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- (71) **Applicant:** OCTOFROST AB [SE/SE]; Volframgatan 3, 213 64 MALMÖ (SE).
- (72) **Inventor:** LARSSON, Rasmus; Fladängsgatan 7, 234 40 LOMMA (SE).
- (74) **Agent:** RWL PATENTS AB; P.O Box 138, 683 23 HAG-FORS (SE).
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(54) **Title:** FLUIDIZED BED FREEZER WITH HEATED INLET

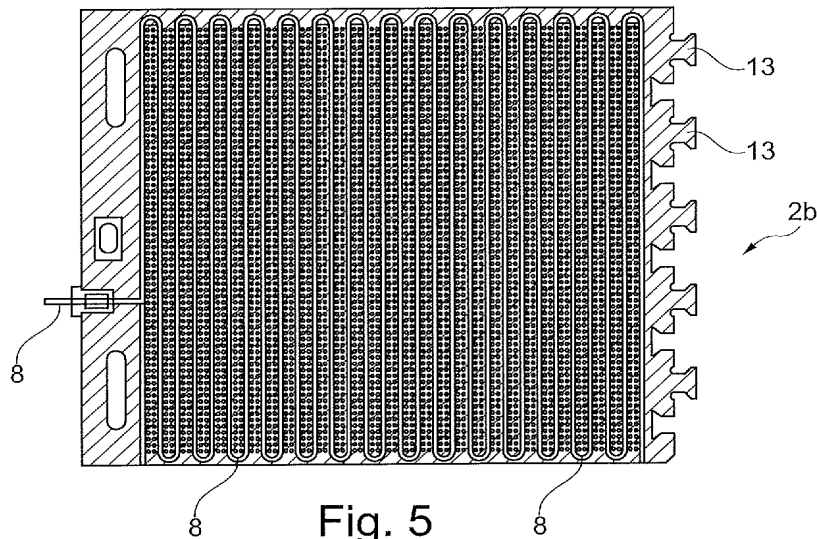


Fig. 5

(57) **Abstract:** Refrigerator or freezer device at a refrigerator or freezer (1) having, a house (3), fan devices (4), refrigeration or freezing aggregates (5), a perforated trough bottom assembly (2), an inlet (6) and an outlet (7) wherein that said perforated trough bottom assembly (2) comprises a first perforated trough bottom part (2b) and a second perforated trough bottom part (2a), in that said first part as well as said second part are subjected to the action of the fan devices (4) as well as the refrigeration or freezing aggregates (5) and in that said first part of said perforated trough bottom assembly (2b) next to the inlet is heated so that the food materials are prevented from being stuck to said perforated trough bottom assembly (2).



MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,  
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## FLUIDIZED BED FREEZER WITH HEATED INLET

## TECHNICAL FIELD

The present invention relates to a refrigeration or freezer device according to the pre-characterizing portion of Claim 1.

## 5 TECHNICAL BACKGROUND AND PRIOR ART

It is a known problem that whenever introducing food material in a continuously running freezer there are challenges with warm products sticking to cold surfaces. Especially the perforated trough bottom or conveyor carrying and transporting the food in a partly or semi-fluidized bed freezer tends to clog with pieces of foodstuff, ice and  
10 snow. This limits the time between defrosting of the freezer and also decreases the freezing result resulting in pieces of food being stuck together.

In US 4,062,202 a freezer is described in which the tendency of sticking together of food material, as e.g. French fries or peas, on the mesh belt food conveyor is prevented  
15 by introducing hot air into an internal duct in the food weir. This arrangement is complicated as it first of all necessitates a food weir and moreover must feed hot air into the weir. The food can nevertheless stick to the mesh belt food conveyor in spite of the heated food weir which implies that the conveyor must be cleaned often.

An object of the invention is to provide a refrigeration or freezer device, which  
20 eliminates the above described problems. The object is achieved with the refrigeration or freezer device according to the characterizing portion of Claim 1.

Preferred embodiments of the refrigeration or freezer device according to the invention have been given the characterizing features which appears in the sub claims.

The refrigeration or freezer device according to the invention comprises substantially  
25 less loose parts than corresponding known freezers which are provided with arrangements to avoid sticking of food material.

The invention focuses on avoiding any foodstuff, ice or snow sticking to the trough rather than mechanically removing what has already accumulated.

