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(71) Applicants:
• **PAUL WURTH S.A.**
1122 Luxembourg (LU)
• **Paul Wurth Umwelttechnik GmbH**
45131 Essen (DE)
• **Paul Wurth IHI Co. Ltd**
Koto-ku, Tokyo 135-8710 (JP)

(72) Inventors:
• **Greiveldinger, Bob**
5753 Frisange (LU)

- **Nowak, Manfred**
45663 Recklinghausen (DE)
- **Kramer, Daniel**
45327 Essen (DE)
- **Weissert, Thilo**
44879 Bochum (DE)
- **Kassebaum, Holger**
44143 Dortmund (DE)
- **Hosoma, Shingo**
Yokosuka, Kanagawa 237-0076 (JP)
- **Kubo, Yasuo**
Itabashi-ku, Tokyo, 175-0094 (JP)

(74) Representative: **Office Freylinger**
P.O. Box 48
8001 Strassen (LU)

(54) **Sinter cooler**

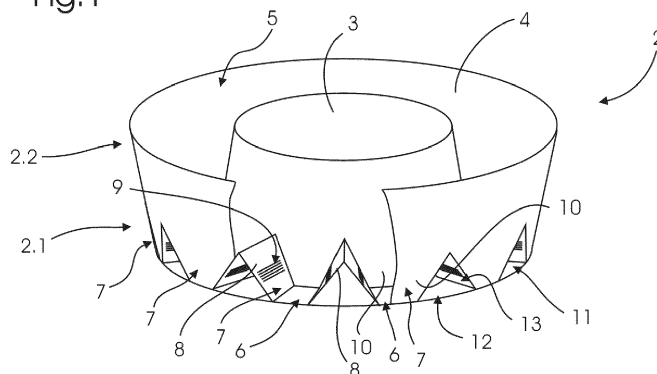
(57) The invention relates to a sinter cooler (1, 1 b-1 e) for counter-current operation, with a circular shaft (2, 2a) for receiving sinter (100), the shaft (2, 2a) having at least one upper charge opening (5) and at least one lower discharge opening (6). In order to provide a sinter cooler in which a highly homogeneous airflow is achieved while excessive abrasion is avoided, the invention provides that

- in a lower part (2.1), the shaft (2, 2a) is divided into a plurality of compartments (7, 7a) which are tangentially spaced apart; and

- each compartment (7, 7a) has at least one side wall (8) with radial inlet vanes (9), which extend radially, for intake of cooling air into the shaft (2, 2a);
- the sinter cooler (1, 1 b-1 e) being so configured that during operation, sinter (100) is charged through the charge opening (5) and moves downwards through the compartments (7, 7a) to the discharge opening (6), while cooling air is sucked in through the radial inlet vanes (9) and upwards through the shaft (2, 2a).

The invention also relates to a method for cooling sinter in such a sinter cooler.

Fig.1



Description**Technical Field**

5 **[0001]** The invention relates to a sinter cooler for counter-current operation and to a method for cooling sinter.

Background Art

10 **[0002]** Sinter machines are commonly used to agglomerate fine particles by a sintering process, in which a normally porous mass is formed from the particles while largely maintaining their chemical properties. The product of the sintering process - the sinter - may be used in a subsequent process. In steel production for example, it is known to produce sinter from iron ore and other particles, which sinter is afterwards used in a blast furnace. After the sintering process, the sinter, initially having a high temperature like 600°C-700°C, is cooled down to a moderate temperature of e.g. 100°C in a sinter cooler.

15 **[0003]** In a common type of sinter cooler, the hot sinter is gravity-fed into a shaft through an upper charge opening. At the lower end of the shaft, the sinter may be extracted e.g. by a scraper through a discharge opening. While the sinter descends through the shaft, a cooling gas (usually air) is guided through it, so that the sinter is cooled and the gas is heated up. It is possible to use the heated gas for a heat recovery process, e.g. for recirculation to the sinter machine and/or to produce steam which may drive a generator.

20 **[0004]** Besides cross-current shaft-type coolers, where the cooling gas mainly flows horizontally, it is also known to employ counter-current coolers, where the general motion of the cooling gas is vertically upwards through the sinter, while the sinter moves downwards. These coolers are highly effective as to the heat transfer between sinter and gas. The gas enters into the lower part of the shaft and is sucked upwards to the top of the shaft, from where it may be guided to some heat recovery means. A common type of sinter cooler has a circular shaft in which the sinter is received and cooled. A charging device like a chute is placed at one location above the shaft, whereas the shaft itself is rotatably mounted. During operation, the shaft is rotated so that different parts of the shaft are sequentially charged with sinter by the charging device. Air inlet vanes are tangentially arranged in the lower part of the inner and outer wall of the shaft. An airtight hood is placed on top of the shaft and connected to an air suction fan or the like.

25 **[0005]** Especially when a new sinter cooler is to be installed in an existing sinter plant, a main target is to minimize the footprint of the cooler, because typically there is quite limited space available in that area. Since a longer shutdown of the sinter plant is economically unacceptable, the existing sinter cooler must generally remain in operation during the installation of the new one.

30 **[0006]** Even though the footprint of a cooler is reduced, the required air flow rate has to remain unchanged, because it is a requirement of the cooling process, defined by the amount of sinter to be cooled, times the specific air-to-sinter ratio (y tons of air / z tons of sinter). If a given air flow rate is guided through a smaller cooler, air velocities therefore increase. This leads to problems, because the pressure drop in the sinter bed increases over-proportionally with the increase of air velocities. The operation costs in a sinter cooler, on the other hand, largely depend on the pressure drop through the sinter bed, as the pressure drop is proportional to the electricity consumption of the air suction fan. Hence, in order to avoid an increase of the operation costs due to small footprint, the air velocities through the sinter bed and thus the pressure drop should be kept as low as possible.

