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(54) Sytems and methods for packaging trays of plantlets

(57) Packaging systems, apparatuses, and methods are provided for improving handling and shipment of plantlets. A carton carrier (10) for transporting trays (50) of plantlets is provided, which includes a bottom panel (12) for receiving plantlet (50) trays having first and second ends (54) and first and second sides (52). The carton carrier also includes supporting side walls (30) extending upwardly from the first and second sides of the bottom panel. The supporting side walls (30) each define a support surface or shoulder (34) at the top thereof. The carton carrier (10) may also include end wall panels (20) extending outwardly from the first and second ends of the bottom panel (12). The end wall panels (20) may be configured to be foldable upwardly from the bottom panel to form end walls.

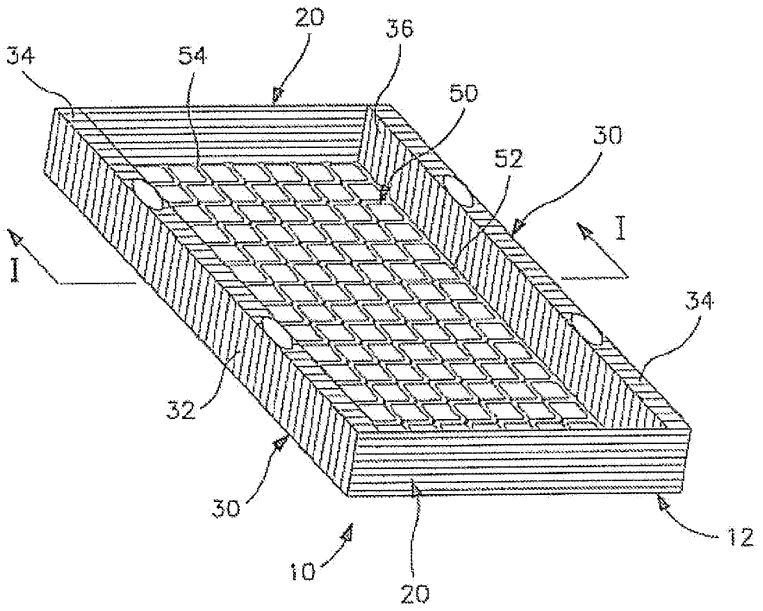

FIG. 1

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Description

TECHNICAL FIELD

[0001] The subject matter described herein relates generally to systems, apparatuses, and methods for transporting plantlets. More particularly, the subject matter disclosed herein relates to the packaging of plantlets for transport employing carton carriers on which trays of plantlets may be placed.

BACKGROUND

[0002] Shipping of plantlets, such as small or fragile plants, seedlings, cuttings, or the like, that have yet to reach maturity has always posed certain challenges for growers, distributors, and retailers. Keeping the plants in a viable condition and protecting them from handling damage are primary concerns during shipping. Further, distributors need to be able to ship plantlets in bulk to help maximize efficiencies associated with delivery and handling to lower the cost associated with each plantlet.

[0003] Often, multiple trays of plantlets are stacked within a box container for bulk shipment of plantlets. The trays provide a holding area for soil to provide nutrients and water to each plantlet during shipment. To prevent the plantlets from being crushed or damaged by the stacking of the trays, the trays are often placed on stackable carton carriers that are insertable and stackable within the box container. While carton carriers may be made of many different materials, corrugated fiberboard carton carriers are typically used due to the fact that they are sturdy and inexpensive. Prefabricated corrugated fiberboard carton carriers that are reinforced on their bottoms and sides provide great durability. Such prefabricated carton carriers also greatly increase cost of the shipment of the plantlets due to their preassembly and bulk.

[0004] Unassembled flat sheets of corrugated fiberboard, typically referred to as blanks, may also be used to create cartons that are stackable within boxes for holding trays of plantlets. Blanks may be used that provide support on all sides and the bottom of the carton carriers when assembled. However, these blanks have complex folding instructions and are often complicated to assemble. The number of folds to be made and the specific order in which the folding of the blanks must occur to create these carton carriers greatly impede the packaging of plantlets within the fields and green houses where the plantlets are to be packed. Therefore, the cost of assembly greatly increases the shipment cost associated with the plantlets.

[0005] Simple blanks have been developed that can be formed into carton carriers having two walls which run parallel to each other. These carton carriers are easy to create from their corresponding blanks. The workers who load the plantlets can easily form a carton carrier by folding a first side and a second side of the blank to create the two parallel walls, In this manner, the carton carrier is formed by the parallel side walls having a bottom panel disposed between the side walls. The bottom panel provides a surface on which the tray of plantlets may rest. The side walls may also provide support for other carton carriers to be stacked above. By easily forming a carton carrier having two side walls, loading efficiencies can increase, thereby decreasing loading times and shipping cost associated with the plantlets.

[0006] While blanks used to form these two-sided carton carriers can increase loading efficiencies, other problems arise with these carton carriers when they are used to ship trays of plantlets. Due to the nature of the plantlets and plantlet trays to be shipped, these two-sided carton carriers tend to bend along the bottom panel of the carton carrier parallel to the side walls. This bending of the carton carriers leads to an increased chance of plant damage and the collapsing of stacks of carton carriers within the shipping box.

[0007] Also, the plantlet trays help to hold moisture within the soil in which the plantlets are placed to help sustain the plantlets. This moisture often evaporates within the box. The fiberboard of the carton carriers absorbs this moisture causing the carrier to lose strength. This is especially true on the bottom panel on which a plantlet tray rests. The weight of the plantlet tray causes the now moist bottom panel to sag. The sagging bends the carton carrier and the trays under its own weight, thereby increasing the chances of the sagging carton carrier to collapse and also causing the trays to bend inward which can lead to damage of the plantlets.

[0008] In light of the above, a need exists for improved handling of plantlet trays within transport boxes, particularly with regard to decreasing the likelihood of damage to the plantlets within the transport boxes, while not negatively effecting loading efficiencies of these boxes.

SUMMARY

[0009] In accordance with this disclosure, novel packaging systems, apparatuses, and methods are provided for improving handling and shipment of plantlets.

[0010] It is a principal purpose of the present disclosure therefore to provide novel packaging systems, apparatuses, and methods for transporting trays of plantlets, such as within carton carriers and plantlet transport boxes. This and other purposes as may become apparent from the present disclosure are achieved, at least in whole or in part, by the subject matter described herein.

[0011] In one embodiment, the invention relates to a packaging system for transporting plantlet trays, the system comprising:

(a) a carton carrier comprising:

(i) a bottom panel having first and second ends and first and second sides, the bottom panel being configured to receive plantlet trays,

(ii) supporting side walls extending upwardly from the first and second sides of the bottom panel, the supporting side walls defining an upper support surfaces or shoulders, and
(iii) end wall panels extending outwardly from the first and second ends of the bottom panel, the end wall panels configured to be foldable upwardly from the bottom panel to form end walls; and

(b) a transport box having box side walls and box end walls, the transport box being configured to receive one or more carton carriers within an interior of the transport box such that the supporting walls and the end walls of each carton carrier inserted therein are supported by the box side walls and the box end walls.

[0012] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein each supporting side wall of the carton carrier comprises an inner side wall panel, an outer side wall panel, and a top shelf panel.

[0013] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein each supporting side wall of the carton carrier has a triangular cross-section.

[0014] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein each top shelf panel of the carton carrier is disposed between the corresponding inner side wall panel and the corresponding outer side wall panel.

[0015] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein the triangular cross-section of each supporting side wall comprises the top shelf panel forming the upper support surface of the respective supporting side wall and the corresponding inner side wall panel and corresponding outer side wall panel converging at a respective side of the bottom panel.

[0016] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein sides of the plantlet tray abut the inner side wall panels of the carton carrier about a top surface of the tray.

[0017] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein the carton carrier is formed from a blank.

[0018] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein the supporting side walls of the carton carrier have a specific height to provide space for the plantlets disposed within the plantlet tray.

[0019] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein the carton carrier is fiberboard, particularly a corrugated cardboard.

[0020] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein ribs are defined by the corrugated cardboard and strengthen the carton carrier in at least one of a width direction or a height direction.

[0021] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein the end walls of the carton carrier contact the supporting side walls when both the ends walls and the supporting side walls extend upright.

[0022] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein the end walls of the carton carrier contact the ends of the tray of plantlets when the ends walls extend upright.

[0023] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein the upper support surface of the supporting side walls of the carton carrier provides a stackable surface on which another carton carrier may be placed.

[0024] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein multiple carton carriers are stackable within the transport box.

[0025] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein the transport box has a height that permits multiple carton carriers to be stacked on top of one another within the transport box.

[0026] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein the height of the transport box corresponds to a height of a specified number of carton carriers such that the upper support surface of the top carton carrier is flush with the top of the transport box once the transport box is closed.

[0027] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein the transport box includes inner lids and outer lids that form at least one of a top wall or a bottom wall of the transport box when the inner and outer lids are in closed positions.

[0028] In one embodiment, the invention relates to a packaging system as disclosed herein before, wherein the inner lids of the transport box comprise edges that abut one another when the inner lids are in a closed position and the outer lids comprise edges that abut one another when the outer lids are in a closed position.

[0029] In one embodiment, the invention relates to a carton carrier for transporting trays of plantlets comprising:

(a) a bottom panel having first and second ends and first and second sides, the bottom panel being configured to receive plantlet trays,
(b) supporting side walls extending upwardly from the first and second sides of the bottom panel, the supporting side walls defining an upper support surface or shoulder, and
(c) end wall panels extending outwardly from the first and second ends of the bottom panel, the end wall

panels configured to be foldable upwardly from the bottom panel to form end walls.

In one embodiment, the invention relates to a carton carrier as described herein before, wherein each supporting side wall of the carton carrier comprises an inner side wall panel, an outer side wall panel, and a top shelf panel.

[0030] In one embodiment, the invention relates to a carton carrier as described herein before, wherein each supporting side wall of the carton carrier has a triangular cross-section.

[0031] In one embodiment, the invention relates to a carton carrier as described herein before, wherein each top shelf panel of the carton carrier is disposed between the corresponding inner side wall panel and the corresponding outer side wall panel.

[0032] In one embodiment, the invention relates to a carton carrier as described herein before, wherein the triangular cross-section of each supporting side wall comprises the top shelf panel forming the upper support surface of the respective supporting side wall and the corresponding inner side wall panel and corresponding outer side wall panel converging at a respective side of the bottom panel.

