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(54) Protective packaging for fragile products

(57) The invention relates to a protective packaging for fragile products comprising an outer box, a base plate (1) of a plastic foam material mounted on the bottom surface of said outer box, a profiled part (2) intended for receiving a product and a top plate of a plastic foam material to be fitted on top of the profiled part, said pro-

filed part having a recess (16) which is bounded by a number of arched portions (4,5,6,7). Said arched portions allow for a clamping connection to the product, which is possible within a variable range by removable strips, and allow for additional shock-absorbing capability.

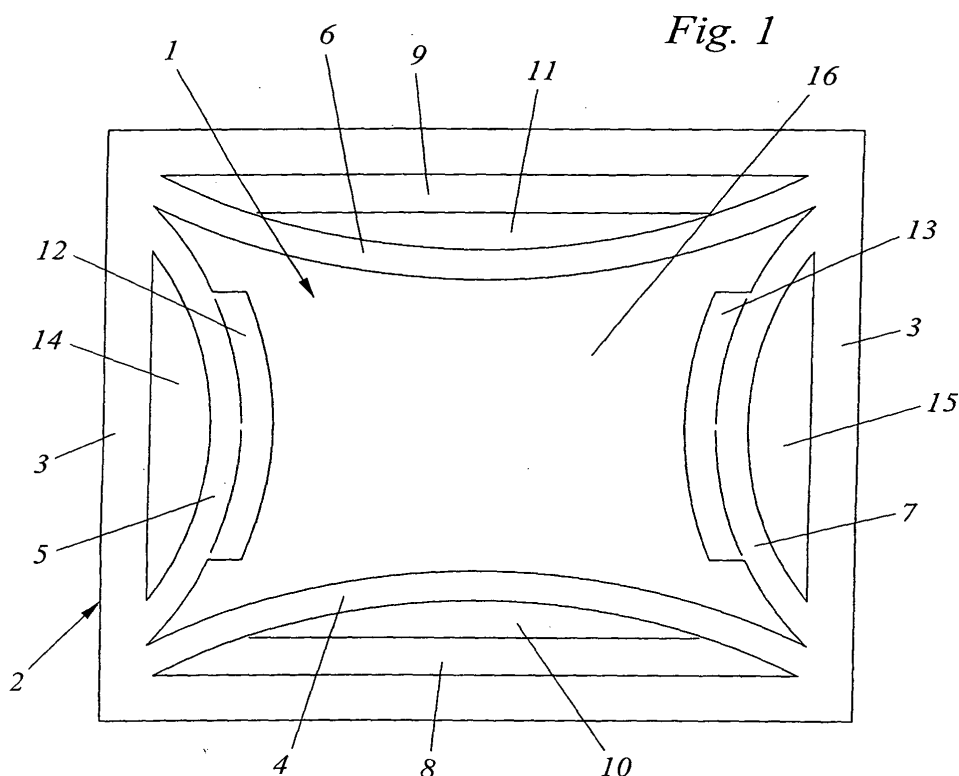


Fig. 1

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Description

[0001] The present invention relates to a protective packaging for fragile products comprising an outer box containing a protective filling material between the product and the packaging.

[0002] Such packagings are known in many embodiments in which the empty space within the enclosing outer packaging, such as a packaging box, is filled with e.g. paper, corrugated board, blister padding, foam material or one of many other possibilities. With these known packaging techniques, it is possible to assemble a sufficiently protective packaging for any fragile product. However, this often means that the packaging must be made rather voluminous in relation to the product to be protected. This is disadvantageous in the sense that the space required for transport of the products manufactured in this way is considerably larger and the transport costs involved are generally considerably higher.

[0003] The object of the invention is to eliminate these disadvantages and to provide a packaging which offers sufficient protection to the product to be packaged with a limited volume of the packaging material. A further object is to produce the packaging in such a way that it can easily be adapted to various dimensions within a certain range of the product to be packaged.

[0004] Accordingly, the invention provides for, that the protective packaging for fragile products comprises an outer box, one or more packaging elements consisting of at least one plastic foam material, said elements can be separately or collectively and be completely or partly fittingly received in the outer box, at least one of said packaging elements is formed for clampingly engaging a product to be packaged.

[0005] The packaging according to the invention is especially intended for fragile products having a relatively heavy weight in relation to the volume and/or relatively valuable products. Here, one could think of computer parts, notebooks, TFT displays, plasma displays and comparable products.

[0006] According to a first embodiment, it is provided for, that a packaging element comprises a base plate made of a plastic foam material mounted on the bottom plane of the outer box, a profiled part intended for accommodating a product and a top plate made of a plastic foam material to be mounted on the profiled part, said profiled part being formed in such a way that it can clampingly engage said product.

