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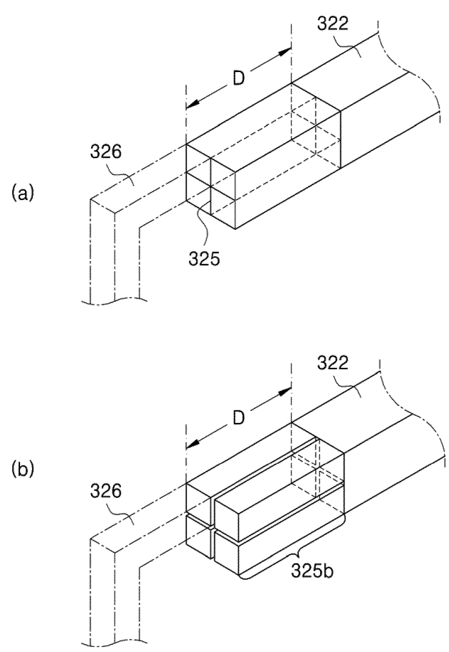
(54) FACILITY FOR MANUFACTURING SINTERED ORES

(57) The present disclosure relates to a facility for producing sintered ores. The facility may include: sintering vehicles movable along a traveling path; a plurality of wind-boxes arranged along the traveling path and below the sintering vehicles; a hood disposed above the sintering vehicles and extending along at least a portion of the traveling path; and an exhaust gas circulation pipe for connecting at least some of the plurality of wind-boxes to the hood. In addition, the exhaust gas circulation pipe at least partially may have at least one exhaust gas distribution region for distributing the exhaust gas in a flow direction of the exhaust gas to efficiently circulate the exhaust gas, thereby improving quality and productivity of the sintered ores.

【FIG. 3】



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a facility for producing sintered ores, and more particularly to, a facility for producing sintered ores capable of efficiently circulating exhaust gas to improve quality and productivity of the sintered ores.

RELATED ART

[0002] In a sintered ore producing process, fine iron ores are sintered to produce sintered ores in a size suitable for use in a blast furnace. Generally, in the sintered ore producing process, the fine iron ores, a binder, a side-raw material, and the like are mixed together with water in a drum mixer to generate a to-be-sintered mixed-raw material. Then, the to-be-sintered mixed-raw material is pseudo particulated and then charged on a sintering vehicle in a predetermined vertical level. A top surface layer of the to-be-sintered mixed-raw material is ignited by an ignition furnace. Then, gas in the mixed-raw material is sucked by a large suction fan and the like while the sintering vehicles are traveling. Therefore, the to-be-sintered mixed-raw material is combusted downwardly, thereby producing the sintered ore.

[0003] A demand for the sintered ore has increased due to enlargement of an internal volume of the blast furnace and an operation with a high tapping ratio. Accordingly, a grate area of the sintering machine should be increased, and a suction air volume should be increased corresponding to the increased area in order to increase the producing of the sintered ore. In order to increase the suction air volume, a capacity of the suction fan may be increased. However, along with the capacity increase, investment and maintenance costs may also increased due to a necessity of expansion of an exhaust gas cleaning facility. Therefore, exhaust gas generated from the sintering machine is circulated to secure a sufficient amount of the air volume based on the increase of the grate area.

[0004] A method for circulating the exhaust gas in the sintering machine is carried out by installing a hood at least at a portion of an upper portion of the sintering machine and supplying the exhaust gas discharged through wind-boxes to the hood. In this connection, the hood is disposed at the upper portion of the sintering machine to extend in a traveling direction of the sintering vehicles. Thus, in order to supply the exhaust gas uniformly throughout the hood, a plurality of inlet pipes are installed at a circulation pipe, along which the exhaust gas flows, to supply the exhaust gas in the hood. However, a flow direction of the exhaust gas in the circulation pipe differs from a flow direction of the exhaust gas in the inlet pipe. Therefore, the exhaust gas is not uniformly distributed into the plurality of inlet pipes, and a large amount of the exhaust gas flows into the inlet pipes connected to an end of the circulation pipe. This causes exhaust gas leakage around the inlet pipes connected to the end of the circulation pipe, thereby reducing an amount of an air volume of the exhaust gas supplied to the sintering machine and reducing overall sintering productivity. Further, an environment is contaminated due to harmful substances contained in the exhaust gas.

SUMMARY

[0005] The present disclosure provides a facility for producing sintered ores capable of efficiently circulating exhaust gas to improve quality and productivity of the sintered ores.

[0006] The present disclosure provides a facility for producing sintered ores capable of suppressing a leakage of exhaust gas and suppressing environmental contamination.

[0007] A facility for producing sintered ores according to the embodiment of the present disclosure may include: sintering vehicles movable along a traveling path; a plurality of wind-boxes arranged along the traveling path and below the sintering vehicles; a hood disposed above the sintering vehicles and extending along at least a portion of the traveling path; and an exhaust gas circulation pipe for connecting at least some of the plurality of wind-boxes to the hood. The exhaust gas circulation pipe at least partially may have at least one exhaust gas distribution region for distributing the exhaust gas in a flow direction of the exhaust gas.

[0008] The exhaust gas circulation pipe may include: a main pipe having one end thereof connected to the wind-boxes, where the main pipe includes the exhaust gas distribution region; and a plurality of inlet pipes, each having one end connected to the main pipe and the other end connected to the hood.

[0009] The main pipe may have a suction fan, and the exhaust gas distribution region may be disposed between the suction fan and the hood.

[0010] The exhaust gas distribution region may include a plurality of distribution pipes, each extending in a parallel manner to a flow direction of the exhaust gas.

[0011] The plurality of distribution pipes may be formed to have the same cross-sectional area.

[0012] One end of the inlet pipe may be connected to the distribution pipe, and the other end of the inlet pipe may be connected to the hood. Further, the inlet pipe may include a number of inlet pipes corresponding to the number of the distribution pipes.

[0013] One end of the inlet pipe may be connected to the distribution pipe, and the other end of the inlet pipe may be connected to the hood. Further, the other end of the inlet pipe may be branched into a plurality of sub-pipes connected to the hood.

[0014] The exhaust gas distribution region may include a partition for dividing an internal space of the main pipe into a plurality of paths, each path extending in a direction parallel to the flow direction of the exhaust gas.

[0015] The partition may divide the internal space of the main pipe such that the plurality of paths have the same cross-sectional area.

[0016] One end of the inlet pipe may be connected to the path and the other end of the inlet pipe may be connected to the hood. Further, the inlet pipe may include a number of inlet pipes corresponding to the number of the paths.

[0017] One end of the inlet pipe may be connected to the path and the other end of the inlet pipe may be connected to the hood. Further, the other end of the inlet pipe may be branched into the plurality of sub-pipes connected to the hood.

[0018] The inlet pipe may be connected to one end of the hood. Further, the other ends of the plurality of inlet pipes may have the same vertical level.

[0019] The inlet pipe may have therein a first induction member for controlling a flow of the exhaust gas.

[0020] The hood may include at least one of: at least one second induction member for controlling the exhaust gas in the hood; or blocking members for blocking a leakage of the exhaust gas.

[0021] The exhaust gas circulation pipe may be connected to the hood to supply the exhaust gas in a direction intersecting the traveling direction of the sintering vehicles. Further, the second induction member disposed in the hood may be oriented in a direction intersecting the supply direction of the exhaust gas.

[0022] The second induction member may be disposed on at least one end of the hood and extend along a longitudinal direction of the hood.

[0023] The second induction member may include an inclined face inclined downwardly and inwardly of the hood.

[0024] Each of the blocking members may be formed in a plate shape having an area. Further, the blocking members may be respectively disposed on both sides of the hood facing each other with respect to the traveling direction of the sintering vehicles, wherein each blocking member may extend vertically.

[0025] The blocking member may be configured to be rotatable in the traveling direction of the sintering vehicles.

[0026] The facility may further include: a pressure gauge for measuring internal pressure of the hood; an auxiliary pipe for connecting the hood and the wind-boxes; and a valve for opening and closing the auxiliary pipe based on the internal pressure of the hood measured by the pressure gauge.

[0027] According to the present disclosure, the exhaust gas may be supplied uniformly to the plurality of inlet pipes that supply the exhaust gas to the hood in the exhaust gas circulating sintering process. Therefore, the leakage of the exhaust gas to the outside due to differences in flow rates of the exhaust gas supplied to the plurality of inlet pipes may be suppressed.

[0028] Further, the leakage of the exhaust gas may be suppressed or prevented in the exhaust gas circulating sintering process. That is, a gap between the movable sintering vehicles and the hood may be minimized to suppress the leakage of the exhaust that may occur around the hood.

[0029] As such, the leakage of the exhaust gas may be suppressed or prevented to improve a circulation rate of the exhaust gas to improve sintering productivity or to reduce the environmental pollution caused by the harmful substances contained in the exhaust gas.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030]

FIG. 1 is a schematic diagram of a sintered ore producing facility according to an embodiment of the present disclosure.

FIG. 2 illustrates a configuration of an exhaust gas circulation portion in the sintered ore producing facility illustrated in FIG. 1.

