US 20060144745A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2006/0144745 A1

Abe (43) Pub. Date: Jul. 6, 2006

(54) FRAME AIR-CUSHIONING MATERIAL

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(21) Appl. No.: **10/544,849**

(22) PCT Filed: **Feb. 19, 2004**

(86) PCT No.: **PCT/JP04/01917**

(30) **Foreign Application Priority Data**

Feb. 20, 2003 (JP) 2003-42653

Publication Classification

(51) **Int. Cl.**
B65D 81/02 (2006.01)

(52) **U.S. Cl.** **206/522**

(57) **ABSTRACT**

An inexpensive frame air-cushioning material capable of compactly and stably packaging precision apparatuses formed in rectangular shapes and having specified thicknesses, wherein two sheets of synthetic resin films are stuck to each other, the inner edge parts thereof forming the end part of an outer frame, the inner edge parts formed by dividing the longitudinal intermediate parts thereof into multiple parts between the inner edge parts, and the divided edge parts formed by dividing the vertical intermediate parts thereof into multiple parts are thermally fused to each other and at least one air flow port is provided at the inner edge parts and the divided edge parts to form a frame having a plurality of air chambers communicating with each other. The frame air-cushioning material is characterized in that air is filled in the air chambers through an air filler port provided on at least one of the air chambers to inflate the entire part of the air chambers so that the insides thereof can be pressed against a product and the outsides thereof can be pressed against the inside walls of a carrying container.