[0033] In one embodiment, the invention relates to a carton carrier as described herein before, wherein sides of the plantlet tray abut the inner side wall panels of the carton carrier about a top surface of the tray.

[0034] In one embodiment, the invention relates to a carton carrier as described herein before, wherein the carton carrier is formed from a blank.

[0035] In one embodiment, the invention relates to a carton carrier as described herein before, wherein the supporting side walls of the carton carrier have a specific height to provide space for the plantlets disposed within the plantlet tray.

[0036] In one embodiment, the invention relates to a carton carrier as described herein before, wherein the carton carrier is fiberboard, particularly a corrugated cardboard.

[0037] In one embodiment, the invention relates to a carton carrier as described herein before, wherein ribs are defined by the corrugated cardboard and strengthen the carton carrier in at least one of a width direction or a height direction.

[0038] In one embodiment, the invention relates to a carton carrier as described herein before, wherein the end walls of the carton carrier contact the supporting side walls when both the ends walls and the supporting side walls extend upright.

[0039] In one embodiment, the invention relates to a carton carrier as described herein before, wherein the end walls of the carton carrier contact the ends of the tray of plantlets when the ends walls extend upright.

[0040] In one embodiment, the invention relates to a carton carrier as described herein before, wherein the upper support surface of the supporting side walls of the carton carrier provides a stackable surface on which another carton carrier may be placed.

[0041] In one embodiment, the invention relates to a method of preparing trays of plantlets for shipping, the method comprising :

(a) placing a tray of plantlets on a bottom panel of a carton carrier;

(b) folding the carton carrier along supporting wall creases to form supporting side walls along first and second sides of bottom panel;

(c) folding the carton carrier along first and second end wall creases to form end walls about first and second ends of the bottom panel; and

(d) placing the carton carrier in a box having box side walls and box end walls, such that the box side walls and box end walls support the supporting side walls and the end walls in an upright position.

[0042] In one embodiment, the invention relates to a the method as described herein before, further comprising stacking multiple carton carriers atop one another within the transport box.

[0043] In one embodiment, the invention relates to a the method as described herein before, wherein the supporting side walls define upper support surfaces or shoulders on which another carton carrier may rest.

[0044] In one embodiment, the invention relates to a the method as described herein before, wherein the transport box securely holds a specified number of carton carriers.

[0045] In one embodiment, the invention relates to a the method as described herein before, wherein the step of folding the carton carrier along first and second end wall creases to form end walls is performed by the step of placing the carton carrier in a transport box.

[0046] In one embodiment, the invention relates to a the method as described herein before, wherein the supporting side walls have an inverted triangular cross-section.

BRIEF DESCRIPTION OF THE DRAWINGS

[0047] A full and enabling disclosure of the present subject matter including the best mode thereof to one of ordinary skill of the art is set forth more particularly in the remainder of the specification, including reference to the accompanying figures in which:

Figure 1 shows a schematic perspective view of an embodiment of a carton carrier according to the present subject matter;

Figure 2 shows a schematic vertical cross-sectional view of the embodiment of the carton carrier of Figure 1 along lines I-I;

Figure 3 shows a perspective view of an embodiment of a blank used to create a carton carrier according to the present subject matter;

Figure 4 shows a schematic perspective view of the blank of Figure 3 used to create a carton carrier according to the present subject matter;

Figure 5 shows a perspective view of the blank of Figure 3 folded to form at least a portion of a carton carrier according to the present subject matter;

Figure 6 shows a schematic perspective view of an embodiment of a carton carrier used in a packaging system according to the present subject matter;

Figure 7 shows a perspective view of an embodiment of a packaging system according to the present subject matter;

Figure 8 shows a perspective view of the packaging system according to Figure 7;

Figure 9 shows a perspective view of the packaging system according to Figure 7;

Figure 10A shows a perspective view of the packaging system according to Figure 7;

Figure 10B shows a perspective view of the packaging system according to Figure 7;

Figure 11 shows a schematic side elevation view of an embodiment of a carton carrier according to the present subject matter;

Figure 12A shows a schematic perspective view of an embodiment of a packaging system according to the present subject mater; and

Figure 12B shows a schematic perspective view of the packaging system according Figure 12A.

DETAILED DESCRIPTION

[0048] Reference will now be made in detail to presently preferred embodiments of the present subject matter, one or more examples of which are shown in the Figures. Each example is provided to explain the subject matter and not as a limitation. In fact, features illustrated or described as part of one embodiment can be used in another embodiment to yield still yet another embodiment. It is intended that the present subject matter covers such modifications and variations.

[0049] Figure 1 illustrates a carton carrier, generally designated as **10,** for use in transporting a tray, generally designated as **50,** of plantlets. Carton carrier **10** has a bottom panel **12** on which tray **50** may reside. Carton carrier **10** includes end walls, generally designated as **20,** on either end of carton carrier **10.** Further, carton carrier **10** has supporting side walls, generally designated as 30, that extend upward from the sides of carton carrier **10.** Supporting side walls **30** may permit the stacking of other carton carriers thereon. Each supporting side wall **30** may have an outer side panel **32**, a top shelf panel **34** and an inner side wall panel **36.** The top shelf panels **34** can create upper support surfaces, or shoulders, on which another carton carrier may be placed when the carton carriers are inserted into a transport box. Carton carrier **10** may be dimensioned such that tray **50** fits securely between supporting side walls **30** and end walls **20.** For example, supporting side walls **30** and end walls **20** may abut against sides **52** and ends **54** of tray **50,** respectively.

[0050] Carton carrier **10** may be made from any suitable material. For example, carton carrier **10** may be constructed from plastic, hardboard, fiberboard, or the like. For instance, carton carrier **10** can be made of a fiberboard, such as corrugated cardboard. Preferably, carton carrier **10** may be formed from the folding of a single blank as will be described below.

[0051] Figure 2 illustrates a cross-sectional view of carton carrier **10** shown in Figure 1 along the lines I-I. Supporting side walls **30** may have a triangular cross-sectional shape, such as an inverted triangular cross-section. However, the supporting walls **30** may also have other cross-sectional shapes, for example, rectangular, trapezoidal, or the like. Outer side wall panels 32 form the outside of supporting side walls **30.** Top shelf panels **34 forming** upper support surfaces that can extend substantially parallel to bottom panel **12** of carton carrier **10** to provide a surface on which another carton carrier **10** may be placed, thereby permitting carton carriers **10** to be stackable.

[0052] Supporting side walls **30** have a height D_1 that provides sufficient space D_2 above tray **50,** which is placed on bottom panel **12.** This space D_2 permits the plantlets that reside in tray **50** to extend upward without damage by another carton carrier **10** that may be placed upon upper support surfaces of supporting side walls **30.** Thus, the space $\mathbf{D_2}$ between a top **56** of tray **50** may be great enough for the stalk or stem of the plantlets to stand upright in its natural posture without any unnecessary or harmful bending. Therefore, depending on the type of plantlet being transported, height D_1 of the supporting side walls 30 and the space $\mathbf{D_2}$ **above** the tray **50** may vary.

[0053] By having an inverted triangular cross-sectional shape with inner side wall panel **36** and outer side wall panel **32** converging at bottom panel **12** of carton carrier **10,** supporting side walls **30** also help to secure tray **50** within carton carrier **10** when carton carrier **10** is placed within a transport box. By having inner side wall panels **36** of supporting side walls **30** extending upwardly and inwardly at an acute angle α from the base **12** when carton carrier **10** is within a box, inner side wall panels **36** can help to keep tray **50** secured in carton carrier **10** by abutting sides **52** of tray **50** about top **56** of tray **50** at an angle to hold tray **50** in place. In this manner, carton carrier **10** may help to prevent a jostling of tray **50** during transport of the box in which carton carrier **10** is placed. By minimizing movement of tray **50** in a vertical direction, supporting side walls **30** help to prevent damage to the plantlets placed in tray **50.**

[0054] Figure 3 illustrates a blank, generally designated as **60,** that may be used to form a carton carrier **10.** Blank **60** can be folded along its creases to form end walls **20** and supporting side walls **30** of a carton carrier **10** described above. Blank **60** may be made of material such as plastic, hardboard, fiberboard, or the like. For

example, blank **60** may be formed out of cardboard. Such cardboard may be corrugated. The corrugations within the cardboard add strength to the different panels within blank **60** to create a sturdier carton carrier **10**. Blank **60** includes bottom panel **12** formed between a first end crease **14**, a second end crease **16**, a first side wall crease **18** and a second side wall crease **19**.

[0055] The first and second end creases **14** and **16** may define first and second ends of bottom panel **12.** Further, first side wall crease **18** and second side wall crease **19** may define first and second sides, respectively, of bottom panel **12.**

[0056] Blank **60** also includes end wall panels **22** on opposite sides of first end crease **14** and second end crease **16** from bottom panel **12.** End wall panels **22** can be folded upward along first and second creases **14, 16** from bottom panel **12** to form end walls **20** of carton carrier **10.** On the opposite sides of the first and second side wall creases **18, 19** from bottom panel **12,** blank **60** includes outer side wall panels **32,** top shelf panels **34** and inner side wall panels **36** used to form supporting side walls **30.** Extending out from the sides of bottom panel **12,** each outer side wall panel **32** follows the respective side wall creases **18,19.** Each of outer side wall panels **32** are followed by the respective top shelf panel **34** which is then followed by the respective inner side wall panel **36.**

[0057] Each inner side wall panel **36** and top shelf panel **34** may be folded along supporting wall creases **38** as each outer side wall panel is folded along side wall creases **18, 19** to form supporting side wall **30.** The inner side wall panels 36 may be secured on or about the bottom panel **12** in a variety of ways. For example, glue, glue strips, tape, staples, or the like may be used to hold inner side wall panels **36** to bottom panel **12.**

[0058] Other mechanical means may also be used. For instance, on an outer edge **40** of inner side wall panel **36,** one or more jags **42** may extend outward from blank **60.** These jags **42** may fit into corresponding sleeves or slots **44** cut into blank **60** along each of the side wall creases **18, 19** when top shelf panels **34** and inner side wall panels **36** are folded inward along supporting wall creases **38** as outer side wall panels **32** are folded upward along side wall creases **18,19** to form support walls **30.** Top shelf panel **34** may have finger apertures **46** cut into blank **60.** These finger apertures **46** permit easy insertion and removal of carton carrier **10** from the transport box in which it will be placed and/or removed.

