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(54) **A COOLING DEVICE COMPRISING AN EVAPORATOR**

KÜHLVORRICHTUNG MIT EINEM VERDAMPFER

DISPOSITIF DE REFROIDISSEMENT COMPRENANT UN ÉVAPORATEUR

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Description

[0001] The present invention relates to a cooling device comprising an evaporator.

[0002] In cooling devices, compartments wherein foodstuffs to be cooled are placed are cooled by means of the evaporators participating in the refrigeration cycle. The commonly-used double door cooling devices are generally composed of two compartments, the freezing compartment and the fresh food compartment. The evaporator, that is used for cooling the freezer compartment and that draws heat from the cabin by natural convection and conduction, is composed of pipes wrapped around the outside of the freezing compartment. However, at the bending points of the pipes the contact area between the pipe and the freezing compartment is reduced and this situation causes the efficiency of the evaporator to decrease. In the state of the art, there are different embodiments for increasing the contact area at the bending points of the circular pipes wrapped around the compartment walls. For example, the pipes with circular cross-sections wrapped around the compartment are shaped as a D. However, when pipes with rectangular cross-sections instead of circular cross-section are used, pipe diameters may be narrowed at the bending points due to narrow bending-point diameters or the contact between the pipe and the compartment deteriorates. The evaporator cannot be used efficiently due to the contact problem between the pipe with a rectangular cross-section and the compartment.

[0003] In the state of the art European Patent No. EP1831625, an evaporator is disclosed, comprising pipes that are wrapped around the freezing compartment walls in a refrigerator having two compartments, a refrigerating compartment and a freezing compartment. The document DE 10 2010 028527 A1 discloses a cooling device according to the preamble of claim 1, it relates to an evaporator for a refrigerator, comprising a pipe carrying refrigerant, at least one carrier plate, to which the pipe is fixed, and a graphite-containing heat distributor layer disposed between the pipe and the carrier plate and the document US 2011/023532 A1 relates to a refrigerating apparatus includes a refrigerating cycle including a compressor, a condenser, a flow divider, a first heat exchanger, a second heat exchanger, a decompressing device, and an evaporator.

[0004] The aim of the present invention is the realization of a cooling device comprising an evaporator of which the efficiency is improved by preventing the bending points of the pipes wrapped around the compartment from being damaged.

[0005] The cooling device realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof comprises a compartment, walls that form the outer surface of the compartment, a compressor and an evaporator providing the circulation of the refrigerant fluid in the cooling device and having pipes wrapped around the compartment. The

cooling device of the present invention furthermore comprises at least one semi-cylindrical bracket mounted onto the edges that form the adjacent walls. By means of the brackets as support units placed at the bending points of the pipes, the pipes are bent at a wider angle than the right angle, thus increasing the efficiency of the evaporator.

[0006] In an embodiment of the present invention, the bracket comprises two flaps that are configured in an inclined form so as to be placed onto two adjacent walls. The inclined form of the flaps prevents the pipes from being damaged while passing over the bracket from the wall or over the wall from the bracket.

[0007] In a derivative of this embodiment, the bracket comprises a semi-spherical body between the two flaps.

[0008] In an embodiment of the present invention, the cooling device comprises a fresh food compartment wherein fresh foodstuffs are stored, a freezing compartment wherein foodstuffs to be frozen are placed and an evaporator placed onto the freezing compartment.

[0009] In a derivative of this embodiment, the pipes are attached onto the walls by means of an aluminum strip. Since the aluminum strip has a higher thermal conductivity coefficient with respect to other adhesive strips, a highly-efficient heat transfer is provided between the pipe and the compartment.

[0010] In an embodiment of the present invention, the bracket is produced from a metal material. By means of the metal material, the heat transfer between the compartment and the refrigerant fluid is realized in an efficient manner.

[0011] In an embodiment of the present invention, the bracket comprises a phase changing material. The bracket helps the compartment temperature to be kept at a desired level by means of the phase changing material which is in solid state between the refrigerant fluid temperature and the compartment temperature.