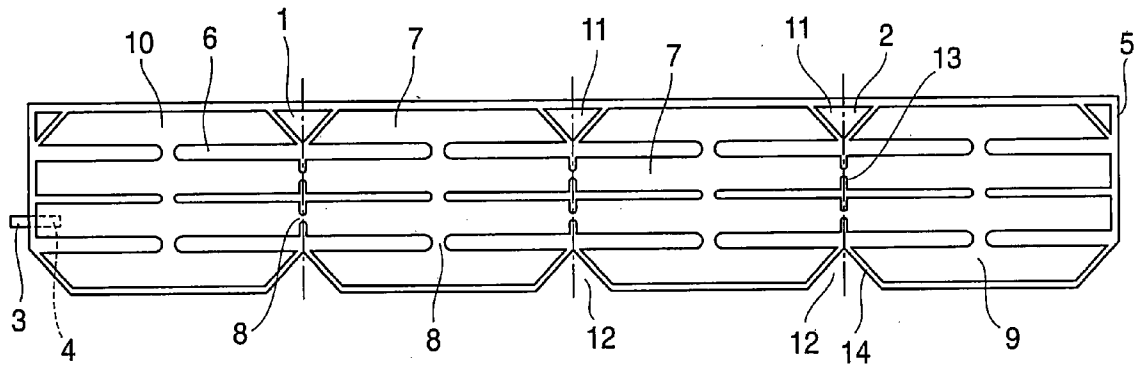


FIG. 1

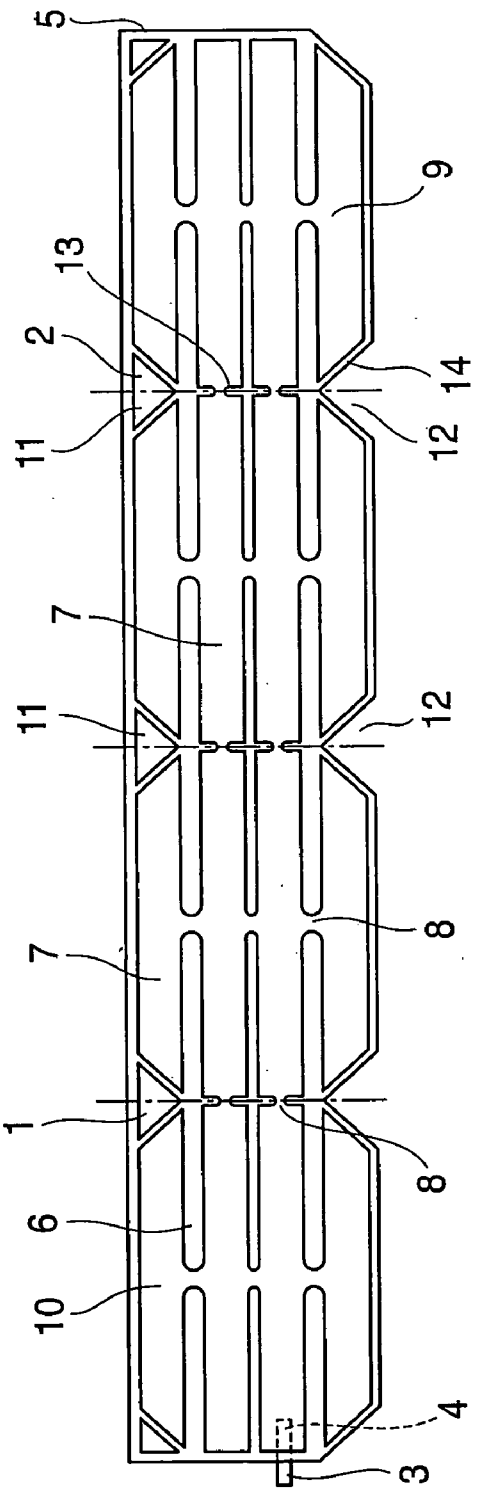


FIG. 2

