification furnace and does not require any special sealing mechanisms such as a double damper. Simultaneously, the combustibles in the hopper are supplied to the gasification furnace in fixed quantity while an amount of stored combustibles supplied to the hopper is controlled so as to be constant. Accordingly, it is possible to reduce a variation of a combustible gas produced in the gasification furnace and facilitate stable operation of the gasification furnace. Further, since a variation of a combustible gas produced is thus reduced, it is also possible to facilitate stable operation of a slagging combustion furnace subsequent to the gasification furnace.

[0033] According to the present invention as recited in claims 4 and 6, it is possible to provide a combustible supplying apparatus for supplying combustibles to a gasification furnace and a gasification and slagging combustion system which can release, through a relief valve, a combustible gas which leaks from the gasification furnace when the gasification furnace has a positive pressure and can introduce the combustible gas to a waste pit by supplying means. Because air is continuously drawn from the waste pit and used for combustion, a combustible gas can be treated safely.

Claims

1. A method of supplying combustibles to a gasification furnace for gasifying the combustibles, said method **characterized by** comprising:

   supplying the combustibles to a hopper while preventing external air from leaking into the gasification furnace by the combustibles; and
   supplying the combustibles in said hopper to the gasification furnace in fixed quantity while controlling an amount of combustibles stored in said hopper so as to be constant.

2. The method of supplying combustibles to a gasification furnace as recited in claim 1, **characterized in that** a combustible gas which leaks from the gasification furnace to a combustible supplying side is released to a waste pit.

3. A combustible supplying apparatus for supplying combustibles to a gasification furnace for gasifying the combustibles, said combustible supplying apparatus **characterized by** comprising:

   a first combustible supplying mechanism for supplying the combustibles while preventing external air from leaking into the gasification furnace by the combustibles;
   a hopper for storing the combustibles supplied through said first combustible supplying mechanism; and
   a second combustible supplying mechanism for supplying the combustibles in said hopper to the gasification furnace in fixed quantity while controlling an amount of combustibles stored in said hopper so as to be constant.

4. The combustible supplying apparatus for supplying combustibles to a gasification furnace as recited in claim 3, said combustible supplying apparatus **characterized by** comprising a relief valve for releasing a combustible gas which leaks from the gasification furnace to a combustible supplying side, and supplying means for supplying the combustible gas released through said relief valve to a waste pit.

5. A gasification and slagging combustion system having a gasification furnace for gasifying combustibles and a slagging combustion furnace for melting a product produced in said gasification furnace, said gasification and slagging combustion system **characterized by** comprising:

a first combustible supplying mechanism for supplying the combustibles while preventing external air from leaking into said gasification furnace together with the combustibles;
a hopper for storing the combustibles supplied through said first combustible supplying mechanism; and
a second combustible supplying mechanism for supplying the combustibles in said hopper to said gasification furnace in fixed quantity while controlling an amount of combustibles stored in said hopper so as to be constant.

6. The gasification and slagging combustion system as recited in claim 5, **characterized by** comprising a relief valve for releasing a combustible gas which leaks from the gasification furnace to a second combustible supplying mechanism side, and supplying means for supplying the combustible gas released through said relief valve to a waste pit.

