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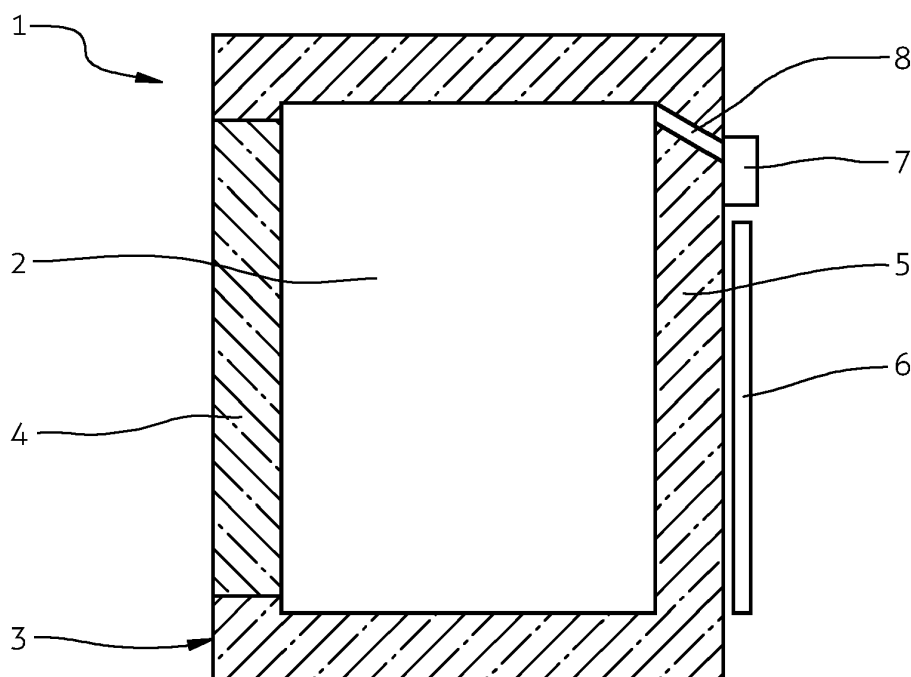
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(54) **COOLING-FREEZING APPARATUS COMPRISING A DEVICE WHICH FACILITATES OPENING A DOOR**

(57) The present invention refers to a cooling-freezing apparatus comprising at least one thermally insulated compartment for receiving goods that can be closed by a door or a cover, and particularly to a pressure equalising device with the cooling-freezing apparatus or said compartment. It is provided for according to the present in-

vention that at least on one wall or at least in one wall of a case (3) or door (4) is arranged a device (7) for equalising pressure in a compartment (2) and, respectively, in a cooling-freezing apparatus (1), wherein a drying agent (9) is arranged inside the pressure equalising device (7).



SL. 1

Description

[0001] The present invention refers to a cooling-freezing apparatus comprising at least one thermally insulated compartment for receiving goods encapsulated with a case that can be closed by a door or a cover, said case comprises circumferential walls and a back wall, and a device which facilitates opening the door of the cooling-freezing apparatus.

[0002] In order to create a temperature difference between a thermally insulated compartment for receiving goods and the surrounding atmosphere a cooling system is provided, such as a compressor cooling system or an absorption cooling system or similar. The temperature of the goods and the air in said thermally insulated compartment changes due to the periodic operation of the cooling system and/or occasional opening of the door and the compartment, respectively, causing a pressure oscillation in the thermally insulated space and, as a result, air exchange with the surrounding atmosphere. Each opening the door and the cover, respectively, results in a part of the air in the thermally insulated compartment to be replaced by warmer air from the surrounding. After the door and the cover, respectively, has been closed a negative pressure is built due to the cooling of said warmer air, said negative pressure sucks warm and moist air from the surrounding into the inside of the cooling-freezing apparatus and, respectively, said compartment. The excessive moisture from the air is deposited on cool surfaces in the form of dew or white frost where it accumulates and creates ice. The pressure equalisation between the surrounding and the thermally insulated compartment may take more time, depending on the tightness of the case and the sealing surfaces between the door and, respectively, the cover and the compartment. Said negative pressure makes difficult or even prevents temporarily to open the door and, respectively, the cover of the compartment. In order to facilitate opening the door and, respectively, the cover various mechanical systems and connecting cavities with the surrounding atmosphere are utilised, so that the pressure inside the cooling-freezing apparatus and, respectively, the compartment equalises faster with the surrounding pressure. A drawback of such solutions is accumulation of white frost, particularly around the connecting cavity, on inner surfaces of the apparatus and on the goods arranged in the vicinity of said opening.

