

(19) **DANMARK**

(10) **DK/EP 2900567 T3**



(12) Oversættelse af
europæisk patentskrift

Patent- og
Varemærkestyrelsen

-
- (51) Int.Cl.: **B 65 D 81/05 (2006.01)** **B 65 D 81/36 (2006.01)** **B 65 D 85/48 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2017-08-14**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2017-04-19**
- (86) Europæisk ansøgning nr.: **13765941.3**
- (86) Europæisk indleveringsdag: **2013-09-09**
- (87) Den europæiske ansøgnings publiceringsdag: **2015-08-05**
- (86) International ansøgning nr.: **EP2013002697**
- (87) Internationalt publikationsnr.: **WO2014048544**
- (30) Prioritet: **2012-09-30 DE 102012019169** **2012-11-20 DE 102012022585**
2012-12-29 DE 102012025523 **2013-01-29 DE 102013001625**
- (84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
- (73) Patenthaver: **Glass-wrap Holding Corporation, Heywood House, South Hill, AI-Anguilla, British West Indies, Anguilla**
- (72) Opfinder: **GILLER, Thomas, Kölner Str. 27, 57368 Lennestadt, Tyskland**
- (74) Fuldmægtig i Danmark: **Plougmann Vingtoft A/S, Rued Langgaards Vej 8, 2300 København S, Danmark**
- (54) Benævnelse: **EMBALLAGE TIL KANT-FØLSOMT TRANSPORTERET GODS**
- (56) Fremdragne publikationer:
EP-A1- 0 502 347
EP-A1- 0 530 611
EP-A1- 0 677 455
EP-A2- 0 216 690
WO-A1-2010/041023
WO-A2-2008/087370
DE-A1- 2 646 908
DE-A1- 3 344 120
DE-A1-102006 025 912
DE-U- 1 953 181
FR-A1- 2 769 601
US-A- 4 989 415
US-A- 5 909 808

The invention relates to packaging for edge-sensitive transported goods. This type of transported goods includes panes of glass, in particular flat plates of glass; natural stone slabs are even more damageable. Even bending-resistant and impact-resistant panes of glass made of laminated glass possess damageable areas. These areas are found on the
5 edges.

Flat glass is available in different forms, for example as single-pane safety glass, as laminated safety glass, as laminated glass, as laminated multi-pane glass, as fire-resistant glazing, as solar control glass, as thermally or chemically toughened glass, as float glass, as thermal insulation glass, as wired glass, as window glass, as cast glass, as sound-proof
10 glass, as horticultural glass. Most of the various types of glass have been standardised. For example in DIN 12150, DIN EN ISO 12543, DIN 1259, DIN 4102, DIN 1863, DIN 11525, DIN 11526, DIN 52290.

Window glass is nowadays mainly produced using a float glass process and then has a high surface quality.

15 The float glass process is a continuous production process. Purified/refined molten glass is fed to a bath of molten tin. The glass has a much lower specific gravity than the tin and therefore floats on top of the molten tin. This results in a very uniform glass with a high surface quality.

Laminated glass sheets typically comprise at least two transparent layers, of which at least
20 one is a glass sheet. Usually the other transparent sheet is also a glass sheet. Both layers are bonded together by an organic interlayer. The organic interlayer is usually a type of film. Such films and the bonding of the glass layers are for example described in DE 1292811. The films that are used are preferably highly tear-resistant, tough and elastic, thermoplastic films. Such films are made of, for example, ethylene vinyl acetate (EVA),
25 polyacrylate (PA), polymethyl methacrylate (PMMA), polyurethane (PUR), etc. PVB, TPU or similar materials may also be used.

Instead of a film, other adhesive layers such as casting resins or the like may also be used.

Laminated glass also includes glass sheets that are bonded with other materials, such as a transparent polycarbonate.

30 Glass, that has comparable properties to those of laminated glass, usually has a substantial thickness. To generate a stress-relieved state, such a glass is preferably also produced in a stress-free manner or is heat-treated after production. In its stress-relieved state, the glass is highly rigid and impact resistant in comparison to other conventionally produced glass.

Hereinafter, the mention of an edge-protection for laminated glass also includes one-piece glass with similar properties.

Laminated glass-sheets have found manifold applications. Their applications in construction and in automotive technology are particularly well known.

- 5 In automotive technology, the laminated glass-sheets are also known as safety glass.

In construction, laminated glass-sheets are particularly used for shop windows, large-surface area windows, glass doors, large-surface glass doors, shower enclosures, balustrades, transparent partition walls, overhead glazing, glass roofing and glass porches or the like.

- 10 Laminated glass can fulfil multiple tasks. Of these, the combination of rigidity and impact resistance is only one of the possible attributes. Other possible uses include fire protection or sound insulation.

In comparison to a single-sheet glass, laminated glass sheets are characterised by a very high rigidity and a high impact resistance. Rigidity and impact resistance are not defined as

- 15 absolute values, but rather as values that are sufficient for the possible application for which the laminated glass is used.

It is also used in considerable volumes for other types of glass such as toughened safety glass, insulating-glass and mirror-glass.

Despite its high strength, the edges of glass, including those of laminated glass, are

- 20 particularly sensitive.

Therefore it is common practice, not only with a simple type of glass but also with laminated glass and other types of glass, to protect glass sheets very well, for example for transport.

Particularly in construction, one cannot expect that glass be handled with extreme

- 25 caution. The rough conditions in the construction business are not amenable to such precautions. Up until now, substantial damage to glass is a regular phenomenon in construction. Ten percent damage to glass is quite common. Twenty percent damage is not regarded as exceptional in the construction industry.

Laminated glass sheets for motor vehicles are usually box- or crate-protected in multiples, i.e. placed in a protective box or crate. In this case, a soft, resilient bed is provided in the boxes. The boxes are designed to transport the laminated glass from the manufacturer to a vehicle manufacturer or to a vehicle repair shop.

- 30

The glass sheets designated for use in the construction industry often have much larger dimensions than the glass sheets used for motor vehicles. Therefore, it is common to transport glass sheets for constructional use to the construction site in an upright position in a so-called load carrier. A load-carrier is a frame in which the glass sheets are

5 transported in an upright position. There are vehicles with fixed load-carriers, as may be seen from DE 20204181. Glass is frequently unloaded from load carriers at the building site.

The load carrier has significant drawbacks:

A special vehicle designed as a load carrier is not suitable for transporting anything

10 else. The vehicle must wait at the building site until every glass pane has been installed or a secure intermediate storage location for the panes of glass must be set up.

The load carriers are resistant to bending and mountable on vehicles or are lockable racks, in which the glass is secured in an upright position. The transport costs for such rack systems are disproportionately high. In this regard, the fact that racks have not only to be

15 transported to the building site, but also have to be picked up again, must also be taken into account. Furthermore, it must also be taken into account that the truck used for the glass transport with the rack system and the glass is not usually filled to capacity. It is not uncommon to see cost estimates for glass in which the transport costs for the glass are at the same level as those for the glass itself.

20 A vehicle with an unloadable load carrier is, however, also suitable for other tasks.

However, the load carrier takes up a considerable amount of the loading space and greatly hinders the loading of any additional cargo.

The load carrier is unloaded at the building site. After the panes of glass have been installed the load carrier must be picked up again.

25 This results in high transport costs. In addition, significant further costs usually occur if the load carriers are not immediately made available. The release is generally delayed as soon as the glass insulation falls behind schedule. When this occurs, the glass is preferably stored in the load carriers until use, because any other storage would involve more risk of damage to the glass.

30 The same problem as described above for glass panes also arises for transported goods that are partly made of glass. This applies for example to photo-voltaic elements/solar cells.

A similar situation to glass panes also exists with natural stone slabs. For the same thickness, due to their inhomogeneity, natural stone slabs are even more damage-prone than glass panes. Thinner natural stone slabs already break under lower bending loads. Natural stone slabs are likewise transported upright in a load carrier to the
 5 customer. Natural stone slabs are also used extensively in construction as floor tiles and window sills.

The edge sensitivity is the most frequent cause of damage for many transported goods. This applies, for example, to other sheet-like transported goods.

The object of the invention is to provide packaging that simplifies the transport of edge-
 10 sensitive cargo and/or that reduces transportation costs, whilst at the same time preserving adequate transport protection.

According to the invention this is achieved with the features of the main claim. Preferred embodiments are the subject matter of the dependent claims.

In this regard a packaging essentially

- 15 a) has an edge protection enveloping the edges
- b) is made of a resilient material, in particular with a resilient plastic foam (resilient material), and
- c) made of a reinforcing material
- d) wherein the resilient material is at least partially disposed between the
 20 reinforcing material and the edge requiring protection.

DE 3344120 also shows an edge protection that, however, includes no packaging, only transport aids.

Any pressure that would cause damage if an edge-protection were not used (edge damaging pressure), is absorbed by the edge-protection. To the extent that part of this
 25 pressure propagates in the direction of the edge that needs protecting, the reinforcing material causes this pressure to be broadly distributed through the resilient material towards the edges. The pressure acting on the edge is thereby reduced to such an extent that the edge can easily withstand the pressure.

A permanent edge protection for glass sheets is already known from DE
 30 102006025912. The already known edge protection consists of plastic and a reinforcing profile. Because this edge protection is permanently provided, the glass sheet must be

inserted together with the edge protection into the associated frame. Consequently, the possible volume of the edge protection is very limited. This applies correspondingly to the efficacy of the edge protection.

WO 2008/87370 likewise also shows a permanent edge protection.

- 5 Such an edge protection makes the packaging necessary for the transport.

Another edge protection is known from DE 2646908. However, this concerns cylindrical or box-shaped packaged goods that are not comparable with sheet-like transported goods such as glass sheets.

- EP 502347 also describes a packaging for box-shaped packaged goods that are not
10 comparable with sheet-like transported goods such as glass sheets.

- As such, an edge-protection with plastic foam is known. The transported goods are usually completely covered with plastic foam and then encased in cardboard. In this regard the cardboard has a much lower resistance than the plastic foam. That is, in the overall packaging design the plastic foam is a stronger material/reinforcing material than the
15 cardboard and the cardboard is the more resilient material/resilient material.

- DE 1953181 also teaches an edge protection made of plastic for glass sheets which only partly encloses the glass sheets. In contrast to conventional packaging this packaging leaves the glass edges essentially unprotected. An additional packaging with a surrounding wooden case is also offered here. However, from experience, such wooden cases rupture
20 very easily.

The edge protection according to the invention is significantly better than the conventional edge protection.

- The resilient layer according to the invention, in comparison to the reinforcing layer, is at least 20% more resilient, preferably at least 40% more resilient, even more preferably at
25 least 60% and most preferably at least 80% more resilient than the reinforcing material. Resilience is understood to mean the degree of compression, as experienced by a cube of material with a 1 cm long edge, placed on a flat and level supporting surface, the compression being measured when an object weighing 1 kg is dropped from a height of 10 centimetres, with its impacting surface parallel to the impacted surface of the cube.

- 30 A multi-layer construction with at least two layers of reinforcing material is advantageous, wherein a layer of resilient material is provided not only between the reinforcing material

and the edge of the transported goods, but also between the two layers of reinforcing material. This positively affects the deformation behaviour of the edge-protection.

The resilient material protrudes laterally over the outer surfaces of the transported goods, even more preferably the edge-protection wraps around the edges of the transported
5 goods. Most preferably the reinforcing material also protrudes laterally over the exterior surface of the transported goods and/or the reinforcing material protrudes into the part of the resilient material covering the transported goods.

The reinforcing material may be made of a type of metal or of plastic. As metals, preferably aluminium and other metals with low specific gravity may be used.

10 Foamed plastics are preferably used as the resilient materials. Expanded polyethylene and polystyrene are already commonly used in the packaging industry. This is attributable to the low costs of such foams. Common packaging foams have a low density (weight per unit of volume). The same foams with a higher density can advantageously serve as a reinforcing material. The density is adjusted by adding a blowing agent. The higher the
15 addition of blowing agent, the lower the density and the greater the resilience of the foam. The lower the addition of blowing agent, the higher the density and the lower the resilience of the foam.

The reinforcing material can also be of an organic or inorganic nature.

The organic reinforcing material can be wood.

20 Wooden profiles, especially straight profiles, represent a cost-effective solution.

A simple profile with a rectangular cross-section can already fulfil the required reinforcement characteristics. Wooden rods, even roof battens, are a very cost-effective solution as straight reinforcing profiles. An exemplary inorganic reinforcement material can consist of glass fibres. The glass fibres in the form of a mesh fabric can enclose the resilient
25 material, thereby forming the above described reinforcement material.

Roof-battens are standardised according to DIN 4047-1. The standardisation essentially ensures specific dimensions of 30 by 50 mm or 40 by 60 mm. However, most of the commercially available roof battens do not adhere to this Standard. These roof-battens usually deviate by 1 or 2 mm or more from the Standard. The greater precision that is
30 provided by the DIN Standard is an advantage, because there will be much less play when the reinforcement profile is slid into the resilient material; or vice versa, the resilient material is slid over the reinforcement profile. The roof-battens are an extremely economical reinforcing material.

Drop tests with a float glass sheet, packaged using a roof-batten as reinforcing material encompassed by a resilient material comprising an extruded polystyrene foam, have been performed without causing damage to the glass sheet. The float glass was 6 mm thick and had a surface area of 1 square metre. The polystyrene foam was a conventional, closed-cell construction foam, used for exterior insulation of buildings, with a density of 30 kg/m³. Such foam comprises at least ninety-five percent closed-cells. The foam properties and the resiliency can be derived from the density. The thickness of the polystyrene foam was 100 mm. The reinforced polystyrene foam according to the invention was held in place on the edges of the sheet by strapping with a steel strap of 10 mm width and 0.5 mm thickness.

The drop height of 2.5 m was unrealistically high. Therefore the results of the tests were surprising. The tests had to be stopped after the sixth consecutive drop, because the strapping had come loose. No damage whatsoever to the glass had occurred until then.

Repeated tests with a 20 mm thick sandstone slab with the same type of edge protection and a plurality of straps were also successful for a reduced drop-height of 1 m.

The straps were advantageously on the long sides.

Packaging for glass sheets are indeed also known from EP 216690 and EP 530611. These packaging types, however, also requires a torsion-resistant base plate on which the glass sheets are clamped. It can be deduced from this that transported goods are also subjected to torsion when transported. Teaching, which advocates that glass sheets can also be moved without a torsion-resistant base plate, is not apparent.

Even better results can be achieved when hollow steel profiles or aluminium profiles are used instead of roof-battens. The advantage of aluminium profiles, in comparison to the steel profiles, is their lower weight. However, these metal profiles lead to significantly higher packaging costs, such that it is recommended to return the packaging to the supplier in order to reuse it. The packaging costs for an edge-protection made of particle foam and roof-battens are so low that disposing of the packaging can be considered instead of returning it.

With curved shapes and/or complicated cross-sections, it may be less expensive to produce the plastic reinforcing material from plastic, in particular from unfoamed plastic. To reduce costs, it is possible to add fillers to the plastic and/or to use recycled material. The filler may also be wood. For this purpose the wood is comminuted to a size that makes it suitable for use in the equipment provided to process the plastic. In the mixture with the plastic, the filler content is at least 50 wt %, even more preferably at least 60 wt % and

most preferably at least 70 wt %. A polyolefin, such as polyethylene or polystyrene, is preferably used as the plastic.

Extrusion lines, in which the plastic is blended with the filler and other additives, are particularly suitable for processing the plastic with fillers. The plastic is melted, such that
 5 the other components of the mixture can be easily blended into the plastic.

The mixture in the extruder is then cooled to the exit temperature and forced through a die, which brings the exiting material into its desired shape. The exiting material cools down and retains the acquired shape.

Alternatively, the melt can be injected into a mould. After the melt in the mould has cooled
 10 down, the melt retains the shape of the mould cavity. This is referred to as moulded components or manufacturing by injection moulding.

The resilient material preferably consists of foamed plastic, preferably a polyolefin foam such as polystyrene foam.

The foam can be a particle foam or an extruded foam.

15 Particle foam consists of a plurality of foam particles. The foam particles can be produced in an autoclave. Particles are produced by polymerising monomers and are then loaded with a propellant, such that after being heated in a container under pressure the particles start to foam when they are returned to atmospheric pressure.

The foamed (expanded) particles are filled into a mould cavity that has the intended shape
 20 of the resilient material destined for the edge-protection. The particles in the mould cavity are usually subjected to superheated steam, such that the outer surface of the particles melts and adheres or welds to adjacent particles. The adhering or welded particles then take the shape of the mould cavity. The mouldings can then be removed from the mould cavity.

