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(56) Documents Cited

GB 2103752 A GB 1387502 A GB 1247987 A  
GB 1219336 A GB 1060527 A GB 0756406 A

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(54) Abstract Title

**A panel assembly for a storage box**

(57) A panel assembly, for instance for the construction of storage or transport boxes, comprises at least two panels (24) and a linkage (2). Each panel (24) has a straight edge and a slot (28) extending parallel, but spaced from the straight edge. The linkage (2) defines at least one socket into which one of the edges of at least one of the panels (24) can be inserted, there being a projection (14) in the socket which engages with the slot (28) of the inserted panel (24).

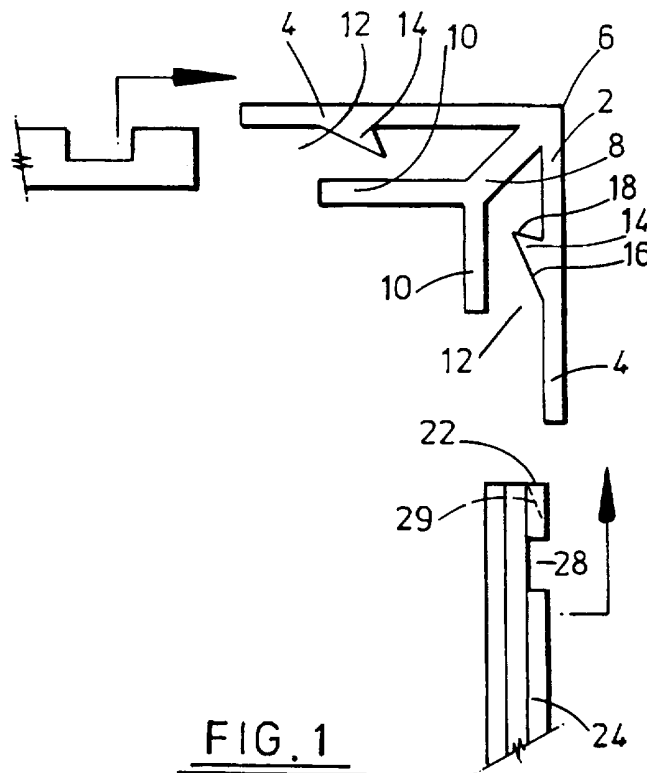
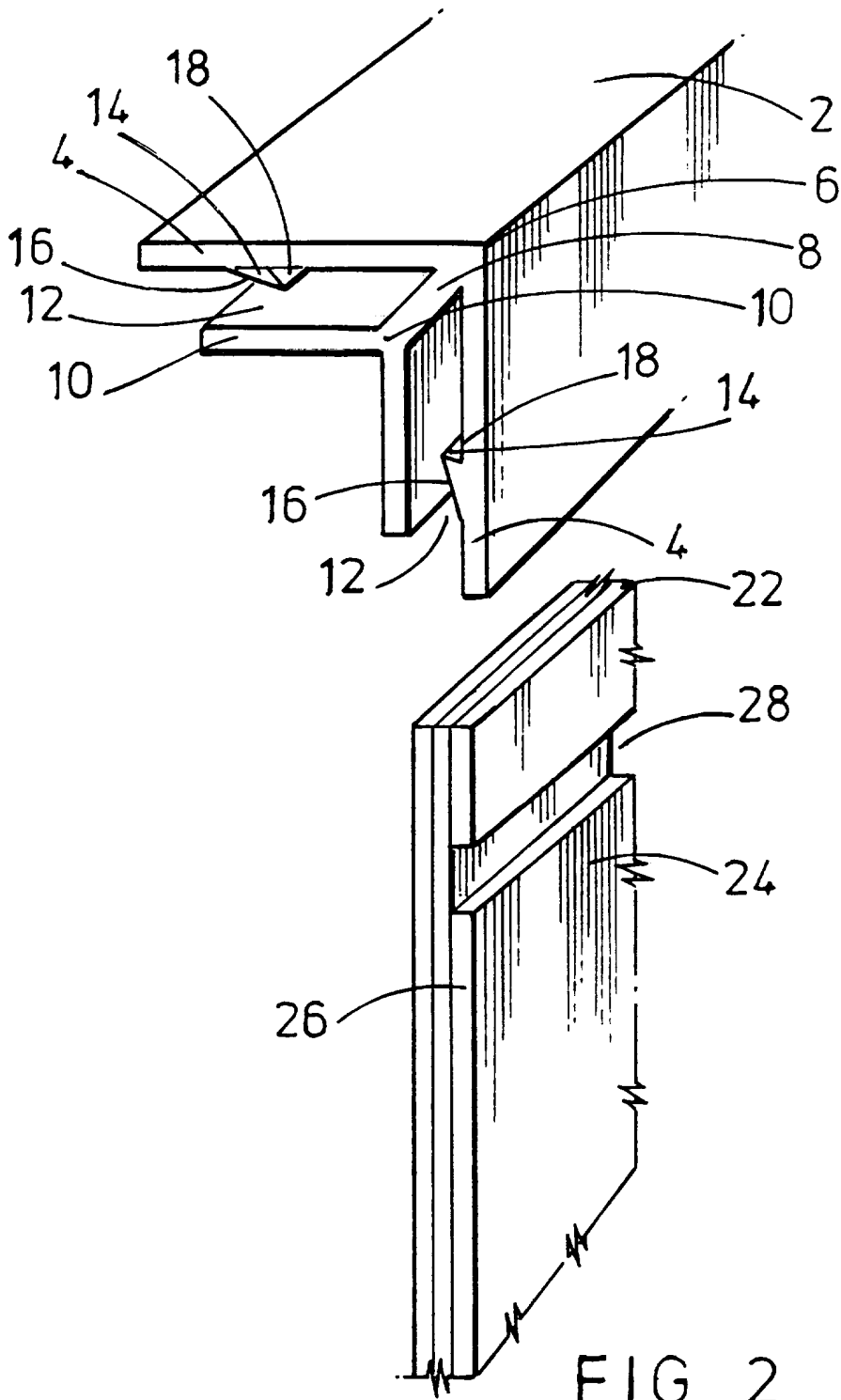