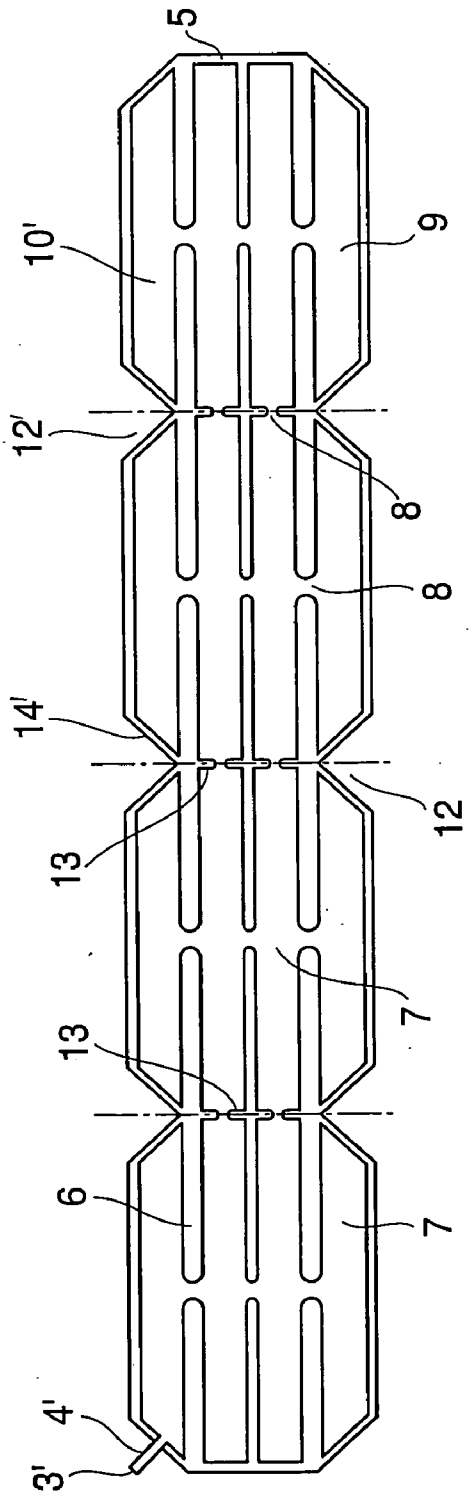


FIG. 3

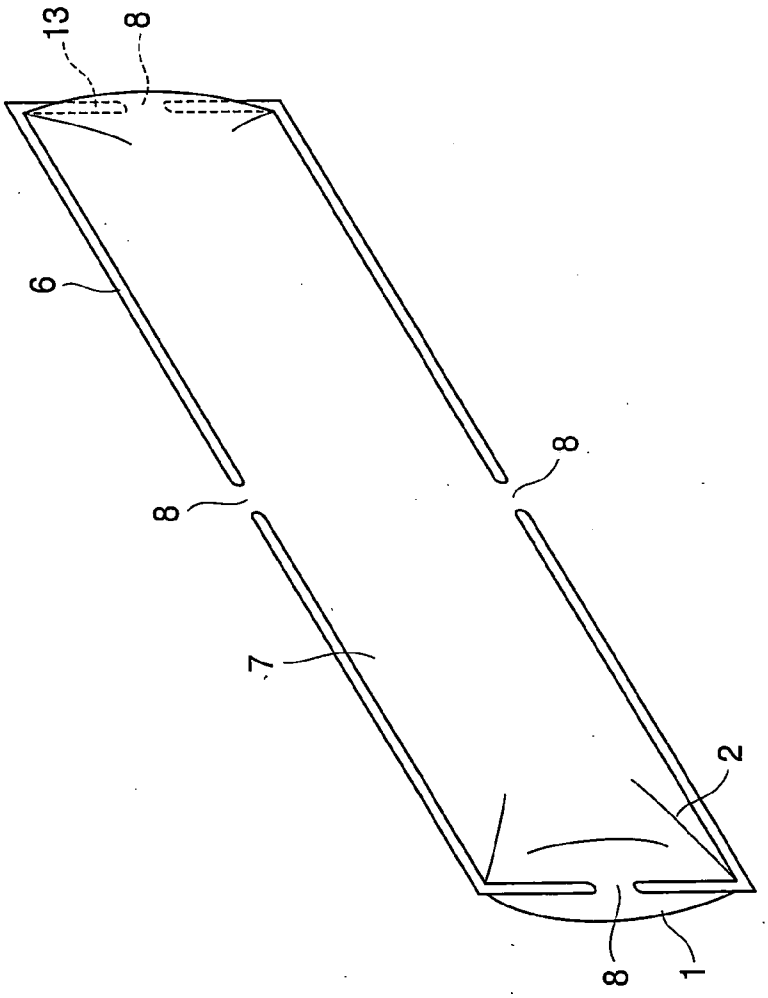


FIG. 4

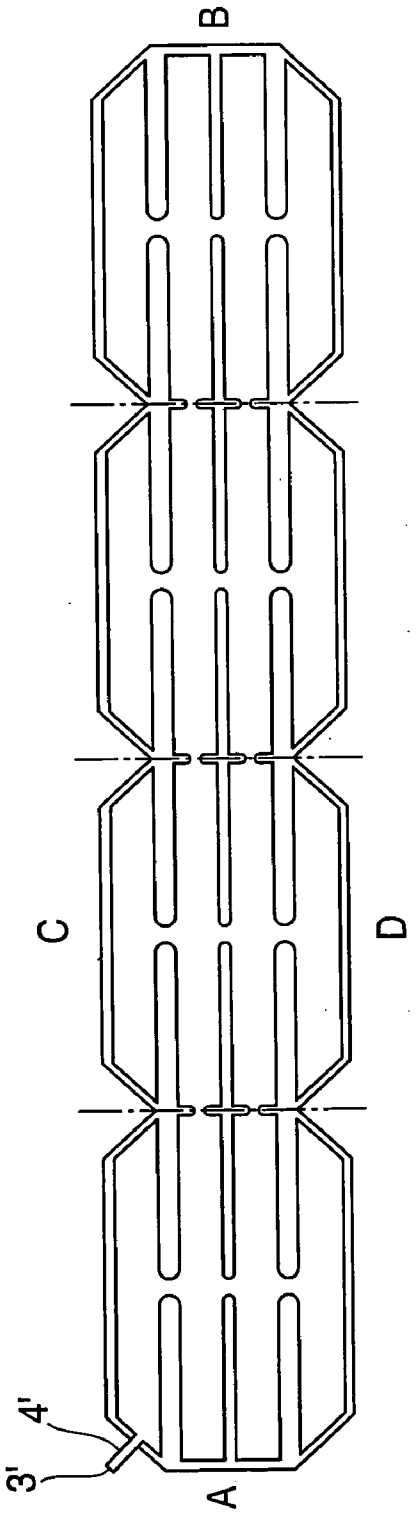


