



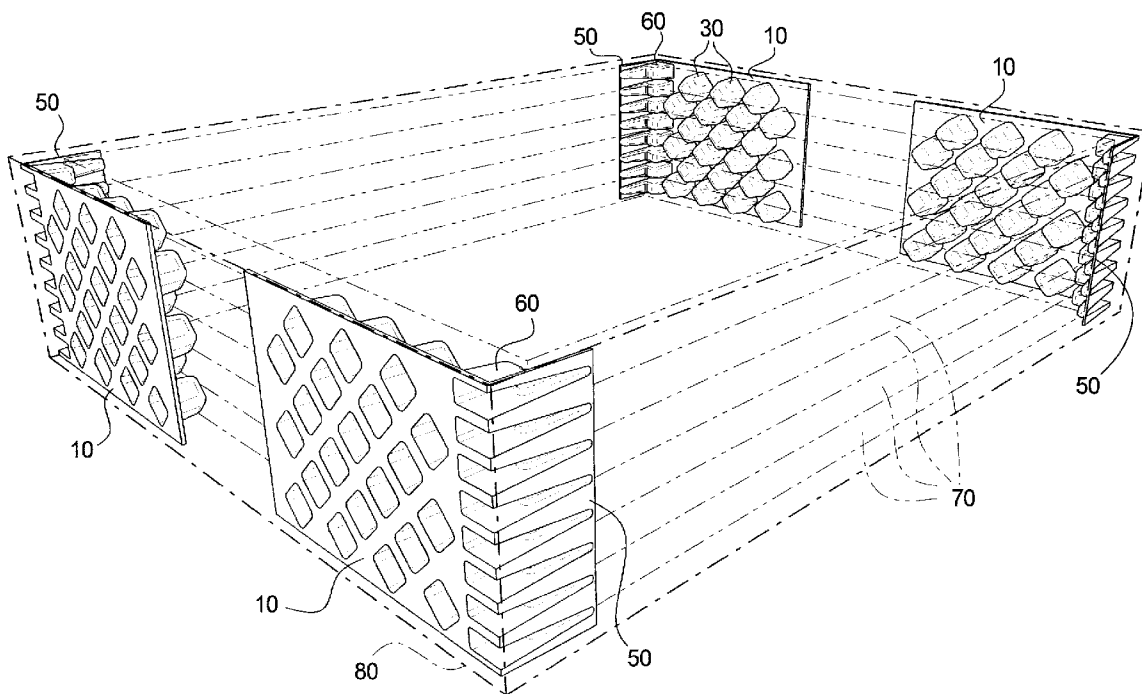
US 20110062040A1

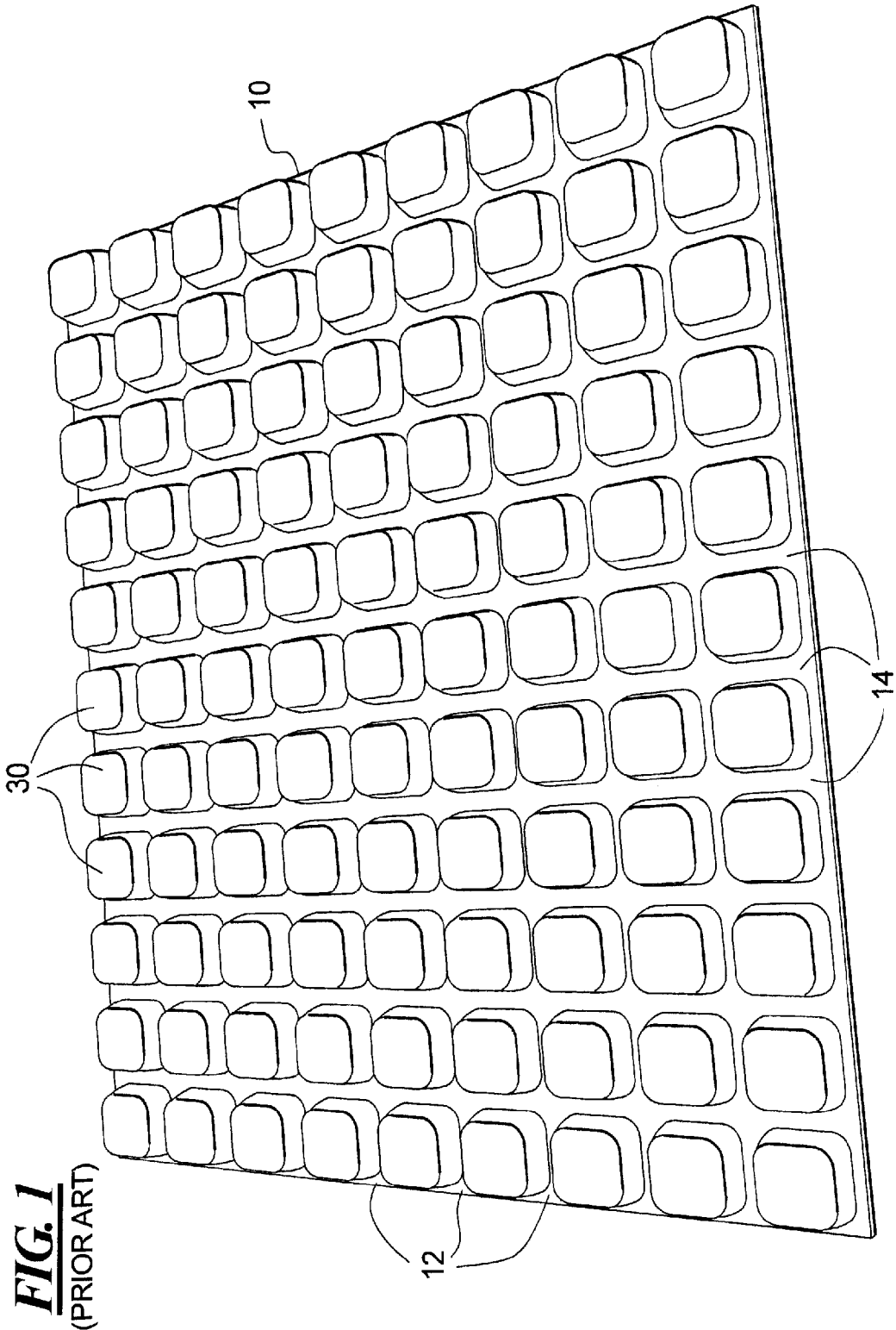
(19) **United States**(12) **Patent Application Publication**
Rich(10) **Pub. No.: US 2011/0062040 A1**(43) **Pub. Date: Mar. 17, 2011**(54) **EDGE PROTECTOR**(76) Inventor: **Mark H. Rich**, Saint Peters, MO
(US)(21) Appl. No.: **12/646,082**(22) Filed: **Dec. 23, 2009****Related U.S. Application Data**

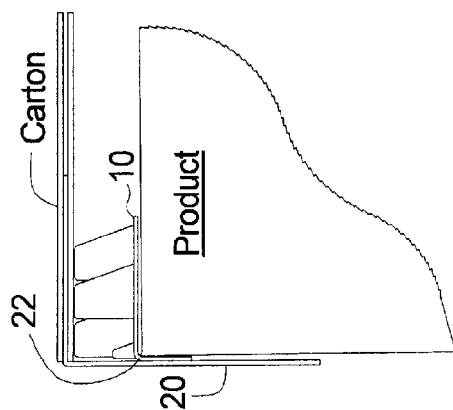
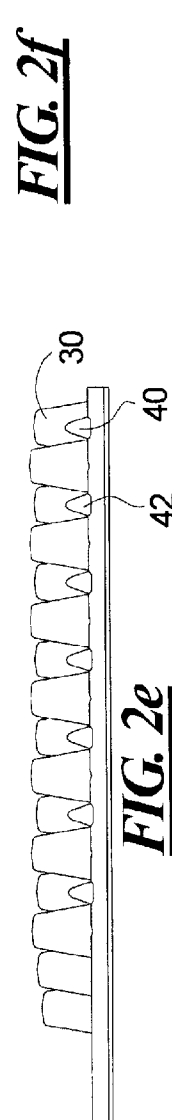
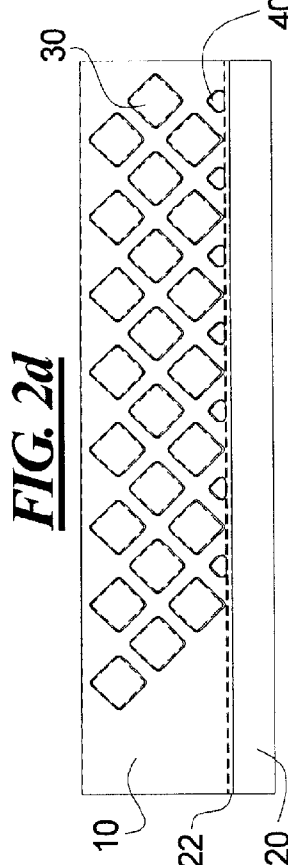
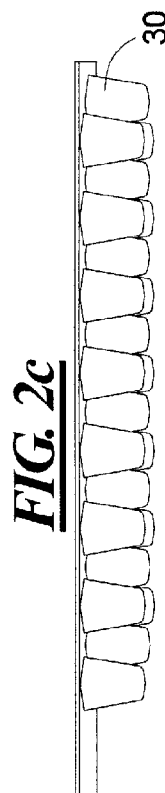
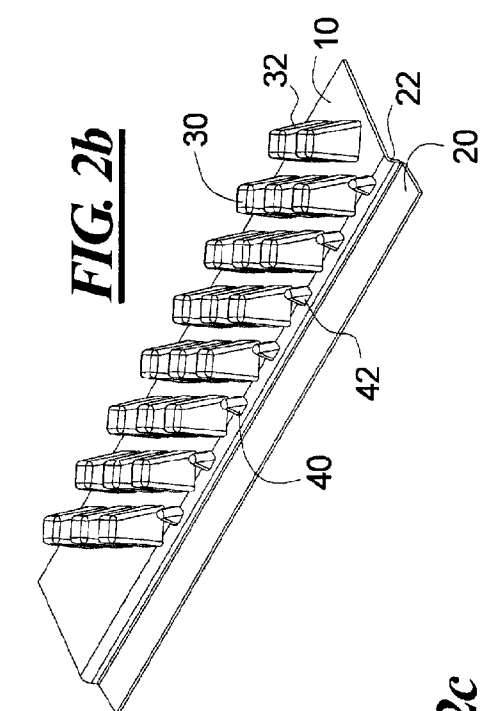
(60) Provisional application No. 61/241,732, filed on Sep. 11, 2009.

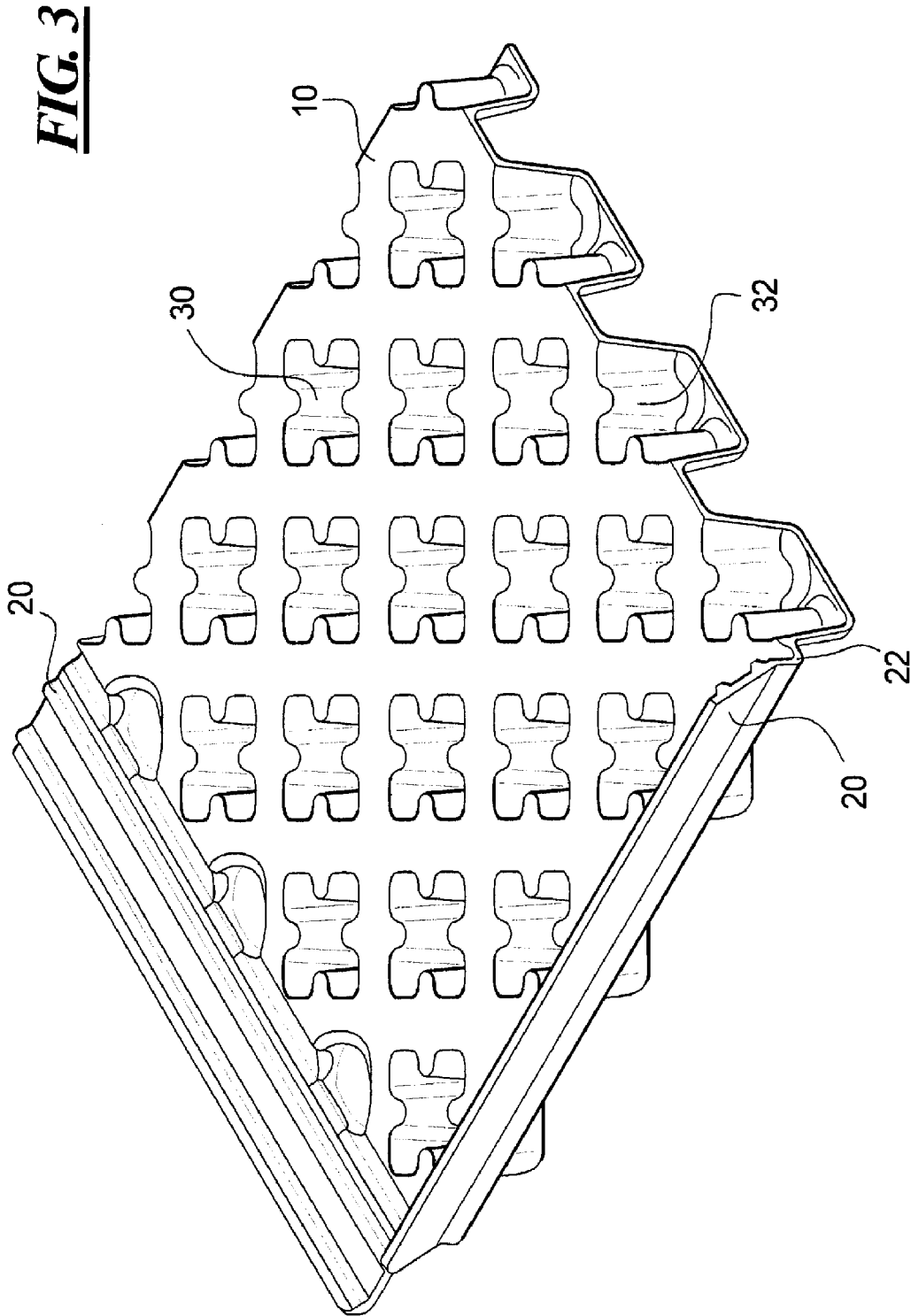
Publication Classification(51) **Int. Cl.**
B65D 81/02 (2006.01)
B65B 23/00 (2006.01)
B65D 85/30 (2006.01)(52) **U.S. Cl. 206/453; 206/586; 53/472**(57) **ABSTRACT**

