

Transport container with cushioning structure

5 FIELD OF THE INVENTION

The invention relates to a cushioning structure for transporting heavy, large and fragile goods, a container reducible in size comprising the cushioning structure, a method to load the goods into the container and a method to collapse the empty container.

10 BACKGROUND OF THE INVENTION

A large variety of containers for shipping goods are available. Fragile goods or sensitive equipments have to be secured against mechanical impacts acting on the container during shipment. Therefore containers are commonly filled with packaging material to absorb an eventual impact, e.g. different kinds of foam arranged between container wall and goods. This packaging material is commonly a one-way-material. Currently, there is strong demand to save resources and consequently to provide containers and packaging material usable frequently. Simultaneously, the containers and/or packaging material should be light material in order to reduce the transport costs. Light containers made of foldable corrugated cardboard as cushioning structure are recently introduced as packaging. To be able to ship fragile goods safely, the goods are placed in between two polyethylene (PE) foils fixed onto two corrugated cardboard frames. In closed transport vehicles, the temperature may raise significantly above room temperature. Occasionally the temperature may exceed 40° C, especially in countries located in the tropical region. The packaging material is also exposed to a high humidity. PE foils are not suitable for transports under such conditions. However there is a demand to provide shipping containers for safety transporting fragile goods in regions with transport temperatures occasionally exceeding 40°C and a humidity of 80% and more.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a cushioning structure suitable to safety transport heavy, large and fragile goods even under temperatures above 40 °C and containers reducible in size comprising these cushioning structures. A further object is to provide a method to safety transport heavy, large and fragile goods using these containers und to return empty containers in a space-saving manner.

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This object is solved by a cushioning structure for safety transporting heavy, large and fragile goods comprising a main frame with at least one bearing surface, a carrier foil at least bonded to the bearing surface of the main frame, preferably at least fully covering the at least one bearing surface, and covering the area between the bearing surfaces as
5 a carrying surface for the goods, wherein the main frame comprises multiple foldable inner and outer side flaps able to be folded into multiple supporting elements to support the bearing surface of the main frame with a height defined by the dimensions of the outer side flaps, wherein the carrier foil comprises a first foil, preferably an urethane foil, and a second foil, preferably an urethane foil, and an air cushion between the first and the
10 second foils. Beside multiple items to be transported, the term "goods" also comprises one single item to be transported.

Carrier foils, e.g. urethane foils, are known as foils providing a high loading capacity and a high tear-resistance, but single foils are only stable at temperatures below 40°C and at low
15 humidity. The new structure of the carrier foil comprising a first and a second foil with an air layer between the two foils enlarges the applicable temperature and humidity ranges. With urethane foils as first and second foil, a temperature of 60°C and a humidity of 90% are applicable without observing any stretch displacement of the carrier foil enabling the transport of heavy goods up to 50kg under these environmental conditions.

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In case of one bearing surface, a contiguous bearing surface is advantageous.

Cushioning structures with a contiguous bearing surface supported by the supporting elements are able to carry heavier goods compared to other cushioning structures of similar dimensions with non-contiguous bearing surfaces with a carrier foil attached to the
25 non-contiguous bearing surfaces. The load is distributed over a larger bearing surface in case of a contiguous bearing surface resulting in a lower load per bearing area. The term "contiguous" denotes a continuously connected area. Mathematically, this contiguous area is an area, where a first point inside this area can be connected to any other point inside this area by a continuous line without said continuous line leaving this area.

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The foldable inner and outer flaps provide sufficient support for the bearing surface of the main frame if folded into the supporting elements having any suitable profile to carry weight, preferably a tubular shape with a rectangular cross section. The foldable inner and outer side flaps provide a foldable cushioning structure, which can be in a two-
35 dimensional shape (structure) or a three-dimensional shape (structure) when folded as the

supporting elements. The flexibility to provide the same cushioning structure as a flat structure or as three-dimensionally shaped structure enables a transport of non-loaded cushioning structure in a flat and therefore volume-saving manner. The term "folded supporting elements" denotes a three-dimensional structure established by the inner and outer side flaps in a folded manner. The terms "inner side flap" and "outer side flap" refer to the direction of the side flaps with respect to the contiguous bearing surface of the main frame in the non-folded status. The Inner side flaps are fully enclosed by the contiguous bearing surface, when the main frame is in the two-dimensional shape. The outer side flaps direct to the opposite direction of the inner side flaps. The non-folded status denotes the cushioning structure being in a two-dimensional shape. Thus the empty two-dimensional cushioning structure (absent goods) can be transported and/or stored in a space saving manner. The carrier foil may extend over the bearing surfaces, e.g. also partly of fully covering the outer side flaps.