FIG.5

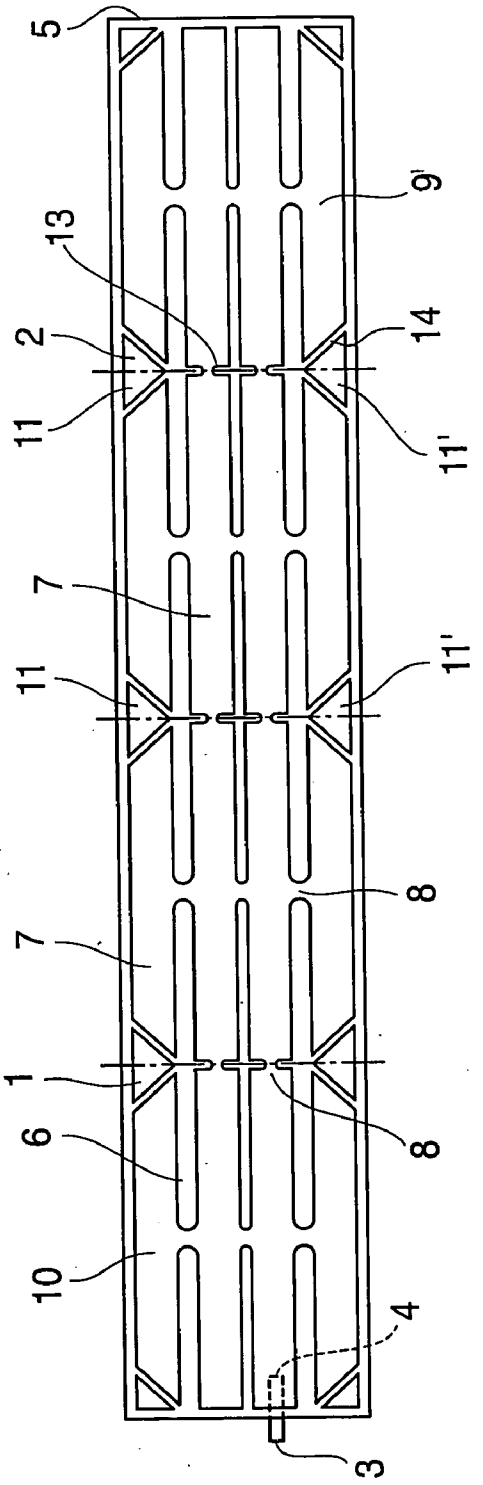
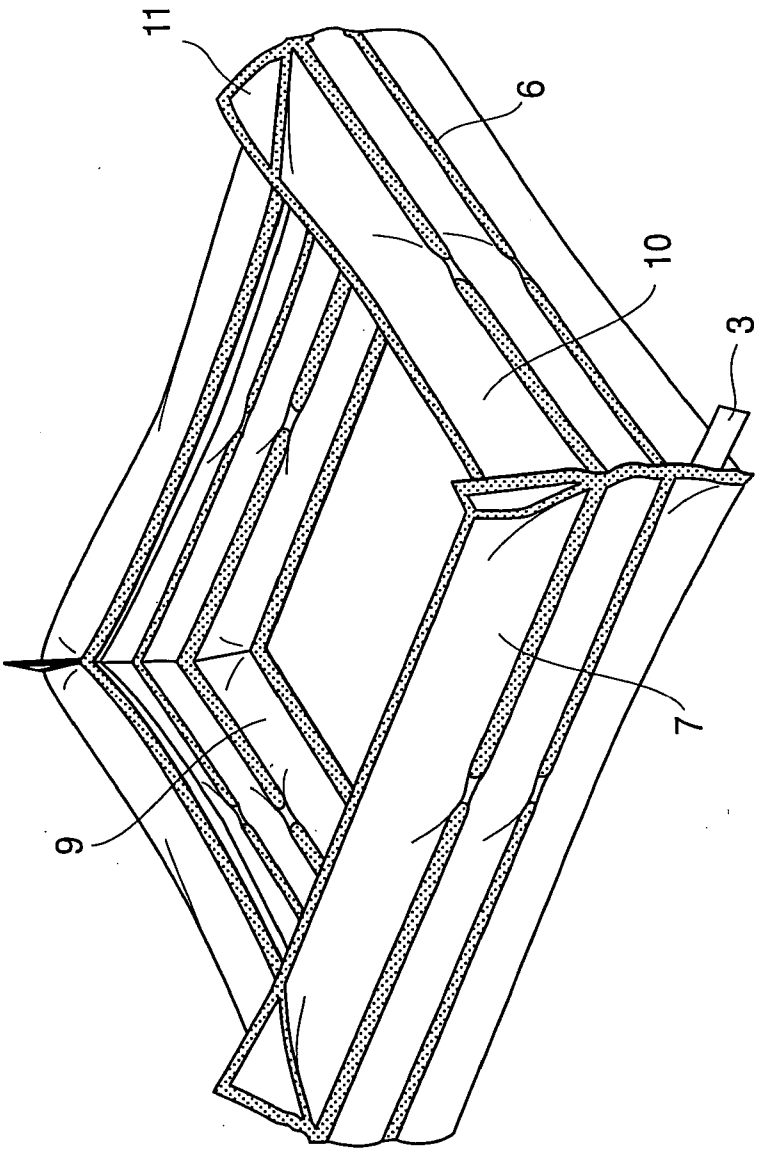


