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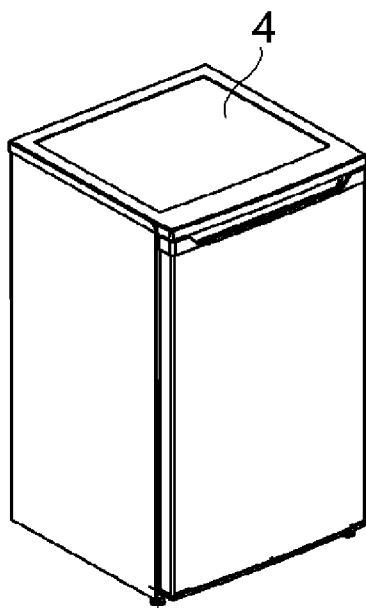
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- (54) Title: IMPROVED EDGE PROTECTOR FOR USE IN A PROTECTIVE PACKAGING ASSEMBLY

Fig. 1



(57) Abstract: The present invention relates to an edge protector (1a-1c) suitable for use in a protective packaging assembly (2) which comprises at least one strap (3) for fastening the edge protector (1) onto the respective edge of a household appliance (4), in particular a domestic refrigerator. According to the present invention, the body (5) of the edge protector (1a-1c) comprises a main section (6) that contains a resilient foam for cushioning the household appliance (4) and at least one reinforcement section (7) that contains a resilient foam for cushioning the household appliance (4) and for bearing the respective strap (3), wherein the compressive strength of the resilient foam inside the reinforcement section (7) is higher than the compressive strength of the resilient foam inside the main section (6).

Description**IMPROVED EDGE PROTECTOR FOR USE IN A PROTECTIVE PACKAGING ASSEMBLY**

[0001] The present invention relates to a protective packaging assembly for packing a household appliance, in particular a domestic refrigerator. The present invention particularly relates to an edge protector for use in the protective packaging assembly and a method of manufacturing the same.

[0002] In general, cargoes such as household appliances must withstand comparatively high mechanical stresses that are generated during the various stages of the transportation. These mechanical stresses are practically unavoidable. In order to mitigate the adverse effects of the impacts, the household appliances are generally packed with protective packaging assemblies which cushion them. Protective packaging assemblies are commonly known in the art. A protective packaging assembly generally comprises: a plurality of edge protectors for cushioning the household appliance; a cardboard box for enclosing the edge protectors and the household appliance and a plurality of straps for securing the cardboard box and the edge protectors onto the respective edges of the household appliance. In general, the edge protector has a body which contains a resilient foam for cushioning the household appliance. During an ordinary impact, the resilient foam partly absorbs the energy of the impact and usually recovers its initial shape.

[0003] The packing process is generally automated so as to save labor costs. The straps are tensioned around cardboard box by means of a strapping machine in which the strapping tension is generally adjustable. A problem with the packaging process is that there are incidents where the strap is tensioned too tightly so that the edges of the cardboard box are torn. In such cases, the resilient foam body of the edge protector is likely to be fractured and thus loses its cushioning function. A visual inspection from the outside of the cardboard box is usually not sufficient to determine with certainty whether the resilient foam edge protector is fractured. It is of utmost importance that the household appliance is properly packed with the protective packaging assembly in order to ensure that the household

appliance can be delivered in an undamaged state.

