(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 October 2016 (13.10.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/162599 A1

(51) International Patent Classification:
F27D 3/18 (2006.01) *F27D 99/00* (2010.01)
B65G 53/04 (2006.01)

(21) International Application Number:
PCT/FI2016/050211

(22) International Filing Date:
6 April 2016 (06.04.2016)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
20155245 7 April 2015 (07.04.2015) FI

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

WO 2016/162599 A1

(54) Title: AIR SLIDE CONVEYOR AND USE OF AN AIR SLIDE CONVEYOR

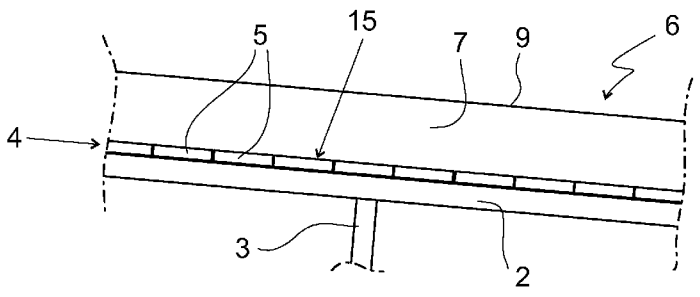

FIG 3

(57) Abstract: The invention relates to an air slide conveyor (1) comprising a plenum chamber (2) configured to receive compressed gas from a gas supply system (3), and a conveying deck (4) forming a top side of the plenum chamber (2). The conveying deck (4) is porous for enabling gas to escape from the plenum chamber (2) through the conveying deck (4). The conveying deck (4) is formed at least partly of a plurality of porous ceramic parts (5).

AIR SLIDE CONVEYOR AND USE OF AN AIR SLIDE CONVEYOR

Field of the invention

The invention relates to an air slide conveyor comprising a plenum chamber configured to receive compressed gas from a gas supply system, and a conveying deck forming a top side of the plenum chamber as defined in the preamble of independent claim 1.

In suspension smelting, such as in flash smelting, fine-divided matter such as sulfidic concentrate is usually fed to a concentrate burner or to a matte burner of a suspension smelting furnace by using feed systems comprising an air slide conveyor. It is known in the art to use porous metal plates in the conveying deck forming the top side of the plenum chamber of the air slide conveyor.

When using an air slide conveyor in a feeding arrangement for feeding material in the form of fine-divided matter into a concentrate burner or a matte burner of a suspension smelting furnace, it important to create an uniform fluidized material bed in the an air slide conveyor, because the fluidized material bed is at a feeding end of the air slide conveyor divided into several sectors of a fine divided matter feeding channel of the concentrate burner or matte burner.

A problem with such porous metal plates to form the top side of the plenum chamber of the air slide conveyor is that the fine-divided matter can block the pores and be extremely wearing on the porous metal plates, which reduces their service life and has a negative effect on bed uniformity.

Another problem with using thin porous metal plates to form the top side of the plenum chamber of the air slide conveyor in feeding arrangements for feeding material in the form of fine-divided matter into a burner of a suspension smelting furnace is that the porous metal plates may be deformed due to the pressure inside the plenum chamber or that the porous metal plates may be deformed at a receiving end of the air slide conveyor at which the fine-divided matter is received in the air slide conveyor. If the porous metal plates are deformed, the fluidized material bed will not be uniform, because the geometry of the plenum chamber is changed.

The function principle of an air slide conveyor is described for example in publication US 3,773,391.

Publication EP 0 319 596 A1 presents a fluidizing gravity conveyor for hot particulate material which includes a heat resistant plate having a plurality of holes for receiving bubble caps or nozzles to disperse air flow from a lower plenum chamber to the upper material chamber. The upper material chamber is suitably lines with heat resistant material. Provisions are made for differential thermal expansion.

Objective of the invention

The object of the invention is to provide an air slide conveyor which solves the above

identified problems.