35 **[0007]** One option to achieve this is to increase the horizontal cross-section of the shaft. This is done by decreasing the diameter of the inner shaft wall, i.e. the shaft becomes wider while maintaining its outer diameter. Although air velocities - and thus the pressure drop - generally decrease through this measure, the air distribution becomes a critical issue. In a common cooler of the described type, air inlet vanes are integrated in the lower part of the inner and outer shaft walls, so this is where the cooling air enters the shaft. In a narrow shaft (up to 1 m width), one can assume that after a certain inlet section, e.g. 1 m, the air is distributed homogeneously through the entire cross section of the shaft. In a wide shaft (e.g. 1.5 m width or more), this homogeneous mixing takes a much longer way, as the distance from the air inlet vanes to the shaft centre is longer, and certain boundary effects (e.g. preferential flow along the shaft walls) exist. However, an uneven distribution of the cooling air leads to an inferior cooling process, i.e. the sinter is not cooled effectively and/or the air is not heated optimally.

40 **[0008]** It has been proposed to solve this problem by providing air ducts, which are arranged radially in the lower part of the shaft and communicate with additional tangential inlet vanes in a central position between the inner and outer wall. While these arrangements serve to improve the supply of cooling air into the inner region of the shaft, the additional components are relatively complex and furthermore are subject to a high abrasion forces and limited lifetime. This is because the shaft usually tapers downwards, which leads to an increased velocity of the sinter in the lower part.

Technical Problem

[0009] It is thus an object of the present invention to provide a sinter cooler in which a highly homogeneous airflow is achieved while excessive abrasion is avoided. This object is solved by a sinter cooler according to claim 1 and by a method according to claim 12.

General Description of the Invention

[0010] The invention provides a sinter cooler for counter-current operation. Counter-current operation means that the cooling gas, usually air, generally flows against the movement of the sinter to be cooled. This may, however, include smaller regions where the airflow is oblique or perpendicular to the movement of the sinter. As explained above, such a sinter cooler is part of an integrated sinter plant and is used to cool hot sinter from high temperatures to low or at least moderate temperatures. While herebelow reference is generally made to "air", "airflow", it is understood that other gasses may be used and fall within the scope of the present invention.

[0011] The cooler has a circular shaft for receiving sinter, the shaft having at least one upper charge opening and at least one lower discharge opening. The shaft is circular, i.e. it is in general ring-shaped and at least approximately symmetric with respect to an axis. The shape may not correspond to a perfect circle, but rather to a polygon, which is also considered "circular" in this context. The circular shape of the shaft and the abovementioned axis define a radial and a tangential direction, which are referred to hereinafter. Normally, the shaft is rotatably mounted with one part of the shaft placed at a charging device, which is fed by a sinter machine. The charging device feeds sinter into one part of the shaft, and the shaft is - continuously or intermittently - rotated about its symmetry axis to allow for sinter to be charged to all parts. The hot sinter is fed through the at least one charge opening and the cooled sinter is extracted (or simply falls out) at the discharge opening. As explained above, the upper part of the shaft may be covered by an airtight hood, which is connected to an air suction device. Generally speaking, the cooler is adapted to create a negative pressure in or above an upper part of the shaft.

[0012] According to the invention, in a lower part, the shaft is divided into a plurality of compartments, which are tangentially spaced apart. Tangentially means in the tangential direction defined by the circular shape of the shaft. While the shaft in an upper part, near the charge opening, preferably has a single, continuous structure along the tangential (i.e. circumferential) direction, the lower part is divided into compartments. In other words, the shaft branches downwards into a plurality of compartments, which are spaced apart along the tangential direction. Thus, the shape of the shaft is not continuous in this lower part, but the overall shape of the shaft is still circular. The cross-section of the compartments may e.g. be circular, polygonal or other.

[0013] Each compartment has at least one sidewall with radial inlet vanes, which extend radially, for intake of cooling air into the shaft. Since the compartments are spaced apart, each compartment is delimited by sidewalls. The radial inlet vanes are installed in at least one such sidewall. Normally, of course, the vanes are disposed so that sinter cannot fall through the vanes by force of gravity, i.e. they guide the sinter to stay within the compartment. The vanes extend radially and preferably are arranged in the radial direction. However, they may also have e.g. a bent shape that does not fully correspond to the radial direction or they may be oblique to the radial direction. In any case, one end of each vane is disposed radially outwards from the other end.

[0014] The sinter cooler is so configured that during operation, sinter is charged through the charge opening and moves downwards through the compartments to the discharge opening, while cooling air is sucked in through the radial inlet vanes and upwards through the shaft. I.e. the gravity-driven movement of the sinter goes through the compartments, wherefore the sinter is divided between the different compartments. The radial inlet vanes allow directing an airflow into the sinter from a more or less tangential direction. Moreover, this airflow can directly act on a radially extending region of the compartment - and the sinter within. While previous approaches only consider tangentially arranged inlet vanes, which leads to a radially inhomogeneous airflow, the inventive solution leads to a considerably improved homogeneity. In comparison to a design, which relies on additional air ducts in the lower part, the inventive solution is less complex and abrasion can be minimised.

[0015] To ensure a wide entry area for the cooling air, it is preferred that the radial inlet vanes extend over more than 50% of the radial width of the compartment. It is further preferred that they extend over more than 70% or more than 90% of the radial width. In such an embodiment, the sidewall of the compartment is open for air intake over a large part of the compartment, which makes the airflow very homogeneous along the radial direction. It is even conceivable that the radial inlet vanes are provided over the entire radial width.

[0016] Since the compartments are spaced apart, there is a space between neighbouring compartments from which cooling air is sucked into the individual compartments. Cooling air may enter into this space e.g. from a radially inner and/or outer direction. In one embodiment, this space has a lower-side opening so that cooling air can enter the space from below. In effect, there is no need to provide a bottom plate or the like between the compartments at all, i.e. the space inbetween can be completely open to the lower side, because gravity-driven sinter cannot enter the space from

below.

