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(54) **SINTER COOLER WITH EXCHANGEABLE SEAL**

VORRICHTUNG ZUM KÜHLEN VON SINTERMATERIAL MIT AUSWECHSELBAREM
DICHTUNGSELEMENT

DISPOSITIF DE REFROIDISSEMENT D'AGGLOMÉRÉS FRITTÉS AVEC JOINT D'ÉTANCHÉITÉ
ÉCHANGEABLE

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Description

[0001] This invention relates to a sinter cooler of a sintering plant for use in metallurgy, comprising a cooling-air chamber and a sinter cooling chamber including a perforated plate, which can travel over the same, and comprising a cooling gas seal between the upper surface of the cooling-air chamber and the lower surface of the sinter cooling chamber.

[0002] In such sinter coolers, external seals of a cotton laminate (e.g. Laminex®), which are provided on the upper surface of rigid rubber strips, previously have been used to avoid cooling air losses. The rubber strips are arranged on adjustable angular brackets, which in turn are fixed on vertical stationary sealing plates. These seals wear relatively quickly and frequently must be re-adjusted by hand.

[0003] US 4 238 120 discloses a sealing device for a sinter cooler, comprising a gas seal between an upper surface of the cooling-air chamber and a lower surface of the sinter cooling chamber, wherein the gas seal includes sealing strip or block elements attached underneath a ring flange mounted on the upper edge of the cooling-air chamber and resting on a flange mounted underneath the frame of the sinter cooler chamber.

[0004] It is the object of the present invention to equip a sinter cooler as mentioned above with a novel cooling gas seal, which with an improved durability safely reduces cooling air losses and hence the amount of required cooling air, without increasing the frictional resistance. This should lead to a saving of operating costs and improve the effectiveness of the cooler.

[0005] In a sinter cooler as mentioned above, this object is solved in particular in that the cooling gas seal carried along with the sinter cooling chamber includes sealing elements of an elastomeric material, which are arranged with a vertical play such that they are seated on the lateral upper edges of the stationary vertical cooling-air chamber wall, which extend in direction of travel of the sinter cooling chamber, and during travel of the sinter cooling chamber slide along the upper edges, wherein the sealing elements are mounted in a vertically movable manner by means of a weight-loaded holder and a guide pin. The sealing elements preferably are replaceable.

[0006] Such seal is self-compensating, because in the case of the end-face wear of the sealing elements the same maintain their sealing function with respect to the cooling-air chamber wall by automatic readjustment. In this way, the service life of the cooling gas seal is prolonged considerably. Due to the reliable sealing, operating costs are saved and the effectiveness of the cooler is improved. The drive unit for the traveling sinter cooling chamber need not be dimensioned larger than before.

[0007] Preferably, the sealing elements are arranged outside a protective side wall of the sinter cooling chamber and at the lower end thereof, whereby the sealing elements are shielded against sinter dust and heat.

[0008] Furthermore, the sealing elements preferably are provided in a region inside an e.g. circular rail base of the cooling-air chamber, in order to protect the bearing of the bogie wheels of the sinter cooling chamber against sinter dust.

[0009] To realize the self-adjusting sealing function, the sealing elements are mounted in a vertically movable manner by means of a possibly weight-loaded holder disposed e.g. as a kind of framework and by means of a guide pin. The weight load can ensure a sufficient contact pressure of the sealing elements on the upper edge of the stationary cooling-air chamber wall, without adversely affecting the slidability.

[0010] For an easily replaceable assembly of the sealing elements, the guide pins can be received in possibly angular brackets which in turn are attached to connecting plates, in particular welded to the same, wherein the connecting plates preferably are releasably connected with stiffening ribs below the sinter cooling chamber wall.

[0011] The respective sealing element holder overlaps the associated sealing element preferably in a roof-like manner with corresponding inclined surfaces, so that fine sinter dust easily can slip off downwards.

[0012] In accordance with a development of the invention, the flat smooth upper edge of the cooling-air chamber wall, which possibly is formed by a stationary sealing plate of the cooling-air chamber wall, is formed with such a width that even in the case of a lateral displacement of the sinter cooling chamber, which for example moves on rails by means of bogie wheels, the sealing elements will always fully rest on the upper edge of the cooling-air chamber wall with their lower end face.