[0007] According to a further elaboration, it is provided for, that said profiled part is designed in such a way that it can, within a predetermined range, be adapted to the dimensions of a product to be packaged. This allows comparable products of e.g. other manufacturers, or products of another type having different dimensions to be accommodated in the same type of packaging.

[0008] Further, it is provided for, that the profiled part has a fixed outer circumference with at least one recess

situated within this fixed outer circumference, said recess being intended to receive at least a portion of the product to be packaged and said profiled part being deformable across at least part of the length of the boundary of at least one recess. The profiled part can be designed such that it can accommodate one product, but could also be designed with a number of recesses e.g. for accommodating a corresponding number of products. For specific products, it may be necessary that two or more recesses are made for receiving certain parts of the product.

[0009] Apart from the fact that the deformable profiled part allows to have the packaging closely fit the product, the most important function of said profiled part is absorbing external forces and the consequently induced reactive forces between the packaged product and the packaging fitting to it. Thus, it is preferred that a recess is bounded by a number of consecutive separate sides, with at least two of these sides being deformable.

[0010] Preferably, it is further provided for, that a portion or a side of the boundary of a recess has a substantially convex course, the convex side being directed towards the recess with a free space being situated behind a convex side or convex portion of the boundary. Thus, an arched portion of the profiled part will contact the product, said arched portion following the shape of the product across a certain area, which is e.g. a straight line, and further maintaining the arched shape or approximately maintaining the arched shape. Thus, this arch shape or these arch shape portions will be stressed and constitute, as practical tests have shown, an excellent buffer for absorbing at least the first onset of impacts and shocks.

[0011] In order to be able to realize this for various dimensions of the product it is provided for that behind a convex side or convex portion of the boundary, one or more webs of material have been removably mounted in the profiled part. To this end, the removable webs of material have already been partly cut loose from said profiled part.

[0012] According to a further elaboration it is provided for that at least one removable strip of material is mounted at the front of at least one convex side or convex portion of the boundary. This strip too is preferably partly cut loose from the profiled part. Providing a removable strip at the front side can be effected especially at e.g. the short sides of a rectangle where less space is available behind the arched portion and thus less material can be removed.

[0013] Preferably the profiled part is made of a foam material and is enclosed between a base plate and a top plate, with the profiled part having its peripheral edge bonded to said base plate mounted on the bottom surface of said outer box. Apart from their pre-stress, the arched portions therefore also experience a static frictional component in relation to base plate and top plate, which contributes further to the shock-absorbing capability.

[0014] The invention provides a second embodiment of the protective packaging, comprising a number of separate packaging elements, in which a packaging element made of a plastic foam material is provided with at least one completely or partly convex portion intended to abut a product to be packaged.

[0015] Said second embodiment is especially meant to be used for larger products, for which a full enclosure with plastic foam material would entail an unnecessary use of material and thus unnecessary high costs.

[0016] According to another elaboration it is provided for that the individual packaging elements are designed as corner pieces to be applied onto the product to be packaged, each of said corner pieces being provided with a number of opposite convex portions or a number of convex portions at an angle with one another or of opposite convex portions and at least one further convex portion being at an angle to said opposite convex portions.

[0017] With such corner pieces, a product is clamped at angular points by having convex portions of a corner piece engage e.g. front and backsides of a relatively flat product. The corner pieces will be situated in corresponding corners of an outer box and are thus retained in the outer box. The corner pieces can be adjusted to certain thicknesses of the products to be packaged by providing corner pieces having various distances between the convex portions. However, to this end preferably a free space will be provided behind the convex portions, so that these can be compressed across a certain region. According to a further elaboration free spaces can be formed or enlarged by providing removable portions.

[0018] In order to further provide a clamping in a direction perpendicular to or at an angle to the opposite corner pieces, according to a further elaboration it is provided for that the corner pieces have a convex portion in this direction as well. This last clamping of the product is effected by retaining two or more corner pieces in the outer box.

[0019] According to yet another elaboration it is provided for that at the outside of a corner piece, at least one side is provided with portions that can be removed or swung aside. This allows an even greater adjustment in relation to the outer box. By also providing for that the dimensions of the outer box are adjustable in at least one direction, it will mostly suffice to mount portions that can be removed or swung aside at only one side of the corner pieces.

[0020] For products having such dimensions that clamping the product with a corner piece can't take place in a simple way in any of the specific directions, corner pieces having convex portions in at least three directions are provided. In this way, the product can be clamped in the outer box, which allows for adjustment of the product dimensions to the dimensions of the outer box across a wide range.

[0021] Hereinafter, the invention will be further ex-

plained by way of the example given in the drawing, in which:

- fig. 1 shows a plan view of a profiled part mounted on a base plate;
- fig. 2 shows a lateral view of a profiled part mounted on a baseplate;
- fig. 3 shows a plan view of a second embodiment of a profiled part mounted on a base plate;
- figs.4A-C show three views of a first corner piece; and
- figs.5A-C show three views of a second corner piece.