[0012] In the cooling device of the present invention, by means of the bracket mounted on the edges of the compartment, the contact area between the compartment and the pipes is increased, thus the cooling device can be used more efficiently.

[0013] The model embodiments relating to a cooling device realized in order to attain the aim of the present invention are illustrated in the attached figures, where:

Figure 1 - is the schematic view of a cooling device in an embodiment of the present invention.

Figure 2 - is the perspective view of a compartment, brackets, walls and pipes.

Figure 3 - is the front view of a compartment when the bracket is mounted onto the compartment.

Figure 4 - is the view of detail A in Figure 3.

Figure 5 - is the perspective view of a bracket.

[0014] The elements illustrated in the figures are numbered as follows:

1. Cooling device
2. Compartment
3. Wall
4. Compressor
5. Pipe
6. Evaporator
7. Bracket
8. Flap
9. Body
10. Fresh food compartment
11. Freezing compartment

[0015] The cooling device (1) comprises a compartment (2) wherein foodstuffs to be cooled are placed, walls (3) that surround the compartment (2), a compressor (4) that compresses and circulates the refrigerant fluid in the refrigeration cycle and at least one evaporator (6) having at least one pipe (5) through which the refrigerant fluid passes, that provides the cooling of the compartment (2) and that is placed on the outside of the walls (3) (Figure 1).

[0016] The cooling device (1) of the present invention comprises at least one bracket (7) that extends over at least one of the edges (K) joining the walls (3) so as to protrude beyond the level of the walls (3) and that increases the radius (R) of the bending point of the pipe (5) passing thereover (Figure 2).

[0017] During the production process of the cooling device (1), the operator first places the brackets (7) onto the edges (K) over which the pipes (5) pass before mounting the pipes (5) onto the compartment (2). Afterwards, the operator wraps the pipes (5) over the outer surface of the walls (3). The bracket (7) is dome-shaped so as to widen the bending angle of the pipe (5) passing thereover when placed onto the compartment (2). By means of the bracket (7), the refrigerant fluid circulating inside the pipes (5) passes from the bending points of the pipes (5) without difficulty, thus increasing the efficiency of the evaporator (6) (Figure 3, Figure 4).

[0018] In an embodiment of the present invention, the bracket (7) comprises two inclined flaps (8) that at least partially extend over the walls (3) adjacent to the edge (K) whereon the bracket (7) is placed and enable the bracket (7) to be placed onto the compartment (2). The flaps (8) are seated onto the walls (3) that form the edge (K), thus the bracket (7) is easily mounted onto the compartment (2) (Figure 5).

[0019] In a derivative of this embodiment, the bracket (7) comprises two flaps (8), the thickness of which increases from the walls (3) towards the edge (K) when placed onto the compartment (2) and a curved body (9) situated between the flaps (8) and having the same thickness as the maximum thickness of the flaps (8). Thus, the pipe (5) is not damaged during the bending process (Figure 5).

[0020] In an embodiment of the present invention, the cooling device (1) comprises a fresh food compartment (10) and a freezing compartment (11) kept at different temperatures from each other and an evaporator (6) sit-

uated on the freezing compartment (11). Thus, the freezing compartment (11) can be cooled efficiently.

[0021] In a derivative of this embodiment, the cooling device (1) comprises the evaporator (6) adhered onto the freezing compartment (11) by means of an aluminum strip. The aluminum strip enables the pipes (5) to be attached onto the walls (3) in a secure manner.

[0022] In an embodiment of the present invention, the cooling device (1) comprises the bracket (7) produced from a metal alloy material. By means of the thermal conductivity of the metal material being high, losses in heat transfer between the refrigerant fluid and the compartment (2) are minimized.

[0023] In an embodiment of the present invention, the bracket (7) comprises a phase changing material. By means of the bracket (7) comprising a phase changing material, foodstuffs in the compartment (2) can be stored for a longer time when the connection between the cooling device (1) and the power source is cut.

[0024] The bracket (7) placed onto the compartment (2) facilitates the passage of the refrigerant fluid at the bending points of the pipes (5) passing thereover, and thus increases the efficiency of the evaporator (6).