FIG. 3 illustrates connection structures of an exhaust gas circulation pipe illustrated in FIG. 2.

FIG. 4 illustrates various structures of an exhaust gas circulation pipe.

FIG. 5 illustrates various examples of an induction member installed in an exhaust gas circulation pipe.

FIG. 6 illustrates a structure of an exhaust gas circulation region according to an embodiment of the present disclosure.

FIG. 7 illustrates cross-sectional structures of a hood taken along a line A-A' in FIG. 6.

FIG. 8 illustrates a front face (or a rear face) structure of the hood illustrated in FIG. 6.

FIG. 9 illustrates arrangements of blocking members based on a change in a vertical level of a raw material layer in a sintering vehicle.

FIG. 10 is a schematic diagram of a sintered ore producing facility according to a variation of the present disclosure.

FIG. 11 illustrates diagrams for comparing leakage degrees of exhaust gas around a hood when producing sintered ores.

DETAILED DESCRIPTION

[0031] Hereinafter, exemplary embodiments of the present disclosure will be described in detail. However, the present disclosure is not limited to the embodiments disclosed below, but may be implemented in various forms. The embodiments of the present disclosure are provided to make the disclosure of the present disclosure complete and fully inform those skilled in the art to which the present disclosure pertains of the scope of the present disclosure.

[0032] FIG. 1 is a diagram of a sintered ore producing facility according to an embodiment of the present disclosure.

[0033] Referring to FIG. 1, the sintered ore producing facility includes: a plurality of sintering vehicles 200 arranged to be movable in one direction and having a space defined therein for heat-treating a mixed-raw material; a traveling path 120 forming a closed-loop such that the sintering vehicles 200 rotate in an endless track manner; an ignition furnace 130 for spraying a flame on the mixed-raw material charged in the sintering vehicles 200; and a plurality of wind-boxes 121 arranged along the traveling path 120 below the sintering vehicles 200 to suck air downwardly from the sintering vehicles 200 to sinter the mixed-raw material. Further, the sintered ore producing facility may include an exhaust gas circulation portion 300 including a hood 310 disposed above the sintering vehicles 200 and extending along at least a portion of the traveling path 120 and an exhaust gas circulation pipe 320 for connecting at least some of the plurality of wind-boxes to the hood 310. In this connection, at least a portion of the exhaust gas circulation pipe 320 may have an exhaust gas distribution region D for distributing exhaust gas such that the exhaust gas flows while forming a plurality of paths. Although the exhaust gas distribution region D is illustrated as being disposed at a portion connected to inlet pipes 326 for supplying the exhaust gas to the hood 310, the exhaust gas distribution region D may include at least one, that is a plurality of exhaust gas distribution regions at the exhaust gas circulation 320.

[0034] The traveling path 120 forms the closed-loop such that the sintering vehicles 200 rotate in the endless track manner. Further, the traveling path 120 may include an upper traveling path where charging and sintering of the raw material are performed and a lower traveling path where the empty sintering vehicles 200, which have discharged sintered ore, travel to the upper traveling path for the sintering process. The upper traveling path may include a raw material supply region for charging the raw material in the sintering vehicles 200, an ignition region, and a sintering region. In addition, the lower traveling path may be a recurrence region where the sintering vehicles 200 travel for a next sintering process. In this connection, a region where the upper traveling path is switched to the lower traveling path may be a discharging portion 126 where the sintered ore is discharged. At one end of the discharging portion 126, a crusher (not shown) for crushing the sintered ore discharged from the sintering vehicles 200 and a cooler (not shown) for cooling the crushed sintered ore maybe provided.

[0035] A raw material supply unit 110 for charging the mixed-raw material into the sintering vehicles 200 may be arranged at one side above the traveling path 120. Further, the ignition furnace 130 may be disposed in front of the raw material supply unit 110 with respect to the traveling direction of the sintering vehicles 200. In addition, the plurality of wind-boxes 121 may be arranged from the ignition region to the sintering region and below the upper traveling path to suck interior of the sintering vehicles. The wind-boxes 121 generate a negative pressure to suck the interior of the sintering vehicles 200 such that a downward flow of air of the raw material layer is generated within the sintering vehicles 200 to sinter the raw material.

[0036] A duct 122 is connected to ends of the wind-boxes 121, and a first suction fan 124 is installed at an end of the duct 122 to generate the negative pressure in the wind-boxes 121 to suck the interior of the sintering vehicles 200. Further, the duct 122 has a dust collector 123 in front of the first suction fan 124 to filter impurities from a portion of the exhaust gas sucked through the wind-boxes 121 and to discharge the filtered impurities through a chimney 125. The wind-boxes 121 suck outdoor air to allow ignition of a surface layer of a to-be-sintered raw material and combustion of the to-be-sintered raw material to produce the sintered ore.

[0037] The exhaust gas circulation portion 300 may include: the hood 310 disposed above the sintering vehicles 200 and extending along at least the portion of the traveling path 120; the exhaust gas circulation pipe 320 having one end thereof connected to at least some of the plurality of wind-boxes 121 and the other end thereof connected to the hood 310; and a second suction fan 328 connected to the exhaust gas circulation pipe 320 to transfer the exhaust gas discharged through the wind-boxes 121 to the hood 310. In this connection, a chamber (not shown) for collecting the exhaust gas discharged from the wind-boxes 121 may be arranged at the one end of the exhaust gas circulation pipe 320.

[0038] The exhaust gas circulation portion 300 may serve to circulate at least a portion of the exhaust gas so as to be reusable to produce the sintered ore in a process of sintering the mixed-raw material. The exhaust gas circulation portion 300 may be disposed to collect and circulate the exhaust gas generated in various regions where the sintered ore is produced. For example, the exhaust gas circulation portion 300 may be disposed to circulate the exhaust gas to the sintering region, to the cooler for cooling the sintering ore, or the like, depending on temperature, component (oxygen concentration and the like), and the like of the exhaust gas.

[0039] FIG. 2 illustrates a configuration of an exhaust gas circulation portion in the sintered ore producing facility illustrated in FIG. 1. Further, FIG. 3 illustrates connection structures of an exhaust gas circulation pipe illustrated in FIG. 2. Further, FIG. 4 illustrates various structures of an exhaust gas circulation pipe. Further, FIG. 5 illustrates various examples of an induction member installed in an exhaust gas circulation pipe.

[0040] Referring to FIGS. 2 and 3, the exhaust gas circulation pipe 320 may include a main pipe 322 having one end thereof connected to at least some the plurality of wind-boxes 121 and the inlet pipes 326, each having one end connected to the main pipe 322 and the other end connected to the hood.

[0041] The main pipe 322 collects exhaust gases discharged from at least some of the plurality of wind-boxes 121, for example, four wind-boxes 121, and circulates the collected exhaust gases to the hood 310. In addition, the inlet pipes 326 respectively supply a portion of the exhaust gas flowing along the main pipe 322 to the hood 310. Thus, the main pipe 322 may have a cross-sectional area significantly larger than that of the inlet pipe 326, and the main pipe 322 may have the cross-sectional area same with or similar to a sum of cross-sectional areas of the inlet pipes 326 connected to the main pipe 322. In the drawing, four inlet pipes 326 are illustrated, and the inlet pipes 326 are respectively referred to as a first inlet pipe 326a, a second inlet pipe 326b, a third inlet pipe 326c, and a fourth inlet pipe 326d, in an order from farthest to the nearest.

[0042] In this connection, the other ends of the inlet pipes 326 may be connected to one end of the hood 310, therefore the exhaust gas may be supplied in a direction intersecting the traveling direction of the sintering vehicles 200. One ends of the plurality of inlet pipes 326 may have vertical levels different from or equal to each other, and may be connected to the main pipe 322. In addition, all of the other ends thereof may have the same vertical level, and may be connected to the hood 310.

[0043] When the plurality of inlet pipes 326 are respectively branched from the main pipe 322 and connected to the hood 310, the largest amount of the exhaust gas may flow into the first inlet pipe 326a, the farthest from the main pipe 322. In this case, a large amount of the exhaust gas may leak around the hood 310 to which the first inlet pipe 326a is connected. Further, the first inlet pipe 326a may be deteriorated or deformed by a kinetic energy of the exhaust gas, resulting in the leakage of the exhaust gas.

[0044] Accordingly, in the present disclosure, the distribution region D for distributing the exhaust gas to allow the exhaust gas to flow along the plurality of paths is formed at least a portion of the main pipe 322. Therefore, the exhaust gas may flow uniformly through the plurality of inlet pipes 326.

[0045] Referring to FIG. 3, a path along which the exhaust gas flows may be defined in the main pipe 322. Further, the distribution region D for distributing the exhaust gas to allow the exhaust gas to flow along the plurality of paths may be formed at at least a portion of the main pipe 322.

[0046] The distribution region D may be formed using a plurality of distribution pipes 325b as shown in (a) in FIG. 3, or may be formed using a partition 325a dividing an internal space of the main pipe 322 into a plurality of spaces as shown in (b) in FIG. 3.

[0047] When the distribution region D is formed by the plurality of distribution pipes 325b, the plurality of distribution pipes 325b having the same cross-sectional area may be connected to inside of the main pipe 322 or to the other end of the main pipe 322 connected to the inlet pipe 326.