[0017] In some embodiments, especially when the tangential width of the individual compartments is relatively large, the inventive concept can be improved in that each compartment has at least one sidewall with tangential inlet vanes, which extend tangentially. Such tangential inlet vanes, which are also known from prior art, may be disposed in a (radially) inner wall and/or outer wall of the compartment. The tangential vanes are preferably arranged in the tangential direction, but also may have e.g. a bent shape that does not fully correspond to the tangential direction or they may be oblique to the tangential direction. Preferably, they extend over more than 50%, more than 70%, more than 90% or even over the entire tangential width of the compartment. It should be noted that if the radial and the tangential vanes extend over the entire width of the compartment, these vanes may be connected or even be made of a single piece. In such a case, there may be a kind of "circumferential" vanes which constitute the tangential and the radial vanes.

[0018] In a typical embodiment of the invention, a radial width of the shaft decreases downwards. In other words, the walls of the shaft are slanted inwards. In this embodiment, which corresponds to the typical cooler design already explained above, the speed of the descending sinter increases towards the lower part, hereby increasing the risk of abrasive stress. In this case, the inventive concept is especially advantageous, because it eliminates the need for additional air ducts or the like in the lower part of the shaft.

[0019] It is further preferred that a tangential width of each compartment decreases downwards. In other words, the respective sidewalls of the compartment are slanted inwards. This, on the other hand, means that the width of the space between neighbouring compartments increases downwards and is relatively small at the top. Therefore, the sidewalls of two neighbouring compartments form a somewhat roof-like structure, which helps to smoothly deflect sinter descending from above into the individual compartments.

[0020] Depending on the design of the shaft, cooling air may still have a tendency to move along the inner and outer walls, leading to an inhomogeneous airflow. One way to avoid this is to provide at least one profile forming means, which is adapted to form an upper profile of the sinter to be concave in the radial direction. In other words, the height of this profile along the radial direction is greater towards the inner and outer wall than in between. Simply speaking, the way out of the sinter bed is made shorter in the central region of the shaft, which means that cooling air will have a tendency to move towards the centre and away from the sidewalls. Such a profile forming means may be a scraper that acts on the sinter from above. In this context, the rotation of the shaft can be utilised in that the profile forming means is standing still and works like a plough which forms a "furrow" in the sinter.

[0021] In this context, it is especially preferred that the profile forming means is adjustable. For instance, the vertical position of the forming means may be adjusted or even the profile of the forming means itself could be changed. Normally such adjustments can be done during a temporary shutdown of the plant, but it is also conceivable that drive means are provided to make these adjustments during operation.

[0022] As is well-known, the sinter entering the cooler consists of particles having different sizes. It is also known that particles of smaller size can be packed more densely, leaving less space for air in between. Therefore, an area with larger particles leaves more space for air to pass through and will be a preferential path for the cooling air. This effect is utilised in another embodiment of the invention where at least one distribution means is provided, which is adapted to charge the sinter mainly towards a radially inner wall and a radially outer wall of the shaft. In these regions, the sinter will be piled up excessively and roll downhill. Herein, larger particles roll farther than smaller particles and gather in the central region between the inner and outer periphery. Thus, a kind of "size gradient" is created in the sinter bed with the smallest particles at the inner and outer wall and the largest particles in the centre. Therefore, cooling air will preferentially move away from the sidewalls and through the centre. It should be noted that a similar effect may be created by the above-mentioned profile forming means, for instance if the forming means initially creates a profile that exceeds the repose angle of the sinter, which causes sinter particles to roll down the slope.

[0023] The airflow in the central region of the shaft may also be actively enhanced. According to another embodiment of the invention, at least one venting system is disposed in an upper part of the shaft so that during operation, it is embedded in the sinter, which venting system is adapted to locally suck air into the shaft. The venting system is located in an upper part of the shaft, where the speed of the descending sinter is not as high as in the lower part, wherefore abrasion is considerably lower. In contrast to conventional suction means, which are installed outside the shaft and above the sinter bed, the venting system is so disposed that during normal operation of the cooler, it is embedded in the sinter. The venting system may comprise at least one air duct with at least one opening. The opening normally is disposed in a (radially) central region of the shaft. If venting system is adapted to suck air into the shaft, an additional cooling air source in the central region is provided. The cooling performance is enhanced.

[0024] Another option to improve the contact between sinter and cooling air is to redirect the sinter to move into the way of the airflow, even if the airflow mainly occurs near the shaft walls. This can be achieved by a central deflecting element arranged in the shaft and adapted to deflect sinter from a radially central region of the shaft radially inwards and outwards. This deflecting element could be a circular beam circumferentially arranged in the shaft. Alternatively, deflecting elements could be arranged lower, in the compartments. In any case, the deflecting elements may have slanted upper surfaces, which form a roof-like structure for optimal deflection of the sinter. It should be noted that the

lower edge of the deflecting element may be above the lower edge of the compartment, i.e. the deflecting element does not have to extend all the way down to the edge of the compartment. A significant improvement in counter-current effectiveness can be achieved if the sinter flow is divided by the deflecting element, redirected towards the shaft walls and flows together below the deflecting element.

[0025] The present invention also provides a method for cooling sinter in a sinter cooler with a circular shaft for receiving sinter, the shaft having at least one upper charge opening and at least one lower discharge opening, wherein in a lower part, the shaft is divided into a plurality of compartments which are tangentially spaced apart; and each compartment has at least one side wall with radial inlet vanes, which extend radially, for intake of cooling air into the shaft. The method comprises charging sinter through the charge opening, the sinter moving downwards through the compartments to the discharge opening, and sucking cooling air in through the radial inlet vanes and upwards through the shaft.

[0026] Preferred embodiments of the inventive method correspond to those of the inventive sinter cooler.

Brief Description of the Drawings

[0027] Preferred embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig.1 is a perspective view of a shaft for a sinter cooler according to a first embodiment of the invention;

Fig.2 is a sectional side view of a sinter cooler with the shaft from fig. 1;

Fig.3 is a perspective view of a shaft for a sinter cooler according to a second embodiment of the invention;

Fig.4 is a sectional side view of a sinter cooler according to a third embodiment of the invention;

Fig.5 is a sectional side view of a sinter cooler according to a fourth embodiment of the invention;

Fig.6 is a sectional side view of a sinter cooler according to a fifth embodiment of the invention; and

Fig.7 is a sectional side view of a sinter cooler according to a sixth embodiment of the invention.