[0022] Fig. 1 illustrates a profiled part 2 mounted on a base plate 1 in plan view. The profiled part 2 has a peripheral edge 3 to which the respective arched portions 4, 5, 6, 7 connect on each of the sides. Removable webs 8, 9 have been mounted between the arched portions 4, 6, with free spaces 10, 11 being situated between the removable portions 8, 9 and the arched portions 4, 6. Removable strips 12, 13 are mounted at the front of the arched portions 5, 7. Free spaces 14, 15 are located between the arched portions 5, 7 and the peripheral edge 3. Arched portions 4, 5, 6, 7 with the removable strips 12, 13 bound the recess 16 in the profiled part 2 which is intended for accommodating a product to be packaged.

[0023] This embodiment is meant for receiving a rectangular product such as especially a notebook, which will have its short sides abut the removable strips 12, 13 and its long sides abut the arched portions 4, 6. Thereby, arched portions 4, 5, 6, 7 are pushed outwardly, in which straight contact surfaces with the product to be packaged are formed and the arched portions are pressed together from the starting point at or near the peripheral edge 3. Sections of the arched portions 4, 5, 6, 7 will be pre-stressed further, due to which shocks and impacts against the packaging can be absorbed even better.

[0024] In case of wider and/or deeper products, removable strips 12, 13 and/or the removable webs 8, 9, respectively, can be taken out.

[0025] Fig. 2 shows a lateral view of a base plate 1 and a profiled portion 2. A top plate not illustrated in the drawing is yet to come on top of the profiled part, in which, when a product does not protrude beyond profiled part 2, said top plate can be of the same thickness as the base plate 1.

[0026] Profiled part 2 is made of a plastic foam material, such as e.g. polyethylene, having a density of 20-40 kg/m³, and preferably of 20-28 kg/m³. Base plate 1 and top plate are made of a plastic foam material such as e.g. polyether having a hardness of 20-80 kPa and preferably of 20-40 kPa and having a density of 20-50 kg/m³ and preferably of 20-30 kg/m³. Then the bottom side of the base plate 1 is preferably provided with conical projections.

[0027] The packaging according to the invention pro-

duces a less voluminous packaging that yet offers more than enough protection to the product enclosed therein. In the transport business, for calculation of the transport cost one mostly looks at the actual weight and an assumed volume weight, in which the highest of the two sums will be charged. The volume of the packaging according to the invention is so much smaller than with the usual packagings that the transport cost will be based on the actual weight and not on the unfavourably assumed volume weight. This is an important advantage of the packaging according to the invention.

[0028] Fig. 3 shows a profiled part 2 in which the peripheral edge 3 has one side provided with a recess 17 and in which recess 16 is bounded by arched portions 5, 6, 7 at three sides. Two removable webs of material 9, 9' are mounted between peripheral edge 3 and arched portion 6. This embodiment is intended for a product composed of two distinctive parts, e.g. a TFT computer display, of which a first fragile part, the display will be placed into the recess 16 and the second less or hardly fragile part, e.g. the foot of the display, will be placed into recess 17. The distribution of removable strips and removable webs is adapted to the specific product, in which larger deviations from a standard dimension can be expected in only one direction.

[0029] The accompanying top plate will have a greater thickness than the base plate in order to be able to receive the part of the foot protruding beyond profiled part 2.

[0030] The assembly of base plate 1, profiled part 2 and top plate 17 are placed in a corrugated cardboard box, in which an exact fit is important. Further it is also important that an appropriate type of corrugated board is employed, e.g. a corrugated board having a B-shaped corrugation. Further, it can be provided for that one or more of the side walls produce a further improvement of the shock absorptive capacity of the entire packaging by dually designed walls or contacting lid edges.

[0031] Figs. 4A-C show a plan view, a cross-section and an elevational view, respectively, of a corner piece 18 according to the second embodiment of the invention of said packaging element. Illustrated corner piece 18 is composed of two sets of plate portions 19, 20 of a plastic foam material being orientated at right angles. In the illustrated example, the sets of plate portions 19, 20 each comprise two parallel plate portions put together, 21, 22 and 23, 24, respectively, said sets of plate portions engaging one another by means of a mitre 25. Here, the plate portions 21, 22 and 23, 24, as well as the sets of plate portions 19, 20, are preferably bonded together.

[0032] The plate portions 21, 22 are provided with opposite arched portions 26, 27. The spaces 28, 29 located behind these arched portions can possibly be further enlarged by providing removable portions in the plate portions 21, 22. This allows the arched portions 26, 27 to be compressed further, without engaging the product with a greater force.