The shape of the main frame can be any suitable shape to transport the desired good. The area between the bearing surfaces and therefore the area of the carrier foil may vary depending on the goods to be transported. As an example, the carrying surface of the carrier foil may have areas of 0.25 m², 0.36 m², 0.49 m², 0.72 m², 1.00 m². In alternative embodiments, people skilled in the art may consider other areas of the carrying surface within the scope of this invention.

The lateral extension of the outer side flaps corresponds to the height of the supporting element in the folded status. To guarantee a safe transport of the goods preventing mechanical impacts from the outside acting on the transported goods, the height of the cushioning structure (= height of the supporting element) should be at least in the order of a few centimeters, e.g. 4 cm, 6 cm, 8 cm or 10 cm. A too large height would result in a bulky container for transporting the goods on the cushioning structures. In alternative embodiments, people skilled in the art may consider other heights within the scope of this invention.

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The bearing surface and the inner and outer side flaps of the main frame may be made of any suitable material to guarantee multiple use. As an example, plastic material can be used as suitable material providing a robust, but cushioning structure. Preferably all components of the main frame except the carrier foil are made of the same material. The previously mentioned components are preferably made of pressed paperboard providing a

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sufficient resilience to carry heavy good and being able to be recycled after reaching the end of life as cushioning structure after multiple use. Such cushioning structures of pressed paperboard can be used more than 100 times before replacement is required. The replaced cushioning structures can be easily recycled and re-used afterwards. In
5 alternative embodiments, people skilled in the art may consider other materials for main frame, the inner and outer side flaps within the scope of this invention. Before recycling, the carrier foil has to be detached from the main frame.

In an embodiment the carrier foil is bonded to the main frame by ultrasonic pressure
10 bonding, preferably without additional adhesives. Ultrasonic pressure bonding utilizes the exothermic effect of ultrasound to bond the foil to the main frame, and preferably also to the outer side flap, even if these parts are made of pressed paperboard. The ultrasound process enables an easy peel-off of the carrier foil in case of cushioning structures to be recycled eliminating the problem of release of environmental hormones, also known as
15 endocrine disturbing chemicals, to secure the logistic workers. The non-present adhesives enable a quick break-down and separation of the components of the cushioning structure for an easier recycling.

In another embodiment the carrier foil extends to the outer side flaps to increase the
20 bonding strength, especially in case of bonding without adhesives.

In another embodiment the carrier foil comprises reinforcement patches to locally support the carrying surface, preferably the patches are located in each corner of the carrying surface near the main frame. The reinforcement patches may be made of the same
25 material as the carrier foil or alternatively made of single foils, e.g. of urethane and/or polyethylene. Reinforcement patches in the corners of the carrying surface is advantageous, because the highest stress conditions during transport of goods occurs in the corners of the carrier foils. To further fix goods on the carrier foils, magic tape (adhesive tape of 3M) may be used.

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In an embodiment the bearing surface of the main frame has a rectangular shape with a first, a second, a third and a fourth part, wherein the first part is opposite to the third part and the second part is opposite to the forth part and each of the parts comprise one of the foldable inner side flaps facing towards the foldable side flap of the opposite part in a non-
35 folded status, preferably with inner side flaps having a triangular shape, more preferably