[0048] Further, when the distribution region D is formed using the partition 325a, the partition 325a maybe inserted into the main pipe 322, for example, in a longitudinal direction of the main pipe 322 or in a direction parallel to the flow direction of the exhaust gas, into the other end of the main pipe 322 to which the inlet pipes 326 are connected, thereby dividing the internal space of the main pipe 322 into the plurality of spaces.

[0049] With these arrangements, the exhaust gas flowing along the main pipe 322 may be divided at the plurality of spaces divided by the distribution pipes 325b or the partition 325a at the distribution region D and may flow into the inlet pipes 326.

[0050] The distribution region D may be configured in various ways based on a sectional shape of the main pipe 322 or the number of the inlet pipes 326. In an example to be described below, it is assumed that the distribution region D is formed by the partition 325a.

[0051] Referring to (a) in FIG. 4, the sectional shape of the main pipe 322 is a long rectangular shape in a vertical direction and three inlet pipes 326 may be connected to the main pipe 322. In this case, the partition 325a may include two partitions 325a vertically spaced apart from each other in the main pipe 322 at the distribution region D to divide the internal space of the main pipe 322 into three spaces. Further, the three inlet pipes 326 may be respectively connected to the three spaces divided by the partitions 325a. In this connection, one ends of the three inlet pipes 326 connected to the main pipe 322 have different vertical levels. However, the other ends thereof may be arranged in a same vertical level. Herein, it is described that the distribution region D is divided into the three spaces, but the distribution region D may be divided into more than three spaces based on the number of the inlet pipes 326.

[0052] Referring to (b) in FIG. 4, the sectional shape of the main pipe 322 is the long rectangular shape in the vertical direction, and two inlet pipes 326 may be connected to the main pipe 322. In this case, the partition 325a may be installed in the main pipe 322 at the distribution region D to divide the internal space of the main pipe 322 into two spaces. Further, the two inlet pipes 326 may be respectively connected to the two spaces divided by partition 325a. In this connection, the other end of the inlet pipe 326 may be branched into two sub-pipes and respectively connected to the hood 310.

[0053] Referring to (c) in FIG. 4, the sectional shape of the main pipe 322 is a square shape and four inlet pipes 326 may be connected to the main pipe 322. In this connection, two partitions 325a may be arranged in a direction intersecting each other to divide the internal space of the main pipe 322 into four spaces. Then, the four inlet pipes 326 may be respectively connected to the four spaces divided by the partitions 325a. Herein, it is described that the distribution region D is divided into the four spaces, but the distribution region D may be divided into more than four spaces based on the number of the inlet pipes 326.

[0054] In this manner, the large amount of the exhaust gas flowing along with the main pipe 322 is distributed by the distribution pipes 325b forming the distribution region D or by the plurality of spaces such that uniform amount of the exhaust gas may respectively flow into the plurality of inlet pipes 326. Accordingly, the deformation of the inlet pipes or the leakage of the exhaust gas, which may occur due to the inflow of the large amount of the exhaust gas into one of the plurality of inlet pipes 326 may be suppressed.

[0055] Even though the exhaust gas is distributed at the distribution region D and the uniform amount of the exhaust gas flows into each of the plurality of inlet pipes 326, the flow direction of the exhaust gas flowing into the hood 310 and the flow direction of the exhaust gas in the hood 310 are different. Therefore, a complex vortex is formed inside the hood 310, so that a smooth exhaust gas flow may not be formed on the sintering vehicles 200 side. Therefore, at least a portion of the inlet pipe 326 is formed with an enlarged region W having an increased sectional area along the flow direction of the exhaust gas to reduce a flow velocity of the exhaust gas, thereby minimizing the occurrence of the vortex in the hood 310.

[0056] Further, the exhaust gas flowing into the inlet pipe 326 becomes eccentric to one end within the inlet pipe 326 due to a property of maintaining the flow direction thereof along the main pipe 322. When the exhaust gas flows eccentrically along the inlet pipe 326, the exhaust gas also remains eccentric when flowing into the hood 310, so that the exhaust gas is also not uniformly diffused in the hood 310. Accordingly, flow rates of the exhaust gases supplied to the raw material layer and the sintering layer in the sintering vehicles 200 may be partially different. Accordingly, a first induction member 330 may be installed in the inlet pipe 326, and more preferably at the enlarged region W of the inlet pipe 326 to diffuse the exhaust gas within the inlet pipe 326. Thus, the exhaust gas may be supplied to the hood 310 while the eccentricity is minimized within the inlet pipe 326.

[0057] The first induction member 330 may be disposed in the enlarged region W in the inlet pipe 326 and switch the flow direction of the exhaust gas in the inlet pipe 326. The first induction member 330 may be formed in a plate shape having an area of 1/2 or greater with respect to the cross-sectional area of the inlet pipe 326 at a region where the first induction member 330 is installed. The first induction member 330 may include at least one first induction member in a direction intersecting the flow direction of the exhaust gas. The first induction member 330 may be disposed to cross the inside of the inlet pipe 326 at an angle about 10 to 20 degrees such that the exhaust gas may collide with a front face of the first induction member 330 in the inlet pipe 326. A path through which the exhaust gas may flow may be formed in front of and behind the first induction member 330. In this connection, when the first induction member 330 includes a plurality of first induction members, the first induction members 330 may be spaced apart from each other to allow the exhaust gas to flow therebetween.

[0058] The first induction member 330 may be disposed at a front end of the enlarged region W formed in the inlet pipe 326 as shown in (a) and (b) in FIG. 5. Alternatively, the first induction member 330 may also be disposed at a rear end of the enlarged region W, for example, a portion adjacent to the hood 310, as shown in (c) in FIG. 5. In this connection, when the first induction member 330 is disposed at the front end of the enlarged region W, because the flow velocity of the exhaust gas flowing into the enlarged region W is fast, the exhaust gas may flow to some extent eccentric even after passing the first induction member 330. However, since the flow velocity of the exhaust gas is reduced while the exhaust gas passes the enlarged region W, when the first induction member 330 is disposed at the rear end of the enlarged region W, the eccentricity of the exhaust gas may be reduced more effectively than in a case where the first induction member 330 is disposed at the front end of the enlarged region W.

[0059] Further, since the sintering vehicles 200 travel along the traveling path 120, the hood 310 may be installed above the sintering vehicles 200 at a predetermined distance. Because of this structural feature, a portion of the exhaust gas supplied to the hood 310 does not flow into the raw material layer in the sintering vehicles 200, but is liable to leak into a gap defined between the hood 310 and the sintering vehicle 200. Therefore, in the present disclosure, in order to minimize an amount of the exhaust gas leaking between the sintering vehicles 200 and the hood 310, second induction members 332 for controlling the flow of the exhaust gas and blocking members 340 for minimizing the gaps between the hood 310 and the sintering vehicles 200 are installed at the hood 310.

[0060] FIG. 6 illustrates a structure of an exhaust gas circulation region according to an embodiment of the present disclosure. Further, FIG. 7 illustrates cross-sectional structures of a hood taken along a line A-A' in FIG. 6. Further, FIG. 8 illustrates a front face (or a rear face) structure of the hood illustrated in FIG. 6. Further, FIG. 9 illustrates arrangements of blocking members based on a change in a vertical level of a raw material layer in a sintering vehicle. Further, FIG. 10 is a schematic diagram of a sintered ore producing facility according to a variation of the present disclosure.

[0061] Hereinafter, one end and the other end of the hood 310 refer to directions disposed in a width direction of the sintering vehicles 200. Front and rear faces of the hood 310 refer opposite faces provided in the traveling direction of the sintering vehicles 200. Further, front and rear of the hood 310 refer opposite directions provided in the traveling direction of the sintering vehicles 200. In addition, a longitudinal direction of the hood 310 refers the traveling direction of the sintering vehicles 200. Further, a width direction of the hood 310 refers a width direction of the sintering vehicles 200.

[0062] Referring to FIGS. 6 and 7, the hood 310 maybe disposed to cover the top of the sintering vehicles 200 at least at a portion of the traveling path 120. The hood 310 may be formed to have a semicircular cross-sectional shape in the traveling direction of the sintering vehicles

200. That is, the hood 310 may extend along the traveling direction of the sintering vehicles 200, and have an open bottom and a top having a hollow shape with a curved face in the width direction of the sintering vehicles 200.

[0063] The exhaust gas circulation pipe 320 may be connected to one end of the hood 310, for example, in the width direction of the sintering vehicles 200. The exhaust gas may flow into the one end of the hood 310 and flow into the raw material layer or the sintering layer while flowing toward the other end.

[0064] The second induction members 332 may be disposed in the hood 310 and oriented in a direction intersecting the inflow direction of the exhaust gas and control the flow direction of the exhaust gas in the hood 310. The second induction members 332 may be disposed on both sides of the hood 310. The second induction members 332 may be respectively disposed on lower portions of the hood 310. The second induction members 332 may be continuously disposed along the longitudinal direction of the hood 310, for example, along the traveling direction of the sintering vehicles 200, or may be optionally disposed at a portion to which the exhaust gas is inflowed, for example, a portion to which the exhaust gas circulation pipe 320 is connected.