25 The resilient material can also be produced as foam by extrusion.

Here, by heating plastic under considerable pressure, the plastic is brought into a molten liquid state and blended with additives and a propellant, and, as explained above, cooled to the exit temperature, after which it is pressed through a die. On exiting the extruder, the melt goes from a high-pressure zone into an ambient-pressure zone. The pressure drop
 30 causes the propellant to react. It expands and as the melt is cooled down, a multitude of cells are formed in the melt. The expansion is limited by a calibrator, which is shaped in the desired cross-sectional dimensions of the foam strand.

The melt comprising the propellant can also be injected into a mould that gives the desired shape to the plastic foam being formed.

Particle foam may also be used for the production of mouldings for the resilient material. Particle foam consists of foam particles. The particles are filled under a certain
5 pressure into a mould, which like the injection mould, has the desired shape of the plastic parts. In the mould, the particles are steamed with superheated steam, such that the outer surfaces of the particles melt and weld together under the prevailing pressure.

At the same density, extruded foam has better strength properties than particle foam.

Conventional extruded polystyrene foam has a closed-cell proportion of 95% or more, in
10 relation to the total number of cells.

For reasons of resilience, it may also be possible to use foam, which has an open-cell proportion of more than the 5% found in conventional construction-foam. The open-cell proportion is then preferably at least 10%, even more preferably at least 20% and most preferably at least 30%. That is, of the total number of cells in the foam, the percentage
15 indicates the proportion not of closed cells but of open cells; open cells are the cells through which entrapped gas is able to escape under stress/pressure.

A propellant gas is used to form the cells. The propellant expands in molten/softened polystyrene, when the ambient pressure is correspondingly reduced.

This takes place during extrusion when the melt, loaded with the propellant, exits the
20 extruder, in which the pressure is much higher than the ambient pressure.

During the production of particle foam this occurs when the unexpanded or only slightly pre-expanded polystyrene particles, loaded with propellant, are softened under pressure and temperature in an autoclave and are then quickly released from the autoclave.

The propellant dosage determines to what extent a common, substantially closed-cell
25 construction foam is produced, or whether an open-cell foam is produced. With today's conventional carbon dioxide-containing propellants, the proportion of propellant in the mixture for conventional construction foam is between 5 and 8 wt %. By gradually increasing the propellant content, the desired proportion of open-cells can be approached.

The propellant that is entrapped in the closed cells of the foam does not stay there. It
30 diffuses outwards through the cell walls and ambient air diffuses inwards through the closed cell walls. The diffusion processes take some time. Usually, the utilisation of such foam products is postponed until the diffusion processes are largely completed.

The open cells have holes in the cell wall through which the initially present propellant is very quickly replaced by ambient air. However, the air that is then entrapped is also pushed out of the cells by mechanical deformation of the foam when it is used as a resilient layer. This facilitates the deformation in comparison to a closed-cell foam. There, the air remains trapped and the cell walls must stretch in order to yield to the pressure.

The proportion of open-cells is preferably limited to a maximum of 50%, even more preferably to 60%. This means that there are still enough closed cells in the foam, such that when the foam is unburdened it quickly recovers its original shape.

The resilient material and the reinforcing material may also be arranged in a plurality of layers (layer by layer) on top of one another. The resilient material and/or the reinforcing material can vary from layer to layer, or remain the same.

A variation of the resilient material may be required if a layer of resilient material is also designed to function as a damping layer. A damping layer differs from the usual plastic foam, in that when deformed it does not rebound/recover promptly when relieved, but rebounds/recovers with a considerable delay after having been compressed and relieved. This damping characteristic prevents both the packaging and the packaged product to start vibrating for example, after a fall. The vibration can lead to bouncing, such that sensitive float glass is not only impacted by the fall, but also by subsequently bouncing and hitting the ground again.

An open-cell foam layer for example, as described above, has these desired damping characteristics.

Optionally the reinforcing material can encompass the resilient material, or vice versa. Alternatively, the reinforcing material may also protrude into the resilient material, or vice versa.

If the packaging is produced in sections it may be advantageous in the case of two or more adjacent sections for one section to engage into the other. This can be used to connect the packaging sections together lengthwise. It can also be used to connect adjacent packaging units together.

The connection can be permanent or detachable.

The connection can be made using spigots or pins. The spigots or pins may be formed on a packaging section and engage into corresponding openings of the adjacent packaging section that is to be joined. Separate spigots or pins can also be used, which engage into opposite openings of two adjacent packaging sections. A plurality of pins also prevents the

packaging sections from rotating against each other. Eccentric spigots or pins may also prevent rotation of the packaging sections against each other. Moreover, spigots, whose cross-section (for example, a square cross-section) differs from a circular cross-section, also prevent the rotation of the packaging sections. By creating a rotation-proof connection, the characteristics of the interconnected packaging sections resemble the characteristics of a one-piece packaging section with the same length as the interconnected packaging sections.

This can also be achieved if the spigots and pins are tightly held in the corresponding packaging sections. This can be achieved by using bulged spigots or pins, resulting in a press-fit in the corresponding packaging sections. Optionally, the bulged spigots or pins can also engage in the undercuts of the recesses in the corresponding packaging sections.

As described above, it is advantageous when the edge of the cargo that needs to be protected is first enclosed by resilient material and is then combined with reinforcing material, placed at a distance from the edge that needs to be protected. The reinforcing material and the resilient material can also, however, simultaneously wrap around each other, or interlock with one another.

The cross-section of the resilient material is preferably designed as a symmetric profile body that receives at least one reinforcing profile in an opening. Optionally, two reinforcing profiles are provided in two openings of the edge-protection which are located at a distance from one another.

Advantageously, the packaging sections made of resilient material can be inserted (threaded) onto the profile body formed by the reinforcing material and thereby connect with one another.

Alternatively, the packaging sections may also be already arranged behind one another and then a profile body formed by the reinforcing material can be pushed through the associated opening in the packaging sections.

Plastic foam may also be used for the reinforcing profiles. The required strength for the reinforcing profile made of plastic foam is obtained by using foam-plastic that has a suitable higher density, and/or by creating a skin on the external surfaces of the profiles. A skin is created when the outer surfaces are heated to such an extent that the foam in this area collapses. To realise this, rapid heating is advantageous. It is advantageous for this technique when the plastic foam has a very low thermal conductivity. After cooling, the skin causes the outer surface to become considerably stiffer. Cooling can be accelerated by the use of auxiliary means.

Optionally and instead of creating an outer skin, the foam plastic reinforcing profile can also be stiffened by a coating.

Unexpanded films or textiles are suitable as a coating. Films and textiles which are likewise made of plastic are advantageously laminated onto the reinforcing profiles. According to the
5 invention, both welding and gluing may be used for the lamination.

However, metallic films can also be laminated onto foam-plastic profiles. An adhesive may be used to bond the metal with the plastic foam. Details of lamination technology may be found by referring to the following publications:

DE602004013008, DE202010008929, DE202010008532, DE20200900339,
10 DE20200900692, DE202008017621, DE2020080016r847, DE202008013755,
DE202008012066, DE202008004965, DE20200701806r4, DE202006017392,
DE1020111199668, DE102011100025, DE102010053740, DE 102020050874,
DE102010030310, DE102009046413, DE1020090141574.

The tough outer layer also enables a plastic foam with the same resilience as the resilient
15 material to become a reinforcing material.

The plastic foam, provided as the resilient material, is for example a polystyrene foam with a density of 25 to 40 kg per cubic metre. The polystyrene foam can be commonly used foam, with a closed-cell proportion of at least 95%, based upon the number of cells. To achieve a higher damping ratio, the foam can have more than 10%, preferably at least
20 20%, even more preferably at least 30% of open cells, based on the number of cells.

The packaging preferably encloses the protected edge of the cargo in a U-shape, such that the edge-protection according to the invention is not only able to absorb forces that occur in the plane of the sheet-like transport goods (for example glass), but also absorbs forces exerted transversely thereto.

25 In order to withstand the forces that occur transversely to the plane of the sheet-like transported goods, the reinforcing material may have the same or a similar shape as the packaging. The invention has recognised that adequate protection will already be achieved when the reinforcing material protrudes transversely to the plane of the sheet-like transported goods against the transported goods and moreover has a frictional connection
30 through the resilient material with the transported goods. In this sense, the above described wooden profiles that have a rectangular cross-section (roof battens with a cross-section of 30 x 50 mm or 40 x 60 mm) may be sufficient for the edge-protection according to the invention. At the same time, the desired frictional connection between the resilient material/foam and the reinforcing material/wood is preferably achieved by embedding the

wood profiles or the reinforcing material into the resilient material. The resilient material can thereby form the part that encloses the edge that the packaging needs to protect.

The reinforcing material may be fixedly connected to the resilient material. As in the case of the abovementioned wooden profile, a reinforcement can be made from separate profiles
 5 made of organic or inorganic material or of plastic or metal loosely seated inside the packaging.

Instead of the described reinforcing profiles, or in addition to the described reinforcing profiles, it also lies within the scope of the invention to use a different kind of reinforcement of the resilient material.

10 The alternative reinforcement is preferably realised through the already described process of creating an outer skin and/or by lamination using films and/or textiles.

The scope of the invention also foresees that a reinforcement is also realised by enveloping the resilient material with films or textiles.

Optionally, the resilient material and/or the reinforcing material can be composed of
 15 different parts.

For the reinforcing material, various exemplary materials have already been described. However, the resilient material may also be composed of separate parts.

The multiple part embodiment may be used regardless of the type of material. The multipart embodiment can be used to combine different kind of materials, or in order to
 20 gain economies of scale.

With mass production, economies of scale are achieved when the edge protection is manufactured in one piece.

With smaller volumes, economies of scale are realised when, for example, profiles of different widths/thicknesses/heights are connected together to manufacture the edge
 25 protection. Preferably, as much as possible the same profiles are used in combination with adapter pieces that compensate for the differences in width/thickness/height.

Advantageously, the system can be applied to different cross-sections, for example round cross-sections and angular cross-sections, rectangular cross-sections, square cross-sections, other triangular, quadratic and polygonal cross-sections.

30 Optionally, the system is also applicable to individual profile cross-sections. Each profile cross-section can be composed of a plurality of profiles. In this case, the profiles, whose

ends form a cross-section, can be referred to as side-profiles, and the profiles that form the adapter pieces between the side-profiles are referred to as centre-profiles.

The profiles may be identical or they may differ from one another.

Identical or different side-profiles (profiles on the packaging that form at least one outer side) and identical or different centre-profiles may be used in the framework. The centre-profiles may also be identical and be supplemented with different side-profiles to create a complete profile.

The same applies to inner-profiles, outer-profiles and other centre-profiles.

Optionally, the various profiles are connected together in a permanent or detachable manner. Welding or gluing is preferably used to create the permanent connection. The detachable connection is preferably created by pushing the profiles into one another.

In the application of this teaching to foam profiles, this means that: The foamed starting profiles can be connected by welding or gluing to form an overall profile that forms the edge protection. When welding, the welding surfaces must be melted. When melting the foam surfaces, it has to be taken into account that, depending on the duration of the process, a certain number of cells will collapse at the welded surface and therefore a reduction in thickness is to be expected. The reduction in thickness is compensated by the use of thicker starting profiles, such that the resulting overall profiles possess the desired dimensions. The correct initial dimension can be determined with a few tests.

The required heating of the welding-surfaces can be achieved through contact with heated welding tools, but can also be achieved using heat radiation or hot gas. When using hot gas for welding, even complicated welding surfaces can be easily reached.

For gluing the starting profiles, various adhesives may be used. With adhesives, including hot melt adhesives, melting of the adhesive surfaces/connecting surfaces on the starting profiles is prevented as long as the application temperature of the adhesive remains below the melting temperature of the resilient material.

Particularly strong adhesive-strengths may be achieved with reactive-adhesives. However, reactive-adhesives are often more expensive than other adhesives.

Hot melt adhesives are inexpensive and have proven themselves time and again.

In addition, gluing has the advantage that different materials that are difficult or impossible to weld, can still be joined together. This is the case for example for joining plastic to metal.

This affords additional design freedom.

Another example concerns the adaptation of the edge-protection to accommodate different thicknesses of the sheet-like transported goods (for example glass). Optionally, a recess in the edge-protection is provided to match the largest thickness of the transported goods to be protected, such that the recess can receive the edge of the transported goods to be protected. Optionally, an insert in the recess for the edge that needs to be protected (for example, the glass edge) is provided for thinner goods. The insert fills out the recess to such an extent that the edge-protection may be placed tightly over the edge of the sheet-like goods, or vice versa, the sheet-like goods can be inserted tightly into the recess of the edge-protection.

Optionally, in the edge protection the recess that receives the edge also has a stepped design. The opening in the edge-protection then tapers by at least one step, such that the recess at its widest can accommodate, for example, glass-sheets with a thickness of 8 mm, and in the lower part of the taper can accommodate a glass-sheet with a thickness of 6 mm.

The reinforcing material may also be made of plastic foam. In this case this preferably concerns a foam with a higher density than the foam used for the resilient material, preferably a density of at least 20% more, even more preferably a density of at least 40 % more.

Optionally, the reinforcing material can also be produced by creating an outer skin on the surface of the foamed resilient material as described above. The foam used as the resilient material is melted along at least one side, such that the foam collapses. The resulting skin is essentially unfoamed and lends the required strength to the edge protection.

When using extruded foam-plastic profiles for the edge protection according to the invention, it is possible to use an extrusion die with a downstream calibrator, wherein the calibrator reproduces the shape of the desired profile in a way that part of the outer surfaces of the resilient material that form the profile strand, may remain untreated. In the finished packaging used for sheet-like cargo, these should at least comprise the lateral surfaces and the outer surface. On these untreated surfaces, this resulting so-called extrusion skin may already be sufficient as a reinforcement of the resilient material. The propellant-laden melt, exiting the extrusion die of the extruder, foams to form the plastic foam part. The volume increase resulting from the foaming process is thereby limited to the point where the melt contacts the temperature-controlled surfaces of the downstream calibrator at which point an extrusion skin is formed. The foaming process stops there, even though the foaming process inside the exited melt strand can still continue for a little

while, thereby influencing the distribution of the cells and their sizes and shapes. Depending on the temperature control (meaning the temperature control inside the calibrator), this creates an extrusion skin with a much greater density than the inside of the finished profile strand and/or results in an unexpanded skin layer.

- 5 For details of possible extrusion skins, reference is made to the following publications:

DE19849149, DE19726959, DE19726415, DE19539511, DEDE10315090, DE10251505, DE10245470, DE10151334, DE10124061, DE10106341, DE10003808, DE2032243.

- The type and thickness of the extrusion skin can be adjusted with just a few experiments to match the desired reinforcement of the resilient layer. During the manufacturing of the
 10 foamed plastic, it is not necessary to take into consideration that the side of the foamed plastic profile constituting the resilient layer, has better resilience and must therefore be free from an extrusion skin. The extrusion skin can be easily removed afterwards. This is common for plastic foamed products. The extrusion skin is generally milled and the resulting waste recycled. The invention optionally utilises the usually removed material
 15 layer resulting from the extrusion as the reinforcement.

- As long as the quantities necessary for extrusion of the profiles according to the invention are not achieved, it may be appropriate to produce the profiles from commercially available products, such as extruded skinless foamed sheets. In that case, a desired reinforcement can be realised by applying a skin to the desired surfaces. To achieve this,
 20 the surfaces that need to be reinforced are melted by appropriate heating. This produces a reinforcing skin on the required surfaces. Heating can be made with hot air or hot gas. The surfaces to be skinned may also be heated by contact with a heated object. Suitable objects for the heat transfer include heated rollers, for example.

- To the extent that the resulting foamed plastic strand, comprising grooves as described
 25 hereunder, is covered by an extruded or subsequently applied skin, the skin may be milled in the same way as in the space provided for holding the cargo. Instead of milling, other mechanical shaping processes such as sawing may also be considered. As an alternative to machining, a groove can be formed by the calibrator, such that the extrusion skin can remain there and contribute to the reinforcement. However, for manufacturing reasons this
 30 requires a considerable rounding of the cross-section corners of the groove. This rounding however, can be advantageously exploited because it increases the tear-resistance of the groove in the foam-plastic strand.

If sharp corners are desired nevertheless, the corners can optionally be machined. If machined shaping is limited to the corners, the extrusion skin in between the corners can remain, thereby positively contributing to the reinforcement.

Instead of or in addition to the extruded foam-plastic strands as described above, the
5 foam-plastic strands/profiles can also be made of particle foam.

