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(54) MULTIPLY BUILT UP BUFFER STRUCTURE AND MANUFACTURING METHOD THEREOF

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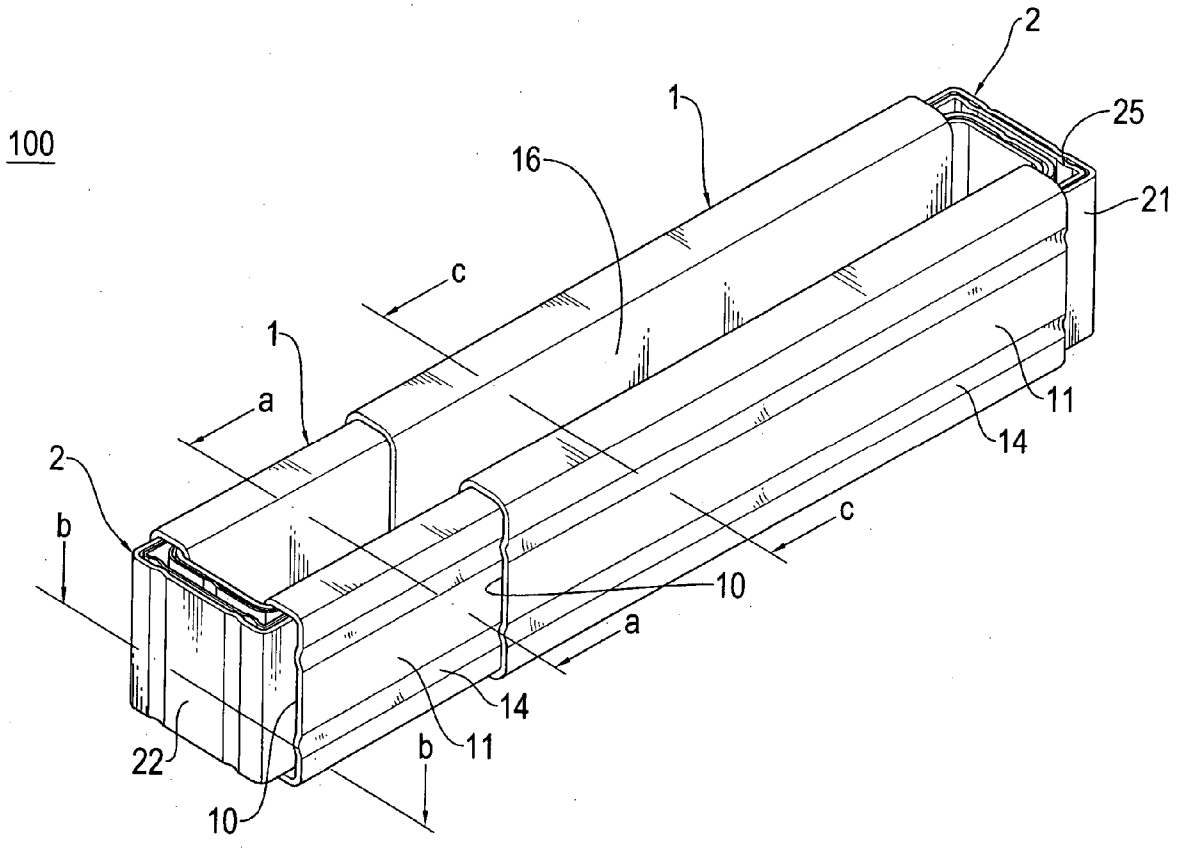
(57) **ABSTRACT**

The present invention provides a multiply built up buffer structure and a manufacturing thereof. The buffer structure includes at least two buffer members and a pair of end caps. The buffer member is made of paper material, having an elongate strip configuration having a U-shaped cross-section forming a hollow chamber shaped to correspond to the configuration thereof. The hollow chamber extends between and completely through opposite ends of the buffer member. One of the buffer members is movably received in the hollow chamber of the other buffer member to form an extendible strip. The end cap is made of paper material, having a U-shaped configuration forming therein a hollow chamber corresponding in shape to the configuration thereof. The hollow chamber extends between and completely through opposite ends of the end cap. The hollow chamber of the end cap receives at least one reinforcement piece made of paper material therein. The pair of end caps is respectively and movably fit into opposite ends of the extendible strip in accordance with the hollow chambers of the respective buffer members.



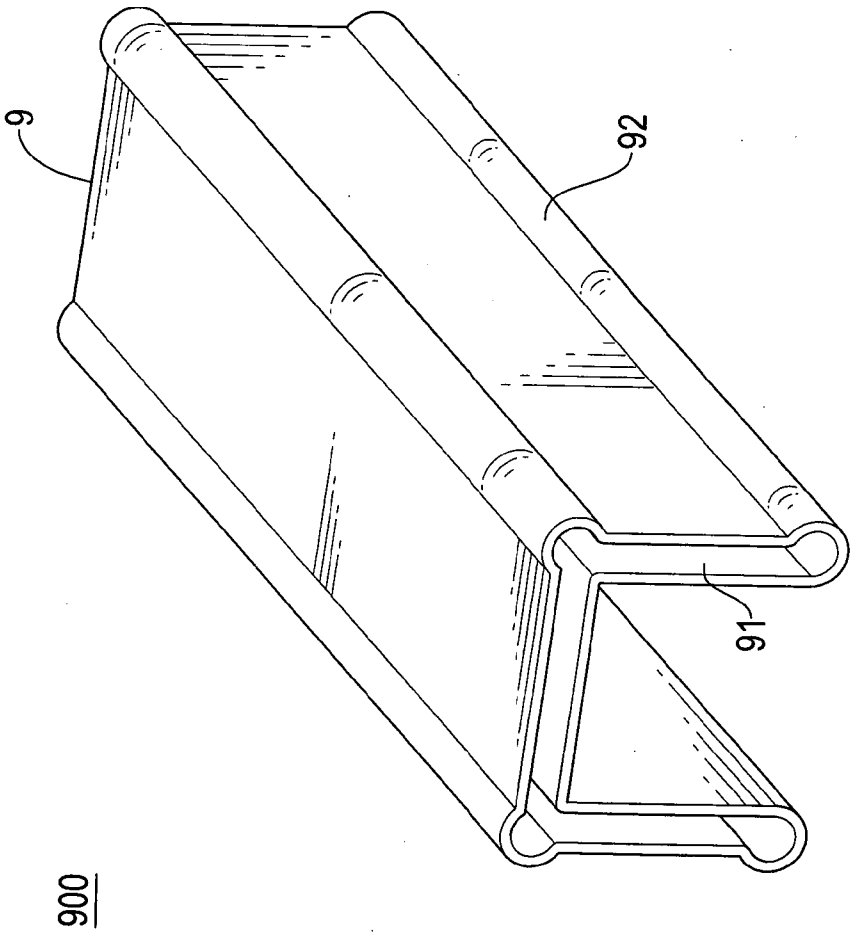


FIG. 1 (Prior Art)