[0065] The second induction members 332 may be respectively disposed on one end and the other end of the lower portions of the hood 310 to have a face inclined downwardly and inwardly of the hood 310. Through this configuration, the exhaust gas flowed into the hood 310 flows along an inner wall of the hood 310 and then flows inside the hood 310 over the inclined face formed on the second intake member 332 such that the leakage of the exhaust gas to the outside of the hood 310 may be prevented.

[0066] Herein, it is described that the second induction members 332 are disposed on the both sides of the hood 310, but may be disposed only in a direction opposite to the one end of the hood 310 into which the exhaust gas flows, that is, only on the other end of the hood 310.

[0067] Referring to FIGS. 8 and 9, the blocking members 340 may be respectively disposed on both faces, front and rear faces of the hood 310 in a direction intersecting the direction of the second induction members 332 or in a direction parallel to the direction in which the exhaust gas inflows to the hood 310. The blocking members 340 may be formed in a plate shape having an area, and may be disposed to extend in a vertical direction downwardly from lower portions of the front and rear faces, respectively. Further, the blocking members 340 may be rotatable relative to the traveling direction of the sintering vehicles 200.

[0068] That is, the front and rear faces of the hood 310 are arranged directly above the raw material layer in the sintering vehicles 200. Therefore, the front and rear faces of the hood 310 are formed to have a larger distance from the sintering vehicles 200 than the both sides of the hood 310 disposed directly above the wall of the sintering vehicles 200. Further, a distance between the hood 310 and the raw material layer may vary based on a change in the vertical level of the raw material layer charged into the sintering vehicles 200 based on a change in operation conditions.

[0069] Therefore, the blocking members 340 may be formed on the front and rear faces of the hood 310 such that lengths of the front and rear faces of the hood 310 may become larger than lengths of the both sides of the hood 310. In this connection, the blocking members 340 may be formed to have a length corresponding to a minimum vertical level of the raw material layer formed in the sintering vehicles 200 so as to minimize a distance between the hood 310 and the raw material layer in response to the change in the vertical level of the raw material layer. For example, as shown in (a) in FIG. 9, when the vertical level of the raw material layer charged into the sintering vehicles 200 is relatively low as about 900 mm, the blocking members 340 may be arranged in the vertical direction. Further, as shown in (b) in FIG. 9, when the vertical level of the raw material layer charged into the sintering vehicles 200 is relatively high as about 1500 mm, the blocking members 340 may be inclined. Therefore, the distance between the hood 310 and the sintering vehicle 200 or the distance between the hood 310 and the raw material layer in the sintering vehicle 200 may be reduced to minimize the gap therebetween the exhaust gas leaks.

[0070] Further, the vertical level of the raw material layer in the sintering vehicles 200 is not always the same in the width direction of the sintering vehicles 200. Accordingly, when the blocking members 340 are configured to extend downwardly from the hood 310, the blocking members 340 may collide with the raw material layer or the sintering layer in the sintering vehicles 200. Therefore, the blocking members 340 may be configured to be rotatable in the traveling direction of the sintering vehicles 200 such that the impact caused by the collision of the blocking members 340 and the raw material layer may be relieved. Further, the blocking members 340 may be provided to extend in the width direction of the hood 310. However, in this case, when the blocking members 340 collide with the raw material layer partially due to the variation in the vertical level of the raw material layer, all of the blocking members 340 are rotated to form a gap between the hood 310 and the raw material layer such that a large amount of the exhaust gas may be leaked therebetween. Thus, the blocking members 340 may be separately arranged in the width direction of the hood 310 to rotate only a blocking member that collides with the raw material layer, thereby minimizing the leakage of the exhaust gas.

[0071] Further, the blocking members 340 may be installed inside the hood 310 so as to be rotatable and a portion thereof may overlap with the hood 310 to limit a rotation range of the blocking members 340. Further, the blocking members 340 may be rotated by the air volume of the exhaust gas supplied into the hood 310 to prevent the gap between the hood 310 and the raw material layer from being opened.

[0072] Further, the second induction members 332 and the blocking members 340 may be used to suppress the exhaust gas from being leaked to the outside. However, in an emergency operation condition in which the sintering vehicles 200 are stopped due to an abnormal operation, a suction force of the first suction fan 124 decreases, so that a positive force may be generated in the hood 310. In this case, it is difficult to suppress the leakage of the exhaust gas via the second induction members 332 and the blocking members 340. Accordingly, a portion of the exhaust gas supplied into the hood 310 may be forcibly discharged through the wind-boxes 121, thereby suppressing or preventing the exhaust gas from leaking around the hood 310.

[0073] In this case, as shown in FIG. 10, a pressure gauge 350 for measuring a pressure inside the hood 310 may be installed on the hood 310, and the hood 310 and the wind-boxes 121 may be connected using an auxiliary pipe 352. In this connection, the auxiliary pipe 352 may has a valve 354 for opening and closing the auxiliary pipe 352 based on the internal pressure of the hood 310 measured by the pressure gauge 350.

[0074] With such a configuration, when the internal pressure of the hood 310 is measured to be excessively high by the pressure gauge 350, the valve 354 may be opened to forcibly discharge the exhaust gas in the hood 310 to the wind-boxes 121, thereby lowering the internal pressure of the hood 310. When the internal pressure of the hood 310 is lowered, the leakage of the exhaust gas supplied into the hood 310 to the space between the hood 310 and the sintering vehicles 200 may be minimized. That is, even when the suction force of the first induction fan 124 is low, the second induction fan 328 may operate normally to supply the exhaust gas to the hood 310. Accordingly, the exhaust gas supplied into the hood 310 may be discharged through the auxiliary pipe 352 without passing through the raw material layer or the sintering layer in the sintering vehicles 200 having a high resistance, thereby suppressing the leakage of the exhaust gas between the hood 310 and the sintering vehicles 200.

[0075] FIG. 11 illustrates diagrams comparing leakage degrees of exhaust gas around a hood when producing sintered ores.

[0076] (a) in FIG. 11 illustrates CO concentrations measured around the hood when the exhaust gas circulation pipe without the distribution region is directly connected to the inlet pipes to supply the exhaust gas to the hood. In this case, the second induction members 332 and the blocking members 340 are not installed in the hood 310.

[0077] Further, (b) in FIG. 11 illustrates CO concentrations measured around the hood when the exhaust gas circulation pipe with the distribution region is connected to the inlet pipes to supply the exhaust gas to the hood. In this case, the second induction members 332 and the blocking members 340 are installed in the hood 310.

[0078] In (a) in FIG. 11, the CO concentrations are high in preceding regions with respect to the traveling direction of the sintering vehicles. Especially, the CO concentration is as high as 2064 ppm in an opposite direction of the inlet pipes. This is because the plurality of inlet pipes are directly connected to the exhaust gas circulation pipe, so that the exhaust gas in the exhaust gas circulation pipe is not uniformly distributed to the plurality of inlet pipes but flows intensively into one of the inlet pipes and the exhaust gas is leaked in an opposite direction of the hood to which the exhaust gas is inflowed. Further, this is because the exhaust gas flowed into the hood was leaked between the hood and the sintering vehicles.

[0079] On the other hand, in (b) in FIG. 11, the CO concentrations are very low throughout the hood compared to that in (a) in FIG. 11. This is because after the exhaust gas is distributed at the distribution region of the exhaust gas circulation pipe, the exhaust gas is uniformly supplied to the plurality of inlet pipes through the entire regions of the hood. This is because the exhaust gas in the hood is prevented from leaking between the hood and the sintering vehicles by the second induction members and the blocking members installed in the hood.

[0080] Although the present disclosure has been described in reference with the accompanying drawings and preferred embodiments, the present disclosure is not limited thereto, but is limited by appended claims described below. Therefore, various modifications, and alterations maybe made to the present disclosure by those skilled in the art without departing from the spirit and scope of the present disclosure as defined in the appended claims.

Industrial availability

[0081] The facility for producing the sintered ores according to the embodiments of the present disclosure efficiently circulates the exhaust gas to improve the quality and productivity of the sintered ores.

Claims

1. A facility for producing sintered ores, the facility comprising:

    sintering vehicles movable along a traveling path;
    a plurality of wind-boxes arranged along the traveling path and below the sintering vehicles;
    a hood disposed above the sintering vehicles and extending along at least a portion of the traveling path; and
    an exhaust gas circulation pipe for connecting at least some of the plurality of wind-boxes to the hood,
    wherein the exhaust gas circulation pipe at least partially has at least one exhaust gas distribution region for distributing the exhaust gas in a flow

direction of the exhaust gas.

2. The facility of claim 1, wherein the exhaust gas circulation pipe includes:

   a main pipe having one end thereof connected to the wind-boxes, where the main pipe includes the exhaust gas distribution region; and
   a plurality of inlet pipes, each having one end connected to the main pipe and the other end connected to the hood.

3. The facility of claim 2, wherein the main pipe has a suction fan, and
wherein the exhaust gas distribution region is disposed between the suction fan and the hood.