FIG.6



FRAME AIR-CUSHIONING MATERIAL

TECHNICAL FIELD

[0001] The present invention relates to a packaging member that is used when medical instruments, various kinds of precision instrument parts, semiconductor products, glass products or the like are transported, in more detail, a cushioning material that is interposed between an article to be transported and a carrying container housing the article to protect the article from an external force such as impact, in particular, a frame air-cushioning material preferably used when various kinds of products and parts having a substantially rectangular shape and a specified thickness are packaged.

BACKGROUND ART

[0002] So far, when finite mass-market products are packaged, molded articles of foamed polystyrene have been used. However, as packing materials or air-cushioning materials for versatile applications, newspapers, cloths, chip-like foamed polystyrene, trapped-bubble films and the like have been conveniently used because these can be used irrespective of shapes of the articles to be packaged.

[0003] However, in the existing technologies, in the molded articles of foamed polystyrene for instance, ones exclusive to individual products are used. Accordingly, after the use thereof, there is no use other than disposing as waste. Furthermore, even in the case of chip-like foamed polystyrene, trapped-bubble sheets (air cap), newspapers and cloths, which are versatile in the applications, when these are finally disposed as waste, their volume becomes very much, resulting in causing a problem incapable of easily overlooking from a viewpoint of recent global environmental protection and energy saving.

[0004] In view of the situations of the existing technologies, bag-like pads that are made of a thin synthetic resin film and in which air compressed at a pressure in the range of 3 to 5 Kpa/cm^2 is encapsulated have been developed and widely used. The bag-like pads, while maintaining the general versatility as the packaging materials, have excellent characteristics as protecting and enveloping materials of various kinds of components and products, gap-filling materials of miscellaneous goods and the cushioning materials of production materials. Furthermore, these can be easily applied when used and folded in sheet when disused, are compact in a housing space when housed, and can be readily and conveniently disposed; that is, these are excellent in the easiness.

[0005] The bag-like pads made of a synthetic resin, to cope with various kinds of components and products having a variety of shapes, have excellent characteristics as mentioned above. However, when products having a rectangular or polygonal external shape and a specified thickness, for instance, box type products are stably packaged, housed in a carrying container and transported under severe conditions, since there remains a little anxiety of the reliability, an unnecessarily large amount of the pads is used, resulting in causing the carrying container to make larger; accordingly, there remains a problem further to be overcome.

DISCLOSURE OF INVENTION

[0006] The present invention intends to overcome problems left from such existing technologies and specifically to provide a cushioning material capable of packaging, with a compact structure and stability, in particular, precision components and products that have a rectangular shape and a specified thickness and have to be handled very carefully.

[0007] An air-cushioning material according to the invention for overcoming the above-mentioned problems is a frame air-cushioning material that is interposed between a product to be packaged and an inner wall of a carrying container to protect the product from the external force such as impact. The air-cushioning material is characterized in that two sheets of synthetic resin films prepared in accordance with a dimension and shape of a product to be packaged are stuck to each other, inner edge parts thereof forming an end part of an outer frame, inner edge parts formed by dividing longitudinal intermediate parts thereof into multiple parts between the inner edge parts, and divided edge parts formed by similarly dividing vertical intermediate parts thereof into multiple parts are thermally fused each other, and at least one air flow port is provided to the inner edge parts and the divided edge parts to form a frame having a plurality of air chambers communicating with each other. The air-cushioning material is further characterized in that at least one of the air chambers is provided with an air filler port with a check valve function, air is filled through the air filler port into the air chambers to inflate an entirety of the air chambers, and thereby the inside thereof is pressed against the product and the outside thereof is pressed against an inner wall of the carrying container.