FIG. 1

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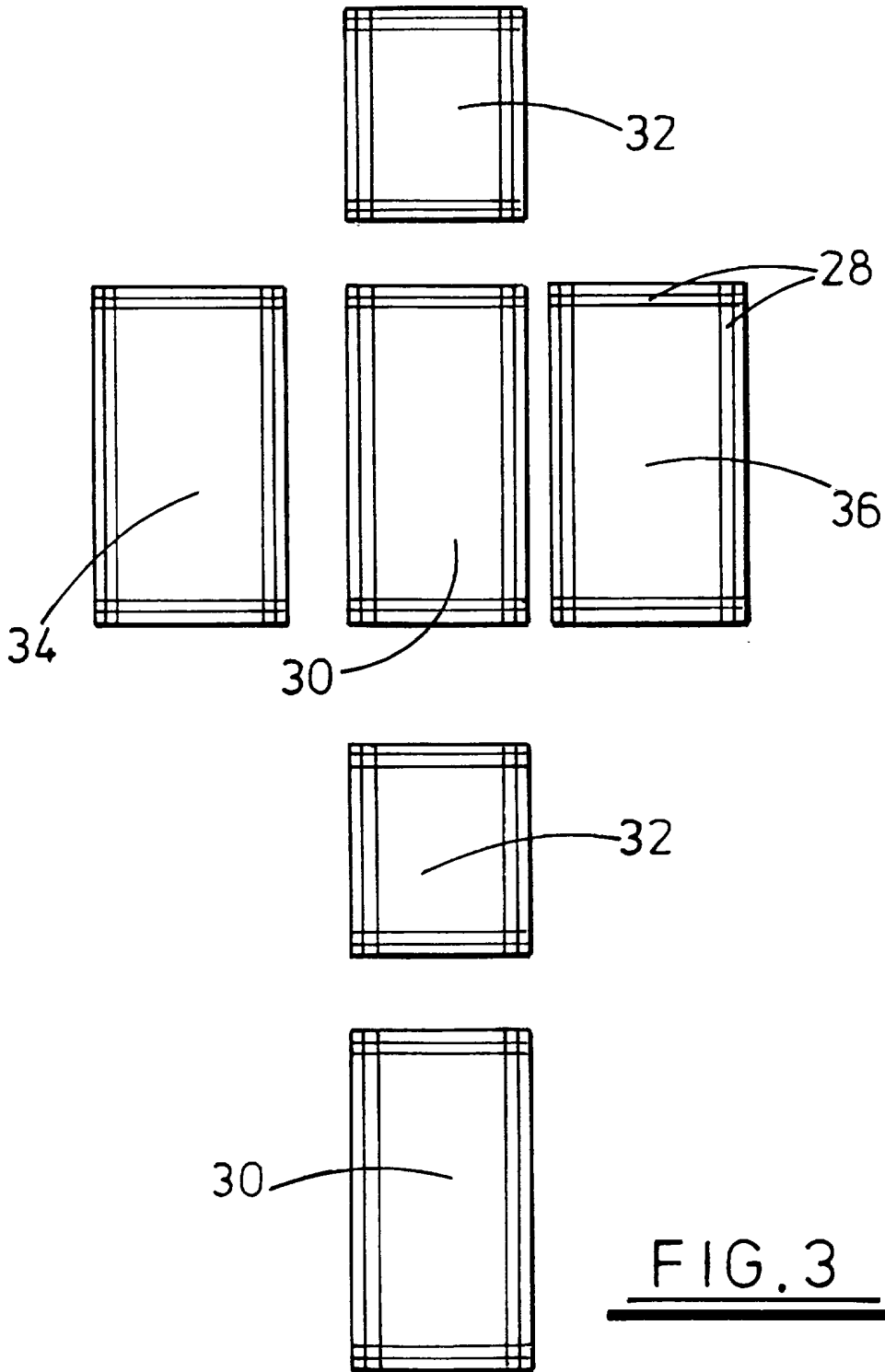