The refrigeration or freezer according to the invention is furthermore easy to manufacture industrially and is also very effective in use.

#### SHORT DESCRIPTION OF THE DRAWINGS

The invention is described in the following with reference to the attached drawings, which show a preferred embodiment. Nota bene that the figures are schematic and that details thereby can be left out therefrom.

Fig. 1 shows schematically a perspective view of a refrigerator or a freezer with a refrigeration or freezer device according to the invention.

Fig. 2 shows a perspective view of a part of the perforated trough in the refrigerator or freezer of Fig. 1.

In Fig. 3 is shown a part of the refrigerator or freezer device according to the invention.

Fig. 4 shows a side view of the refrigerator or freezer device according to the invention.

Fig. 5 shows a section after line A-A of the refrigerator or freezer device according to the invention.

#### DETAILED DESCRIPTION OF THE INVENTION

Details, which refer to substantially alike parts of the different embodiments, have been given the same reference numbers.

With reference to the drawings in Fig. 1 is shown a refrigerator or freezer 1 for refrigeration or freezing treatment and transportation of a material, consisting of piece goods or granules of solid material. The refrigerator or freezer 1 comprises a perforated trough bottom 2 which is divided into two parts 2a and 2b, wherein the part 2b is preferably the refrigerator or freezer device according to the invention. The refrigerator or freezer furthermore comprises a house 3, fan devices 4 and refrigerator or freezing aggregates 5. Moreover, the refrigerator or freezer 1 is provided with an inlet 6 and an outlet 7. The inlet trough part 2b comprises a heated trough bottom which is provided with electrical heating cables 8 in a zigzag pattern, as shown in Figs. 3 to 5. The trough bottom parts 2a and 2b are perforated having holes 9 spread over their surfaces. The transportation of the product, as food material, is shown by arrows 10 and 11. 12 and 13

denotes coupling elements to join several portions of the trough bottom 2 together. At the end of each path part 2a or 2b are portions of the trough bottoms with a coupling on only one side and where the other side is without coupling as the side 14 illustrated in Figs. 3 to 5.

- 5 As shown in the drawings two or more portions of the trough bottom, the bottom 2a as well as the bottom 2b, can be coupled together to form a longitudinal path through the refrigerator or freezer 1. The trough portion 2b is situated on a higher level than the trough portion 2a so that food material entering into the inlet 6 will first be transported along the trough portion 2b and thereafter fall down on the trough portion 2a and finally  
10 be transported to the outlet 7 and out from the refrigerator or freezer.

By heating the first part 2b of the trough bottom 2 the food material is prevented from being stuck to the trough bottom part 2b which makes the refrigerator or freezer more efficient.

- The transportation of the food material is performed preferably by achieving a semi-  
15 fluidized refrigerator or freezer, i.e. the fan devices 4 blowing air from the refrigerating or freezing elements through the perforated troughs 2a and 2b so that only a part of the food material is in contact with the trough bottom, whereby the trough bottom parts 2a and 2b are subjected to an asymmetric vibration movement to facilitate the transportation.

- 20 Of course the refrigerator or freezer device according to the invention can be provide with a perforated transport band or a fully fluidized refrigerator or freezer, i.e. a refrigerator or freezer which transports the food material on a perforated transport band moving only in one direction.

- Hence, the invention is related to a refrigerator or freezer 1 of the kind where the  
25 product by means of a fan device 4 is fluidized or semi-fluidized (lower energy as part of the products are always in touch with the trough bottoms 2a and 2b) and where the product, as e.g. fruit or vegetables, in small pieces is fed first through the inlet 6 to a part 2b and thereafter is fed further to part 2a and finally out from the refrigerator or freezer through an outlet 7. The product is preferably fed by means of an asymmetric  
30 movement in the length direction of the troughs 2a and 2b. The trough bottoms 2a and

2b are provided with through holes 9 for letting the air from the fan devices 4 and the refrigerating or freezing aggregates 5 blow through the holes 9 and lift and freeze, alternatively, the product, see EP 1163048 or WO 00/45949.

5 One disadvantage is that the product can be clogged and stick to the first trough part 2b due to temperature differences between trough bottoms and product when entering the refrigerator or freezer. This is normally eliminated by vibrations or cleaning of the first trough as well as replacing the first trough part 2b with a new cleaned one.