- with inner side flaps having a shape like a trapezium. The term "opposite" denotes the location of the parts within the main frame, not the orientation of the surfaces of the parts. Here, opposite parts are arranged essentially in one plane all facing upwards or downwards depending on the orientation of the main frame. A square shape of the main
- 5 frame is a particular embodiment of the rectangular shape. As an example the rectangular area of the main frame may be 96 cm x 65 cm. In alternative embodiments, people skilled in the art may consider other sizes within the scope of this invention. However, a rectangular shape consumes the smallest possible loading space (or volume) if this structure is loaded (stacked) together with other corresponding structures in a transport
- 10 vehicle and/or container. The best transport efficiency is achieved with rectangular shapes of shipped items such as cushioning structure or containers with correspondingly adapted shaped to comprise such cushioning structures avoiding empty interspaces within a loading volume.
- 15 In another embodiment the main frame comprises at least one corner element, preferably an L-shaped corner element, fixed to the bearing surface of the main frame in at least one corner, preferably in each corner, of the main frame to strengthen the main frame. The corner element may be fixed to the main frame with suitable mechanical and/or chemical fastening means, e.g. rivets riveted from both sides (side of corner element and lower side
- 20 of main frame). Preferably, the main frame is sandwiched between the corner element on top of the bearing surface and a second corner element arranged on the opposite side of the main frame below the corner element to further improve the strength (loadability) of the main frame. Here the rivets fix both corner elements to the main frame. The corner element as well as the second corner element may be made of any suitable material to
- 25 improve the strength of the cushioning structure such as metal and/or plastic elements. In a preferred embodiment, the corner element is made of pressed paperboard to be able to be recycled. Preferably the corner elements are L-shaped corner elements in case of rectangular bearing surfaces of the main frame.
- 30 In another embodiment the areas, preferably rectangular areas, of the outer side flaps are smaller than the areas of the inner side flaps. Since the inner flaps can occupy the full area between the bearing structures of the main frame, the areas of the inner side flaps are designed larger than the areas of the outer side flaps in order to build the same supporting elements to achieve a cushioning structure occupying a smaller total area
- 35 compared to cushioning structures, where the areas of the outer side flaps are larger than

the areas of the inner side flaps. The required space to transporting non-folded two-dimensional cushioning structures is reduced leading to a more efficient transporting.

In another embodiment the supporting elements are established by the inner and outer
5 side flaps, which are attached to each other by at least one first fixation means, preferably hook-and-loop fasteners, per corresponding inner and outer side flaps. The term "established" denote the folding-together (joining) of the inner and outer side flaps to build the support elements. The term "fixation means" (either first or second) denotes any kind of means able to connect (join) two parts, preferably a hook-and-loop fasteners
10 comprising fasteners having hooks and loops, Velcro fasteners, fasteners with mushroom heads or the like. The first fixation means are attached to the inner and/or outer side flaps with suitable means such as rivets or adhesive tapes. The corresponding first fixation means of inner and outer side flap will hold the corresponding outer and inner side flaps together. The mounting of the first fixation means to the inner and outer side flaps has no
15 influence on the bonding strength of inner and outer side flap established by the first fixation means. People skilled in the art may consider other first fixations of the hook-and-loop-fasteners within the scope of this invention. The first fixation means, e.g. the hook-and-loop fasteners, may be attached to the inner and/or outer side flaps at any suitable location, preferably on the inner side flap at the largest distance to the main frame and
20 aligned to the middle of the corresponding bearing surface. Depending on the dimensions of the inner side flap, the corresponding counterpart of the first fixation means, e.g. the hook-and-loop fastener, has to be arranged on a suitable location at the outer side flap. Alternatively, the corresponding counterpart may also be arranged on the bearing surface of main frame.

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In an embodiment the neighbored outer side flaps are connected to each other by at least one second fixation means, preferably hook-and-loop fasteners, arranged on the outer surface of at least two outer side flaps, preferably of each of the outer side flaps. The term "outer surface" denotes the surface, which is facing away from the volume surrounded by
30 the folded supporting elements in the three-dimensional status of the cushioning structure ready for being loaded with good. Alternatively one or more second fixation means, preferably hook-and-loop fasteners, may also be arranged on each outer side flap. In a preferred embodiment two opposite outer side flaps comprise foldable side areas to be folded around the corner of the supporting element in order to be connected to the
35 corresponding neighbored outer side flap. Here the second fixation means are arranged

on the outer surface of the side areas and on the inner surface of the neighbored outer side flap, or vice versa. The term inner surface denotes the surface of the outer side flap opposite to its outer surface. The second fixation means to connect (join) neighbored outer side flaps may be attached to the outer side flaps in the same manner as previously described first fixation means for inner and outer side flaps.

In another embodiment the support elements have a rectangular tubular profile, which provides the best resilience against loaded weights.