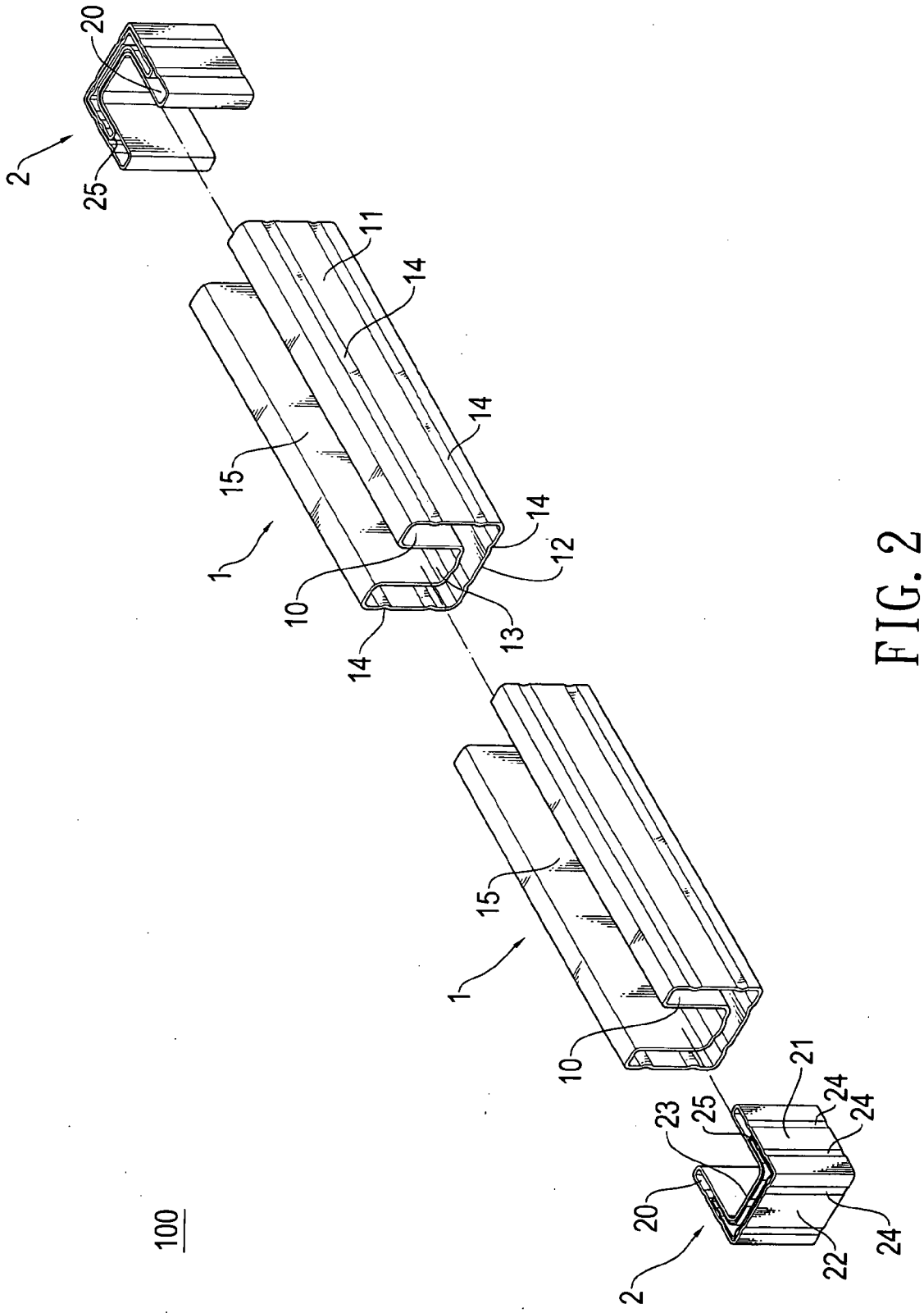


FIG. 2

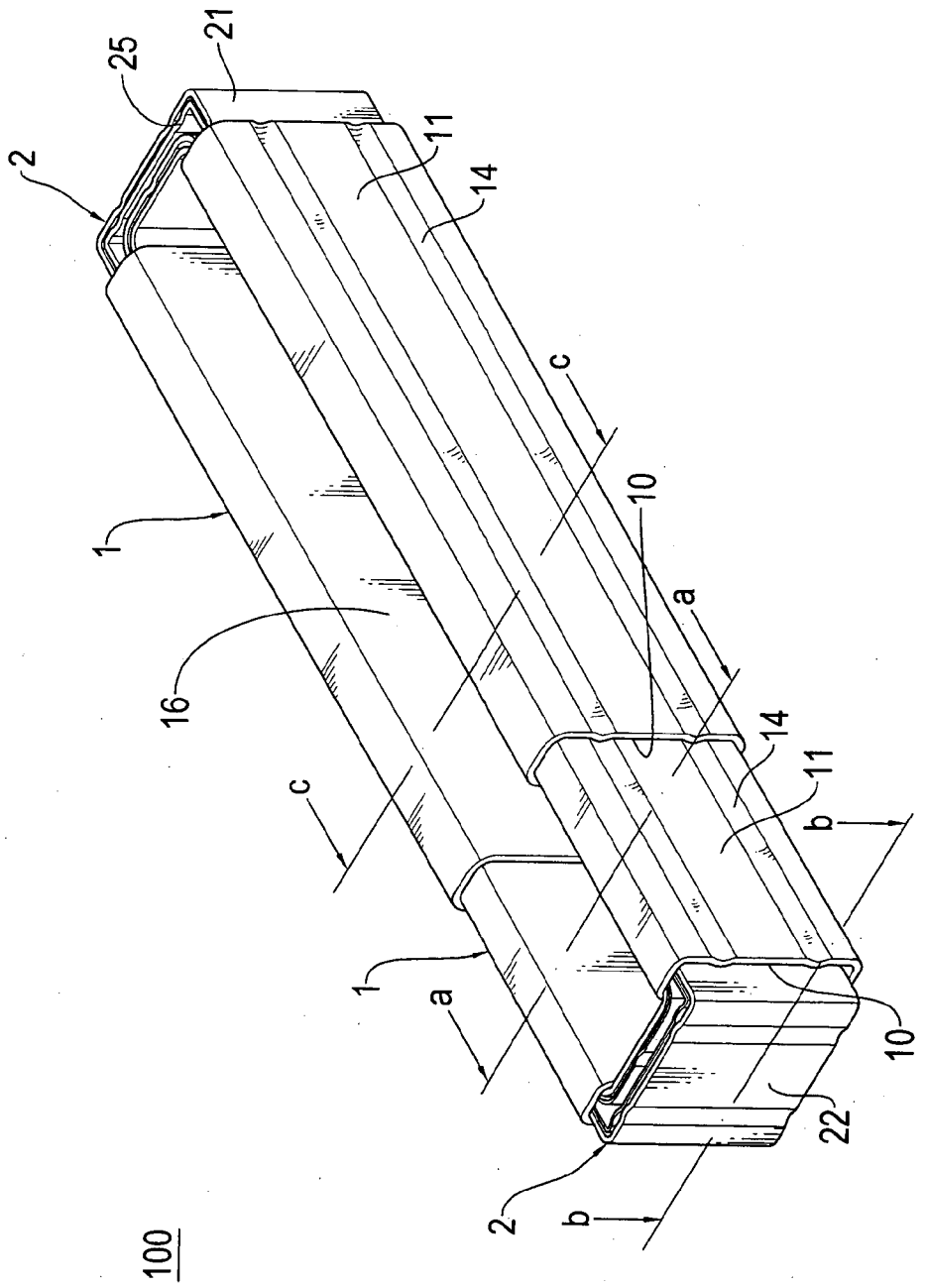


FIG. 3

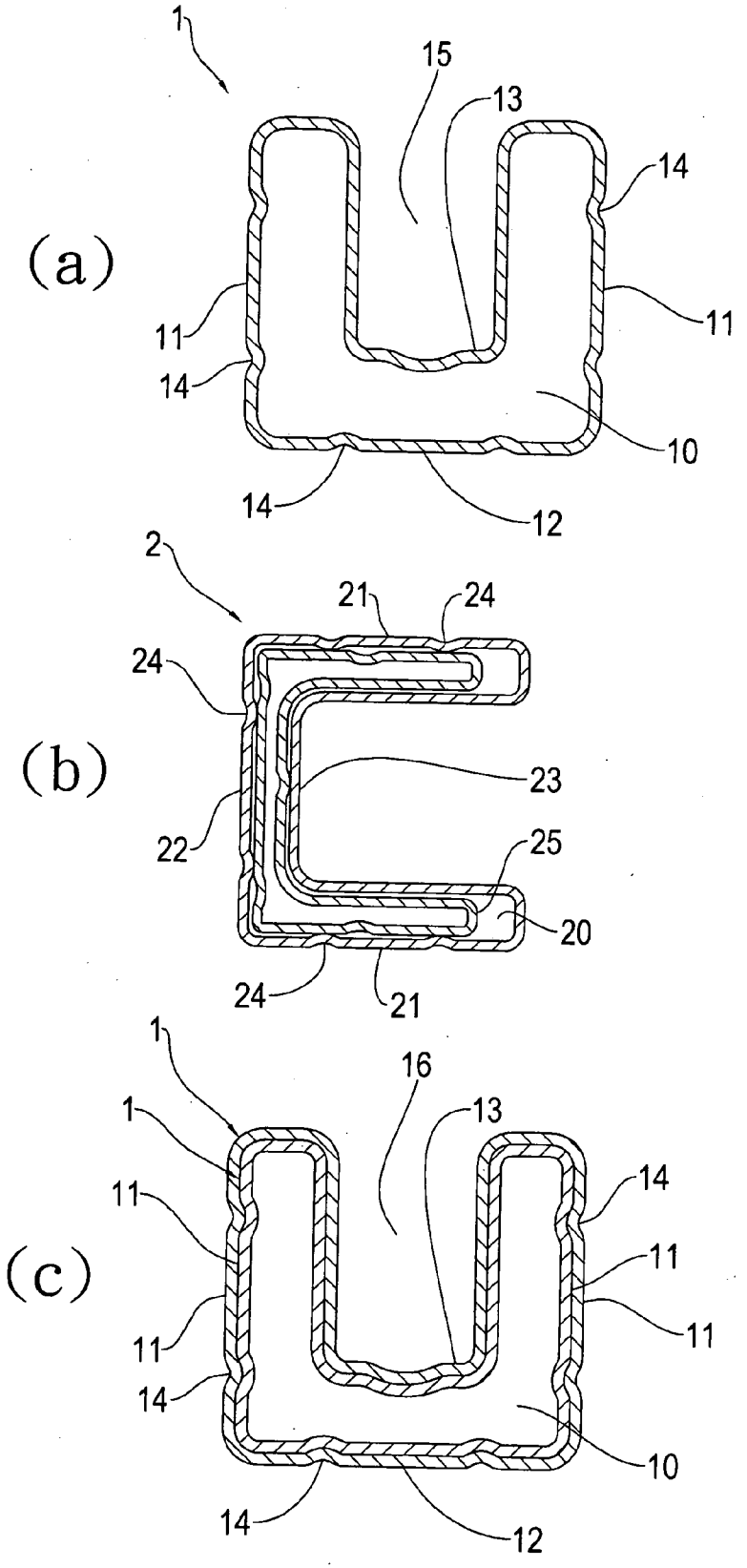

(a)
1
15
13
14
11
11
14
10
14
12
(b)
2
21
24
24
23
22
25
20
24
21
(c)
1
1
16
13
14
11
11
11
14
10
14
12