Fig 1

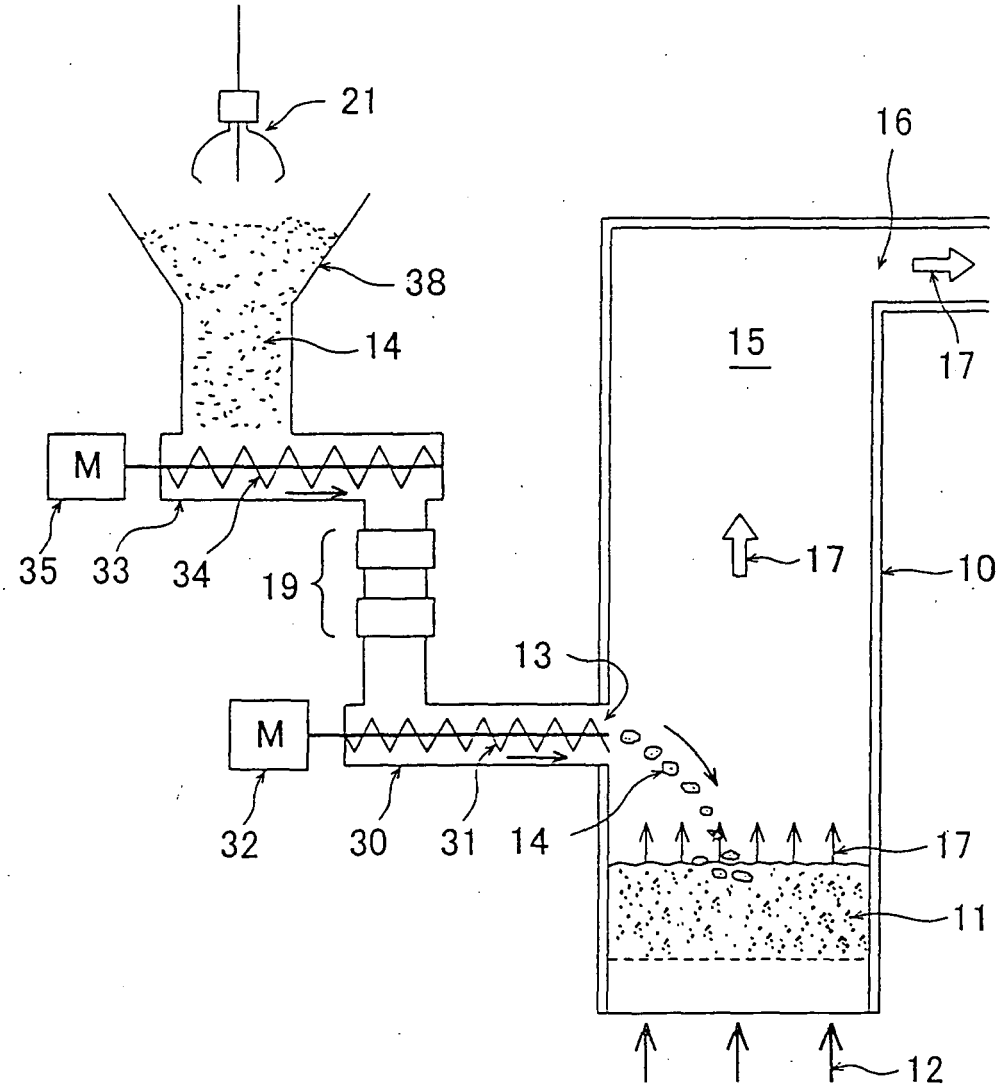


Fig 2

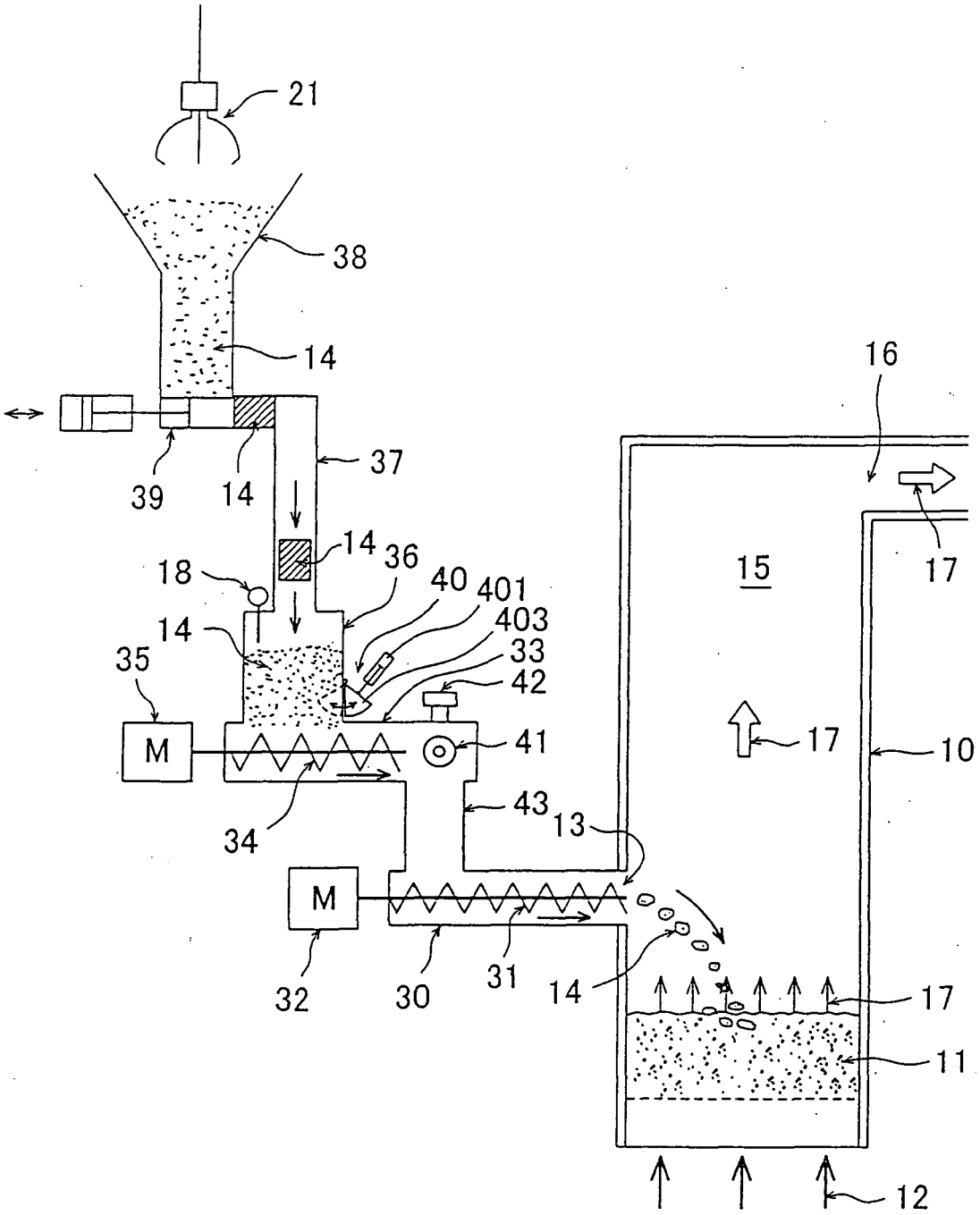

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