10 In another embodiment the cushioning structure further comprises reinforcement elements separate from the main frame suitable to be inserted into the supporting elements to further increase the resilience of the main frame to carry goods with weights of more than 30 kg, preferably more than 40 kg, more preferably more than 50 kg. The reinforcement elements may be made of any suitable material, preferably made of the same material as
15 the main frame and its components (inner and outer side flaps), more preferably made of pressed paperboard in order to allow a recycling of damaged reinforcement elements. Pressed paperboard allows to use the reinforcement element more than 100 times before any necessity occurs to replaced the elements. In a preferred embodiment the reinforcement elements have a profile adapted to the profile of the supporting elements,
20 preferably a profile adapted to fit into the supporting elements in a snug fit manner. If the profiles of supporting elements and reinforcement elements as fitting together, the highest resilience giving the highest loading capacity of the cushioning structure is achieved.

In another embodiment the reinforcement elements are foldable into the profile adapted to
25 the profile of the supporting elements and are collapsible into a two-dimensional structure. Reinforcement elements can be transported in the most volume saving manner in a collapsed structure, when the non-loaded cushioning structure is transported. The term "foldable" comprises any kind of folding methods.

30 In a preferred embodiment the reinforcement elements in a folded status have a profile adapted to the profile of the supporting elements, preferably a profile adapted to fit into the supporting elements in a snug fit manner. If the profiles of supporting elements and reinforcement elements as fitting together, the highest resilience giving the highest loading capacity of the cushioning structure is achieved.

The invention further relates to a container for safety transporting heavy, large and fragile goods comprising a bottom section, a midsection as a container side wall fitting into the bottom section, at least a first and a second cushioning structure according to the present invention with the first cushioning structure as a bottom element fitting into the midsection
5 and for being placed on top of the bottom section with the carrier foil facing upwards to carry good and with the second cushioning structure for being placed on top of the goods with the carrier foil facing downwards to sandwich the goods between the carrier foils of first and second cushioning structures, and a top section fitting on top of the midsection to close the container. Here the top section is placed on top of the midsection and the
10 second cushioning structure if loaded with goods. During the transport of a container without goods inside, the volume of the container can be reduced and subsequently the top section is placed on top of the bottom section. The midsection may further comprise reinforcement sleeves at the upper and lower edges of the midsection enabling a stacking of the containers of at least 2 meter stacking height. The reinforcement sleeves further
15 improves the reusability (multiple use) of the midsections.

In another embodiment the bottom section, the top section and the midsection are made of pressed paperboard. Pressed paperboard provides a high resilience and the possibility of being easily recycled.

20 In another embodiment the midsection is foldable fitting into the bottom section in a collapsed status, preferably comprising at least one hook-and-loop fastener to be fixed to the first and/or second cushioning structures. In case of empty containers (=without goods inside), the containers can be transported having a reduced size, because the collapsed
25 midsection is placed inside the container now defined by bottom and top section solely.

In another embodiment the midsection comprises suitable closing means to be fixed to the top section and/or bottom section in order to improve the robustness of the container during transport. People skilled in the art may choose any suitable fixation means within
30 the scope of this invention, e.g. anchors, hooks, hook-and-loop fasteners, bolts, screws or the like. The closing means enable stacking of the containers of at least 2 meters stacking height.

The invention further relates to a method for loading heavy, large and fragile goods for a
35 safe transport into a container to the present invention comprising the steps of

- placing the midsection on top of the bottom section,
- placing the first cushioning structure with folded support elements, preferably comprising reinforcement elements, into the midsection and on top of the bottom section with the carrier foil facing upwards,
- 5 - placing the to-be-transported goods on top of the carrier foil,
- placing the second cushioning structure with folded support elements, preferably comprising reinforcement elements, into the midsection on top of the goods with the carrier foil facing downwards, and
- 10 - placing the top section over the second cushioning structure and the midsection in order to close the container, preferably secure the closed containers at least one fixation means, preferably a securing strap.

The invention further relates to a method for transporting a container according to the present invention without loaded goods

- 15 - collapsing the foldable midsection
- placing the collapsed midsection on top of the bottom section,
- collapsing the first and second cushioning structures by unfolding the support elements
- placing the first and second cushioning structures on top of the bottom section
- 20 or on top of the collapsed midsection, preferably together with reinforcement elements of the first and/or second cushioning structures, and
- placing the top section over the bottom section in order to close the container reduced in size.

25 BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

30 In the drawings:

Fig.1: an embodiment of the cushioning structure according to the present invention in a non-folded two-dimensional structure (shape) without carrier foil.