[0013] For example, a plurality of sealing element portions can adhesively be bonded at their ends to form an integral sealing element.

[0014] The ends of the sealing element segments facing each other preferably overlap each other and form a miter.

[0015] In their lower region, the sealing elements preferably are made of a wear-resistant, creep-resistant polymer having good sliding properties, whereas in their upper region they are made of a polymer that bonds well to metal. The two polymer components should also bond well to each other, e.g. by adhesion or by co-extrusion. It is, however, less expensive to use only one single material for the sealing elements.

[0016] In accordance with a preferred aspect of this invention, the sealing elements in particular are made of an ultra-high molecular weight polyethylene (PE-UH-MW).

[0017] Preferably, the upper edge of the cooling-air chamber wall is formed by a stationary sealing strip with round, preferably circular cross-section, in order to avoid a deposition of sinter dust and offer a small contact surface for the sealing elements.

[0018] Further developments, advantages and possible applications of the invention can be taken from the following description of an embodiment and the drawing.

All features described and/or illustrated form the subject-matter of the invention per se or in any combination, also independent of their inclusion in individual claims and/or their back-reference.

[0019] In the drawing:

- Fig. 1A shows a complete top view of a sinter cooler including the invention,
- Fig. 1B shows a complete side view from direction B in Fig. 1A of a sinter cooler including the invention,
- Fig. 1C shows a section along line C-C in Figure 1A,
- Fig. 2A shows a top view of the side wall of a sinter cooler including the invention,
- Fig. 2B shows a portion of a cooling gas seal including the invention in an oblique view, and
- Fig. 2C shows a section corresponding to C-C in Fig. 2A, completed by a special stationary sealing strip.

[0020] The embodiment of a sinter cooler including the invention as shown in the Figures is part of a sintering plant for use in metallurgy. It serves to cool the lumpy sintered ore to be supplied to a blast furnace by means of cooling air and to supply the thermal energy of the hot waste air recovered for example to another load.

[0021] The sinter cooler has a cooling-air chamber 1 and a sinter cooling chamber 3 for the hot sinter material accommodated therein, which for example by means of bogie wheels 22 can travel on a rail track 17, 19 and includes a perforated plate 2 for the supply of cooling air. To minimize a loss of cooling air, a cooling gas seal 4 is provided between the upper edge 5 of the cooling-air chamber 1 and the lower surface of the sinter cooling chamber 3. The upper portion of the cooling-air chamber wall 7 is formed by stationary, in particular metallic sealing plates 18.

[0022] The cooling gas seal 4 carried along with the sinter cooling chamber 3 includes replaceable sealing elements 6 of an elastomeric material. The sealing elements 6 are mounted with a vertical play such that they are seated on the smooth upper edge 5 of the sealing plates 18 of the stationary vertical cooling-air chamber wall 7 and during travel of the sinter cooling chamber 3 slide along the upper edge 5.

[0023] The sealing elements 6 are arranged outside a protective side wall 8 of the sinter cooling chamber 3 and at the lower end thereof such that the former are protected against sinter dust and heat. The sealing elements 6 are mounted in a vertically movable manner by means of a possibly weight-loaded holder 9 and a guide pin 10, so that they can compensate a possible wear by automatic readjustment. The upper head 21 of the guide pin

10 forms a stop when the sealing elements 6 have reached their maximum of admissible wear. In the illustrated embodiment, the guide pins 10 are accommodated in angular brackets 11 in a vertically movable manner, wherein the through holes through which the guide pins 10 are passed are large enough to provide for freely shifting the sealing elements 6 with respect to the sealing plates 18.

[0024] The brackets 11 are attached to connecting plates 12 for example by welding. For a fast replacement of used sealing elements 6, the connecting plates 12 in turn are releasably connected with stiffening ribs 13 below the sinter cooling chamber wall 14. The holders 9 overlap the associated sealing element 6 in a roof-like manner with corresponding inclined surfaces 15, so that sinter dust obtained is easily discharged downwards upon reaching the discharge area. The holders 9 also can be formed in two parts and be clamped onto the sealing elements 6 from the side, in order to provide for an easy assembly and disassembly.