[0033] Plate portions 23, 24 are provided with an arched part 30 with a free space 31 located behind them, which are perpendicular to the opposite arched portions 26, 27 and extend approximately up to that point.

[0034] The corner piece according to figs. 4A-C is meant for a relatively large and flat product such as e. g. a plasma display, in which the front and back sides will be retained at the various corner points between arched portions 26, 27 and arched portions 30 will come to abut the lateral sides. Since such a plasma display should be transported in upright position, corner piece 18 is provided with a base plate 32 allowing a better weight distribution. Further, this provides an elevation for keeping the stand of the screen at a distance from the bottom side of the outer box.

[0035] Further, a support plate 33 is provided between the arched portions 26, 27, 30 where the product will come to bear on the corner pieces. The support plate 33 is made of a much less deformable material than the other portions of the corner piece 18, but could also be made of a plastic foam material.

[0036] Plate portions 23, 24 have their back sides provided with continuous strips 34, 35 which have been partly cut loose from the remaining part of the plate portions 23, 24 according to lines 36, 37. These strips can be swung aside or be broken off if a product must be packaged which falls in the maximum portion of the width range. This provision together with an outer box of which the dimensions can be varied in at least one other direction, e.g. vertical, allow for that the flat products indicated can be clamped into the packaging within a wide range. By providing an outer box comprising two parts slidable across one another the height can be varied in a simple way.

[0037] Figs. 5A-C show a plan view, a cross-section and side view of a corner piece 38, which is meant to serve as upper corner piece. Corner piece 38 largely corresponds to corner piece 18 and thus corresponding parts are indicated with the same reference numerals. Corner piece 38 is not provided with a plate corresponding to base plate 32 of corner piece 18 since there aren't any projecting parts at the top of said products. However, a support plate 33 is provided because through this plate, the forces must be discharged to the corner pieces 38 and the outer box, successively.

Claims

1. Protective packaging for fragile products comprises an outer box, one or more packaging elements consisting of at least one plastic foam material, said elements can be separately or collectively and be completely or partly fittingly received in the outer box, at least one of said packaging elements is formed for clampingly engaging a product to be packaged.

2. Protective packaging according to claim 1, **characterized in that** a packaging element comprises a base plate made of a plastic foam material mounted on the bottom plane of the outer box, a profiled part intended for accommodating a product and a top plate made of a plastic foam material to be mounted on the profiled part, said profiled part being formed in such a way that it can clampingly engage said product. 5
3. Protective packaging according to claim 2, **characterized in that** the profiled part is designed in such a way that it can, within a predetermined range, be adapted to the dimensions of a product to be packaged. 10
4. Protective packaging according to claim 3, **characterized in that** the profiled part has a fixed outer circumference with at least one recess situated within this fixed outer circumference, said recess being intended to receive at least a portion of the product to be packaged and said profiled part being deformable across at least part of the length of the boundary of at least one recess. 20
5. Protective packaging according to claim 1, **characterized in that** a recess is bounded by a number of consecutive separate sides, at least two of these sides being deformable. 25
6. Protective packaging according to claims 4-5, **characterized in that** a portion or a side of the boundary of a recess has a substantially convex course, the convex side being directed towards the recess. 30
7. Protective packaging according to claim 6, **characterized in that** a free space is situated behind a convex side or convex portion of the boundary. 35
8. Protective packaging according to claims 6-7, **characterized in that** behind a convex side or convex portion of the boundary, one or more webs of material have been removably mounted in the profiled part. 40
9. Protective packaging according to claim 8, **characterized in that** the removable webs of material have been partly cut loose from said profiled part in advance. 45
10. Protective packaging according to claims 6-7, **characterized in that** at least one removable strip of material is mounted at the front of a convex side or convex portion of the boundary. 50
11. Protective packaging according to claim 10, **characterized in that** the removable material strip is partly cut loose from the profiled part in advance. 55
12. Protective packaging according to claims 2-11, **characterized in that** the profiled part has its peripheral edge bonded to said base plate mounted on the bottom surface of said outer box.
13. Protective packaging according to claims 2-12, **characterized in that** the profiled part is made of a plastic foam material, such as e.g. polyethylene, having a density of 20-40 kg/m³, and preferably of 20-28 kg/m³.
14. Protective packaging according to claims 2-13, **characterized in that** base plate and top plate are made of a plastic foam material having a hardness of 20-80 kPa and preferably between 20-40 kPa.
15. Protective packaging according to claim 14, **characterized in that** the plastic foam material used for base plate and top plate is polyether having a density of 20-50 kg/m³ and preferably of 20-30 kg/m³.
16. Protective packaging according to claims 14-15, **characterized in that** the bottom side of the base plate is provided with approximately conical projections across a part of the surface.
17. Protective packaging according to claim 1, **characterized in that** it comprises a number of separate packaging elements, a packaging element of a plastic foam material being provided with at least one completely or partly convex portion which is meant to abut a product to be packaged.
18. Protective packaging according to claim 17, **characterized in that** a free space is situated behind said convex portion.
19. Protective packaging according to claim 18, **characterized in that** one or more removable webs of material have been mounted in the packaging element in such a way that the free space behind the convex portion can be enhanced.
20. Protective packaging according to claim 19, **characterized in that** the removable webs of material were cut at least partly from said packaging element in advance.
21. Protective packaging according to claims 17-20, **characterized in that** the packaging element is designed as a corner piece to be mounted on the product to be packaged and it is provided with a number of opposite convex portions or a number of convex portions being at angles to one another or with opposite convex portions and at least one further convex portion being at an angle to said opposite convex portions.