In order to remedy said problems several solutions have been disclosed that provide for utilisation of a special demisting unit as a part of the cooling system, or a renewable drying agent in the sense of a molecular sieve arranged inside the cooling-freezing apparatus or in said connecting cavity. When the drying agent is placed inside the apparatus, the available space is substantially reduced, and also the white frost created around the connecting cavity is eliminated in a smaller extent. In addition, the user of the cooling-freezing apparatus must remove said drying agent after the latter is saturated and regenerate it or install a new one, if the creation of the white frost is to be prevented in the cooling-freezing apparatus.

Embodiments comprising a drying agent in the connecting cavity do reduce entering the moisture into the apparatus and, respectively, the compartment substantially, however, replacing or regenerating of such drying agent is rather difficult. Arrangement in the connecting cavity reduces locally a thermal insulation of the apparatus, or reduces a useful volume thereof.

[0003] It is the object of the present invention to create a pressure equalising device with a cooling-freezing apparatus, which remedies drawbacks of the know solutions.

[0004] The object as set above is solved, according to the present invention, by features according to the characterising clause of the claim 1. The invention is disclosed in detail in corresponding subclaims.

[0005] The invention is further described in detail by way of non-limiting embodiment, and with a reference to the accompanying drawings, where

Fig. 1	a simplified view of a cooling-freezing apparatus,
Fig. 2	a longitudinal section of a pressure equalising device according to the invention,
Fig. 3	a three-dimensional view of a connecting channel, and
Fig. 4	a three-dimensional view of the pressure equalising device.

[0006] A cooling-freezing apparatus 1 comprises at least one thermally insulated compartment 2 for receiving goods, said compartment 2 being encompassed with a case 3 and can be closed by a door 4 or a cover. Said door 4 can be formed as an upright door or as a horizontal door, depending on the embodiment of the cooling-freezing apparatus 1. The invention is further described as the embodiment of an upright apparatus 1.

[0007] Said case 3 comprise side walls, a bottom wall and a top wall, and a back wall 5. A condenser 6 know per se is arranged along the back wall 5, at the outer side and in the bottom area thereof. In order to prevent creation of a negative pressure in the compartment 2, a removable device 7 for equalising pressure in the compartment 2 and, respectively, in the cooling-freezing apparatus 1 is arranged at the outer side of one of the wall of the case 3 or the door 4, and, in the present embodiment, at the outer side of the back wall 5. Said device 7 is preferably arranged in the area

directly above the condenser 6 of the cooling-freezing apparatus 1. Said pressure equalising device 7 is connected with the interior of the cooling-freezing apparatus 1 and, respectively, with the interior of the compartment w by means of a connecting channel 8 formed in said back wall 5. The connecting channel 8 extends inclined downwardly in the direction from the interior of the compartment 2 toward the surrounding. A drying agent 9 is arranged inside the pressure equalising device 7, in a form of a molecular sieve for instance.

[0008] Said pressure equalising device 7 is formed as a container 10 comprising a tubular protrusion 11 that is tightly insertable into said connecting channel 8. Said tubular protrusion 11 extends from the container 10 with approximately the same inclination as is the inclination of the connecting channel 8. The latter is formed at the outside of the back wall 5 with a flange 12 configured for the attachment of the pressure equalising device 7. Said device 7 forms with said flange 12 either a positive joint, such as a snap-in, and/or a non-positive joint, such as at least one threaded means. To this end the container 10 is provided in the area of the connection with the tubular protrusion with a flange 13 comprising either the opposite blocking means as said flange 12 of the connecting channel 8, and/or at least one through hole 13a for accommodation of said threaded means. Furthermore, at least one wall and/or a bottom 14 of the container 10 is formed with at least one through hole 15, preferably with a plurality of through holes 15 for the air to flow from the surrounding into the interior of the compartment 2. The total area of the through holes amounts to the value which enables satisfactory air flow and, thus, fast pressure equalisation between the interior of the cooling-freezing apparatus 1 and, respectively, the compartment 2 and the surrounding atmosphere.