- [0004] An objective of the present invention is to provide an edge protector for use in a protective packaging assembly which solves the aforementioned problems of the prior art in a cost-effective way and which enables an improved reliability and safety. Another objective of the present invention is to provide a cost-effective method of manufacturing the edge protector.
- [0005] These objectives have been achieved by the edge protector as defined in claim 1, the protective packaging assembly as defined in claim 7 and the manufacturing method as defined in claim 11. Further achievements have been attained by the subject-matters respectively defined in the dependent claims.
- [0006] In the edge protector of the present invention, the body comprises a main section that contains a resilient foam for cushioning the household appliance and at least one reinforcement section that also contains a resilient foam for cushioning the household appliance and for bearing the respective strap. The compressive strength of the resilient foam inside the reinforcement section is higher than the compressive strength of the resilient foam inside the main section.
- [0007] The protective packaging assembly of the present invention comprises one or more than one edge protector each having at least one reinforcement section that is arranged to bear the respective strap. The edge protector of the present invention can be used in various protective packaging assemblies adapted for packing a domestic refrigerator, a laundry washer/dryer, a dishwasher, a cooking oven or the like.
- [0008] A major advantages effect of the present invention is that by virtue of the reinforcement section the risk that the edge protector fractures during the strapping is eliminated or reduced as much as possible. Thereby, the reliability of the protective packaging assembly has been increased in a cost-effective way. Thus, with the present invention, the performance of the protective packaging assembly against impacts has been improved.
- [0009] According to the present invention, the resilient foam of the main section and the resilient foam of the reinforcement section can be manufactured from the same material or alternatively from different materials. According

to the present invention, such material may be any resilient polymeric foam such as expanded polystyrene, expanded polyurethane, expanded polyethylene, expanded polypropylene and expanded rubber. These exemplary materials are not exhaustive. Of course, other resilient polymeric foams which are known to those skilled in the art can be alternatively used. Also resilient copolymer foams can be used. In an embodiment, the main section comprises polystyrene. In alternative versions of this embodiment, the reinforcement section comprises polystyrene, rubber or another polymer respectively. This embodiment is particularly advantageous as polystyrene is easy to process and cost-effective.

- [0010] The compressive strength of the resilient foam generally depends on its density. According to the present invention, the density of the resilient foam inside the reinforcement section may be set comparatively higher than the density of the resilient foam inside the main section, for instance, where the same polymers are used for both the main section and the reinforcement section. Of course, where different polymers are used for the main section and the reinforcement section, the densities must be set in accordance with the specific choice. In another embodiment, the main section and the reinforcement section are both made of expanded polystyrene. This embodiment is particularly advantageous as the manufacturing process becomes easier. In this embodiment, the density of the resilient foam inside the reinforcement section is preferably at least thirty kilograms per cubic meter or more.
- [0011] According to the present invention, the size and the shape of the edge protectors and, in particular the size and the shape of the reinforcement sections and the relative positions and the number of the reinforcement sections can be adjusted in accordance with the dimensions and the weight of the household appliance to be transported and also in accordance with the size and shape of the straps and the number of straps required. According to the present invention, the edge protector may be longitudinal or rectangular shaped. According to the present invention, in the packaging assembly, edge protectors with the same shape or with

different shapes can be used to cushion various edges of the household appliance.

- [0012] In another embodiment, the reinforcement section is recessed into at least part of the outer surface of the edge protector in close proximity to the edge of its body. According to the present invention, the reinforcement section may have different depths. In a version of this embodiment, the reinforcement section extends to the inner surface of the body. This embodiment is particularly advantageous as the reinforcement section abuts against the strap.
- [0013] According to the present invention, the width of the straps used in the protective packaging assembly may vary according to the weight and the dimensions of the household appliance. In another embodiment, the width of the reinforcement section is equal to or broader than the width of the respective strap. This embodiment is particularly advantageous as the risk of a mismatch between the strap and the reinforcement section can be reduced.
- [0014] In another embodiment, the protective packaging assembly comprises two longitudinal edge protectors for cushioning the opposing upper edges of the household appliance respectively and a rectangular edge protector for cushioning the bottom edges of the household appliance. In a version of this embodiment, two straps are used to fasten the edge protectors onto the household appliance. In this embodiment, the edge protectors have altogether eight reinforcement sections. This embodiment is particularly advantageous as the packing process can be expedited and the cost of the packaging assembly can be reduced.
- [0015] In another embodiment, the protective packaging assembly comprises a cardboard box for at least partly enclosing the edge protectors and the household appliance. In this embodiment, each strap is tensioned around the cardboard box at relative positions so as to match the reinforcement sections respectively. This embodiment is particularly advantageous as the cardboard box provides additional safety. Of course, the protective packaging assembly may be provided without a cardboard box and the straps may be directly tensioned onto the edge protectors such that the

straps run across the reinforcement sections respectively.