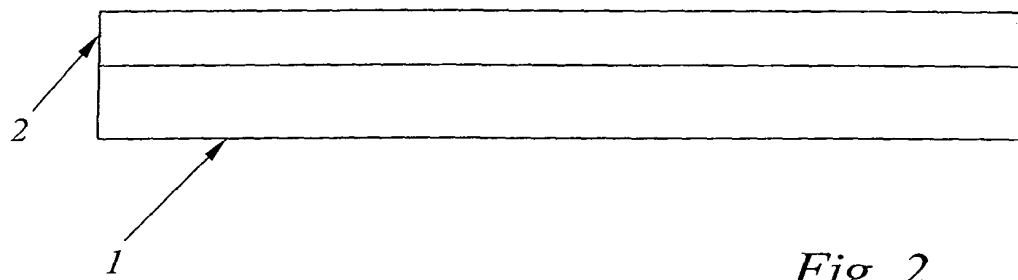
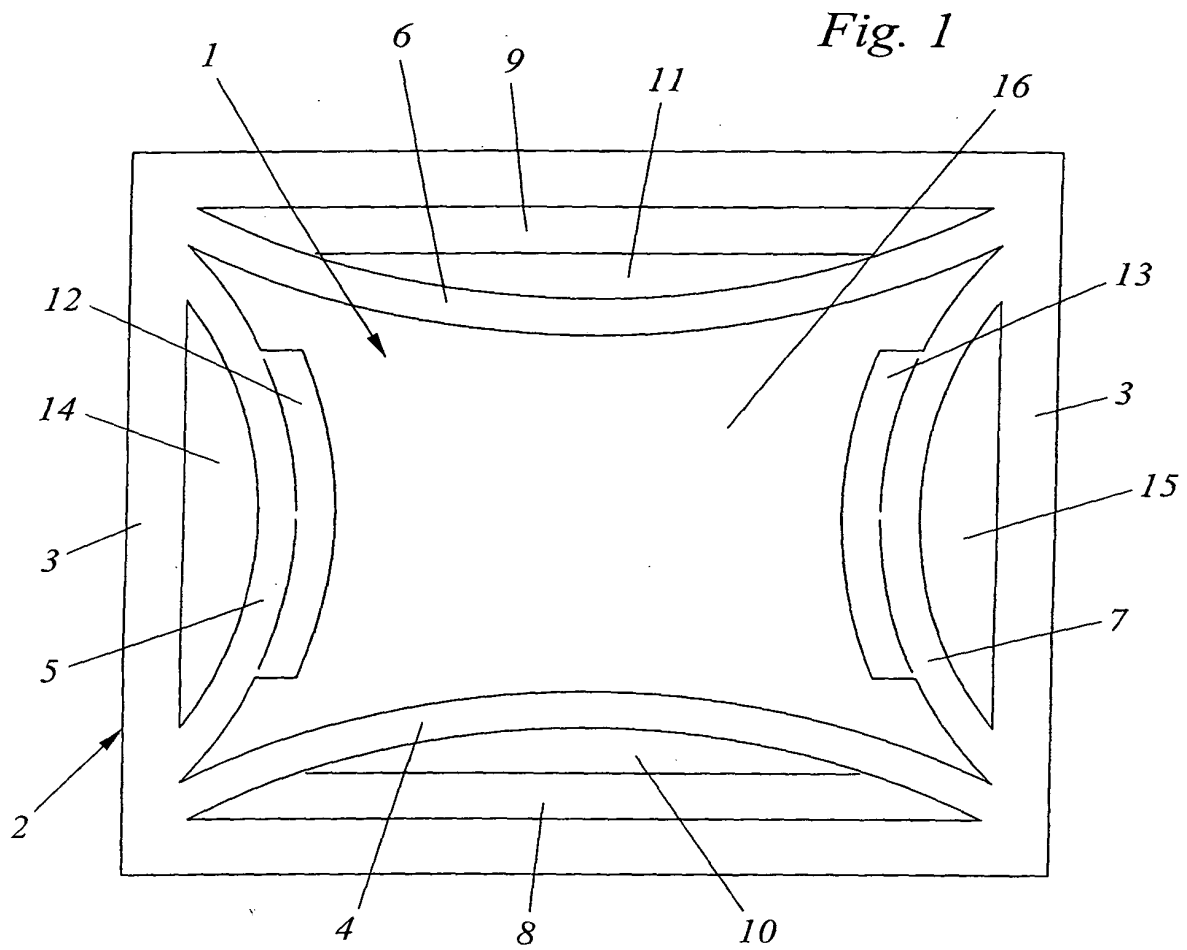
22. Protective packaging according to claim 21, **characterized in that** the packaging element is provided with a supporting surface located between said convex portions which can withstand a higher load than the material of the packaging element. 5
23. Protective packaging according to claims 21-22, **characterized in that** said packaging element has at least one outer side provided with a further support plate. 10
24. Protective packaging according to claims 21-23, **characterized in that** the outer side of said packaging element has at least one side provided with portions that can be removed or swung aside. 15
25. Protective packaging according to claims 21-24, **characterized in that** a packaging element is assembled from at least two parts engaging one another, in which said parts can comprise one or more individual layers. 20
26. Protective packaging according to claims 2-12, **characterized in that** the packaging element comprises a plastic foam material, such as e.g. polyethylene, having a density of 20-40 kg/m³ and preferably of 20-28 kg/m³. 25
27. Protective packaging according to claims 2-13, **characterized in that** the support surface mounted between convex portions consists of a plastic foam material, such as e.g. polyethylene, having a density of 40-80 kg/m³ and preferably of 60-70 kg/m³. 30
28. Protective packaging according to claims 1-27, **characterized in that** the outer box is manufactured of corrugated board, preferably corrugated cardboard having a B-shaped or a BC-shaped corrugation. 35