[0025] The end faces 16 of the sealing elements 6 are formed with such a width that they will always rest on the upper edge 5 of the cooling-air chamber wall 7, even in the case of a lateral displacement of the traveling sinter cooling chamber 3 by e.g. ± 25 mm. Preferably, the end faces 16 have a width of about 6 to 12 cm.

[0026] A plurality of sealing element portions can be connected with each other at their ends to form an integral sealing element 6. The connection can be made for example by bonding. To improve tightness, the ends of the sealing element segments facing each other furthermore overlap to form a miter.

[0027] For further improvement of a permanent operability of the cooling gas seal 4, the sealing elements 6 are formed in their lower region of a wear-resistant, creep-resistant polymer having good sliding properties and in their upper region of a polymer that bonds well to metal. Furthermore, the polymers expediently should be selected such that they can easily be connected with each other, for example by bonding or by co-extrusion.

[0028] The upper edge 5 of the cooling-air chamber wall 7 in particular can be formed by a sealing strip 23 which is round, in particular circular in cross-section (see Fig. 2C), in order to avoid a deposition of sinter dust and offer a small contact surface for the sealing elements 6. The sealing strip 23 preferably is made of steel, wherein an additional sheath can be provided, and is replaceable.

List of Reference Numerals

[0029]

- | | |
|---|---|
| 1 | cooling-air chamber |
| 2 | perforated plate |
| 3 | sinter cooling chamber |
| 4 | cooling gas seal |
| 5 | upper edge of the cooling-air chamber wall (sealing plates) |

- 6 sealing elements
- 7 cooling-air chamber wall
- 8 protective side wall
- 9 sealing element holder
- 10 guide pins
- 11 bracket
- 12 connecting plates
- 13 stiffening ribs
- 14 sinter cooling chamber wall
- 15 inclined surfaces
- 16 end faces
- 17 rail base
- 18 stationary sealing plates
- 19 rails for sinter cooling chamber
- 20 mounting holes
- 21 head
- 22 bogie wheels
- 23 sealing strip

Claims

1. A sinter cooler of a sintering plant for use in metallurgy, comprising a cooling-air chamber (1) and a sinter cooling chamber (3) including a perforated plate (2), which can travel over the same, and comprising a cooling gas seal (4) between the upper surface of the cooling-air chamber (1) and the lower surface of the sinter cooling chamber (3), **characterized in that** the cooling gas seal (4) carried along with the sinter cooling chamber (3) includes sealing elements (6) of an elastomeric material, which are mounted with a vertical play such that they are seated on the lateral upper edges (5) of the stationary vertical cooling-air chamber wall (7), which extend in direction of travel of the sinter cooling chamber (3), and during travel of the sinter cooling chamber (3) slide along the upper edges (5), wherein the sealing elements (6) are mounted in a vertically movable manner by means of a weight-loaded holder (9) and a guide pin (10).
2. The sinter cooler according to claim 1, **characterized in that** the sealing elements (6) are mounted outside a protective side wall (8) of the sinter cooling chamber (3) and at the lower end thereof.
3. The sinter cooler according to claim 1 or 2, **characterized in that** the sealing elements (6) are located in a region inside an e.g. circular rail base (17) of the cooling-air chamber (1).
4. The sinter cooler according to any of the preceding claims, **characterized in that** the guide pins (10) are received in possibly angular brackets (11), which in turn are attached to connecting plates (12) provided below the sinter cooling chamber wall (14).

5. The sinter cooler according to any of the preceding claims, **characterized in that** the respective sealing element holder (9) overlaps the associated sealing element (6) in a roof-like manner with corresponding inclined surfaces (15).
6. The sinter cooler according to any of the preceding claims, **characterized in that** the end faces (16) of the respective sealing elements (6) are formed with such a width that they will always rest on the upper edge (5) of the cooling-air chamber wall (7) even in the case of a lateral displacement of the traveling sinter cooling chamber (3).
7. The sinter cooler according to any of the preceding claims, **characterized in that** a plurality of sealing element portions are connected with each other at their ends to form an integral sealing element (6), e.g. are bonded to each other.
8. The sinter cooler according to any of the preceding claims, **characterized in that** the ends of the sealing element segments facing each other overlap to form a miter.
9. The sinter cooler according to any of the preceding claims, **characterized in that** in their lower region the sealing elements (6) are made of a wear-resistant, creep-resistant polymer having good sliding properties, in particular of polyethylene.
10. The sinter cooler according to any of the preceding claims, **characterized in that** in their upper region the sealing elements (6) are made of a polymer that bonds well to metal, in particular of polyethylene.
11. The sinter cooler according to any of the preceding claims, **characterized in that** the two sealing element regions of the sealing elements are bonded to each other or co-extruded.
12. The sinter cooler according to any of the preceding claims, **characterized in that** the upper edge (5) of the cooling-air chamber wall (7) is formed by a stationary sealing strip (23) with round, preferably circular cross-section.