[0009] Said container 10 can be made as a single disposable part that can be removed and disposed after the drying agent 9 has been consumed. An alternative embodiment provides the container 10 formed with a lid 16 which closes the container 10 at the side opposite to the bottom 14. In this case, the consumed drying agent 9 can be removed and replaced with a new one. Said drying agent 9 can be in the form of a granulate or a monolithic blank that can be accepted by the container 10. In any case, each said through hole 15 is smaller than the size of a granulate and, respectively, of a single grain of the drying agent 9, thus, preventing the particles of the drying agent 9 to fall through the holes 15. Said container 10 can be made of a high temperature resistant material, thus, enabling regeneration of the drying agent 9 without opening thereof, in an oven for example. In addition, the container 10 can be made of a translucent material, which enables fast insight whether the drying agent 9 is already consumed and the regeneration thereof is required. To additionally improve detecting the consumption of the drying agent a pigment can be added to the drying agent 9 which changes the colour depending on the moisture rate and saturation with moisture, respectively.

[0010] When assembled, said connecting channel 8 and said tubular protrusion 11 form a positive joint, thus, preventing the air from the surrounding to enter the cooling-freezing apparatus 1 and, respectively, the compartment 2 anywhere else but through the through holes 15 and the drying agent 9. Said interference fit is additionally supported by said positive joint between the flange 12 of the connecting channel 8 and the flange 13 of the container 10. To this end the flange 12 is formed in the area of the entrance of the tubular protrusion 11 with at least one tooth 17 which mates an appropriately undercut edge 18 of the flange 13.

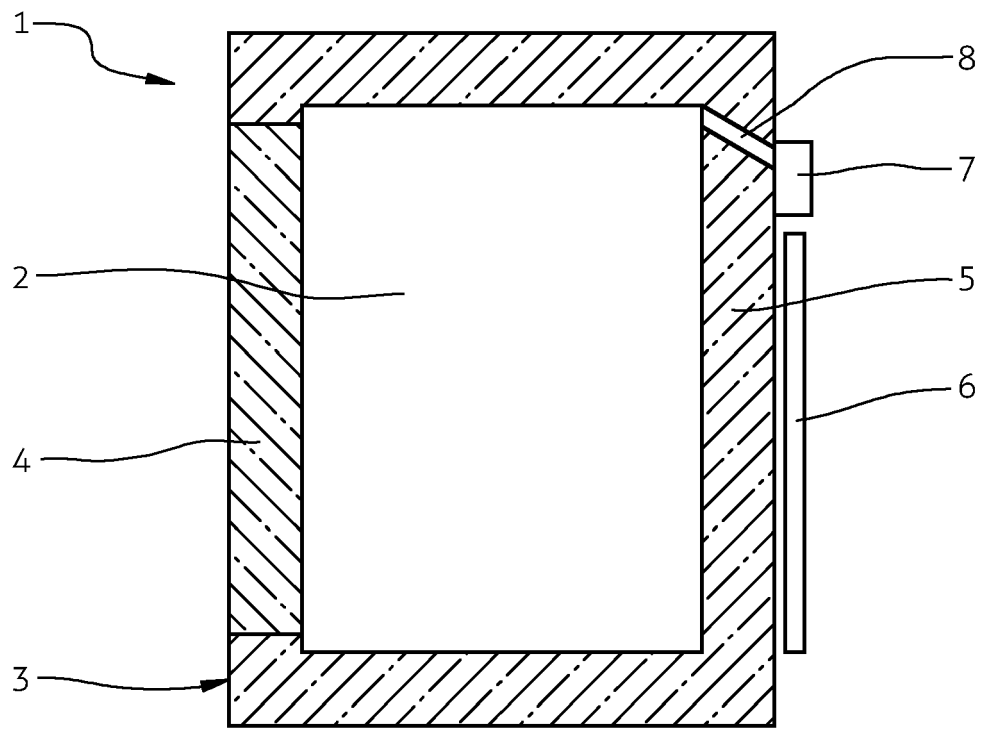
[0011] Due to the pressure differences which occur as a result of temperature changes with periodical operation of the cooling system or opening of the door/cover, the air flows from the surrounding into the interior of the apparatus and vice versa. The air flows through the drying agent 9 in the container 10 which is arranged at the outside of the apparatus 1, preferably above the condenser 6. When entering the apparatus 1 the drying agent 9 retains water molecules and dry air continues its way to the inside of the apparatus. In opposite case, when dry air flows from the freezer, said dry air absorbs on its way out water molecules from the drying agent 9 and release them into surrounding. Since the container 10 with the drying agent 9 is arranged directly above the condenser 6 and, respectively, in the close vicinity thereof, natural heat convection additionally contributes the regeneration of the drying capacity of the absorbent. If extremely high moisture is present in the surrounding atmosphere, the capacity of the drying agent 9 might be too low for a long term efficiency. In such cases the drying agent 9 can be regenerated by drying at the required temperature or by being replaced with a new one.

