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(54) **REFRIGERATION TRANSPORT CONTAINER**

KÜHLTRANSPORTBEHÄLTER

CONTENEUR DE TRANSPORT RÉFRIGÉRÉ

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(56) References cited:
**WO-A1-87/00808 WO-A1-97/24567
WO-A1-2007/129280 WO-A1-2010/091181
FR-A- 1 490 951 US-A- 5 319 941
US-A- 6 151 908 US-A1- 2007 095 092**

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Description

FIELD OF THE INVENTION

[0001] This invention relates to a refrigeration transport container.

BACKGROUND TO THE INVENTION

[0002] Refrigerated transport containers are widely used in industry to transport fresh produce. Fruit and vegetables need to be kept at reduced temperatures to maintain the freshness, and in so doing the shelf-life and marketability thereof. Rigid rules regulate the temperature at which, for example, the fruit or vegetables are transported at. If the required temperature is not maintained, the container of fresh produce may be rejected and thus discarded. This can lead to large losses for the supplier. Homogenous, controlled cooling of the contents of refrigerated containers is thus essential.

[0003] Refrigeration containers typically have a standard configuration with a refrigeration unit located at one end of the container opposite the doors. The refrigeration unit is typically located behind a panel with openings provided at the top and bottom of the panel. Air from the interior of the container is drawn through the opening at the top of the panel into the refrigeration unit and cooled air blown into the container through the opening at the bottom.

[0004] Standard refrigeration containers also have a floor formed by spaced apart T-sectioned extrusions which run the length of the container from the refrigeration unit to the doors. This is often referred to as a "T-bar floor". With the container loaded with produce, cooled air exiting the refrigeration unit is intended to flow between the extrusions along the length of the floor and then up through the produce before being drawn back into the refrigeration unit. In practice, however, the cooled air flows only very weakly near the door end of the floor as it tends to short-circuit from the outlet to the inlet through gaps between the produce and the sides of the container, and through gaps in the produce near to the outlet. This results in the produce not being homogeneously cooled and particularly the produce adjacent the doors often being insufficiently cooled.

[0005] South African patent number 2009/00716 proposes a refrigeration container in which short-circuiting of cooled air is avoided by covering the conventional T-bar floor with a sheet of metal which leaves an opening adjacent the doors, and through the use of baffles between the produce and the sides and roof of the container. The baffles take the form of inflatable bags or strips of a flexible plastics material. Cooled air thus travels from the refrigeration unit along the floor of the container and enters the container near the doors whereafter it is forced to flow through the produce before reaching the air inlet at the opposite end of the container. Although the container proposed in this patent appears to work effectively,

it suffers the disadvantage that the baffles are cumbersome and inconvenient to install. Furthermore, the cooled air flowing along the floor of the container will tend to absorb heat from the floor and thus provide less efficient heat transfer with the produce once it enters the container. This in turn will require a higher volume of cooled air to be generated and circulated.

[0006] Although the containers described above are what are commonly referred to as "shipping containers", a virtually identical internal design is used for refrigerated containers which are built integrally with road transport vehicles, either as self-propelled vehicles or trailers. In this specification "refrigeration transport container" shall have its widest meaning and include shipping containers and those forming part of road transport vehicles.

[0007] WO 87/00808 discloses a heat insulated freezing box having a refrigeration system at its front and an intermediate ceiling that stretches from the front to the rear end of the box such that a channel is formed between the ceiling and intermediate ceiling of the box. WO 87/00808 does not teach the use of a barrier to prevent cargo from being stacked too close to the air outlet nor the use of a barrier to direct air flow upward and then horizontally into the cargo space.

OBJECT OF THE INVENTION

[0008] It is an object of this invention to provide a refrigeration transport container which will, at least partially, alleviate some of the above-mentioned problems.

SUMMARY OF THE INVENTION

[0009] In accordance with this invention there is provided a refrigeration transport container having doors at one end with a refrigeration unit behind a panel at the opposite end, and wherein the refrigeration unit has a cold air outlet adjacent the bottom of the container and an air inlet adjacent the top thereof, characterised in that the air outlet is configured to discharge air into the container substantially above floor level and wherein the air inlet draws air through a passage which opens into the container near the doors.