Particle foam results when foam particles with a conventional particle size of 0.5 to 12 mm, preferably 2 to 5 mm, combine inside a moulding machine. The foam particles are usually produced in large-scale autoclaves by polymerising plastic monomers in suspension under pressure and heat. This causes the particles to agglomerate. At the same time or
10 later, the particles are loaded with propellant, such that the particles, upon exiting the autoclave, foam into foam-plastic particles. These particles are available in large quantities. One of the major suppliers, BASF, offers the foam particles in various grades and dimensions, inter alia under the well-known brand Styropor.

In one variation, the finished particles bond together in high-volume moulding machines to
15 form blocks. This is done through steaming with superheated steam. The superheated steam melts the surface of the foam particles. Under pressure the foam particles weld into blocks. If the pressure and/or temperature is too low for the welding process, the foam particles will generally still stick to one another. Customarily the resulting blocks are cut into sheets, which are used for insulation purposes in construction. Generally, the blocks
20 are cut into sheets using saws.

As long as the quantities are such that special production is required, the desired foam-plastic strands/profiles can be cut from commercially available particle foam panels. For larger quantities, the purchase of moulds, with a mould cavity reflecting the desired shape of the profiles, is justified. As an option, in such moulds an outer skin can also be created
25 by heating the desired surface areas of the mould walls. The heating preferably takes place after applying superheated steam onto the particles, in order to weld them together.

Other than that, the subsequent creation of an outer skin can be realised in the same way as with the profiles made of extruded material. That is, an outer skin can be created in the same way as described above by melting the desired surface areas.

30 Preferably the extruded foamed plastic sheets as well as the particle foam sheets, still more preferably the plastic foam blocks, are separated by cutting with a hot wire. The hot wire is preferably electrically heated to such an extent that the plastic foam melts on contacting it. This can be used to cut plastic foam. Details of this technology may be found by referring to the following publications:

DE102004050867, DE19803915, DE19607897, DE19607896, DE9110930, DE6903524, DE2741725, DE1162064.

The cutting technique may also be used for the above cutting up of blocks into boards and/or for the cutting up of boards into strands. However, the cutting technique in
5 comparison to cutting with a saw is relatively slow.

According to the invention this cutting technique is used to create a skin, in that the heating of the hot wire is increased and/or a thicker hot wire is used. The higher heating and the thickness of the hot wire melts much more material than in a conventional hot wire cut, such that with a few experiments a skin can be produced which corresponds to
10 the strength described below or the strength of the reference film.

Foamed plastic strands of particle foam, which are intended to serve as the inventive resilient material, may also be produced directly in moulding machines, even with a skin. Relatively simple moulds suffice for the plastic foam strands. This means that mouldings created in a moulding machine immediately exhibit the shape of foamed plastic
15 strands that result from cutting the above described blocks.

The moulding machine has a mould cavity that differs from that of the moulding machines for the above described blocks made of particle foam. The cavity is significantly smaller and matched to the volume of the desired foamed plastic strands.

To produce the skin on the surface of the moulding the walls of the mould are equipped
20 with a temperature control at the place where skin is required. For controlling the temperature the walls belonging to the moulding machine are designed for example with twin-walled chambers, through which the temperature control fluid flows, such that the walls can be heated or cooled as needed in order to heat up the foam particles to such an extent at the desired place that the surface of the moulding melts and forms a skin inside
25 the mould. In order to accelerate the cooling of the moulding down to the ejection temperature it is advisable, once the skin has formed, to cool the moulding machine walls. For this, cooling fluid can be directed into the walls of the moulding machine.

For further details of skin formation for particle foam mouldings in moulding machines, reference is made to the following publications:

30 DE10247190, DE10247190, DE10226202, DE3022017.

In all the above described processes a skin is preferably formed that produces at least the same reinforcement as that provided by an unfoamed film of 0.3 mm thickness (reference film thickness) made of the same plastic as the resilient material. Even more preferably a

reference film thickness of at least 0.6 mm and most preferably at least 0.9 mm is provided.

By a combination with another foam layer the reinforcing skin resulting from the skin process can be arranged to be on the inner side of the edge protection. The desired jointing
5 can once again be produced by welding or gluing.

For the stability of the edge protection it may be beneficial to form a skin on at least two opposite surfaces of the foam layer. The greater the distance between the two opposite reinforcing skins the better the bending resistance.

The additional foam layer provided to the inner facing skin layer/skin may, however, lay
10 loosely on the skin. For example, this may be the case if the above described insert (for receiving different edges to be protected) is used at the same time as such a foam layer. It is then beneficial if the insert is enclosed in a U-shape by the foam layer.

Optionally, the plastic foam may also be given the desired strength by means of a laminated film or fabric. The preceding proposals for the skin formation also apply to the
15 lamination of the film or fabric. This means that a film coating or fabric coating, preferably on two opposite surfaces, is beneficial. In this regard, an inner layer of a film or fabric can also be produced with the help of an additional foam layer. The inner layer results when a film or fabric is enclosed between two foam layers.

The films may include unfoamed films and foamed films. The foamed films, even with
20 characteristics that are otherwise similar to the foamed plastic profiles, may exhibit a higher strength if they have a higher density.

The fabrics that may be used include non-wovens, cloth, knitted fabrics, netting and interlaced yarns. Preferred fabrics for use exhibit a low elongation in at least one direction, preferably in two directions. Mesh fabrics with threads that run crosswise to one another
25 and as straight as possible in the fabric are particularly advantageous. Further advantages result when the mesh fabric is fixed to the packaging, such that the threads run in the major directions of stress. The major directions of stress for sheet-like packaged goods that are enclosed by a frame-like packaging are considered to be parts of the packaging running along an edge. Consequently, the mesh fabrics are fixed on the packaging or
30 wrapped round the packaging, such that the one threads in the fabric run parallel to the longitudinal direction of one of the edges and the other threads run parallel to the adjacent perpendicular edge. Each bump against the packaging creates a deformation in the packaging. Here, the mesh fabric absorbs a significant part of the impact and distributes it over the length of the threads onto a large area of the packaging, such that the impact

energy is distributed over a large area and an aggregated load on the edge to be protected is prevented.

- Even if the distribution of the impact energy on the packaging with laminated fabrics with unevenly running threads is better than for packaging without laminated fabrics, the
- 5 distribution of the impact energy with the straight threads of the mesh fabric is still significantly better than for fabrics with unevenly running threads.

The edge protection according to the invention is placed as a frame round the sheet-like cargo, for example the glass sheet.

- In this regard the peripheral edge protection may be composed of sections. Single profiles,
- 10 cut to size as required from a starting profile, may be used as the edge protection for straight edges. The requirement depends on the lengths of the straight edges on the cargo, for example a glass. If required, the edge protection sections for the straight edges may also be combined with edge protection sections for curved edges. For a small number of curved edge protection sections they can be produced in a special production run; for
- 15 greater numbers it pays off to produce the edge protection according to the invention straight away with the appropriate curvature.

The length of the sections of the edge protection depends on

- a) whether the sections on the corners of the edge protection for a cargo, for example for a glass sheet, directly butt against one another and which straddle the edge to
- 20 be protected from corner to corner as a single profile, wherein a further differentiation is whether the sections of the edge protection abut flush against one another at the corners, or the sections on the corners are sections that are mitre-cut at the joint

or

- 25 b) the sections on the corners of the edge protection for a cargo butt against a corner piece and which as a single profile straddle the edge to be protected between the corners over the total length between corner piece to corner piece

or

- c) whether the sections according to a) and b) are subdivided into additional
- 30 sections. This can be referred to as a modular concept, in which the modules may be combined together in any way and optionally with adapter pieces.

The length of the sections has a significant influence on the nature and scope of the production. The more single productions are required, the more expensive the production. According to the invention a differentiation is made between the corners and the area between the corners.

- 5 In the case of a modular composition of the packaging according to the preceding variant c) the aim is to compose the packaging between two corners/corner pieces from as many identical sections as possible.

Identical and different corner pieces may be used.

- 10 The corner pieces may enclose a right angle or another angle. The corner pieces may also possess different arm lengths. The corner pieces may also form the connection for differently shaped packaging pieces, for example for curved and for straight packaging pieces/sections.

- 15 A single package for a rectangular sheet shape requires two identical broadsides and the two long sides of equal length may be composed from broadsides and a supplementary adapter piece. The length of the adapter piece is then the difference in length between the broadside and the long side. These adapter pieces are different adapter pieces than the abovementioned adapter pieces and referred to as the central profiles of a packaging profile cross section.

- 20 For a single package the difference between the preceding modular composition and a special production of integrally-formed packaging parts for the long sides may appear to be small. However, for a plurality of packaging that differ in their broadsides and long sides the advantages become apparent; the advantages are greater, the greater the number of the packaging that differ in their broadsides and long sides. Moreover, the size of the advantage associated with the use of identical sections depends on the nature of the
25 production of the sections and on the design of the sections.

The system according to the invention can also be applied to packaging with different sides.

- 30 According to the invention the long sides as well as the broadsides on a packaging with flush abutting sections are composed of sections that for a plurality of packaging (except for an extreme case), whose broadside lengths and long side lengths differ, at least one identical section module can be employed on each packaging side. Depending on the broadside length and long side length, a plurality of section modules may also be used for each side. Insofar as a piece remains open on one side, and an additional identical section module is too long, then an adapter piece is used instead of an additional section

module. When very small adapter pieces are required, it may be advisable to use an adapter piece that has the length of a section module plus the length of the otherwise required very small adapter piece. These very small adapter pieces preferably have a length that is smaller than 0.5 times the thickness (average thickness in the case of
 5 different thicknesses) of the section module, even more preferably a length that is smaller than 0.25 times the (average) thickness of the section module.

The abovementioned extreme case for the number of the section modules and adapter pieces then arises if the section module has the same length as the broadside of a packaging.

- 10 In the case where corner-forming sections are used that should be mitre-cut at their point of abutment, the above considerations apply to the modules and the adapter pieces in regard to the length between the corner-forming sections on each side of the packaging. It is also possible to utilise corner-forming sections also as adapter pieces. Because of the particular situation for an impact loading on one corner, preferably additional adapter
 15 pieces are provided, such that the corner-forming adapter pieces can remain intact.

The same applies if particular corner pieces are provided on the corners and the sections lay flush against the corner pieces.

For longer broadsides of a packaging a plurality of section modules may be used for each broadside. Then, except for the adapter piece, the various sections are all the same length.

- 20 For the larger long sides that for rectangular sheet shapes are always longer than the broadsides, the embodiments for the number of section modules for larger broadsides apply *a fortiori*.

- The reinforcing profiles/reinforcing material preferably act as the guide and supports for the various section modules and adapter pieces on one side of the packaging. The
 25 reinforcing profiles formed from the reinforcing material then extend from one corner of the sheet-shaped cargo (for example the glass sheet) to the other corner of the sheet-shaped cargo; optionally, individual reinforcing profiles may also extend further. This applies preferably for the reinforcing profile on the lower end of the packaging. The various sections can be advantageously pushed onto the reinforcing profile and are thereby
 30 subjected to the desired guidance and support.

For small series this has exceptional economic advantages because waste/scrap can thus be reduced. The sections provided for the resilient material are advantageously cut to size from a commercially available starting material.

The starting material may be commercially extruded foamed plastic plaques or foamed plastic plaques made of particle foam or extruded foam, which are cut up into bars. The required sections or section modules can be cut to size from the material bars. In most cases there remain left-overs that, however, according to the invention do not have to be
 5 disposed of, rather they can be used with other left-overs and/or other sections as the resilient material, without causing significant functional impairments. These left-overs are then pushed with other left-overs and/or other sections onto the profiles that form the reinforcing material. Alternatively, the profiles may be pushed into the sections.

The mentioned left-overs may also concern usable parts from a returned
 10 packaging. Depending on the design and value of a packaging it may concern a disposable packaging or a reusable packaging. However, with reusable packaging there may be some abrasion or damage. The abraded and damaged parts of the packaging are then preferably sorted out and the remaining parts are preferably treated in the above sense as left-overs.

The same applies when delivery problems occur. Then, missing parts for new packaging can
 15 be replaced by recovered packaging parts.

Insofar as the cargo always has the same dimensions, a recovered undamaged packaging can be readily re-shipped with a new cargo. However, the invention has recognised that a major part of transported goods, such as flat glass, has to be transported with customised dimensions. When such packaging is recovered there is no easy possibility to reuse it.

20 The inventive packaging made of packaging sections offers an advantageous solution for reuse, in that this packaging enables the returned packaging to be disassembled. The accumulated sections and corner pieces can then be assembled to form new packaging for a differently shaped cargo or be assembled, together with fresh sections, into a new packaging for a differently shaped cargo.

25 A problem-free disposal is important for disposable packaging. The disposal depends greatly on the plastic used. For example, polyethylene (PE) can be incinerated without problem. The same applies to polystyrene (PS). Polyurethane (PU) and polyvinyl chloride (PVC) on the other hand require a costly specific incineration or a costly cleaning of the flue gases or an expensive disposal as hazardous waste. At the same time because of costs
 30 only economically attractive commodity plastics come into consideration.

This situation is not the same for reusable packaging. In this case one may also consider the use of a better plastic, such as for example polypropylene (PP) that has superior characteristics in comparison to polyethylene and polystyrene. Commodity plastics such as PU and PVC can also be considered because their cost can be distributed over a plurality of

packaging procedures. However, the use of more expensive plastics for a reusable covering of the cargo demands that after transportation the covering can be dismantled in a reusable manner from the cargo.

The dismantling of the plastic foam from the cargo can be facilitated by an intermediate
5 release agent, for example a layer of silicone paper.

Let us return to disposable packaging with a covering of the cargo with a PE and PS particle foam. Coming back to disposable packaging with a wrapping of the cargo made from PE and PS particle foam: Not only are both inexpensive, but they can also be processed at low temperatures as particle foam and extruded foam and appear to be
10 compatible with cargo such as glass sheets. However, when manufacturing the packaging using particle foam, the steam-management requires special attention. Heated steam is used to bond the particles together in a mould. In common moulds, the heated steam is fed in from one side and sucked out on the other side. If the constructional design of the mould and/or inserts in the mould interferes with the steam-flow through the mould, the
15 weld between the particles may be impaired.

By choice sufficient steaming is nevertheless essentially ensured: steam enters through the wall of the mould into the mould itself. To make sure that the steam is not obstructed by the cargo in such a way that a disturbance in the steam management occurs, the wall can be steamed in sections, whereby next to each surface-section where heated steam is
20 fed in, there is a surface-section where the heated steam is sucked out. The sucked out steam has transferred its heat to the particle foam. The steam is applied in bursts over a predetermined time period. The steam fed to the wall-section is halted and instead this wall section is now used to suck out the steam. At the same time within the adjacent wall-section the sucking out of the steam stops and steam starts to be fed in. For this
25 procedure, every surface-section is preferably equipped both with steam nozzles and suction openings. Conduits, that are preferably insulated, lead to the steam nozzles, and differ from those leading to the suction openings. This prevents the steam nozzles and their supply conduits from cooling down too much after the steam burst, which could result in too low a steam-temperature for the next steam-burst. If required, the alternating
30 steam-bursts and suction-operations on the adjacent surface sections are repeated several times in order to ensure the required bonding of the particles in the mould. The duration of the steam-bursts, the steam temperature, the steam pressure, the suction-strength, the size of the surface sections of the mould, the number of surface sections, the size and the density of the particles and the number of steam-bursts are optimised through a number
35 of trials. To control the dosage of the steam-bursts and suction-operations, adjustable/controllable operation valves are provided in the supply and suction conduits of the different surface sections of the mould.

Advantageously, the sectional use of the mouldwalls for the supply of heated steam and/or for the withdrawal of heated steam makes it possible to directly foam the particle foam around the cargo. For this, the cargo is placed into the mould and the remaining cavity filled with foam particles, which are subsequently bonded together by applying heated
 5 steam. As cargo, the glass has such a high heat-resistance that the heated steam will not damage the glass.

The above coating/wrapping of objects with particle foam can also be used on other objects, independently of the packaging concerned.

According to the concept as described above, the cargo can be fully or partially wrapped in
 10 a resilient material.

After the cargo has been encased with foam-plastic, the foam-plastic layer can be reinforced in the manner described above

- a) By creating a skin
- b) By laminating additional layers that cover the full-surface or partial-surface
- 15 c) By partially or fully tensioning the surface of the welded or glued films or fabrics with the foam-plastic
- c) By wrapping the full- or partial surface loosely with fabric or film, and tensioning them with strapping, a tensioning-band or a lashing-strap

For details on creating a skin, reference is made to the above embodiments. The same
 20 applies to full-surface or partial-surface laminated layers.

It is also explained how welded or glued film or textiles and their tension reinforce the foam-plastic layer, in particular when it concerns holding the sections of the packaging together.