Short description of the invention

The air slide conveyor of the invention is characterized by the definitions of independent claim 1.

Preferred embodiments of the air slide conveyor are defined in the dependent claims 2 to 16.

The invention relates also to the use of the air slide conveyor according to any of the claims 1 to 16 in a feeding arrangement configured to feed fine divided material into a burner of a suspension smelting furnace as defined in claim 17.

Due to the higher thickness of porous ceramic bricks leading to higher stiffness and the microstructure of porous ceramic bricks compared to porous metallic plates, porous ceramic bricks provided for a more even gas distribution through the porous ceramic brick. The advantage of this is that the fine-divided material to be conveyed with the air slide conveyor will be evenly fluidized by the gas flowing through the conveying deck. Another advantage of this is that the velocity of the fluidized material bed will be steadier, which is advantageous particularly if the air slide conveyor is used in a feeding arrangement for feeding material in the form of fine-divided matter into several sectors of a fine divided matter feeding channel of a concentrate or of a matte burner of a suspension smelting furnace, because the fine-divided matter will be evenly distributed into the sectors of the fine divided matter feeding channel of the concentrate or matte burner. Even distribution of fine divided matter in the fluidized material bed causes also fewer pulses in the fluidized material bed, which in turn makes the utilization of process gases such as of oxygen in the suspension smelting furnace better.

The porosity in the porous ceramic bricks is uniform and isotropic and pore size is smaller compared to porous metal plates in which the porosity is anisotropic and inhomogeneous because the structure consists of larger alternating areas of pores and solid metal. This ensures on the microscopic scale a more uniform gas distribution leading to a more uniform fluidized bed. In addition, the pore shape is such that they do not contain sharp edges which prevents the sticking of the material into the pores and it will take longer time before the porous ceramic bricks become blocked.

Due to the fact that porous ceramic bricks can be manufactured to be thicker than the porous metal plates the porous ceramic bricks are not similarly prone to wearing.

Due to the stiffness of porous ceramic bricks, the conveying deck forming the top side of the plenum chamber will not be deformed due to pressure in the plenum chamber or due to impact of the material that is fed onto the conveying deck at a receiving end of the air slide conveyor, and geometry of the plenum chamber will remain unchanged.

List of figures

In the following the invention will described in more detail by referring to the figures, of which

Figure 1 is a schematic illustration of a suspension smelting furnace, which is provided with a feeding arrangement for feeding fine divided matter into a burner of the suspension smelting furnace and where the feeding arrangement comprises an air slide conveyor,

Figure 2 is another schematic illustration of a suspension smelting furnace, which is provided with a feeding arrangement for feeding fine divided matter into a burner of the suspension smelting furnace and where the feeding arrangement comprises an air slide conveyor,

Figure 3 shows a part of an air slide conveyor in cross section, and

Figure 4 shows in section view the air slide conveyor shown in figure 4.

Detailed description of the invention

The invention relates to an air slide conveyor 1 comprising a plenum chamber 2 configured to receive compressed gas from a gas supply system 3, and a conveying deck 4 forming a top side of the plenum chamber 2. The conveying deck 4 is porous for enabling gas to escape from the plenum chamber 2 through the conveying deck 4.

The air slide conveyor 1 has a receiving end 13 at which material to be conveyed by the air slide conveyor 1 is received at the conveying deck 4 of the air slide conveyor 1.

The air slide conveyor 1 has a delivery end 14 at which material to be conveyed by the air slide conveyor 1 is discharged from the conveying deck 4 of the air slide conveyor 1.

The conveying deck 4 is formed at least partly, preferably essentially completely, of a plurality porous ceramic parts 5, such as of porous ceramic bricks.

The air slide conveyor 1 comprises preferably, but not necessarily, a casing structure 6 covering the conveying deck 4 so that a conveying space 7 for the material to be conveyed with the air slide conveyor 1 is formed between the conveying deck 4 and the casing structure 6.