[0012] One of additional advantages of the external arrangement of the pressure equalisation device 7 according to the invention is also shown in a fact that it does not decrease the useful volume in the freezer. Additionally, said device 7 can be incorporated into every old cooling-freezing apparatus where such a device was not provided initially. Therewith, the accumulation rate and the quantity of the white frost on the evaporation surfaces is lowered, and opening the door/cover is substantially easier. When reconstructing existing apparatuses, a hole is made through the insulation at the appropriate spot, a connecting channel 8 being placed in said hole. A flange 13 of the container 10 is snapped-in by means of the edge 18 to the flange 12 of the connecting channel 8, and if necessary additionally fixed by screws.

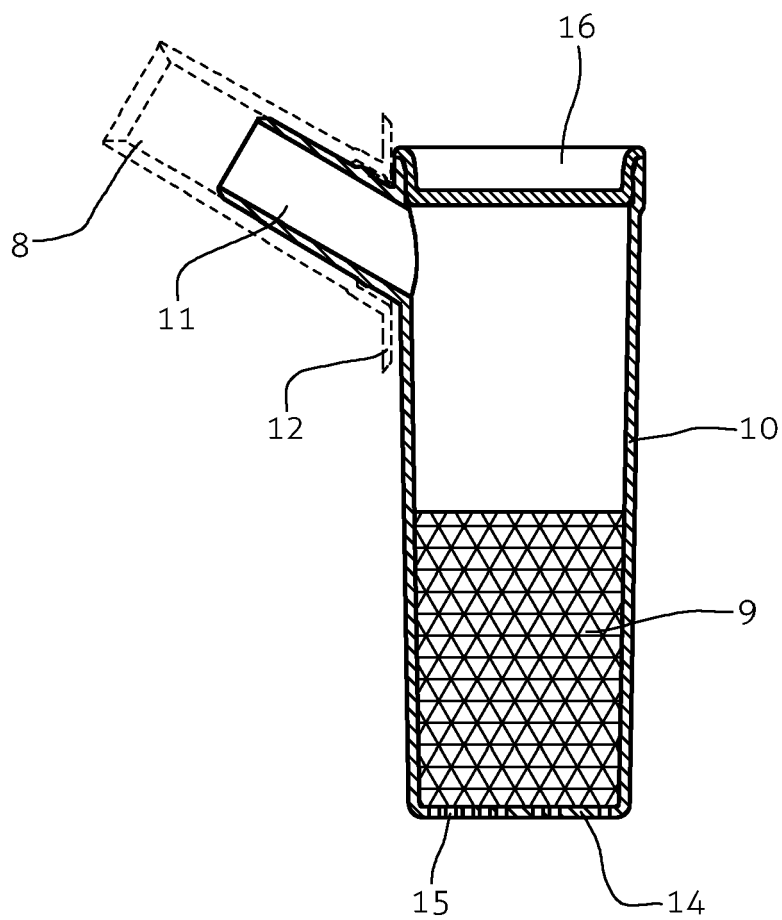
[0013] It is also possible according to the present invention that the device 7 for equalising pressure in the cooling-freezing apparatus 1 is arranged on or in any other wall of the case 3 or in the door 4, and not only on the back wall 5. In addition, said device 7 can be arranged outside or inside the cooling-freezing apparatus 1. It is provided for, according to one of the possible embodiments, that the device 7 is formed in a handle of the cooling-freezing apparatus 1, which substantially facilitates the user to access the pressure equalisation device 7 and to manipulate therewith.