According to the invention, the wrapping of packaging with cargo in a loose film or loose
 25 fabric is achieved by connecting the overlapping film-ends or fabric-ends.

The overlapping film ends are preferably welded or glued. Depending on the nature of the fabric used, the overlapping fabric ends can also be welded. In practice, fabrics made of glass fibres are not welded. In practice, fabrics made of organic fibres are not welded either. However, it is possible to glue different sorts of fabrics. If the mesh openings of the
 30 fabric are too large to glue together, it is possible to use close-knit connection pieces.

When of the right nature, the fabrics can be sewn together directly. Instead of sewing, a connection can be made through needling, knitting, stitching, braiding and other known processing techniques for fabrics. If the ends of the fabric are not suitable to be connected directly, connection pieces are again helpful. These may be fabrics with a small mesh size,
 5 which can be used as a connecting piece between the two fabric ends of the non-suitable fabric.

According to the invention, by strapping or enclosing with a tensioning band or tensioning strap and use of the optionally provided wrapping with shrink-film or other film or textiles, the edge-protection, composed of sections and left-overs, in terms of the resilient
 10 material, will function as an edge protection extending in one piece from one corner of the packaging to the other. The connection of an edge-protection section made according to the invention to protect the required or desired edge, can be realised at the ends where the one edge protection section meets the other edge protection section.

The connection may be realised on the reinforcing profiles.

- 15 The reinforcing profiles can be connected together with conventional screws and nails. The reinforcing profiles can also interlock at the corners of the edge that needs to be protected, so that the use of screws and nails or the like to make the connection becomes completely or partially redundant. The ends of one reinforcing profile can interlock through spigots or hooks with openings or eyelets at the ends of the adjacent reinforcing profile.
- 20 Advantageously, the eyelets and openings are located on the vertical reinforcing profiles whilst the spigots and hooks are located on the horizontal reinforcing profiles. Hooks may feature on both the vertical and the horizontal reinforcing profiles and interact with openings or eyelets in the adjacent reinforcing profile, without the risk of unintended loosening of the connection.
- 25 With adequate strapping, any additional connection of the edge-protection at the ends of the reinforcing profiles can become redundant. The same applies if the packaging is held together with a tensioning-band or a tensioning-strap. The same also applies when a film or a textile with the same functionality is provided as a wrapping around the packaging. Then, the individual sections of the edge-protection may loosely abut each other at the
 30 corners of the edges requiring protection. The ends of one section can bluntly abut the ends of the other section. The ends can also be mitre-cut and loosely abut each other. Strapping or enclosing with a tensioning-band or tensioning-strap then forms an adequate connection for the entire edge-protection. A blunt joint is usually the easiest and most economical joint. A mitred joint may cause significant left-over material, which cannot be
 35 used afterwards.

- When using the above described particularly economical wooden profiles as a reinforcing material, a method can also be used for small series and without the support of auxiliary devices which affords a reliable determination of the length of the reinforcing profiles and the resilient material threaded onto or otherwise attached to them. Starting at the corner
- 5 of the edge requiring protection, the end of an edge-protection section is placed bluntly against the adjacent end of the adjoining edge-protection section. With two mutually perpendicular edge-protection sections this is preferably done in such a way that the edge-protection section, whose other side abuts the other edge-protection section, is flush with its front surface against the outside of the abutting edge-protection section.
- 10 Then, this flush fitted edge protection section, which corresponds with an adjacent corner of the cargo at its other end, is cut to such a length, that this end bluntly abuts the protruding end of the next edge protection section. This blunt joining of the ends is repeated as done before. This continues until the cargo (for example the glass-sheet), is enclosed with an edge-protection frame along the edges that need to be protected. The
- 15 same method can be used when, instead of the wooden profiles, other materials are used as the reinforcing material. These other materials, as described elsewhere, can for example be metal, plastic, other organic material or inorganic material. Metal is preferably used for sheets of stone and similar packaged goods/cargo with a high weight and relatively low strength.
- 20 The connection of the edge-protection sections at the corners of the packaged goods/cargo (for example glasssheets) may be enhanced by special corners/corner pieces that also cover the reinforcing profiles.

- One part of the corners/corner pieces covers a length of one of the edges requiring protection, (for example the edge of the glass) whilst the other part covers a length of the
- 25 other adjacent edge that requires protection.

- The corners/corner pieces can be of the same nature as the other resilient material of the edge-protection sections. The corners/corner pieces can also be of a higher strength, in order to fulfil additional requirements for the connection of the edge-protection sections at the corners of the edges that require protection. Additional strain arises from strapping, or
- 30 from a tensioning-band or by a tensioning-strap. The strapping, tensioning-band or the tensioning-strap must be pulled around the corners causing some deformation. This causes an additional strain on the corners/corner pieces. It can damage or deform the edges in a way that the resilient behaviour is no longer guaranteed to be the same as it is in other places of the edge-protection. To prevent this, an edge-protection can optionally be
- 35 provided made of foam-plastic with a higher density, and/or skin formation, and/or laminated films, and/or laminated fabrics. Optionally, a fixed corner-protection at the

corners/corner pieces, made of resilient material, can be used. The corner-protection can be made of metal or plastic. The corner-protection can be glued or laminated on. The corner-protection can also rest loosely on the corners/corner pieces and be held in its protective position by the strapping, the tensioning-band, the tensioning-strap or by the
 5 film or textile wrapping. The corner-protection also has advantages when the edge-protection according to the invention is used without the abovementioned special corners/corner pieces.

For sheet-shaped cargo such as glass, the corners/corner pieces have two connection-surfaces for edge-protection sections or for reinforcing profiles.

10 Advantageously, the edge-protection according to the invention is also applicable to cargo/packaging goods that, unlike glass sheets, have a larger three-dimensional expanse. In that case more connection-surfaces for edge-protection sections, for example three, will be provided for edge-protection sections or for reinforcing profiles. In the situation of two
 15 connection-surfaces, the edge-protection sections and the corner/corner piece lie in a plane. In the situation of three connection-surfaces, the third connection-surface is connected in such a way that the associated edge-protection section stands perpendicular to the plane of the other two edge-protection sections. For sheet-shaped rectangular cargo, four corners/corner pieces are used.

The corners/corner pieces are preferably at least partly provided with through openings for
 20 the reinforcement profiles that act as the reinforcing material. The through openings have the advantage that they are easily fabricated. In addition, adapting the roof battens (and other similar reinforcement profiles) to their required or desired length becomes easier when the roof battens are abutted bluntly at the one end as described above, whereas the other end which protrudes through the corner/corner piece can be cut off for example by
 25 using a saw.

Blind holes can also be provided in the corners/corner pieces for the reinforcing profiles. When used in conjunction with corners/corner pieces with blind holes, it is possible to specify the length of the reinforcing profile in advance.

When implemented as above, the reinforcing profiles can be connected together at their
 30 ends, but may also loosely abut one another. If they loosely abut one another, the edge-protection sections are preferably held in their functional position by strapping, or by a tensioning-strap or a tensioning-band. For edge-protection sections, whose reinforcing profiles are held together with screws, nails, hooks, spigots, eyelets or notches, strapping or a tensioning-strap or tensioning-band can be of additional use.

The same applies to packaging with corners/corner pieces, provided with three connection-surfaces as described above:

the ends of the reinforcing profiles can be loosely placed in the corners/ corner pieces and be kept together by strapping, or a tensioning-strap or tensioning-band. The reinforcing
 5 profiles can also be connected together in the corners/corner pieces, or be connected to the corners/corner pieces themselves. Even then, the additional strapping, the additional tensioning-band or the additional tensioning-strap can still be beneficial.

Surprisingly, tests have shown that with average loads, loosely abutting edge-protection sections that are held together by a strapping, tensioning-band or tensioning-strap already
 10 guarantee an adequate connection between the edge-protection section and the cargo.

Preferably, a strapping, tensioning-band or tensioning-strap tightens all the edge-protection sections against the cargo-edges that need to be protected.

Optionally, a plurality of straps, tensioning-bands or tensioning-straps are provided. For sheet-shaped cargo, the strappings, tensioning-bands and tensioning-straps are arranged
 15 side-by-side/parallel to each other. The multiple arrangement is preferably used with very wide edge-protection applications. Moreover, for large packaged goods and correspondingly large packaging, centrally arranged additional strapping, tensioning-bands or tensioning-straps may be useful for the reinforcement. This is particularly true when the frame-shaped packaging is reinforced in the middle. The additional strappings, tensioning-
 20 bands and tensioning-straps are then used on the reinforcements and run diagonally to the other strappings, tensioning-bands or tensioning-straps.

For strappings, tensioning-bands and tensioning-straps it is advantageous if a recess is provided in the packaging, on the side facing away from the edge requiring protection (for example the edge of the glass), preferably in the resilient material. The recess provides a
 25 guidance/centring for strapping with the provided tensioning-band or tensioning-strap. If for other reasons recesses in the outside edges of the edge-protection are required, these recesses are preferably combined with the recesses for the bands and straps.

For the strapping technique, the person skilled in the art can rely on commercially available technology. This includes strapping material, tensioning devices, means for
 30 connecting the ends of the strapping material, shears for cutting the protruding ends of strapping material and for cutting the strapping material from a supply roll. The range is diverse. The range comprises complex automated systems for installation in streets for continuous production, as well as simple and inexpensive small handheld devices for incidental strapping procedures.

The strapping material is usually a band that is tensioned after being looped around a packaged product. In this respect the band used for the strapping procedure can also be referred to as a tensioning-band; in other words, there is common ground with other tensioning-bands. In contrast to a strapping, tensioning-bands can be tensioned or
 5 loosened and tensioned again. For that, tensioning devices/turnbuckles are provided as part of the tensioning-bands. Tensioning-bands are therefore reusable.

Tensioning-straps differ from the tensioning-bands by using straps instead of bands. That is, tensioning-straps have a permanent tensioning-device and can be tensioned and or loosened and tensioned again. They are reusable.

- 10 A strapping can only be destroyed and replaced by a new strapping. Compared with a tensioning-band or tensioning-strap, a strapping used as one-way packaging is generally much lower in cost than the use of a tensioning-band or a tensioning-strap. However, there are grey areas where the costs of a tensioning-bands somewhat approach the low costs of a strapping. This concerns tensioning-bands made of metal, which are tensioned
 15 by a so-called easy-lock. The easy-lock comprises a flattened bow and a rotational slotted bulge. The easy-lock is placed in such a way that the bow slips under the overlapping band-ends with the slotted bulge placed over the end of the band in which the end of the upper tape is inserted, so that rotation of the bulge causes tensioning of the strap. Because of the workload involved, this type of tensioning-band is suitable for small series.
 20 To re-tension the metal band, it must first be bent back. The same applies for reusing this type of tensioning-band.

- With tensioning-straps, commercially available products provide similar economical solutions. There are simple tensioning devices with two movable parts, where one part is held in the other. Bands and straps made of plastic are regularly used in this situation.
 25 Such straps and bands are available in the market at low cost.

Typically, one end of the band is firmly connected to the tensioning-device. The other strap-end is pulled through the opening gap of the tensioning-device.

- The movable part of the tensioning-device does not create any obstacles for the tensioning-movement. However, when the strap-end is released, the strap-end tensions in
 30 the opening of the tensioning-device. It is problematic to apply a high tensioning force on the strap by hand. Besides that, the tensioning effect depends on the friction and friction conditions can change significantly under external influences. Elaborate tensioning devices are required to realise a higher tensioning force and a constant or substantially constant tension not susceptible to external influences.

An alternative is a tensioning device that is made from a solid piece of material with a plurality of successive openings. One strap-end is fastened to the material-part. The other strap-end is moved back and forth through the openings of the material-part. After tensioning, the inserted strap-end remains in the material-part due to its friction or
 5 because of resistance in the material-part, preventing loosening.

Optionally, parts of the tensioning device are connected to a section of the packaging, preferably to a corner piece. Optionally the turnbuckle is attached to a section or to a corner piece. This simplifies the tensioning process as one hand remains free, which is otherwise needed to hold the turnbuckle in position whilst tensioning. With sophisticated
 10 turnbuckles, the permanent attachment of the turnbuckle to a section of the package is a complex measure. This is different for the simplest turnbuckles, such as with the previously explained material-part with multiple openings through which the tensioning-strap or the tensioning-band is moved back and forth. Such materials can for example be manufactured from low-cost sheet metal, which can be shaped as required by deep
 15 drawing and punching and provided with recesses. With large series, the use of materials such as plastic, preferably unexpanded plastic, is even cheaper, such that the use of injection moulds required for the production becomes economically viable.

Connecting turnbuckles to a section/corner piece can be realised by gluing. Suitable adhesives are those that are well known in construction, for example, polyurethane
 20 adhesives.

The above embodiments for strapping, tensioning-bands and tensioning-straps apply to packaging sections that bluntly abut each other at the corners, as well as to packaging sections abutting against a corner piece, and they apply to packaging sections that abut at the corners with a mitred-cut.

25 If the ends of the edge-protection sections are mitre-cut, the mitred angle is preferably 45 degrees for perpendicularly standing edge-protection sections. For edge-protection sections whose edges are otherwise positioned to one another, the mitred angle is preferably equal to half the angle of that which the otherwise positioned ends of the edge-protection sections enclose between them.

30 As described above, the forces that act on the edge-protection during strapping are greatest at the corners of the edge-protection and hence additional corner reinforcement may optionally be required. Independently of the corner load, there may be other grounds for the corner reinforcement: For example an additional function such as a transport-aid.

The transport-aids can complement particularly advantageously the edge-protection according to the invention. They improve handling and thereby reduce the risk of damage to the packaging and the packaged goods/transported goods. However, the transportaids, independently of the edge-protection according to the invention, are also advantageous for
 5 other types of packaging.

The transportaid can be a handle, sling, eyelet, hook. The eyelets can serve different purposes. Eyelets are suitable for attaching tensioning means for securing the load during transport. The eyelets are also suitable for attaching handles. Advantageously, the eyelets can even form, together with a simple accessory, a handle. This can be realised with two
 10 eyelets spaced apart and a rod, for example a wooden rod. The eyelets spaced apart can be connected to one another by the rod, such that the packaging, with the enclosed cargo, can be lifted with the rod.

It is advantageous if the eyelets have an opening wide enough to allow the rod to be inserted through the two eyelets. Together with the eyelets, the rod then forms a handle.

15 A roller is also a suitable transportaid. The same applies for stacker bases, containers, fasteners or connectors for a secure transport. The containers are of considerable advantage for various applications of the packaging. This is particularly the case if fasteners/assembly aids/assembly instructions/accompanying documents are to be transported with for example one sheet or more sheets of glass. This applies particularly
 20 when glass parts for showers or building-kits for showers are transported. For the various applications, different sized containers can be made available.

Containers that can be connected together with other containers are known from EP 677455. A connection of containers with a packaging, in particular with a packaging for sheet-shaped cargo, can be discerned.

25 The transportaids can also be made of plastic foam. The transportaids can also be made of other materials, even of a composite of plastic foam with other materials. Containers are preferably selected that are made of unfoamed/slightly foamed plastic, insofar as damping against an impact-like stress is not required. It is advantageous to manufacture such containers from the same plastic as the foamed plastic used for the packaging and to
 30 connect them with foamed plastic components, with which the container engages into the grooves in the packaging. In that case, the foamed plastic components match the cross-sectional shape of the grooves. The foamed plastic can be properly connected to the containers by gluing. Hot melt adhesives, *inter alia*, are a well-known, suitable glue for this type of adhesion.

The connection can also be welded, provided the container itself and the parts that engage in the grooves are sufficiently compatible for the welding process.

The multi-part design of the container is advantageous for small series, because common parts can then be kept for all sizes. Such common moulded parts will at least comprise
5 those parts that are used to engage the container into the grooves of the packaging. Moreover, it may be advantageous to develop containers with different volumes. This is realised by using tubular containers, which are sealed at both ends by lids and which are selected by choosing the right length to achieve the desired volume. The tubular
10 containers preferably have a rectangular or square cross-section in order to facilitate the connection with the moulded parts, with which the containers engage into the grooves of the packaging.

The transportaids do not have to be directly attached to the packaging, instead it is sufficient if the packaging has a connection for a transport-aid or allows the transport-aids to be assembled. Attaching a transport-aid to the resilient material, and/or to the
15 reinforcing material, and/or to the strapping, the tensioning-band, or tensioning-strap thus becomes possible. The transport-aids can be mounted permanently or detachably. Such a connection can be formed for example by an exterior and/or interior connection surface and one or more openings for securing bolts or retainer bolts. It is advantageous if the transport-aid is slipped over the connection and subsequently secured with a bolt. The
20 various transport-aids may also be integrated in a packaging section. This is the case for stacker bases and rollers.