Fig 3

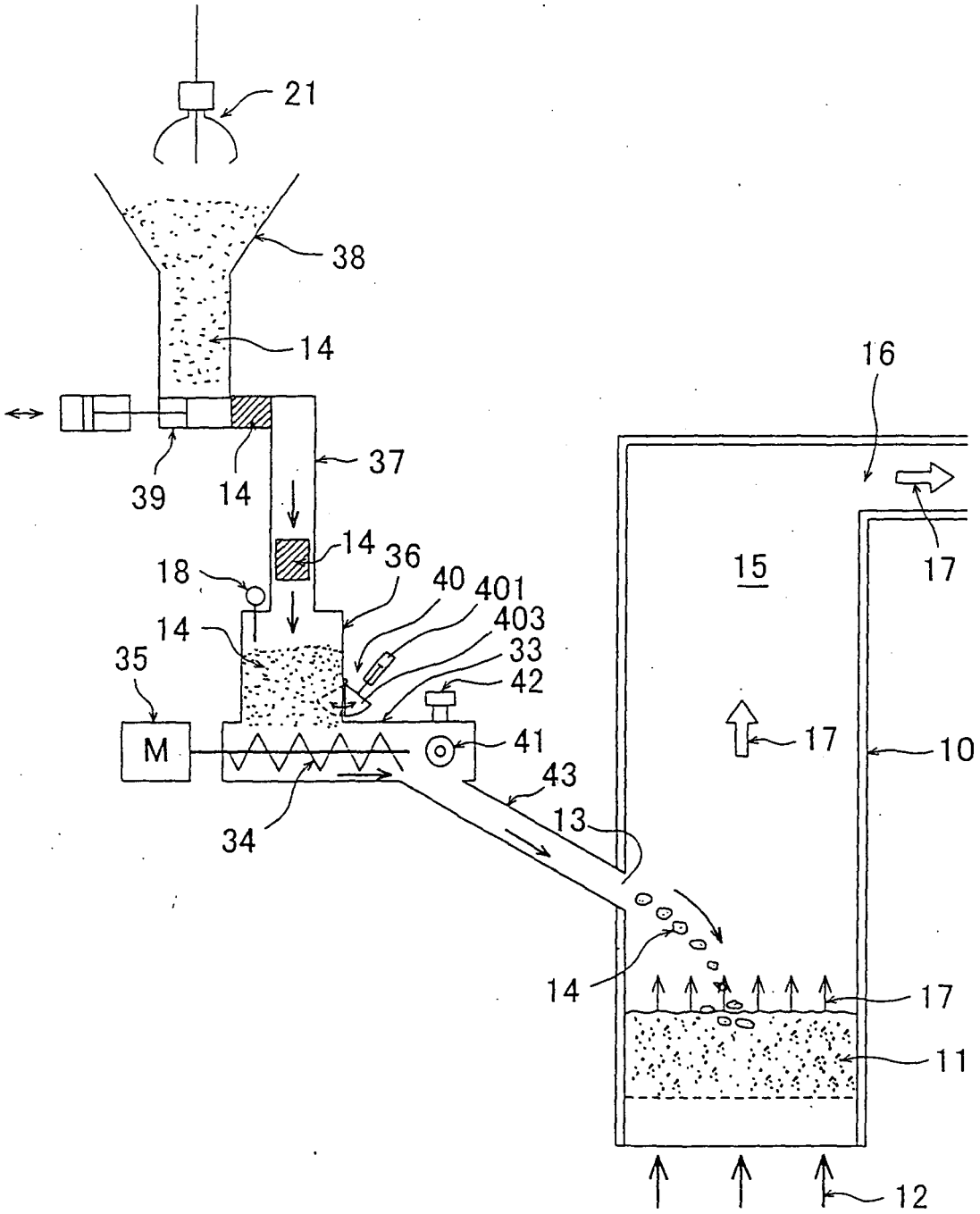
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Fig 4