Fig.2: another embodiment of the cushioning structure according to the present invention in a non-folded two-dimensional structure (shape) without carrier foil.

35 Fig.3: the carrier foil according to the present invention on bearing surface of supporting

element.

Fig.4: cushioning structure according to the present invention in a non-folded two-dimensional structure (shape) with carrier foil.

5 Fig.5: cushioning structure according to the present invention in a folded status (structure) with reinforcement elements to be inserted into the supporting elements.

Fig.6: a container according to the present invention transporting goods comprising bottom section, midsection and top section carrying two cushioning structures and goods.

10 Fig.7: a collapsed container according to the present invention for empty back transport comprising bottom section and top section carrying two cushioning structures and the midsection

DETAILED DESCRIPTION OF EMBODIMENTS

15 Fig. 1 shows an embodiment of a cushioning structure 1 according to the present invention in an unfolded two dimensional structure. The main frame 11 comprises a rectangular contiguous bearing surface 2 defining an inner area, where the inner side flaps 3 as gray areas with trapezium shape are located. The rectangular bearing surface 2 has four parts as subareas defining the shape of a rectangular frame. Each of the four
20 parts of the bearing surface 2 has an inner side flap 3 attached to the bearing surface 2 at its inner side. The term "attached" denotes any kind of fixed connection. The short sides of the trapezoidal inner side flaps are pointing together. Four outer side flaps 4 are arranged at outer sides of the four parts of the rectangular bearing surface 2. The outer side flaps 4 together with the inner side flaps 3 define the supporting elements in a folded status
25 (structure). Advantageous, the folded status is supported by suitable first fixation means 32 and 42 providing a proper connection between inner side flaps 3 and outer side flaps 4. In this embodiment, one first fixation means 32 is arranged on the inner side flap 3 and the corresponding counterpart of the first fixation means 42 is arranged on outer side flap 4. The fixation means 32, 42 might by hook-and-loop-fasteners enabling fast and easy
30 establishment of the supporting structure for the bearing surface 2 of the main frame 11 as well as fast collapsing of the supporting structure to provide a main frame 11 as a two-dimensional structure (shape). The height of the supporting structure of connected inner and outer side flaps (by the fixation means) is defined by the height of the outer side flaps 4. The inner side flaps 3 comprise foldable lines 31 to fold the inner side flaps 3 in order to
35 establish the supporting elements for the bearing surface 2 to provide a cushioning

structure 1 ready to be loaded with goods. The carrier foil is not shown in figure 1 for ease of understanding.

Fig.2 shows another embodiment of the cushioning structure 1 according to the present invention, where the outer side flaps 41 of two opposite sides of the bearing surface 2 extend to the outer dimensions of the neighbored outer side flaps 4. The dashed lines at the outer parts of the extended outer side flap 41 indicate, that the extended area can be folded to the neighbored outer side flaps 4 to establish joined supporting elements with improved resilience, because the neighbored outer side flaps 4 and 41 can be fixed together with second fixation means 43 and 413 arranged on the outer sides of the outer side flaps 4 and 41. The second fixation means can be the same kind of fixation means as the first fixation means 32 and 42.

Fig.3 shows a cross section of the cushioning structure as shown in fig 1 or 2 in a three-dimensional structure with folded inner and outer side flaps 3, 4 connected by the fixation means 32, 42 of the inner and outer side flaps 3, 4 establishing a supporting element with a rectangular tubular shape to support the bearing surface 2. The inner side flap 3 is folded along the foldable lines 31. The supporting element comprises a reinforcement element 7 (dashed line) arranged inside the supporting element of inner and outer side flap 3,4. On top of the bearing surface 2, the carrier foil 5 is bonded to the bearing surface 2 within a bonding area 55. The carrier foil 5 comprises a stack of a first foil 51, a second foil 53 and an air cushion 52 between first and second foil 51, 53. Preferably, the first and second foils are urethane foils. The bonding process of the carrier foil to the bearing surface 2 comprises the steps of placing the first foil 51 on top of the bearing surface 2, then placing the second foil 53 on top of the first foil 51 allowing air to remain between the two foils 51, 53 to build the air cushion 52. Then ultrasonic welding is applied to bond the carrier foil 5 to the bearing surface 2 of the main frame 11 sealing the air cushion laterally between first and second foil.