Claims

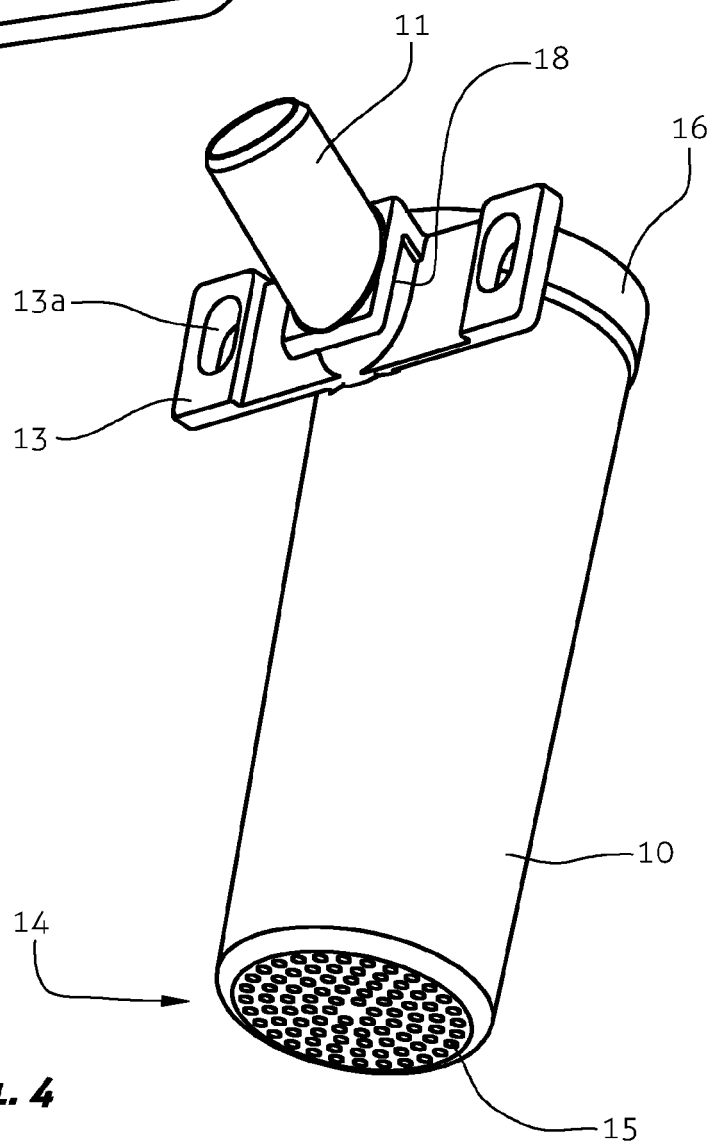
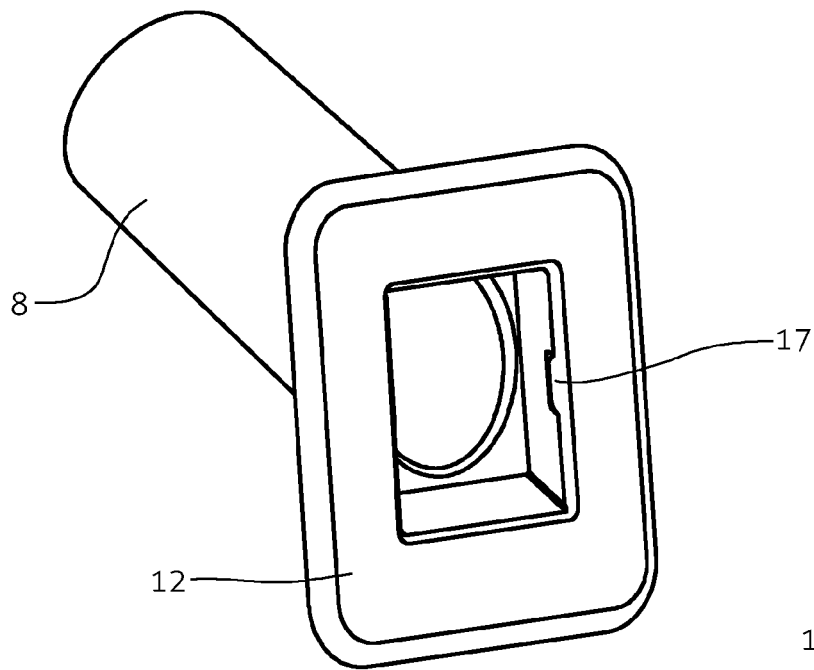
- 5 1. A cooling-freezing apparatus comprising at least one thermally insulated compartment for receiving goods encapsulated with a case that can be closed by a door or a cover, said case comprises circumferential walls and a back wall, and a device which facilitates opening the door of the cooling-freezing apparatus, **characterized in that** at least on one wall or in at least one wall of a case (3) or door (4) is arranged a device (7) for equalising pressure in a compartment (2) and, respectively, in a cooling-freezing apparatus (1), wherein a drying agent (9) is arranged inside the pressure equalising device (7).
- 10 2. A pressure equalising device according to claim 1, **characterized in that** the pressure equalising device (7) is removable.
- 15 3. A pressure equalising device according to claims 1 and 2, **characterized in that** the device (7) is connected with an interior of the cooling-freezing apparatus (1) and, respectively, with an interior of the compartment (2) by means of a connecting channel (8) formed in said at least one wall of the case (3) or the door (4).
- 20 4. A pressure equalising device according to claims 1 to 3, **characterized in that** said pressure equalising device (7) is formed as a container (10) which comprises a tubular protrusion (11) firmly insertable into said connecting channel (8) provided with a flange (12), wherein the container (10) comprises a flange (13) provided in the area of the connection with the tubular protrusion (11).
- 25 5. A pressure equalising device according to claim 4, **characterized in that** the connection between the flange (12) of the connecting channel (8) and the flange (13) of the container (10) form a positive joint.
- 30 6. A pressure equalising device according to claim 5, **characterized in that** the flange(12) of the connecting channel (8) is formed in the area of entrance of the tubular protrusion (11) with at least one tooth (17) that mates an appropriately undercut edge (18) of the flange (13) of the container (10).
- 35 7. A pressure equalising device according to any of the preceding claims, **characterized in that** at least one wall and/or a bottom (14) of the container (10) is formed with at least one through hole (15), preferably with a plurality of through holes (15) for flowing air from the surrounding in to interior of the compartment (2).