- [0016] In another embodiment, the edge protector is manufactured by injection molding. This embodiment is particularly advantageous as the edge protectors can be manufactured to exactly match the unique shape of the household appliance. In the injection molding process, the same resilient foam or different resilient foams can be used for the main section and the reinforcement section. In a version of this embodiment, the main section and the reinforcement section of the edge protector are manufactured in a double-injection molding process. This embodiment is particularly advantageous as the manufacturing process can be expedited and the cost can be reduced. In an alternative version of this embodiment, the main section and the reinforcement section are manufactured in individual injection molding processes and are subsequently combined to obtain an integral structure. The main section and the reinforcement section can be combined chemically through gluing or mechanically through an interlocking connection. Other type of connections known to those skilled in the art may be alternatively used. Of course, the edge protector can be produced by fabricating the main section and the reinforcement section from corresponding resilient foam workpieces.
- [0017] Additional advantageous effects of the edge protector and the protective packaging assembly of the present invention will become more apparent with the detailed description of the embodiments with reference to the accompanying drawings in which:
- [0018] Figures 1 to 5 – are schematic perspective views which illustrate the various stages of a packing process of a household appliance, i.e., a domestic refrigerator, by way of using the protective packaging assembly which has a plurality of edge protectors according to an embodiment of the present invention, wherein the area A enclosed by the dashed lines shown in Fig. 5 shows the location of a hidden reinforcement section;
- [0019] Figure 6 – is a schematic side view of the domestic refrigerator which is fitted with the edge protectors as shown in Fig.2;
- [0020] Figure 7 – is a schematic sectional view of the domestic refrigerator which is fitted with the edge protectors as shown in Fig.2, taken along the line

B-B.

- [0021] The reference signs appearing on the drawings relate to the following technical features.
- [0022] 1a. Edge protector
- [0023] 1b. Edge protector
- [0024] 1c. Edge protector
2. Packaging assembly
 3. Strap
 4. Household appliance
 5. Body
 6. Main section
 7. Reinforcement section
 8. Inner surface
 9. Outer surface
- [0025] 10. Cardboard box
11. Flap
- [0026] The edge protector (1a-1c) is suitable for use in a protective packaging assembly (2).
- [0027] The protective packaging assembly (2) is suitable for packing a household appliance (4), in particular a domestic refrigerator. The protective packaging assembly (2) comprises at least one strap (3) for fastening the edge protector (1a-1c) onto the respective edge of the household appliance (4), in particular the domestic refrigerator (Fig. 1 to 7).
- [0028] In the edge protector (1a-1c) of the present invention, the body (5) of the edge protector (1a-1c) comprises a main section (6) that contains a resilient foam for cushioning the household appliance (4) and at least one reinforcement section (7) that contains a resilient foam for cushioning the household appliance (4) and for bearing the respective strap (3), wherein the compressive strength of the resilient foam inside the reinforcement section (7) is higher than the compressive strength of the resilient foam inside the main section (6).
- [0029] The protective packaging assembly (2) of the present invention comprises one or more than one edge protector (1a-1c) according to the present

invention. The reinforcement sections (7) are arranged to bear the respective straps (3).