[0010] Further features of the invention provide for a barrier to extend upwardly from the floor across the width of the container adjacent the outlet and shaped to direct air upwardly and to prevent movement of pallets on the floor towards the outlet; for the height of the barrier to be substantially the height of a pallet; for elongate spaced apart stops to be provided on the panel extending generally upwardly; for the stops to extend partway between the air inlet and air outlet; and for a plate to extend across the upper end of the stops between the sides of the container.

[0011] Still further features of the invention provide for the passage to extend along the top of the container from the air inlet to near the doors; and for the passage to extend the width of the container.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] One embodiment of the invention will be described, by way of example only, with reference to the drawings in which:

Figure 1 is part sectional perspective view of a refrigeration container;

Figure 2 is a sectional side elevation of the refrigeration container in Figure 1; and,

Figure 3 is a sectional plain view of the refrigeration container in Figure 1.

DETAILED DESCRIPTION WITH REFERENCE TO THE DRAWINGS

[0013] A refrigeration transport container (1), in this embodiment a shipping container, is shown in Figures 1 to 3 and includes a refrigeration unit (3) located at one end (5) behind a panel (7) opposite the doors (9). The panel (7) extends parallel to the end (5) between the sides (11) of the container (1) and is spaced apart from the top (13) and bottom (15) thereof to provide elongate openings (17, 19) which act as an air inlet and an air outlet respectively. A T-bar floor (21) is provided on the bottom (15) of the container and extends from the doors (9) to adjacent the air outlet (19).

[0014] The container described thus far is of conventional configuration.

[0015] In accordance with the invention a barrier (25) is provided which extends between the sides (11) adjacent the air outlet (19). The barrier (25) extends from the bottom (15) of the container over the end of the T-bar floor (21) to the height of a standard pallet (27) (shown in broken lines in Figure 2) above the T-bar floor (21).

[0016] A plurality of elongate stops (29), made in this embodiment from lengths of rectangular tubing, are secured to the panel (7) spaced apart from each other and extending generally upwardly. A plate (30) having the same thickness as the tubes extends across the upper ends of the stops (29) between the sides (11) of the container.

[0017] The barrier (25) and stops (29) extend the same distance into the container from the panel (7).

[0018] Furthermore, a passage (40) is provided internally along the top (13) of the container by, in this embodiment, a metal sheet which extends between the sides (11) from the air inlet (17) to near the doors (9). The passage (40) covers the air inlet (17) so that air is drawn through the passage into the inlet.

[0019] In use, pallets (27) with produce (45) thereon are loaded into the container with the front of the first pallet abutting the barrier (25) and that of the produce abutting the stops (29). With the refrigeration unit (3) operational, air in the container is drawn through the open end of the passage (40), cooled and forced into the con-

tainer once more through the outlet (19). The barrier (25) prevents the cooled air from flowing either along the T-bar floor (21) or through the aligned openings of the pallets (27). Instead, the cooled air is directed by the barrier (25) upwardly between the stops (29). The plate (30) prevents continued upward flow of the cooled air and which is thus forced to flow through the produce (45) until it is able to escape and return through the passage (40).

[0020] The configuration of the container is highly effective in that the cooled air is immediately used to cool the produce and does not have an opportunity to short-circuit along the floor, sides or top of the container. Furthermore, the approximately 6m² area of the panel (7) over which air is forced into the container is much smaller than the approximately 26m² area of the floor and the air velocity is consequently much higher, again providing more efficient heat transfer. Still further, as the air is forced through the produce there is little opportunity for dead spots to form and homogenous cooling is thus achieved.

[0021] It is calculated that the high degree of homogenous cooling achieved by the configuration of the container of the invention will result in a smaller temperature differential across the refrigeration unit as compared to conventional refrigerated containers and this has the result that the refrigeration unit will operate more effectively and thus use less energy.

[0022] It is further envisaged that the elimination of hotspots and the reduction of the temperature differential across the refrigeration unit will result in an improved relative humidity of close to 95%. This in turn will enhance the quality of the produce and discourage deterioration thereof.