Advantageously, the hooks may be designed as a fork, making it possible to grab the packaging on both sides of the strapping, tensioning-band or tensioning-strap.

Grooves are preferably provided in the packaging, in particular in the resilient material,
25 into which the transport-aids can be inserted or pressed with a suitable tongue. A dovetail shape, or a shape derived therefrom, is advantageous for the tongue and groove connection. Such connections are particularly stable, however with limited clearance they can be difficult to handle. Easier to handle are tongue and groove connections, in which the tongue has a rounded shape, such that the tongue can be pushed into the groove,
30 transversely to the longitudinal direction, and can be pulled out again in the opposite direction. In this case, the groove encloses the tongue; the opening width of the groove must be smaller than the diameter of the tongue, for it to enclose the tongue. The smaller the opening width becomes, the more effort is required to press the tongue transversely to the longitudinal direction into the groove. A few trials will be sufficient to determine a
35 balanced dimension of the opening width of the groove, which allows the tongue to be

pressed into the groove by hand with reasonable effort, whilst at the same time providing sufficient grip in the groove.

The grooves can be machined into the foamed plastic. Suitable methods are, for example, milling and/or sawing.

- 5 However, the grooves may also be pre-formed in the foamed plastic. This is then realised during production of the foamed plastic. It is done for example by means of a suitably shaped extrusion die and an appropriately shaped calibrator. In this regard, preferably rounded corners (both inside corners as well as outside corners) are created in the groove, and matching corresponding round corners are realised in the transport-aids that grip into
10 the grooves.

The grooves can also be created when shaping the packaging sections in a moulding machine or in an injection mould.

- Moreover, non-machined shaping and machined shaping can be combined, in a way whereby the grooves partially originate from non-machined shaping and obtain their final
15 shape by milling or sawing.

The grooves according to the invention preferably run on the sides (front and back) of the packaging sections and on the outer surfaces (including top and bottom) of the packaging sections round the packaging. In this way, the transport-aids can be inserted into the grooves as desired/required.

- 20 The rollers are inserted on the bottom, the handles on the side of the packaging at a comfortable height for the transport personnel.

Stacker bases or other bases are also inserted on the bottom.

- Hooks and spigots can be inserted into the sides; hooks and eyelets not only into the sides, but also into the top. The same applies to connections for securing the load. The
25 eyelets, hooks and spigots may also be used for securing the load/transport. Usually, further load/transport securing is created using tensioning-straps, which can be attached to the eyelets, hooks or spigots.

- The containers are used for the transport of cargo accessories. Installation of glass sheets for example, generally requires special angles, rails, seals, screws, dowels, etc. These
30 accessories must at least be supplied when the goods are delivered to the end-user or to the craftsmen appointed by the end-user. The containers may be positioned anywhere on the packaging.

The connectors are used for example to connect a plurality of packages together. A connection is preferably made between all the packaging parts, on which opposite grooves are found.

The various packagings may be arranged in such a way that at least one connection is created between the lower packaging-sections, as well as one between each section perpendicular to the lower sections.

When strapping, a band is placed around the edge-protected goods, for example the glass sheet. The band is then tensioned with a tensioning device. The tension presses the edge-protection sections against the edges that need to be protected. After tensioning, the band is secured in the tensioned position. This can be done by means of clamps, bushings, seals or by welding.

In the tensioning procedure, the band is pulled from a roll. After securing, the band used for the strapping is separated from the rest of the band that remains on the roll.

The band can be made of plastic or steel. Plastic bands made from various materials such as polyester, PP, PET are known, which can be used for strapping. In each case the band must be able to withstand the tensional forces. Fabric bands made of plastic, such as threadlike structured bands, woven bands and composite bands are the most suitable for this.

In most cases, the strapping tool has grooved tensioners that are used to grip the band ends and pull them against each other until a desired tension is achieved. To maintain the band tension for the duration of the transport, only those plastics may be used that exhibit a negligible creep effect per se and/or exhibit only a negligible creep effect because they have been treated, for example pre-stretched. Steel bands exhibit no significant creep effect per se. The creep effect describes a deformation of the plastic under high continuous load.

Brackets, clips and seals press the band ends permanently against each other. This might already be sufficient to lock the band-ends. Moreover, it is well known, for example, how to give steel bands additional grip by making an incision before and after the clamps, brackets, and seals and to bend them outwards at these positions. Alternatively, corrugated brackets and clips can be placed at the ends of the band, wherein the corrugations run transversely to the longitudinal direction of the band. The corrugation increases the grip of the brackets and clamps pressed around the ends of the band.

Welding is a jointing technique that is preferably used when plastic bands are used.

Optionally, the transport-aids, even in the situation where rollers are used, are formed of at least two parts, wherein the strapping band holds one part and the connection as described above is formed by the other part of the transport-aid. In this case, the part that forms the connection can be a sleeve or a seal or be connected to a sleeve or a seal, which is attached to the strapping band. To position the sleeve or seal, the sleeve or seal is advantageously slit laterally and can be pushed onto the strapping band sideways after it is positioned and before it is tensioned. The sleeve or seal is preferably pressed onto the strapping band, causing it to stay fixed on the strapping band. In addition, it is advantageous if the slit of the sleeve or seal is provided with a funnel-shaped guide, and if the sleeve, after being slid on, directly engages behind the strapping band. The funnel-shape facilitates the sliding on. The retro-engagement prevents the sleeve from falling off. Moreover, when the sleeve clamps the strapping band, the sleeve will stay in its selected position and cannot slip off.

Optionally the sleeves or seals provided for the transport aids can also be mounted in suitable positions on the strapping band during its production. This obviates the need to bring along tools for a later attachment of sleeves and seals.

The adhesion of the sleeves and seals to the strapping band depends on the compacting pressure and the friction values of the contact-surfaces. Roughened contact-surfaces are therefore advantageous. Optionally, claws on the sleeves and seals can also be provided.

Handles and flaps that are provided on the lateral edge protection at a distance from its upper end may also be advantageous.

Optionally, a handle or eyelet can also be clamped on the strapping band, the clamping strength of which constantly increases with an increasing weight of the transported goods to be protected, such as a glass sheet and its packaging. This type of clamping is created for example by handles/eyelets, which simultaneously form a lever arm of a double-armed lever, wherein the other lever arm presses against the strapping band. Due to the described mechanics, these levers are self-clamping. These mechanics can also be used when the handles and eyelets, as described above, are pushed into a groove. The friction between the tongue and groove, both made of plastic and/or of foamed plastic, is so great that the tongue jams into the groove.

In another variant the connectors or sleeves are glued or welded or connected to the strapping band in the same manner as with the connection of the band ends to the strapping band.

Even without the above described sleeves and connections, the handles/eyelets can form a transport-aid if they enclose the strapping band at the desired location, for example with two fingers/jaws, such that an upward pivotal movement of the handle/sleeve leads to a twisting of the strapping band and to a clamping of the handle/eyelet on the strapping
5 band.

If additional reinforcing corners are provided for the packaging which are to be placed over the corners of the packaging, it can be advantageous to design these additional reinforcing corners in the same way as the sleeves or seals as described above, and to position them on the strapping band.

10 Corners for the protection of transported goods are known from EP 2769601.

The edge-protection according to the invention may also be designed in such a way that a plurality of sheet-like transported goods (for example glass sheets) can be simultaneously transported next to one another.

For this purpose, the edge-protection can optionally be provided with a plurality of
15 recesses that run parallel to one another, as is described for example in DE 1953181.

The individual packagings are preferably connectable to other packagings, thereby enabling a space-saving transport. The connection, as described above, can be realised for example with tongue and grooves. In this regard, recesses having a dovetail shaped cross section are advantageous. Recesses are preferably provided in each packaging, such that
20 the connection can be made with appropriate tongues, which engage with one side into one recess and with the other side into the other recess.

Advantageously, the recesses can also be used for other tasks, for example to connect with other profiles to thicken the resilient material.

Advantageously, the edge-protection according to the invention solely forms the packaging
25 for glass and other packaged goods.

In the abovementioned rough construction environment, it may also be necessary to supplement the edge-protection by protecting the space enclosed by the edge protection of the packaged goods. This is the case for example for goods with a sensitive surface.

In order to prevent scratching of the outer surfaces of the transported goods, for example
30 glass, the space that is enclosed by the proposed edge-protection, might for instance be wholly or partially filled with carton or cardboard. In particular, corrugated cardboard in substantial thicknesses is widely available on the market, such that the space can easily be

filled with single-layer or multi-layer corrugated cardboard. If the space is large or the carton/cardboard insert is even intended to protrude over the edge-protection, the use of a honeycomb insert made of cardboard or cardboard/corrugated board is preferable.

- In comparison to other carton/cardboard constructions, the honeycomb carton/cardboard construction has a very favourable overall protective effect. The various protective features include a good scratch protection.

Cardboard/corrugated cardboard is a very economical protection for the glass and similar transport goods.

- If the carton/cardboard cannot meet the requirements of the transported goods, a resilient layer, made of foamed plastic, can be used between the carton/cardboard and the goods. In this regard, the foamed plastic may have the same characteristics as the foamed plastic provided for the edge-protection. The cardboard, either by itself or in combination with another protection material, can fill the space of the glass sheet enclosed by the edge-protection according to the invention. Other protection materials also include air cushions. Air cushions can also be used alone and/or with cardboard, or in combination with other protection materials, to fill the space of the packaged goods enclosed by the edge-protection according to the invention.

Optionally, the space filled with cardboard or other materials is covered with protective plates on both sides of the packaged goods.

- The protective plates can overlap the packaging, or fit into the space enclosed by the packaging. The protective plates create stiffening, which can replace the reinforcing bars suggested elsewhere, or can be used in addition to the reinforcing bars.

- The protective plates can be fixed in any manner. A detachable type of fastening that does not hinder the reuse of the packaging is preferred. Optionally, the protective plates can be attached to the packaging with claws or hooks. These claws or hooks can grip into the grooves of the packaging, in the same way as the transport-aids explained earlier. If all sections of the packaging are provided with such grooves, then the claws or hooks may clasp the protective plate on all four sides, thereby ensuring that under usual transport loading, the protective plates do not detach from the packaging.

- To attach the protection plates, the claws or hooks are pushed into the grooves and at the same time slid over the protective plates. To detach the protection plates the claws or hooks are pulled out of the grooves.

Optionally, the entire cargo is wrapped in foam-plastic during the transport.

For small series, the wrapping is assembled using different parts in order to avoid the cost of moulds, which would allow wrapping in a single step.

Once large series are foreseeable, "wrapping in one step" can be considered. To start with, wrapping in particle foam is preferred. In order to wrap in particle foam, a large-size mould must be obtained. This mould is also referred to as a tool. The goods are placed in the open mould, which is then closed and the mould cavity is filled with particles ensuring that the cargo is surrounded by particles on all sides. Subsequently, heated steam is injected into the mould, such that the foamed particles' outer surface softens and becomes doughy and weld together. After sufficient cooling, the mould is opened and the enveloped transport goods are removed.

Preferably, the foamed plastic is then strengthened near the edges of the goods, for example the glass, in the manner as described above.

The transport goods, together with the packaging, are preferably wrapped with shrink film. Shrink films are films that shrink considerably when heated. Shrink films are usually composed of a blend of polyethylene and polypropylene. The films are often wrapped around the packaged product. The films can also be produced as sacks or tubes and slipped over the packaged product. The heat required to shrink the film can come from hot air or hot gas. Series products are preferably guided through a tunnel oven, in which they are heated.

The shrink film is preferably cut away from the abovementioned transport-aids or their connections in order to expose them. This may be done as the film is being wrapped. Cut-outs for the transport-aids may also be provided in the film tubes and film bags for the transport-aids and/or their connections.

It is also possible to make cut-outs in the film at the time when the connections for the transport-aids have to be accessed.

The transported goods, packaged according to the invention, for example glass destined for building sites, have to be moved at the building site. It is important, here, to distinguish between smaller sheets of a correspondingly lower weight which can be offloaded and moved around by hand at the site by one or more builders, and larger sheets with a correspondingly greater weight which need to be moved mechanically.

In either case, the handling of the sheets can be facilitated by the transport-aids, such as handles and/or loops and/or eyelets and/or hooks and/or fasteners and/or feet on the edge protection. The transport-aids can be permanently attached to the edge-protection or for the duration of the transport. If the transport-aids are permanently attached, an

appropriate attachment method to the edge-protection can be used. Detachable attachments are provided for a temporary attachment.

Here, it is advantageous when the edge-protection with the transport-aids is subjected as far as possible only to pulling forces and as little as possible to bending forces.

- 5 This is achieved when the transport-aids are attached to the lateral edge-protection.

Furthermore, it is advantageous to equip the bottom edge-protection with stacker bases. Stacker bases on pallets are known. Pallets have wooden stacker bases in the form of beams on the underside. The stacker bases guide a forklift that places its forks under the pallet to lift it up, transport it to another location and then put the pallet back down again.

- 10 The same applies to pallet jacks, which are equipped with the same fork as a forklift, and which are designed to move pallets. However, pallet jacks are used only for short transport distances and are not suitable for stacking. The pallet jack only lifts up in order to provide the necessary ground-clearance to move the packaged goods.

- Pallet jacks are usually moved by hand. Insofar as forklifts are mentioned below, the term
15 includes pallet jacks.

The stacker bases ensure that the forklift/pallet jack centrally grips the goods and prevent the pallet from slipping sideways when moved by the forklift. This may be important when the forklift/pallet jack is turning corners.

- Compared to normal pallets, the stacker bases may optionally be smaller. However, this is
20 possible only to the extent that the forks of the forklift/pallet jack still fit between the stacker bases. The stacker bases have a thickness that ensures that the forklift can drive its forks under the edge-protection, allowing it to lift the goods together with the packaging. The stacker bases can also be considered as transport-aids. The stacker bases can also be attached to the fastening strap using sleeves and seals, as provided for the
25 previously described transport-aids.

Optionally, the stacker bases are integrated into the protective packaging, still more preferably integrated into a packaging section.

- Other transport-aids are handles, loops, hooks, spigots, rings, rollers, fasteners,
30 containers, and connections for safe transport.

Handles and loops make it easier to move the packaged cargo by hand, for example to lift the cargo or to push/pull the cargo by using the rollers. The hooks, spigots and eyelets simplify the attachment to the packaging of lifting means and means for securing during transport (i.e. chains, ropes, bands). Fasteners should enable/facilitate connecting

5 different packages to one another. Containers facilitate the carrying of cargo-accessories and of accompanying documents. The transport-aids can be attached to different places of the packaging in a fixed or detachable manner. For a permanent arrangement, individual packaging sections can be combined to form the required transport-aids, or be

10 permanently connected to the transport-aids. Packaging sections at the bottom may have protrusions that serve as feet or stacker bases. Handles, hooks, spigots, eyelets, fasteners and connectors for a transport-lock may be moulded or welded or taped to the packaging. Loops and containers may be welded or taped to the packaging as well. Rollers are held in a roller casing. The casing may be formed by a packaging-section, or it might be welded or glued to the packaging. In one possible embodiment, the transport-aids are mounted in a

15 detachable manner in order to reduce the number of transport-aids required or desired for packaging.

For this purpose, the transport-aids can be fastened to connections that are provided on the packaging. The connections might be formed for example, by means of protrusions and/or recesses in the packaging. The transport-aids engage with the projection and/or

20 hook into the recesses.

Grooves are preferably provided in the packaging, and the transport-aids engage with so-called tongues into the grooves. There are no special requirements for the grooves, if they are on opposite sides from one another. Small recesses already suffice as grooves and small bumps as tongues. In principle, the recesses (grooves) may also be provided in the

25 transport-aids and the bumps (tongues) may be provided on the packaging. The effort required for this is however higher than the other way around. Moreover, the packaging may be damaged more easily at the bumps than in the recesses.

More needs to be considered for the grooves and tongues if each of the transport-aids is

30 intended to engage into only one groove. The transport-aids should then be secured against falling out, against tilting and against unforeseen slipping in the grooves. This can be essentially achieved by means of the cross-sectional shape of the groove and tongue. A cross-sectional shape like a dovetail fitting is advantageous. Such cross-sectional shapes are characterised by undercuts in the grooves and on the tongues, such that the tongues

35 can engage with the protruding cross-sectional parts into the undercuts in the grooves. The use of such grooves and tongues prevents any falling out as well as tilting.