FIG. 4

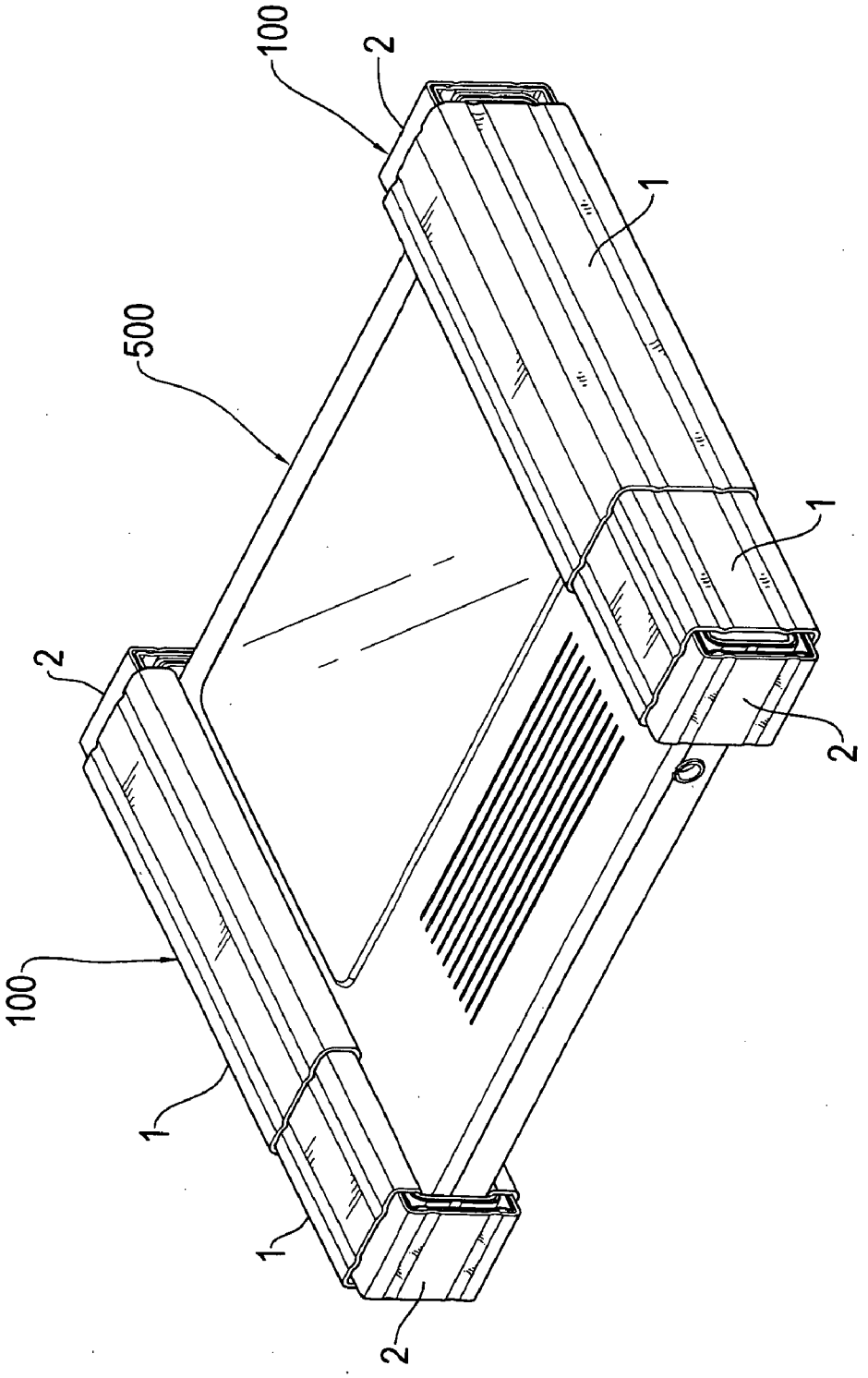


FIG. 5

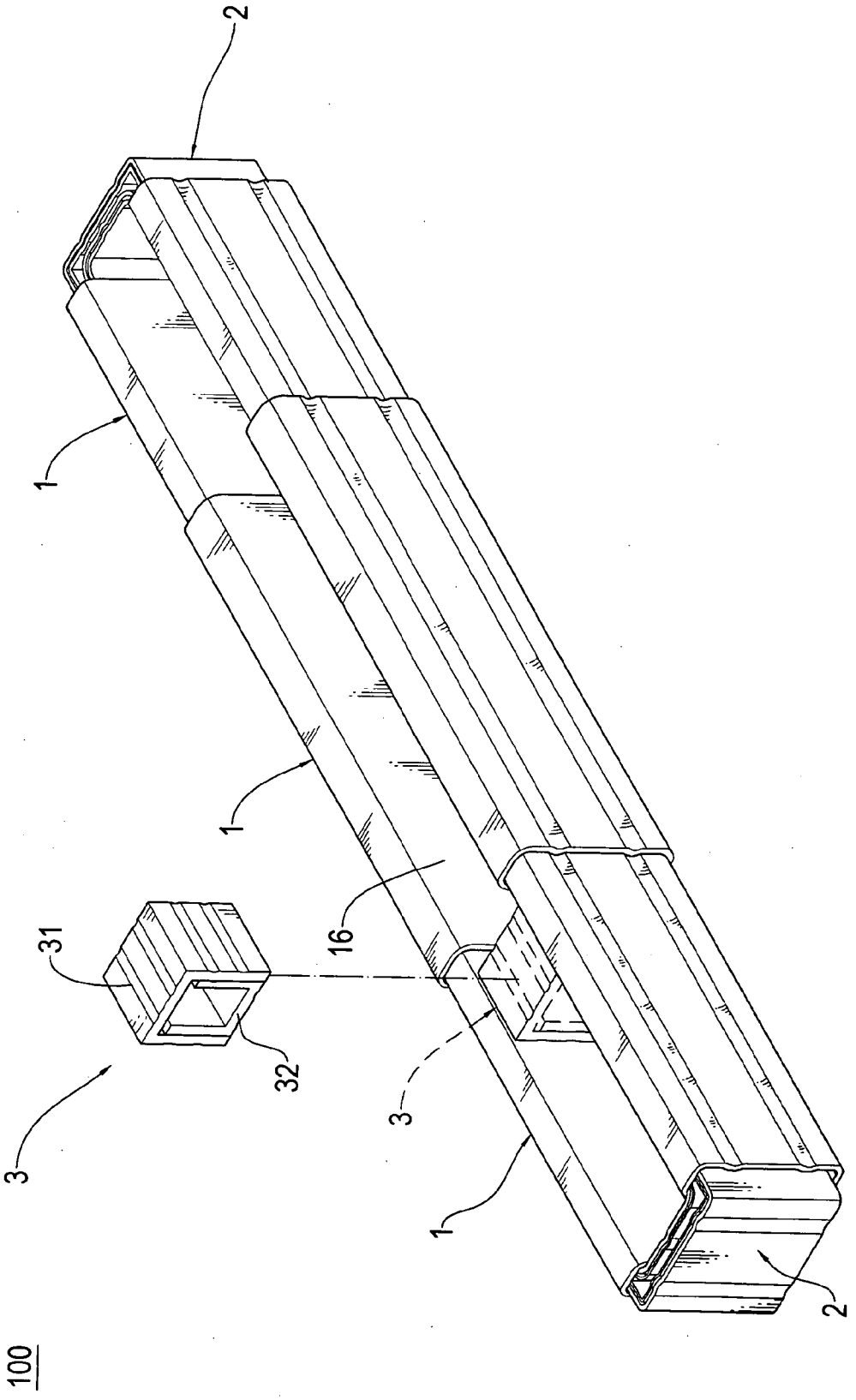


FIG. 6

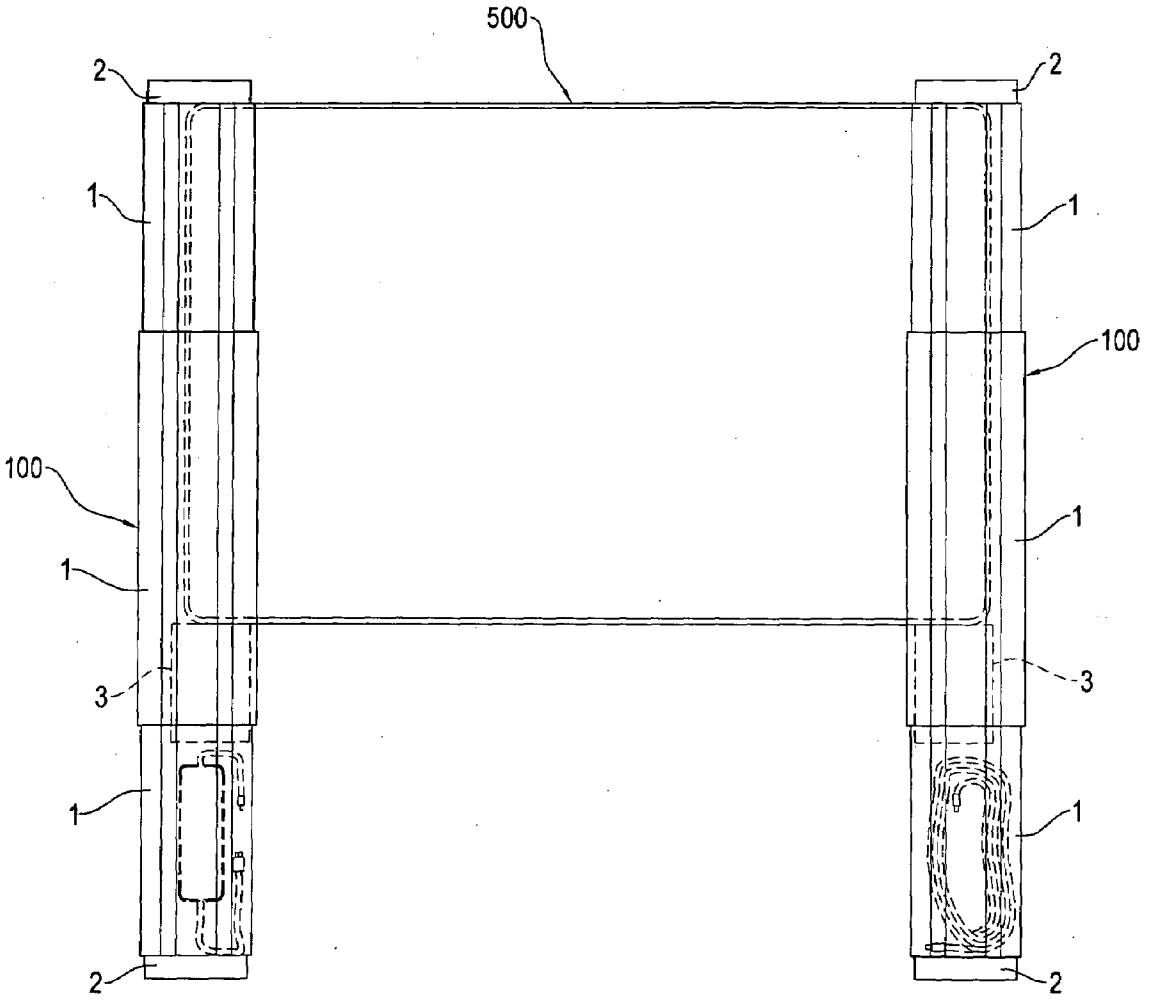


FIG. 7

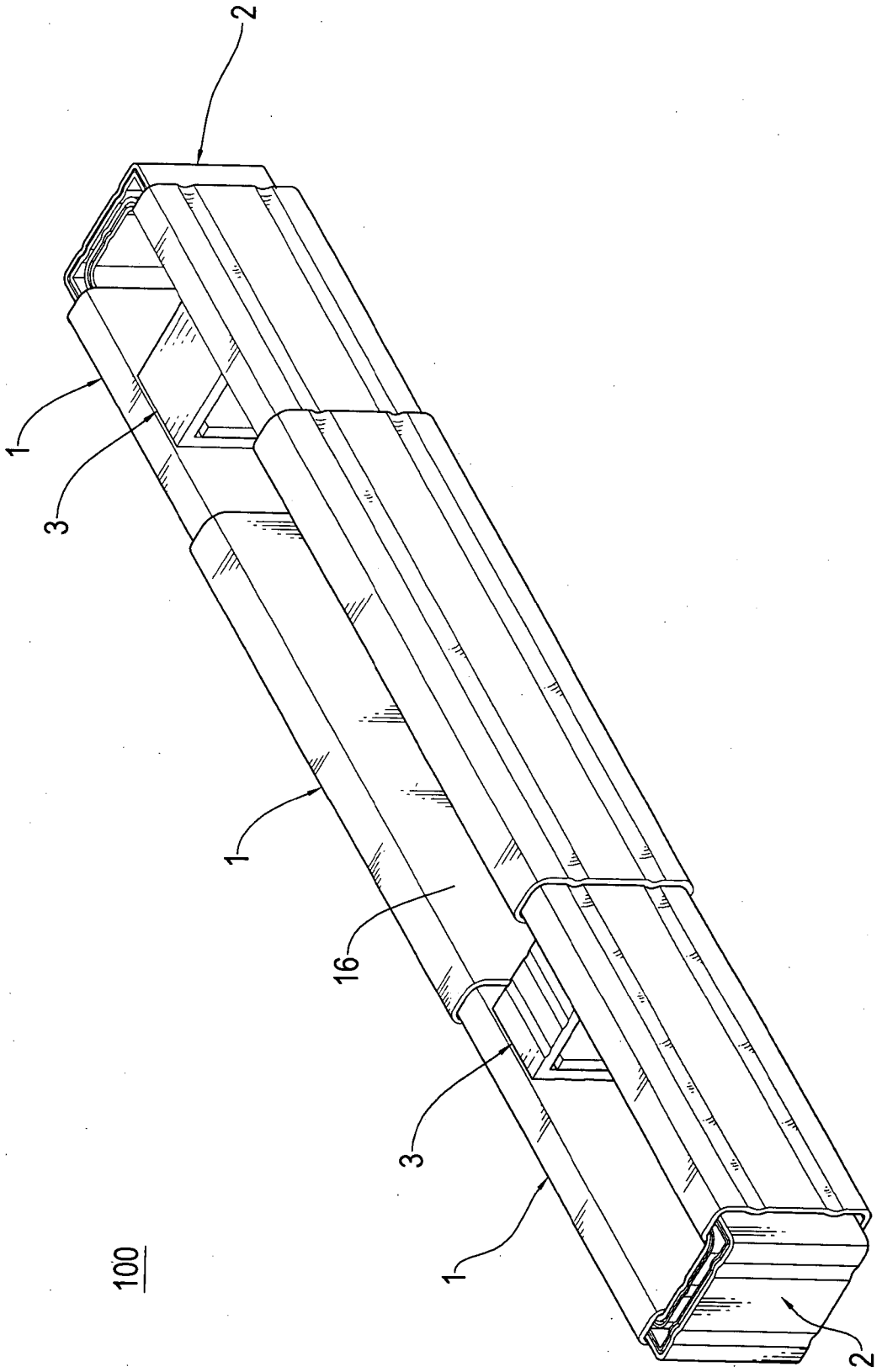


FIG. 8

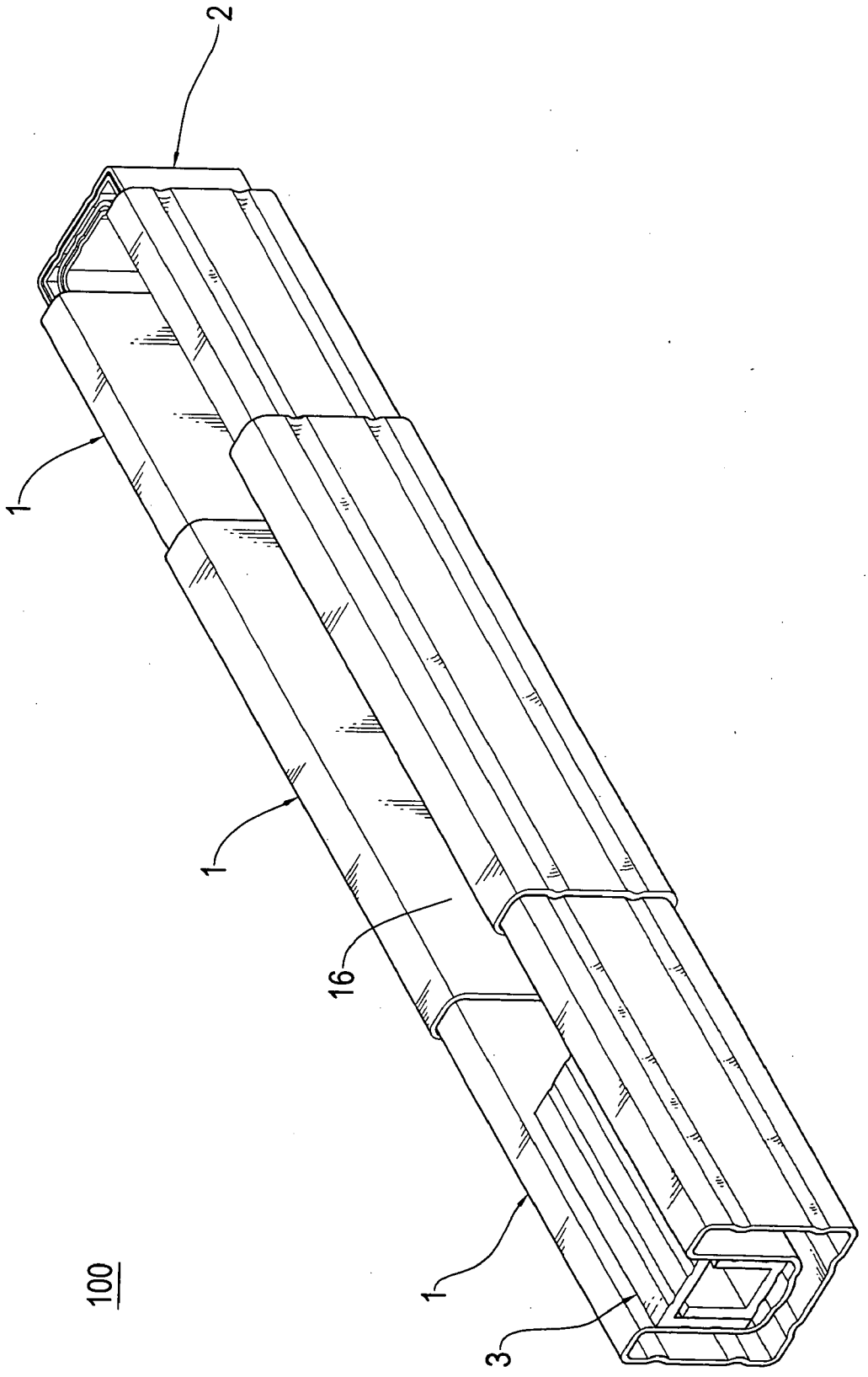


FIG. 9

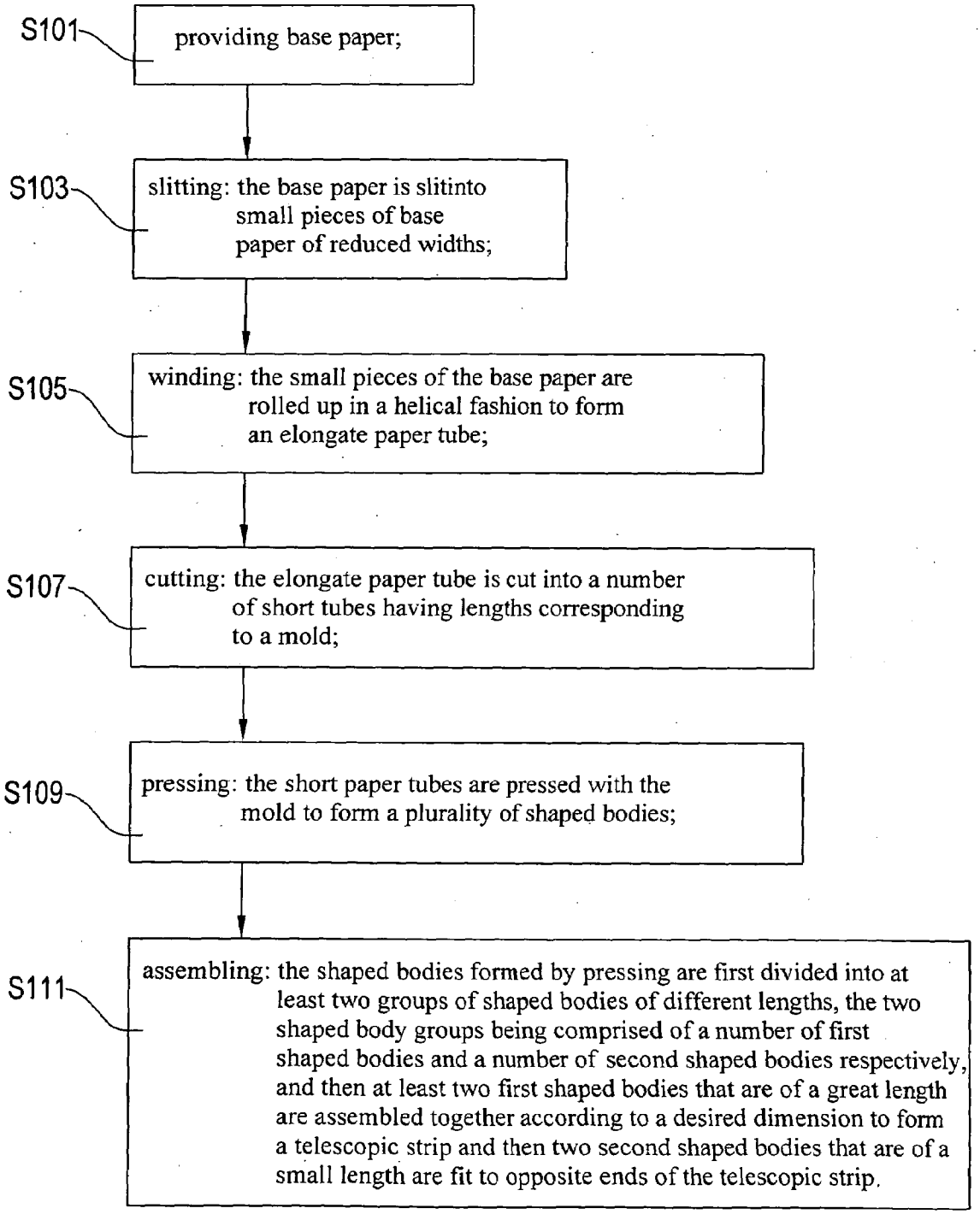

S101
providing base paper;
S103
slitting: the base paper is slitinto small pieces of base paper of reduced widths;
S105
winding: the small pieces of the base paper are rolled up in a helical fashion to form an elongate paper tube;
S107
cutting: the elongate paper tube is cut into a number of short tubes having lengths corresponding to a mold;
S109
pressing: the short paper tubes are pressed with the mold to form a plurality of shaped bodies;
S111
assembling: the shaped bodies formed by pressing are first divided into at least two groups of shaped bodies of different lengths, the two shaped body groups being comprised of a number of first shaped bodies and a number of second shaped bodies respectively, and then at least two first shaped bodies that are of a great length are assembled together according to a desired dimension to form a telescopic strip and then two second shaped bodies that are of a small length are fit to opposite ends of the telescopic strip.

FIG. 10

MULTIPLY BUILT UP BUFFER STRUCTURE AND MANUFACTURING METHOD THEREOF

FIELD OF THE INVENTION

[0001] The present invention relates to a multiply built up buffer structure and a manufacturing method thereof, and in particular to a buffer structure and the manufacturing method thereof, which is used to encase a product to be protected for providing effects of resisting pressure, drop, and impact between a package box and the product to be protected and is applicable to electric appliances, computers, various kinds of monitor screen, electronic products, mechanical products, and other fragile products.

BACKGROUND OF THE INVENTION