- [0030] In an embodiment, the resilient foam inside main section (6) comprises polystyrene. In alternative versions of this embodiment, the resilient foam inside reinforcement section (7) comprises polystyrene or rubber or another polymer.
- [0031] In another embodiment, the density of the resilient polystyrene foam inside the reinforcement section (7) ranges between 30 to 40 kilogram per cubic meter.
- [0032] In another embodiment, the body (5) comprises an inner surface (8) which is adapted to abut against the outer edge of the household appliance (4) and an outer surface (9) which is adapted to abut against the inner edge of the respective strap (3). In this embodiment, the reinforcement section (7) is recessed into at least part of the outer surface (9) in close proximity to the edge of the body (5).
- [0033] In another embodiment, the reinforcement section (7) extends from the outer surface (9), through the body (5), to the inner surface (8).
- [0034] In another embodiment, the width of the reinforcement section (7) is equal to or larger than the width of the strap (3).
- [0035] In another embodiment, the protective packaging assembly (2) comprises two longitudinal edge protectors (1a, 1b) which are adapted to cushion the upper left edge and the upper right edge of the household appliance (4) respectively and a rectangular edge protector (1c) which is adapted to circumferentially cushion the bottom edges of the household appliance (4).
- [0036] In another embodiment, the protective packaging assembly (2) comprises two straps (3). In this embodiment, each longitudinal edge protector (1a, 1b) has two reinforcement sections (7) which are arranged to bear the respective straps (3) and the rectangular edge protector (1c) has four reinforcement sections (7) which are arranged to bear the respective straps (3).
- [0037] In another embodiment, the protective packaging assembly (2) further comprises a cardboard box (10) for at least partly enclosing the edge protectors (1a-1c) and the household appliance (4). In this embodiment,

each strap (3) is adapted to fasten the cardboard box (10) and the respective edge protector (1a-1c) onto the respective edge of the household appliance (4).

[0038] In the subsequent description, the packing process in which the domestic refrigerator (4) is packed with the protective packaging assembly (2) of the present invention will be briefly explained by way of example.

[0039] At an initial stage, the domestic refrigerator (4) to be packed is provided (Fig. 1). At the next stage, the bottom edges of the domestic refrigerator (4) are fitted into the rectangular edge protector (1c). And the two longitudinal edge protectors (1a;1b) are fitted onto the upper left edge and the upper right edge of the domestic refrigerator (4) respectively (Fig. 2). At the next stage, the domestic refrigerator (4) and the edge protectors (1a-1c) are put into the cardboard box (10). And the flaps (11) are closed (Fig. 3 to 4). At the next stage, two straps (3) are fastened around the closed cardboard box (10) such that the straps (3) pass through the areas A which match to the positions of the reinforcement sections (7) of the edge protectors (1a-1c). In this example, there are totally eight such areas A. Herein the areas A on the rear edge of the cardboard box (10) have not been shown. (Fig. 5).

[0040] The method of manufacturing the edge protector (1a-1c) according to the present invention comprises a step of preparing a first mold (not shown) and a second mold (not shown) which are adapted for molding the body (5) of the edge protector (1a-1c) so as to have a main section (6) and a reinforcement section (7) respectively; a step of injecting a resilient foam into the first mold so as to form the main section (6) of the body (5) for cushioning the household appliance (4) and a step of injecting a resilient foam into the second mold so as to form the reinforcement section (7) of the body (5) for cushioning the household appliance (5) and for bearing the respective strap (3). The compressive strength of the resilient foam inside the reinforcement section (7) is higher than the compressive strength of the resilient foam inside the main section (6) (Fig. 1 to 7).

[0041] In another embodiment, the first mold and the second mold are adapted for molding the body (5) of the edge protector (1a-1c) through

double-injection molding.

[0042] A major advantage of the present invention is that the edge protectors (1a-1c) of the protective packaging assembly (2) are provided with reinforcement sections (7) which are arranged to respectively bear the straps (3) and to protect the edge protectors (1a-1c) from receiving fractures when the straps (3) are tensioned too tightly during the packaging process or the subsequent handling. Other additional advantageous effects of the present invention can be taken from the aforementioned embodiments.