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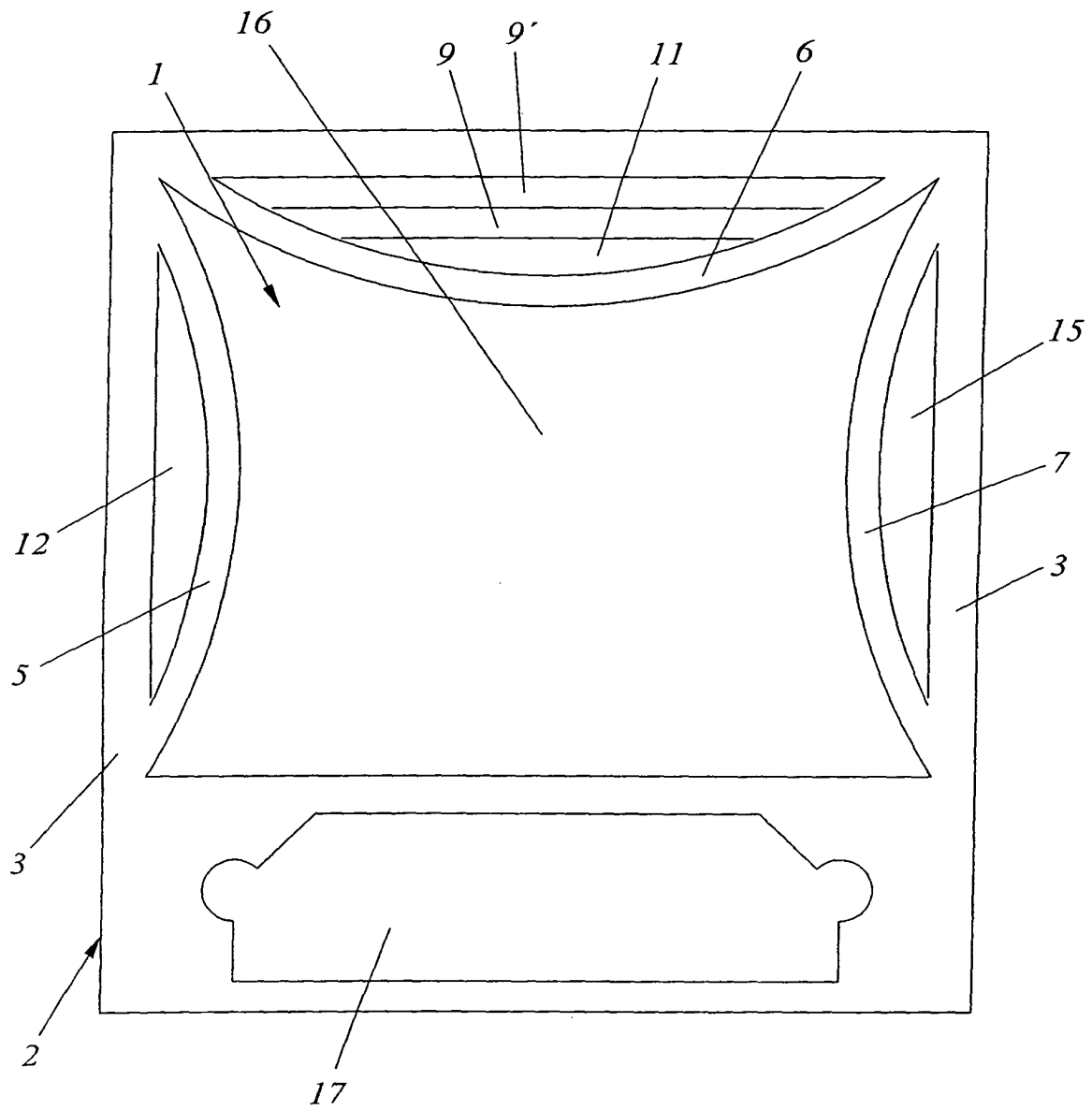