FIG. 3





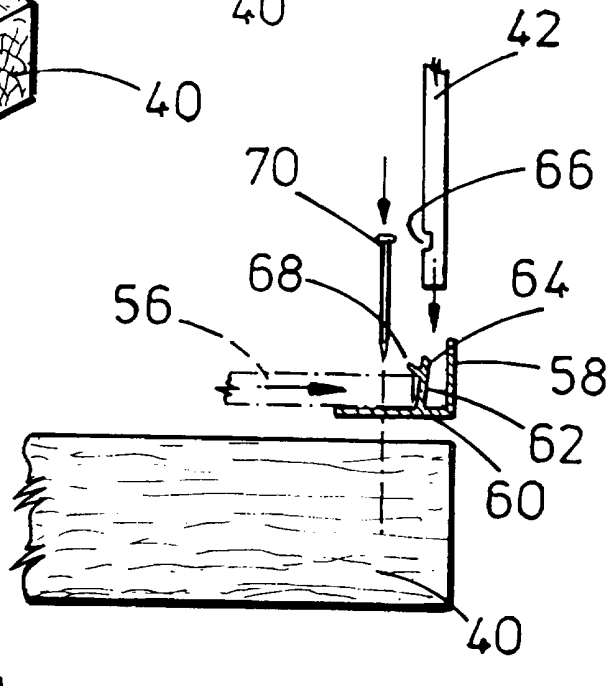
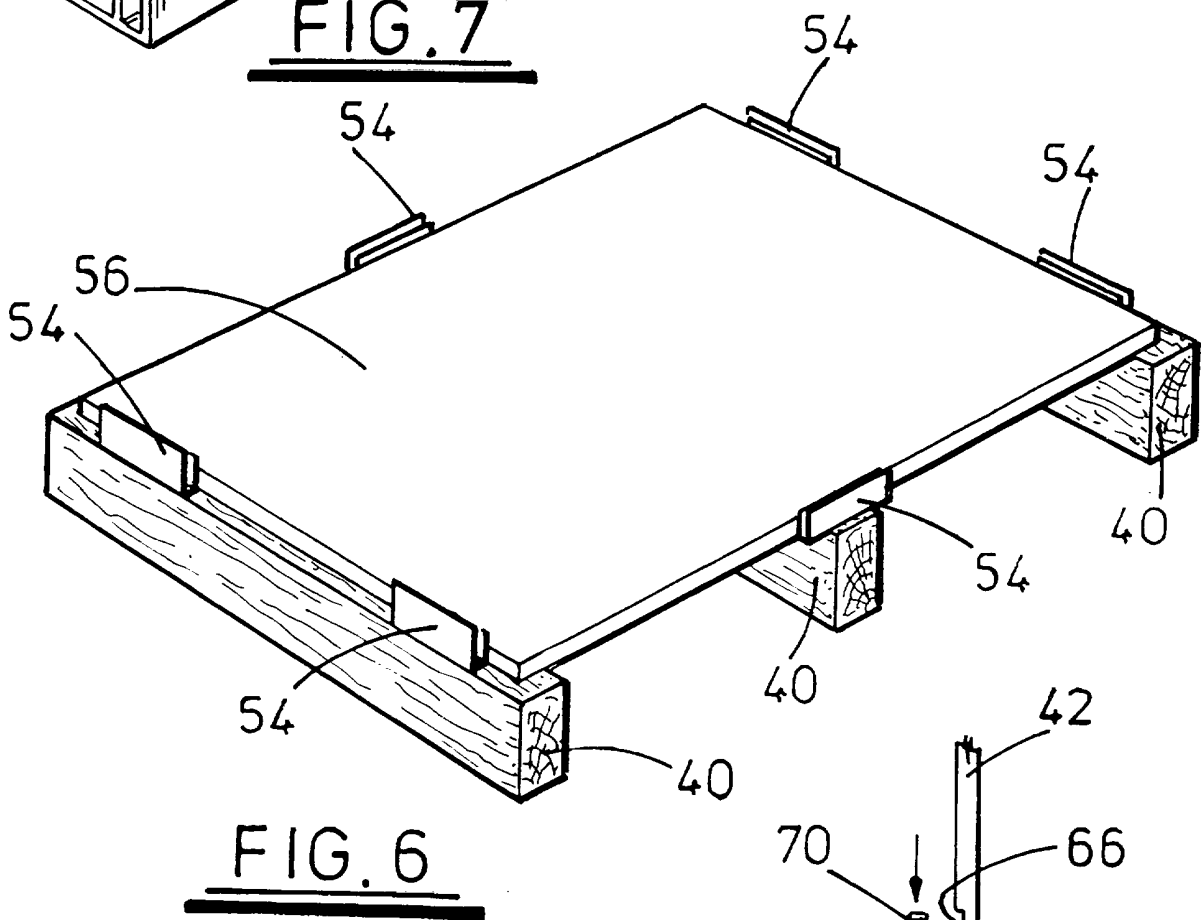
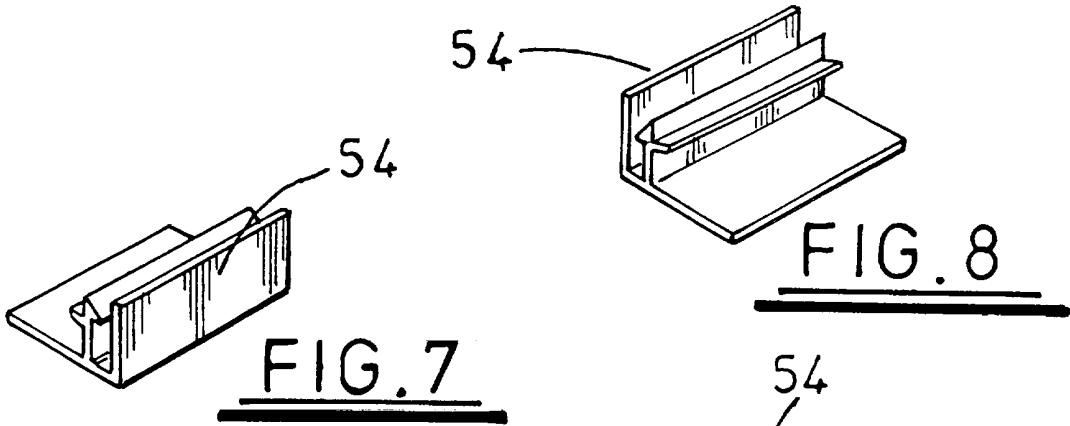