[0059] Figure 4 illustrates a blank **60** with tray **50** of plantlets placed on bottom panel **12.** Tray **50** may be placed on bottom panel **12** and outer side wall panels **32** may be folded up along side wall creases **18, 19** in directions $\mathbf{A_1}$**.** Top shelf panel **34** may be folded around supporting wall creases **38** in directions $\mathbf{A_2}$**,** while inner side wall panel **36** may be folded over around supporting wall creases **38** in directions $\mathbf{A_3}$ to form supporting side walls **30.** Once the outer side wall panels **32,** top shelf panels **34,** and inner side wall panels **36** are folded around and jags **42** are inserted into sleeves **44** (see Figure 3), the supporting side walls **30** of carton carrier 10 are formed. Similarly, the supporting side walls **30** may be formed before tray 50 is placed on bottom panel **12.**

[0060] If the blank is made from corrugated cardboard as shown in Figure 4, ribs **62** may run perpendicular to side wall creases **18, 19** and supporting side walls 30, while running parallel to end creases **14, 16** and end walls **20**. These ribs **62** within the corrugation can also help stabilize carton carrier **10**. Also, blank **60** can be different sizes depending on the size of tray **50** which is to be used. Similarly, bottom panel **12** can be different widths and lengths and the panels, which form end walls and side walls may be different heights depending on the size of the tray and the size of the plantlets being transported.

[0061] As shown in Figure 5, once outer side wall panels **32** are folded along side wall creases **18**, **19,** and top shelf panel **34** and inner side wall panel **36** are folded over along supporting wall creases **38** to form supporting side walls **30,** end panel **22** can be folded up to form end walls **20** to finish forming carton carrier **10.** However, with carton carrier **10** outside the box, the support walls **30** do not necessarily have to reside up against tray **50.** Further, end walls **20** will not necessarily have to reside against ends **54** of tray **50** even when carton **carrier 10** is outside the transport box in which it will be inserted.

[0062] Figure 6 illustrates a carton carrier **10** being placed into a transport box **70,** once supporting side walls **30** are formed and tray **50** of plantlets are placed on bottom panel **12** of carton carrier **10.** As can been seen from Figure 6, end panels **22** which form end walls **20** now have to be folded into a standing position to fit into a transport box, generally designated as **70.** Transport box **70** may have an interior **72** which is generally similar to the shape of the outer perimeter formed by supporting side walls **30** and end walls **20** of carton carrier **10** once carton carrier **10** is placed into transport box **70.** End panels **22** do not have to be folded along first and second end creases **14, 16** (see Figure 4) to form end walls **20** until carton carrier **10** is placed within transport box **70.** As carton carrier **10** is lowered into the interior **72** in direction **B,** end walls **74** of transport box **70** fold end panels **22** in a direction **C** along first and second end creases **14, 16** to form end walls **20.** Carton carrier **10** may be lowered into transport box **70** by using finger apertures **46** to lower carton carrier **10** into interior **72** of transport box **70.** Once carton carrier **10** is lowered into transport box **70,** transport box **70** may hold supporting side walls **30** and end walls **20** in an upright, or standing, position as shown in Figure 1. At this point, carton carrier **10** is supported on four sides. End walls **20** help create a sturdier carton **10** by adding greater support in a direction perpendicular to supporting side walls **30** to prevent sagging of bottom panel **12.**

[0063] Figure 7 shows a carton carrier **10** being placed within a transport box **70.** A tray **50** may be placed upon bottom panel **12** of carton carrier **10,** and the panels that

form supporting side walls **30** can be quickly folded to create the supporting side walls **30** in a timely manner. Top shelf panels **34** define finger apertures **46** therein to allow carton carrier **10** to be lowered into transport box **70.** As carton carrier **10** is placed within transport box **70,** end walls **74** of transport box **70** force end panels **22** upward to form end walls **20** of carton carrier **10.** Carton carrier **10** is then pushed downward into transport box 70 to until it rests firmly against an upper support surface of another carton carrier or against the bottom of transport box **70.**

[0064] Figure 8 shows a carton **10** disposed within transport box **70.** Carton carrier **10** has tray **50** disposed therein for carrying plantlets. Tray **50** resides on a bottom panel of the carton **10.** Transport box **70** supports supporting side walls **30** and end walls **20** of carton carrier **10** in upright positions to provide the desired protection to the plantlets that may be disposed within tray **50.** Side walls **76** of transport box **70** may help to support supporting side walls **30** of carton carrier **10** in an upright position and may push supporting side walls **30** against sides **52** of tray **50.** End walls **74** of transport box **70** may help to support end walls **20** of carton carrier **10** in an upright position and may push end walls **20** against ends **54** of tray **50**. Top shelf panels **34** provide upper support surfaces which allow for the stacking of a similar carton carrier within transport box **70** on top of upper support surfaces.

[0065] As stated above, height **H** (see Figure 6) of transport box **70** may correspond to a height of a select number of carton carriers **10** that may fit within transport box **70.** For example, as shown in Figure 9, height **H** of box **70** may permit six carton carrier **10** to be stacked within interior **72** of **box 70** with the last carton being flush with an outer edge **73** of the interior **72** of transport **box 70.** At this point, inner lids **78** and outer lids **79** may be closed onto the top carton carrier **10** to form a top wall of transport box **70.** Since top carton carrier **10** is flush with outer edge **73** of interior **72** of transport box **70,** this carton carrier **10** will also be flush with a top wall formed by inner lids **78** and outer lids **79** once these lids **78, 79** are folded into a closed position.

[0066] As shown in Figures 10A and 10B, inner lids **78** may be folded into a closed position with the outer lids **79** folded on top of the inner lids **78** and secured to form a top wall 80 of transport box **70.** Similar inner and outer lids may be folded and secured in a closed position to form a bottom wall of transport box **70.** The folding closed and securing of inner lids **78** and outer lids **79** further facilitate quick and easy shipment of the trays of plantlets. With the trays securely placed between the supporting side walls of the carton carrier and the carton carrier placed securely within transport box **70,** movement of the trays within transport box **70** is minimized or prevented.

[0067] The inner and outer lids **78, 79** for both the top and the bottom of transport box **70** may have lengths and widths that permit full coverage of the opening of interior **72** of transport box **70** when each set of lids are folded into a closed position. For example, the edges **82** of inner lids **78** may abut against one another and the edges **84** of outer lids **79** may abut against one another. Alternatively, edges **82** of inner lids **78** may overlap one another when the inner lids **78** are folded in a closed position, while edges **84** of outer lids **79** may overlap one another when the inner lids **78** are folded in a closed position. By providing full coverage of the opening of interior **72** of transport box **70** with each set of lids **78, 79,** the plantlets contained within transport box **70** are better insulated against outside temperatures. Also, with each carton carrier **10** (see Figure 1) having end walls **20** and supporting walls **30,** at least two layers of walls exist between the plantlets within the trays in carton carriers **10** and the outer environment surrounding transport box **70.** Further, the strength in the width and length directions can be maximized.

[0068] Figure 11 illustrates a side view of a carton **carrier 10** having a tray **50** residing upon bottom panel 12 of carton carrier **10** as carton carrier 10 resides within a transport box. The weight of tray **50** creates a downward force $\mathbf{F_1}$ on the carton carrier 10. This created force $\mathbf{F_1}$ causes carton carrier **10** to want to bow inward in the directions $\mathbf{E_1}$ and $\mathbf{E_2}$ and thereby bend bottom panel 12 outward. By having end walls **20** folded upward and perpendicular to supporting side walls **30,** end walls **20** counteract the tendency of carton carrier **10** to bow inward caused by force $\mathbf{F_1}$**.** End walls **20,** which run perpendicular to supporting side walls **30,** resist the bowing tendency by adding strength to carton carrier **10** in a width direction on either end of carton carrier **10.** Even after carton carrier **10** is dampened through absorption of moisture from trays **50,** end walls **20** still help to minimize any sagging of bottom panel **12** due to the added stability by end walls **20.** In this manner, the sturdiness and stability of carton carrier 10 is greatly increased over carton carriers which have only two parallel side walls. At the same time, the amount of time needed to assemble cartons 10 is not increased, because no extra steps are needed to form end walls **20** within carton carrier **10.** This is due to the fact that end walls **20** may be pushed into place by placement of carton carrier **10** within the transport box used to ship the plantlets to a desired location.

[0069] By having both end walls **20** and supporting side walls **30** within carton carrier **10,** carton carrier **10** is made more stable and less likely to bend or collapse because end walls **20** and supporting side walls **30** add support in three different directions. As seen in Figure 12A, supporting side walls **30** provide stability in a length direction **Z** with its inner side wall panel **36** and outer side wall panel **32** as well as top shelf panel **34.** Further, these panels **32, 34, 36** of supporting side wall 30 also provide stability in carton carrier 10 in a height direction **Y**. Finally, by having end wall panels **22** that fold up to create end walls 20 of carton carrier 10, stability is created in a width direction **X** of carton carrier 10. By having added stability in carton carrier 10 in width direction **X**, height direction

Y, and length direction **Z**, a more stable carton carrier is created for placement of a tray **50** thereon. The added stability by supporting side walls 30 and end walls **20** in the directions **X, Y**, and **Z** help to minimize sagging or bending of carton carrier **10** and thereby tray **50** which is placed thereon. Thus, damage to the plantlets within tray **50** due to the stability of carton carrier 10 can be minimized.

[0070] Transport box **70** with its end wall **74,** side wall **76,** inner lids **78** and outer lids **79** add stability in three directions as well. As shown in Figure 12B, side walls **76** add stability in direction **Y** and direction **Z.** End walls **74** add stability in direction **X** and direction **Y,** while outer lids **79** add stability in direction **Z** and inner lids **78** add stability in direction **X** as shown in Figure 12A.

[0071] Further, depending on the corrugation of the fiberboard used to create carton carrier **10,** the ribs within the corrugation can also help stabilize carton carrier **10** in different directions. For example, the ribs of corrugation that run perpendicular to supporting side walls **30** may help to reinforce the stability of carton carrier **10** in both the height direction **Y** and the width direction **X.** Tray **50** placed within carton carrier **10** may also help to stabilize carton carrier **10** in both the width direction **X** and the length direction **Z** depending on the stability of tray **50.** Similarly, transport box **70** may be made of a corrugated fiberboard such that the ribs of the corrugation help to reinforce the stability of transport box **70** for protection of the plantlets contained within the trays on carton carrier **10** within transport box **70.** The ribs of the corrugation of the transport box 70 may reinforce transport box **70** in any or all of directions **X**, **Y,** and **Z.**

[0072] The packing systems and apparatuses disclosed above are designed to be efficient in loading and unloading of boxes, while creating greater strength in the box with minimal use of a carton. Such a system reduces the labor cost of packing and unloading of plantlets, thereby reducing the overall cost associated with the plantlets. The system is easy to understand and can increase efficiency of packing and shipping plantlets, even in high volume production environments including third world countries where education of the work force may be limited.