Patentansprüche

1. Sinterkühler einer Sinteranlage für den Einsatz in der Metallurgie, mit einer Kühlluftkammer (1) und einer über diese verfahrbaren, einen Lochboden (2) aufweisenden Sinterkühlkammer (3) sowie mit einer Kühlgasabdichtung (4) zwischen der Oberseite der Kühlluftkammer (1) und der Unterseite der Sinterkühlkammer (3), **dadurch gekennzeichnet, dass** die mit der Sinterkühlkammer (3) mitgeführte Kühl-

- gasabdichtung (4) Dichtelemente (6) aus elastome-
rem Material aufweist, welche so mit vertikalem Spiel
gelagert sind, dass sie auf den seitlichen in Verfah-
rensrichtung der Sinterkühlkammer (3) verlaufen-
den Oberkanten (5) der stationären vertikalen Kühl-
luftkammerwand (7) aufsitzen und beim Verfahren
der Sinterkühlkammer (3) auf den Oberkanten (5)
entlang gleiten, wobei die Dichtelemente (6) mittels
eines ggf. gewichtbelasteten Halters (9) und eines
Führungsbolzens (10) höhenverschieblich gelagert
sind.
2. Sinterkühler nach Anspruch 1, **dadurch gekenn-
zeichnet, dass** die Dichtelemente (6) außerhalb ei-
ner Seitenschutzwand (8) der Sinterkühlkammer (3)
und an deren unterem Ende gelagert sind.
 3. Sinterkühler nach Anspruch 1 oder 2, **dadurch ge-
kennzeichnet, dass** die Dichtelemente (6) in einem
Bereich innerhalb einer z.B. im Kreis geführten
Schienenbasis (17) der Kühlluftkammer (1) liegen.
 4. Sinterkühler nach einem der vorhergehenden An-
sprüche, **dadurch gekennzeichnet, dass** die Füh-
rungsbolzen (10) in ggf. winkelförmigen Trägern (11)
aufgenommen sind, welche ihrerseits an unterhalb
der Sinterkühlkammerwand (14) vorgesehenen Ver-
bindungsplatten (12) befestigt sind.
 5. Sinterkühler nach einem der vorhergehenden An-
sprüche, **dadurch gekennzeichnet, dass** der je-
weilige Dichtelementhalter (9) das zugehörige Dich-
telement (6) dachartig mit entsprechenden Schräg-
flächen (15) übergreift.
 6. Sinterkühler nach einem der vorhergehenden An-
sprüche, **dadurch gekennzeichnet, dass** die Stirn-
flächen (16) der jeweiligen Dichtelemente (6) so breit
ausgebildet ist, dass sie auch bei seitlichem Auswei-
chen der fahrenden Sinterkühlkammer (3) immer auf
der Oberkante (5) der Kühlluftkammerwand (7) auf-
liegen.
 7. Sinterkühler nach einem der vorhergehenden An-
sprüche, **dadurch gekennzeichnet, dass** mehrere
Dichtelementabschnitte an ihren Enden miteinander
zu einem einstückigen Dichtelement (6) verbunden,
z. B. miteinander verklebt sind.
 8. Sinterkühler nach einem der vorhergehenden An-
sprüche, **dadurch gekennzeichnet, dass** die ein-
ander zugewandten Enden der Dichtelementseg-
mente sich überlappend eine Gehrung bilden.
 9. Sinterkühler nach einem der vorhergehenden An-
sprüche, **dadurch gekennzeichnet, dass** die Dich-
telemente (6) in ihrem unteren Bereich aus einem
verschleißfesten, kriechfesten und gute Gleiteigen-
schaften aufweisenden Polymer, insbesondere Po-
lyethylen, bestehen.
 10. Sinterkühler nach einem der vorhergehenden An-
sprüche, **dadurch gekennzeichnet, dass** die Dich-
telemente (6) in ihrem oberen Bereich aus einem mit
Metall gut verbindbaren Polymer, insbesondere Po-
lyethylen, bestehen.
 11. Sinterkühler nach einem der vorhergehenden An-
sprüche, **dadurch gekennzeichnet, dass** die bei-
den Dichtelementbereiche der Dichtelemente mit-
einander verklebt oder gemeinsam extrudiert sind.
 12. Sinterkühler nach einem der vorhergehenden An-
sprüche, **dadurch gekennzeichnet, dass** die Ober-
kante (5) der Kühlluftkammerwand (7) von einer sta-
tionären Dichtleiste (23) mit rundem, vorzugsweise
kreisrundem Querschnitt gebildet ist.