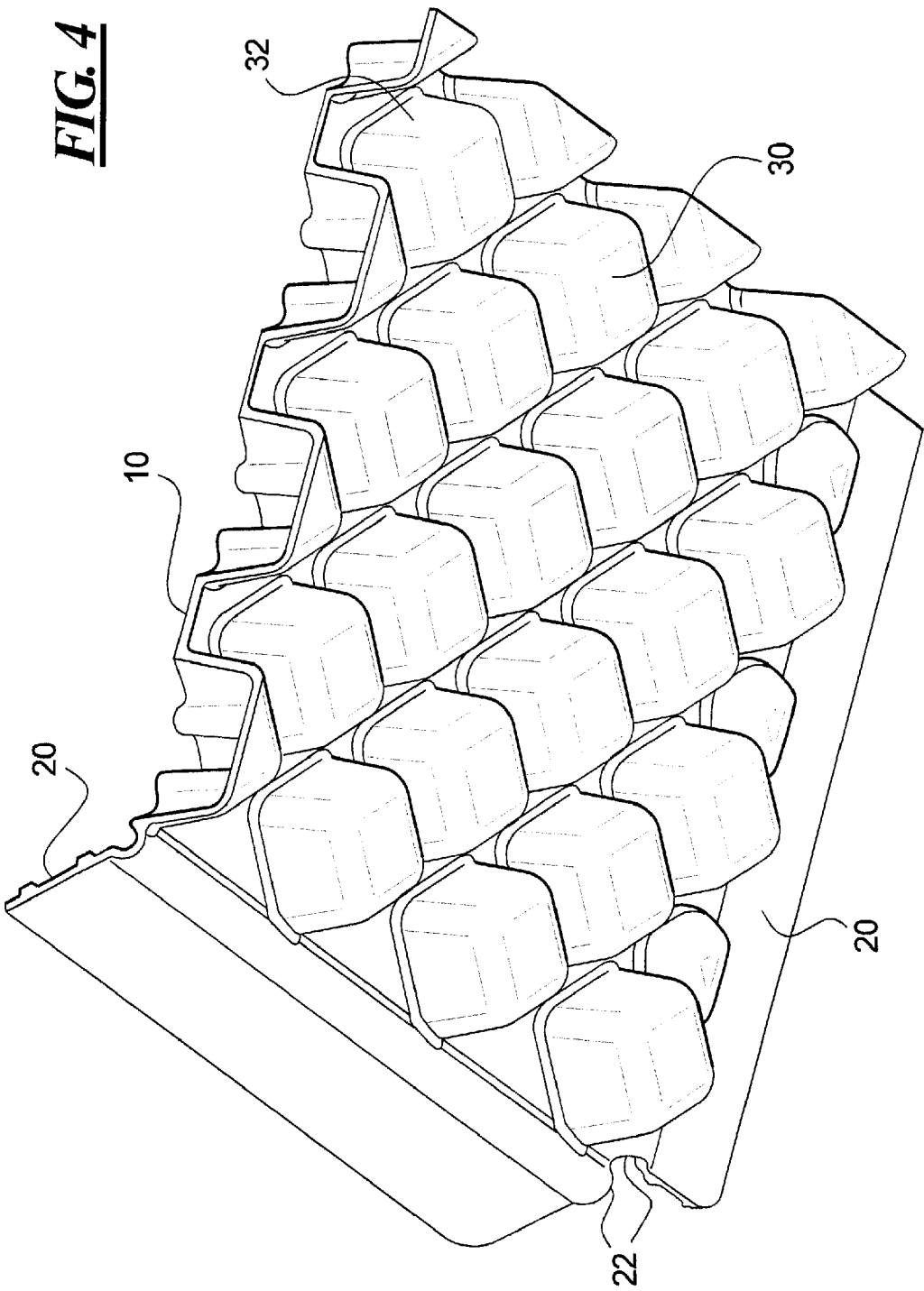
Articles being transported are susceptible to damage upon impact. In order to prevent damage to articles during handling or transport, edge protectors are provided that are preferably made from molded pulp fiber and are formed into a base of protrusions. The protrusions on the base are arranged, e.g., in a grid pattern to help prevent stacked flat articles from slipping between rows of protrusions. The edge protector may have a foldable flap containing protrusions that add protection of the edges of the articles, as well as rib protrusions. The edge protector alternatively may include an elongated edge rigidly attached to the base, which includes protrusions or chair-shaped protrusions to add protection of the edges of the articles, as well as rib protrusion. The edge protectors described may be used inside a container (e.g., a corrugated box), and articles may be transported while protected by the edge protectors.

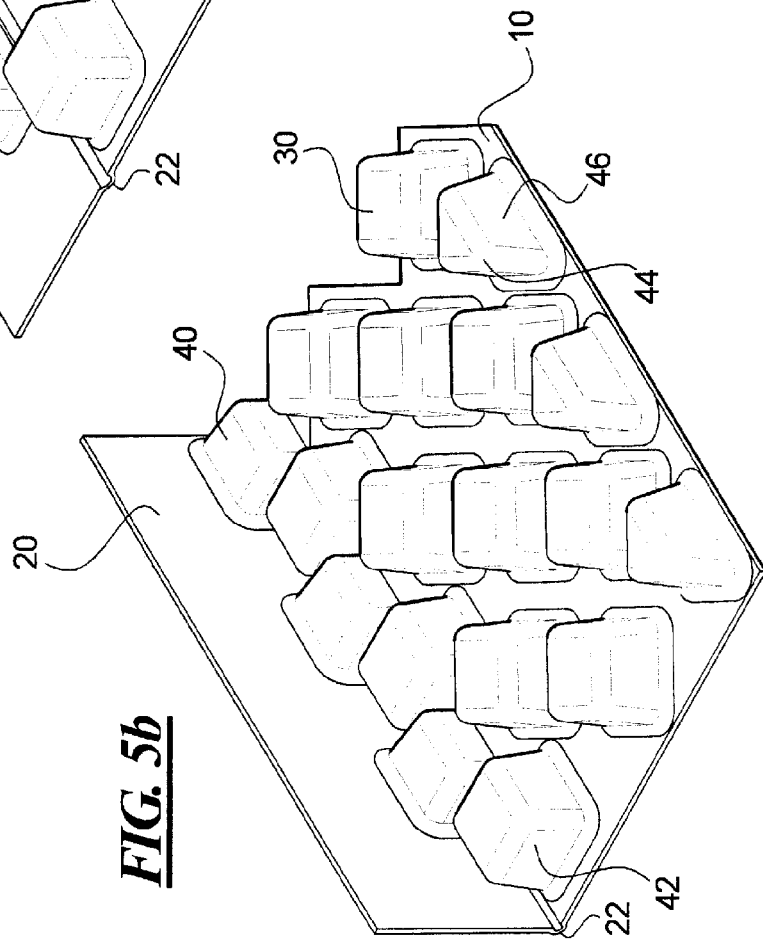
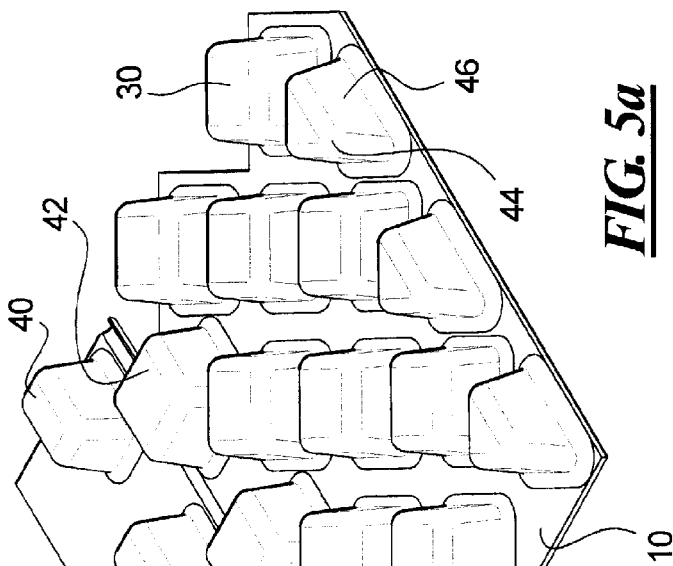