Fig.4 shows the same cushioning structure as present in figure 1 with the carrier foil 5 covering the inner side flaps in an unfolded two-dimensional structure of the cushioning structure 1. The inner side flaps arranged below the carrier foil 5 are not shown for ease of understanding. The carrier foil 5 is attached to the main frame 1 with a suitable process, e.g. ultrasonic welding, fully covering the bearing surface 2. Here, the bonding strength between carrier foil 5 and main frame 1 is improved compared to embodiments, where the

carrier foil 5 is only attached to parts of the bearing surface 2. An improved bonding strength enables loading of the carrier foil with heavier goods. In other embodiments according to the present invention, the carrier foil 5 may be bonded additionally to at least parts of the outer side flaps 4 to further improve the bonding strength. In an preferred
5 embodiment, the carrier foil 5 comprises reinforcement patches 54, e.g. small additional foils applied to the carrier foil 5 close to the edges of the carrying surface where the highest forces occur, e.g. by gluing the reinforcement patches 54 on top of the carrier foil 5. The reinforcement patches may have shapes different from the shape shown in fig. 4 within the scope of this invention. In this embodiment, the main frame 11 is a one-part
10 piece, where only the carrier foil is attached to the main frame in a second process step. In alternative embodiments, the inner and outer side flaps may be fixed to main frame in another additional process.

Fig.5 shows the cushioning structure 1 of fig. 1 or 2 in a three-dimensional structure,
15 where the bearing surface 2 of the main frame 11 is supported by the folded inner and outer side flaps 3 and 4 connected to each other by fixation means 32 establishing the supporting elements. The corresponding fixation means 42 of the outer side flaps are covered by the inner side flaps 3 and therefore not shown in this figure. The supporting elements have a rectangular cross section of width and height defined by the height of
20 outer side flap 4 and the width of the bearing surface. The foldable lines 31 of the inner side flaps are adapted to the width of the bearing surface 2 and/or the height of the outer side flap 4. In an embodiment, the main frame 11 comprises one or more corner elements 6, e.g. one corner element 6 in each corner of the bearing surface 2, to strengthen the bearing surface in the corners further improving the loadability of the bearing surface 2.
25 The corner elements 6 might have any shape suitable for the corresponding shape of the bearing surface. For rectangular bearing surfaces, the corner elements 6 preferably have a L-shape. To further improve the loadability, a corresponding corner element might be arranged at the bottom side of the bearing surface (inside the supporting elements) below the shown corner elements 6. The corner elements can be attached to the bearing surface
30 with any suitable method, e.g. with rivets. The corner elements might be arranged underneath the carrier foil 5 or on top of the carrier foil 5. The carrier foil 5 is indicated by two rolling lines in the middle of the main frame 11. In fig. 5, the cushioning structure 1 comprises reinforcement elements 7 inside the supporting elements. Since the supporting elements are closed, the reinforcement elements 7 are schematically shown outside the
35 supporting elements for ease of understanding, where arrow 71 shall indicate the intended

location of the reinforcement elements 7 inside the supporting elements. Here, only two reinforcement elements 7 are shown. Depending on the required reinforcement of the cushioning structure 1 to carrier the to-be-transported goods, the supporting elements may be reinforced by arranging one, two, three or four reinforcement elements 7 inside the supporting elements. To establish a supporting structure with reinforcement elements 7 inside, the reinforcement elements 7 have to be placed below the bearing surface before folding the inner side flaps 3 around the reinforcement elements 7 in order to be connected with the outer side flaps 4.