[0023] As the container of the present invention does not require airflow along the floor or bottom of the container, and in fact prevents such flow, it is not necessary for the container to be provided with a T-bar floor. The T-bar floor could thus be eliminated, at least in part, and this can result in a saving of up to 750 kg in weight and an associated saving of the cost of materials and manufacturing.

[0024] Existing refrigerated containers can easily be modified to incorporate the features of the invention, or refrigerated containers can be built to incorporate these features.

[0025] It will be appreciated that many other embodiments of a refrigerated container exist which fall within the scope of the invention particularly as regards the configuration thereof. For example, the plate across the top of the stops can be bent to extend downwards towards the floor to aid mixing of the air. Also, any suitable stops can be used, including, for example, rubber extrusions. Furthermore, the inlet passage could have any suitable configuration and could, for example, include a number of tubes which could run between the inner and outer sides of the container.

Claims

1. A refrigeration transport container (1) having doors (9) at one end with a refrigeration unit (3) behind a panel (7) at the opposite end, and wherein the refrigeration (3) unit has a cold air outlet (19) adjacent the bottom (15) of the container (1) and an air inlet (17) adjacent the top (13) thereof, and wherein a barrier (25) extends upwardly from a floor (21) of the container provided on the bottom (15) thereof across the width of the container (1) adjacent the outlet (19) and is shaped to direct air from the outlet (19) upwardly such that air is discharged into the container (1) substantially above floor level, and the barrier further shaped to prevent movement of pallets on the floor (21) towards the outlet (19) and wherein the air inlet (17) draws air through a passage (40) which opens into the container (1) near the doors (9). 5 10
2. A refrigeration transport container (1) as claimed in claim 1 wherein elongate spaced apart stops (29) are provided on the panel (7) extending in a generally upward direction. 15 20
3. A refrigeration transport container (1) as claimed in claim 1 or 2 wherein the height of the barrier (25) is substantially the height of a pallet. 25
4. A refrigeration transport container (1) as claimed in claim 2 wherein the stops (29) extend partway between the air inlet (17) and air outlet (19). 30
5. A refrigeration transport container (1) as claimed in claim 4 wherein a plate (30) extends across the upper end of the stops (29) between the sides of the container (1). 35
6. A refrigeration transport container (1) as claimed in any one of the preceding claims wherein the passage (40) extends along the top of the container (1) from the air inlet (17) to near the doors (9). 40
7. A refrigeration transport container (1) as claimed in any one of the preceding claims wherein the passage (40) extends the width of the container (1). 45

Patentansprüche

1. Kühltransportcontainer (1) mit Türen (9) an einem Ende, mit einer Kühleinheit (3) hinter einer Platte (7) am gegenüberliegenden Ende und wobei die Kühleinheit (3) einen Kaltluftauslass (19) nahe dem Boden (15) des Containers (1) und einen Lufteinlass (17) nahe der Oberseite (13) davon aufweist und wobei eine Barriere (25) sich aufwärts von einem Boden (21) des Containers erstreckt, welche auf dem Boden (15) davon über die Breite des Containers (1) 50 55

nahe dem Auslass (19) vorgesehen und so geformt ist, um Luft aus dem Auslass (19) nach oben zu lenken, so dass Luft in den Container (1) im Wesentlichen über dem Bodenniveau eingespeist wird, und wobei die Barriere des Weiteren geformt ist, um die Bewegung von Paletten auf dem Boden (21) zum Auslass (19) hin zu verhindern und wobei der Lufteinlass (17) Luft durch einen Durchlasskanal (40) zieht, welcher sich in den Container (1) in der Nähe der Türen (9) öffnet.

2. Kühltransportcontainer (1) nach Anspruch 1, wobei längliche, beabstandete Anschläge (29) auf der Platte (7) vorgesehen sind, welche sich in einer allgemein nach oben gerichteten Richtung erstrecken.
3. Kühltransportcontainer (1) nach Anspruch 1 oder 2, wobei die Höhe der Barriere (25) im Wesentlichen die Höhe einer Palette beträgt.
4. Kühltransportcontainer (1) nach Anspruch 2, wobei die Anschläge (29) sich teilweise zwischen dem Lufteinlass (17) und dem Luftauslass (19) erstrecken.
5. Kühltransportcontainer (1) nach Anspruch 4, wobei eine Platte (30) sich über das obere Ende der Anschläge (29) zwischen den Seiten des Containers (1) erstreckt.
6. Kühltransportcontainer (1) nach einem der vorhergehenden Ansprüche, wobei der Durchlasskanal (40) sich entlang der Oberseite des Containers (1) vom Lufteinlass (17) bis in die Nähe der Türen (9) erstreckt.
7. Kühltransportcontainer (1) nach einem beliebigen der vorhergehenden Ansprüche, wobei der Durchlasskanal (40) sich über die Breite des Containers (1) erstreckt.