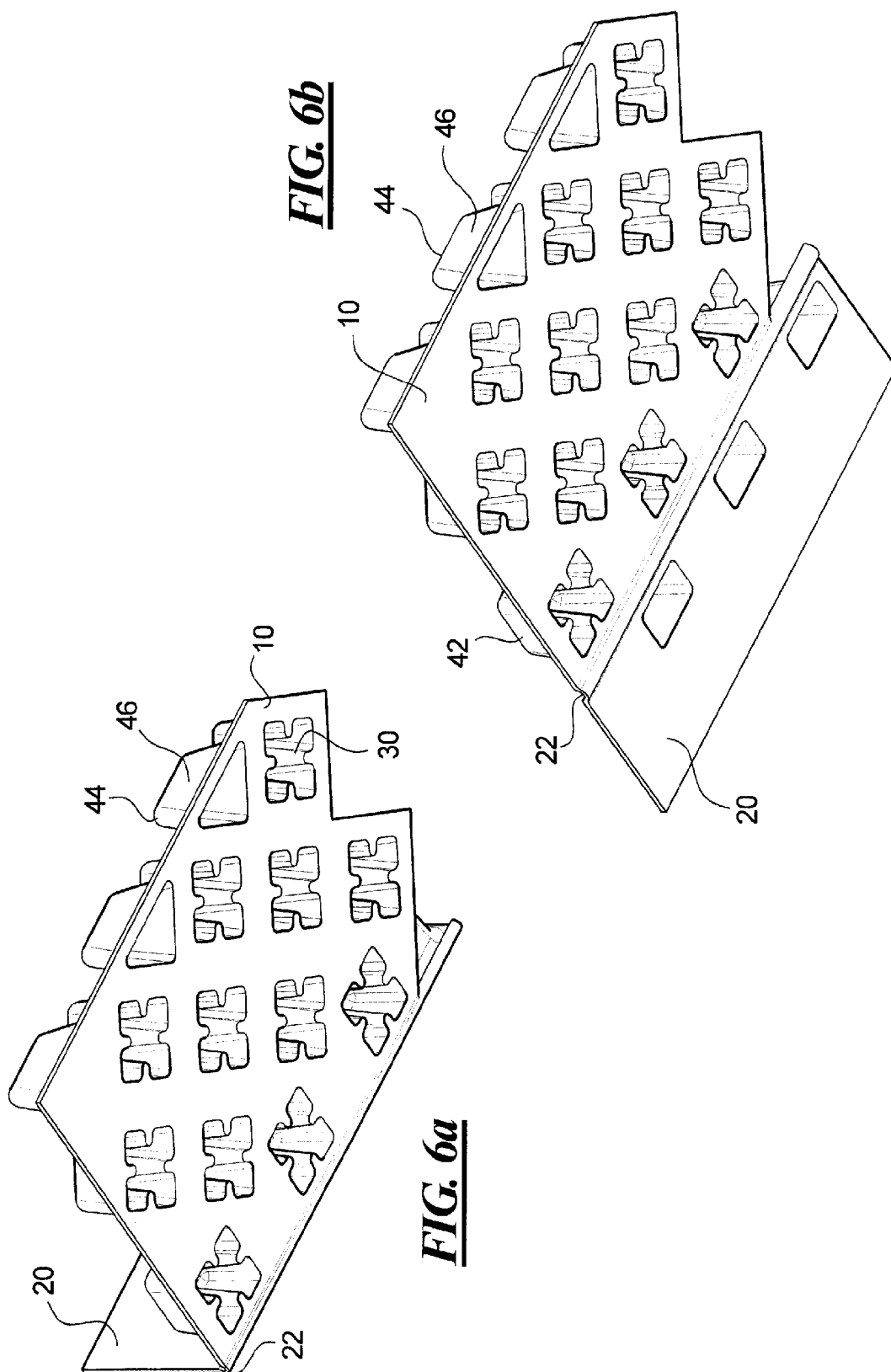












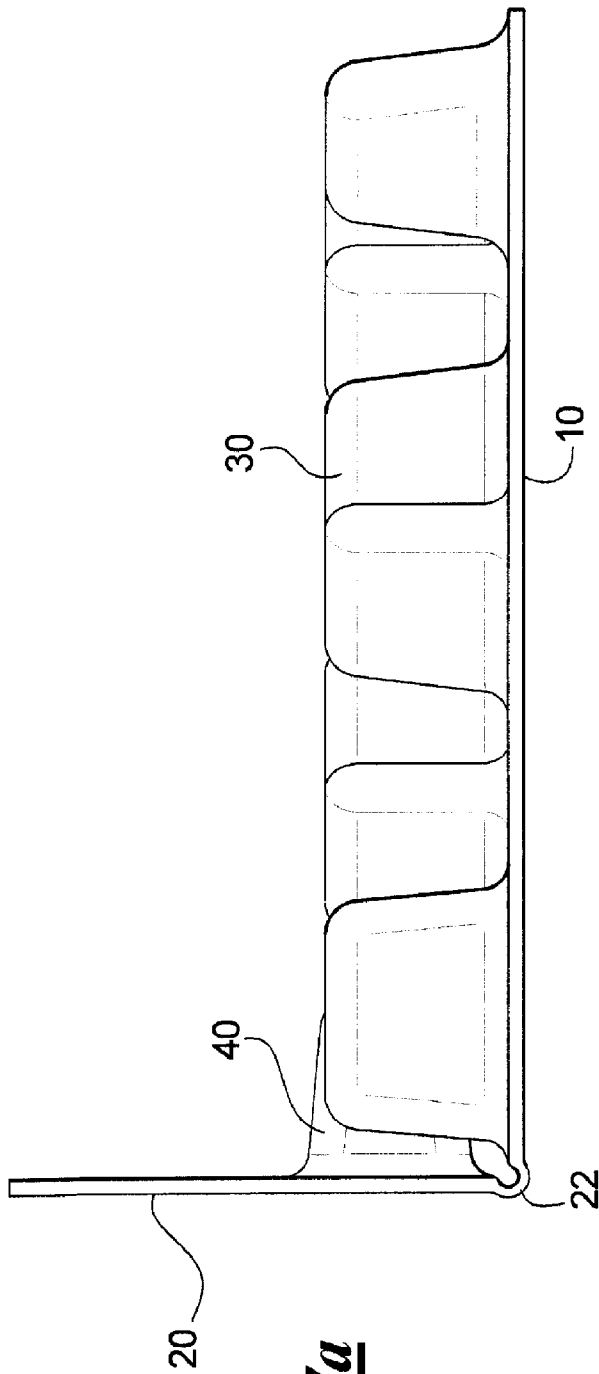


FIG. 7a

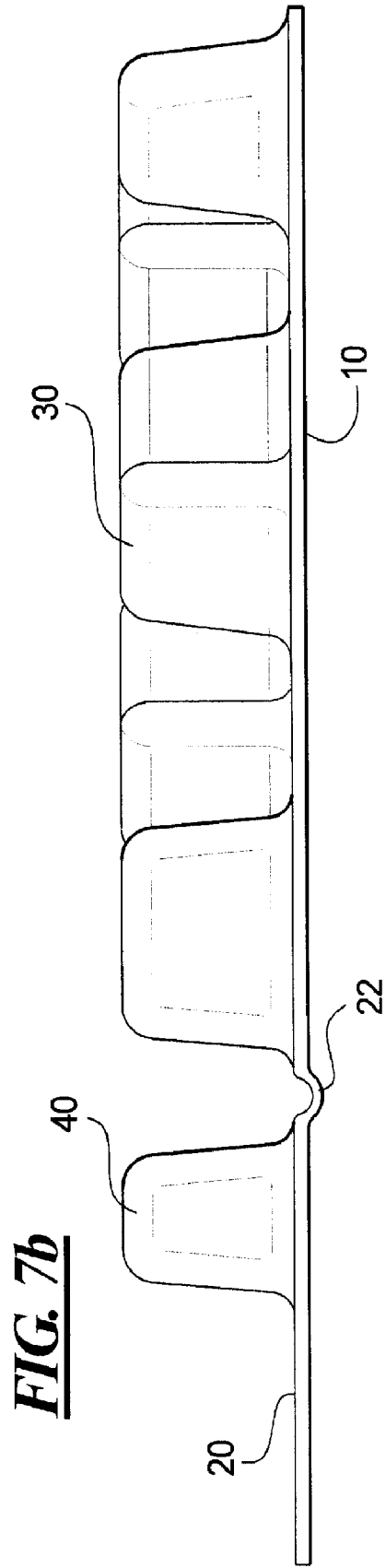
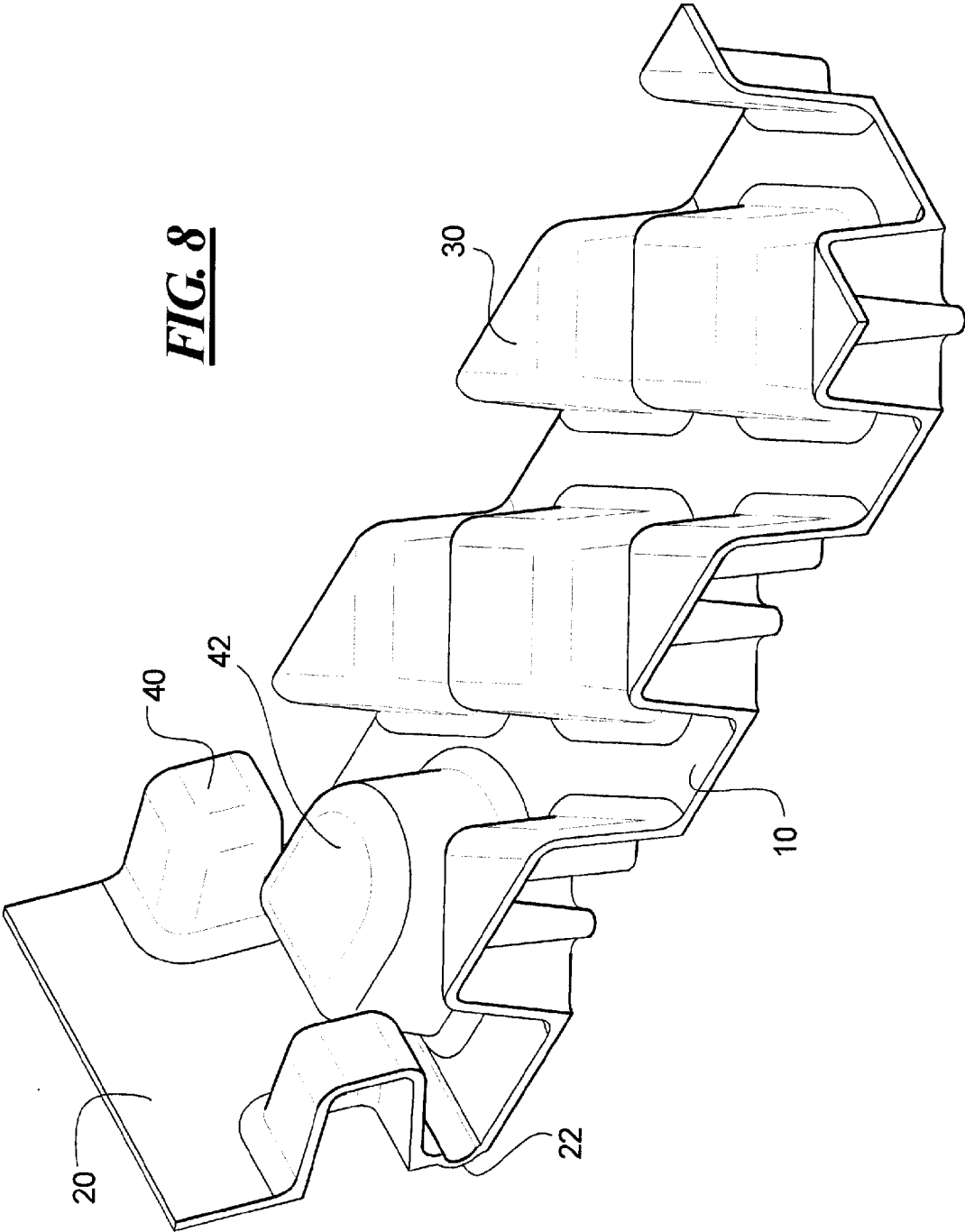


FIG. 7b

FIG. 8



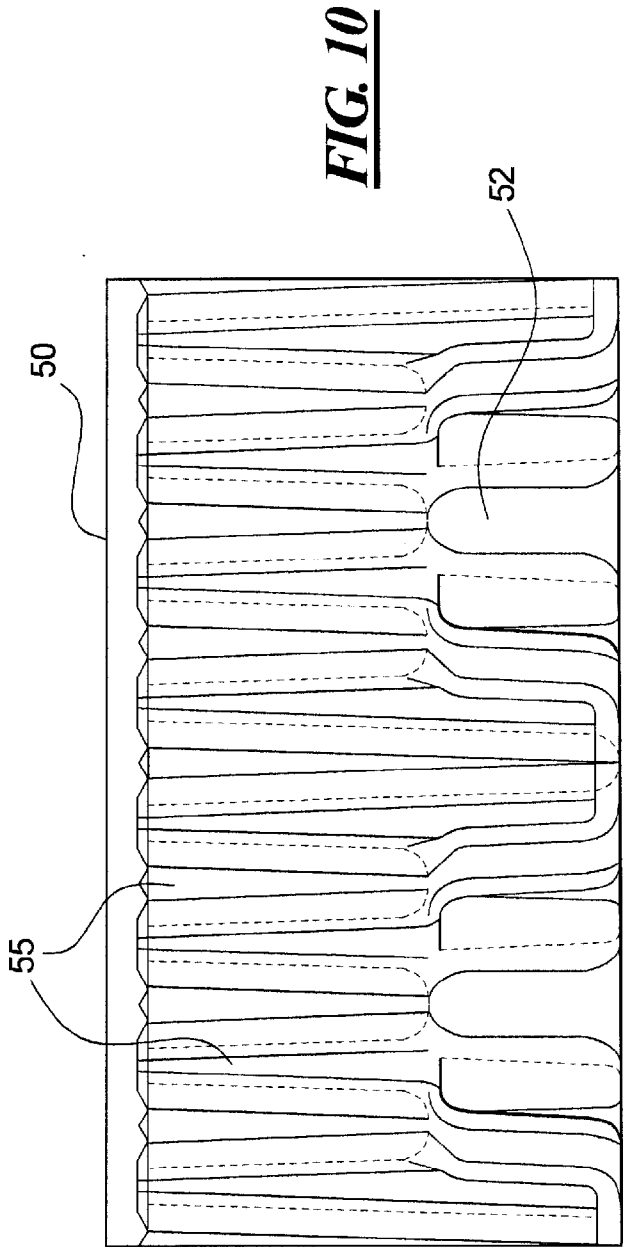
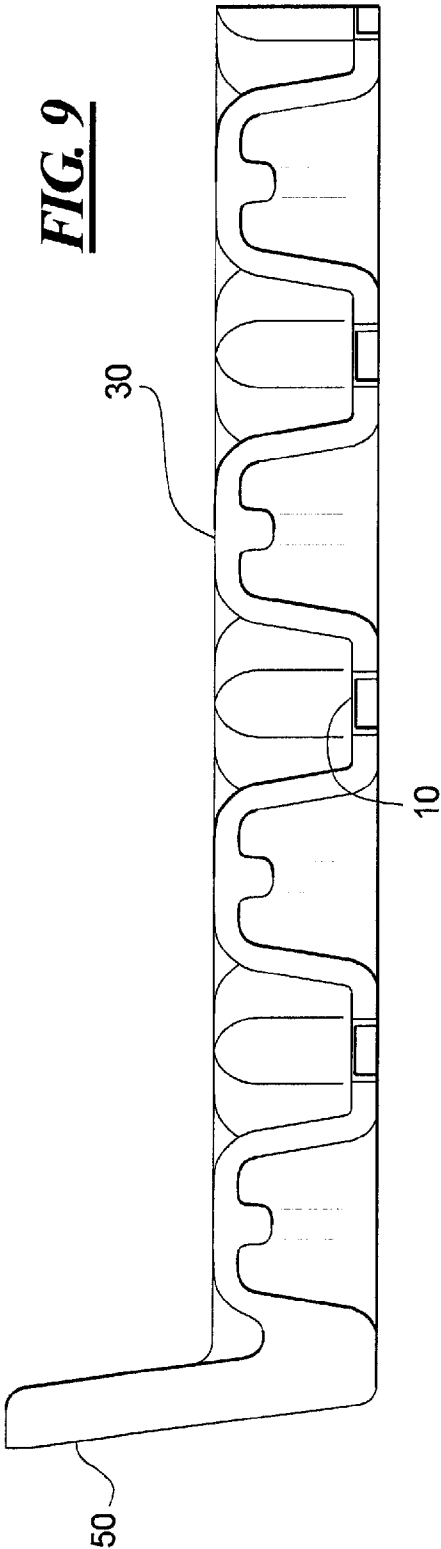