The air slide conveyor 1 comprises preferably, but not necessarily, side walls 8 at opposite sides of the conveying deck 4.

The air slide conveyor 1 comprises preferably, but not necessarily, a roof structure 9.

The thickness of the porous ceramic parts 5 can be between 5 mm and 200 mm, preferably between 10 mm and 100 mm, more preferably between 30 mm and 50 mm, such as about 40 mm.

The porosity of the porous ceramic parts 5 can be between 10 and 50 %, preferably between 15 and 40 %, more preferably between 20 and 30 %, most preferably between 25 and 27 %.

The porous ceramic parts 5 is preferably, but not necessarily, free of openings and/or slots leading through the porous ceramic parts 5 except for pores (not shown in the figures) forming the porosity of the porous ceramic parts 5.

The porous ceramic parts 5 is preferably, but not necessarily, free of openings for gas

and/or slots for gas leading through the porous ceramic parts 5 except for pores (not shown in the figures) forming the porosity of the porous ceramic parts 5.

The air slide conveyor 1 is preferably, but not necessarily, part of a feeding arrangement 10 configured to feed fine divided material to a burner 11 of a suspension smelting furnace 12.

The conveyor deck is preferably, but not necessarily, inclined with respect to the horizontal level by an angle that is between 1 and 10°, preferably between 5 and 9°, more preferably between 6 and 8°, such as about 7°.

The conveyor deck is preferably, but not necessarily, inclined with respect to the horizontal level between the receiving end 13 and the delivery end 15 towards the delivery end 14 by an angle that is between 1 and 10°, preferably between 5 and 9°, more preferably between 6 and 8°, such as about 7°.

The conveying deck 4 is preferably, but not necessarily, formed by the porous ceramic parts 5 having an essentially even conveying surface 15 free of grooves, slots, holes and or the like.

Adjacent porous ceramic parts 5 are preferably, but not necessarily, arranged in a non-overlapping relationship.

Adjacent porous ceramic parts 5 are preferably, but not necessarily, arranged in an abutting relationship.

Adjacent porous ceramic parts 5 are preferably, but not necessarily, joined together by means of adhesive material.

At least one of the porous ceramic parts 5 can comprise Al_2O_3, and SiO_2 and optionally at least one of Cr_2O_3, ZrO_2, TiO_2, and P_2O_5.

At least one of the porous ceramic parts 5 can comprise MgO and Cr_2O_3 and optionally at least one of Al_2O_3, Fe_2O_3, CaO, and SiO_2.

The invention relates also to use of an air slide conveyor 1 according to at least one embodiment as described earlier for feeding fine divided material to a burner 11 of a suspension smelting furnace 12.

It is apparent to a person skilled in the art that as technology advances, the basic idea of the invention can be implemented in various ways. The invention and its embodiments are therefore not restricted to the above examples, but they may vary within the scope of the claims.

Claims

1. An air slide conveyor (1) comprising

a plenum chamber (2) configured to receive compressed gas from a gas supply system (3), and

a conveying deck (4) forming a top side of the plenum chamber (2),

wherein the conveying deck (4) being porous for enabling gas to escape from the plenum chamber (2) through the conveying deck (4),

characterized

by the conveying deck (4) being formed at least partly of a plurality of porous ceramic parts (5).

2. The air slide conveyor according to claim 1, **characterized** by a casing structure (6) covering the conveying deck (4) so that a conveying space (7) for the material to be conveyed with the air slide conveyor (1) is formed between the conveying deck (4) and the casing structure (6).

3. The air slide conveyor according to claim 1 or 2, **characterized** by the air slide conveyor (1) comprising side walls (8) at opposite sides of the conveying deck (4).

4. The air slide conveyor according to claim 3, **characterized** by the air slide conveyor (1) comprising a roof structure (9).