[0008] Furthermore, the invention is characterized in that, in the foregoing frame air-cushioning material, air chambers at a bottom end are folded inside, notches are disposed so that an angle of 90° may be formed at a part where the inner edge part and the divided edge part intersect, notch edge parts thereof are thermally fused to form a bottom part made of a plurality of air chambers; and parts where the inner edge parts of the air chambers at a top end and the divided edge parts interest each other are, so as to be folded inside, thermally fused partially on a diagonal line to form a top cap part made of a plurality of air chambers.

[0009] Still furthermore, the invention is characterized in that, in the frame air-cushioning material, the air chambers at the top and bottom ends are folded inside, notches are disposed so that an angle of 90° may be formed at parts where the respective inner edge parts and divided edge parts intersect, and notch edge parts of the notches are thermally fused to form a bottom part and a top cap part same in shape and having a plurality of air chambers.

[0010] The air-cushioning material according to the invention is characterized in that, in the frame air-cushioning material, the air chambers at the top and bottom ends are folded inside, parts where the respective inner edge parts and divided edge parts intersect, so as to be folded inside, are thermally fused partially on a diagonal line to form a bottom part and a top cap part having a same shape and a plurality of air chambers.

[0011] The air-cushioning material according to the invention is characterized in that, in the frame air-cushioning material, in place of an air filler port provided to at least one of the air chambers and having a function of check valve, after air is filled in the air chambers, the air-filler port is thermally fused to seal.

[0012] Furthermore, the air-cushioning material according to the invention is characterized in that, in the frame

air-cushioning material, an antistatic agent is mingled in a synthetic resin film constituting a raw material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] **FIG. 1** is a plan view showing a state before forming a frame of a synthetic resin film that forms an outer frame of a frame air-cushioning material according to an example of the invention.

[0014] **FIG. 2** is a plan view showing a state before forming a frame (corresponding to **FIG. 1**) in another example.

[0015] **FIG. 3** is an enlarged perspective view schematically showing an inflated state of a single air chamber in another example.

[0016] **FIG. 4** is a plan view showing a state before forming a frame (corresponding to **FIG. 1**) in still another example.

[0017] **FIG. 5** is a plan view showing a state before forming a frame (corresponding to **FIG. 1**) in still further another example.

[0018] **FIG. 6** is an entire perspective view schematically showing a state before use of a frame air-cushioning material formed according to one example of the invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0019] The invention will be more detailed with reference to accompanying drawings. However, the invention is not restricted thereto and can be freely changed in design within the gist of the invention. In the example, with, as a target article to be packaged, a precision electric component having a substantially cubic body, a packaging frame air-cushioning material will be exemplified. However, the frame air-cushioning material according to the invention can be preferably applied not only to packaging rectangular ones but also to packaging polygonal articles having a specified thickness.

[0020] A frame air-cushioning material according to the example is formed by stacking, as shown in **FIG. 1**, a first frame film **1** and a second frame film **2** both made of a synthetic resin, thermally fusing inner edge parts **5** and inner edge parts **6** that are divided longitudinally into four, and forming a belt-like synthetic resin film having four air chambers having a length of 1225 mm and a width of 40 mm. At this time, the inner edge parts **5** and the inner edge parts **6**, respectively, are provided with a width of 5 mm as a fusing margin. Then, in accordance with a dimension of a precision electric component to be packaged, the material is partitioned into squares having a side of 300 mm, and divided edge parts **13** are thermally fused to form a belt-like synthetic resin film made of substantially 16 rectangular air chambers **7**. At this time, at least one non-fused part is provided to the inner edge parts **6** and the divided edge parts **13** to form an air flow port **8**, and through the air flow ports **8** the respective air chambers **7** are integrally communicated.