4. The facility of claim 3, wherein the exhaust gas distribution region includes a plurality of distribution pipes, each extending in a parallel manner to a flow direction of the exhaust gas.

5. The facility of claim 4, wherein the plurality of distribution pipes are formed to have the same cross-sectional area.

6. The facility of claim 5, wherein one end of the inlet pipe is connected to the distribution pipe, and the other end of the inlet pipe is connected to the hood, and
wherein the inlet pipe includes a number of inlet pipes corresponding to the number of the distribution pipes.

7. The facility of claim 5, wherein one end of the inlet pipe is connected to the distribution pipe, and the other end of the inlet pipe is connected to the hood, and
wherein the other end of the inlet pipe is branched into a plurality of sub-pipes connected to the hood.

8. The facility of claim 3, wherein the exhaust gas distribution region includes a partition for dividing an internal space of the main pipe into a plurality of paths, each path extending in a direction parallel to the flow direction of the exhaust gas.

9. The facility of claim 8, wherein the partition divides the internal space of the main pipe such that the plurality of paths have the same cross-sectional area.

10. The facility of claim 9, wherein one end of the inlet pipe is connected to the path and the other end of the inlet pipe is connected to the hood, and
wherein the inlet pipe includes a number of inlet pipes corresponding to the number of the paths.

11. The facility of claim 9, wherein one end of the inlet pipe is connected to the path and the other end of the inlet pipe is connected to the hood, and
wherein the other end of the inlet pipe is branched into the plurality of sub-pipes connected to the hood.

12. The facility of any one of claims 2 to 11, wherein the inlet pipe is connected to one end of the hood, and wherein the other ends of the plurality of inlet pipes have the same vertical level.

13. The facility of claim 12, wherein the inlet pipe has therein a first induction member for controlling a flow of the exhaust gas.

14. The facility of claim 13, wherein the hood includes at least one of:

   at least one second induction member for controlling the exhaust gas in the hood; or
   blocking members for blocking a leakage of the exhaust gas.

15. The facility of claim 14, wherein the exhaust gas circulation pipe is connected to the hood to supply the exhaust gas in a direction intersecting the traveling direction of the sintering vehicles, and
wherein the second induction member disposed in the hood is oriented in a direction intersecting the supply direction of the exhaust gas.

16. The facility of claim 15, wherein the second induction member is disposed on at least one end of the hood and extends along a longitudinal direction of the hood.

17. The facility of claim 16, wherein the second induction member includes an inclined face inclined downwardly and inwardly of the hood.

18. The facility of claim 17, wherein each of the blocking members is formed in a plate shape having an area, and
wherein the blocking members are respectively disposed on both sides of the hood facing each other with respect to the traveling direction of the sintering vehicles, wherein each blocking member extends vertically.

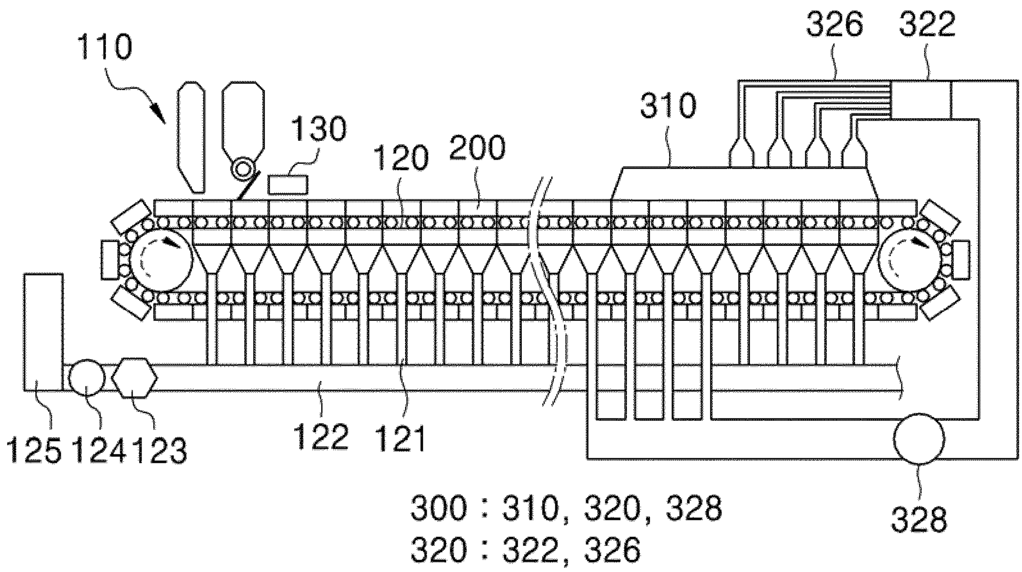
19. The facility of claim 18, wherein the blocking member is configured to be rotatable in the traveling direction of the sintering vehicles.

20. The facility of claim 19, further comprising:

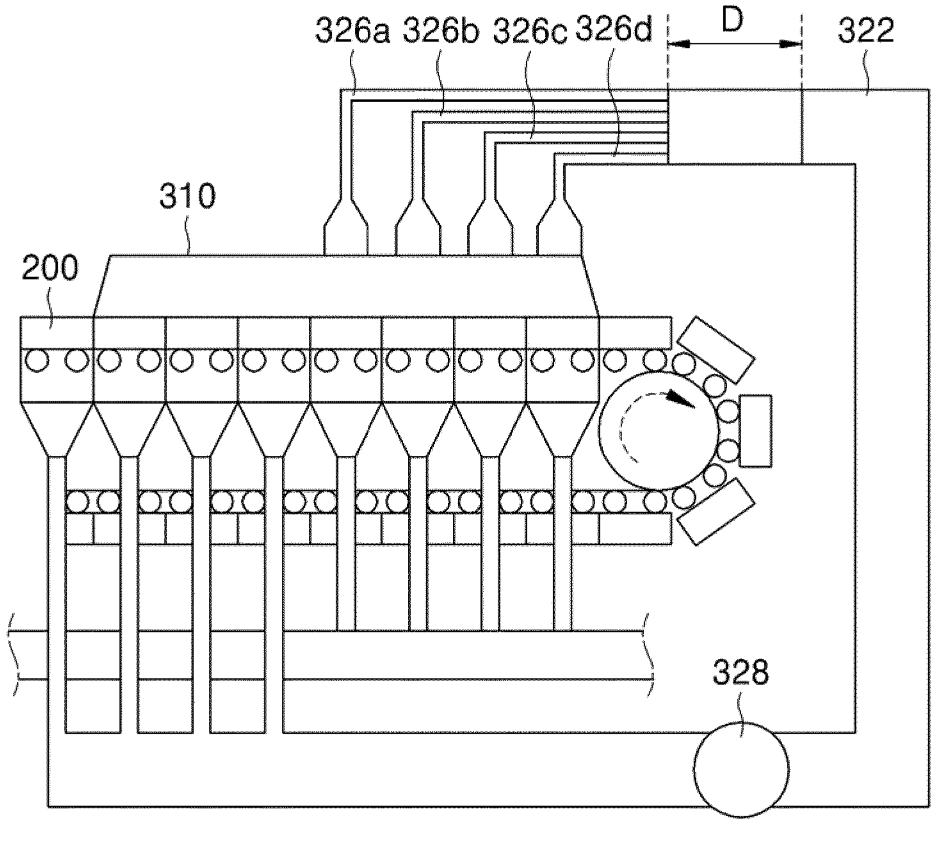
   a pressure gauge for measuring internal pressure of the hood;
   an auxiliary pipe for connecting the hood and the wind-boxes; and

a valve for opening and closing the auxiliary pipe based on the internal pressure of the hood measured by the pressure gauge.

【FIG. 1】


110
130
120
200
310
326
322
125
124
123
122
121
328
300 : 310, 320, 328
320 : 322, 326