5. The air slide conveyor according to any of the claims 1 to 4, **characterized** by the thickness of the porous ceramic parts (5) being between 5 mm and 200 mm, preferably between 10 mm and 100 mm, more preferably between 30 mm and 50 mm, such as about 40 mm.

6. The air slide conveyor according to any of the claims 1 to 5, **characterized** by the porosity of the porous ceramic parts (5) being between 10 and 50 %, preferably between 15 and 40 %, more preferably between 20 and 30 %, most preferably between 25 and 27 %.

7. The air slide conveyor according to any of the claims 1 to 6, **characterized** by the porous ceramic parts (5) being free of openings leading through the porous ceramic parts (5) except for pores forming the porosity of the porous ceramic parts (5).

8. The air slide conveyor according to any of the claims 1 to 7, **characterized** by the air slide conveyor (1) being part of a feeding arrangement (10) configured to feed fine divided material to a burner (11) of a suspension smelting furnace (12).

9. The air slide conveyor according to any of the claims 1 to 8, **characterized** by the conveyor deck being inclined with respect to the horizontal level by an angle that is between 1 and 10°, preferably between 5 and 9°, more preferably between 6 and 8°, such as about 7°

10. The air slide conveyor according to any of the claims 1 to 9, **characterized** by the conveying deck (4) formed by the porous ceramic parts (5) having an essentially even conveying surface (15) free of grooves and/or holes.

11. The air slide conveyor according to any of the claims 1 to 10, **characterized** by adjacent porous ceramic parts (5) being arranged in a non-overlapping relationship.

12. The air slide conveyor according to any of the claims 1 to 11, **characterized** by adjacent porous ceramic parts (5) being arranged in an abutting relationship.

13. The air slide conveyor according to claim 12, **characterized** by adjacent porous ceramic parts (5) being joined together by means of adhesive material.

14. The air slide conveyor according to any of the claims 1 to 13, **characterized** by at least one of the porous ceramic parts (5) comprising Al_2O_3, and SiO_2 and optionally at least one of Cr_2O_3, ZrO_2, TiO_2, and P_2O_5.

15. The air slide conveyor according to any of the claims 1 to 14, **characterized** by at least one of the porous ceramic parts (5) comprising MgO and Cr_2O_3 and optionally at least one of Al_2O_3, Fe_2O_3, CaO, and SiO_2.

16. The air slide conveyor according to any of the claims 1 to 15 **characterized** by the porous ceramic parts (5) being free of openings for gas leading through the porous ceramic parts (5) except for pores forming the porosity of the porous ceramic parts (5).

17. Use of an air slide conveyor according to any of the claims 1 to 16 for feeding fine divided material to a burner (11) of a suspension smelting furnace (12).