The stability of the tongues and grooves depends on the foamed plastic. If required, the stability can be modified by reinforcing the grooves/tongues and/or the surrounding area. The choice of a different plastic for the packaging in order to increase the reinforcement is only possible within the limits of the defined resilience for the packaging. However, simple measures such as the rounding of corners/edges on the tongues and in the grooves already afford a substantial reinforcement. Moreover, a reinforcement may be obtained by the above described skin and coating process. A material for the transport-aids which can withstand all types of stress can, of course, be selected. Transport-aids with low weight, for example when made out of aluminium, are advantageous.

Clamping prevents the transport-aids from slipping in the grooves.

Clamping devices may be provided for this. Simple clamping devices are for example wedges. More elaborate clamping devices may also be used. The transport-aids themselves can also be designed as clamping devices.

The frictional behaviour in the groove and on the tongue, the amount of play between tongue and groove, and the lever ratios, resulting from the forces exerted by the transport-aids and their distance from the tongue and groove connection to the packaging, greatly influence the clamping.

Transport-aids that can self-lock in the grooves or on the tongues are economically advantageous.

Depending on the circumstances, the transport-aids are self-locking in the groove or on the tongues. This is for example the case when cut surfaces of foamed plastic slide against each other in the tongue and groove connection.

Such transport-aids are wedged when a load is applied that is not centred exactly at the central axis of the grooves. This can be achieved easily by choosing an appropriate distance within which loads are directed into the transport-aids.

Wedges may also be used to clamp transport-aids.

The transport-aids as described above are advantageous. At construction sites, a crane or a forklift is frequently available. The crane can be the construction crane or a crane that is transported with the truck itself. These devices can facilitate the unloading of the cargo. Sometimes the crane can also provide the transport onto the respective construction floor.

In general however, on the construction floor, the cargo must then be moved further by hand. Often too, the packaged goods must be off-loaded by hand and then carried to the relevant floor. On a construction site, transporting by hand is linked to the risk of damage. With current transports, cargo corners are bumped and the cargo is placed on the floor too hard too often. On the other hand, with the packaging according to the invention, transport is no longer associated with the risk of damage to any great extent. This becomes evident in the drop tests as described above. When cargo survives such drop tests without damage, cargo in the packaging according to the invention will also survive the usual bumping and can be placed hard on the floor without damage. In one possible embodiment, glass can be extra protected as a cargo when it is lightly honed at the edges.

Minimal honing, sufficient to cover the size and deepness of the micro-cracks, is enough.

Although this improved transport safety furthers the transport, it can also increase the negligence during transport. In order to counteract this, the cargo can be equipped with a shock detector that responds when the impact force exceeds a certain level. A commercially available detector uses a liquid-filled glass tube. A color-coded impact causes the liquid to spill over the detector and colours it.

Various embodiments of the invention are described in the drawings.

Figs 1 and 2 show a composite glass sheet 1 that is surrounded on the edges by four edge protection profiles 2, 3, 4, 5.

In the embodiment all profiles 2, 3, 4, 5 are made of XPS foam (extruded polystyrene foam, in other embodiments another foam) with a density of 25 kg/cubic meter. All the profiles 2, 3, 4, 5 have the same cross section.

Moreover, the profiles 2 and 4 are of the same length. The same applies to profiles 3 and 5. The cross section of the profiles 2, 3, 4, 5 is apparent from Figs 1 and 3.

The profiles 2, 3, 4, 5 are mitre cut at the ends.

The profile cross section is illustrated in Fig. 3. The profile cross section is basically rectangular with dimensions of 130 mm x 200 mm. On one short side a recess 6 with a width of 23 mm and a depth of 50 mm is provided to receive the composite glass sheet 1. On the opposite short side there is a recess 7 with a width of 60 mm and a depth of 5 mm provided for a strapping band.

Inside the profile there are two recesses 8 and 9 with cross sections of 25 mm x 50 mm which are designed to receive wooden slats 10.

In the embodiment the XPS foam of the profile constitutes a resilient material. The wooden slats constitute a reinforcing material for the resilient material. The use of a plurality of
5 wooden slats with interposed foam creates a particular resistance of the edge protection against the particularly feared shock and impact loads during transport.

In the embodiment the profile is composed of three parts (not shown). When the three parts are unconnected two split joints run through the recesses 8 and 9, i.e. parallel to the short sides.

10 The three parts are cut from commercially available XPS foam boards and surface finished, such that the recesses 6 and 7 and additional recesses are created, which form the recesses 8 and 9 after all the parts have been assembled.

The cutting processes are carried out by sawing.

In the embodiment the recesses are milled.

15 The parts are assembled by hot melt adhesion. Suitable adhesive guns are used to coat the hot melt adhesive.

In other embodiments the parts are welded. For the welding, the weld surfaces are heated and the parts are then pressed together. The required heat can be imparted with a hot air gun, (in other embodiments by contact with a heated blade or by means of another object
20 that has suitably heated surfaces, with which the weld surfaces are brought into contact).

After the market introduction of the edge protection according to the invention, it may then be considered to extrude the required lot sizes (in regard to the cross section) in one piece or to injection mould them or to mould them from particle foam. Extrusion requires
25 extruders with extrusion dies that simulate the profile cross section and convey the foam into a shaping calibrator.

Extrusion of a profile that has all the cross sectional dimensions of the required profiles obviates the need for the above described machining operations, at least in part.

The illustrated profiles 2, 3, 4, 5 are pressed against the edge of the glass sheet 1 by a strapping band (not shown), (in other embodiments by a tensioning-band or tensioning-
30 strap). In the embodiment the strapping band is a plastic band. The strapping band is taken off a roller from the strapping equipment and wrapped round the outside of the profiles 2, 3, 4, 5. This is initially done manually. For larger series there is provided a strapping

machine with an automatic band supply or automatic wrapping of the strapping band around the profiles 2, 3, 4, 5.

There are various embodiments of the strapping machine.

- Initially, a simple hand-operated machine may be used to stretch the strapping band. For appropriate lot sizes an electric strapping machine with automatic control may be used instead of the hand-operated machine.

- In the embodiment both ends of the plastic strapping band are welded together after being stretched. For this, a hot blade is momentarily guided between the two ends of the strapping band. The hot blade momentarily melts the contact surfaces of the two ends of the strapping band, such that under a suitable pressure they are immediately welded together without any noticeable weakening of the strapping band. Rapid cooling of the weld immediately affords a welded seam of adequate strength.

The strapping maintains the profiles 2, 3, 4, 5 in the illustrated form, without the need for further measures.

- In another embodiment a reinforcement/corner protection is provided on the corners. The reinforcement/corner protection is made up of caps that are fixed over the corners prior to the strapping. Such caps are commercially available. Such caps are offered as a plastic angle or metal angle. The automatic equipment seats the caps automatically; the functioning of such equipment depends on whether the equipment is designed to use the caps.

- Manual strapping is recommended as long as product series that would justify automatic strapping are lacking. With manual strapping the placement of the caps is problematic as long as the caps are not held in place by the strapping. It is then advantageous to set/hold the caps in place with a double-sided adhesive self-adhesive strip, when this is not carried out by the strapping.

In Fig. 49 the caps 321 may, however, also be positioned on the strapping 320. For this the caps may be equipped with slits, through which the strapping in the illustrated form is guided.

- For manual strapping various commercial machines are available – from a quite simple design up to a sophisticated design. A quite simple design is presented in Fig. 50. This concerns a material strip 325 with a series of successive recesses 326, whose opening width and spacing are matched to the dimensions of the strapping band. In the embodiment the material is a metal sheet. In other embodiments another stiff material is

used. One end of the strapping band is fastened to the end of the strip 325. The band is then wrapped round the packaging and its other end is pushed back and forth through the openings 326. After the band has been tensioned it remains under tension due to the frictional resistance in the sheet metal strip.

- 5 The profiles 2, 3, 4, 5 form an edge protection that protrudes about 53.5 mm transverse to the plane of the glass sheet. In the thus enclosed space a 50 mm thick layer of cardboard 11 is provided on each side. Moreover, a 1.5 mm thick layer (not shown) of soft plastic polyethylene foam lies between the cardboard 11 and the sheet 1.

Figs 4 and 5 show different constructions of corrugated cardboard.

- 10 In Fig. 4 each cardboard layer has a honeycomb core 16, which is connected on either side with a cardboard layer 15 or 17. The honeycombs are formed by cardboard strips that are bent and glued together in a way that creates a honeycomb-like structure.

A differently structured core is shown in Fig. 5. Here also the core is made out of cardboard strips, however the strips are inserted into each other in such a way that they create a

- 15 four-cornered structure as opposed to the 6-cornered honeycomb structure.

After strapping, the glass sheet, together with its edge protection and the lateral cardboard layers, is sealed into a shrink film.

The shrink film leaves the bottom partly free, such that stacker bases 20 can be installed there. The stacker bases serve as transport aids for the placement of the fork of a forklift,

- 20 used for loading and/or unloading.

Fig. 6 shows skids as transport-aid for the glass-sheets 26 with their edge-protection and shrink-film.

The skids are made of a strut 29 with feet 25. On the upper side the feet 25 have different openings 27 spaced apart from one another. The openings 27 take up rods 28 that can be

- 25 tensioned with the load against the strut 29. With the skids, the load can be easily stored and transported with vehicles.

Figs 7 and 8 show the edge protection 30 made of the individual profiles with a hole 31. The hole 31 serves as a transport-aid for attaching hooks 33. With the hook, each glass-sheet including its edge-protection and other packaging can be loaded/unloaded.

- 30 Fig. 9 shows the edge-protection 35 made of various profile sections with lateral hooks 36 and eyelets 37 as the transport-aids.

Figs 21 and 22 show another embodiment of the packaging with a grip 121. The grip 121 has been cut out of a plate 120 and folded. Moreover, claws are formed on the plate 120 enabling the plate 120 to be pushed into the resilient material. This is done when needed. The tensioned strapping-band 125 that is placed around the packaging/edge-
 5 protection 124 is then lifted slightly in order to push the plate with the grip 121 into its desired position under the strapping band 125, and to press the claws into the resilient material. The strapping-band 125 holds the plate 120 in the desired position.

Fig. 10 shows the edge-protection made of various profile sections 41 with lateral loops 42 as a transport-aid.

10 Fig. 11 shows another edge-protection made of various profile sections 45 with a roller 47 at one of the lower corners as a transport-aid. The roller facilitates the movement of the glass-sheet together with the packaging.

In addition a grip 46 is advantageous.

Fig. 20 shows another embodiment for a roller 111 as a transport aid. The roller 111 is
 15 seated in a housing 112 that is designed at the same time as a hood/cap for enclosing a corner of the edge-protection. In the embodiment the hood/cap 112 is made of sheet metal, in other embodiments it is made of plastic. The hood/cap 112 has a number of claws 113, with which the hood is pressed into the resilient material. The hood/cap can be put in place as required once the packaging is finished, and can be reused when the glass-
 20 transport has been completed.

The hood/cap 112 can also be put in place during the strapping. The strapping is then preferably guided between the roller and the hood/cap 112 in order to mount the hood/cap in a permanent manner. The hood/cap then also acts as a corner reinforcement/corner-protection for the packaging.

25 The embodiment shows a roller, whose two ends are rotatably seated in the hood/cap 112.

To facilitate the insertion of the strapping-band between the roller and hood/cap, the roller in other embodiments can be seated on one-side (floating) in the hood/cap.

Fig. 12 shows a cross section of another edge protection 50.

With its three recesses 51, 52 for reinforcing profiles the cross section 50 differs from the
 30 cross section of Fig. 3. Furthermore, a recess 54 is provided for inserts 60.

Of the recesses for reinforcing profiles, recess 52 is positioned at a distance from and centred under the recess/groove 54 for the inserts. The recesses 52 are positioned on both

sides of the recess/groove 54 for the inserts 60. This arrangement is intended to provide reinforcement against impacts that act on the edge-protection at a right angle to the plane of the glass. The recesses 51 and 52 are formed in the same way as the recesses/openings of the edge-protection in Fig. 3.

- 5 The recess/groove 54 has a dovetail shape. The dovetail-shape ensures that the respective insert 60 is firmly held in the edge-protection. Accordingly, the insert 60 has a cross section that matches the recess/groove.

In the embodiment of Fig. 14 the insert 60 has an opening 61 that is intended to receive the respective glass sheet. In the embodiment the insert 60 is made of an elastomer. There
10 are natural and synthetic elastomers. Natural rubber/rubber belongs to the natural elastomers.

The elastomers are capable (within certain limits) of receiving different thicknesses of glass-sheets. In the embodiment the insert 60 is intended for sheets with a thickness of 5 to 10 mm. Other inserts are provided for thicknesses ranging from 10 to 20 mm and 20 to
15 35 mm.

Fig. 14a shows another embodiment with an insert 60.1. A stepped recess is provided in the insert. In the recess step 61.1 the recess has an opening width for 12 mm thick glass. In the other recess step 61.2 the recess has an opening width for 8 mm thick glass.

Fig. 14b shows a recess 61.3 that tapers conically towards the deepest part. The conical
20 taper enables a continual adjustment to any glass thickness ranging here between 12 mm and 8 mm.

Fig. 14c corresponds to the principle of a step-less match illustrated Fig. 14b. However, for insert 60.3 three different ranges 61.4, 61.5, 61.6 are provided that allow for a continual adjustment to any glass thickness, provided the glass thickness falls within one of the
25 three ranges.

Fig. 14d corresponds to the principle illustrated Fig. 14a. However, in the embodiment a three-staged recess 61.7, 61.8 and 61.9 is provided on an insert 60.4 for three different glass thicknesses.

The embodiment in Fig. 14f differs from the embodiment in Fig. 14a in that instead of a
30 single glass sheet, two sheets of glass can be placed side-by-side.

The embodiment in Fig. 14e differs from the embodiment in Fig. 14a in that instead of a single glass sheet, three sheets of glass can be placed side-by-side.

Fig. 23 shows an edge-protection 130 with an insert 131 that differs from the insert 60 of Fig. 14 in the way that it holds the glass sheet 133 with an inlay 132 on the edge. In the embodiment the insert 132 is made of cardboard and has the task to prevent damage to the insert caused by the sharp edges of the glass.

- 5 In the embodiment in Fig. 13 a cross-section of an edge-protection 55 differs from the edge-protection 50 in Fig. 12, only in that one recess 57 centred below recess 56 is provided for inserts 60.

The edge-protection 107 in Fig. 19 is made of polystyrene foam with a density of 30 kg per cubic meter and differs from the edge-protector in Fig. 13 by its different dimensions. The cross sectional width is 130 mm, the height 160 mm. An opening 100 of 24 mm x 48 mm is provided in the centre. The opening serves to receive a roof batten as a reinforcing profile. Furthermore, four grooves 101, 102, 103 and 104 are provided on the periphery. The four grooves have a dovetail shaped cross section. Groove 101 differs from groove 56 in Fig. 13 by its different dimensions, namely a width of 60 mm at the bottom, a depth of 60 mm and an opening width of 50 mm at the top.

Groove 101 serves to receive an insert, similar to the one shown and described in Fig. 14. As for the edge protection of Fig. 13 a recess 102 is provided on the opposite side. In the edge protection of Fig. 13 the groove/recess 13 alone serves to guide and secure a strapping band.

- 20 In the embodiment the groove/recess 102 is 20 mm deep, 50 mm wide at the deepest point and 40 mm wide at the opening.

According to Fig. 19 the groove/recess 102 has additional uses. A housing, in which a roller is rotatably maintained, can be pushed into the groove. Additionally or alternatively, two stacker bases can be pushed into the groove 102. The bases are arranged centrally under the glass sheet below the packaging at a distance from the forks of the fork lift in order to facilitate the transport of the glass sheet by the forklift, for example to load or unload a vehicle.

Moreover, the groove/recess 102 can be used to fasten a flat profile 105 (shown with a dashed line) made of the same plastic foam to the profile.

- 30 A similar flat profile may also be fastened to both of the other sides with the grooves/recesses 103 and 104. Fitting the flat profiles results in more resilient material with a correspondingly modified/increased damping behaviour that takes account of the load of heavier glass sheets.

The grooves/recesses 103 and 104 are 15 mm deep, 40 mm wide at the deepest point and 30 mm wide at the opening.

A significant additional role of the grooves/recesses 103 and 104 is the connection to other packaging/edge protection, from which a packaging 106 (shown with a dashed dotted line) is illustrated sectionally.

The packaging/edge protection 106 possesses the same groove/recess as the packaging/edge protection/resilient profile 107. The connection may be achieved with the help of a so-called tongue 108. The tongue 108 is formed by a profile rod that in cross section has two sides/ends that are matched to the grooves/recesses in the packaging/edge protection 106 and 107, such that a rigid connection results.

With the connection technology formed by the tongue 108 a plurality of packages containing packaged goods can be connected together to form an easy-to-transport block. The width of the resulting block can be formed within wide limits, thereby allowing an optimal utilisation of the breadth of the transport surfaces.