FIG. 11

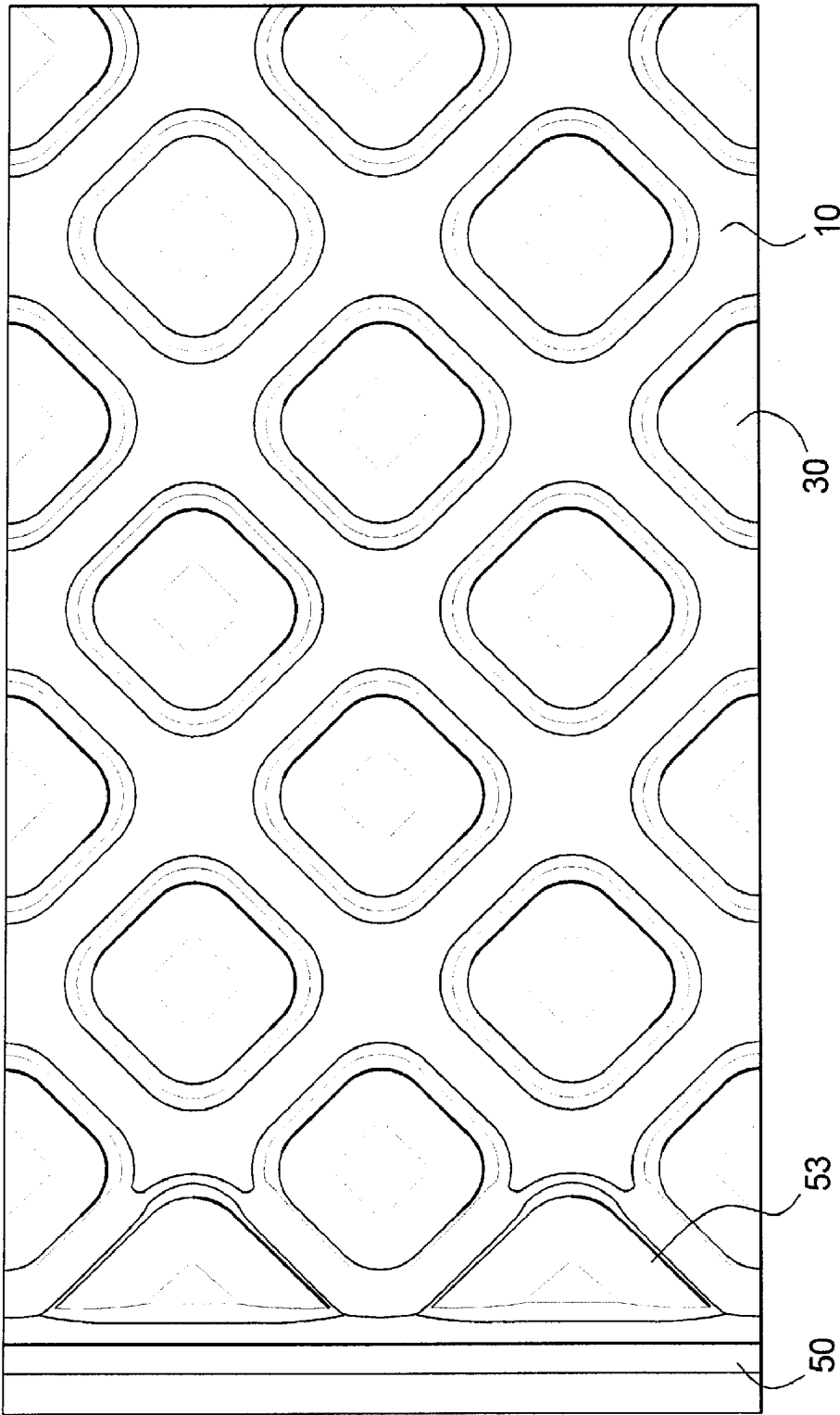
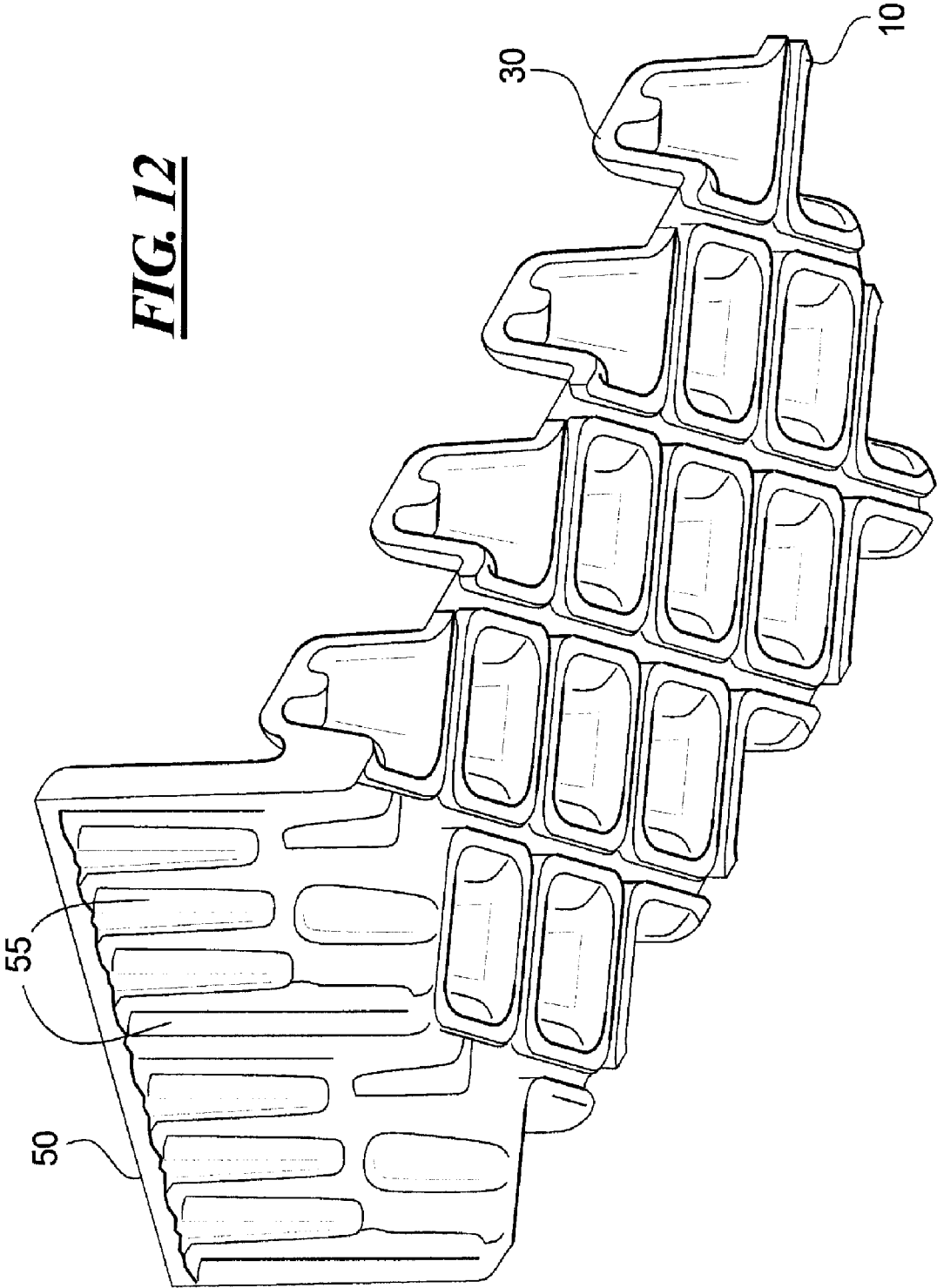
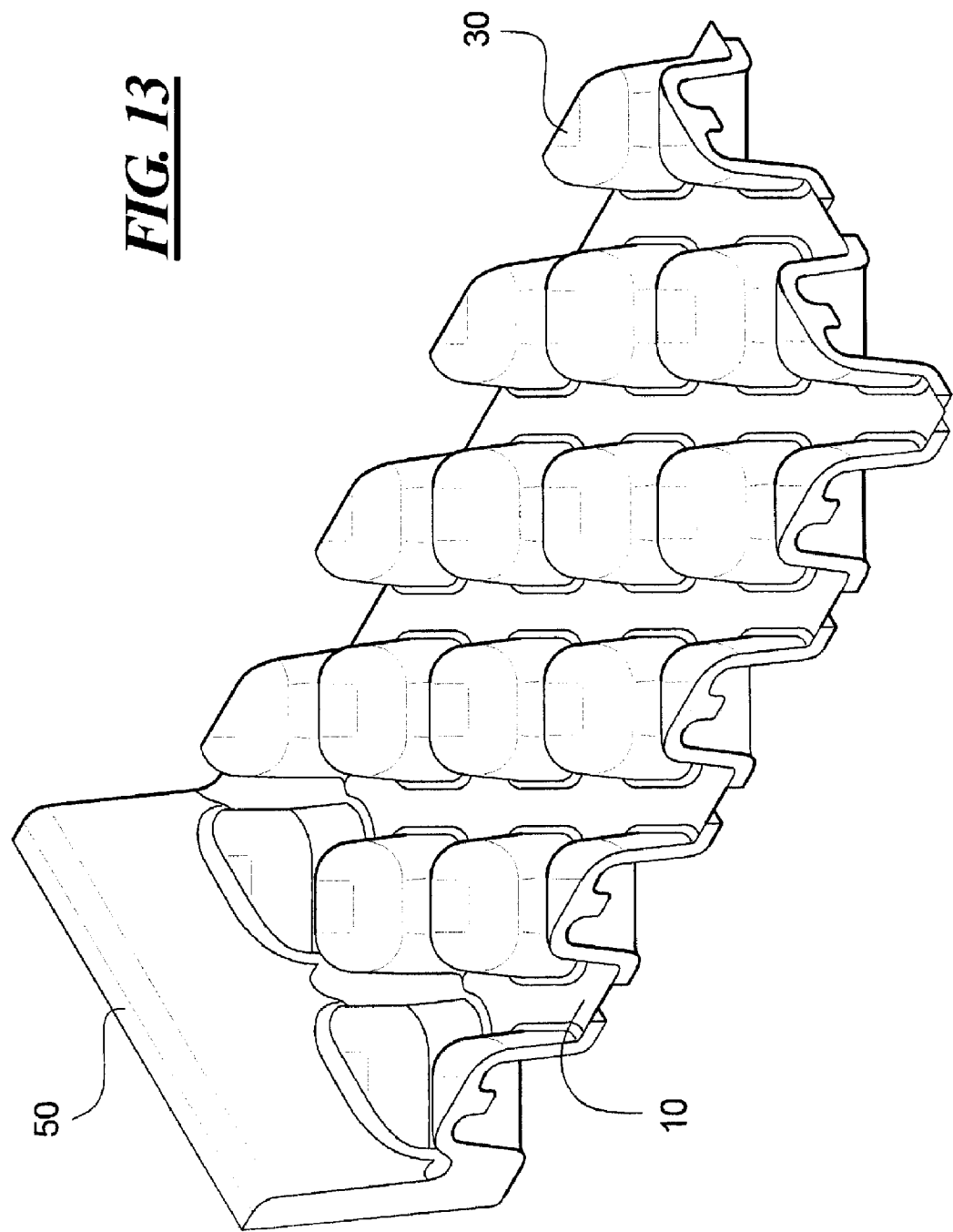