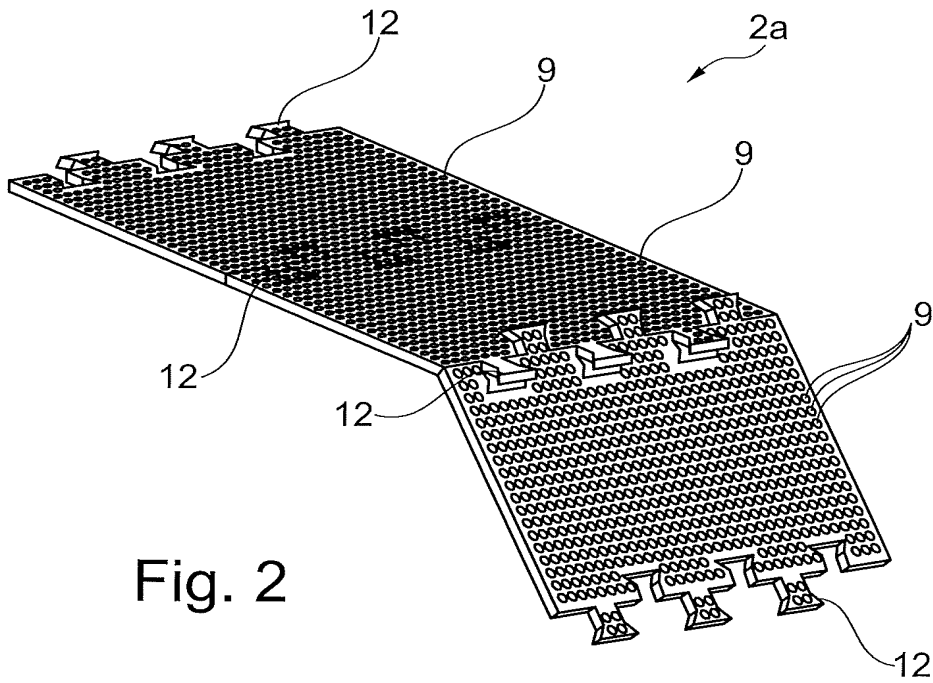
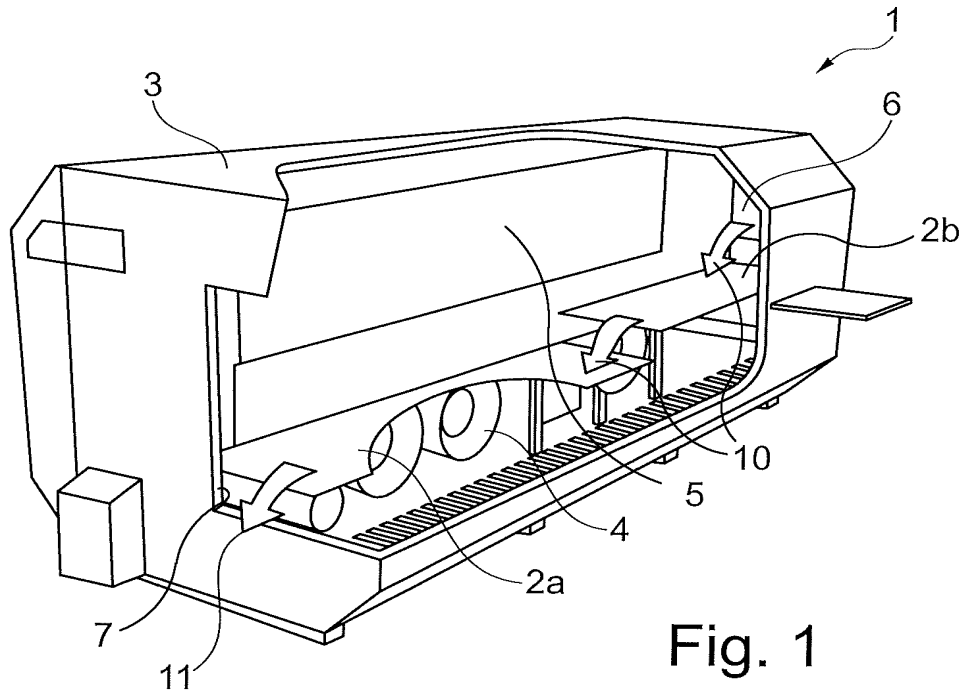
10 By heating the first trough bottom part 2b the product will be prevented to stick to the first trough bottom part 2b and by arriving to the second trough bottom part 2a the affect does not exist anymore as the product is already partly or entirely frozen around its periphery. The heating is performed by providing the first trough bottom part 2b or the separate parts of trough bottom part 2b with electrical heating cables 8 for electrical loops or heating liquid for heating the trough part 2b.