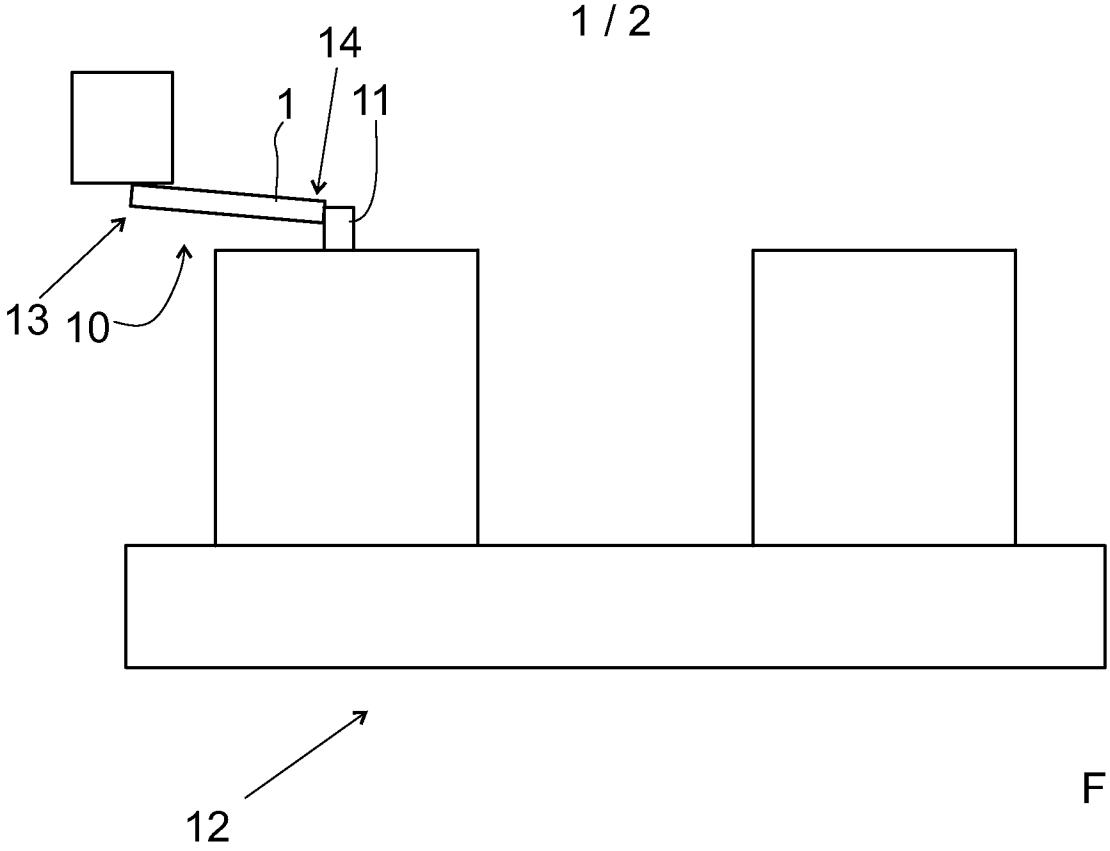

FIG 1

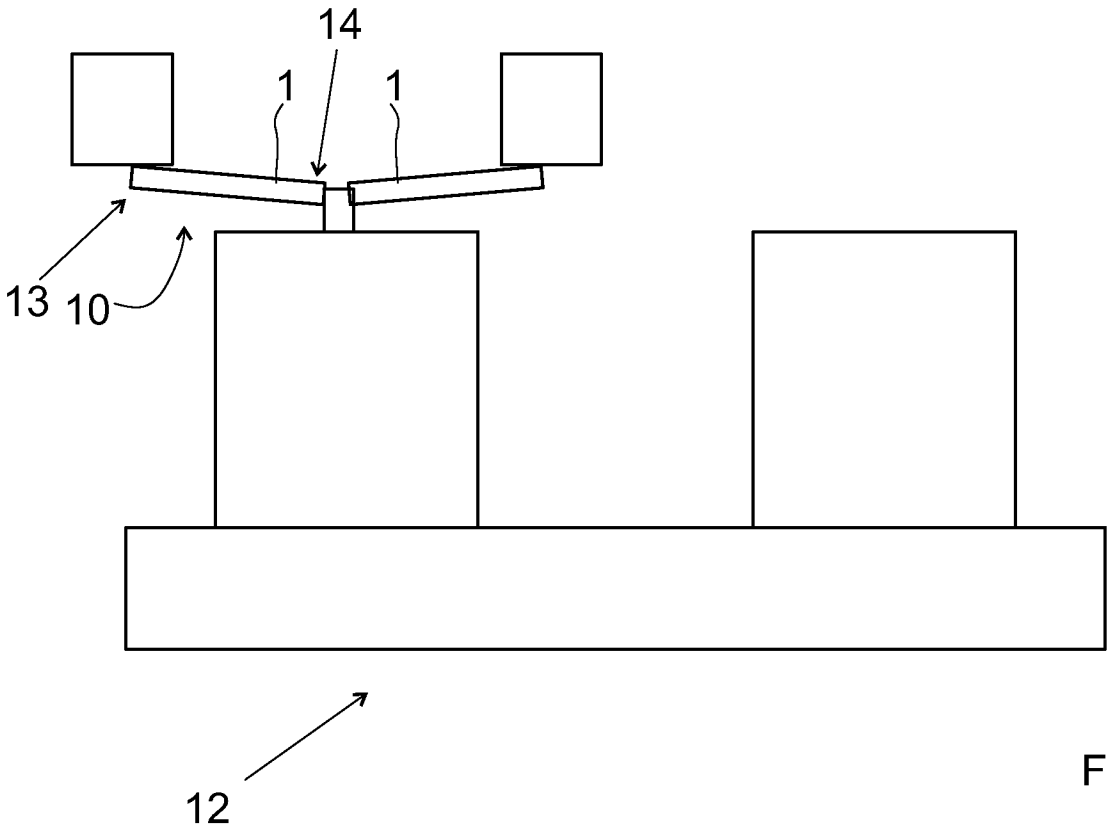

FIG 2

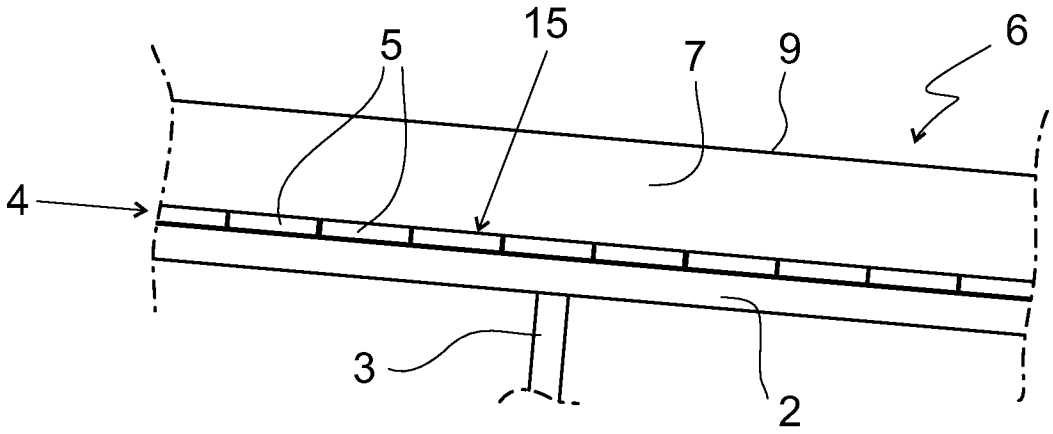

FIG 3

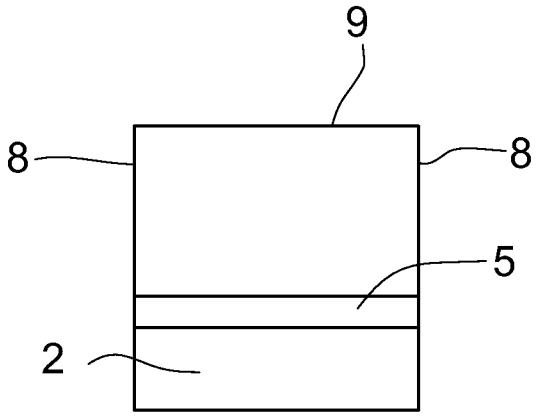

FIG 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/FI2016/050211

A. CLASSIFICATION OF SUBJECT MATTER
INV. F27D3/18 B65G53/04 F27D99/00
ADD.

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)
F27D B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X Y	US 2 527 488 A (RIPLEY SCHEMM HENRY) 24 October 1950 (1950-10-24) column 3, line 46 - column 5, line 23; claims 1-5; figures 1-6	1-16 17

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
13 June 2016	23/06/2016

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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