【FIG. 2】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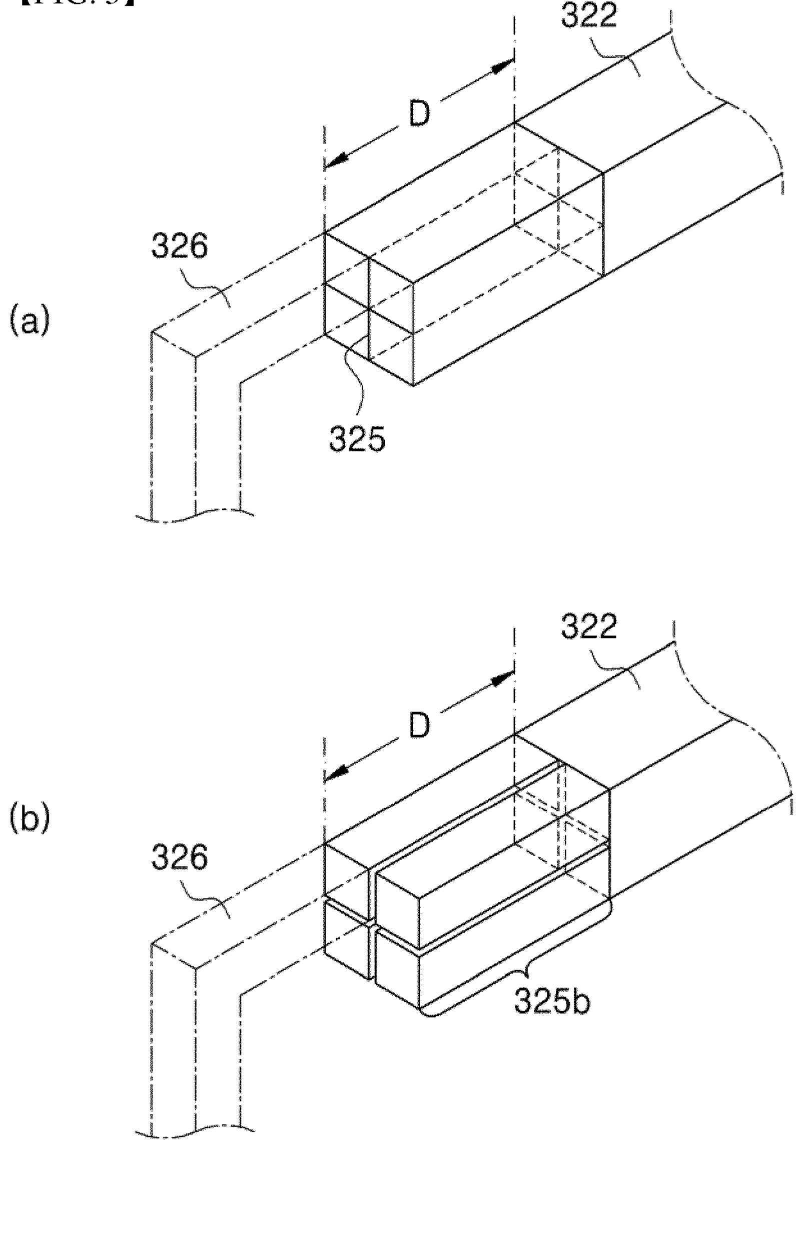
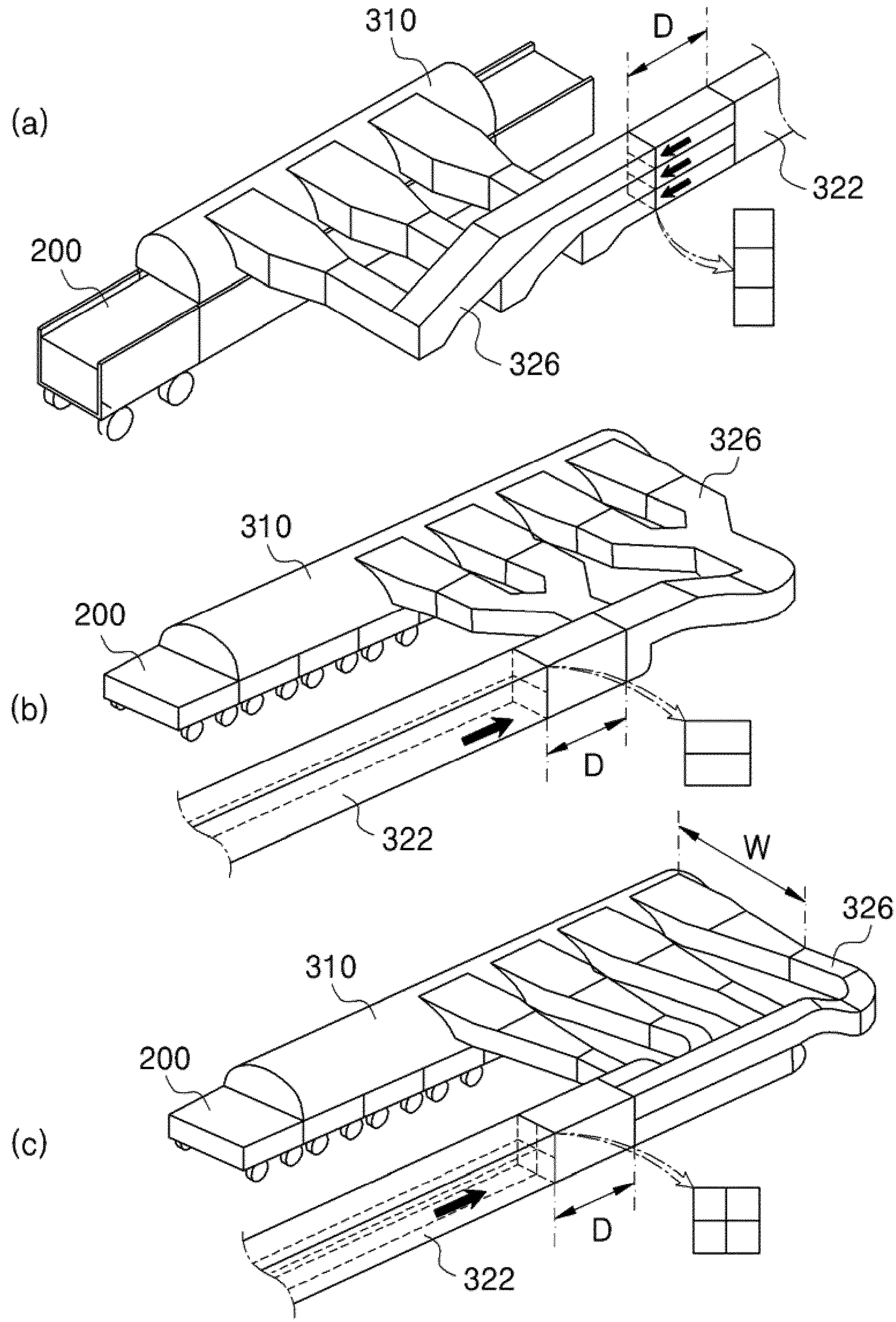
326b
326c
326d
D
322
310
200
328