FIG. 12





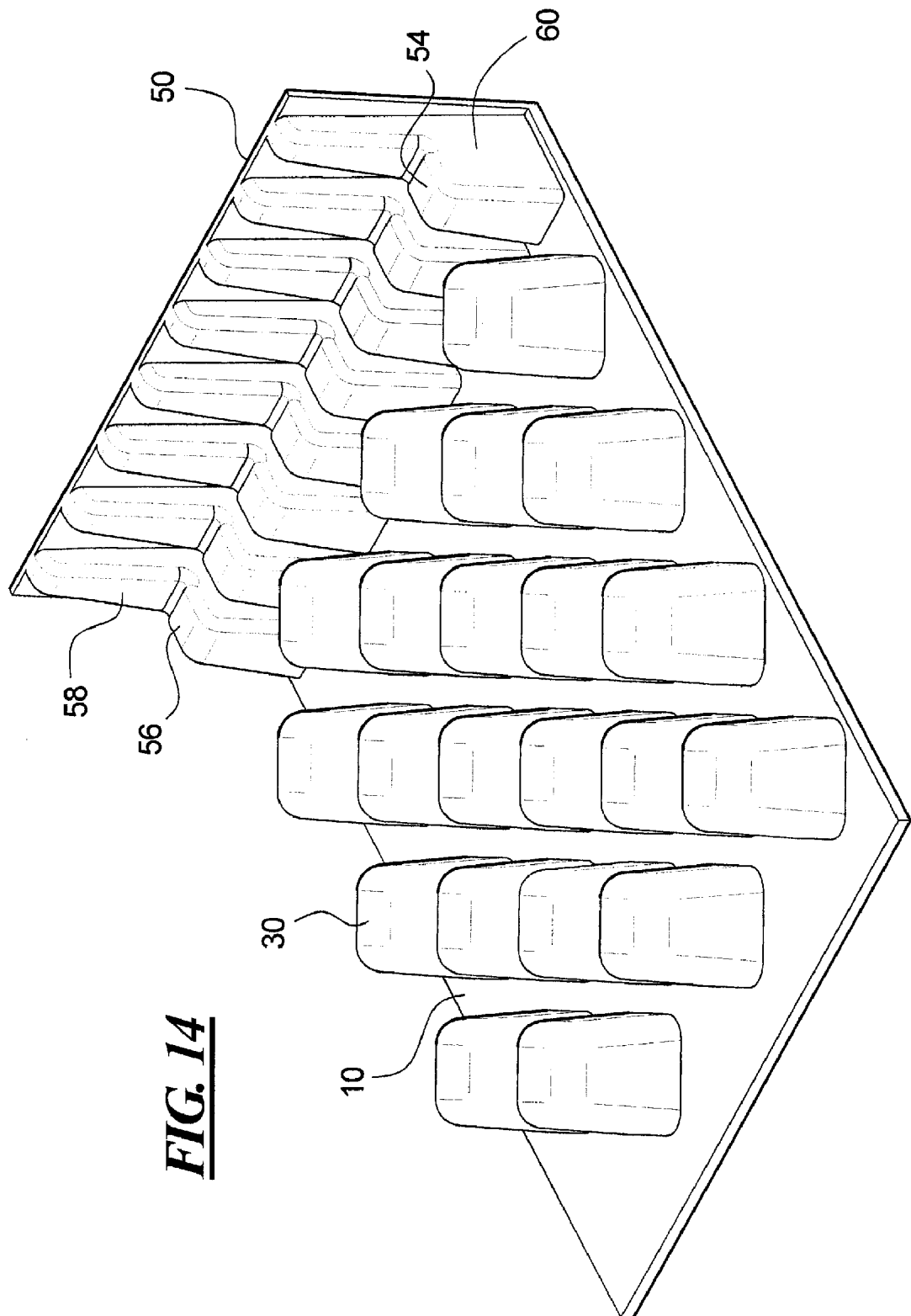
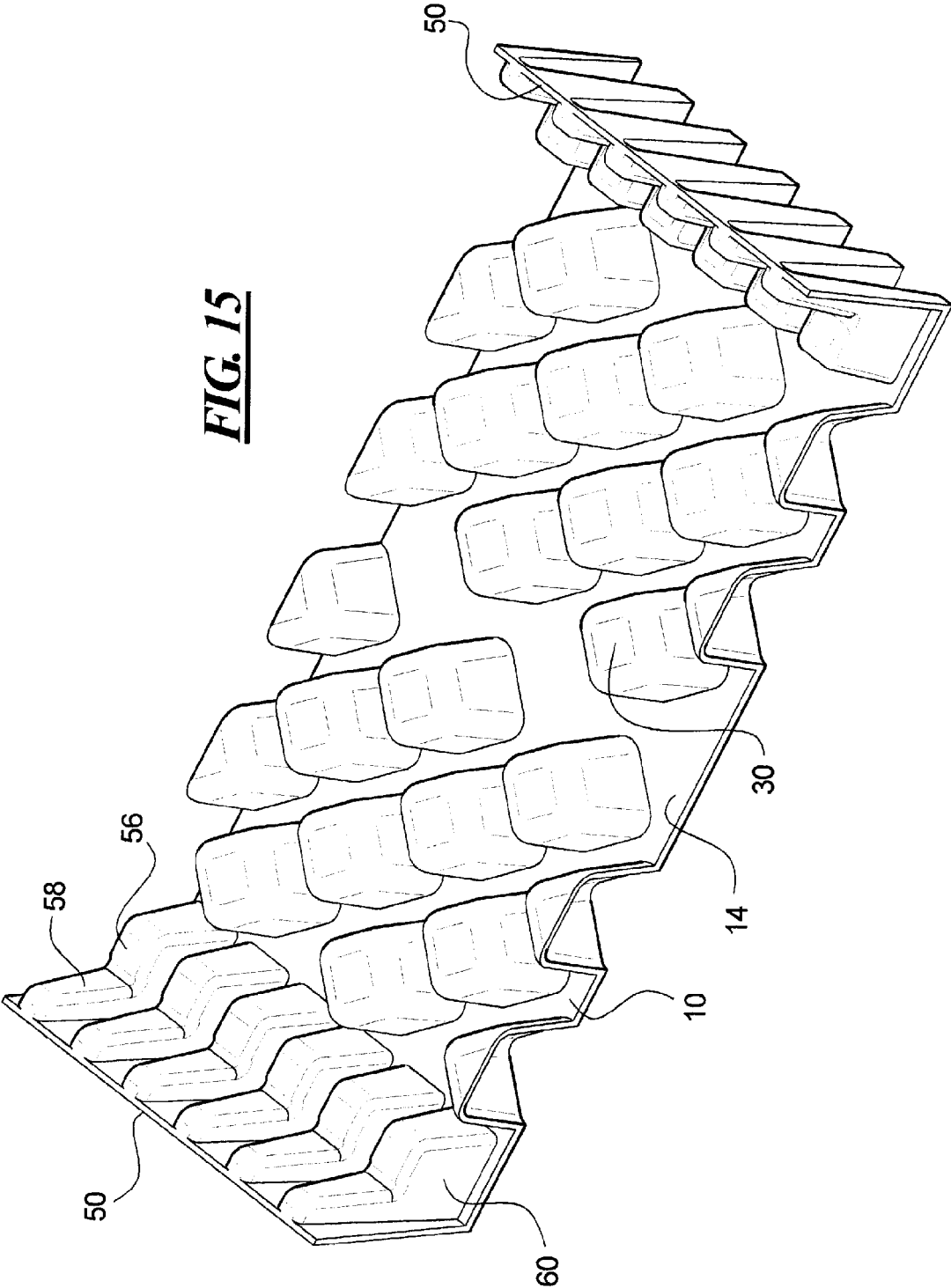
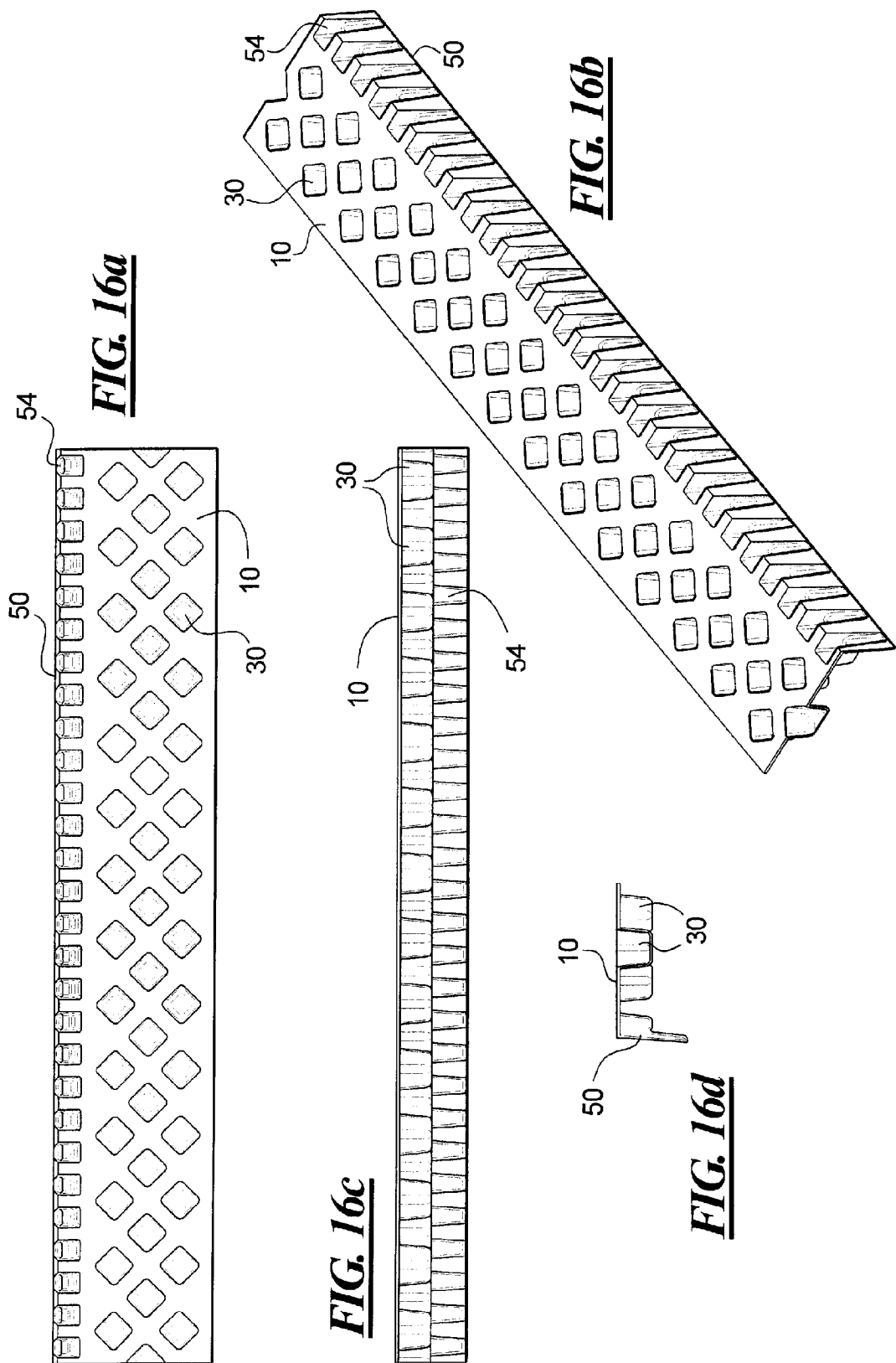
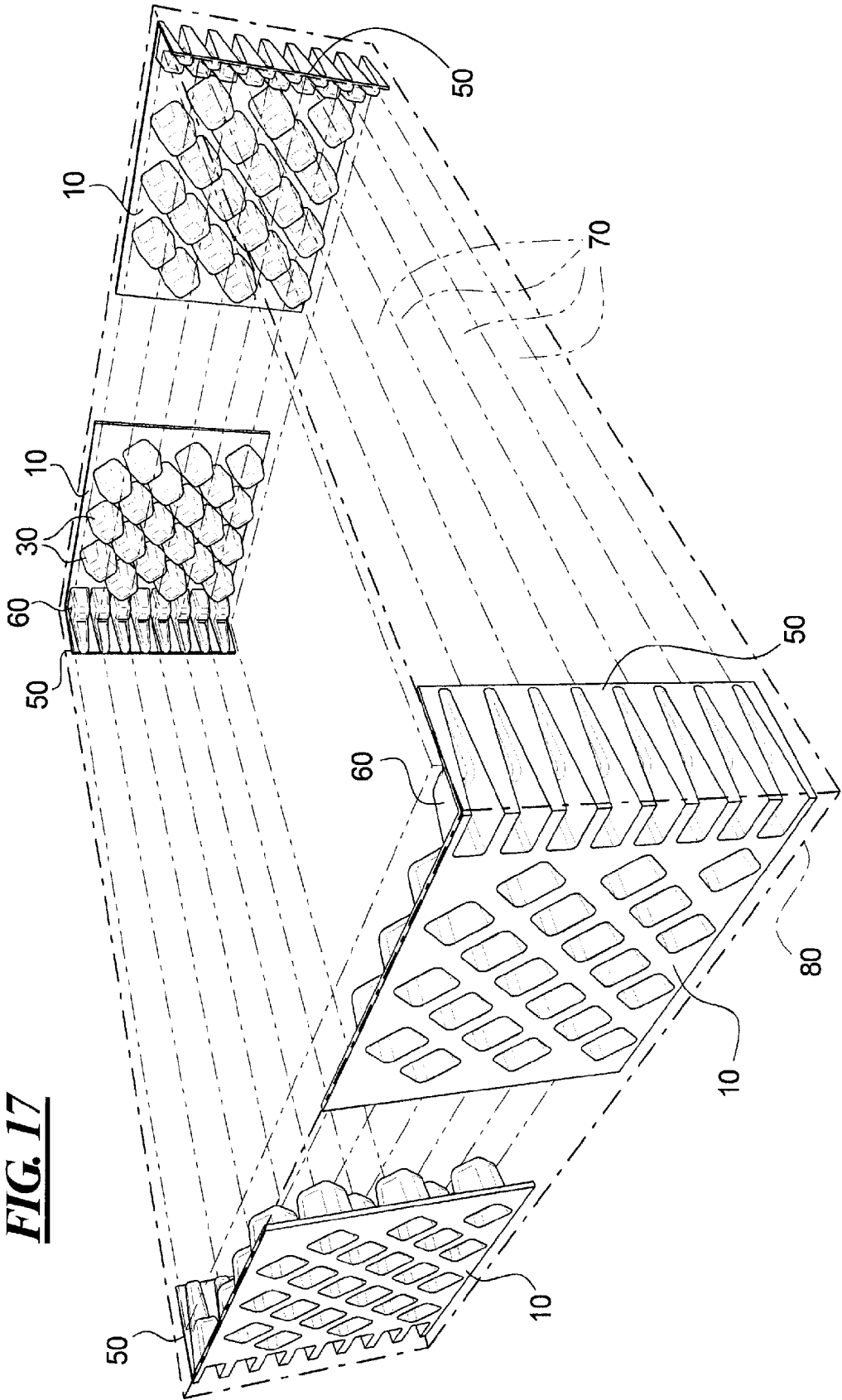