[0002] To convey or ship a product to be protected, such as electric appliances, computers, various kinds of monitor screen, electronic products, mechanical products, and other fragile products, the product is wrapped with an enclosure buffer material to provide buffering effect between a package box and the product to be protected, whereby protections of the product can be secured during the transportation or shipping thereof.

[0003] Conventional buffering materials are often made of Styrofoam, which is known to be non-environment-conservative, bulky, and having drawbacks of occupying a large amount of container space and increasing transportation costs resulting from bulkiness thereof. Other disadvantages, such as insufficient resistance against pressure, drop, and impact, are often found.

[0004] FIG. **1** of the attached drawings illustrates a conventional buffer **900**, which comprises body **9** made of pulp molding. The body **9** has a U-shaped configuration and forms a hollow chamber **91**, which is also made U-shaped, and four curved edges **92**. With the hollow chamber **91** and the four curved edges **92**, buffering effect is realized.

[0005] The conventional buffer **900**, however, has the following disadvantages: (1) insufficient resistance against pressure, drop, and impact; (2) requiring a devoted mold and unique material for manufacturing for each specific product to be protected thereby, apparently leading to excessively high costs and a waste of natural resources; (3) potential risk of generating odors in a humid and high temperature condition (such as being stored in a container for maritime transportation) due to the fact that the buffer **900** is made of pulp molding; (4) poor resistance against humidity and temperature and thus being not suitable for maritime transportation; and (5) insufficient resistance against pressure, making it impossible to be high stacked for after-packaged stacking.