[0021] At least one of the air chambers **7** is provided with an air filler port **3** and the air filler port **3** is provided with a check valve **4**. Owing to air supplied from the air filler port **3**, the respective chambers have a desired uniform air pressure (3.5 Kpa/cm^2 in the example) to be inflated. At this time, in place of the check valve **4** disposed together at the air filler port **3**, the air filler port **3** may be thermally fused to be sealed after air is filled in.

[0022] Notches **12** are formed so that when four air chambers **7** positioned at the bottom end of the belt-like synthetic resin film made of 16 rectangular air chambers **7** in the example are bent inside, the four air chambers may form a substantial right-angle of 90°, notch edge parts **14** of the notches **12** are thermally fused to form a bottom part **9** made of four air chambers, and thereby as shown in **FIG. 6 a** square frame having the bottom part **9** is completed. A bottom surface of a precision electric component packaged with the cushioning effect of the bottom part **9** has an increase in the friction resistance owing to a surface contact, the cushioning effect owing to air and protection owing to the frame shape, and so can be secure from fears such as collapse of cargo or slippage. In another example according to the invention, as shown in **FIG. 2**, a top cap part **10'** is processed similarly to the bottom part **9**, and thereby an article to be packaged is packaged as if surrounding it by attaching by winding from a periphery (side face) and above and down. Accordingly, more stable cushioning effect can be expected.

[0023] In a top end part of the frame in the example, in order that four corners thereof may be conveniently folded inside, portions where the respective inner edge parts **6** and the divided edge parts **13** intersect with each other are thermally fused together along the respective diagonal lines, thereby as shown in **FIG. 1 a** top cap part **10** having folding parts **11** and four air chambers is formed, and thereby an upper (or surface) constituent part of a precision electric component to be packaged is protected by air chambers in square. Accordingly, even when the precision electric components are stacked to be housed in a housing container, contacts between the components or contacts between the components and the housing container owing to the collapse of cargo can be prevented in advance from occurring. Furthermore, when a notch is disposed in the center of the folding part **11**, the top cap part **10** is allowed to open outside; accordingly, the components can be readily set and taken out.

[0024] As another example in the invention, when, as shown in **FIG. 4**, an A-B part of the frame is thermally fused and a C-D part is simply folded, the frame becomes capable of coping with arbitrarily-shaped articles to be packaged. An air filler port **3'** in the example is not provided with a check valve, but after air is filled in, is sealed by thermal fusion to form a seal **4'** as mentioned above. Such a process can be selectively applied also to other examples.

[0025] Furthermore, as still another example in the invention, four air chambers located at a bottom end may form a frame in a same shape with respect to the top cap part **10** and the bottom part **9'** as shown in **FIG. 5**, as a bottom part **9'** of a structure having a folding part **11'** so that four corners thereof can be conveniently folded inside similarly to the top cap part **10** according to the example shown in **FIG. 1**. Still furthermore, the cushioning member according to the invention can package an article to be packaged by not only vertically sandwiching but also clasping sideward.

[0026] The frames in the respective examples, as a configuration having air chambers in a longitudinal direction, are constituted so that in accordance with a dimension and

a shape of an article to be packaged the number of steps of the air chambers and a length of partition thereof are controlled. However, the air chambers can be disposed connecting in a vertical direction as well, and when such a structure is taken, the frame can be used as a cushioning material of a polygonal article to be packaged, finally a disc-like article to be packaged.

[0027] In another example in the invention, it is preferably proposed that a frame air-cushioning material is formed with one where in a synthetic resin film that is a frame-forming raw material, specifically PE/PA/PE, PE/PETAL or deposition/PE, an antistatic agent is previously mixed. Thereby, electrification of a product to be packaged can be prevented from occurring and dusts caused by the electrification can be also prevented from adhering. An ingredient that is used as an antistatic agent is not particularly restricted as far as it can achieve the object of the invention. A polymer antistatic agent that can be easily mixed with the polymer polyethylene resin or the like that is a synthetic resin constituting a raw material of the frame air-cushioning material according to the invention, more specifically polymers having an organic acid, sulfonic acid or an organic ammonium salt can be preferably selected.