15 The invention is of course not limited to the embodiment described above, but can be modified within the frame of the patent claims.

## CLAIMS

1. Refrigerator or freezer device at a refrigerator or freezer (1) having, a house (3),  
fan devices (4), refrigeration or freezing aggregates (5), a perforated trough  
5 bottom assembly (2), an inlet (6) and an outlet (7), **characterized** in that said  
perforated trough bottom assembly (2) comprises a first perforated trough  
bottom part (2b) and a second perforated trough bottom part (2a), in that said  
first part as well as said second part are subjected to the action of the fan devices  
(4) as well as the refrigeration or freezing aggregates (5) and in that said first  
10 part (2b) of said perforated trough bottom assembly (2) next to the inlet (6) is  
heated so that the food materials are prevented from being stuck to said  
perforated trough bottom assembly (2).
  
2. Refrigerator or freezer device according to claim 1, characterized in that the  
15 trough bottom part (2b) which is heated is provided with electrical heating  
cables (8).
  
3. Refrigerator or freezer device according to claim 1, characterized in that the  
20 trough bottom part (2b) which is heated is provided with channels for a heating  
liquid or air.
  
4. Refrigerator or freezer device according to any of claims 2-3, characterized in  
that said cables (8) or channels are mounted in a zigzag pattern over the trough  
part (2b).