FIG. 14







EDGE PROTECTOR

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application Ser. No. 61/241,732, filed Sep. 11, 2009.

BACKGROUND

[0002] Shipping containers, such as boxes and the like, are at constant risk of being damaged about their ends and corners, which presents a concomitant risk of damaging the containers' contents. If the container is dropped, there is a risk of damage to the articles being transported. This risk is particularly great at the edges and corners of the container because they typically receive the bulk of adverse impacts encountered during transit and are the most susceptible to damage. This is a particular problem where the articles being transported are individual or stacked flat sheets, e.g., particleboard, plywood, glass, ceramic, fiber and other tiles, cardboard, fiberboard, posterboard, and any other articles that may be stacked for shipping or storage. In the event that the container is dropped or sustains some other impact, the edge or corner of the flat article is at risk of sustaining acute damage. Because the flat articles are often stacked for transport, where the container dropped on its edge, the impact will be felt by the articles' edges and corners, maximizing potential damage to the articles. Moreover, stacked flat articles may shift, slide or slip during transport. Where a flat article has slipped, that article has an increased likelihood of sustaining damage.

[0003] To resist such damage, various products and methods have been used to protect the corners and edges of articles during shipment or transit. Such products and methods often involve placing molded protectors on the inside of the shipping container in order to sustain the brunt of any impact, such that the protector absorbs the damage that would otherwise transfer to the article in transit. Interior package protective materials currently in use in packaging products for shipping and distribution are various types of plastic foams, e.g., polystyrene (commonly known as "Styrofoam"). Styrofoam is advantageous in that it may be molded to a specific shape in order to protect from damage while simultaneously minimizing shifting of the container's contents. However, Styrofoam presents significant environmental disadvantages. First, Styrofoam is a major contributor to municipal solid waste, and is neither biodegradable nor compostable. Also, Styrofoam itself is made from petroleum-based sources, and thus is inherently non-renewable.

[0004] Styrofoam also presents disadvantages in the way in which it absorbs damage from impact. Styrofoam's ability to absorb an impact is dependent on the Styrofoam's density. Due to its nature, Styrofoam's ability to cushion is affected by spring constant parameters, which limit Styrofoam's ability to protect from all types of damage.

[0005] One alternative to Styrofoam protectors is pulp fiber, which can be molded into desirable shapes. Compared to Styrofoam, pulp fiber is environmentally friendly and biodegradable. Pulp fiber can be formed with recesses complementary with the article or articles to be shipped, thus minimizing displacement of articles during shipment. Depending on the desired application, the thickness of molded pulp fiber can be varied either to resist crushing or to absorb the energy

from impact by crushing, either of which can absorb the impact energy from edge and corner drops and thus can protect damage to articles being transported

[0006] Moreover, whereas the means by which Styrofoam provides protection is through density, molded pulp fiber is able to provide protection advantages through its configuration. By utilizing particular geometries, molded pulp protectors can be designed to target damage protection where needed, while preventing slippage or other movement by the articles.

[0007] Current molded pulp edge protectors are limited in their effectiveness to protect the corners of stacked, flat articles. Molded pulp edge protectors may be heavy-walled (typically $\frac{3}{16}$ inch to $\frac{1}{2}$ inch in thickness) or thin-walled (about $\frac{1}{16}$ inch in thickness). Heavy-walled protectors are used for relatively hard and heavy objects. Although heavy-walled protectors can be used to protect the corners and edges of stacked flat articles, the protection they offer is limited because heavy-walled protectors have limited ability to absorb the energy from impact by crushing. Thus, articles, and particularly stacked flat articles, may be damaged by an impact notwithstanding the use of heavy-walled protectors. Heavy-walled molded protectors transfer more impact energy to the article or product being protected compared to thin-walled molded protectors, thus increasing the risk of damage to the article or product during transport. For this reason, heavy-walled molded pulp edge protectors are generally not suitable for relatively fragile articles, such as stacked particleboard or cardboard.

[0008] In addition, hardening agents are often used to manufacture heavy-walled molded edge protectors. In contrast, thin-walled molded-pulp edge protectors require little or no additional chemical agents, thereby making them more environmentally friendly.

[0009] Thin-walled molded pulp edge protectors have more flexibility and can be molded into more intricate shapes. This flexibility in molding allows thin-walled protectors to be crafted into shapes that fit the protector's specific use. Also, thin-walled protectors can be manufactured with shapes that are designed to absorb the energy from impact by crushing, thus adding further protection to articles not offered by heavy-walled protectors. The intricate shapes with which thin-walled molded pulp edge protectors can be designed allow the thin-walled molded pulp edge protector to crush upon impact. This crushing absorbs energy from an impact, thereby protecting the article or product from damage.

[0010] Current edge protectors—including current thin-walled edge protectors—are designed to protect edges that are part of a unitary structure, as in the edge of a single article. Where current edge protectors are used to protect multiple corners of a stacked sheet or flat articles that rest to form a line, they lack the ability to provide optimal protection to the corners of the stacked articles. Moreover, due to the geometry of the stacked flat articles, articles that have slipped have a greater susceptibility to damage from an impact. Current molded pulp protectors are not specifically designed for these particular risks, and as such they present inferior products and methods for protecting edges and corners during shipment.

[0011] Thus, there is a need to provide protection along the edges of a container to protect articles, including stacked, flat articles made of materials such as particle board, plywood, glass and tiles, etc., from impact and consequential damage. There is also a need to provide protection to prevent slippage of stacked, flat articles.

[0012] It is therefore an object of the present invention to provide new package cushioning structures or protectors that hold flat, stacked articles stationary during transport, while providing optimal protection from drops, particularly at the edges and corners.

BRIEF DESCRIPTION

[0013] One aspect of the present invention is a protector comprising a base having a plurality of base protrusions and an elongated edge having a flexible connection to the base, wherein the elongated edge has rib protrusions. Another aspect of the present invention is a protector comprising a base having a plurality of base protrusions and an elongated edge, wherein the elongated edge has a rigid connection to the base. Another aspect of the present invention is a method of protecting flat, stacked articles comprising placing a plurality of articles having edges into a container having an inside surface and arranging one or more edge protectors between edges of the articles and the inside surface of the container. Another aspect of the present invention is a method of transporting flat, stacked articles comprising placing a plurality of articles having edges into a container having an inside surface, arranging one or more edge protectors between edges of the articles and the inside surface of the container, and transporting the container. Another aspect of the present invention is a container comprising a plurality of flat stacked articles and one or more edge protectors, wherein the container has an inside surface and wherein the one or more edge protectors are positioned between the inside surface of the container and the stacked flat articles.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Embodiments of the present invention will be readily understood by the following detailed description in conjunction with the accompanying drawings. Embodiments of the invention are illustrated by way of example and not by way of limitation in the figures of the accompanying drawings:

[0015] FIG. 1 illustrates a top perspective view of a protector.

[0016] FIG. 2a is a side cross-section view of a protector.

[0017] FIG. 2b is a top perspective view of the protector of FIG. 2a.

[0018] FIGS. 2c and e are side views of the protector of FIG. 2a.

[0019] FIG. 2d is a bottom view of the protector of FIG. 2a.

[0020] FIG. 2f is a side cross-section view of the protector of FIG. 2a.

[0021] FIG. 2g is a side cross-sectional view of a product or article protected by the protector of FIG. 2a and packed in a carton.

[0022] FIG. 3 is a perspective view of the bottom of a protector.

[0023] FIG. 4 is a perspective view of the top of a protector.

[0024] FIG. 5a is perspective view of the top of a foldable protector in an open position.

[0025] FIG. 5b is a perspective view of the protector of FIG. 5a in a closed position.

[0026] FIG. 6a is a perspective view of the bottom of the protector of FIG. 5a in a closed position.

[0027] FIG. 6b is a perspective view of the bottom of the protector of FIG. 5a in an open position.

[0028] FIG. 7a is a side view of the protector of FIG. 5a in a closed position.

[0029] FIG. 7b is a side view of the protector of FIG. 5a in an open position.

[0030] FIG. 8 is a top perspective view and cross-sectional view of a protector.

[0031] FIG. 9 is a side cross-sectional view of a protector.

[0032] FIG. 10 is a side view of the elongated edge of a protector.

[0033] FIG. 11 is a top view of a protector.

[0034] FIG. 12 is a bottom perspective view of the protector of FIG. 11.

[0035] FIG. 13 is a top perspective view of the protector of FIG. 11.

[0036] FIG. 14 is a top perspective view of a protector.

[0037] FIG. 15 is a top perspective view of a protector.

[0038] FIG. 16a is a bottom view of a protector.

[0039] FIG. 16b is a perspective view of the bottom of the protector of FIG. 16a.

[0040] FIG. 16c is a side view of the front of the protector of FIG. 16a.

[0041] FIG. 16d is a side cross-sectional view of the side of the protector of FIG. 16a.

[0042] FIG. 17 is a perspective view of the protector of FIG. 14 engaging flat stacked articles within a container.