Description of Preferred Embodiments

[0028] Fig.1 shows a perspective view of a shaft 2 for an inventive sinter cooler 1 in a simplified representation. The shaft 2 has a generally circular or annular shape with an inner wall 3 and an outer wall 4. The shaft 2 has an upper charge opening 5, which extends circumferentially between the upper edges of the inner and outer wall 3, 4. A part of the outer wall 4 has been removed in fig. 1 to show the inside of the shaft 2. In a lower part 2.1, the shaft 2 branches into a plurality of compartments 7, each of which has a discharge opening 6 at a lower end. During operation, sinter 100 is charged through the charge opening 5 into the shaft 2, descends by force of gravity and moves through the compartments 7 to the respective discharge opening 6. Rotation of the shaft 2 about its symmetry axis ensures a uniform distribution of the sinter 100.

[0029] As can be seen, every compartment 7 is delimited by radially disposed sidewalls 8, which face the neighbouring compartments 7. The sidewalls 8 of neighbouring compartments 7 are slanted inwards so that they form a roof-like structure. A plurality of radial inlet vanes 9 are disposed in each of the sidewalls 8. They extend over approximately 80% of the radial width of the compartment 7. During operation, a negative pressure is applied above an upper part 2.2 of the shaft, whereby air is sucked in through the radial inlet vanes 9 and upwards through the compartments 7 and the upper part 2.2 of the shaft. Therefore, the air moves in counter-current with respect to the descending sinter 100. In the embodiment shown, the tangential sidewalls 10 of the compartments 7 are completely closed and have no inlet vanes. It has been found that the provision of radial vanes 9 combined with dividing the shaft 2 into several compartments 7 can ensure a sufficiently homogeneous airflow that results in effective cooling of the sinter 100. In the embodiment shown, the shaft 2 is divided into twelve compartments 7; this number, of course, may be different, in particular considerably higher, like up to 20 or up to 50. In the embodiment shown, a space 11 between neighbouring compartments 7 has a lower-side opening 12 as well as radially inner and outer openings 13. These openings 12, 13 may also form a single opening. However, it should be noted that the design also works if the lower side opening 12 or at least one of the inner and outer opening 13 is missing.

[0030] Fig.2 shows a sectional side view of a part of the sinter cooler 1 with the shaft 2 from fig.1. As can be seen more clearly in this representation, the radial width of the shaft 2 decreases downwards. For structural stability, the inner shaft wall 3 is connected to a support structure 14 and the two shaft walls 3, 4 are connected by three horizontally

disposed connecting beams 15. During operation, a charging device (not shown) of the sinter plant is positioned over the charge opening 5 of the shaft 2 and drops the sinter 100 onto the shaft 2, where it descends by force of gravity as has already been explained. An airtight hood, which is connected to an air suction system, is placed over the upper part 2.2 of the shaft 2. These elements, however, are not shown in fig.2. The shaft is mounted on a rotational platform 16, which slowly rotates on circular tracks so that the stationary charging device is sequentially placed over different sections of the shaft 2. At the lower discharge opening 6, a stationary stripper 17 is provided, which helps to remove the cooled sinter 100 from the shaft 2. As can be seen in this more detailed view, each compartment comprises four inlet vanes 9 on either side, which extend radially over about 80% of the width of the compartment 7. Of course, this is just an example and a higher or lower number of vanes 9 extending more or less far could also be employed.

[0031] Fig.3 is a perspective view showing a second embodiment of a shaft 2a according to the invention. It largely resembles the shaft 2 shown in figs.1 and 2, and also has compartments 7a with radial inlet vanes 9. However, it additionally comprises tangential inlet vanes 18 disposed on each of the compartments. In this embodiment, the radial and tangential inlet vanes 9, 18 extend over approximately 80% of the respective width of the compartment 7a. It is, however, conceivable to provide them over the entire width so that they practically form single-piece circumferential inlet vanes. The provision of the tangential inlet vanes 18 increases the air intake area and therefore helps to reduce the airflow velocity at the intake. Moreover, the homogeneity of the airflow can be further improved, in particular in the lower part of the shaft 2a with the compartments 7a.

[0032] Fig.4 shows a schematic sectional view of a sinter cooler 1 b according to a third embodiment. This embodiment uses the shaft 2a from fig.3, which has inner and outer tangential inlet vanes 18. To further enhance the effectiveness of the counter-current even if the air has a tendency to move along the sidewalls 3a, 4a of the shaft 2a, a deflecting beam 19 may be disposed circumferentially in a (radially) central region of the shaft 2a. The deflecting beam 19 is disposed in a middle or lower part of the shaft 2a, but somewhat above the tangential inlet vanes 18, for example immediately above the compartments 7a. Alternatively, deflecting beams could be installed in each compartment 7a. As can be seen in fig.4, the deflecting beam 19 does not extend all the way down the shaft 2a, i.e. it does not completely divide the lower part. Its function is rather to divide the descending sinter 100 into two streams (indicated by bold black arrows), which are forced closer to the inner and outer walls, where they meet the upward moving air (indicated by bold white arrows). At some point below the deflecting beam 19, the two streams may join again.

[0033] Fig.5 shows a schematic sectional view of a sinter cooler 1c according to a fourth embodiment, which also employs the shaft 2a from fig.3. Here, the sinter 100 is not charged uniformly along the radial direction, but preferentially towards the inner and outer sidewalls 3a, 4a. This is simply achieved by a roof-shaped distribution element 21, which is placed at the end of a chute (not shown) of a charging device. The sinter 100 is piled up and starts to roll or slide down the slopes towards the middle 20 of the shaft 2a. This process leads to a certain degree of segregation, because larger particles tend to move farther than small particles. Larger particles, however, leave more space for air to flow through, wherefore the middle 20 of the shaft 2a is a preferred flow path. Thus, cooling air

(indicated by bold white arrows) is directed away from the sidewalls 3a, 4a to the middle 20 of the shaft 2a.