Revendications

1. Refroidisseur de métal fritté d'une unité de frittage
destiné à être utilisé dans la métallurgie, comportant
une chambre d'air de refroidissement (1) et une
chambre de refroidissement de métal fritté (3) com-
prenant une plaque perforée (2), qui peut se dépla-
cer sur celle-ci, et comportant un joint étanche au
gaz de refroidissement (4) entre la surface supérieu-
re de la chambre d'air de refroidissement (1) et la
surface inférieure de la chambre de refroidissement
de métal fritté (3), **caractérisé en ce que** le joint
étanche au gaz de refroidissement (4) transporté
conjointement à la chambre de refroidissement de
métal fritté (3) comprend des éléments d'étanchéité
(6) en un matériau élastomère, qui sont montés avec
un jeu vertical de telle sorte qu'ils reposent sur les
bords supérieurs latéraux (5) de la paroi (7) de cham-
bre d'air de refroidissement verticale stationnaire,
qui s'étendent dans la direction de déplacement de
la chambre de refroidissement de métal fritté (3), et
durant le déplacement de la chambre de métal fritté
(3) coulisent le long des bords supérieur (5), dans
lequel les éléments d'étanchéité (6) sont montés de
manière verticalement mobile au moyen d'un sup-
port lesté (9) et d'une broche de guidage (10).
2. Refroidisseur de métal fritté selon la revendication
1, **caractérisé en ce que** les éléments d'étanchéité
(6) sont montés hors d'une paroi latérale de protec-
tion (8) de la chambre de refroidissement de métal
fritté (3) et au niveau de son extrémité inférieure.
3. Refroidisseur de métal fritté selon la revendication
1 ou 2, **caractérisé en ce que** les éléments d'étan-
chéité (6) sont situés dans une région à l'intérieur,
par exemple, d'une base de rail circulaire (17) de la

chambre d'air de refroidissement (1).

4. Refroidisseur de métal fritté selon l'une quelconque des revendications précédentes, caractérisé en ce que les broches de guidage (10) sont reçues dans des fixations éventuellement angulaires (11) qui sont à leur tour fixées à des plaques de raccordement (12) fournies en dessous de la paroi (14) de chambre de refroidissement de métal fritté. 5
5. Refroidisseur de métal fritté selon l'une quelconque des revendications précédentes, caractérisé en ce que le support d'élément d'étanchéité respectif (9) chevauche l'élément d'étanchéité associé (6) de manière similaire à un toit avec des surfaces inclinées correspondantes (15). 10
6. Refroidisseur de métal fritté selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les faces terminales (16) des éléments d'étanchéité respectifs (6) sont formées avec une largeur telle qu'ils reposeront toujours sur le bord supérieur (5) de la paroi (7) de chambre d'air de refroidissement même dans le cas d'un déplacement latéral de la chambre de refroidissement de métal fritté (3) en déplacement. 20
7. Refroidisseur de métal fritté selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la pluralité de parties éléments d'étanchéité sont raccordées les unes avec les autres au niveau de leurs extrémités pour former un élément d'étanchéité intégral (6), par exemple sont liées les unes aux autres. 25
8. Refroidisseur de métal fritté selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les extrémités des segments d'éléments d'étanchéité se faisant face les unes les autres se chevauchent pour former un onglet. 30
9. Refroidisseur de métal fritté selon l'une quelconque des revendications précédentes, **caractérisé en ce que** dans leur région inférieure les éléments d'étanchéité (6) sont constitués d'un polymère résistant à l'usure et résistant au fluage ayant de bonnes propriétés de glissement, notamment en polyéthylène. 35
10. Refroidisseur de métal fritté selon l'une quelconque des revendications précédentes, **caractérisé en ce que** dans leur région supérieure les éléments d'étanchéité (6) sont formés en un polymère qui se lie bien au métal, en particulier en polyéthylène. 40
11. Refroidisseur de métal fritté selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les deux régions éléments d'étanchéité des éléments d'étanchéité sont liées les unes aux autres ou 45