Claims

1. A cooling device (1) comprising

- a compartment (2) wherein foodstuffs to be cooled are placed,
- walls (3) that surround the compartment (2),
- a compressor (4) that compresses and circulates a refrigerant fluid in a refrigeration cycle and
- at least one evaporator (6) having at least one pipe (5) through which the refrigerant fluid passes, wherein said evaporator provides the cooling of the compartment (2) and is placed on the outside of the walls (3)

characterized by

- at least one bracket (7) that extends over at least one of the edges (K) joining the walls (3) so as to protrude beyond the level of the walls (3) and thereby increases the radius (R) of the bending point of the pipe (5) passing thereover.

2. A cooling device (1) as in Claim 1, characterized in that the bracket (7) comprises two inclined flaps (8) that at least partially extend over the walls (3) adjacent to the edge (K) whereon the bracket (7) is placed and enable the bracket (7) to be placed onto the compartment (2).

3. A cooling device (1) as in Claim 2, characterized in that the bracket (7) comprises two flaps (8), the thick-

ness of which increases from the walls (3) towards the edge (K) when placed onto the compartment (2) and a curved body (9) situated between the flaps (8) and having the same thickness as the maximum thickness of the flaps (8).

4. A cooling device (1) as in any one of the above claims, **characterized by** a fresh food compartment (10) and a freezing compartment (11) kept at different temperatures from each other and an evaporator (6) situated on the freezing compartment (11).
5. A cooling device (1) as in Claim 4, **characterized in that** the evaporator (6) is adhered onto the freezing compartment (11) by means of an aluminum strip.
6. A cooling device (1) as in any one of the above claims, **characterized in that** the bracket (7) is produced from a metal alloy material.
7. A cooling device (1) as in any one of the above claims, **characterized in that** the bracket (7) comprises a phase changing material.

Patentansprüche

1. Kühlvorrichtung (1), umfassend

- ein Fach (2), in das zu kühlende Lebensmittel gegeben werden,
- Wände (3), die das Fach (2) umgeben,
- einen Kompressor (4), der ein Kühlfluid verdichtet und in einem Kühlzyklus zirkulieren lässt, und
- wenigstens einen Verdampfer (6) mit wenigstens einem Rohr (5), durch das Kühlfluid strömt, wobei der Verdampfer (6) für das Kühlen des Fachs (2) sorgt und auf der Außenseite der Wände (3) angeordnet ist,

gekennzeichnet durch

- wenigstens eine Halterung (7), die sich über wenigstens eine der Kanten (K) erstreckt, die die Wände (3) verbinden, derart, dass sie über die Höhe der Wände (3) hinaus ragt und **dadurch** den Radius (R) des Biegepunkts des darüber verlaufenden Rohrs (5) erhöht.

2. Kühlvorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Halterung (7) zwei geneigte Klappen (8) umfasst, die sich wenigstens teilweise über die Wände (3) benachbart zu der Kante (K) erstrecken, auf denen die Halterung (7) angeordnet ist und die es ermöglichen, dass die Halterung (7) an dem Fach (2) angeordnet wird.

3. Kühlvorrichtung (1) nach Anspruch 2, **dadurch gekennzeichnet, dass** die Halterung (7) zwei Klappen (8), deren Dicke von den Wänden (3) zur Kante (K) hin zunimmt, wenn sie an dem Fach (2) angeordnet sind, und einen gekrümmten Körper (9) umfasst, der zwischen den Klappen (8) angeordnet ist und dieselbe Dicke wie die maximale Dicke der Klappen (8) aufweist.

4. Kühlvorrichtung (1) nach einem der vorangehenden Ansprüche, **gekennzeichnet durch** ein Frischhaltefach (10) und ein Gefrierfach (11), die auf voneinander unterschiedlichen Temperaturen gehalten werden, und einen Verdampfer (6), der am Gefrierfach (11) angeordnet ist.