Fig. 3

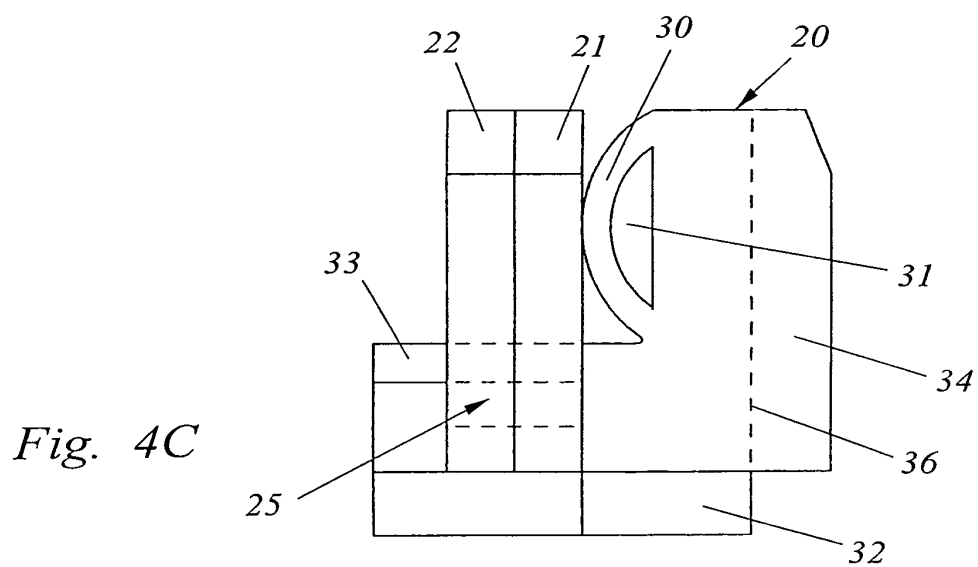
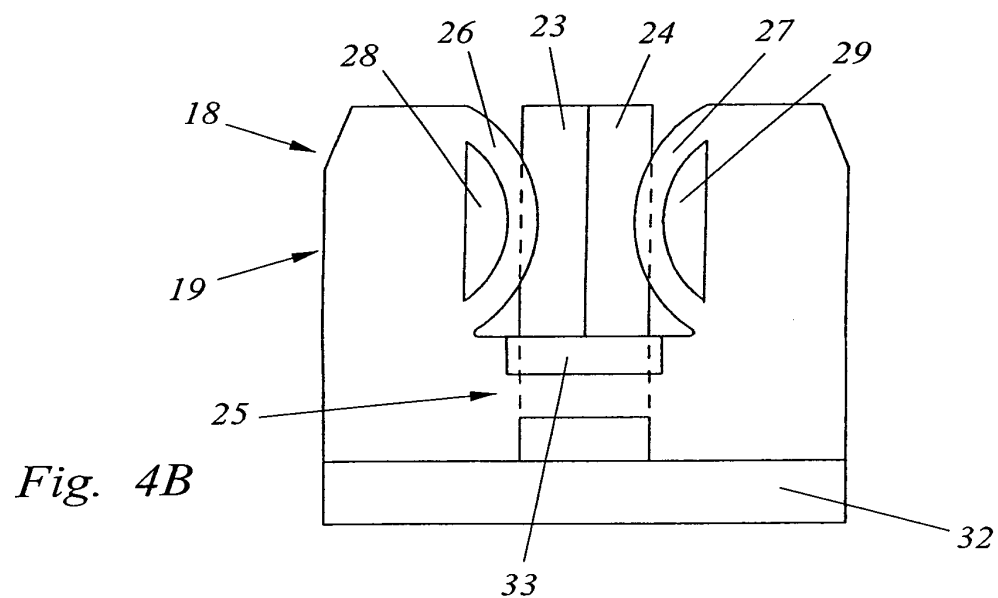
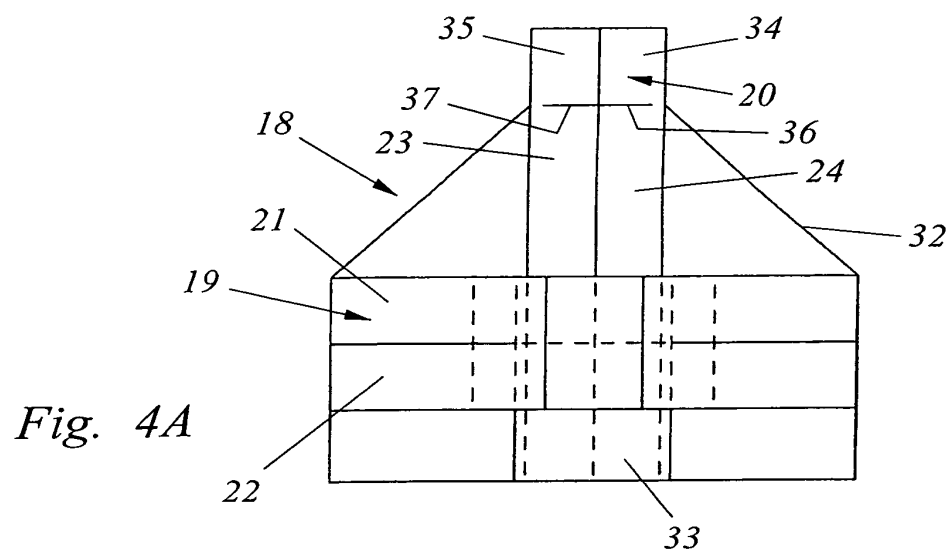