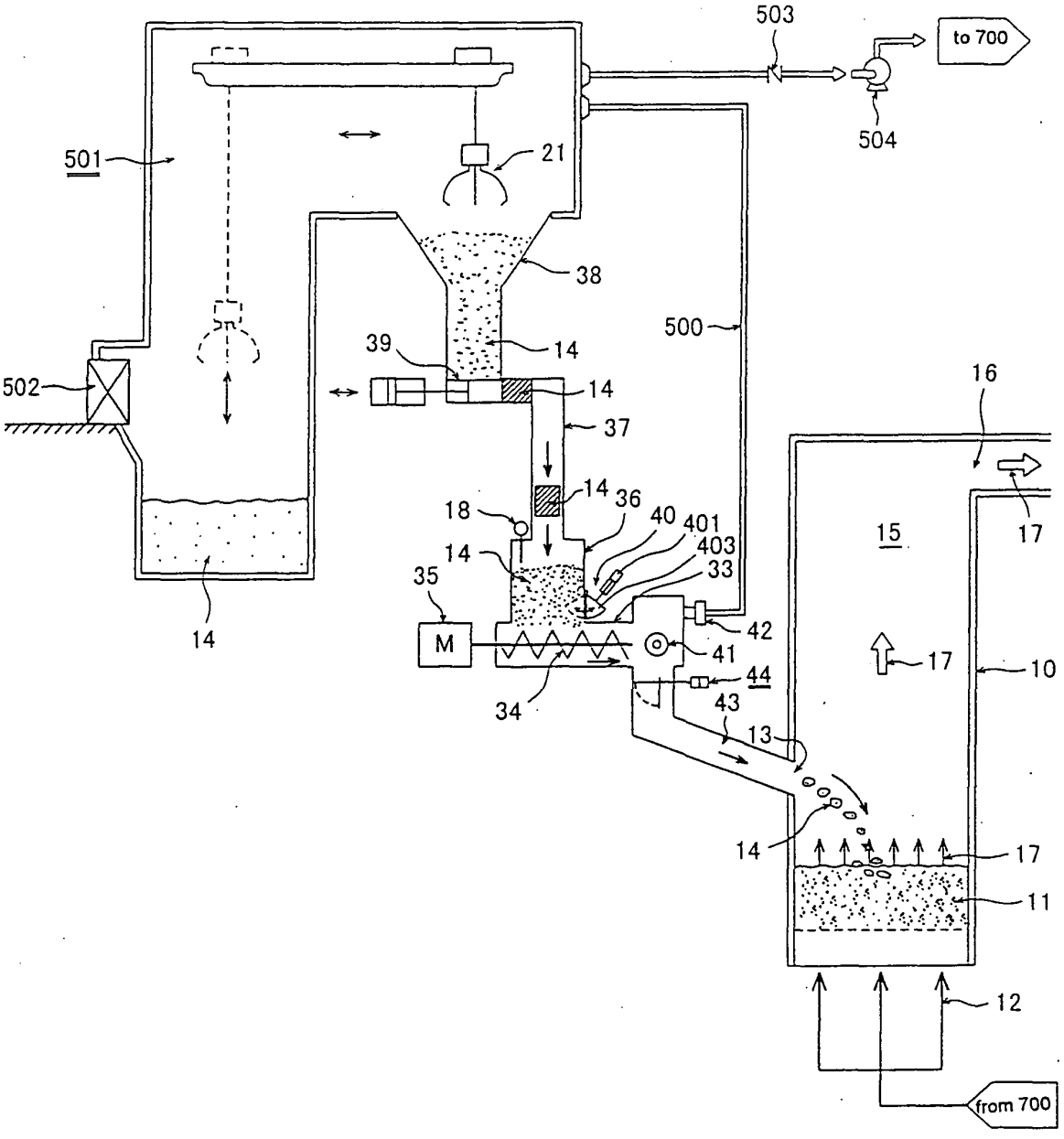
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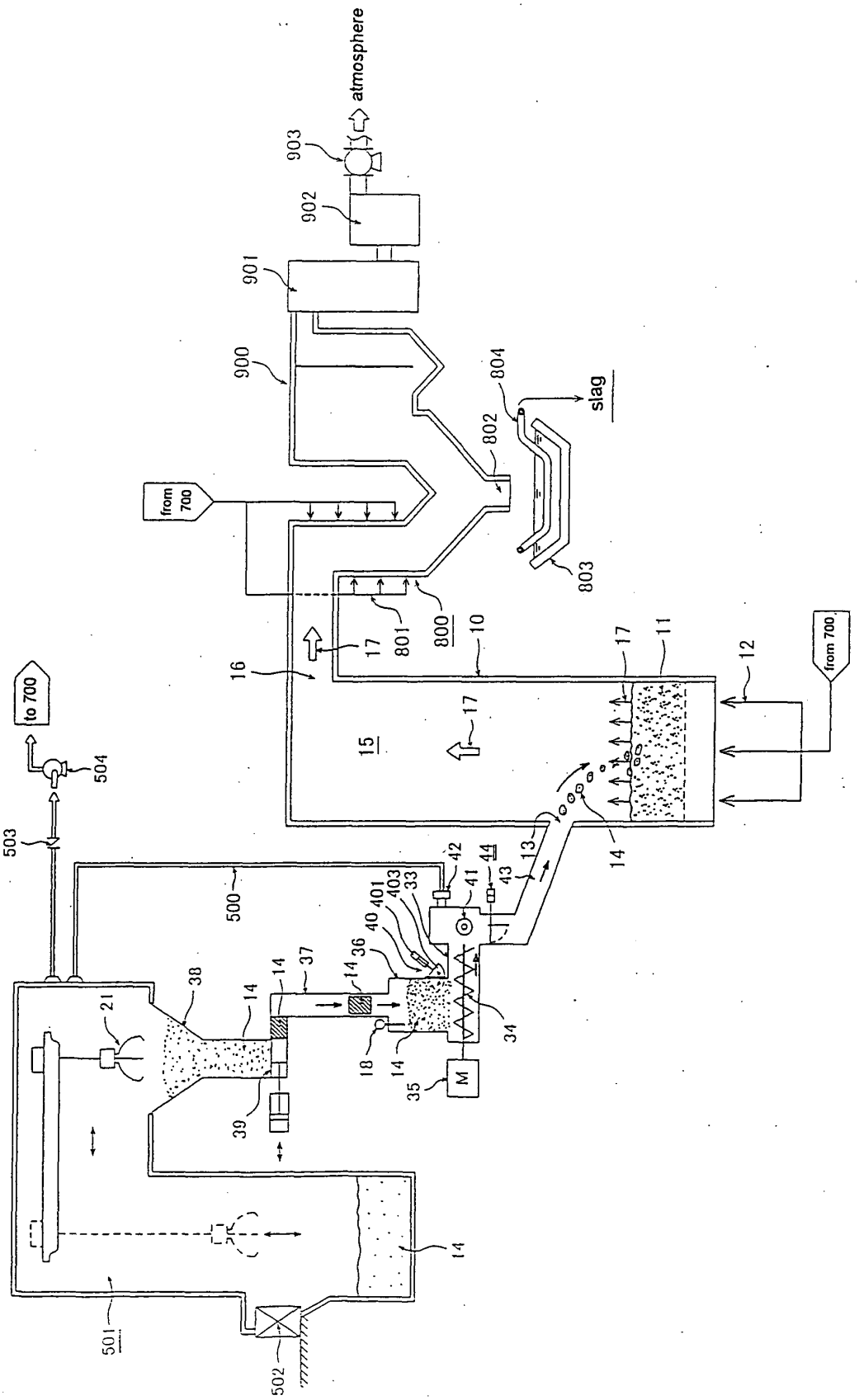
Fig 5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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/01736