FIG. 9

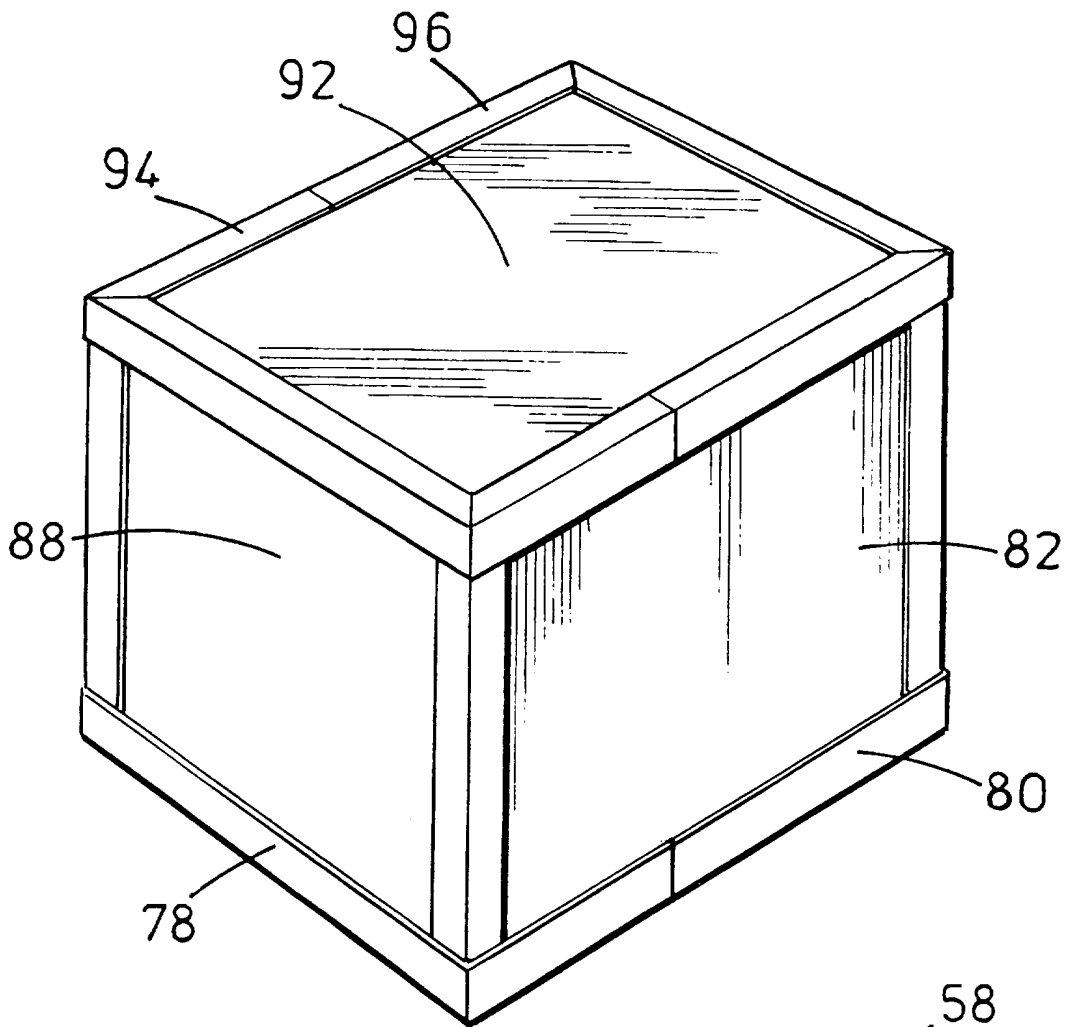


FIG. 11

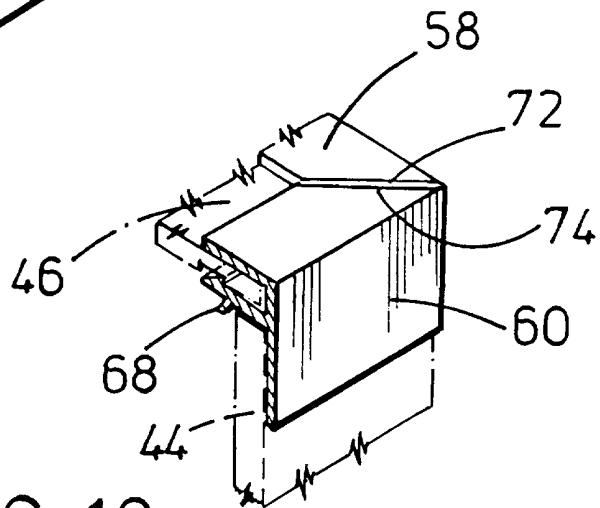


FIG. 10

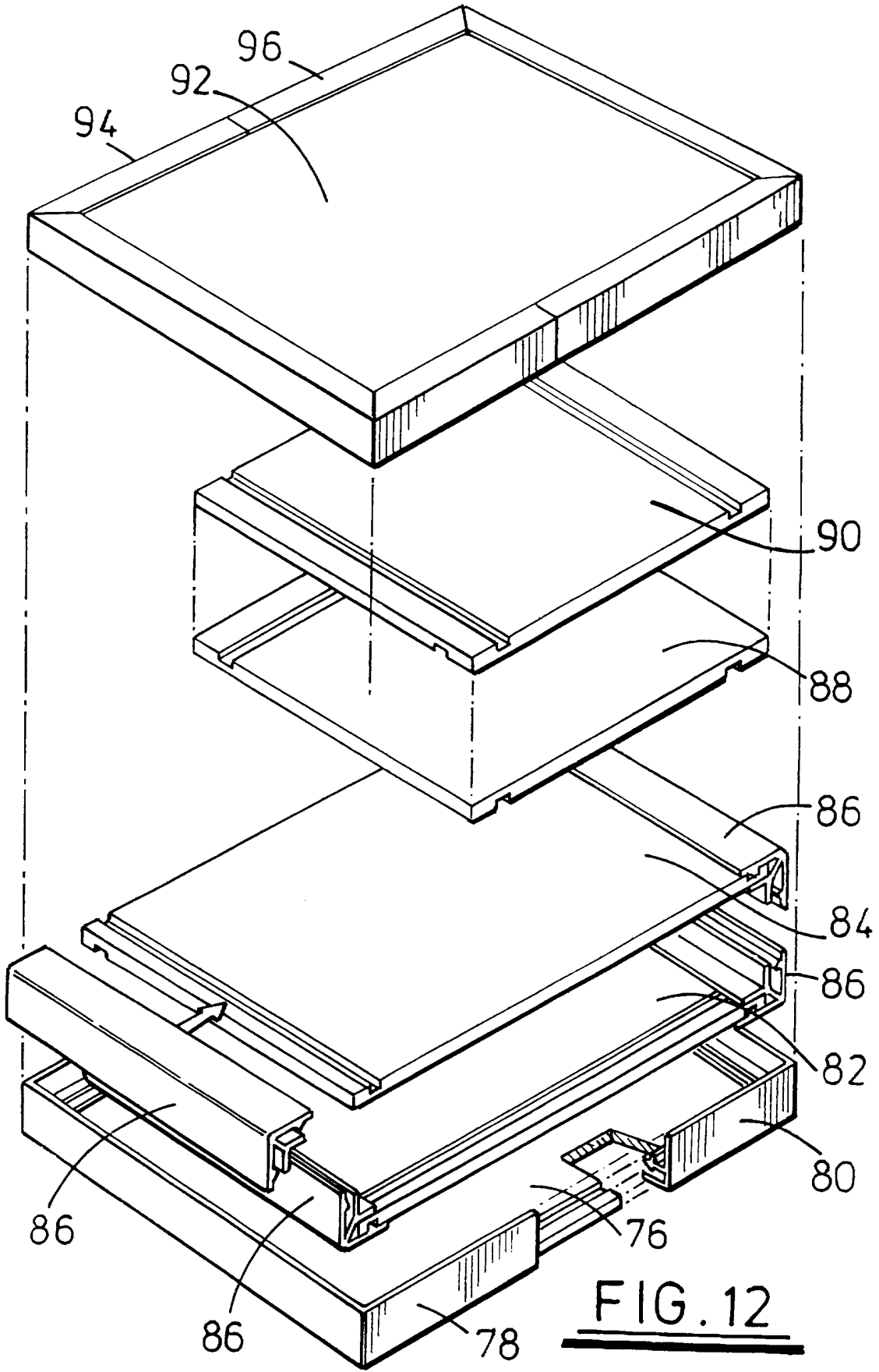


FIG. 12

## PANEL ASSEMBLY

The present invention relates to a panel assembly, and in particular to a panel assembly formed by interconnecting a series of panels together edge to edge using linkages.

Storage and transport boxes typically consist of a cardboard or plastics sheet that has been scored and cut to enable erection into a box of predetermined dimensions. The boxes are usually delivered to the end user in a flat ready to erect format. To erect such a box, the sheet material is folded along the pre-scored lines into the required shape, using pre-formed flaps and the like to retain that shape.

Such boxes have the advantages that they are lightweight and, as they are made from inexpensive materials, such as cardboard, they are cheap to manufacture. Generally they are simply disposed of after use. This does result in the generation of large volumes of waste however as it is difficult to reuse such boxes. In addition, the boxes have only limited strength, as they are made of lightweight material. Although this may be ideal for transporting and storing lightweight products, in instances where the products to be packaged are large or heavy the boxes may not be strong enough.

It is an object of the present invention to obviate or mitigate the above mentioned disadvantages.

According to the present invention, there is provided a panel assembly comprising at least two panels edges of which are interconnected by a linkage, wherein each panel has a straight edge and parallel faces extending away from the straight edge, and a slot extending along at least one face parallel to but spaced from the straight edge, the linkage defining a socket into which the straight edge of the said at least one panel is inserted, the socket defining at least one projection which engages in the slot of an inserted panel so as to resist withdrawal of the panel from the socket in a direction perpendicular to the straight edge.