FIG. 5A

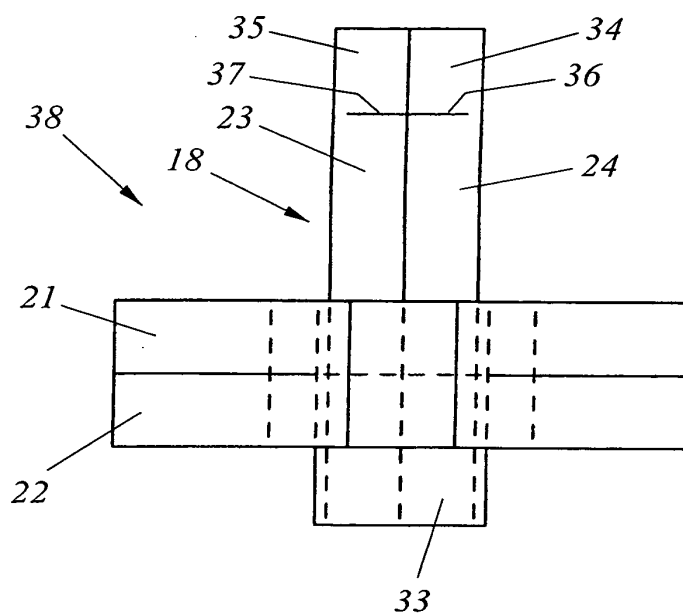


FIG. 5B

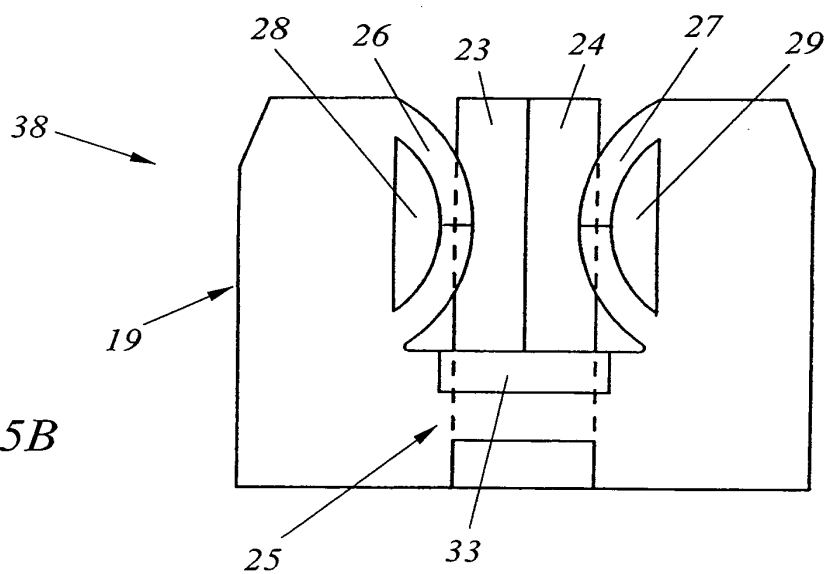


FIG. 5C