Fig.6 shows a container 8 according to the present invention comprising a bottom section 81, a midsection 82 and a top section 83. The midsection 82 fits into the bottom and top sections 81, 83. The midsection is the side wall of the container 8. Depending on the size of the goods, the height of the midsection 82 may be different for different containers 8. Inside the container, two cushioning structures 1 with established supporting elements are arranged. The first cushioning structure 1 fitting into the container 8, especially into the midsection 82, is arranged on top of the bottom section 81. To avoid slippage of the cushioning structure during transport, the sizes of the bottom section 81 and the midsection 82 have to be adapted to the size of the cushioning structure 1. The same holds for the second cushioning structure 1 with respect to midsection 82 and top section 83. The carrier foil 5 of the first cushioning structure 1 is facing upwards to be loaded with goods 10. The goods 10 are placed on top of the carrier foil 5 of the first cushioning structure 1. Subsequently, the second cushioning structure 1 is placed on top of the goods 10 with the carrier foil facing towards the goods 10 (facing downwards). The site of the container is adapted to push the carrier foils 5 of both cushioning structure towards the goods 10 in order to prevent any slippage of the goods 10 on the carrier foils 5 during transport. The bottom, mid and top sections 81, 82, 83 of the container 8 are fixed together with any suitable closing means 9, 91 such as claps, hinges or anchors. Alternatively, one or more transport belts 91 may further prevent the container 8 from being opened accidentally. The midsection 83 may further comprise reinforcement sleeves arranged at the upper and/or lower edges of the midsection 83. Such containers are stackable at least up to 2 meter stacking height. The reinforcement sleeves may be made of any suitable material, preferably made of metal.

After transport, the goods 10 will be de-loaded from the container 8 and the empty container 8 will be returned to another loading facility to be loaded again. The collapsible

cushioning structures 1 and a collapsible midsection 82 provide the possibility to reduce the size of the container 8 when being transported empty, see fig.7. The midsection comprises at least two foldable lines in order to be able to collapse the midsection 82, preferably one foldable line on each short side of the midsection 82 assuming a container
5 8 with a rectangular shape of the bottom section 81. The foldable midsection 82 and the first and second cushioning structures 1 are collapsed by unfolding the supporting elements, then the three parts are placed in any sequence on top of the bottom section 81, preferably together with reinforcement elements 7 (collapsed or non-collapsed). The container 8 with reduced size is closed by placing the top section 83 over the bottom
10 section 81. For the empty transport, the same closing means 9, 91 can be used.

While the invention has been illustrated and described in details in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and not restrictive; the invention is not limited to the disclosed embodiments.

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Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a
20 plurality. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. Any reference sign in the claims should not be construed as limiting the scope.

LIST OF REFERENCE SIGNS

	1	Cushioning structure
	11	main frame
5	2	bearing surface
	3	inner side flap
	31	foldable lines of inner side flap
	32	fixation means of the inner side flaps
	4	outer side flap
10	41	another embodiment of an outer side flap
	42	fixation means of outer side flaps to be connected to the corresponding fixation means of the inner side flaps
	43	fixation means of outer side flaps to be connected to the corresponding fixation means of neighbored outer side flaps.
15	413	fixation means of outer side flaps to be connected to the corresponding fixation means of neighbored outer side flaps.
	5	carrier foil
	51	first foil
	52	air cushion
20	53	second foil
	54	reinforcement patches
	55	bonding area of carrier foil
	6	corner element
	7	reinforcement elements
25	71	arrow indicating insertion of the reinforcement elements into the supporting elements
	8	container
	81	bottom section of the container
	82	midsection of the container
30	83	top section of the container
	9	closing means
	91	transport belt as a closing means
	10	goods

CLAIMS

1. A cushioning structure (1) for safety transporting heavy, large and fragile goods comprising a main frame (11) with at least one bearing surface (2), a carrier foil (5)
5 at least bonded to the bearing surface (2) of the main frame (11), preferably at least fully covering the at least one bearing surface (2), and covering the area between the bearing surfaces (2) as a carrying surface for the goods (10), wherein the main frame (1) comprises multiple foldable inner and outer side flaps (3, 4, 41) able to be folded into multiple supporting elements to support the bearing surface
10 (2) of the main frame (11) with a height defined by the dimensions of the outer side flaps (4, 41), wherein the carrier foil (5) comprises a first foil (51), preferably an urethane foil, and a second foil (53), preferably an urethane foil, and an air cushion (52) between the first and the second foils.
- 15 2. The cushioning structure (1) according to claim 1, characterized in that the carrier foil (5) is at least bonded to the bearing surface (2) of the main frame (11) by ultrasonic pressure bonding, preferably without additional adhesives.
3. The cushioning structure (1) according to claim 2, characterized in that the carrier
20 foil (5) extend to the outer side flaps (4, 41) to increase the bonding strength
4. The cushioning structure (1) according to any of the preceding claims, characterized in that the carrier foil (5) comprises reinforcement patches (54) to locally support the carrying surface, preferably the reinforcement patches (54) are
25 located in each corner of the carrying surface near the bearing surface (2) of the main frame (11).
5. The cushioning structure (1) according to any of the preceding claims, characterized in that the bearing surface (2) of the main frame (11) has a
30 rectangular shape with a first, a second, a third and a fourth part, wherein the first part is opposite to the third part and the second part is opposite to the forth part and each of the parts comprise one of the foldable inner side flaps (3) facing towards the foldable side flap (3) of the opposite part in a non-folded status, preferably with inner side flaps (3) having a triangular shape, more preferably with
35 inner side flaps (3) having a shape like a trapezium.