Claims

1. An edge protector (1a-1c) suitable for use in a protective packaging assembly (2) which comprises at least one strap (3) for fastening the edge protector (1a-1c) onto the respective edge of a household appliance (4), in particular a domestic refrigerator (4), the edge protector (1a-1c) being **characterized in that** the body (5) of the edge protector (1a-1c) comprising a main section (6) that contains a resilient foam for cushioning the household appliance (4) and at least one reinforcement section (7) that contains a resilient foam for cushioning the household appliance (4) and for bearing the respective strap (3), wherein the compressive strength of the resilient foam inside the reinforcement section (7) is higher than the compressive strength of the resilient foam inside the main section (6).
2. The edge protector (1a-1c) according to claim 1, **characterized in that** the resilient foam inside main section (6) comprising polystyrene and the resilient foam inside reinforcement section (7) comprises polystyrene or rubber or another polymer.
3. The edge protector (1a-1c) according to claim 2, **characterized in that** the density of the resilient polystyrene foam inside the reinforcement section (7) ranges between 30 to 40 kilogram per cubic meter.
4. The edge protector (1a-1c) according to claim 1, **characterized in that** the body (5) comprising an inner surface (8) which is adapted to abut against the outer edge of the household appliance (4) and an outer surface (9) which is adapted to abut against the inner edge of the respective strap (3), wherein the reinforcement section (7) is recessed into at least part of the outer surface (9) in close proximity to the edge of the body (5).
5. The edge protector (1a-1c) according to claim 1, **characterized in that** the reinforcement section (7) extends from the outer surface (9), through the body (5), to the inner surface (8).
6. The edge protector (1a-1c) according to claim 1, **characterized in that** the width of the reinforcement section (7) is equal to or larger than the width of the strap (3).
7. A protective packaging assembly (2) for packing a household appliance (4), in particular a domestic refrigerator, the protective packaging assembly (2) being

characterized in that one or more than one edge protector (1a-1c) as defined in any one of claims 1 to 6 and one or more than one strap (3) for fastening the edge protectors (1a-1c) onto the respective edges of the household appliance (4) respectively, wherein the reinforcement sections (7) are arranged to bear the respective straps (3).

8. The protective packaging assembly (2) according to claim 7, **characterized in that** two longitudinal edge protectors (1a;1b) which are adapted to cushion the upper left edge and the upper right edge of the household appliance (4) respectively and a rectangular edge protector (1c) which is adapted to circumferentially cushion the bottom edges the household appliance (4).
9. The protective packaging assembly (2) according to claim 8, **characterized in that** two straps (3), wherein each longitudinal edge protector (1a;1b) has two reinforcement sections (7) which are arranged to bear the respective straps (3) and the rectangular edge protector (1c) has four reinforcement sections (7) which are arranged to bear the respective straps (3).
10. The protective packaging assembly (2) according to claim 8 or 9, **characterized in that** a cardboard box (10) for at least partly enclosing the edge protectors (1a-1c) and the household appliance (4), wherein each strap (3) is adapted to fasten the cardboard box (10) and the respective edge protector (1a-1c) onto the respective edge of the household appliance (4).
11. A method of manufacturing an edge protector (1a-1c) for use in a protective packaging assembly (2) which comprises at least one strap (3) for fastening the edge protector (1a-1c) onto the respective edge of a household appliance (4), in particular a refrigerator, the method being **characterized by** comprising:
 - a step of preparing a first mold and a second mold which are adapted for molding the body (5) of the edge protector (1a-1c) so as to have a main section (6) and a reinforcement section (7) respectively,
 - a step of injecting a resilient foam into the first mold so as to form the main section (6) of the body (5) for cushioning the household appliance (4) and
 - a step of injecting a resilient foam into the second mold so as to form the reinforcement section (7) of the body (5) for cushioning the household appliance (5) and for bearing the respective strap (3), wherein the compressive strength of the resilient foam inside the reinforcement section (7) is set higher

than the compressive strength of the resilient foam inside the main section (6).

12. The manufacturing method according to claim 11, **characterized in that** the first mold and the second mold are adapted for molding the body (5) of the edge protector (1a-1c) through double-injection molding.
13. The manufacturing method according to claim 11 or 12, **characterized in that** the resilient foam inside the main section (6) comprising polystyrene and the resilient foam inside reinforcement section (7) comprising polystyrene or rubber or another polymer.
14. The manufacturing method according to claim 13, **characterized in that** the density of the resilient polystyrene foam inside the reinforcement section (7) ranges between 30 to 40 kilogram per cubic meter.