Revendications

1. Conteneur de transport de réfrigération (1) présentant des portes (9) au niveau d'une extrémité avec une unité de réfrigération (3) derrière un panneau (7) au niveau de l'extrémité opposée, et dans lequel l'unité de réfrigération (3) présente une sortie d'air froid (19) adjacente au bas (15) du conteneur (1) et une entrée d'air (17) adjacente au bas (13) de celui-ci, et dans lequel une barrière (25) s'étend vers le haut depuis un plancher (21) du conteneur prévu sur le bas (15) de celui-ci sur la largeur du conteneur (1) adjacent à la sortie (19) et est formée pour diriger de l'air de la sortie (19) vers le haut de sorte que de l'air soit évacué dans le conteneur (1) sensiblement au-dessus du niveau du plancher, et la barrière est en outre formée pour empêcher le mouvement de 50 55

palettes sur le plancher (21) vers la sortie (19) et dans lequel l'entrée d'air (17) aspire de l'air par un passage (40) qui s'ouvre dans le conteneur (1) à proximité des portes (9).

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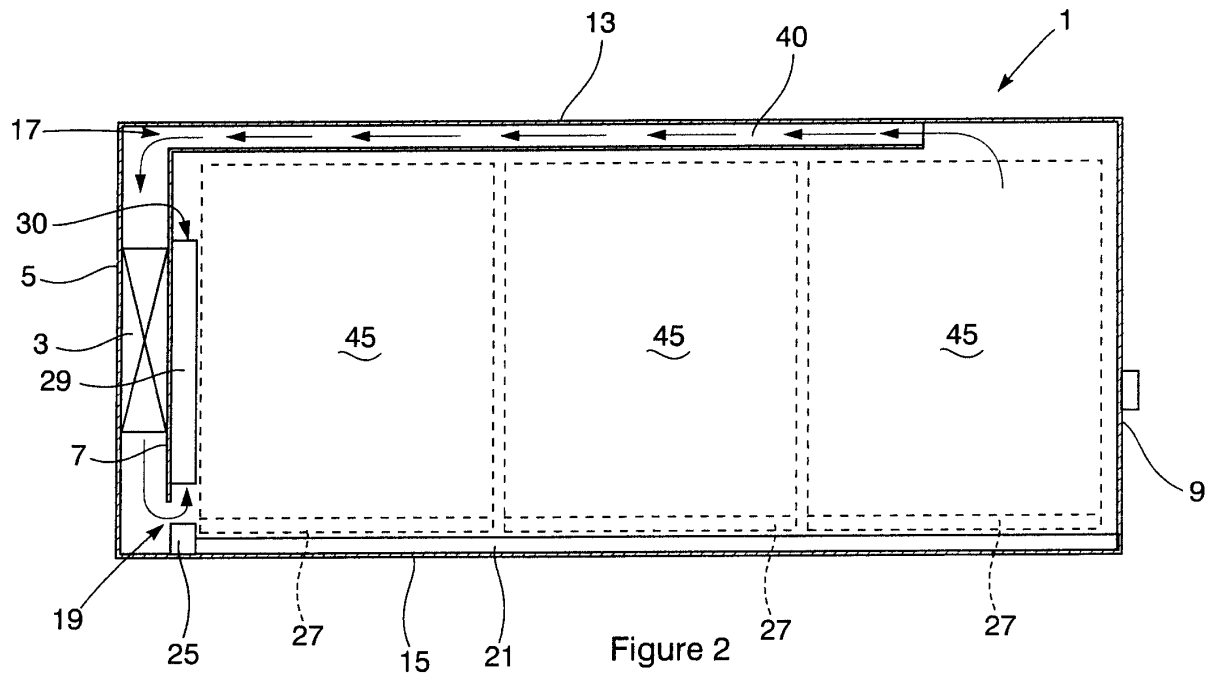
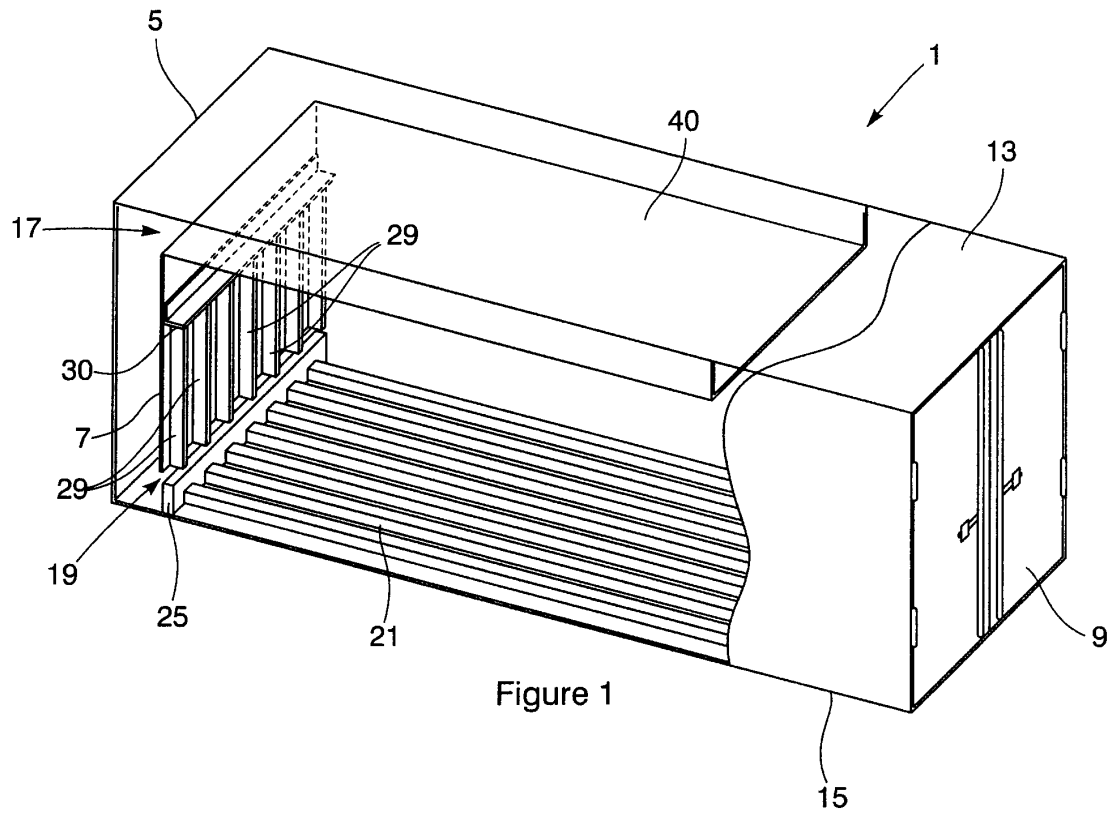
2. Conteneur de transport de réfrigération (1) selon la revendication 1, dans lequel des butées espacées allongées (29) sont prévues sur le panneau (7) s'étendant dans une direction généralement vers le haut. 10
3. Conteneur de transport de réfrigération (1) selon la revendication 1 ou 2, dans lequel la hauteur de la barrière (25) est sensiblement la hauteur d'une palette. 15
4. Conteneur de transport de réfrigération (1) selon la revendication 2, dans lequel les butées (29) s'étendent à mi-chemin entre l'entrée d'air (17) et la sortie d'air (19). 20
5. Conteneur de transport de réfrigération (1) selon la revendication 4, dans lequel une plaque (30) s'étend sur l'extrémité supérieure des butées (29) entre les côtés du conteneur (1). 25
6. Conteneur de transport de réfrigération (1) selon l'une quelconque des revendications précédentes, dans lequel le passage (40) s'étend le long du haut du conteneur (1) de l'entrée d'air (17) jusqu'à proximité des portes (9). 30
7. Conteneur de transport de réfrigération (1) selon l'une quelconque des revendications précédentes, dans lequel le passage (40) étend la largeur du conteneur (1). 35