DETAILED DESCRIPTION

[0043] In the following detailed description, reference is made to the accompanying drawings and illustrations which form a part hereof, and in which are shown by way of illustration embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural or logical changes may be made without departing from the scope of the present invention. Therefore, the following detailed description is not to be taken in a limiting sense, and the scope of embodiments will be defined by the claims and their equivalents.

[0044] The present invention is directed to protecting devices that are used to protect items such as furniture, table tops, stacked particleboard, plywood, glass, ceramic, fiber and other tiles, shelving, cardboard, fiberboard, posterboard, and other items from damage during transit, where the items have an edge or corner. In particular, the protecting devices are well-suited for flat articles that are stacked on top of each other during storage and shipment. Some examples of such flat items or articles are shelving, particle board and plywood. The protecting devices are particularly well-suited for use in shipment of ready-to-assemble furniture. In addition, the protecting devices are well-suited for use within a shipping container such as a box.

[0045] The protecting devices are preferably made from molded fiber or paper pulp. Processes for manufacturing thin-walled protectors from molded fiber or paper pulp are well known in the art. (See, e.g., U.S. Pat. No. 6,629,608 (filed Aug. 22, 2001); PCT Published Patent Application No. WO 93/16937 (filed Feb. 26, 1993), which are hereby incorporated by reference in their entirety.) Molded fiber or pulp is biodegradable and more environmentally friendly compared to other packaging materials, such as Styrofoam. Molded pulp or fiber can be made from recyclable material, may itself be recyclable, and is relatively easy to manufacture.

[0046] FIG. 1 illustrates a top perspective view of a commercially available molded pulp protector that is formed on a single mold form. The protector has a base 10 with protu-

sions 30 arranged in a grid pattern with horizontal and vertical rows of protrusions 30. The protrusions 30 have four side-walls and are preferably square or rectangular in shape. The protector of FIG. 1 may be placed between the article to be protected and a container in which the article is shipped, such as a box. The protrusions 30 absorb energy from an impact and provide a cushion for the article in the container. The protector of FIG. 1 may be cut to a desired size and may be arranged between the edge or surface of the article being shipped and the walls of a shipping container. As used in this disclosure, the term “protrusion-free channel” refers to a linear channel in the base 10 having no protrusions 30. As shown in FIG. 1, the arrangement of protrusions 30 leaves horizontal protrusion-free channels 12 and vertical protrusion-free channels 14. One disadvantage of protector of FIG. 1 is seen where this design is used to attempt to protect the edges or corners of stacked flat articles. In such a situation, the stacked flat articles might slip into the horizontal protrusion-free channels 12 or vertical protrusion-free channels 14, which would cause the protector of FIG. 1 to provide little protection from impact to the slipped articles. Articles which slip into the horizontal protrusion-free channels 12 or vertical protrusion-free channels 14 are thus more likely to be damaged from a drop or impact. Another disadvantage of this design is that multiple pieces of the protector need to be arranged around the article (or stacked flat articles) to protect its corners or edges. Multiple pieces are more likely to change position during transport and offer less support compared to a unitary structure used to protect edges or corners. Another disadvantage of this design is that it offers poor protection along the edges of the container holding the products or articles to be transported. Although this design is suitable for protecting a flat surface, in order to protect from edge or corner drops it must be cut or folded about the edge or corner. Where such cut or fold does not cross any protrusions, the benefit of protection from the protrusions is diminished at the edge or corner, where it is needed most. Where such cut or fold does cross protrusions, the protrusions themselves will be cut. Protrusions that have been cut are structurally weaker than protrusions that have not been cut, which results in the cut protrusions’ inferior capability to absorb the energy from impact. Thus, the edge or corner of the article remains vulnerable to damage.

[0047] FIGS. 2a-g illustrate one embodiment of an edge protector having a base 10 with a foldable flap 20. The foldable flap is connected to the base 10 by a flexible connection 22. As illustrated in FIG. 2g, the base 10 of the protector is placed on the edges of stacked flat articles and the foldable flap 20 is folded such that the protector is positioned between the inside surface of the container and the product. In this embodiment, the protector has protrusions 30 arranged in a diagonal grid pattern relative to the base 10 of the protector, thereby eliminating the horizontal protrusion-free channels 12 and the vertical protrusion free channels 14 of the protector of FIG. 1. The arrangement of the protrusions 30 in a diagonal grid pattern is advantageous in that it helps to prevent stacked flat articles from slipping past or between protrusions 30 such that they receive less or no protection offered by the protrusions 30 in the event of an impact. As used in this disclosure, the term “horizontal protrusion-free channel” refers to a protrusion-free channel in the base 10, where the protrusion-free channel is parallel to the plane in which stacked flat articles lie. Similarly, as used in this disclosure, the term “vertical protrusion-free channel” refers to a protrusion-free channel in

the base 10, where the protrusion free channel is perpendicular to the plane in which stacked flat articles lie. It should be noted that where stacked flat articles are arranged non-horizontally, e.g., vertically, a horizontal protrusion-free channel may not be horizontal as the term “horizontal” is customarily understood, and a vertical protrusion-free channel may not be vertical as the term “vertical” is customarily understood. Although in some embodiments, the protector has protrusions 30 that are arranged in a diagonal grid pattern, the protrusions 30 may be arranged in other patterns; as long as the base 10 is free of horizontal protrusion-free channels, the protector will be able to help prevent stacked flat articles from slipping between the protrusions 30. In some embodiments, the presence of a vertical protrusion-free channel is advantageous. Where the base 10 is cut across protrusions 30 in order to customize the dimensions of the protector, the cut protrusions 30 provide inferior protection from impact. Thus, the presence of a vertical protrusion-free channel allows the protector to be cut at that channel, giving the protector desirable dimensions while avoiding the need to cut across protrusions 30.

[0048] The protrusions 30 have four side-walls 32 and are preferably square or rectangular shaped. The four side-walls 32 are preferably angled inward so that the area of the protrusion 30 near the base of the protector is larger than area of the protrusion 30 at the top of the protector. As illustrated in FIGS. 2b, 2d and 2e, the protector preferably has smaller protrusions 40 along the edge of the foldable flap 20. The smaller protrusions 40 along the edge of the foldable flap 20 are preferably smaller in height and have a side-wall 42 that is parallel to the edge of the foldable flap 20. In the embodiment shown in FIGS. 2a-g, the smaller protrusions 40 are triangle shaped and are positioned so that one side-wall 42 is parallel to the foldable edge of the protector and the other side-walls are parallel to the diagonal grid pattern formed by the rows and columns of the protrusions 30.

[0049] FIG. 3 is a bottom perspective view of another embodiment of an edge protector. The protector has square or rectangular-shaped hollow protrusions 30. The protrusions 30 may be hollow or filled or partially filled with molded paper pulp, depending upon the amount of protection that is required. Preferably, the protrusions 30 are hollow and the thickness of the side-walls 32 of the protrusion may be varied depending upon the amount of protection required. For example, in the embodiment shown in FIG. 3, the centers of the sidewalls 32 are thicker, forming hollow protrusions 30 shaped like a four-leaf clover when viewed from the bottom. FIG. 4 is a top perspective view of another embodiment of a protector having two foldable flaps 20.

[0050] In some applications, the embodiments of an edge protector illustrated in FIGS. 2a-2g, FIG. 3, and FIG. 4 are limited in their effectiveness to protect the article to be shipped from an impact suffered at or near the foldable flap 20. Moreover, the foldable flap 20 is susceptible to being torn or broken away from the base 10 in the event of an impact. In other applications, these embodiments are advantageous because the foldable flap 20 allows the protector to remain in its proper position while requiring minimal additional space between the article being transported and the inside surface of the container. Also, the foldable flap 20 allows the protector to be used to protect a wide variety of articles with corners of varying angles, due to the flexibility in the flexible connection 22 between the foldable flap 20 and the base 10.

[0051] FIGS. 5a and 5b illustrate a top perspective view of an alternate embodiment of a protector with foldable flaps. In the embodiment shown in FIGS. 5a and 5b, the protrusions 30 form a diagonal grid on the base 10 of the protector. The protrusions 42 on the base 10 nearest the foldable flap 20, however, are square or rectangular in shape with sidewalls that are parallel and perpendicular to the foldable flap 20. The foldable flap 20 also has protrusions 40 that preferably have the same width as the height of the protrusions 42 on the base of the protector, such that when the foldable flap 20 is folded, the protrusions 40 on the flap 20 fill the gaps between the protrusions 42 on the base 10, as shown in FIG. 5b. In the context of this disclosure, this aspect wherein the protrusions 40 fill the gaps between protrusions 42 on the base 10 when the foldable flap 20 is folded is referred to as being "adjacent." In other words, when the foldable flap 20 is folded about its flexible connection 22 to the base 10, the protrusions 40 are adjacent to the protrusions 42. The base 10 of the protector also has protrusions 44 on the base 10 farthest the foldable flap 20. In a preferred embodiment, the protrusions 44 have three side-walls 46 and are preferably triangular shaped. FIGS. 6a and 6b illustrate a bottom perspective view of the protector shown in FIGS. 5a and 5b. FIGS. 7a and 7b illustrate a side perspective view of the protector shown in FIGS. 5a and 5b. An advantage of the protector illustrated in FIGS. 5a and 5b in some applications is that, because of the geometries of the protrusions 40 and 42, the walls of these protrusions offer structural support in the same plane (or in close to the same plane) in which one or more flat articles lie. This provides added protection from impact and further protects the one or more stacked articles from damage.

[0052] FIG. 8 is a top perspective view and cross-sectional view of a protector with a foldable flap 20, illustrating an alternate shape for the protrusion 42 on the base of the protector nearest the foldable flap 20.

[0053] FIG. 9 is a side cross-sectional view of a protector molded as a unitary piece. In this embodiment the elongated end 50 at the end of the protector is not foldable, which makes the edge protector stronger and provides more protection to the article near an edge of the container. For the purposes of this disclosure, the connection of the base 10 to the elongated edge 50 can be described as being rigid. FIG. 10 is a side view of the elongated edge 50 of a protector. As illustrated in FIG. 10, the elongated edge 50 is preferably ribbed with protrusions 52 that protrude inward into the gaps formed by the protrusions 30 on the base 10 of the protector. The elongated edge 50 is also preferably ribbed with rib protrusions 55 that protrude inward from elongated edge 50 and extend in elongated edge 50 beyond the height of protrusions 30. In some embodiments, the rib protrusions 55 extend substantially the height of elongated edge 50 from its connection to the base 10. FIG. 11 is a top view of an alternate embodiment of a protector, wherein the protrusions 53 on the elongated edge 50 of the protector are molded so that they share a sidewall with the protrusions on the base 10 of the protector that are nearest to the elongated edge 50. FIG. 12 is a bottom perspective view of the protector of FIG. 11. FIG. 13 is a top perspective view of the protector of FIG. 11.

[0054] In certain applications, the embodiments of edge protectors as illustrated in FIG. 9 through FIG. 13 are advantageous in that they provide additional protection to the article near an edge of the container, due to the fact that the elongated edge 50 is not foldable. Moreover, the rib protrusions 55 provide added strength to the elongated edge 50, which

assists the elongated edge 50 in absorbing the energy from impacts and thereby provides additional protection.

[0055] FIG. 14 is a top perspective view of a preferred embodiment of a protector. In this preferred embodiment, the protrusions 30 are preferably square or rectangular shaped and are arranged in a diagonal pattern to form a diagonal grid relative to the base 10 of the protector. On one end of the protector, there is preferably an elongated edge 50 with chair-shaped protrusions 54. The height of the seat 56 of the chair-shaped protrusions 54 from the base 10 of the protector is approximately the same height as the protrusions 30 on the base 10 of the protector. The back 58 of the chair-shaped protrusions 54 provides a ribbed structure to the portion of elongated edge 50 that extends beyond the height of the seat 56. The seat 56 is connected to the back 58 at a juncture; when the protector is in use, the juncture engages a corner or edge of an article to be protected. The sidewalls 60 of the chair-shaped protrusions 54 are perpendicular or nearly perpendicular to the elongated edge 50, and preferably have a draft angle of about seven degrees compared to the base 10. The sidewalls 60 add structural integrity to elongated edge 50, which provides greater protection from impact while also helping to prevent breaking or tearing of the protector upon impact. FIG. 15 is a top perspective view of an alternate preferred embodiment of a protector, which includes two elongated edges 50 on opposite sides of the base 30 and parallel to each other. The protector shown in FIG. 15, could either be cut in the center, between the elongated edges 50, to fit a shipping container, or it could be designed to an appropriate length so that the protector fits snugly within a container having specific dimensions. In some embodiments, as shown in FIG. 15, the protrusions 30 in base 10 are arranged such that a vertical protrusion-free channel 14 exists between and parallel to the elongated edges 50. It should be noted that whereas in this embodiment the protrusions 30 on base 10 are arranged to be free of horizontal protrusion-free channels, vertical protrusion-free channel 14 is perpendicular to the plane in which stacked flat articles protected by the protector would lie. Thus, if the stacked flat articles were lying horizontally, the vertical protrusion-free channel would be vertical; depending on the position of the stacked flat articles, the vertical protrusion-free channel may or may not be "vertical" as that term is commonly understood.