[0073] The embodiments of the present disclosure shown in the drawings and described above are exemplary of numerous embodiments that can be made within the scope of the appending claims. It is contemplated that the configurations for packaging trays of plantlets for transport can comprise numerous configurations other than those specifically disclosed. Thus, it is the applicant's intention that the scope of a patent issuing herefrom will only be limited by the scope of the appending claims.

Claims

1. A packaging system for transporting plantlet trays, the system comprising:

(a) a carton carrier comprising:

(i) a bottom panel having first and second ends and first and second sides, the bottom panel being configured to receive plantlet trays,

(ii) supporting side walls extending upwardly from the first and second sides of the bottom panel, the supporting side walls defining an upper support surfaces or shoulders, and

(iii) end wall panels extending outwardly from the first and second ends of the bottom panel, the end wall panels configured to be foldable upwardly from the bottom panel to form end walls; and

(b) a transport box having box side walls and box end walls, the transport box being configured to receive one or more carton carriers within an interior of the transport box such that the supporting walls and the end walls of each carton carrier inserted therein are supported by the box side walls and the box end walls.

2. The packaging system as in claim 1, wherein each supporting side wall of the carton carrier comprises an inner side wall panel, an outer side wall panel, and a top shelf panel.

3. The packaging system as in claim 2, wherein each supporting side wall of the carton carrier has a triangular cross-section.

4. The packaging system as in claim 3, wherein each top shelf panel of the carton carrier is disposed between the corresponding inner side wall panel and the corresponding outer side wall panel.

5. The packaging system as in claim 4, wherein the triangular cross-section of each supporting side wall comprises the top shelf panel forming the upper support surface of the respective supporting side wall and the corresponding inner side wall panel and corresponding outer side wall panel converging at a respective side of the bottom panel.

6. The packaging system as in claim 5, wherein sides of the plantlet tray abut the inner side wall panels of the carton carrier about a top surface of the tray.

7. The packaging system as claimed in any of the preceding claims, wherein the carton carrier is formed from a blank.

8. The packaging system as claimed in any of the pre-

ceding claims, wherein the supporting side walls of the carton carrier have a specific height to provide space for the plantlets disposed within the plantlet tray.

9. The packaging system as claimed in any of the preceding claims, wherein the carton carrier is fiberboard.

10. The packaging system as in claim 9, wherein the fiberboard is a corrugated cardboard.

11. The packaging system as in claim 10, wherein ribs are defined by the corrugated cardboard and strengthen the carton carrier in at least one of a width direction or a height direction.

12. The packaging system as claimed in any of the preceding claims, wherein the end walls of the carton carrier contact the supporting side walls when both the ends walls and the supporting side walls extend upright.

13. The packaging system as claimed in any of the preceding claims, wherein the end walls of the carton carrier contact the ends of the tray of plantlets when the ends walls extend upright.

14. The packaging system as claimed in any of the preceding claims, wherein the upper support surface of the supporting side walls of the carton carrier provides a stackable surface on which another carton carrier may be placed.

15. The packaging system as in claim 14, wherein multiple carton carriers are stackable within the transport box.

16. The packaging system as in claim 15, wherein the transport box has a height that permits multiple carton carriers to be stacked on top of one another within the transport box.

17. The packaging system as in claim 16, wherein the height of the transport box corresponds to a height of a specified number of carton carriers such that the upper support surface of the top carton carrier is flush with the top of the transport box once the transport box is closed.

18. The packaging system as claimed in any of the preceding claims, wherein the transport box includes inner lids and outer lids that form at least one of a top wall or a bottom wall of the transport box when the inner and outer lids are in closed positions.

19. The packaging system as in claim 18, wherein the inner lids of the transport box comprise edges that abut one another when the inner lids are in a closed position and the outer lids comprise edges that abut one another when the outer lids are in a closed position.

20. A carton carrier for transporting trays of plantlets, the carton carrier comprising:

(a) a bottom panel having first and second ends and first and second sides, the bottom panel being configured to receive plantlet trays,
(b) supporting side walls extending upwardly from the first and second sides of the bottom panel, the supporting side walls defining an upper support surface or shoulder, and
(c) end wall panels extending outwardly from the first and second ends of the bottom panel, the end wall panels configured to be foldable upwardly from the bottom panel to form end walls.

21. The carton carrier as in claim 20, wherein each supporting side wall of the carton carrier comprises an inner side wall panel, an outer side wall panel, and a top shelf panel.

22. The carton carrier as in claim 21, wherein each supporting side wall of the carton carrier has a triangular cross-section.

23. The carton carrier as in claim 22, wherein each top shelf panel of the carton carrier is disposed between the corresponding inner side wall panel and the corresponding outer side wall panel.

24. The carton carrier as in claim 23, wherein the triangular cross-section of each supporting side wall comprises the top shelf panel forming the upper support surface of the respective supporting side wall and the corresponding inner side wall panel and corresponding outer side wall panel converging at a respective side of the bottom panel.

25. The carton carrier as in claim 24, wherein sides of the plantlet tray abut the inner side wall panels of the carton carrier about a top surface of the tray.

26. The carton carrier as claimed in any of the preceding claims, wherein the carton carrier is formed from a blank.

27. The carton carrier as claimed in any of the preceding claims, wherein the supporting side walls of the carton carrier have a specific height to provide space for the plantlets disposed within the plantlet tray.

28. The carton carrier as claimed in any of the preceding claims, wherein the carton carrier is fiberboard.

29. The carton carrier as in claim 28, wherein the fiberboard is a corrugated cardboard.

30. The carton carrier as in claim 29, wherein ribs are defined by the corrugated cardboard and strengthen the carton carrier in at least one of a width direction or a height direction.

31. The carton carrier as claimed in any of the preceding claims, wherein the end walls of the carton carrier contact the supporting side walls when both the ends walls and the supporting side walls extend upright.

32. The carton carrier as claimed in any of the preceding claims, wherein the end walls of the carton carrier contact the ends of the tray of plantlets when the ends walls extend upright.

33. The carton carrier as claimed in any of the preceding claims, wherein the upper support surface of the supporting side walls of the carton carrier provides a stackable surface on which another carton carrier may be placed.

34. A method of preparing trays of plantlets for shipping, the method comprising:

(a) placing a tray of plantlets on a bottom panel of a carton carrier;
(b) folding the carton carrier along supporting wall creases to form supporting side walls along first and second sides of bottom panel;
(c) folding the carton carrier along first and second end wall creases to form end walls about first and second ends of the bottom panel; and
(d) placing the carton carrier in a box having box side walls and box end walls, such that the box side walls and box end walls support the supporting side walls and the end walls in an upright position.

35. The method as in claim 34, further comprising stacking multiple carton carriers atop one another within the transport box.

36. The method as in claim 35, wherein the supporting side walls define upper support surfaces or shoulders on which another carton carrier may rest.

37. The method as in claim 35, wherein the transport box securely holds a specified number of carton carriers.

38. The method as in claim 34, wherein the step of folding the carton carrier along first and second end wall creases to form end walls is performed by the step of placing the carton carrier in a transport box.