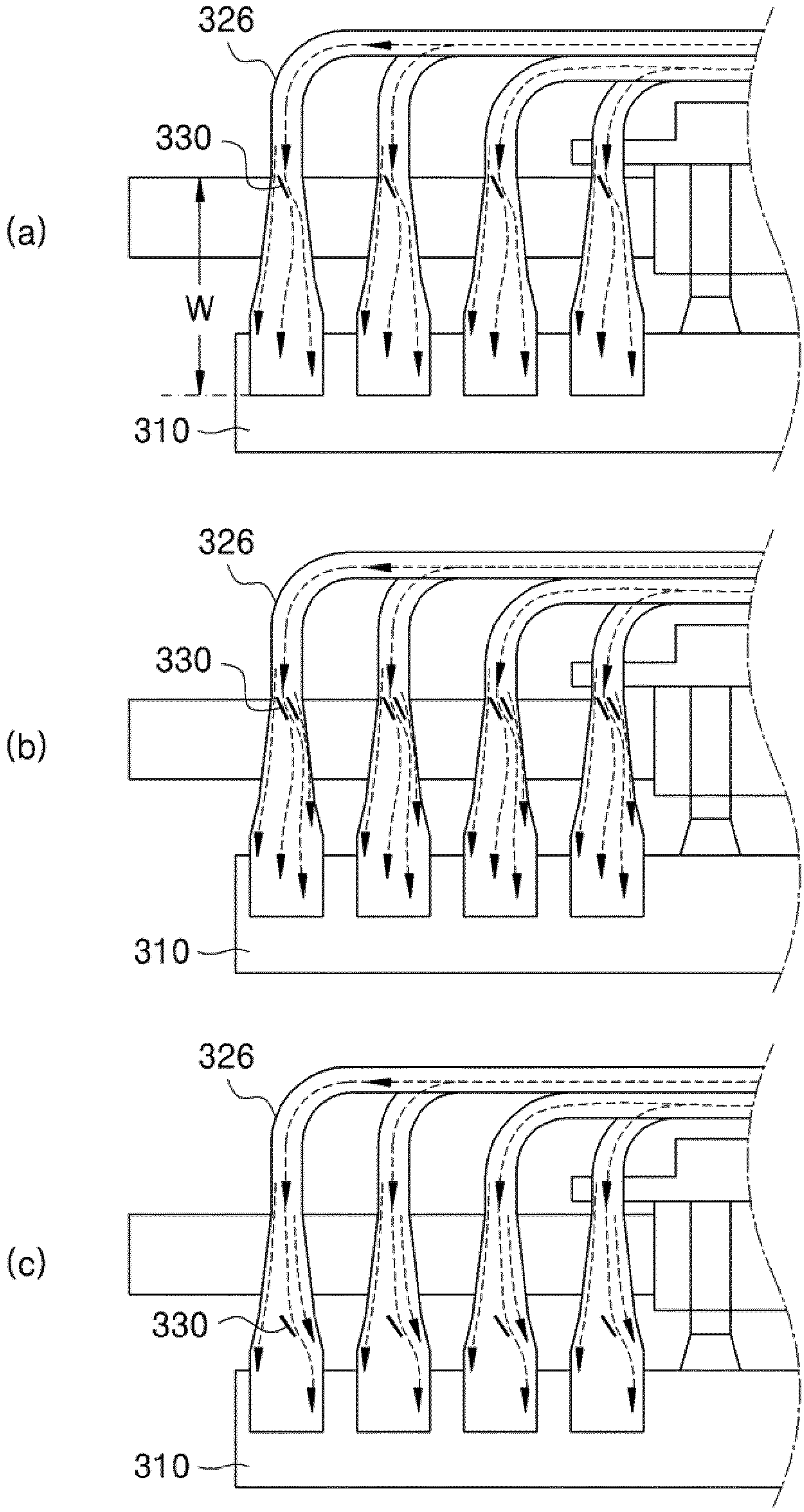
【FIG. 3】



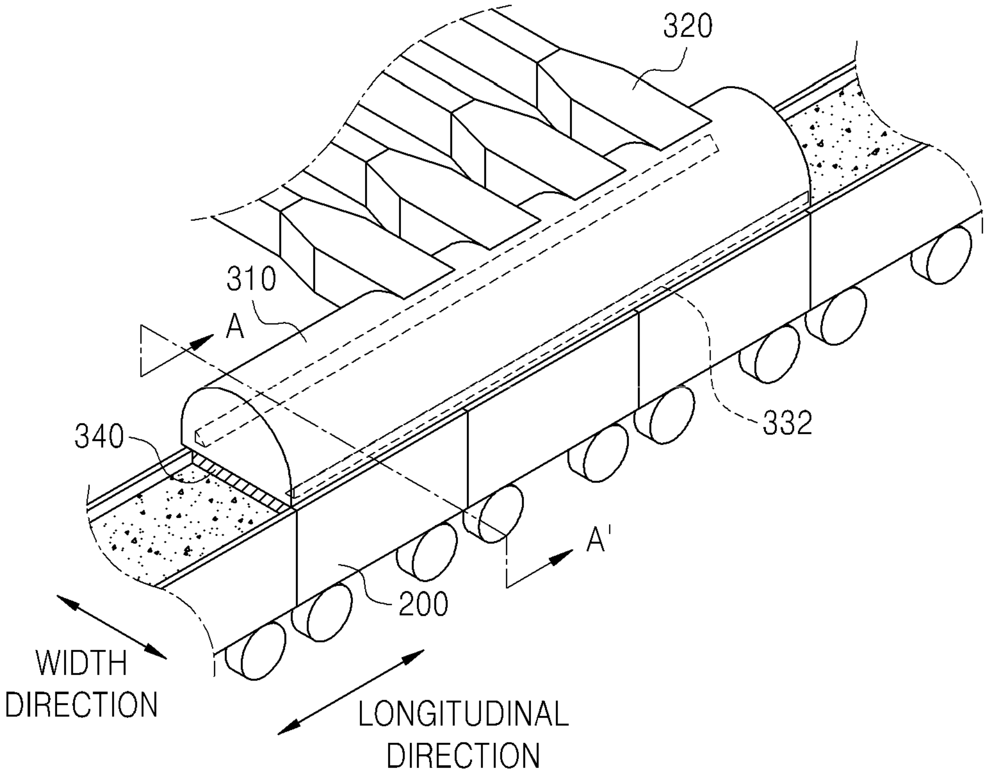
【FIG. 4】



【FIG. 5】



【FIG. 6】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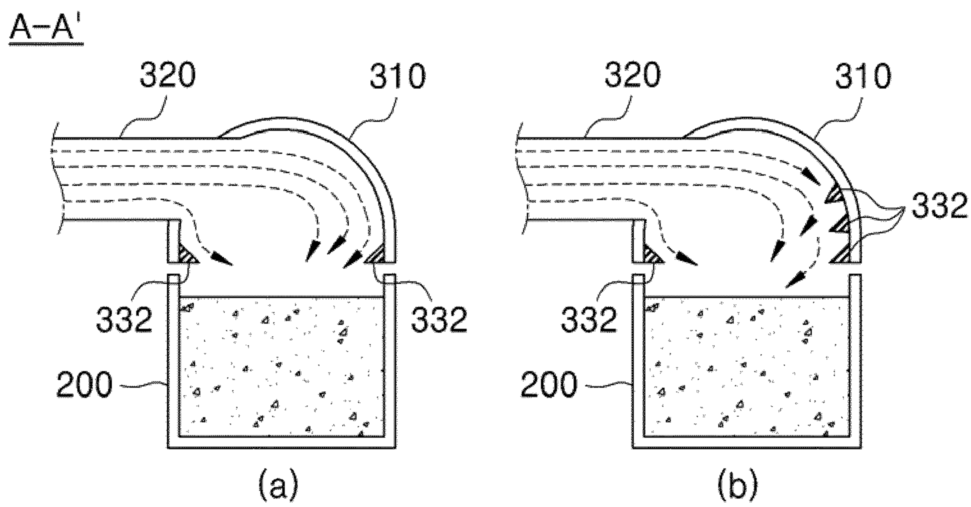
310
A
340
332
A'
200
WIDTH
DIRECTION
LONGITUDINAL
DIRECTION

【FIG. 7】


A-A'
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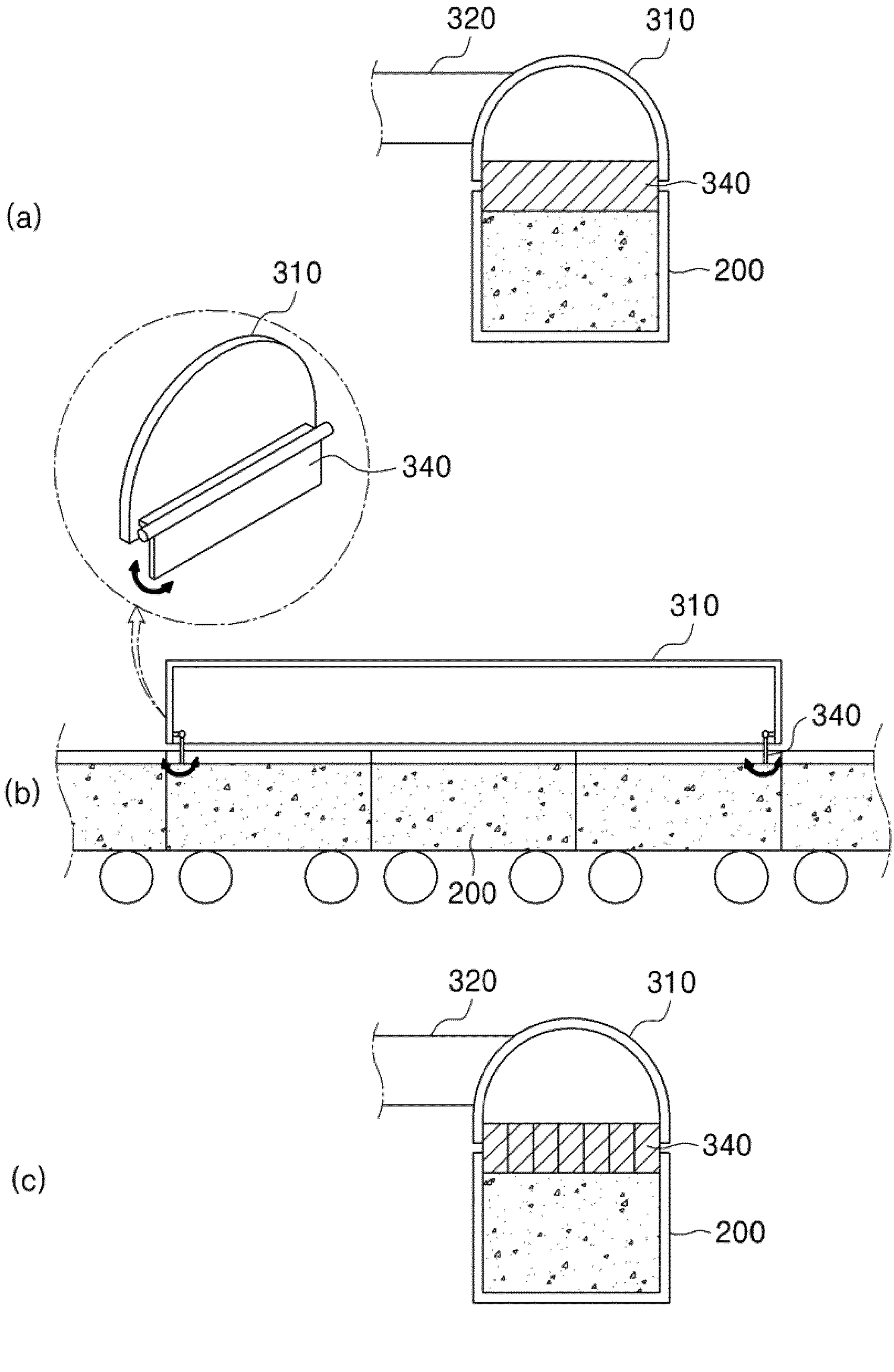
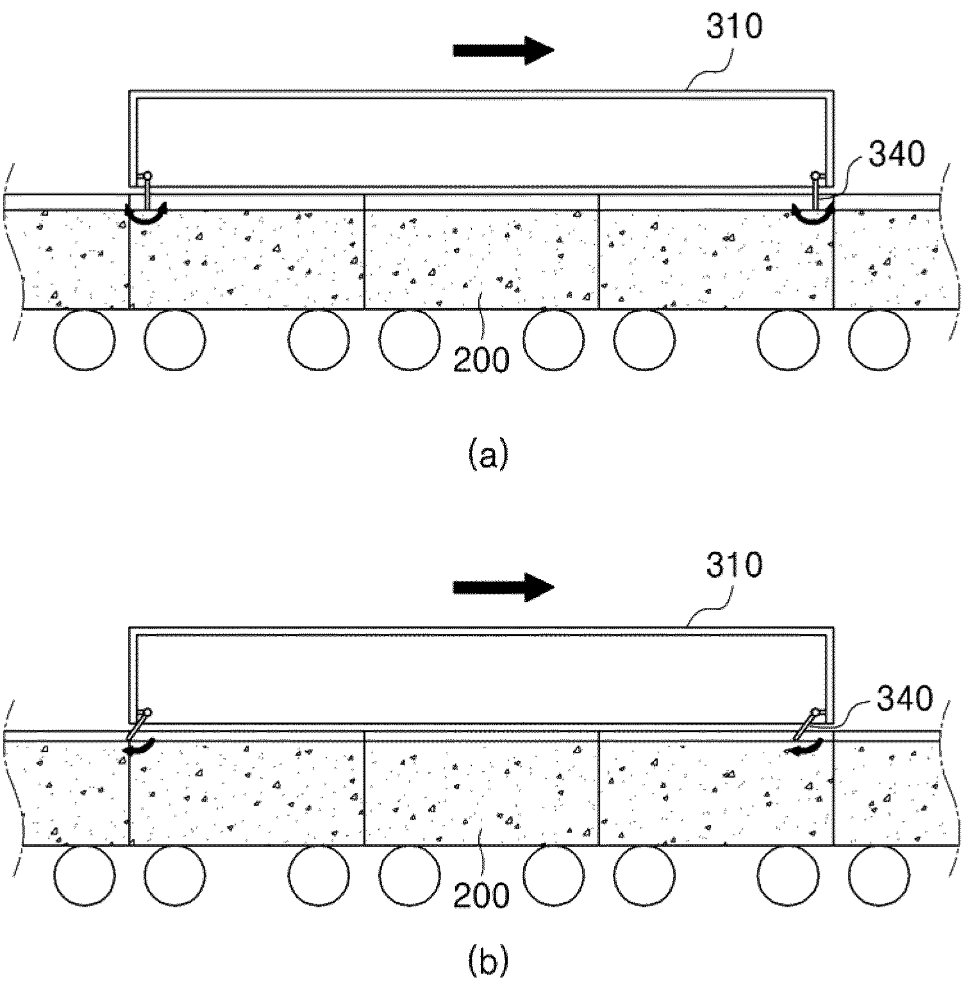
310
332
332
200
(a)
320
310
332
332
200
(b)