Preferably the linkage is resiliently deformable and shaped to enable insertion of the straight edge of a panel into the socket by forcing the panel edge past the projection. The projection may be formed on an inside wall of the socket and extend from the inside wall in a direction into the socket, whereby the projection snaps into the slot of the inserted panel edge.

Preferably each panel defines a slot extending along at least one face parallel to but spaced from the straight edge, and the linkage defines sockets into each of which a straight edge of a respective panel is inserted, each socket incorporating a said projection.

Three or more rectangular panels may be provided, each defining slots along opposed edges, the panels being interconnected edge to edge by linkages to define a continuous wall. Preferably four panels are provided, each linkage defining two sockets arranged at right angles to each other. At least one end cover may be secured over an opening defined by edges of the panels which are perpendicular to the linkages. The edges of the panels which are perpendicular to the linkages may define slots extending parallel to those edges, the or each end cover having slotted straight edges, and the edges of the panels and the end cover being interconnected by further linkages which engage the slotted edges.

Where an end cover is provided, it may comprise a panel supporting edge strips which define sockets adapted to receive edges of the panel defined in the continuous wall, the said edges defining slots extending parallel thereto which are engaged by at least one projection inside the strip sockets. The cover panel may be secured to pallet runners extending beneath the panel, and the edge strips may define legs secured between the cover panel and the runners. The end cover may also comprise a panel defining edges adjacent to which a slot extends around one face of the panel parallel to but spaced from the panel edge. A strip may also extend around the edges of the panel and define a socket in which the panel edges are received, the socket defining at least one projection which engages in the slot in the cover panel to resist withdrawal of the panel from the strip. The strip also defines an edge defining a socket which may be slipped without positive engagement over the end of the continuous wall. The strip may in addition define a projection arranged to engage behind the continuous wall to resist inwards deflection of the panels making up the continuous wall.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows an end view of a linkage and edges of panels which may be interconnected in an assembly in accordance with the present invention;

Figure 2 shows a perspective view of the end of the linkage of Figure 1 and one of the panels of Figure 1;

Figure 3 shows in plan view six panels which can be assembled into a six-sided container in accordance with a first embodiment of the present invention;

Figure 4 is a perspective view of a partially exploded container assembled using the panels of Figure 3;

Figure 5 illustrates a container in accordance with a second embodiment of the invention;

Figures 6, 7, 8, 9 and 10 illustrate component parts of the container of Figure 5;

Figure 11 illustrates a container in accordance with a third embodiment of the invention; and

Figure 12 illustrates components of the container of Figure 11.

Referring to Figures 1 and 2, the illustrated linkage 2 has legs 4 extending from an apex 6. Legs 4 are of the same length and define an angle of  $90^\circ$  between them, creating an "L" shape. A member 8 extends from the apex 6 so as to be equally distant from the legs 4, the member supporting legs 10, which are also the same length as each other and also define an angle of  $90^\circ$  between them, creating a second "L" shape. Legs 4 and 10 together form sockets extending from openings 12. The sockets each have a triangular projection or lip 14 protruding from legs 4. Triangular lip 14 has two faces 16, 18. Face 16 defines an obtuse angle with leg 4 and face 18 an acute angle. Face 16 is oriented towards the opening 12, face 18 away from the opening.

The linkage 2 is formed from a resilient plastics material. In use a straight edge 22 of a rectangular panel or sheet 24 formed of three layers 26 and having a straight slot 28 spaced inwardly from and parallel to the edge is offered to the socket opening 12. The slot may typically be rectangular and be 6mm by 3mm. The sheet thickness is such that it is an easy sliding fit between the legs 4 and 10. As the leading edge 22 is pushed into the socket it abuts face 16 of lip 14. As the sheet 24 is pushed further into the socket the edge 22 of sheet 24 moves along the face 16 of lip 14, parting legs 4 and 10 and deforming the lip 14 until the lip 14 snaps into the slot

28. The corner of the edge 22 may be chamfered as indicated by broken line 29 to make it easier for the edge to ride up over the lip 14.

Referring to Figures 3 and 4, panels and linkages as described with reference to Figures 1 and 2 may be used to form an enclosed rectangular case structure having side panels 30, end panels 32, a top cover panel 34 and a bottom cover panel 36. All the panels have slots 28 formed along each of their edges.

As shown in Figure, side edges of the side panels 30 and the end panels 32 cooperate with linkages 2 defining posts which are shorter than the sheet edges on which they are fitted. The side panels 30 and end panels 32 are interconnected edge to edge to form a continuous wall using the linkages 2. Linkages 38 which are identical in cross-section to the linkages 2 are fitted onto each of the four edges of the top and bottom panels 34 and 36. To assemble the structure, side and end panels are first assembled to form a continuous wall and the bottom cover panel 36 is then pushed downwards onto the continuous wall. The assembled structure is then inverted and the top cover panel 34 is then pushed onto the assembly to define the final six-walled case.

A panel assembly in accordance with the present invention does not have to have top and bottom end covers as illustrated in Figure 4. For example, simple cardboard or similar end covers could be provided which are secured onto the side walls in an appropriate manner. Alternatively, a bottom cover panel could be provided but no top cover panel. As a further alternative, the four-walled assembly of two side and two end panels could simply be placed upon a pallet and used to protect products loaded directly onto that pallet.