39. A method as in claim 34, wherein the supporting side walls have an inverted triangular cross-section.

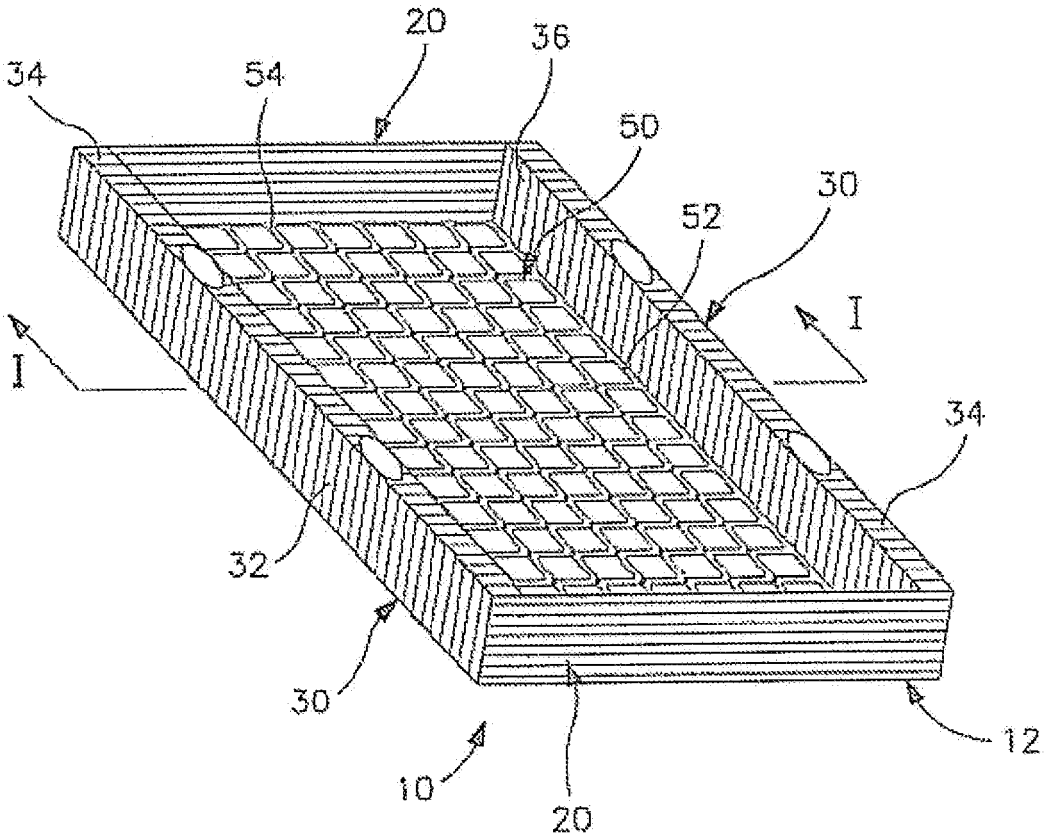


FIG. 1

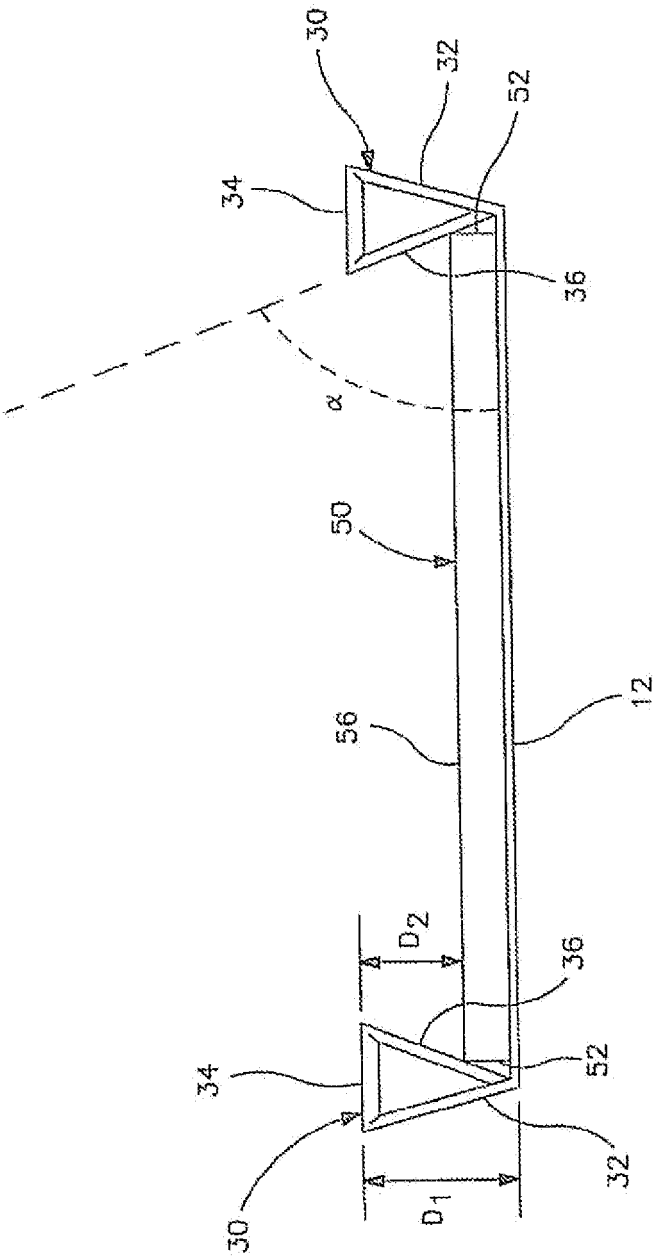


FIG. 2

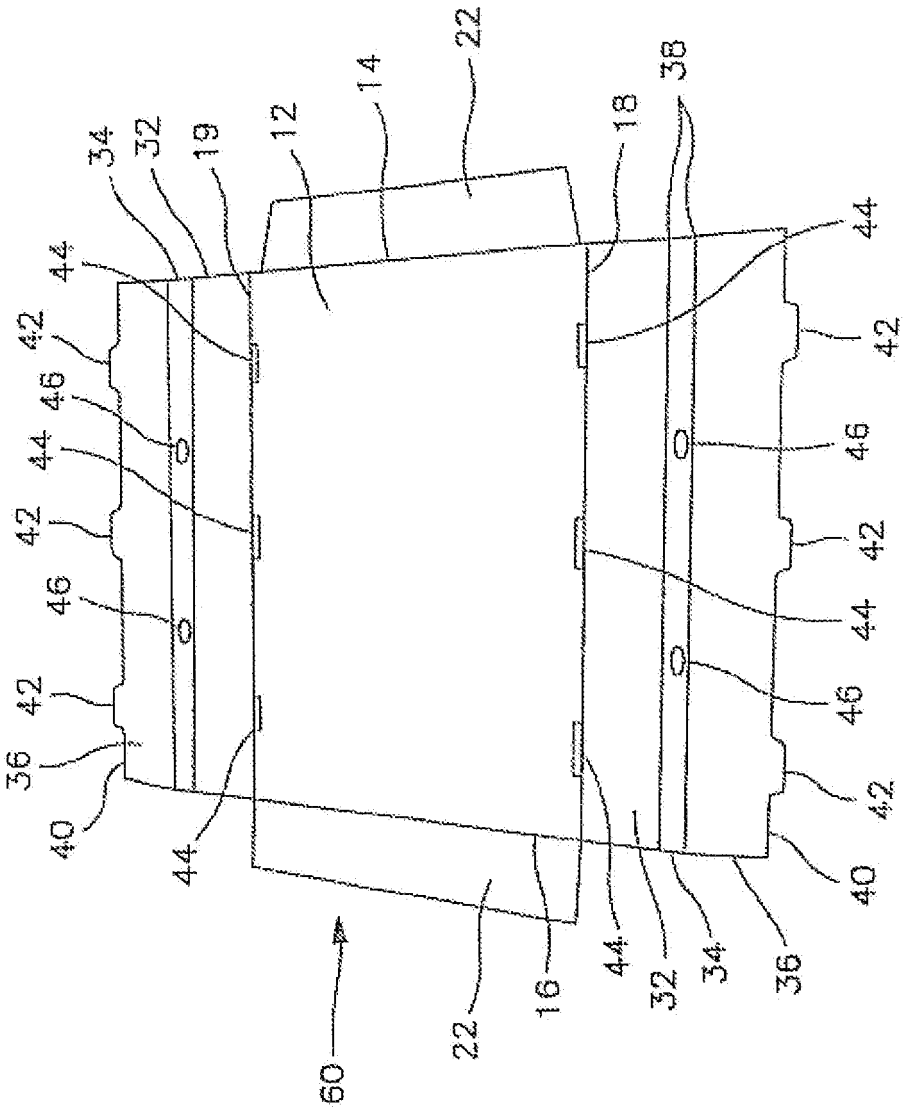
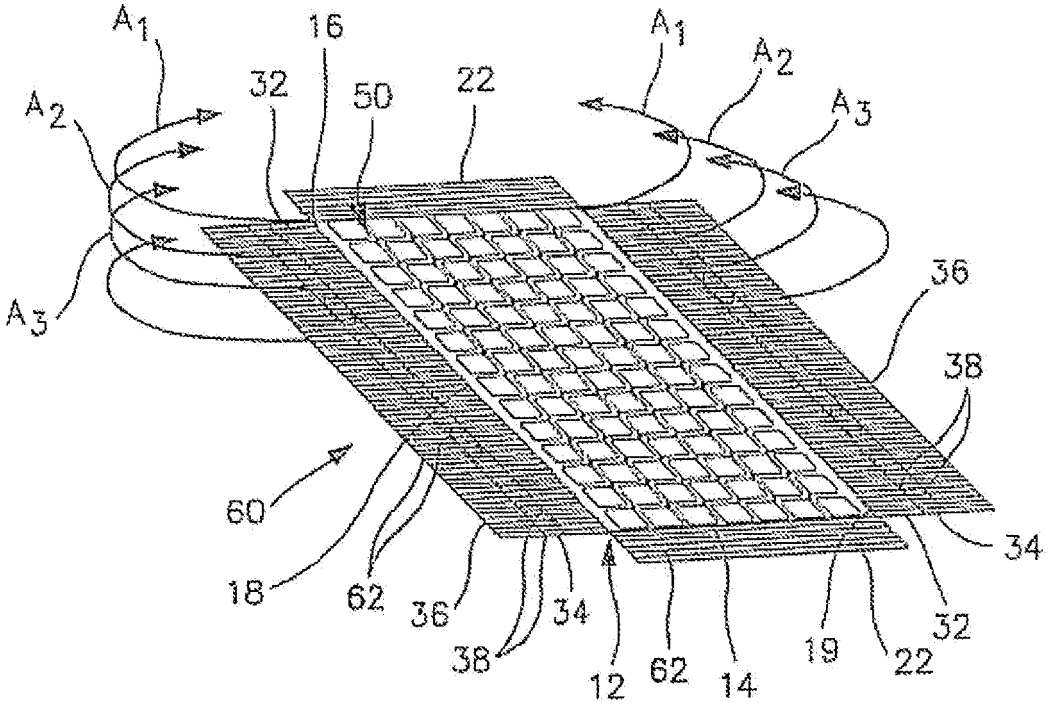


FIG. 3


A1
A2
A3
16
32
50
22
A1
A2
A3
36
38
34
60
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38
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12
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32