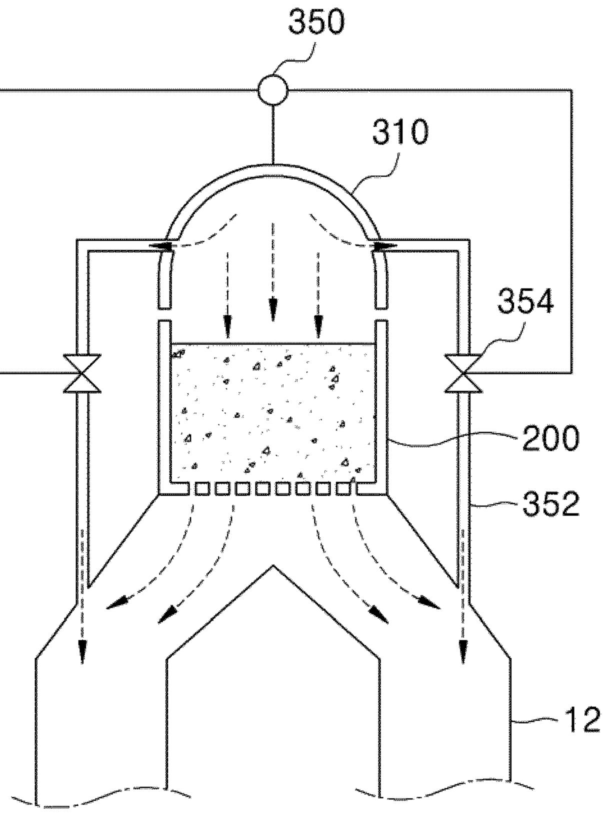
【FIG. 8】



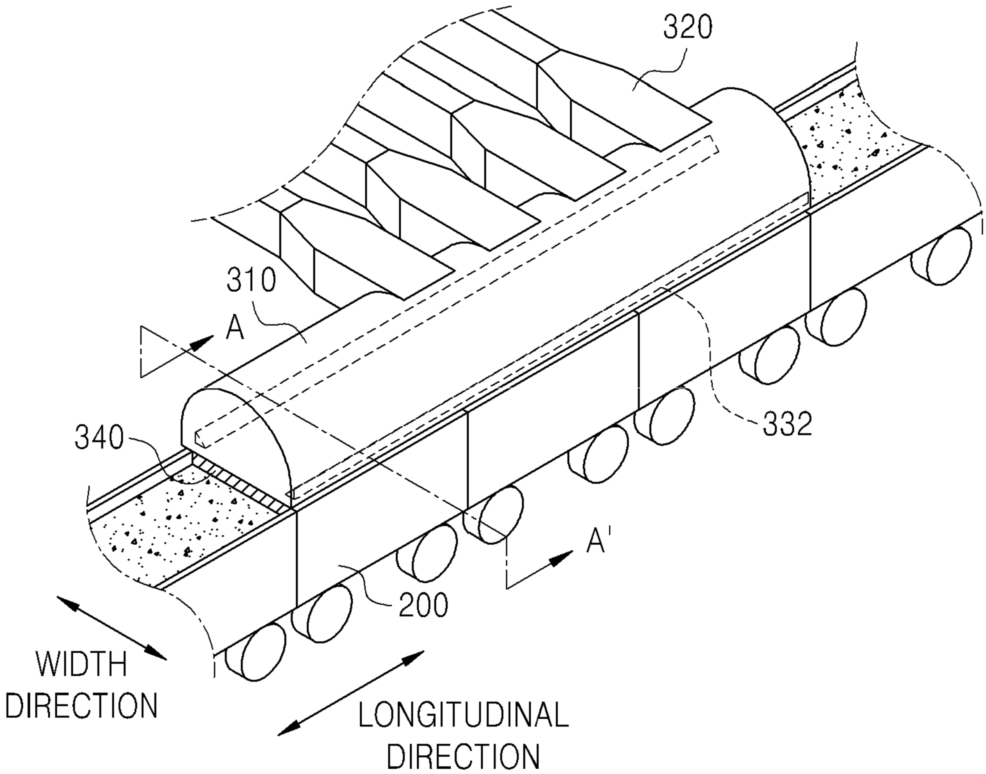
【FIG. 9】



【FIG. 10】



【FIG. 11】


320
310
A
340
332
A'
200
WIDTH
DIRECTION
LONGITUDINAL
DIRECTION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2016/014844

A. CLASSIFICATION OF SUBJECT MATTER

C22B 1/20(2006.01)i, F27B 21/02(2006.01)i, F27B 21/06(2006.01)i, F27D 17/00(2006.01)i, F27D 7/04(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)
C22B 1/20; F27B 21/14; F27B 21/08; F27B 21/00; C22B 1/16; F27B 21/02; F27B 21/06; F27D 17/00; F27D 7/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS (KIPO internal) & Keywords: sintering trailer, circulation pipe, leading-in pipe, exhaust gas, wind box, hood

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-1421896 B1 (POSCO) 22 July 2014 See paragraphs [0002]-[0039]; and figures 1-3.	1
Y		2-20
Y	JP 2009-168359 A (KOBE STEEL LTD.) 30 July 2009 See paragraphs [0028]-[0047]; and figures 1-4.	2-20
Y	JP 2014-055723 A (JFE STEEL CORP.) 27 March 2014 See paragraph [0028]; and figures 9-10.	14-20
A	KR 10-2016-0062288 A (POSCO) 02 June 2016 See paragraphs [0008]-[0090]; and figures 1-4.	1-20
A	KR 10-2013-0098601 A (HYUNDAI STEEL COMPANY) 05 September 2013 See paragraphs [0005]-[0062]; and figures 1-4.	1-20

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"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
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"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 AUGUST 2017 (23.08.2017)	**23 AUGUST 2017 (23.08.2017)**

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Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2016/014844

Patent document cited in search report	Publication date	Patent family member	Publication date
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JP 2014-055723 A	27/03/2014	JP 6090558 B2	08/03/2017
KR 10-2016-0062288 A	02/06/2016	KR 10-1665066 B1	25/10/2016
		KR 10-1719518 B1	27/03/2017
		KR 10-2016-0059565 A	27/05/2016
		TW 201621248 A	16/06/2016
		WO 2016-080650 A1	26/05/2016
KR 10-2013-0098601 A	05/09/2013	KR 10-1377629 B1	25/03/2014

Form PCT/ISA/210 (patent family annex) (January 2015)