[0035] Fig.6 shows a schematic sectional view of a sinter cooler 1d according to a fifth embodiment. In this embodiment, the sinter 100 is distributed over the entire radial width of the shaft 2a, but a scraper 22 acts on the uppermost layer of the sinter 100 to create a concave profile. The scraper 22 is stationary and works similar to a plough as the shaft 2a rotates. The concave profile means that the total height of the sinter layer in the middle of the shaft is a less than towards the inner and outer wall 3a, 4a. Also, the distance from the tangential inlet vanes 18 to the centre of the concave profile is reduced with respect to the distance to the inner and outer edges of the profile. Therefore, cooling air (indicated by bold white arrows) is at least partially redirected from the sidewalls 3a, 4a to the middle of the shaft 2a. It should be noted that the segregation effect described for the fourth embodiment may also, to some extent, occur in the present embodiment. On the other hand, it should be noted that in the fourth embodiment, too, a concave profile is formed.

[0036] Fig.7 shows a schematic sectional view of a sinter cooler 1e according to a sixth embodiment. Here, a venting system is installed into a connecting beam 15 in a central or upper region of the shaft. The venting system comprises an air duct (not shown), which can be easily integrated into or mounted to the beam 15, and an outlet opening 23 to emit air into the shaft. In the embodiment shown, the air duct is simply connected to the outside, i.e. to atmospheric pressure, so that the air is drawn into the shaft by the same negative pressure that draws in the air through the inlet vanes 18. An additional supply for cooling air is thus provided in an upper part of the shaft, which on the one hand increases the airflow through the central or upper part and furthermore introduces fresh cooling air into this part whereas the air rising from the inlet vanes 18 has already been heated up to some extent. Such a central outlet opening 23 allows providing additional cooling air for cooling the sinter in the central area of the shaft.

[0037] Fig.7 shows the venting system as a means for sucking air into the shaft 2a.

[0038] It should be noted that in Figs 4 to 7, only tangential inlet vanes 18 are visible due to the orientation of the cut through the shaft. Air is of course also sucked into the shaft through the radial inlet vanes, which are not visible on these figures. The embodiments shown in Figs 4 to 7 are all also valid for embodiments without tangential inlet vanes, i.e. with radial inlet vanes only.

Legend of Reference Numbers:

5	1, 1b-1e	sinter cooler	12	lower-side opening
	2, 2a	shaft	13	opening
	2.1	lower part	14	support structure
	2.2	upper part	15	connecting beam
	3, 3a	inner sidewall	16	platform
	4, 4a	outer sidewall	17	stripper
10	5	charge opening	18	tangential inlet vane
	6	discharge opening	19	deflecting beam
	7, 7a	compartment	20	middle
	8	radial sidewall	22	scraper
	9	radial inlet vane	23	outlet opening
15	10	tangential sidewall	100	sinter
	11	space		

Claims

1. Sinter cooler (1, 1 b-1 e) for counter-current operation, with a circular shaft (2, 2a) for receiving sinter (100), the shaft (2,2a) having at least one upper charge opening (5) and at least one lower discharge opening (6), wherein
 - in a lower part (2.1), the shaft (2, 2a) is divided into a plurality of compartments (7, 7a) which are tangentially spaced apart; and
 - each compartment (7, 7a) has at least one sidewall (8) with radial inlet vanes (9), which extend radially, for intake of cooling gas into the shaft (2, 2a);
 - the sinter cooler (1, 1 b-1 e) being so configured that during operation, sinter (100) is charged through the charge opening (5) and moves downwards through the compartments (7, 7a) to the discharge opening (6), while cooling gas is sucked in through the radial inlet vanes (9) and upwards through the shaft (2, 2a).
2. Sinter cooler according to claim 1, **characterised in that** the radial inlet vanes (9) extend over more than 50% of the radial width of the compartment (7, 7a).
3. Sinter cooler according to claim 1 or 2, **characterised in that** a space (11) between neighbouring compartments (7, 7a) has a lower-side opening (12) so that cooling gas can enter the space (11) from below.
4. Sinter cooler according to any of the preceding claims, **characterised in that** each compartment (7, 7a) has at least one sidewall (10) with tangential inlet vanes (18), which extend tangentially.
5. Sinter cooler according to any of the preceding claims, **characterised in that** a radial width of the shaft (2, 2a) decreases downwards.
6. Sinter cooler according to any of the preceding claims, **characterised in that** a tangential width of each compartment (7, 7a) decreases downwards.
7. Sinter cooler according to any of the preceding claims, **characterised by** at least one profile forming means (22), which is adapted to form an upper profile of the sinter (100) to be concave in the radial direction.
8. Sinter cooler according to claim 7, **characterised in that** the profile forming means (22) is adjustable.
9. Sinter cooler according to any of the preceding claims, **characterised by** at least one distribution means (21) that is adapted to charge the sinter mainly towards a radially inner wall (3, 3a) and a radially outer wall (4, 4a) of the shaft (2, 2a).
10. Sinter cooler according to any of the preceding claims, **characterised in that** at least one venting system (23) is disposed in an upper part of the shaft (2a) so that during operation, it is embedded in the sinter (100), which venting

system (23) is adapted to suck air into the shaft (2a).

11. Sinter cooler according to any of the preceding claims, **characterised by** a central deflecting element (19) arranged in the shaft (2a) and adapted to deflect sinter (100) from a radially central region of the shaft (2a) radially inwards and outwards.

12. Method for cooling sinter (100) in a sinter cooler (1, 1 b-1 e) with a circular shaft (2, 2a) for receiving sinter (100), the shaft (2, 2a) having at least one upper charge opening (5) and at least one lower discharge opening (6), wherein

- in a lower part (2.1), the shaft (2, 2a) is divided into a plurality of compartments (7, 7a) which are tangentially spaced apart; and
 - each compartment (7, 7a) has at least one side wall (8) with radial inlet vanes (9), which extend radially, for intake of cooling gas into the shaft (2, 2a),
- the method comprising
- charging sinter (100) through the charge opening (5),
 - the sinter (100) moving downwards through the compartments (7, 7a) to the discharge opening (6),
 - sucking cooling gas in through the radial inlet vanes (9) and upwards through the shaft (2, 2a).