FIG. 4

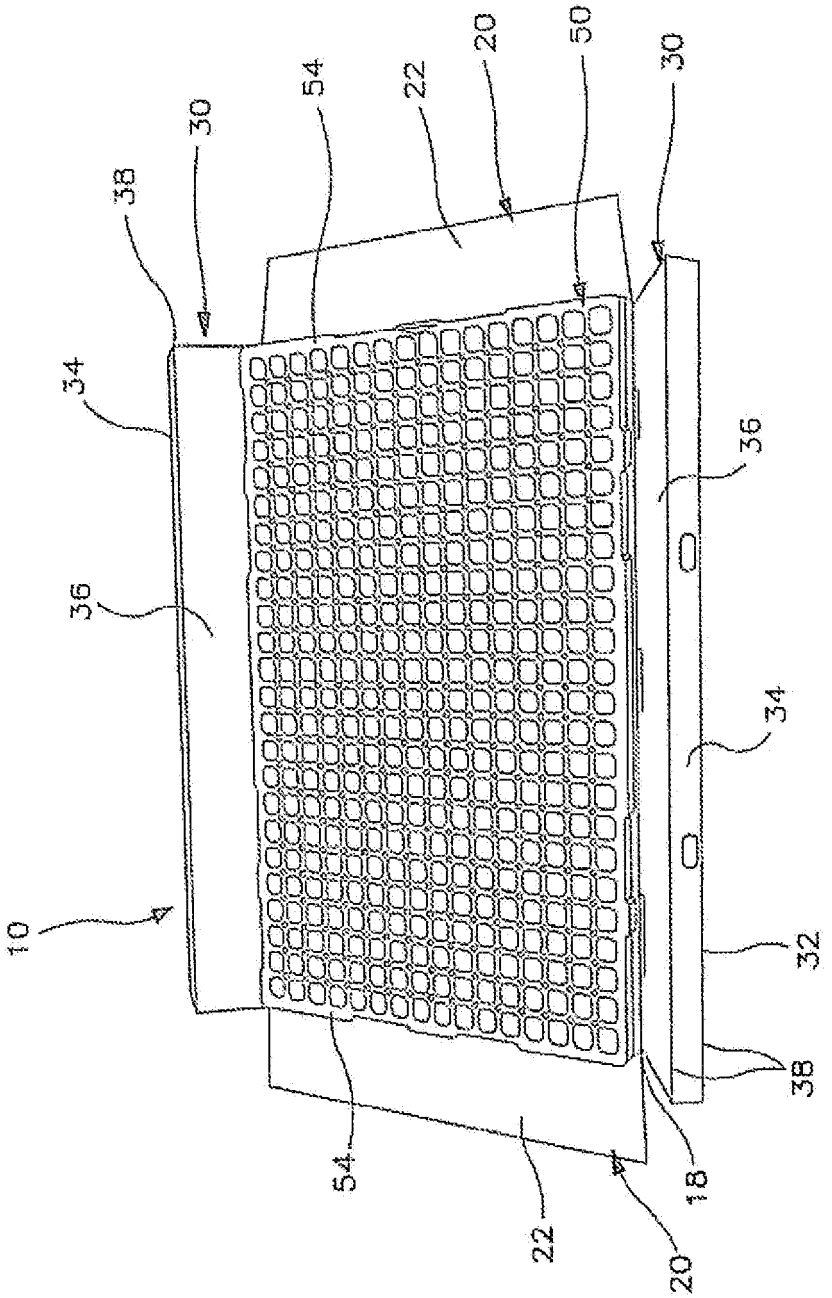

FIG. 5

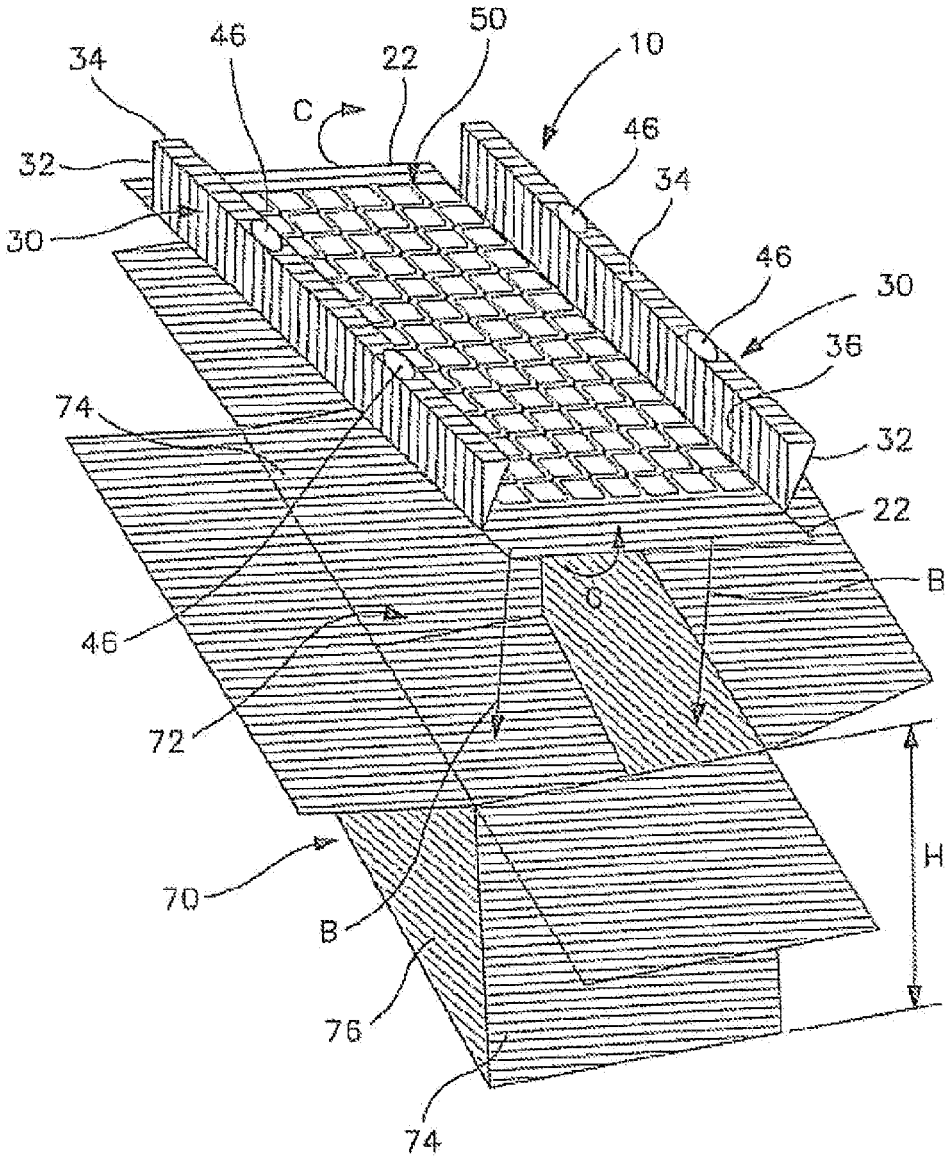

FIG. 6

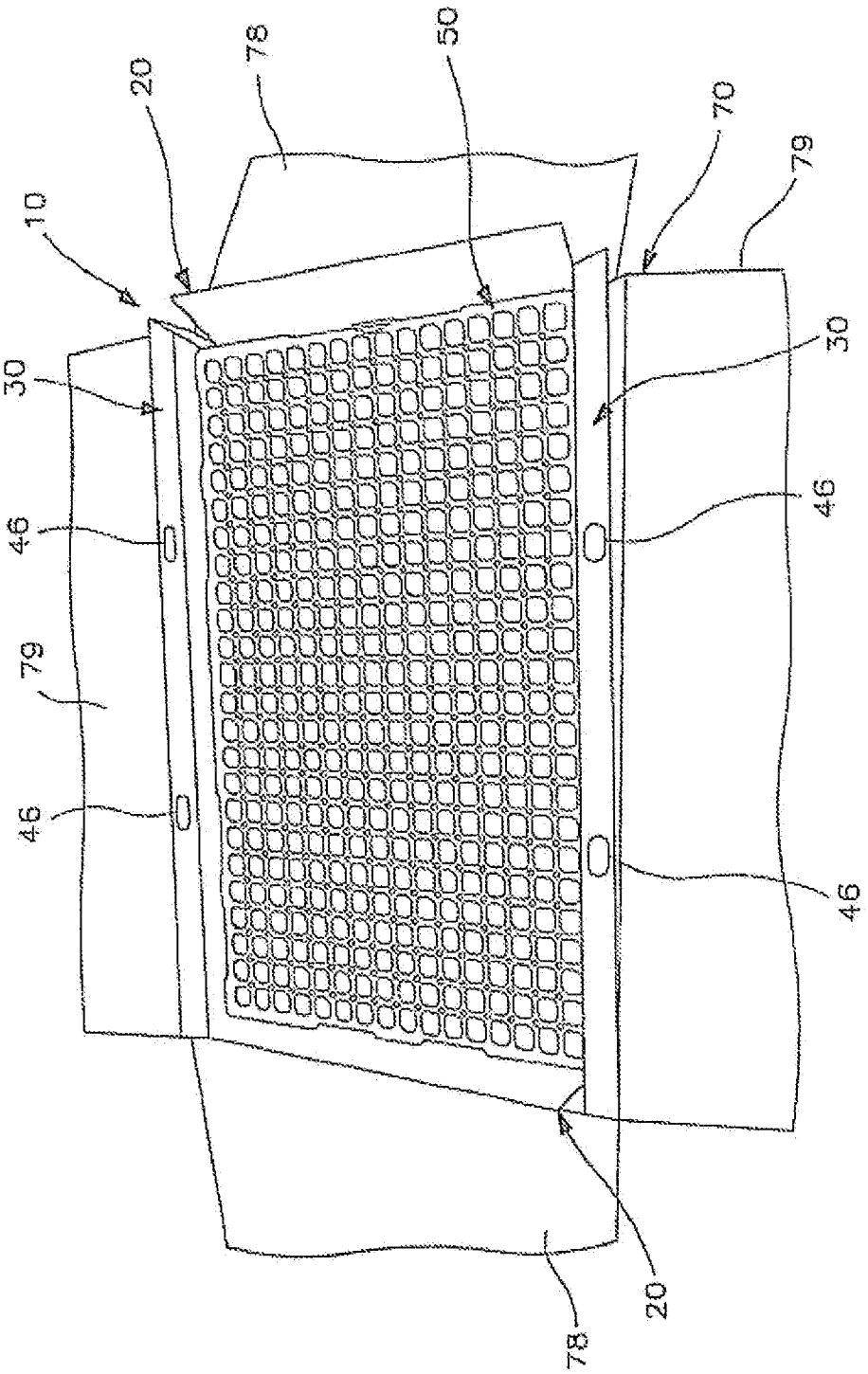

FIG. 7

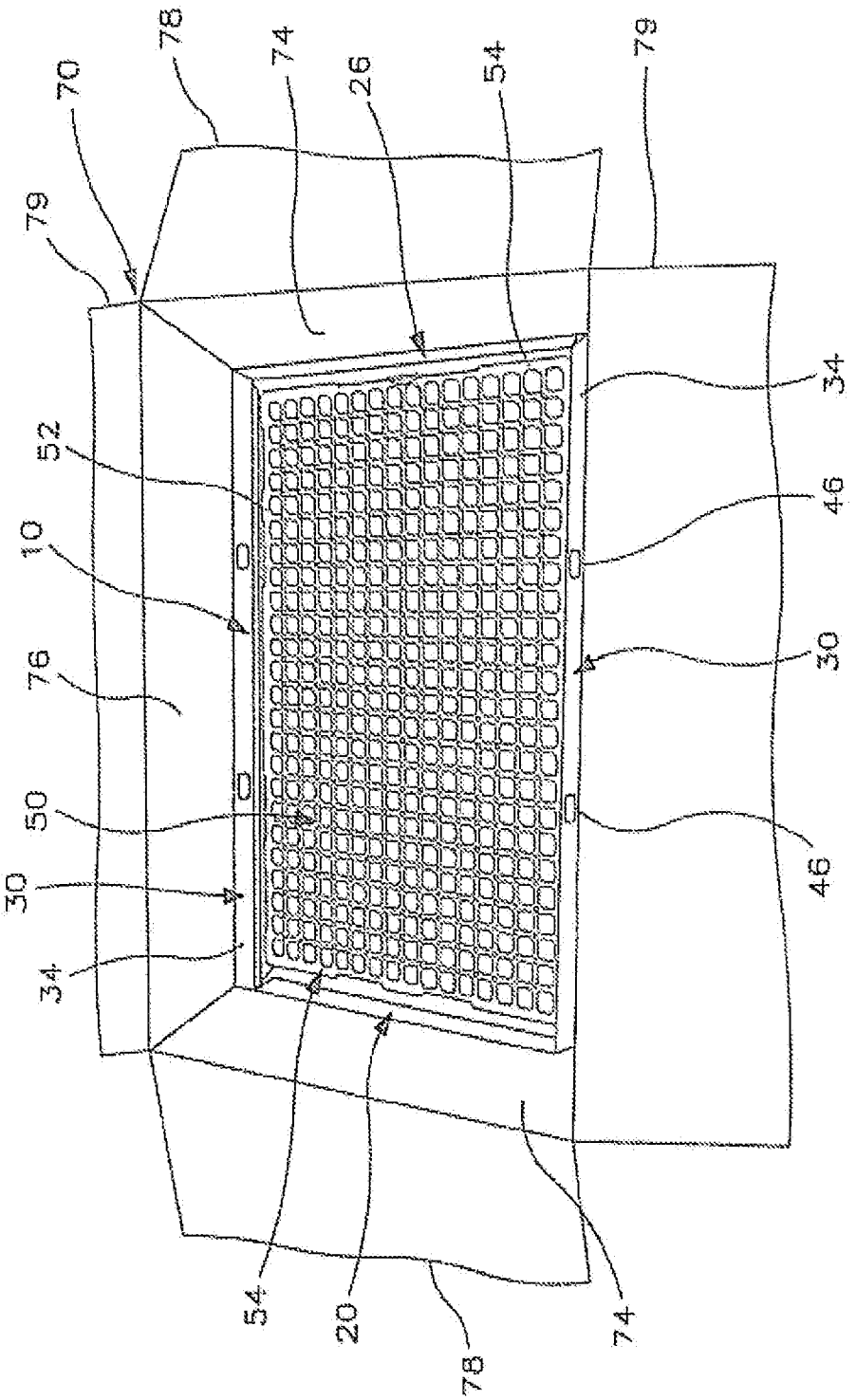

FIG. 8

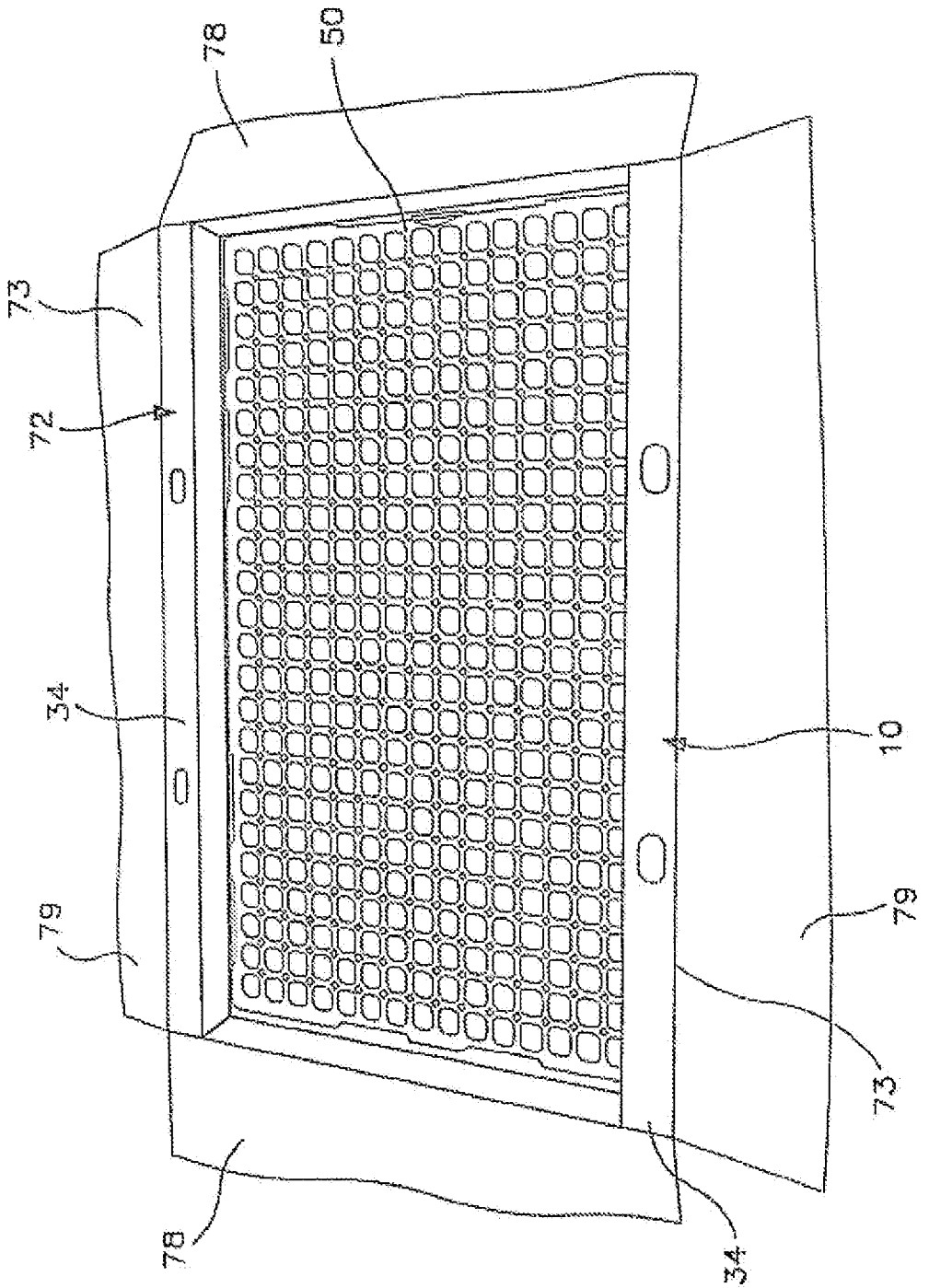

FIG. 9

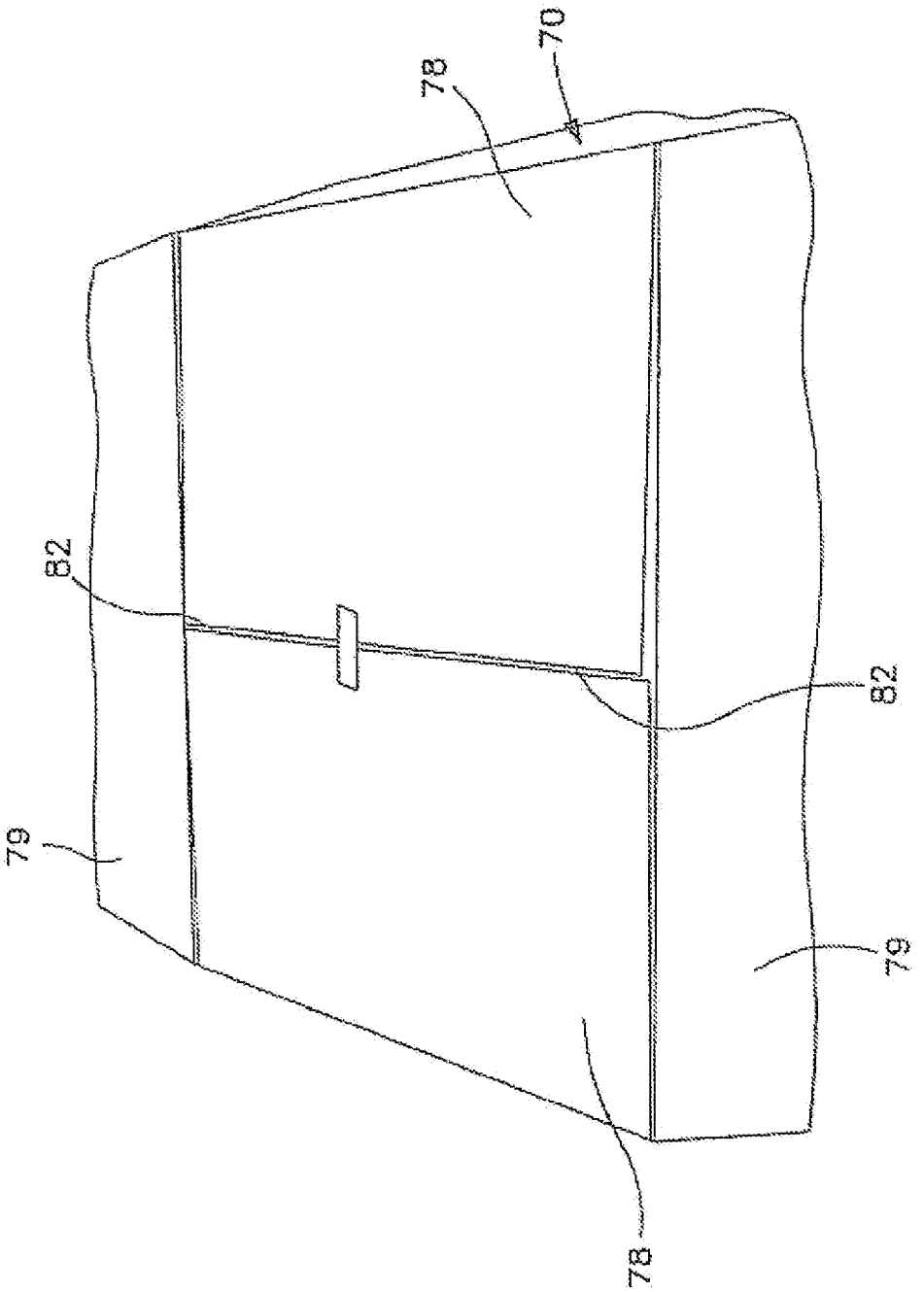

FIG. 10A

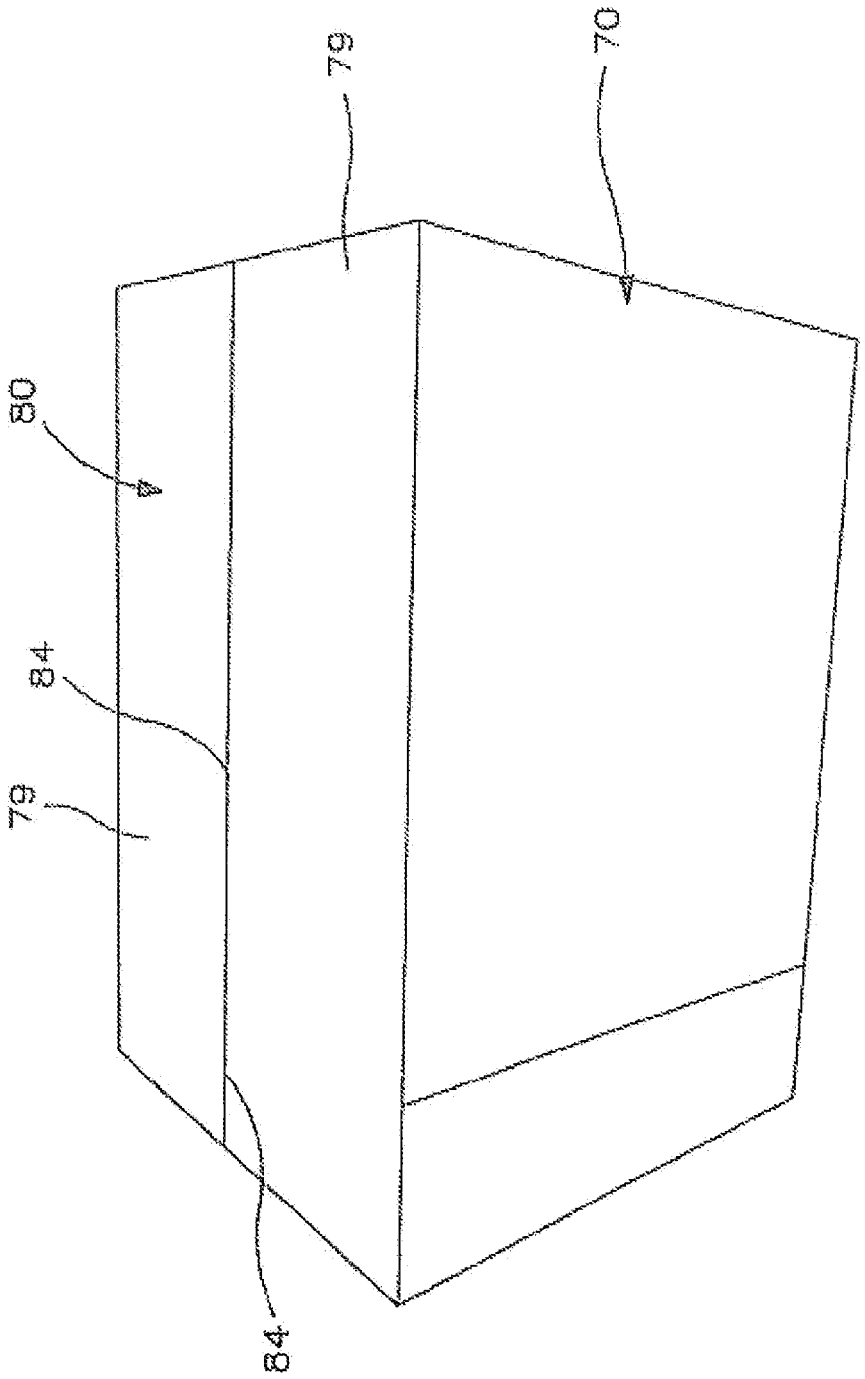

FIG. 10B

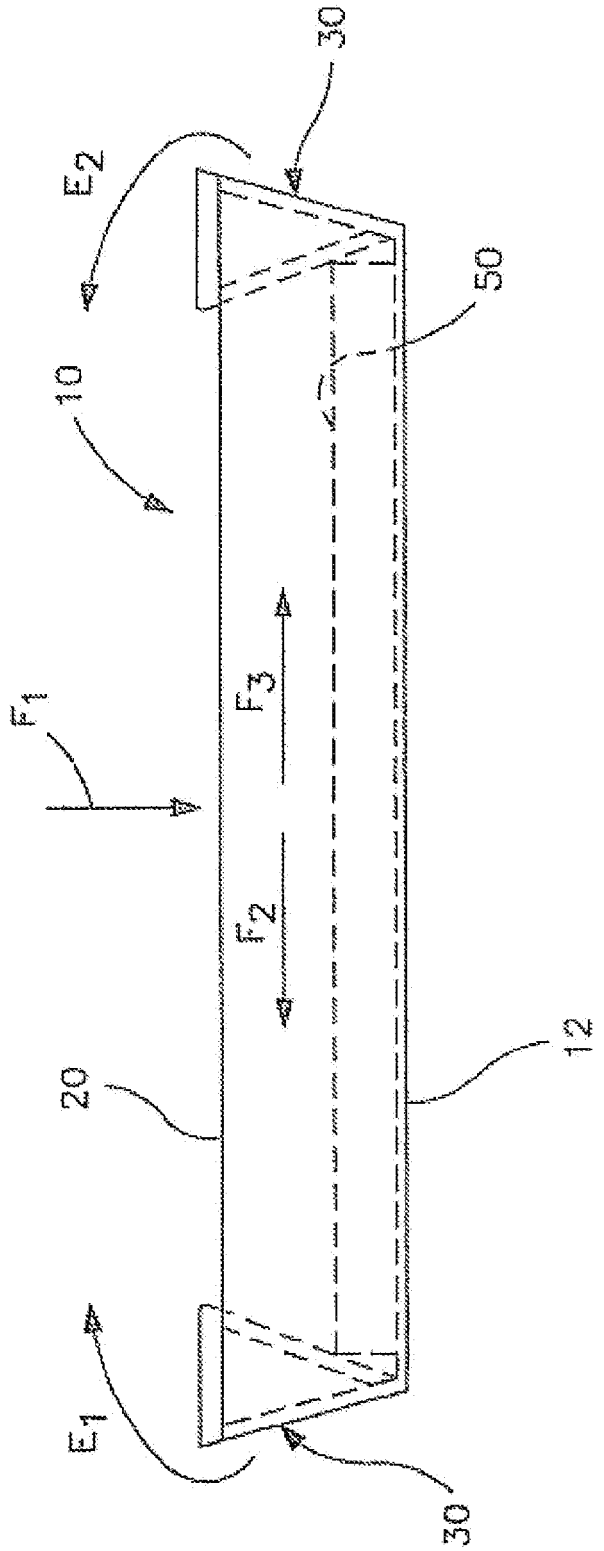

FIG. 11