5. Kühlvorrichtung (1) nach Anspruch 4, **dadurch gekennzeichnet, dass** der Verdampfer (6) mithilfe eines Aluminiumstreifens am Gefrierfach (11) anhaftet.

6. Kühlvorrichtung (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Halterung (7) aus einem Metalllegierungsmaterial hergestellt ist.

7. Kühlvorrichtung (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Halterung (7) ein Phasenwechselndes Material umfasst.

Revendications

1. Un dispositif de refroidissement (1) comprenant

- un compartiment (2) dans lequel les aliments à refroidir sont placés,
- des parois (3) qui entoure le compartiment (2),
- un compresseur (4) qui comprime et fait circuler un fluide frigorigène dans un cycle de réfrigération et
- au moins un évaporateur (6) qui présente au moins un tuyau (5) à travers lequel le fluide frigorigène passe, où ledit évaporateur (6) permet le refroidissement du compartiment (2) et qui est disposé sur l'extérieur des parois (3)

caractérisé par

- au moins une équerre (7) qui s'étend sur au moins un des bords (K) joignant les parois (3) de manière à faire saillie au-delà du niveau des parois (3) et donc qui augmente le rayon (R) du point de flexion du tuyau (5) passant sur celle-ci.

2. Un dispositif de refroidissement (1) selon la Revendication 1, **caractérisé en ce que** l'équerre (7) com-

prend deux rabats inclinées (8) qui s'étendent au moins partiellement sur les parois (3) adjacentes au bord (K) sur lequel l'équerre (7) est placée et qui permettent à l'équerre (7) d'être placée sur le compartiment (2).

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3. Un dispositif de refroidissement (1) selon la Revendication 2, **caractérisé en ce que** l'équerre (7) comprend les deux rabats (8), dont l'épaisseur augmente à partir des parois (3) vers le bord (K) lorsqu'elles sont placées sur le compartiment (2) et un corps courbé (9) qui est situé entre les rabats (8) et qui présente la même épaisseur que l'épaisseur maximale des rabats (8).
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4. Un dispositif de refroidissement (1) selon l'une quelconque des revendications précédentes, **caractérisé par** un compartiment d'aliments frais (10) et un compartiment de congélation (11) qui sont maintenus à des températures différentes et un évaporateur (6) qui est situé sur le compartiment de congélation (11).
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5. Un dispositif de refroidissement (1) selon la Revendication 4, **caractérisé en ce que** l'évaporateur (6) est collé sur le compartiment de congélation (11) au moyen d'une bande d'aluminium.
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6. Un dispositif de refroidissement (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** l'équerre (7) est produite d'un matériau en alliage métallique.
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7. Un dispositif de refroidissement (1) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** l'équerre (7) comprend un matériau à changement de phase.
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Figure 1