6. The cushioning structure according to claim 5, characterized in that the main frame (11) comprises at least one corner element (6), preferably an L-shaped corner element, fixed to the bearing surface (2) of the main frame (11) in at least one corner, preferably in each corner, of the main frame (11) to strengthen the main frame (11).
7. The cushioning structure (1) according to any of the preceding claims, characterized in that the areas, preferably rectangular areas, of the outer side flaps (4, 41) are smaller than the areas of the inner side flaps (3).
8. The cushioning structure according to any of the preceding claims, characterized in that the supporting elements are established by the inner and outer side flaps (3, 4, 41), which are attached to each other by at least one first fixation means (32, 42), preferably hook-and-loop fasteners, per corresponding inner and outer side flaps (3, 4, 41).
9. The cushioning structure according to any of the preceding claims, characterized in that neighbored outer side flaps (4, 41) are connected to each other by at least one second fixation means (43, 413), preferably hook-and-loop fasteners, arranged on the outer surface of at least two outer side flaps (4), preferably of each of the outer side flaps (4).
10. The cushioning structure according to any of the preceding claims, characterized in that the support elements have a rectangular tubular profile.
11. The cushioning structure (1) according to any of the preceding claims, characterized in that the main frame (11) is made of pressed paperboard.
12. A container (8) for safety transporting heavy, large and fragile goods comprising a bottom section (81), a midsection (82) as a container side wall fitting into the bottom section (81), at least a first and a second cushioning structure (1) according to claim 1 with the first cushioning structure (1) as a bottom element fitting into the midsection (82) and for being placed on top of the bottom section (81) with the carrier foil (5) facing upwards to carry good (10) and with the second

cushioning structure (1) for being placed on top of the goods (10) with the carrier foil (5) facing downwards to sandwich the goods (10) between the carrier foils (5) of first and second cushioning structures (1), and a top section (83) fitting on top of the midsection (82) to close the container (8).

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13. The container according to claim 12, characterized in that bottom section (81), the top section (83) and the midsection (82) are made of pressed paperboard.
14. The container according to claim 12 or 13, characterized in that the midsection
10 (82) is foldable fitting into the bottom section (81) in a collapsed status, preferably comprising at least one hook-and-loop fastener to be fixed to the first and/or second cushioning structures (1).
15. The container according to any of claims 12 to 14, characterized in that the
15 midsection (82) comprises suitable closing means (9, 91) to be fixed to the top section (83) and/or bottom section (81).
16. A method for loading heavy, large and fragile goods for a safe transport into a container (8) according to claim 12 comprising the steps of
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 - placing the midsection (82) on top of the bottom section (81),
 - placing the first cushioning structure (1) with folded support elements, preferably comprising reinforcement elements (7), into the midsection (82) and on top of the bottom section (81) with the carrier foil (5) facing upwards,
 - placing the to-be-transported goods (10) on top of the carrier foil (5),
 - 25 - placing the second cushioning structure (1) with folded support elements, preferably comprising reinforcement elements (7), into the midsection (82) on top of the goods (10) with the carrier foil (5) facing downwards, and
 - placing the top section (83) over the second cushioning structure (1) and the midsection (82) in order to close the container (8), preferably secure the
30 closed containers (8) at least one fixation means (9, 91), preferably a securing strap (91).

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17. A method for transporting a container (8) according to claim 12 without loaded goods
- collapsing the foldable midsection (82),
 - placing the collapsed midsection (81) on top of the bottom section (81),
 - 5 - collapsing the first and second cushioning structures (1) by unfolding the support elements,
 - placing the first and second cushioning structures (1) on top of the bottom section (81) or on top of the collapsed midsection (82) , preferably together with reinforcement elements (7) of the first and/or second cushioning
 - 10 structures (1), and
 - placing the top section (83) over the bottom section (81) in order to close the container (8) reduced in size.