Moreover, the height of the blocks can be formed within wide limits, thereby allowing an optimal utilisation of the height of the transport volumes. Here, instead of the flat profile 105, another package is put on top and connected by means of the tongue 108.

Finally, the length of the block may also be formed within wide limits. For this the packages containing the transported goods are arranged one after the other and connected together by means of the tongues 108.

This offers significant advantages for container transport or truck transport and for similar transport in that the transport volume may be fully exploited.

Packages of different sizes may also be connected together. This can be done directly with the tongues 108 if the associated grooves in the various packages are exactly opposite one another. If the grooves are not opposite one another, a connection may nevertheless be made with the grooves 108. An adapter is provided in this case. For this, grooves are incorporated at an appropriate height or distance to the adapter, such that with the adapter the tongues 108 can connect a package from one side and the other package from the other side.

Alternatively, adapters may be provided that are matched to the different sizes of the packages to be connected. This means that these adapters correspond to the above described adapters with tongues 108 provided on both sides, but are formed integrally with the tongues.

The tongue 108 is illustrated in a cross sectional view in Fig. 19b.

Fig. 19a shows another tongue 280, with which the unused grooves in the packaging according to the invention may be sealed.

Figs 19c to 19d show variants of the profile made from resilient material belonging to the
5 edge-protection according to the invention.

In Fig 19c, in contrast to the profile of Fig. 19, a reinforcing material with a circular cross section and also a circular opening 276 is provided in the profile 275 for the reinforcing profile. The circular opening can be more easily machine-manufactured than an angular opening.

10 Fig. 19d differs from the embodiment in Fig. 19c in that it has two circular openings 279 instead of one circular opening 276 for reinforcing material with a circular cross-section.

Fig. 19e shows a profile 277 that instead of the profiles formed by resilient material in the Figs 19 to 19c, possesses no openings other than the recess for an insert.

Fig. 19f builds on the embodiment of Fig 19 and the possibility illustrated therein to
15 connect two adjacent packages. In Fig. 19 this occurs with a separate tongue. In the embodiment of Fig. 19 only one connection is illustrated on the bottom of the packaging that surrounds the glass sheet. In general this is sufficient, because the packages are handled individually after being unloaded from a vehicle. The particular advantages of the packaging therefore arise when a plurality of adjoining packages are transported with a
20 truck. The load can then be secured much more easily. The securing of the load may, for example, be limited to lashing the packages together at the top.

In other embodiments the need for more security is taken into account by connecting the adjoining packages together with such a connection, at least on the upper side of the package as well. This connection already affords a very stable/resistant overall
25 packaging. This type of requirement is needed when the transport is not carried out with a truck but rather with transporters with a maximum permissible weight of less than 7.5 tons. With such transporters all the goods handling is usually done manually (without loading equipment), because the transporters are much faster than truck transporters.

From experience, the load securing in such transporters is seriously deficient in spite of
30 compliance with the traffic regulations. For this kind of transport an additional connection on the upper side of the adjacent packages is advantageous.

When there is still more need to connect the adjacent packages, then such a connection is also provided on both of the sides that connect the upper side and the lower side of the packaging.

Fig. 19b shows a variant of the profile of Fig. 19 formed from resilient material. The variant has profiles 280 and 281 that show a groove 282 on one side as shown in Fig. 19, whereas on the opposite side they show a tongue 283 instead of a groove 282. When connecting two adjacent packagings, the separate tongues 108 thus become superfluous. This may apply if the simultaneous connection of adjacent packagings on the sides connecting the top and bottom of the packaging is not required.

Fig. 27 shows another edge-protection 151 with a profile cross-section that differs from the cross-section of Fig. 19, in that there is no recess/groove provided on the outer side 160 of the edge-protection for the strapping-band. This is possible because the strapping-band will also maintain its intended position without a recess/groove, as long as the strapping-band is slightly constricted when tensioned around the resilient material.

Fig. 28 shows the schematic application of the profile cross-sections 161 in the packaging for a glass-sheet 162.

In the embodiment the packaging is covered on both sides with a foam layer 163, which although also made of polystyrene, has a density that is 30% lower. This is synonymous for being more resilient.

In the embodiment the foam layers 163 are formed in such a way that they fill out the space enclosed by the edge-protection on both sides of the sheet.

Fig. 15 shows a cross-section of the edge-protection 60 that differs from the edge-protection of Fig. 3 in that the recess 63, intended to accommodate the glass-sheet, is provided with an insert 62 that may be replaced by other inserts, when other glass-sheets are intended to be accommodated.

Moreover, the recess 64 that is centred below the recess 63, is provided for not just one reinforcing profile, but for a plurality of reinforcing profiles 61.

Fig. 16 differs from the one-piece cross-section of Fig. 3 in that it has two halves 65 and 66, which are brought together at their cross-section, as shown in Fig. 3. In the embodiment the contact-surfaces 67 and 68 of the two halves are positioned on the centre line when assembled.

The halves are made of the same foamed plastic as in the embodiment of Fig. 3

To connect the two halves 65 and 66, the contact surfaces are melted and pressed against one other, creating a weld.

Fig. 17 shows a cross section of another edge protection.

This edge-protector has the same recess for the glass sheet as in Fig. 3 and the same
5 recess for the strapping band as in Fig. 3. In contrast to the embodiment of Fig. 3 the cross section according to Fig. 17 is composed of three parts 70, 71 and 72. Parts 70 and 71 are made of the same plastic foam as that provided in Fig. 3. The parts 70 and 71 thus form the resilient material. At the same time, part 70 forms the recess, in which the glass-sheet is to be placed, whereas part 71 functions as the recess for the strapping band.

10 A reinforcing layer 72 of an unfoamed plastic is provided between the two parts. Like parts 70 and 71, this plastic is also made of polystyrene, such that all the parts can be welded together.

Other materials are provided in other embodiments. If the materials are unweldable then they can be adhesively bonded together.

15 Fig. 18 shows an embodiment with a cross-section 75, which has a similar recess 76 as the cross-section shown in Fig. 3 and also the same recess for the strapping band. In contrast to Fig. 3, however, two recesses 77 and 78 are provided for receiving two glass sheets arranged parallel to one another and spaced apart.

Fig. 24 shows another embodiment that differs from other embodiments in that to protect
20 the glass sheet a cross 141 made of plastic foam is provided in the cavity on both sides of the glass sheet enclosed by the edge protection 140. The cross forms a strut. In the embodiment the cross is made of the same foam as the resilient material.

In other embodiments one or more stays are provided as the strut instead of the cross.

Furthermore, Fig. 24 shows an edge-protection, composed of an upper profile/side, a lower
25 profile/side and two similar side profiles. In this regard the edge-protection forms a rectangular frame corresponding to the rectangular glass sheet that is to be packaged. The various profiles extend between two adjacent corners of the frame.

According to Fig. 25, the profiles shown in Fig. 24 are divided into different sections. The sections are labelled 140, 141, 142, 143, 144 and 145.

30 The sections 140, 141, 142, 143, 144 and 145 have a profile with a cross-section corresponding to the profile cross-section shown in Fig. 13. The sections 140, 141, 142,

143, 144 and 145 were created by cutting long profile bars/rods to size. Moreover, the sections 145 are mitre-cut. The sections 143 are also equipped with stacker bases.

Each section 140, 141, 144, 142 and 143 is placed with two mitre-cut sections 145 on wooden profiles, whose cross-section is shown; in the remainder of this document they are shown as partly dashed and dash-dotted centre lines 153. In this situation, the inserts 146 and 147 are mounted, i.e. pushed into the corresponding grooves. In this way parts are created that correspond to the profiles/sides/side profiles described in Fig. 24. The wooden profiles already lend considerable support to the profiles/sides/side-profiles composed of individual sections, such that the edge-protection can be placed around the glass sheet to be packaged. In the embodiment the required additional solidity with the glass sheet is provided by the strapping.

Appropriate recesses for the wooden profiles are provided in the sections 140, 141, 144, 141, 143 and 145. Due to the strapping tension of the strapping the ends of the wooden profiles do not have to be connected together. This facilitates the installation of the packaging.

In other embodiments all sections 140, 141, 144, 142, 143 with the exception of one for each profile/side/side profile section are of the same length. This single section has an adjusted length and may therefore be called an adjustment piece. Using the same length for the other sections streamlines production. For larger quantities it opens up the possibility of producing the sections as particle-foam parts. Obtaining a complex mould is a prerequisite for the production of particle-foam parts; this is only worthwhile when quantities are large enough, even when particle-foam is cheaper than extruded foam.

According to Fig. 26, integrally formed corner pieces 152 are provided instead of the two corner sections 145 needed for each corner as shown in Fig. 25. The corner pieces 152 may contribute to a rational production. The corner pieces 152 make mitre-cuts unnecessary which otherwise lead to considerable waste/scrap.

In the corner-pieces, the wooden profiles may abut one another bluntly, or abut one another with a mitre-cut, or may even be slightly spaced apart from one another.

Fig. 26a shows the situation where the blunt ends of the wooden profiles 152.1 and 152.2 abut one another. The corner-piece 152 of Fig. 26 is shown in dashed/dotted lines.

In other embodiments the wooden profiles are connected together instead of loosely abutting each other. The connection can be used solely as an assembly aid, or it can provide the required cohesion for the packaging if so required, either alone or in combination with the strapping of the packaging. A screw 152.3 is provided as the

connection. The screw can be easily screwed through the corner-piece 152, because the corner-piece 152.1 has an opening for the wooden profile 152.1 that extends from one end to the other. The same is true for the opening 152.2 of the wood-profile. Both openings cross one another. As a result, the screw 152.3 can be initially screwed through the profile 152.2, through the opening of the wooden profile 152.1 and then into the profile 152.1.

In the embodiment according to Fig. 25 even more transport aids are provided in addition to the stacker bases. They concern hooks 149 and handles 150. In the embodiment the hooks combine with the openings 148 provided in the lateral profiles 144. The hooks 149 can be hooked into the openings 148, such that the sheets with the packaging can be suspended for the transport. This has significant advantages in construction sites because cranes or other lifting equipment are often available on site. With these devices, the manual transport of a glass sheet becomes partly unnecessary.

If, nevertheless it is still required to manually transport a glass sheet, then a handle 150 on the packaging may be very helpful. The handle 150 differs from the embodiment in Fig. 21 and Fig. 22 in that it is S-shaped or meandering bent sheet metal, or is made of moulded plastic. The handle 150 is attached to the lower corners of the packaging and should grip into the package with claws. At the same time, the handle 150 can encompass the corners of the packaging, thereby adding to the corner protection and improving the seating of the handle 150 at the packaging corner.

Fig. 29 shows another use of the profile illustrated in Fig. 27 for the edge protection according to the invention. Here, the edge-protection is composed of sections 165 and corner pieces 166. As already shown in Fig. 27, dovetail-shaped cross sectional grooves/recesses are provided on the sides of the sections 165. These grooves continue in the corner pieces 166 up to the end of each of the corner pieces 166, such that accessories can be slid onto the corner pieces. The accessories grip into the grooves/recesses with dove-tail-shaped tongues/protrusions having corresponding cross-sectional dimensions.

An accessory is illustrated in Fig. 30. It concerns a U-shaped sleeve 170 that can be slid onto the outside of the edge-protection shown in Fig. 29. For this, the inside of the sleeve 170 fits the outer shape of the edge-protection. That is, the width of the inside space is equal to the width of the edge-protection plus the necessary clearance to allow the sleeve 170 to be slid on. Moreover, as with other accessories, tongues/protrusions with dovetail-shaped cross sections are provided, which connect with sufficient clearance into the grooves/recesses of the edge-protection. This includes a corresponding distance of the tongues/protrusions from the deepest part of the sleeve 170.

The sleeve 170 carries a handle 172. After blocking the sleeve 170 at a desired position, the glass sheet with its packaging can be carried by hand using the handle 172.

In the embodiment, blocking is provided with a narrow wedge (not shown) that is pushed between the sleeve and edge protection. In the embodiment, when the cargo/packaged goods together with the packaging is to be carried by the sleeves, the wedge is inserted from above. This has the advantage that the wedges cannot fall out of the gap between the sleeve and the packaging.

The shorter the sleeve 170, in particular if the sleeve length is shortened to such an extent that one can speak of a bracket, the more the sleeve will self-lock on the packaging. The forces acting on the handle cause the sleeve 170 to tilt towards the packaging. A slight tilt is already sufficient when both the packaging and the sleeve are made of foamed plastic, which is cut at the contact surface. The self-locking does not prevent the sleeve 170 from sliding on the packaging if the sleeve 170 is held in the area of the dovetail-shaped grooves/recesses and tongues/protrusions, so that the sliding forces act there.

The handle 172 can also be used as a hook for transporting a suspended glass sheet and its packaging.

Figs 31 and 32 show additional embodiments of handles. In both embodiments, the handles are shaped like a bracket, created by shortening the sleeve, thereby resulting in a self-locking attachment/transport aid as shown in Fig. 30.

Fig. 31 shows the bracket shape 175 that has an opening 177 with the same cross section as the sleeve 170. Consequently, the bracket shape 175, like the sleeve 170, can be pushed onto the edge protection. The bracket shape is advantageously blocked in the recesses/grooves by tilting, if an appropriate pull is exerted on the bracket shape. In addition, an opening 176 for the handle is provided in the bracket shape.

This handle can also be used for a suspended transport, in that a hook is hooked into the handle opening or a pulling means is guided through the handle opening 176 and secured.

Fig. 31a builds on the embodiment of Fig. 31 for a handle that can be pushed onto the packaging. According to Fig. 31a the same recess as in Fig. 31 is provided, but is referred to as 177.1. The material that surrounds the packaging is the same as in Fig. 31 and referred to as 175.1. However, an ergonomically enhanced shape is selected on the opposite side of the recess 177.1. The handle 178 has no sharp edges, but is rounded and therefore more pleasant to use. The handle bar 178 is held between two side bolsters, which taper from the enclosing material 175.1 to the handle bar 178.

This transport-aid, like the other transport-aids, is made of plastic. However, reinforcement by creating a skin or coating is provided, as described elsewhere for the reinforcement of foam plastic.

Fig. 32 also shows a bracket-shaped accessory/transport-aid 180 that differs from the accessory shown in Fig. 31 in that it is shaped like a hook, bent on the end facing away from the recess 181. The hook-shaped end 182 can be used as a handle or can be used for attaching a suitable pulling means.

Fig. 32a shows another handle as the transport aid which differs from the handle of Fig. 32 by having a better ergonomic shape 182.1 of the bend that forms the handle. When using this transport-aid as a hook, this embodiment provides more security against the possibility of cables or similar types of lifting means slipping off.

The accessories/transport aids shown in Figs 31 and 32 can also be used as stacker bases, in that they are pushed on the lower edge protection externally onto the edge protection.

According to Fig. 33, a special part 190 is optionally provided for this as an accessory/transport-aid that differs from the accessories shown in Figs 31 and 32 in that it has neither a handle opening nor a hooked-end.

When used as stacker bases, the accessories shown in Figs. 31 to 33 contribute to the stability of the glass-sheet and its packaging, because they create a wider footprint.

Fig. 34 shows a special foot 191 as an accessory, which creates an even wider footprint than with the accessories shown in Figs 31 to 33.

The foot 191 is slid onto the bottom corners of the packaging.

Fig. 35 shows another accessory 193 for the packaging according to the invention. The accessory 193 has two openings 194 and 195, both of which are able to slide over a packaging/edge-protection according to the invention. This enables two glass sheets on their packaging to be connected together. Advantageously, the packaging and the glass-sheets will then support each other.

Fig. 36 also shows an accessory/transport-aid for a connection between two glass sheets and their packaging. The connection profile 197 is then provided, however, to connect glass sheets standing one behind the other and their packaging. For this the connection profile has an H-shape with openings 198 and 199 placed one behind the other, with which the connection profile can be pushed over the packaging/edge protection according to the invention.

Fig. 37 likewise shows an H-shaped transport-aid 205, wherein the upper opening 206 is intended to grip the lower edge of the packaging/edge-protection according to the invention with the opening facing upwards, whereas a roller 207 is positioned in the lower opening such that the glass sheet, together with its packaging, can be moved with the help
5 of the transport-aid.

Fig. 38 builds on the profile for the edge-protection depicted in Fig. 19 which forms the resilient material for the edge-protection according to the invention.

The profile shown in Fig. 19 shows a single recess 101 for an insert for receiving a glass-sheet. The insert is exchangeable and by an exchange can be adjusted to match the
10 respective thickness of the glass sheet. In this regard a plurality of glass thicknesses can be accommodated by the inserts; for example, five or ten or more different glass-sheets can be held, depending on the dimensions of the inserts.