It will be appreciated that although it is possible to interconnect a slotted panel and a linkage by pushing the panel into the linkage socket in a direction perpendicular to the length of the linkage, it is also possible to slide a linkage onto a panel or to slide a panel into an appropriately positioned linkage. For example, a three sided panel assembly could be produced and positioned on a pallet. Products could then be loaded onto the pallet inside the three-walled structure and the fourth wall of the structure could then be added simply by sliding a fourth panel vertically downwards after engaging slots in that panel with the linkage projections. Thus panelled assemblies in accordance with the present invention offer great flexibility in use.

Assemblies in accordance with the present invention may be delivered in flat-package form for use and after use may be disassembled for storage or transport prior to re-use. The panels are robust as are the linkages. Damage to any one panel does not destroy a complete case assembly as that one panel can simply be replaced.

Referring now to Figure 5, this illustrates a second embodiment of the present invention in the form of a container having an integral pallet base including three runners 40. Side panels 42 and end panels 44 are interconnected by posts 2 identical to the posts shown in Figures 1, 2 and 4. A top panel 46 supporting two edge strips 48, 50 is slipped onto the side and end panels. The edge strips 48 and 50 abut at lines 52, and each edge strip defines two corners. The side and edge panels 42, 44 are secure to the base by further strips 54.

Referring to Figures 6 to 9, details of the pallet base and the strips 54 are shown. The runners 40 are nailed to a base panel 56. Each strip 54 is L-shaped, comprising a vertical leg 58 and a horizontal leg 60 which supports an upstanding limb 62. The limb 62 supports a first ridge 64 shaped to engage in a slot 66 in a side or end panel, e.g. side panel 42 is shown in Figure 9, and a second ridge 68 beneath which the base panel 56 engages. The detailed configurations of the ridges 64 and 68 are best seen in the perspective views of the strip 54 in Figures 7 and 8. The leg 58 is longer than the limb 62, and the leading edge of the limb 62 is chamfered to assist the insertion of a panel between the leg 58 and the limb 62. The strips 54 are secured in position by driving a nail 70 through the base panel 56 and the leg 60 into the runner 40.

Referring to Figure 10, this illustrates one of the two corners defined by the strip 48 which extends around part of the top panel 46. It will be seen that the cross-section of the strip 48 is identical to that of the strips 54 of Figures 5 to 9. The corner is formed by taking a straight length of the strip, cutting a V-shaped notch extending through the leg 48 and the limb 62 up to but not into the leg 60 so as to define notch edges 72 and 74, and then folding the strip so as to bring the edges 72 and 74 together. The edges 72, 74 can be secured together by an adhesive, and then the top panel 46 can be slipped into the strip, or the strip can be folded around the panel 46 and secured in position relative to the panel 46 by engagement of the ridges 64 in the slots in the panel 46. The folded strip could be further secured in position if desired by

using nails or staples extending through the strip into the panel 46. A separate container lid is thus formed.

Generally the container lid and base will be supplied to the end user ready assembled. If so, a container as illustrated in Figure 5 may be assembled by placing the base on a support surface, pushing the side and edge panels 42, 44 into engagement with the strips 54, pushing the posts into the slots in the side and end panels, filling the container, and placing the lid on the assembly. All the components can be delivered in flat-packed form with the posts 2 and side and end panels retained between the base and the lid.

It will be appreciated that if pressure is applied to the side or end panels so as to push the panels inwards, inwards deflection of the panels will be resisted as a result of engagement of the panel edges with the ridges 68.

A third embodiment of the invention will now be described with reference to Figures 11 and 12. The container shown in Figure 11 differs from that of Figure 5 only in so far as it does not include an integral pallet base. In the embodiment of Figures 11 and 12, a container base is provided which is identical to the lid except for the fact that the lid is slightly larger than the base so as to enable the base to nest within the lid.

Figure 12 shows the components that make up the container of Figure 11, that is a base defined by base panel 76 edged by strips 78 and 80, two side panels 82, 84 each supporting two posts 86, two end panels 88, 90, and a lid defined by a top panel 92 edged by strips 94 and 96.

The components shown in Figure 12 are delivered with the lid slipped onto the base and all the other components retained between the lid and the base. The container is assembled by placing the base on a supporting surface, placing a first one of the side panels and the posts 86 it supports inside the base so that the side panels and posts are upstanding and the bottom ends of the upstanding posts are located within the base corners, sliding the end panels into engagement with respective upstanding posts, and then sliding the other side panel into position by sliding the posts onto the upstanding edges of the end panels. The lid can then be slipped over the upper edges of the end and side panels to complete the assembly.

Although the present invention has been described in the context of containers which can be used for the transport of goods, it will be appreciated that the present invention is equally applicable to the formation of any structure formed of interconnected panels. For example, the invention could be used to provide self-assembly furniture or buildings such as sheds.