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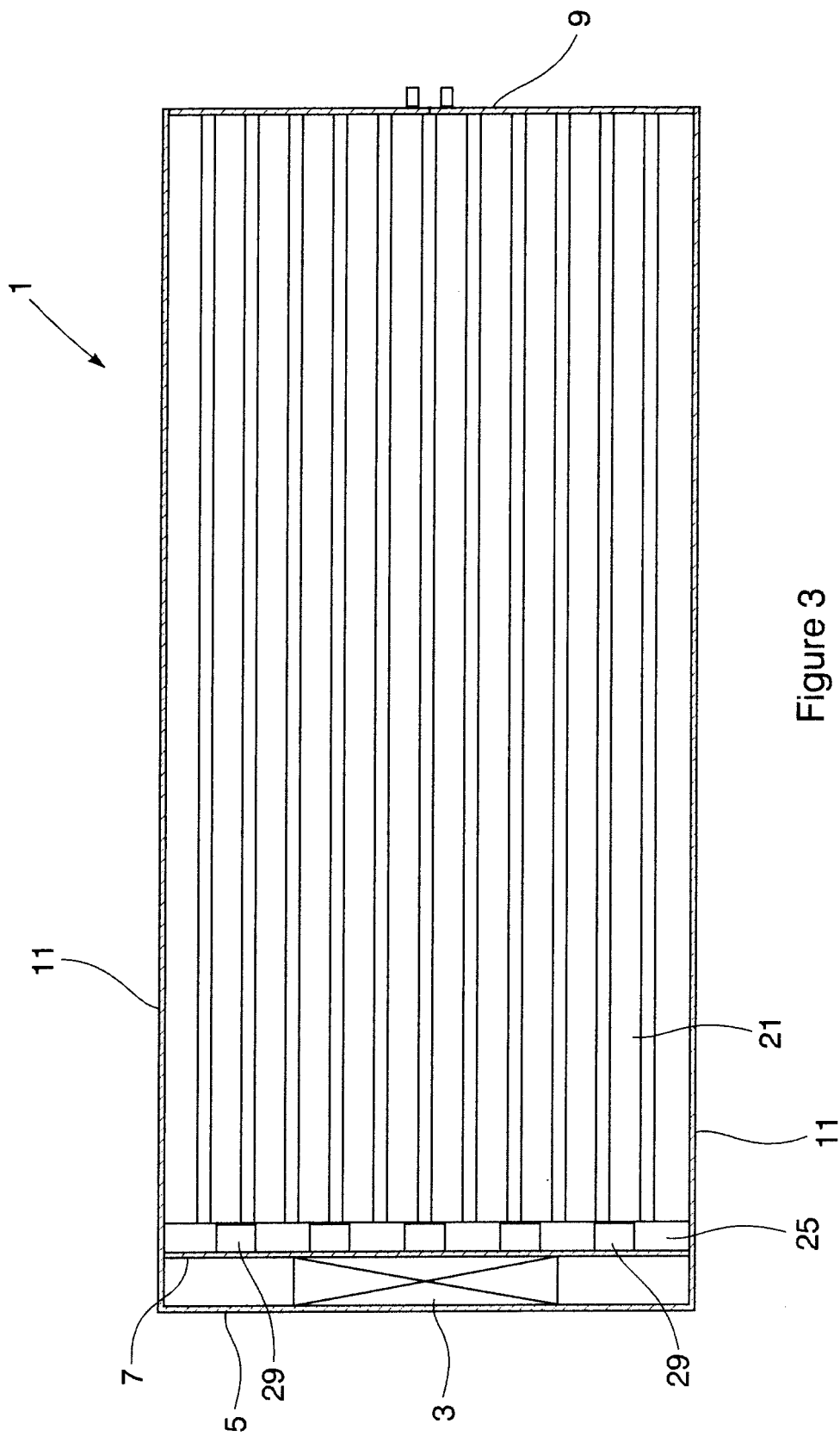


Figure 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 200900716 A [0005]
- WO 8700808 A [0007]