[0006] Thus, it is desired to provide a solution to overcome the above discussed problems.

SUMMARY OF THE INVENTION

[0007] A first objective of the present invention is to provide a multiply built up buffer structure and a manufacturing method thereof, wherein a unique structural design and a multiple-structured arrangement are employed to provide improved resistance against pressure, drop, and impact between a package box and a product-to-be-protected so as to realize excellent strength of pressure resistance and applicability of high stacking of the packaged products. With a telescopic structure provided by the present invention makes it possible to apply to various sizes of products to be protected to thus realize reduction of costs and conservation of natural resources.

[0008] A second objective of the present invention is to provide a multiply built up buffer structure and a manufacturing method thereof, wherein with the improved resistance against pressure, drop, and impact that the present invention offers, the thickness of the buffer structure can be made small, and further, buffer members, end caps, and even stop blocks can be made with the same mold, leading to further reduction of costs and better conservation of resources.

[0009] A third objective of the present invention is to provide a multiply built up buffer structure and a manufacturing method thereof, wherein an elongate stop block is selectively set in an encasing channel of the buffer structure, the applicability of the buffer structure is made wide.

[0010] A fourth objective of the present invention is to provide a multiply built up buffer structure and a manufacturing method thereof, wherein the buffer structure **100** is made of paper material comprising base paper, such as corrugated boards, rather than being formed with pulp molding, and thus