[0028] In still another example in the invention, the number of air chambers on a side surface is further increased to be capable of preferably packaging a thicker product or the like. Furthermore, by applying lamination to a crossed portion, the wear resistance and the impact resistance can be improved and thereby the safety can be further secured. In the foregoing example according to the invention, a shape of the frame air-cushioning material is formed into a rectangle in accordance with a shape of a corresponding precision electric component. However, as proposed in the respective examples, there is no problem in adopting a polygonal shape in accordance with a shape of a corresponding packaging product.

INDUSTRIAL APPLICABILITY

[0029] As obvious from the foregoing examples as well, the frame air-cushioning material according to the invention, having advantages such as shown below, is very high in the industrial value thereof. That is, the frame air-cushioning material according to the invention, only by filling in air, comes to completion in a inner packaging state; accordingly a packaging operation becomes very convenient. In addition, a shape of the cushioning material is formed in accordance with an external shape of a product to be packaged; accordingly, when, in particular, rectangular products or the like are packaged, there is no fear of causing slippage from left to right and up and down with an external packaging container, and, together with the cushioning effect owing to air, even in storage or transport of precision instruments such as medical instruments and semiconductor products, excellent safety can be secured. Furthermore, as raw materials paper or powder are not used; accordingly, it can sufficiently endure moisture during storage and transport. When a machine is packaged with the frame air-cushioning material according to the invention, since a specified space is formed at the center of the top cap part and the bottom part, the space can be effectively used as a space for housing an instruction manual and accessories. The frame air-cushioning material according to the invention, when a synthetic resin film that is a raw material thereof is mixed with an antistatic agent and used, can prevent in advance the electrification of static electricity which is most hated in the precision electric components and medical instruments from occurring, and thereby the malfunction of a machine caused thereby and adhesion of dust can be effectively avoided. In addition to the foregoing advantages of the invention, materials to be used are reduced to the limit and the cushioning material before use, being a thin sheet, largely contributes to reduction of a storage space and transportation cost and to energy saving.

1. A frame air-cushioning material that is interposed between a product to be packaged and an inner wall of a carrying container to protect the product from the external force such as impact, characterized in that two sheets of synthetic resin films prepared in accordance with a dimension and shape of a product to be packaged are stuck to each other, inner edge parts thereof forming an edge part of an outer frame, inner edge parts formed by dividing longitudinal intermediate parts thereof into multiple parts between the inner edge parts, and divided edge parts formed by dividing vertical intermediate parts thereof into multiple parts are thermally fused to each other, and at least one air flow port is provided to the inner edge parts and the divided edge parts to form a frame having a plurality of air chambers communicating with each other; and at least one of the air chambers is provided with an air filler port with a check valve function, air is filled through the air filler port into the air chambers to inflate an entirety of the air chambers, and the inside thereof is pressed against the product and the outside thereof is pressed against an inner wall of the carrying container.

2. The frame air-cushioning material according to claim 1, wherein air chambers at a bottom end of the frame air-cushioning material are folded inside, notches are disposed so that an angle of 90° is formed at a part where the inner edge part and the divided edge part intersect, and notch edge parts of the notches are thermally fused to form a bottom part made of a plurality of air chambers; and parts where the inner edge parts of the air chambers at a top end and the divided edge portions interest each other, so as to be folded inside, are thermally fused partially on a diagonal line to form a top cap part made of a plurality of air chambers.

3. The frame air-cushioning material according to claim 1, wherein the air chambers at top and bottom ends of the frame air-cushioning material are folded inside, notches are disposed so that an angle of 90° is formed at parts where the respective inner edge parts and divided edge parts intersect, and notch edge parts of the notches are thermally fused to form a bottom part and a top cap part having a same shape and a plurality of air chambers.

4. The frame air-cushioning material according to claim 1, wherein the air chambers at the top and bottom ends are folded inside, parts where the respective inner edge parts and divided edge parts intersect, so as to be folded inside, are thermally fused partially on a diagonal line to form a bottom part and a top cap part having a same shape and a plurality of air chambers.

5. The air-cushioning material according to claim 1, wherein the in place of an air filler port provided to at least one of the air chambers and having a function of check valve, after air is filled in the air chambers, the air-filler port is thermally fused to seal.

6. The air-cushioning material according to claim 1, wherein an antistatic agent is mingled in a synthetic resin film constituting a raw material.

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