In the context of containers for goods, it is desirable sometimes to stack goods within a container to a depth such that the bottom most layer of goods may be damaged by the weight of upper layers. In such circumstances it would be useful to be able to provide intermediate "floors" within the container so as to reduce the load applied to lower layers of goods. This can be achieved in accordance with the present invention by forming shelves within containers using linkages to interconnect upper and lower side and end walls and at the same time to provide support for an internal shelf. For example, the end and side walls of the embodiment of Figure 11 could be split into two vertically spaced portions, the upper and lower portions of each end or sidewall being interconnected by a T-shaped component with three substantially identical sockets two of which are substantially co-planar and the third of which is perpendicular thereto, each of the sockets being shaped to receive the edge of an inserted panel in exactly the same manner as each of the two sockets shown in Figure 1 is adapted to receive the edge of a panel. What might be best termed a multi-storey container could thus be formed quickly and easily, intermediate "floors" being inserted as the container is filled. It will also be appreciated that it would be possible to form containers with individual side or end panels formed from two or more vertically spaced panels interconnected by a vertical linkage defining two aligned sockets each of which is adapted to receive the edge of one panel.

It will be appreciated that a container could be manufactured which in outward appearance would be identical to the container illustrated in Figure 11 but in which the positive engagement between the posts 86 of Figure 12 was not required, that is by replacing the slot and socket engagement between the posts 86 and the side and end wall panels with a simple socket arrangement in which there was no positive interengagement between the post and panels. Stability of the container would be ensured by the interengagement between the strips forming the edges of the base and lid of the container. If the posts 86 had simple open sockets rather than relying upon

projections engaging in slots in the side and end walled panels, the resultant structure would still provide resistance against displacement of the side and end walls because each of the posts would be engaged with two panels arranged perpendicular to each other. Such an arrangement might be particularly easy to use if for example each of the four side/end walls had stapled to it one of the four corner posts.

## CLAIMS

1. A panel assembly comprising at least two panels edges of which are interconnected by a linkage, wherein each panel has a straight edge and parallel faces extending away from the straight edge, and a slot extending along at least one face parallel to but spaced from the straight edge, the linkage defining a socket into which the straight edge of the said at least one panel is inserted, the socket defining at least one projection which engages in the slot of an inserted panel so as to resist withdrawal of the panel from the socket in a direction perpendicular to the straight edge.
2. A panel assembly according to claim 1, wherein the linkage is resiliently deformable and shaped to enable insertion of the straight edge of a panel into the socket by forcing the panel edge past the projection.
3. A panel assembly according to claim 2, wherein the projection is formed on an inside wall of the socket and extends from the inside wall in a direction into the socket, whereby the projection snaps into the slot of the inserted panel edge.
4. A panel assembly according to claim 1, 2 or 3, wherein each panel defines a slot extending along at least one face parallel to but spaced from the straight edge, and the linkage defines sockets into each of which a straight edge of a respective panel is inserted, each socket incorporating a said projection.
5. A panel assembly according to claim 4, comprising three or more rectangular panels each defining slots along opposed edges, the panels being interconnected edge to edge by linkages to define a continuous wall.
6. A panel assembly according to claim 5, comprising four panels, each linkage defining two sockets arranged at right angles to each other.

7. A panel assembly according to claim 5 or 6, comprising at least one end cover secured over an opening defined by edges of the panels which are perpendicular to the linkages.

8. A panel assembly according to claim 7, wherein the edges of the panels which are perpendicular to the linkages define slots extending parallel to those edges, the or each end cover has slotted straight edges, and the edges of the panels and the end cover are interconnected by further linkages which engage the slotted edges.

9. A panel assembly according to claim 7, wherein the at least one end cover comprises a panel supporting edge strips which define sockets adapted to receive edges of the panels defined in the continuous wall, the said edges defining slots extending parallel thereto which are engaged by at least one projection inside the strip sockets.

10. A panel assembly according to claim, wherein the base panel is secured to pallet runners extending beneath the panel, and the edge strips define legs secured between the cover panel and the runners.

11. A panel assembly according to claim 7, wherein the at least one end cover comprises a panel defining edges and a slot extending along at least one face of the panel parallel but spaced from the edges, and a strip extending around the edges of the panel and defining a socket in which the panel edges are received, the socket defining at least one projection which engages in the slot in the cover panel to resist withdrawal of the panel from the slot, and the strip defining a socket which may be slipped over the end of the continuous wall.

12. A panel assembly according to claim 11, wherein the strip defines a projection arranged to engage behind the continuous wall to resist inwards deflection of the panels making up the continuous wall.

13. A panel assembly substantially as hereinbefore described with reference to Figures 1 to 4, Figures 5 to 10 or Figures 11 and 12 of the accompanying drawings.



INVESTOR IN PEOPLE

Application No: GB 0008171.1  
Claims searched: 1 - 13

Examiner: Peter Macey  
Date of search: 23 June 2000

### Patents Act 1977 Search Report under Section 17

#### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.R): F2M (MC2, MD3), B8P (PJ)

Int CI (Ed.7): F16B 5/00

Other: Online: WPI, EPODOC, JAPIO

#### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2103752 A (HARTE) see especially figure 1a	1, 4
X	GB 1387502 (MEUBELFABRIEK) see all figures	1, 4 - 6
X	GB 1247987 (HOLZWERTE) see figures 1 and 3	1 - 9
X	GB 1219336 (NO-NAIL BOXES) see all figures	1 - 6
X	GB 1060527 (PIGET) see especially figures 1 and 2	1, 4
X	GB 756406 (LANGSCHMIDT) see figures 8 and 9	1, 4

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.