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] C10J3/00

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)
Int.Cl[7] C10J3/00

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,E	JP 2003-56822 A (Ebara Corp.), 26 February, 2003 (26.02.03), Full text (Family: none)	1,3,5
A	JP 2001-279264 A (Toshiba Corp.), 10 October, 2001 (10.10.01), Full text (Family: none)	1-6
A	JP 2001-289422 A (Babcock-Hitachi Kabushiki Kaisha), 19 October, 2001 (19.10.01), Full text (Family: none)	1-6

☐ 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 document 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
23 May, 2003 (23.05.03)	10 June, 2003 (10.06.03)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/01736

(Scope of International Search)

It is not clear from the descriptions of Claims 1 and 2 and the mechanical skill of those skilled in the art what means "a process for feeding inflammables to a hopper while preventing external air from leaking into a gasifying furnace by the inflammables" uses specifically. Even if the descriptions in the specification are taken into consideration, the specific scope of the means is not definitely specified in the specification.

Accordingly, the inventions (concept of the inventions) relating to Claims 1 and 2 are not clear.

It is also applicable to Claims 3-6 "a first inflammable feed mechanism for feeding inflammables while preventing external air from leaking into a gasifying furnace by the inflammables."

Since Claims 1-6 of this international application are not clear, an international search was performed on "a method having a process for feeding inflammables compacted by a pusher in a hopper lower sending part to second inflammables through a chute" selected from among methods specified in Claims 1-2 and "a device having a first inflammable feed mechanism for feeding inflammables compacted by a pusher in a hopper lower part sending part to second inflammables through a chute" selected from among devices specified in Claims 3-6.