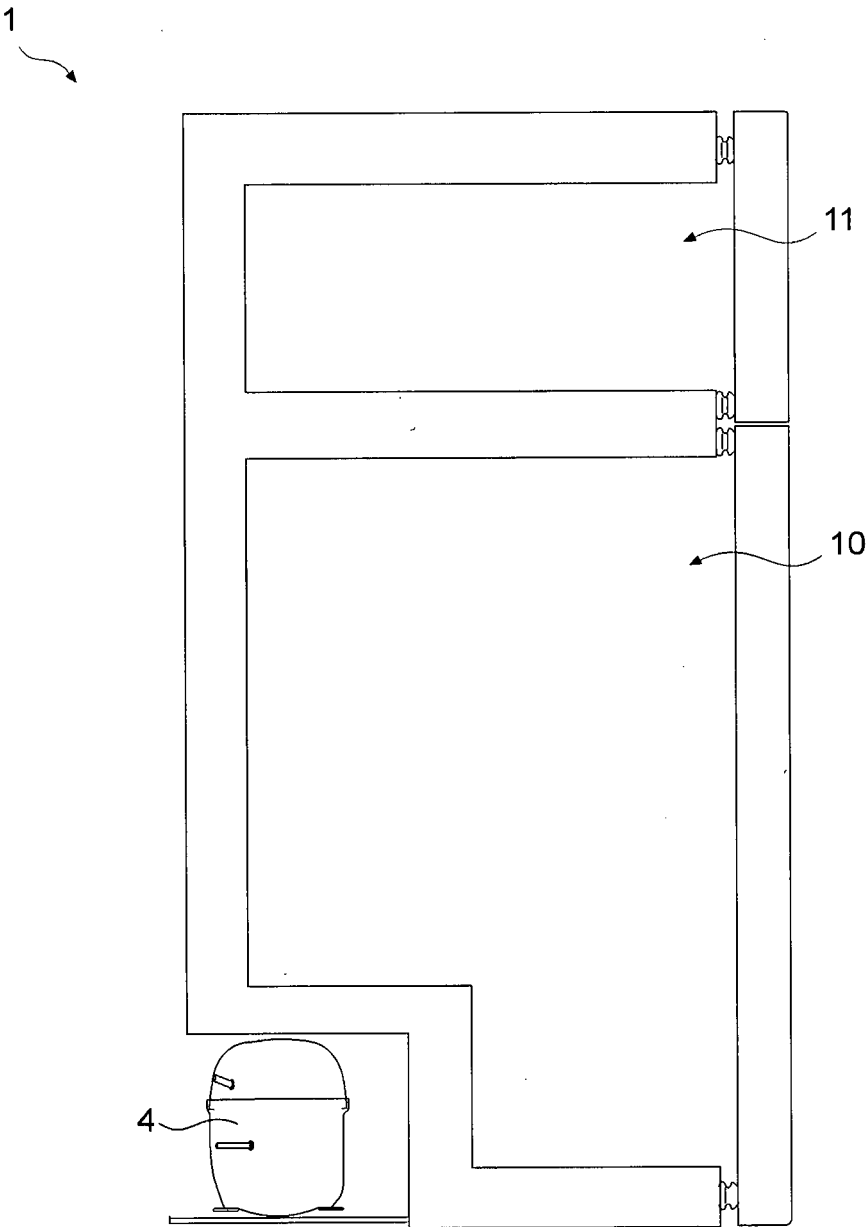


Figure 2

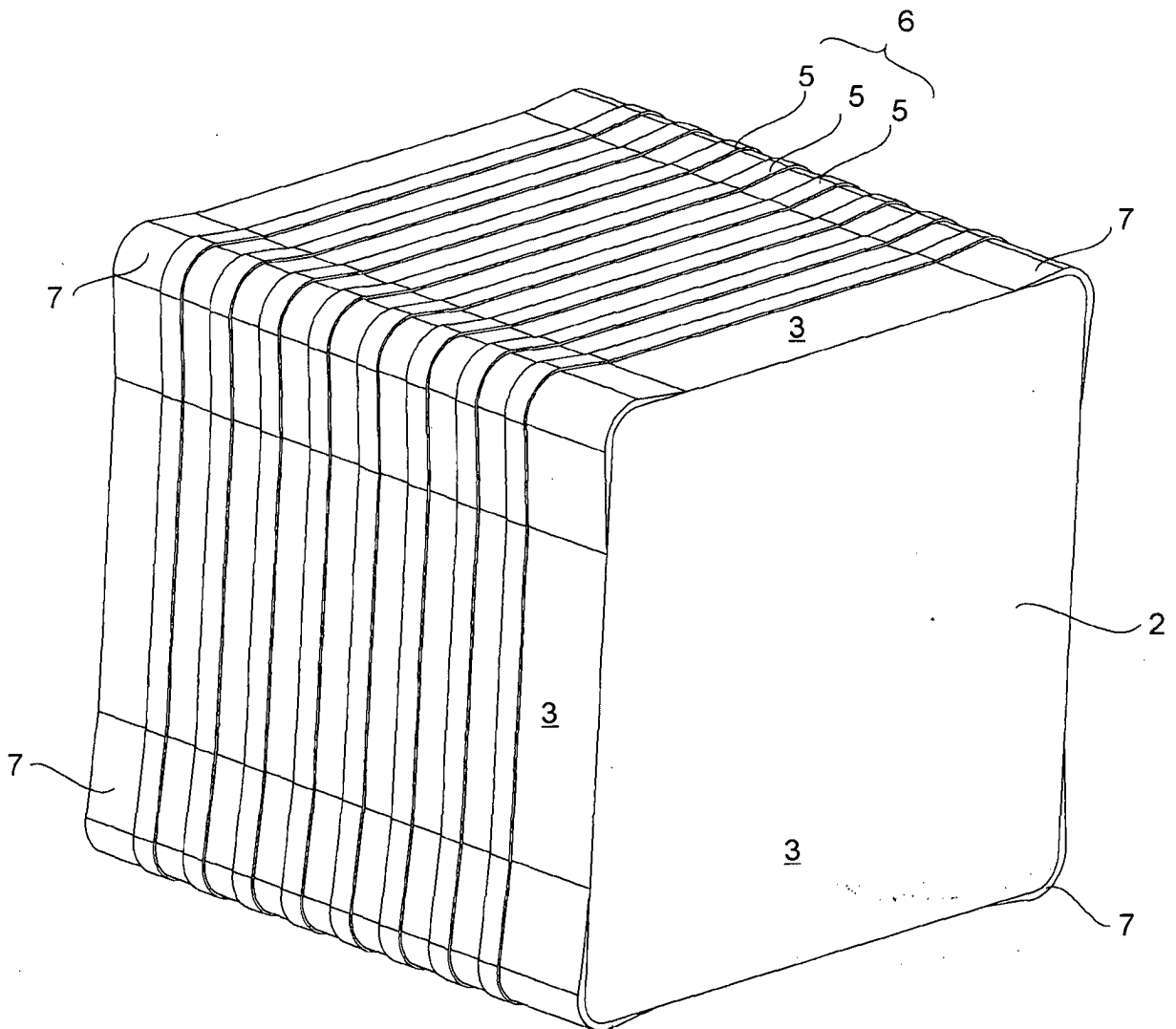


Figure 3