Fig. 1

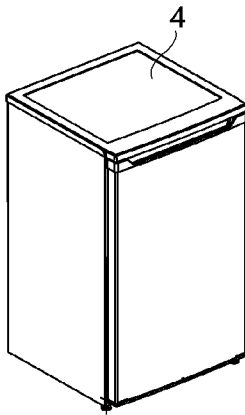


Fig. 2

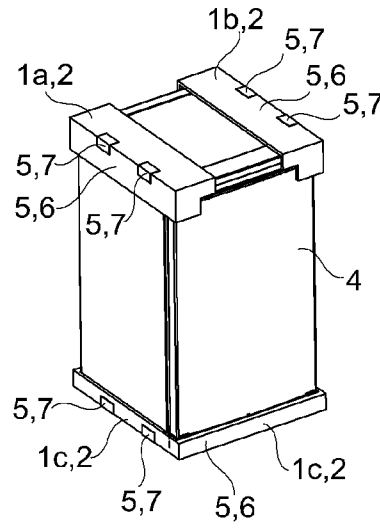


Fig. 3

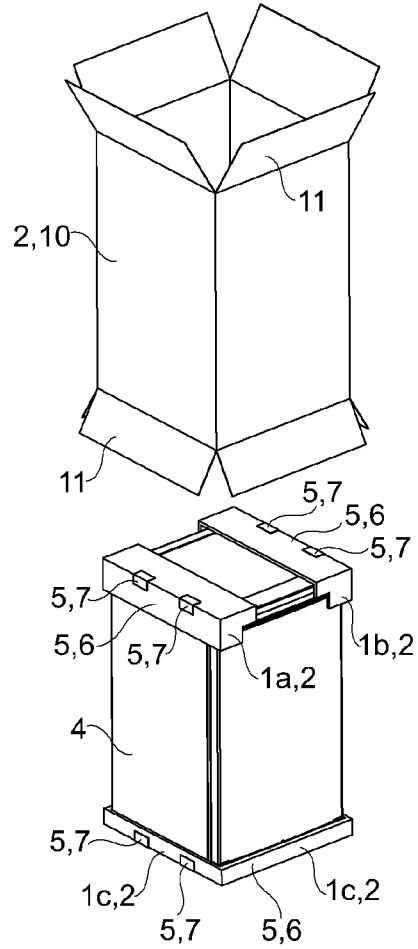


Fig. 5

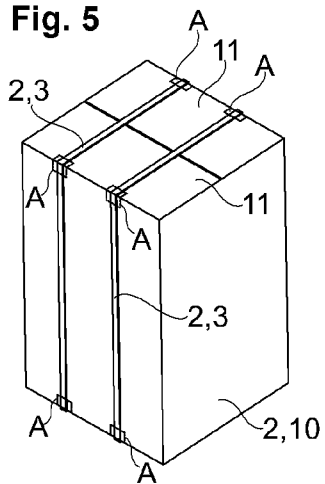


Fig. 4

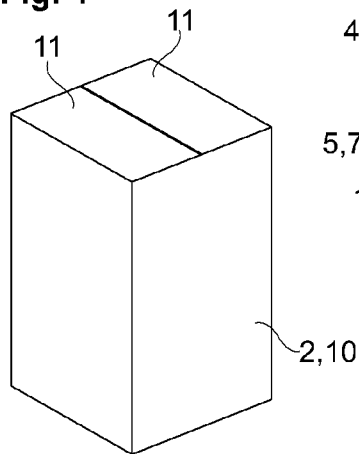


Fig. 6

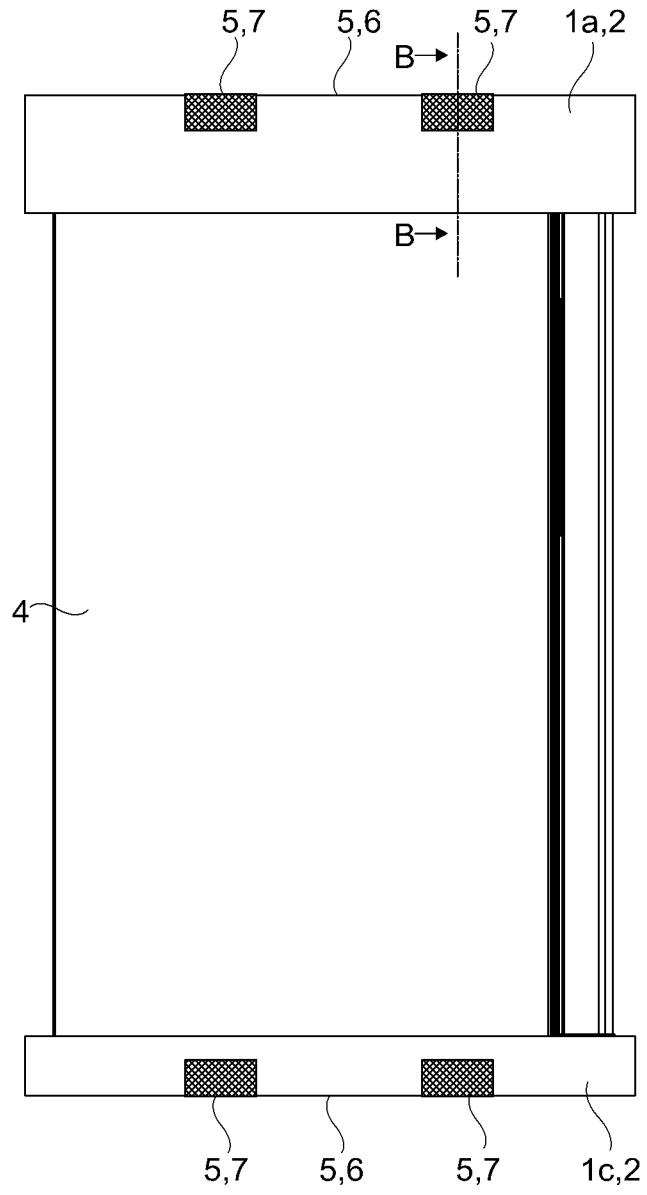
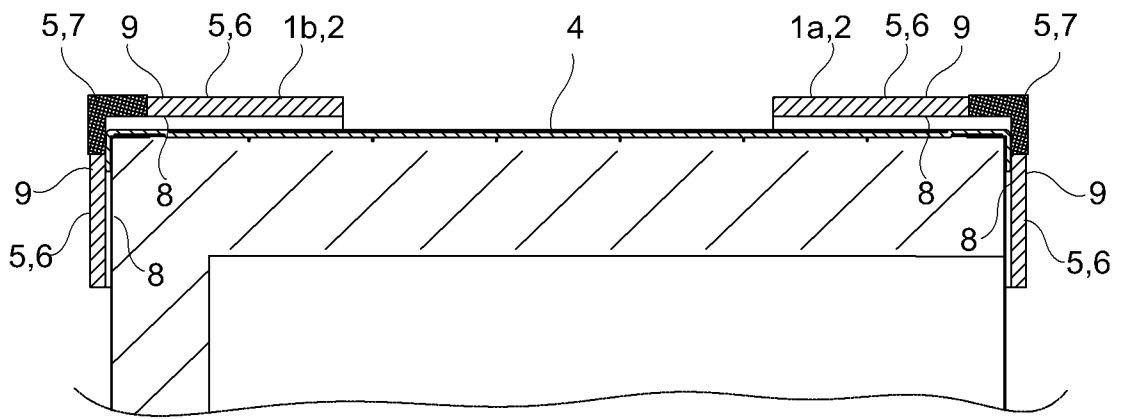


Fig. 7



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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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)
B65D

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

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X	DE 202 20 951 U1 (ARMACELL ENTERPRISE GMBH [DE]) 15 July 2004 (2004-07-15) paragraphs [0006] - [0010], [0027]; figures 1,2 -----	1,2,5
Y	WO 2010/067819 A1 (SHARP KK [JP]; FUKUI KAZUHIKO) 17 June 2010 (2010-06-17) figure 1 -----	7-10
Y		7-10

Further documents are listed in the continuation of Box C.

See patent family annex.

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Jervelund, Niels

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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