effects of such as generating no odor, being humidity resistant, being temperature durable, and being suitable for maritime transportation, can be realized. Other advantages, such as small size, occupying less container space, reducing transportation costs, meeting requirement of environmental protection, are also offered.

[0011] To realize the above objective, the present invention provides a multiply built up buffer structure, which comprises at least two buffer members and a pair of end caps. The two buffer members are made of paper material, and each has an elongate strip configuration having a U-shaped cross-section forming a hollow chamber shaped to correspond to the configuration thereof. The hollow chamber extends between and completely through opposite ends of the buffer member. One of the buffer members is movably received in the hollow chamber of the other buffer member to form an extendible strip. The pair of end caps is also made of paper material, and each end cap has a U-shaped configuration forming therein a hollow chamber corresponding in shape to the configuration thereof. The hollow chamber of each end cap extends between and completely through opposite ends thereof. The hollow chamber of each end cap receives at least one reinforcement piece made of paper material therein. The pair of end caps is respectively and movably fit into opposite ends of the extendible strip in accordance with the hollow chambers of the respective buffer members.

[0012] As such, improved resistance against pressure, drop, and impact is provided between a package box and a product to be protected. Further, with the extendible structure, the buffer of the present invention is applicable to various sizes of products to be protected to provide excellent strength of pressure resistance and allows for high stacking of packaged products, reduction of costs and non-wasting of resources.