Fig. 1

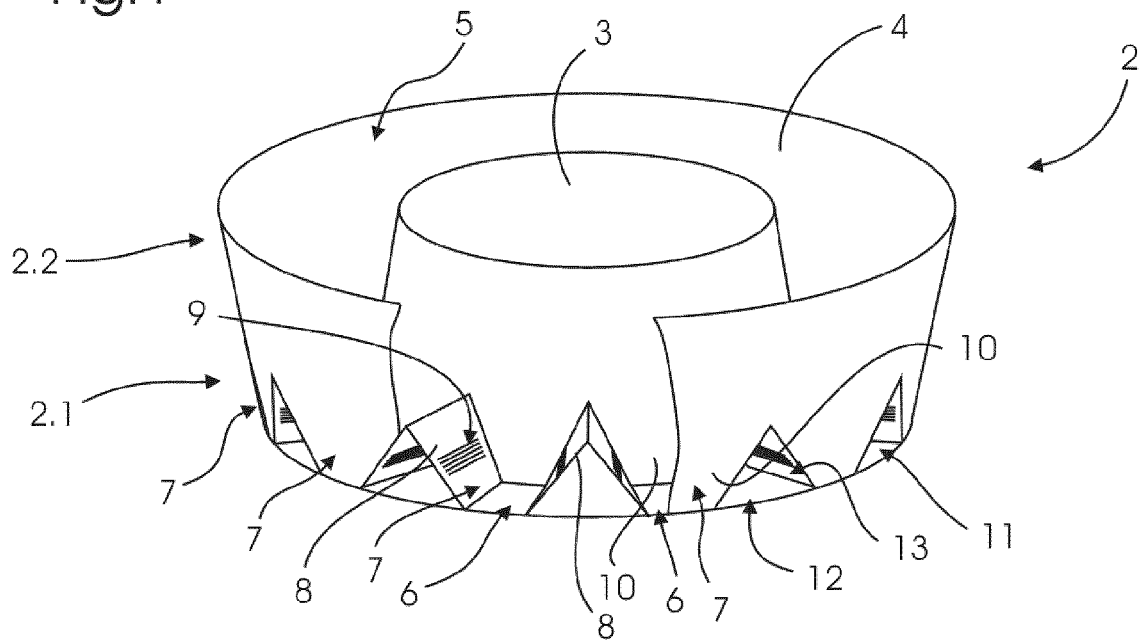


Fig. 2

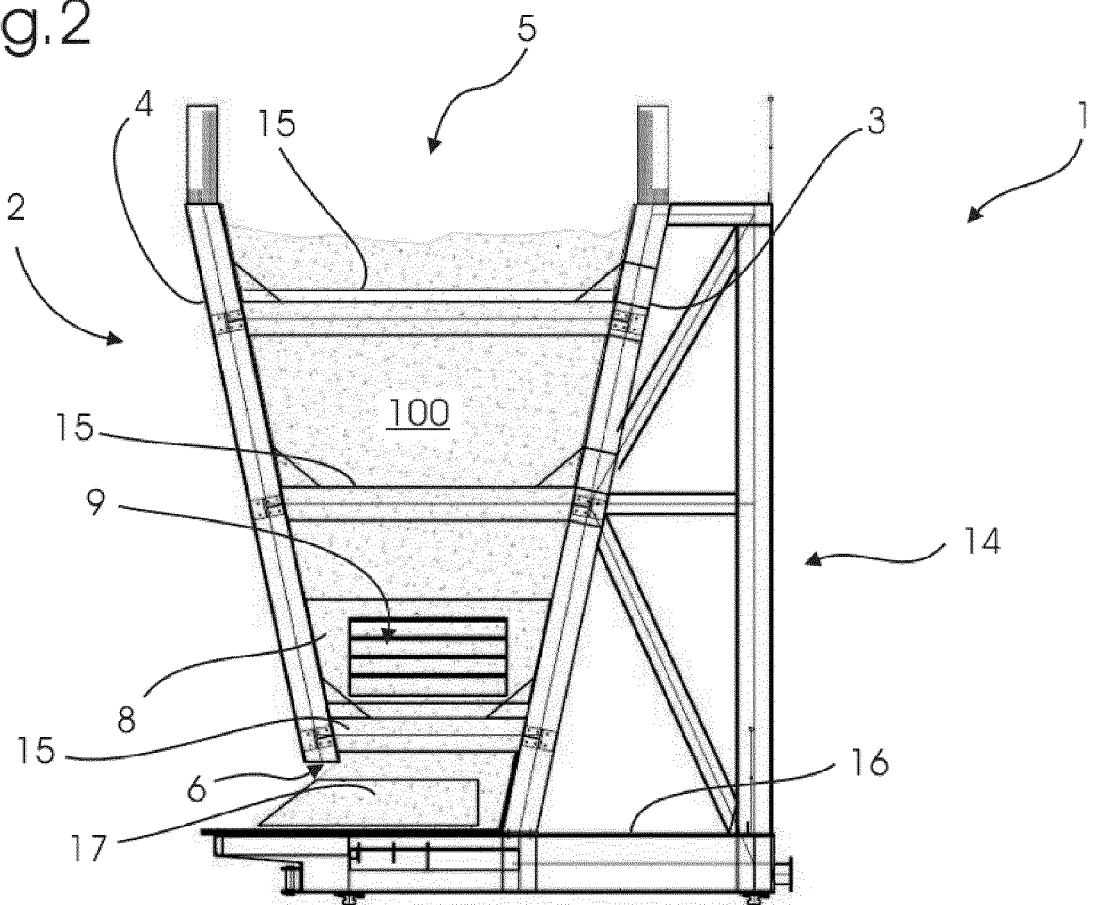


Fig.3

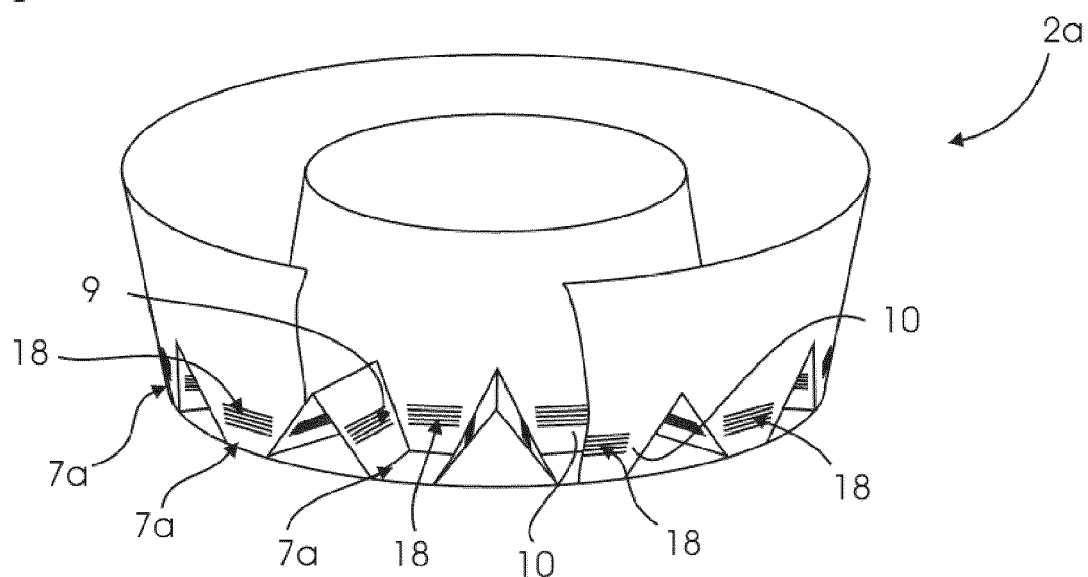