- 40 8. A pressure equalising device according to any of the preceding claims, **characterized in that** said container (10) is produced as a single disposable part.
- 45 9. A pressure equalising device according to any of the preceding claims, **characterized in that** said container (10) is formed with a lid (16) that closes the container (10) at the side opposite to the bottom (14).
- 50 10. A pressure equalising device according to any of the preceding claims, **characterized in that** said container (10) is made of material that is resistant against high temperature.
- 55 11. A pressure equalising device according to any of the preceding claims, **characterized in that** said container (10) is made of a translucent material.
12. A pressure equalising device according to any of the preceding claims, **characterized in that** a pigment is added to the drying agent (9), said pigment can change colour with respect to the moisture rate and, respectively, to saturation with the moisture.
13. A pressure equalising device according to any of the preceding claims, **characterized in that** said connecting channel (8) and said tubular protrusion (11) form an interference form when assembled.
14. A pressure equalising device according to any of the preceding claims, **characterized in that** the pressure equalising device (7) is arranged at the outside of the cooling-freezing apparatus (1), preferably in the area directly above a condenser (6).



SL. 1



SL. 2





EUROPEAN SEARCH REPORT

Application Number
EP 17 15 2545

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 204 165 314 U (AUCMA CO LTD) 18 February 2015 (2015-02-18) * the whole document *	1-14	INV. F25D17/04
X	CN 201 828 101 U (QINGDAO ESSIN ELECTRICAL APPLIANCES CO LTD) 11 May 2011 (2011-05-11) * the whole document *	1-14	
X	CN 204 963 374 U (HEFEI HUALING CO LTD; MIDEA GROUP CO LTD) 13 January 2016 (2016-01-13) * the whole document *	1-14	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 2 June 2017	Examiner Kolev, Ivelin
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 204165314 U	18-02-2015	NONE	
CN 201828101 U	11-05-2011	NONE	
CN 204963374 U	13-01-2016	NONE	

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