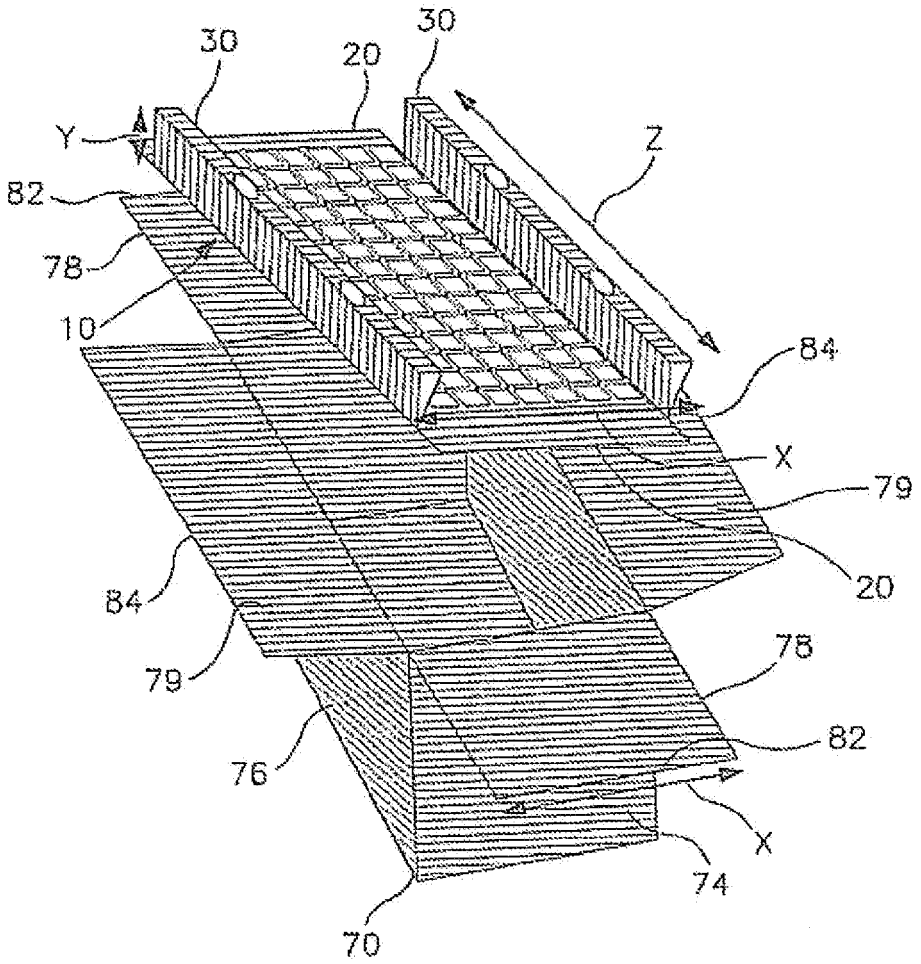

FIG. 12A

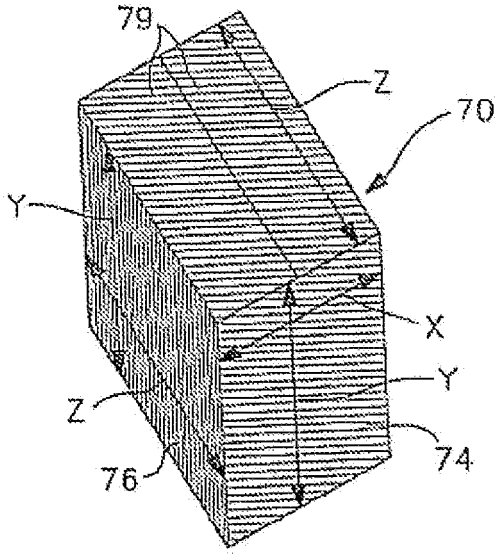

FIG. 12B

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 11 5053

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 3 119 492 A (SAMUEL BURKET RICHARD) 28 January 1964 (1964-01-28) * column 2, line 6 - column 4, line 4; claims; figures * -----	20-24, 26, 28-31,33 1-19,25, 27,32, 34-39	INV. B65D85/52 B65D77/04 B65D5/00 B65D5/20
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TECHNICAL FIELDS SEARCHED (IPC)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 November 2007	Dederichs, August

CATEGORY OF CITED DOCUMENTS

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L : document cited for other reasons

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 11 5053

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82