[0056] Preferred dimensions of a protector with chair shaped protrusions 54 are as follows. Base protrusions 30 are at a height of one inch above the base 10 and have a draft angle of about seven degrees. The elongated edge 50 extends to a height of about two inches above the base 10. The seats 56 have a height of about one inch above the base 10. Each of the seats 56 has a length of about 0.5 inch measured from each seat's 56 juncture with the back 58 of the chair-shaped protrusions 54 and extending into the base 10. The backs 58 of the chair-shaped protrusions 54 extend about one inch above the seats 56 of the chair-shaped protrusions 54. The distance between the chair-shaped protrusions 54, measured center-to-center, is about 0.63 inch. The chair shaped protrusions 54 are about 0.22 inches wide, measured at the top of the chair-shaped protrusions 54. The juncture of the seat 56 and the back 58 is about 0.39 inch from the elongated edge 50. Each of the chair-shaped protrusions 54 has a draft angle of about seven degrees.

[0057] FIGS. 16a to 16d illustrate an alternate preferred embodiment of an edge protector. FIG. 16a is a bottom view of the edge protector. FIG. 16b is a perspective view of the

bottom of the edge protector. FIG. 16c is a side view of the front of the edge protector, and FIG. 16d is a side view of the edge protector.

[0058] The edge protector is preferably manufactured from molded paper pulp. It can be in any color, but is preferably in standard gray. The average thickness of the walls of the protector are preferably about $\frac{1}{16}$ of an inch, which is a standard thickness for thin-walled protectors.

[0059] The elongated edge 50 preferably has a draft angle of about seven degrees. It should be noted that the side-walls of the protrusions 30 and 54 are preferably angled inward so that the area of the protrusion at the base is larger than the area of the protrusion at the top. It should also be noted that the side-walls 60 of the chair-shaped protrusions 54 are preferably angled inward so that the distance between the side-walls 60 on either side of a chair-shaped protrusion 54 is greater at the base than it is at the top. The draft angle and the angled inward protrusions and chair-shaped protrusions allow the protectors to be stacked on top of each other, which not only saves space, but makes it easier and cheaper to store and transport the protectors of the present invention.

[0060] In the embodiments of an edge protector shown in FIG. 1 through FIG. 17, it is generally preferable to fit as many protrusions 30 as possible on a given protector, such that the area of the base 10 covered by each individual protrusion 30 is small. Moreover, the height of protrusions 30 off of the base 10 is determined by the amount of protection required. Generally, the amount of protection increases with an increase in the height of protrusions 30, although in some applications greater height of protrusions 30 can result in a higher manufacturing cost. Similarly, in the embodiments of an edge protector shown in FIG. 14 through FIG. 16d, it is generally preferable that as many chair-shaped protrusions 54 be placed along elongated edge 50 as possible, such that the width of each individual chair-shaped protrusion 54 is small. It is also preferable that the height of the seat 56 of the chair-shaped protrusions 54 off of the base 10 matches the height of the protrusions 30. Due to manufacturing constraints, the applicant has found the dimensions given in paragraph [0056] to be well-suited in applications requiring protection of stacked flat particleboard sheets having a thickness of $\frac{1}{2}$ inch or $\frac{5}{8}$ inch, as well as in applications requiring protection of stacked flat sheets having other thicknesses.

[0061] To demonstrate an example of protectors in use, FIG. 17 shows the protector of FIG. 14 engaging stacked flat articles 70 within a container 80, such as a box. FIG. 17 shows four protectors, each engaging an edge of a stack of flat articles. FIG. 17 illustrates the diagonal arrangement of the protrusions 30 with respect to the plane of the stacked flat articles. Specifically, the arrangement of protrusions 30 in base 10 is free of horizontal protrusion-free channels, and the stacked flat articles are inhibited from slipping between or past the protrusions 30. Also, side-walls 60 lie in the same plane or in nearly the same plane as the stacked flat articles 70. In this way, the protectors protect the stacked flat articles 70 from damage from impact, while at the same time positioning the stacked flat articles 70 within the container 80. Although FIG. 17 shows an example of the protector of FIG. 14 in use, other protectors as described herein operate in similar or identical ways to protect articles such as stacked flat articles.

[0062] A short edge drop test was performed according to the guidelines set for such a test by the International Safe Transit Association ("ISTA"). A Model 273 shipping carton, which is a cardboard box typically used to ship ready-to-

assemble furniture, was used for the ISTA drop test. Particle boards were cut to simulate the flat stacked articles in a Model 273 shipping carton. A Model 273 shipping carton packed with flat stacked particle boards and 1 inch foam end pads was dropped on its shortest edges. The results were evaluated and used as a control. Multiple other Model 273 shipping cartons were packed using flat stacked particle boards to compare the protection offered by different embodiments of edge protectors. The following embodiments were tested and compared to each other and the control: (1) the protector with a foldable flap as illustrated in FIGS. 5-8; (2) the protector illustrated in FIGS. 9-13; and (3) the protector illustrated in FIG. 14. The results of the ISTA drop test show that the embodiment illustrated in FIG. 14 performs better than the other embodiments tested and performs better than the 1 inch foam protector. The results of the ISTA test are listed in the table below.

TABLE 1

Results of ISTA Drop Test.	
Type of Protector	Result
1 inch foam pads	Significant Damage
Embodiment Illustrated in FIGS. 5 to 8	Significant Damage
Embodiment Illustrated in FIGS. 9 to 13	Some Damage
Embodiment Illustrated in FIG. 14	Minor to No Damage

[0063] Although certain embodiments have been illustrated and described herein for purposes of description of the preferred embodiment, it will be appreciated by those of ordinary skill in the art that a wide variety of alternate and/or equivalent embodiments or implementations calculated to achieve the same purposes may be substituted for the embodiments shown and described without departing from the scope of the present invention. Those with skill in the art will readily appreciate that embodiments in accordance with the present invention may be implemented in a wide variety of ways. This application is intended to cover any adaptations or variations of the embodiments discussed herein. Therefore, it is manifestly intended that embodiments in accordance of the present invention be limited only by the claims and the equivalents thereof.

I claim:

1. A protector comprising:

a base having a plurality of base protrusions; and
an elongated edge having a flexible connection to the base wherein the elongated edge has a plurality of rib protrusions.

2. The protector of claim 1, wherein the plurality of base protrusions is arranged in a pattern that is free of horizontal protrusion-free channels and vertical protrusion-free channels.

3. The protector of claim 1 wherein the plurality of base protrusions is arranged in a diagonal grid pattern.

4. The protector of claim 3, wherein the protector is constructed from thin-walled molded pulp fiber.

5. The protector of claim 4, wherein the elongated edge has one or more edge protrusions so arranged as to be adjacent to the base protrusions when the elongated edge is folded about the flexible connection.

6. A protector comprising:

a base having a plurality of base protrusions; and
an elongated edge, wherein the elongated edge has a rigid connection to the base.

7. The protector of claim 6, wherein the plurality of base protrusions has an arrangement that is free of horizontal protrusion-free channels and vertical protrusion-free channels.

8. The protector of claim 6 wherein the base has a plurality of base protrusions arranged in a diagonal grid pattern.

9. The protector of claim 8, wherein the protector is constructed from thin-walled molded pulp fiber.

10. The protector of claim 9, wherein the elongated edge has rib protrusions.

11. The protector of claim 8, wherein the rigid connection contains one or more chair-shaped protrusions, the chair-shaped protrusions being comprised of a seat and a back, wherein the seat extends the same distance from the base as the height of the base protrusions, wherein the back extends substantially the height of the elongated edge, and wherein the seat and the back meet at a juncture.

12. The protector of claim 11, wherein the base protrusions are at a height of about one inch above the base and have a draft angle of about seven degrees; the elongated edge extends to a height of about two inches above the base;

the seat of each of the chair-shaped protrusions is at a height of about one inch above the base;

the seat of each of the chair-shaped protrusions has a length of about 0.5 inch measured from the juncture and extending into the base;

the back of each of the chair-shaped protrusions extends one inch above the seat of the chair-shaped protrusions; the chair-shaped protrusions are spaced at a distance of about 0.63 inch, measured from center to center;

each of the chair-shaped protrusions has a width and a top, wherein the width is about 0.22 inches measured at the top of the chair-shaped protrusions;

the juncture is about 0.39 inch from the elongated edge; and

each of the chair-shaped protrusions has a draft angle of seven degrees.

13. The protector of claim 11, further comprising a second elongated edge, wherein the second elongated edge has a second rigid connection to the base.

14. The protector of claim 13, wherein the second rigid connection contains one or more second chair-shaped protrusions, the second chair-shaped protrusions being comprised of a second seat and a second back,

wherein the second seat extends the same distance from the base as the height of the base protrusions,

wherein the second back extends substantially the height of the second elongated edge, and

wherein the second seat and the second back meet at a second juncture.

15. The protector of claim 14 wherein the elongated edge is parallel to the second elongated edge, and wherein the elongated edge and the second elongated edge are connected to the base on opposite sides of the base.

16. The protector of claim 15 having a vertical protrusion-free channel between and parallel to the elongated edge and the second elongated edge.

17. The protector of claim 16 wherein

the base protrusions are at a height of one inch above the base and have a draft angle of about seven degrees;

the elongated edge and the second elongated edge extend to a height of about two inches above the base;

the seats and the second seats have a height of about one inch above the base;

each of the seats has a length of about 0.5 inch measured from each seat's juncture and extending into the base;

each of the second seats has a length of about 0.5 inch measured from each second seat's second juncture and extending into the base;

the backs of the chair-shaped protrusions extend about one inch above the seats of the chair-shaped protrusions;

the second backs of the second chair-shaped protrusions extend about one inch above the second seats of the second chair-shaped protrusions;

the distance between the chair-shaped protrusions, measured from center to center, is about 0.63 inches;

the distance between the second chair-shaped protrusions, measured from center to center, is about 0.63 inches;

the chair-shaped protrusions have a width and a top, wherein the width is about 0.22 inches measured at the top of the chair-shaped protrusions;

the second chair-shaped protrusions have a second width and a second top, wherein the second width is about 0.22 inches measured at the second top of the second chair-shaped protrusions;

the juncture is about 0.39 inch from the elongated edge;

the second juncture is about 0.39 inch from the second elongated edge; and

each of the chair-shaped protrusions and each of the second chair-shaped protrusions has a draft angle of about seven degrees.

18. A method of protecting flat, stacked articles comprising:

placing a plurality of articles having edges into a container having an inside surface; and

arranging one or more edge protectors between edges of the articles and the inside surface of the container.

19. The method of protecting flat, stacked articles of claim 18, wherein the one or more edge protectors are edge protectors as described in the claims consisting of claim 2, claim 5, claim 7, claim 11, claim 12, and claim 16.

20. The method of protecting flat, stacked articles of claim 19 wherein the stacked flat articles are particleboard having a thickness of about 0.5 inch to about 0.625 inch.

21. A method of transporting flat, stacked articles comprising:

placing a plurality of articles having edges into a container having an inside surface;

arranging one or more edge protectors between edges of the articles and the inside surface of the container; and transporting the container.

22. The method of transporting flat stacked articles of claim 21, wherein the one or more edge protectors are edge protectors as described in the claims consisting of claim 2, claim 5, claim 7, claim 11, claim 12, and claim 16.

23. The method of transporting flat stacked articles of claim 22 wherein the stacked flat articles are particleboard having a thickness of about 0.5 inch to about 0.625 inch.

24. A container comprising:

a plurality of flat stacked articles; and

one or more edge protectors as described in the claims consisting of claim 2, claim 5, claim 7, claim 11, claim 12, and claim 16;

wherein the container has an inside surface, and wherein the one or more edge protectors are positioned between the inside surface of the container and the stacked flat articles.

25. The container of claim **24** wherein the stacked flat articles have shortest edges and are arranged such that the shortest edges of the articles are aligned, further comprising

four edge protectors, wherein the edge protectors are arranged about the aligned shortest edges of the stacked flat articles.

26. The container of claim **25** wherein the stacked flat articles are particleboard having a thickness of about 0.5 inch to about 0.625 inch.

* * * * *