[0013] The present invention also provides a method for manufacturing a multiply built up buffer structure, comprising the following steps: providing base paper; slitting: in which the base paper is slit into small pieces of base paper of reduced widths; winding: in which the small pieces of base paper are rolled up in a helical fashion to form an elongate paper tube; cutting: in which the elongate paper tube is cut into a number of short tubes having lengths corresponding to a mold; pressing: in which the short paper tubes are pressed with the mold to form a plurality of shaped bodies; and

assembling: in which the shaped bodies formed by pressing are first divided into at least two groups of shaped bodies of different lengths, the two shaped body groups comprising a number of first shaped bodies and a number of second shaped bodies respectively, and then at least two first shaped bodies that are of a great length being assembled together according to a desired dimension to form an extendible strip, and then two second shaped bodies that are of a small length being fit to opposite ends of the extendible strip.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The present invention will be apparent to those skilled in the art by reading the following description of preferred embodiments thereof, as well as the best mode of a manufacturing method thereof, with reference to the drawings, in which:

[0015] FIG. **1** is a perspective view of a conventional buffer;

[0016] FIG. **2** is an exploded view of a buffer structure in accordance with an embodiment of the present invention;

[0017] FIG. **3** is a perspective view of the buffer structure of the present invention in an assembled form;

[0018] FIG. **4** shows, respectively in Part a, b, and c, cross-sectional views of the buffer structure in accordance with the present invention taken along line a-a, b-b, and c-c of FIG. **3**;

[0019] FIG. **5** is a perspective view illustrating an application of the buffer structures in accordance with the present invention;

[0020] FIG. **6** is a perspective view of a buffer structure in accordance with another embodiment of the present invention;

[0021] FIG. **7** is a plan view illustrating an application of the buffer structures in accordance with said another embodiment of the present invention;

[0022] FIG. **8** is a perspective view of a buffer structure in accordance with a further embodiment of the present invention;

[0023] FIG. **9** is a perspective view of a buffer structure in accordance with yet a further embodiment of the present invention; and

[0024] FIG. **10** is a flowchart of a manufacturing method of a buffer structure in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] The present invention provide a multiply built up buffer structure and a manufacturing method thereof for substituting the conventional Styrofoam-molded buffers or pulp-molding buffers to provide various effects of pressure resistance, drop resistance, and impact resistance between a package box and a product-to-be-protected.

[0026] Referring to FIGS. **2-4**, a buffer structure constructed in accordance with the present invention, generally designated at **100**, comprises at least two buffer members **1** and a pair of end caps **2** and preferably further comprises at least one stop block **3**.

[0027] The buffer members **1** are made of paper material, such as corrugated boards, and are each of an elongate strip configuration having a U-shaped cross-section. Each buffer member **1** forms a hollow chamber **10** arranged in a U-shape to correspond to the U-shaped configuration of the buffer member **1**. The hollow chamber **10** extends between and completely through opposite ends of the buffer member **1**. One of the two buffer members **1** is movably received in the hollow chamber **10** of the other buffer member **1**, whereby a telescope strip that is freely extendible in accordance with a dimension of the product-to-be-protected is formed. The telescopic strip is made up of at least two buffer members **1** telescopically fit into each other. In the embodiment illustrated, the telescopic strip is made up of two buffer members **1** and it is apparent that the telescopic strip can be alternatively made up of a number of buffer members **1** telescopically fit into each other (examples being shown in FIGS. **6-9**).

[0028] The pair of end caps **2** are both made of paper material (such as corrugated boards) and each end cap **2** is of a U-shaped configuration and forms therein a U-shaped hollow chamber **20** corresponding to the U-shaped configuration thereof. The hollow chamber **20** extends between and completely through opposite ends of the end cap **2**. The hollow chamber **20** of each end cap **2** receives at least one reinforcement piece **25** made of paper material (such as corrugated boards), which forms an additional layer of structure inside the hollow chamber **20** of the end cap **2** for enhancing resistance of the end cap **2** against pressure, drop, and impact. One of the end caps **2** is movably fit into one end of the telescopic strip in accordance with the hollow chamber **10** of the corresponding one of the buffer members **1**, while the other end cap **2** is movably fit into an opposite end of the telescopic strip in accordance with the hollow chamber **10** of the other one of the buffer members **1**.

[0029] Each buffer member **1** has two outer side walls **11**, an outer bottom wall **12**, and an inner bottom wall **13** each forming a plurality of pressure-resistant patterns **14** (see Part a of FIG. **4**). The pressure-resistant patterns **14** extend in a direction parallel to length of the buffer members **1** in order to provide enhanced resistance to pressure, drop, and impact. Each end cap **2** has two outer side walls **21** and an outer bottom wall **22** each forming a plurality of pressure-resistant patterns **24** (see Part b of FIG. **4**). These pressure-resistant patterns **24** extend in a direction parallel to height of the end caps **2** in order to provide enhanced resistance to pressure, drop, and impact.

[0030] As shown in Part a of FIG. **4**, each buffer member **1** has a cross-section that is made up of two vertical sections (not labeled) and a horizontal section (not labels) connecting between the vertical sections, which sections constitute the U-shape. The hollow chamber **10** of the buffer member **1** is correspondingly comprised of two vertical sections and a horizontal section. Further referring to Part b of FIG. **4**, each end cap **2** has a cross-section comprising two vertical sections and a horizontal section connecting between the vertical sections, and these sections form the U-shape. Referring to FIGS. **2** and **3**, the two vertical sections of the end cap **2** are respectively fit into the two vertical sections of the hollow chamber **10** of the corresponding buffer member **1** to thereby form the buffer structure **100**.

[0031] As shown in FIG. **2**, each buffer member **1** forms a trough **15** that makes the U-shaped configuration of the buffer member **1**. The buffer structure **100** is comprised of a plurality of troughs **15** arranged between the two end caps **2** (two troughs **15** being shown in the embodiment illustrated), which together form an encasing channel **16** (see FIG. **3**) for receiving and encasing a product-to-be-protected **500**.

[0032] Referring to FIG. **5**, to package the product-to-be-protected **500** in a package box (not shown), opposite sides of the product-to-be-protected **500** are respectively covered and encased by two buffer structures **100** of the present invention. The encasement is made in accordance with the length of the

corresponding side of the product-to-be-protected **500** by controlling the telescopically extended length of the buffer structure **100** to be substantially the same so as to allow the encasing channel **16** of the buffer structure **100** to fit over and encase the side of the product-to-be-protected **500** for providing protective effects of pressure resistance, drop resistance, and impact resistance between the package box and the product-to-be-protected **500**.

[0033] Besides the additional arrangement of the reinforcement piece **25** in the hollow chamber **20** of the end cap **2**, each buffer member **1** can be selectively provided with at least one reinforcement piece (not shown) made of paper material (such as corrugated boards) in the hollow chamber **10** thereof. Both the reinforcement piece for the buffer member **1** and the reinforcement piece **25** of the end cap **2** can be formed as any desired structure made of paper material. In the embodiment illustrated, the reinforcement piece **25** is of a form that is one size smaller than the end cap **2**. (The reinforcement piece for the buffer member **1** can be made in the same way.)

[0034] Further, as shown in FIG. **6**, the buffer structure **100** further comprises at least one stop block **3** made of paper material (such as corrugated boards). The stop block **3** is fit into and retained in the trough **15** of at least one of the buffer member **1**, namely being fixed in the encasing channel **16** of the buffer structure **100** (the buffer structure **100** shown in FIG. **6** being comprised of three buffer members **1** movably fit into each other). With the stop block **3**, as shown in FIG. **7**, an accessory (not shown) for the product-to-be-protected **500** can be encased together. In other words, a large space defined between upper portions of a pair of buffer structures **100** can be used to accommodate and encase a product-to-be-protected **500** in such a way that the product-to-be-protected **500** is retained in position by the stop blocks **3**, while lower portions of the pair of buffer structures **100** that define a small space therebetween can separately receive and store small-size accessories of the product-to-be-protected **500** therein. In the embodiment illustrated, the product-to-be-protected **500** comprises a notebook computer and two small-sized accessories are respectively a power cable and a transformer of the notebook computer. The applicability of the buffer structure **100** is thus made wider with the stop block **3** (as being applicable to products-to-be-protected of various sizes and having various accessories) and can also be extended to accommodate and store accessories that are usually of smaller sizes. Further, in case that the product-to-be-protected **500** has a dimension (not shown) that is smaller than the length of any single buffer member **1** and the product-to-be-protected **500** can be kept in position without undesired movement by setting a stop block **3** in the trough **15** of the buffer member **1** by setting a stop block **3**.