Fig.4

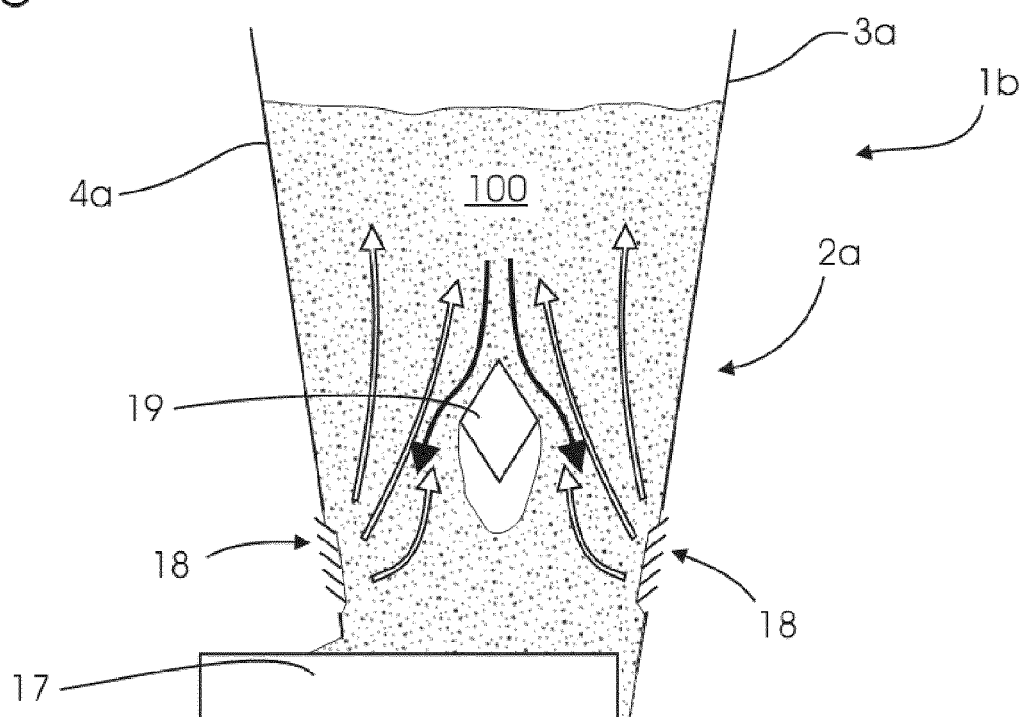


Fig.5

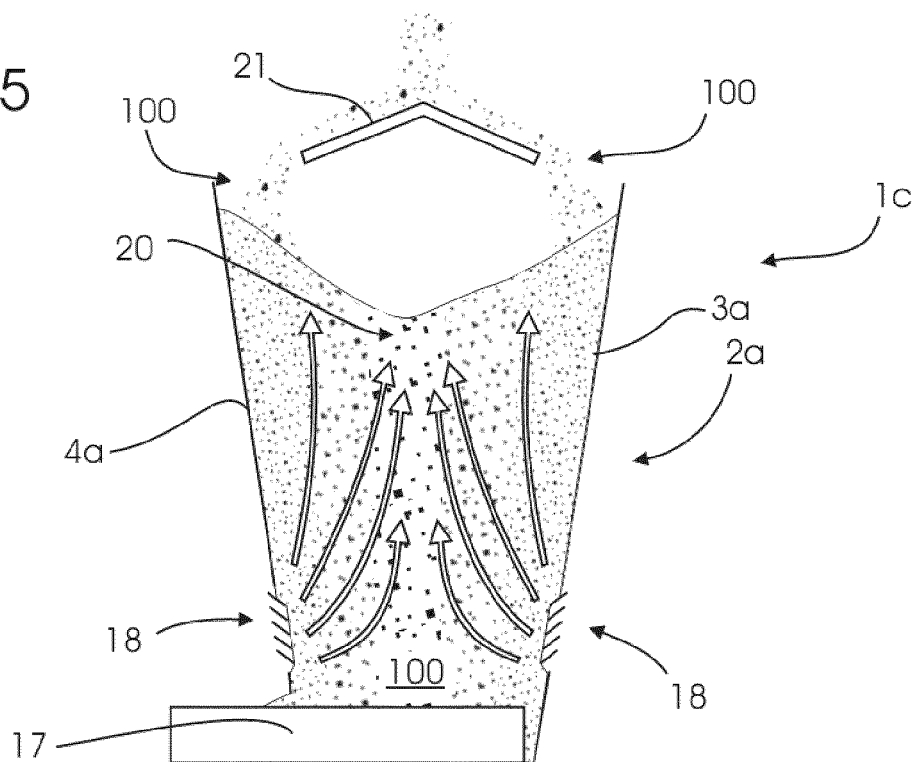


Fig.6