co-extrudées.

12. Refroidisseur de métal fritté selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le bord supérieur (5) de la paroi (7) de chambre d'air de refroidissement est formé par une bande d'étanchéité stationnaire (23) ayant une section transversale arrondie, de préférence circulaire. 50

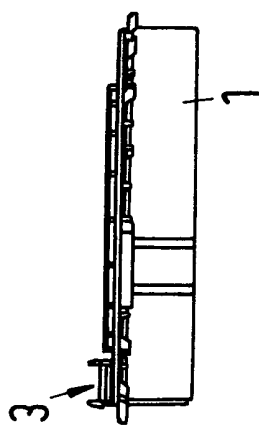


Fig.1B

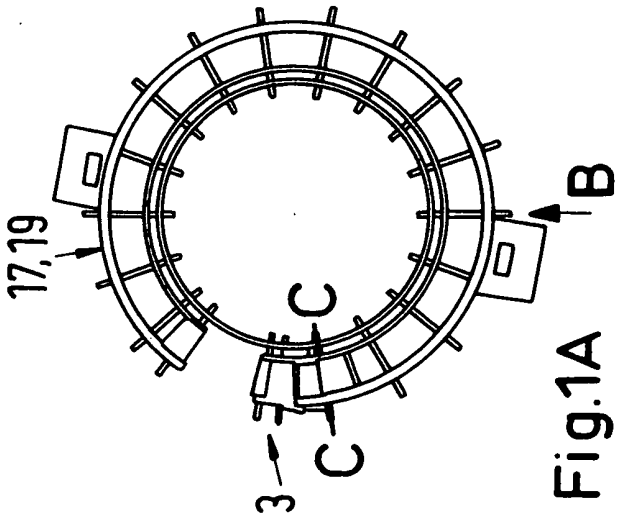


Fig.1A

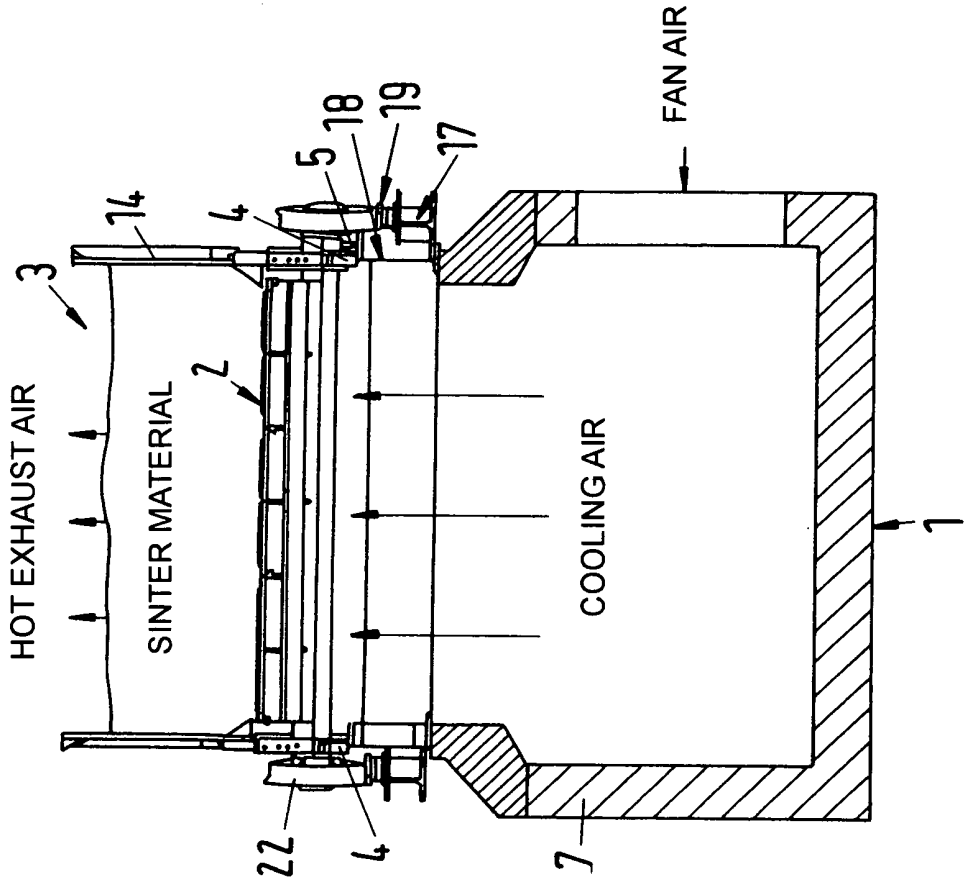
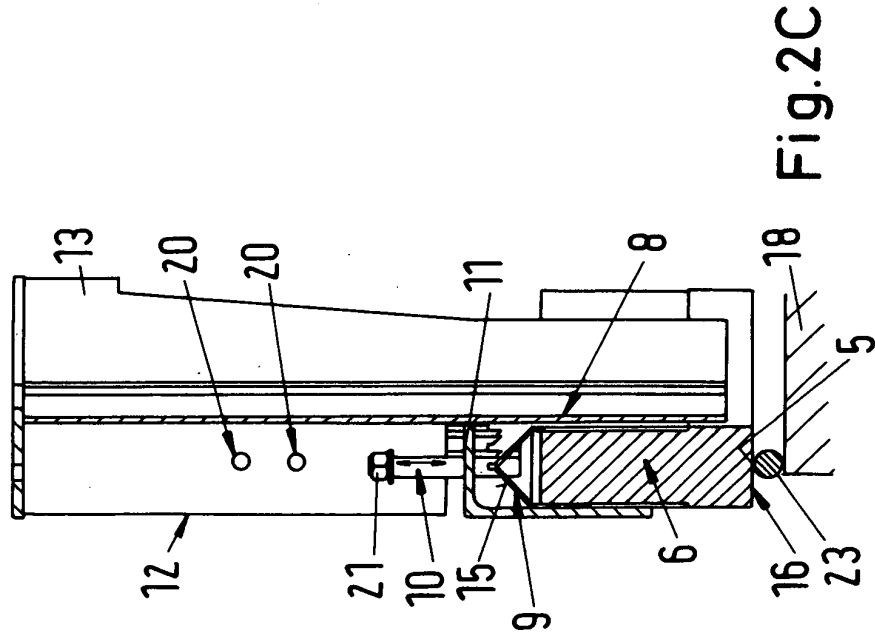
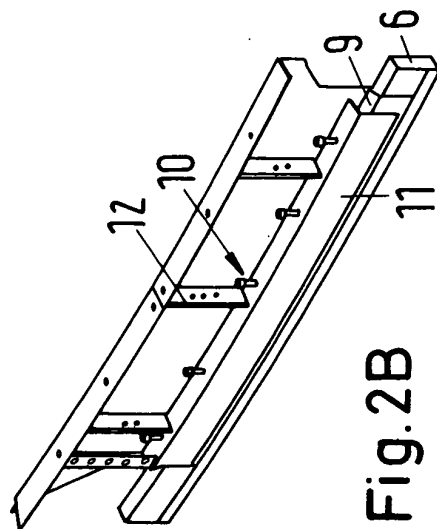
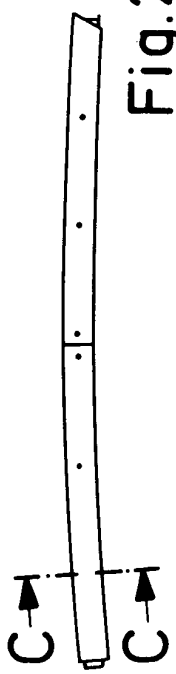


Fig.1C



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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