[0035] Referring to FIG. **8**, the encasing channel **16** of the buffer structure **100** can be selectively provided with more than one stop blocks **3**. In the embodiment illustrated, two stop blocks **3** are provided to divide the buffer structure **100** into three segments, of which a large space is used to accommodate and encase a product-to-be-protected, while the other two small spaces each receive and retain one accessory. For a package with two buffer structures **100** to encase the product-to-be-protected, the two buffer structures **100** provide four small segments of the encasing channels to receive four accessories.

[0036] Referring to FIG. **9**, in case that a product-to-be-protected has a substantial weight, to protect the bottom of the product-to-be-protected from damage caused by gravity, one end of the buffer structure **100** is provided with an end cap **2** fit therein, similar to the previous embodiments, but a stop block **3** is set in the encasing channel **16** close to the opposite end of the buffer structure **100** and the stop block **3** is made elongate to support a downward force induced by the substantial weight of the product-to-be-protected and also to resist external downward force (such as that caused by vibration, impact, and shaking). This means a substantial downward force can be supported and this allows a number of packages to be stacked vertically to a higher level.

[0037] The stop block **3** can be made in any desired form, such as in the embodiment illustrated, including a pair of U-shaped pieces **31**, **32**, which are of slightly different sizes and are mated to each other to make a rectangular body. Preferably, each U-shaped piece **31**, **32** is provided with pressure resistant patterns (not labeled).

[0038] Referring to FIG. **10**, a manufacturing method in accordance with the present invention is illustrated. The method comprises the following steps: providing base paper (step S**101**); slitting (step S**103**): in which the base paper is slit into small pieces of base paper of reduced widths; winding (step S**105**): in which the small pieces of the base paper are rolled up in a helical fashion to form an elongate paper tube; cutting (step S**107**): in which the elongate paper tube is cut into a number of short tubes having lengths corresponding to a mold; pressing (step S**109**): in which the short paper tubes are pressed with the mold to form a plurality of shaped bodies; and assembling (step S**111**): in which the shaped bodies formed by pressing are first divided into at least two groups of shaped bodies of different lengths, the two shaped body groups being comprised of a number of first shaped bodies and a number of second shaped bodies respectively, and then at least two first shaped bodies that are of a great length (such as buffer members **1** of FIG. **2**) are assembled together according to a desired dimension to form a telescopic strip and then two second shaped bodies that are of a small length (such as end caps **2** of FIG. **2**) are fit to opposite ends of the telescopic strip.

[0039] The features of the multiply built up buffer structure and the manufacturing method thereof are that structural design of unique U-shape and pressure-resistant patterns **14** and **24**, together with a multiple-structured arrangement, provide improved resistance against pressure, drop, and impact between a package box and a product-to-be-protected so as to realize excellent strength of pressure resistance and applicability of high stacking of packaged products. The multiple-structured arrangement adopted in the present invention means the overlap between two mutually-fit buffer members **1** (see Part c of FIG. **4**), reinforcement piece **25** inside each end cap **2**, and/or reinforcement piece selectively set in each buffer member **1** (made in the same way as the reinforcement piece **25** of the end cap **2**). The telescopic structure of the multiple mutually-fit buffer members **1** is applicable to various sizes of products-to-be-protected **500** to realize reduction of costs and conservation of natural resources. With the improved resistance against pressure, drop, and impact inherent to the buffer structure **100**, the thickness of the buffer structure **100** can be made small, and further, the buffer member **1**, the end cap **2**, and even the stop block **3** can be made with the same mold, both leading to further reduction of costs and better conservation of resources. With at least one elongate stop block **3** set in the encasing channel **16** of the buffer structure **100**, the applicability of the buffer structures **100** is made wide (being applicable to products-to-be-protected of

various sizes and containing various small-sized accessories), and may be used to accommodate and store various small-sized accessories. With an elongate stop block **3** set in the encasing channel **16** of the buffer structure **100** at a location close to an end thereof, the gravitational force (which is in a direction parallel to a length of the elongate stop block **3**) induced by a heavy product-to-be-protected **500** can be properly supported and additionally, strong external forces, such as those caused by vibration, impact, and/or shaking, (which are in a direction parallel to the length of the elongate stop block **3**), can also be supported. In other words, increased gravitational force, as well as strong external forces, can be supported in the present invention to offer better protection to heavy products-to-be-protected and this facilitates high stacking of packaged products in large number. The buffer structure **100** is made of paper material comprising base paper, such as corrugated boards, rather than being formed with pulp molding and thus effects of such as generating no odor, being humidity resistant, being temperature durable, and being suitable for maritime transportation, can be realized. Other advantages, such as small size, occupying less container space, reducing transportation costs, meeting requirement of environmental protection, are also offered. With the buffer member **1** and the end cap **2** both forming hollow chambers **10**, **20**, clearances for resisting vibration and shaking is provided. In other words, when an external force is applied to one outer wall of the buffer member **1** or the end cap **2**, the presence of the hollow chamber **10**, **20** makes the external force only affecting the outer wall, but not the inner wall and this makes the product-to-be-protected **500** that is set in engagement with the inner wall well protected and not affected by vibration, shaking, and/or abrasion caused by the external force. The product-to-be-protected **500** is thus well protected against wearing caused by abrasion.

[0040] Although the present invention has been described with reference to the preferred embodiment thereof, as well as the best mode for carrying out a manufacturing method thereof, it is apparent to those skilled in the art that a variety of modifications and changes may be made without departing from the scope of the present invention which is intended to be defined by the appended claims.

1. A buffer structure, comprising:

at least two buffer members, the buffer members being made of paper material comprising base paper, each of said buffer members being of an elongate strip configuration having a U-shaped cross-section forming a hollow chamber shaped to correspond to the configuration thereof, the hollow chamber extending between and completely through opposite ends of the buffer member, one of the buffer members being movably received in the hollow chamber of the other buffer member to form an extendible strip; and

a pair of end caps, the pair of end caps being made of paper material comprising base paper, each end cap being of a U-shaped configuration and forming therein a hollow chamber corresponding in shape to the configuration thereof, the hollow chamber extending between and completely through opposite ends of the end cap, the hollow chamber of each end cap receiving at least one reinforcement piece made of paper material therein, the pair of end caps being respectively and movably fit into opposite ends of the extendible strip in accordance with the hollow chambers of the respective buffer members;

wherein said buffer structure and said pair of end caps are slidingly adjustable to conform to a length of a product accommodated therein.

2. The buffer structure as claimed in claim **1** further comprising at least one stop block made of paper material and wherein each buffer member forms a trough for configuring the U-shape, the stop block being set in the trough of at least one of the buffer members.

3. The buffer structure as claimed in claim **2**, wherein the stop block comprises a pair of U-shaped pieces made of paper material, the U-shaped pieces being mated together to make a rectangular body.

4. The buffer structure as claimed in claim **1**, wherein each buffer member has two outer side walls, an outer bottom wall, and an inner bottom wall each forming a plurality of pressure-resistant patterns extending in a direction parallel to length of the buffer member and wherein each end cap has two outer side walls and an outer bottom wall each forming a plurality of pressure-resistant patterns extending in a direction parallel to height of the end cap.

5. The buffer structure as claimed in claim **1**, wherein each buffer member has a cross-section that comprises two vertical sections and a horizontal section connecting between the vertical sections to constitute the U-shape, the hollow chamber of the buffer member correspondingly comprising two vertical sections and a horizontal section, and wherein each end cap has a cross-section comprising two vertical sections and a horizontal section connecting between the vertical sections, the two vertical sections of the end cap being respectively fit into the two vertical sections of the hollow chamber of the corresponding buffer member.

6. The buffer structure as claimed in claim **1** further comprising a plurality of additional buffer members, the buffer members being movably fit into each other to from the extendible strip.

7. The buffer structure as claimed in claim **1**, wherein the hollow chamber of each buffer member receives at least one reinforcement piece made of paper material therein.

8. (canceled)

9. The buffer structure as claimed in claim **1**, wherein the base paper is corrugated board.

* * * * *