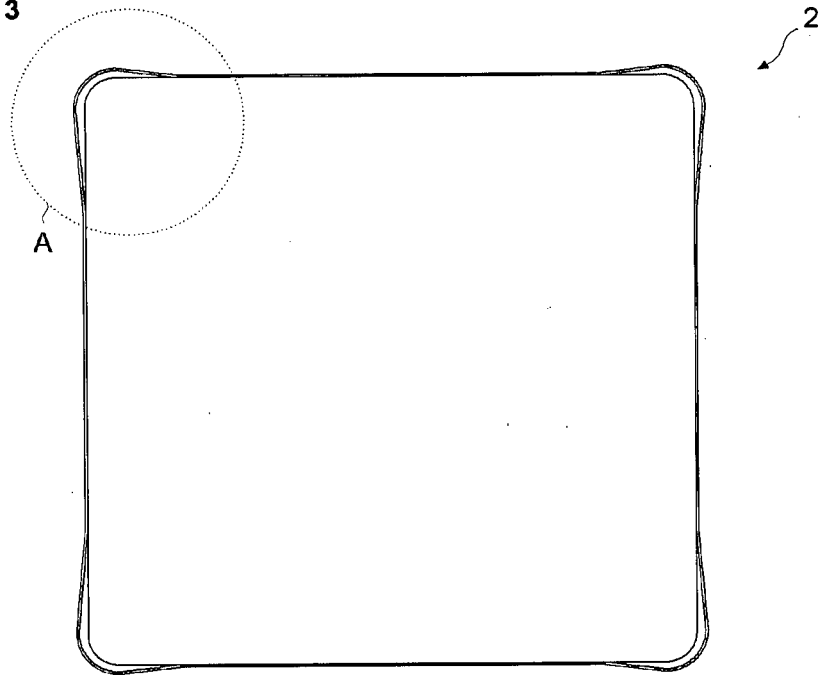


Figure 4

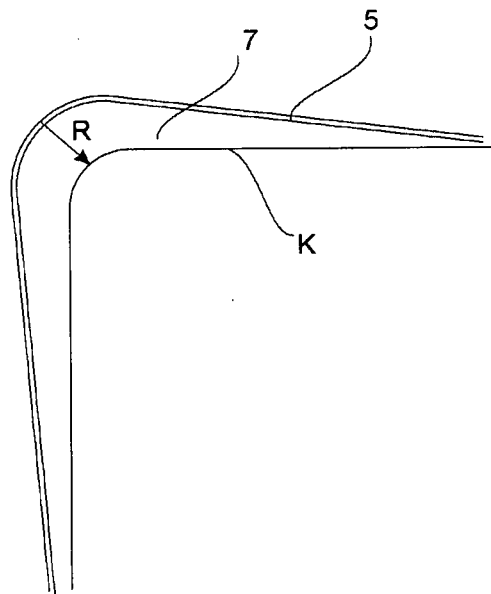
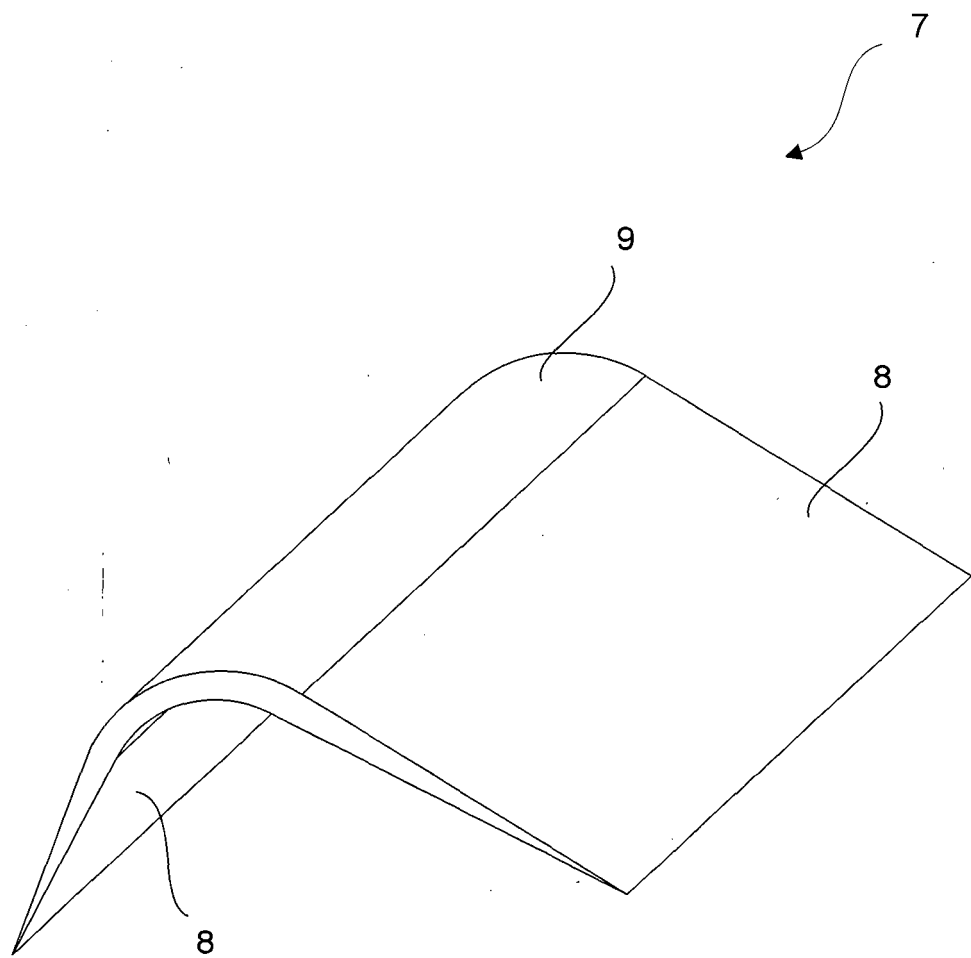


Figure 5



REFERENCES CITED IN THE DESCRIPTION

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