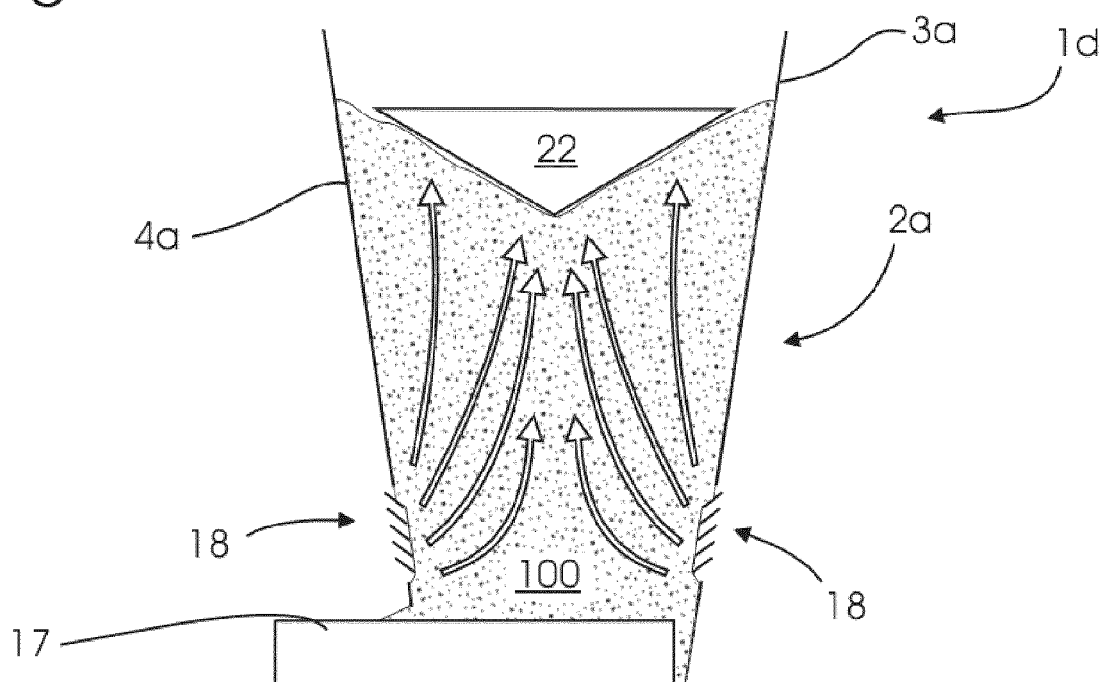
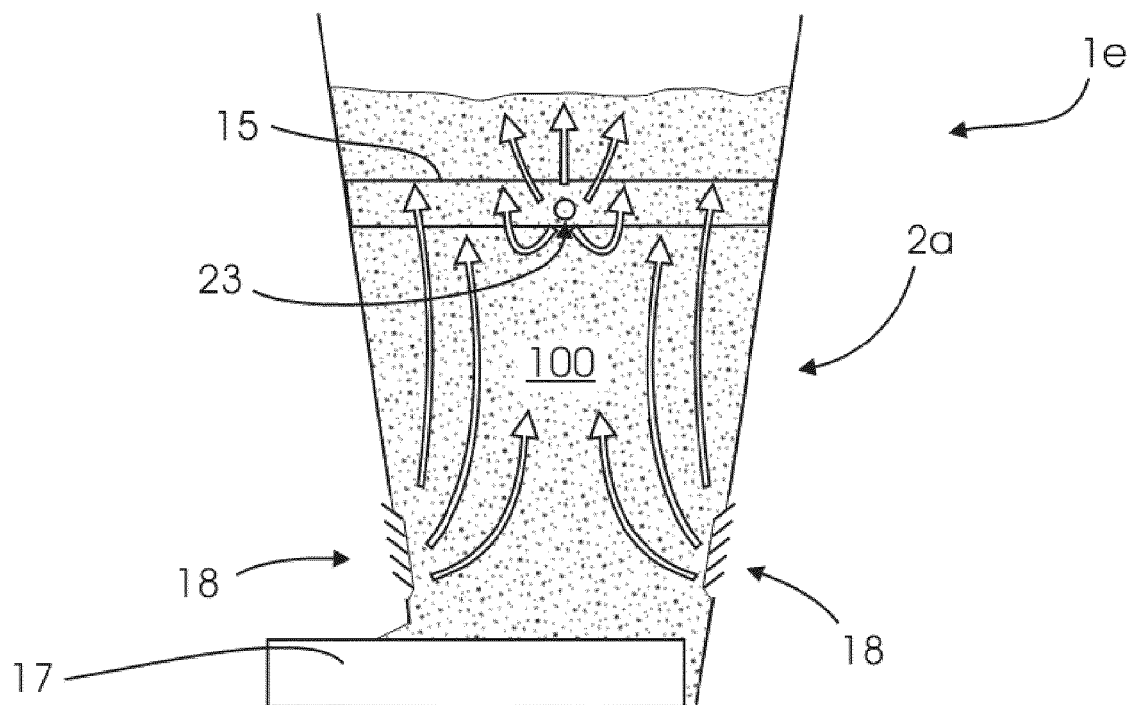


Fig.7





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