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2/2

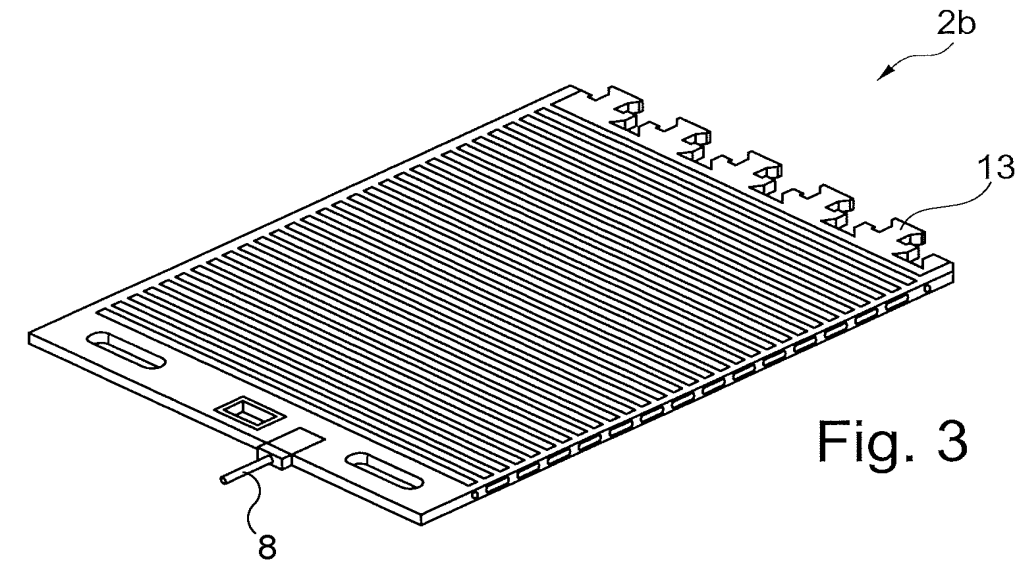


Fig. 3

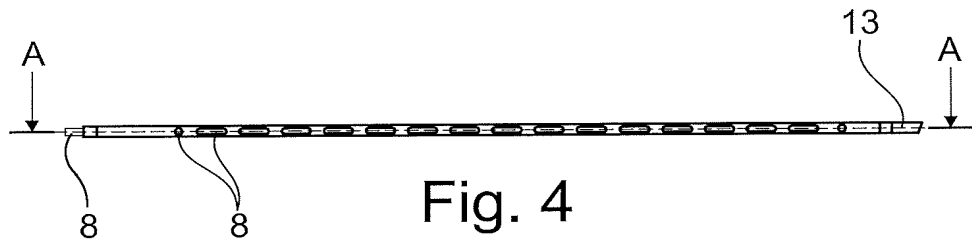


Fig. 4

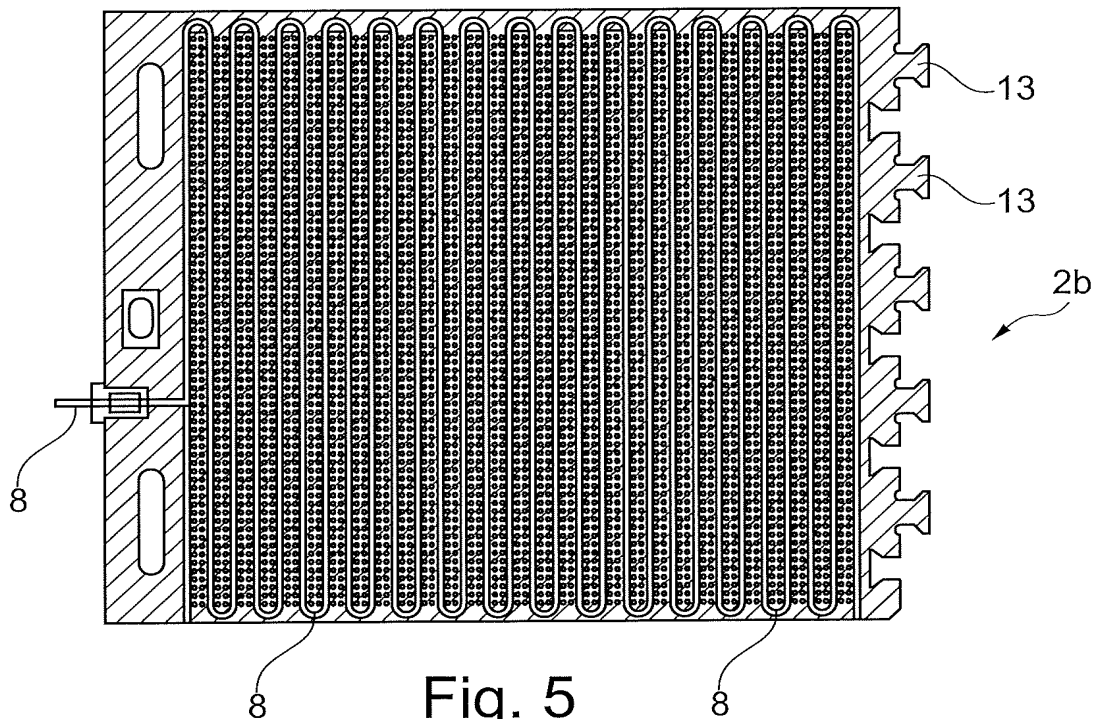


Fig. 5

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE2017/050578

A. CLASSIFICATION OF SUBJECT MATTER		
IPC: see extra sheet		
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)		
IPC: A23L, F25D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE, DK, FI, NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
EPO-Internal, PAJ, WPI data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4062202 A1 (CLOUDY WESTLEY RAY), 13 December 1977 (1977-12-13); column 3, line 49 - line 65 --	1-4
A	US 3169381 A1 (PER-OSKAR PERSSON), 16 February 1965 (1965-02-16); abstract; column 4, line 26 - line 42; figures --	1-4
A	GB 731749 A (ESKIMO PIE CORP), 15 June 1955 (1955-06-15); abstract; page 2, line 75 - line 80; figures --	1-4
A	US 6477845 B1 (LARSSON RUBEN), 12 November 2002 (2002-11-12); abstract; page 1, line 12 - line 31; figures --	1-4
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	
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"P" document published prior to the international filing date but later than the priority date claimed		
Date of the actual completion of the international search	Date of mailing of the international search report	
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 759663 A (SVENSKA FLAEKTFABRIKEN AB), 24 October 1956 (1956-10-24); abstract; page 1, line 60 - line 65; figures -- -----	1-4

**Continuation of:** second sheet

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2017/050578

US	4062202 A1	13/12/1977	NONE		
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