The profile 215 in Fig. 38 differs therefrom in that there two adjacently positioned recesses are provided. In the embodiment the two recesses are designed to receive the glass sheets
15 directly (without the use of an insert as shown in Figs 14 to 14f).

Other embodiments are likewise intended to receive the glass sheets without the use of inserts and for this show the same recesses as the inserts of Figs 14 to 14f.

In the embodiment of Fig. 38 the recesses are stepped. On top, the recesses are designed to receive glass sheets with a thickness of 8 mm. In the deepest part of each recess 216, a
20 constriction 217 is provided to receive glass sheets with a thickness of 6 mm.

Therefore the profile in Fig. 38 can accommodate two thicknesses of glass sheet.

Figs 39 and 40 show other profiles for an edge-protection according to the invention, i.e. they are also intended to receive the glass-sheets directly.

The profiles of Fig. 39 possess four recesses 221 with constrictions 222 in the deepest
25 part. In the embodiment the recesses 221 and 222 are designed for other thicknesses of glass sheet than is the case for the profile in Fig. 38.

Fig. 40 shows a profile 225 with recesses 226 and constrictions 228 in the deepest part. The profile 225 is designed for additional thicknesses of glass sheet.

A comparison of various packaging for glass sheets is shown in the Figs 40 to 47.

30 All packages enclose the glass sheets in a frame.

Fig. 41 shows a packaging 230 that is permanently provided with stacker bases 231.

Fig. 42 shows a frame 235 with permanently provided band hooks 241. These are hooks on which the frame, suspended on bands, can be transported.

Fig. 43 shows a frame 240 with permanently provided carrying handles 241 in order to
5 enable the frame to be carried on the carrying handles.

Fig. 44 shows a frame 245 with attached feet 246. The feet also serve the frame 245 with the glass sheet. Fig. 44a shows the feet in detail. It shows that the feet are made of a triangular plate 247 and a tongue 248.

The tongue 248 is designed to slide into the grooves described above, which are provided
10 on the outside of the packaging.

Both plate and tongue can be made of foamed plastic, such that both parts can be formed integrally. The plate shape saves space. On the other hand, a thin plate is easily damaged. To reduce the risk of damage, a greater strength of the plate made of foamed plastic is advantageous. To achieve this, the plate can be given a skin, or be reinforced in the same
15 way as described elsewhere for the profiles that form the packaging for the glass sheets.

In other embodiments the plate and the tongue are composed of different materials. They may be joined by gluing or in a conventional mechanical manner.

The feet can be mounted flush to the packaging. However, the feet may also maintain the packaging at a distance from the ground. In this case it is advantageous to attach a small
20 plinth to the feet which grips below the packaging. The plinths afford a corresponding distance of the packaging to the footprint.

Fig. 45 shows a frame 250 with a built-in strut 251 to stiffen the frame.

Fig. 46 shows a frame 255 with a plurality of struts that are joined in the form of a cross 256 to stiffen the frame.

25 Fig. 47 shows a frame 260 with a handle 261 at the upper end of the frame on one side, and a roller 262 underneath the frame on the opposite side of the frame.

Fig. 48 builds on Fig. 19 and shows a profile 265 with further profiles 266, 267 and 268. The further profiles 266, 267 and 268 are made of the same foamed plastic as the profile 265 and serve to thicken the profile 265. The additional profiles 266, 267 and 268
30 grip into the grooves of profile 265. The details of the grooves are described in Fig. 19. These grooves have corresponding tongues in the profiles 266, 267 and 268. The

tongues are part of a so-called tongue and groove connection. In this regard the tongues are formed by protrusions/bulges on the profiles 266, 267 and 268, which match the cross-sections of the grooves, such that the profiles can be slid with these tongues into the grooves.

- 5 In another embodiment the profiles 266, 267 and 268 are made of open-cell foamed plastic with an open-cell proportion of 30%. The open-cell percentage is indicated as a percentage of the total number of cells. The open-cell percentage is measured by counting the open cells on a straight line per unit length.

- The open-cell structure affords a damping behaviour of the profiles 266, 267 and 268;
 10 during deformation the air can escape from the open cells, such that when released only a slow reset/recovery of the profiles occurs. This prevents the cargo from vibrating after an impact or a bump. For sensitive glass like float glass, this has considerable advantages.

In other embodiments the profiles 266, 267 and 268 may also have another cross sectional shape, for example with curves or nipples on the surface.

- 15 Figs 48a and 48b show variations of the thickness profiles 266, 267 and 268 of Fig. 48. This concerns thickened profiles 270 and 271, whose tongues 271 or 272 is arranged on other places. This means that, in a modification of the embodiment in Fig. 48, the lengths, thicknesses, and arrangement of the tongues on the thickening profiles 266 to 268 of Fig. 48 can vary over a wide range.
- 20 Figs 48c and 48d show two additional transport-aids in the form of containers for the packaging according to the invention, with which accessories and/or transport documents and/or assembly instructions can be sent. The container according to Fig. 48d is small; the container according to Fig. 48c is large in comparison. Both containers have a tongue 290 or 299 that allows them to be inserted into the available grooves of the packaging. In both
 25 figures a tubular defect is illustrated for the containers 291 and 298. They are sealed with lids (not shown) after the container has been filled.

- Fig. 48e shows an eyelet as another transport aid for the packaging according to the invention. This transport aid consists of a part 300 that is identical to part 175.1 of Fig. 31a which encompasses the packaging, but possesses a shaped bar 301. Like the other
 30 transport aids the eyelet is made of plastic. However, the plastic is reinforced by providing it with a skin or coating, in the same way as described elsewhere for the reinforcement of foamed plastic.

The eyelets are suitable both for attaching lifting means, such as for example hooks and cables, as well as for securing the transport.

When used to attach lifting means, the eyelets may be pushed onto the sides that are pushed onto the top and bottom sides of the frame-like packaging surrounding the glass sheet.

The same applies to the upper end of the packaging, where the lowest load on the
5 packaging can be expected.

For using eyelets to secure the load, the same applies as for attaching lifting means.

Fig. 48f shows a transport aid with a spigot. The transport aid serves to attach lifting means such as cables and hooks. But it can also be used for manual carrying. This additional transport aid consists of a part 310 that is identical to part 175.1 of Fig. 31a
10 which encompasses the packaging, but possesses a shaped bar 311. Like the other transport aids the transport aid is made of plastic. However, the plastic is reinforced by providing it with a skin or coating, in the same way as described elsewhere for the reinforcement of foamed plastic. The spigots are pushed onto the sides that connect together the top and bottom of the packaging.

15 Fig. 51 show two profile halves 340 and 341 that possess a central cavity 342 in which a wooden rod can be inserted as a reinforcement profile. The two profile-halves 340 and 341 are welded together. On the top, the illustrated profile has a recess 343 for an insert, which, in this embodiment, holds a glass sheet and protects the edge of the glass sheet. Moreover, the profile-half 341 has a groove for a tongue of a tongue and groove
20 connection.

The profile-half 340 has a tongue 345 for a groove of a tongue and groove connection. The tongue and groove connection is dovetail shaped.

The use of two profile halves and their welding has production advantages for small production series. It then becomes economical to cut the profile-halves out of foam boards.

25 The profile in Fig. 52 differs from the profile in Fig. 51 in that different profile-halves 351 and 352 are used as the edge-protection. The two profile-halves differ from the profile-halves of Fig. 51 in that they are held together by a tongue and groove connection, that allows them to be disconnected from one-another. With multiple usage the possibility to disconnect the profile-halves from one another is advantageous, because in the situation
30 where damage has occurred to one of the profile-halves, the damaged profile half can simply be replaced with an undamaged profile half.

Furthermore, the ability to disconnect affords a significant advantage for the storage of profiles for different profile cross-sections.

If a plurality of sheets are to be packed simultaneously side-by-side and only small quantities per type of sheet are required, it can be advantageous to use the profile halves 350 and 352 as side-profiles and to space them apart by means of centre-profiles 353 and 354, in order to enlarge the space for receiving the glass sheets.

- 5 Fig. 53 shows a profile with a centre-profile 353 between two side-profiles 350 and 351. The two side-profiles and the middle-profile can be connected together with a recess 360 for three glass sheets.

Fig. 54 shows a profile with two middle profiles 353 and 354 between the side-profiles 350 and 351. These middle profiles can be connected together with the side-profiles and a
10 recess 361 for 6 glass sheets.

Patentkrav

- 1.** Emballage for skive-formet transportgods såsom glas (1, 26, 162) eller lignende,
med en periferisk kantbeskyttelse som et profil (2, 3, 4, 5, 30, 35, 41, 45, 55, 60,
5 107, 124, 130, 140, 151, 230, 235, 240, 245, 260),
hvor kantbeskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260) består mindst delvist af elastisk materiale og et forstærkningsmateriale,
hvor det elastiske materiale omgiver forstærkningsmaterialet (152.1, 152.2),
10 hvor det elastiske materiale udviser en elasticitet der er mindst 20% større end elasticiteten af forstærkningsmaterialet (152.1, 152.2), fortrinsvis mindst 40%, endnu mere fortrinsvis mindst 60% og mest fortrinsvis mindst 80% større end elasticiteten af forstærkningsmaterialet (152.1, 152.2),
hvor det elastiske materiale består af plastskum.
- 15 **kendetegnet ved at**
det elastiske materiale af den periferiske kantbeskyttelse på kanterne er sammensat af dele (142, 143, 144, 145),
hvor delene holdes sammen på det skive-formede transportgods af en rem eller af en gjord eller af et forankringsbælte eller af en spændt wrappingfilm eller af et
20 spændt wrappingtekstil på det skive-formede transportgods.
- 2.** Emballage ifølge krav 1, **kendetegnet ved at** filmen eller tekstilet er mindst delvist lamineret på emballagen.
- 25 **3.** Emballage ifølge krav 1 eller 2 **kendetegnet ved** dele (142, 143, 144, 145) af elastisk materiale og profiler som forstærkningsmateriale (152.1, 152.2),
- a) hvor profiler som forstærkningsmateriale (152.1, 152.2) kan glide på og/eller
- b) hvor profiler som forstærkningsmateriale (152.1, 152.2) kan glide ind i
30 det elastiske materiale og/eller

- c) hvor fra to tilgrænsende dele (142, 143, 144, 145) en del (142, 143, 144, 145) indgriber med et fremspring i en udsparring af den anden del (142, 143, 144, 145) og/eller
- 5 d) hvor fra to tilgrænsende dele (142, 143, 144, 145) en del (142, 143, 144, 145) indgriber med et forbindelsesorgan på eller ind i den anden del (142, 143, 144, 145) og/eller
- 10 e) hvor én eller flere dele (142, 143, 144, 145) er udvendigt forstærket med en film og/eller tekstil, fortrinsvis med en film og/eller tekstil der overlapper mindst to dele (142, 143, 144, 145) fremstillet af elastisk materiale og anbragt side-om-side eller bagved hinanden i emballagen, hvor endnu mere fortrinsvis, filmen eller tekstilet er lamineret på det elastiske materiale og/eller
- d) hvor dæklaget er en ekstruderet hud eller en hud fra en varmtrådskeer eller en hud fra varmebehandling.
- 15
4. Emballage ifølge et af kravene 1 til 3, **kendetegnet ved at** det elastiske materiale er en plastskum med mindst 10% åbne celler, endnu mere fortrinsvis med mindst 20% åbne celler og mest fortrinsvis med mindst 30% åbne celler.
- 20 5. Emballage ifølge et af kravene 1 til 4, **kendetegnet ved at** forstærkningsmaterialet (152.1, 152,2) er af metallisk, organisk eller uorganisk beskaffenhed, eller er fremstillet af plast, eller er fremstillet af en blanding af mindst to forskellige materialer, endnu mere fortrinsvis er konstrueret lag på lag.
- 25 6. Emballage ifølge et af kravene 1 til 5, **kendetegnet ved at** delene (142, 143, 144, 145) der anvendes til en emballage kan delvist anvendes til en emballage af andre dimensioner.
7. Emballage ifølge et af kravene 1 til 6, **kendetegnet ved at**
- 30 forstærkningsmaterialet (152.1, 152,2), især til glasskiver, er et træprofil, fortrinsvis en taglægte og endnu mere fortrinsvis en taglægte ifølge DIN 4074-1.

- 8.** Emballage ifølge et af kravene 1 til 7, **kendetegnet ved at** det elastiske materiale, henvist til på yderfladen af transportgodset, rager ud mellem transportgodset, fortrinsvis omgiver kanten der skal beskyttes.
- 5 **9.** Emballage ifølge krav 8, **kendetegnet ved at** forstærkningsmaterialet (152.1, 152,2) strækker sig i regionen af det elastiske materiale der rager frem på tværs af yderfladen af transportgodset over for transportgodset og fortrinsvis strækker sig i regionen med hvilket det elastiske materiale omgiver kanten der skal beskyttes.
- 10 **10.** Emballage ifølge et af kravene 1 til 9, hvor en periferisk kant-beskyttelse (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260) for transportgodset er tilvejebragt og kant-beskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260) er sammensat
- 15 af individuelle dele (142, 143, 144, 145), holdes sammen af mindst en rem, eller mindst et spændebånd, eller mindst en spændings-rem, og/eller mindst en spændt film til omhylning af transportgodset, og/eller mindst et spændt tekstil til omhylning af transportgodset, hvor en hjørnebeskyttelse er tilvejebragt med henblik på at reducere hjørnebelastningen og/eller til at forbedre glidevirkningen
- 20 for fastspændingen, remmen eller spændebåndet eller filmen eller tekstilet på emballagehjørnet.
- 11.** Emballage ifølge et af kravene 1 til 10, **kendetegnet ved at**
- a) mindst to profil-dele af kant-beskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55,
- 25 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260) støder glat mod hinanden med deres ender ved et hjørne af transportgodset eller
- b) mindst to profil-dele (142, 143, 144, 145) af kant-beskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260) er skåret i gering ved deres ender ved et hjørne af transportgodset
- 30 eller
- c) mindst to profil-dele (142, 143, 144, 145) af kant-beskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245,

260) med deres ender stødende mod et hjørnestykke ved et hjørne af transportgodset, i særdeleshed støder glat mod hjørnestykket.

12. Emballage ifølge krav 10 eller 11, kendetegnet ved at

- 5 a) en enkelt profil-del (142, 143, 144, 145) er tilvejebragt mellem to tilgrænsende hjørner af transportgodset eller
- b) en flerhed af profil-dele (142, 143, 144, 145) er tilvejebragt mellem totilgrænsende hjørner af transportgodset, i særdeleshed hvor ud af flere profildele (142, 143, 144, 145) mindst en del (142, 143, 144, 145) tjener
- 10 som et del-modul (142, 143, 144, 145) af den samme længde til forskellige emballager, og en anden profil-del (142, 143, 144, 145) danner et justeringsstykke der sammen med én eller flere del-moduler (142, 143, 144, 145), danner den krævede profil-længde mellem to tilgrænsende hjørner.

15

13. Emballage ifølge et af kravene 1 til 12 kendetegnet ved en udskiftelig indsats i kantbeskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260)

- 20 a) til at modtage og justere til forskellige tykkelser af det skive-formede transportgods og/eller
- b) til at modtage en flerhed af tilgrænsende anbragte transportgods og/eller
- c) til at tilpasse til forskellige længder og/eller bredder af emballage-transportgodset.

25

14. Emballage ifølge et af kravene 1 til 13 kendetegnet ved

- a) trinvis udsparring i kantbeskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260) til at modtage

indsatser af forskellige tykkelser og/eller transportgods af forskellige tykkelser og/eller

- b) trinvis udsparringer i indsatserne i kantbeskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260) til at modtage transportgods af forskellige tykkelser.

15. Emballage ifølge et af kravene 1 til 14 **kendetegnet ved** en permanent eller frigørlig aftagelig fortykkelse af kantbeskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260),
10 hvor

- a) den permanente fortykkelse er fortrinsvis lamineret på og/eller
b) en not- og fjerforbindelse er fortrinsvis tilvejebragt som den frigørlige fortykkelse mellem kantdelene (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260) og fortykkelsen.

15

16. Emballage ifølge ét eller flere af kravene 1 til 15, **kendetegnet ved at** flere indpakninger kan forbindes med hinanden, fortrinsvis med en not- og fjerforbindelse, hvor fjerens er underskåret og noten griber rundt om fjerens, endnu mere fortrinsvis af en svalehale-pasning mellem noten og fjerens.

20

17. Emballage ifølge et af kravene 1 til 16, **kendetegnet ved at** det elastiske materiale består

- a) fuldstændigt eller delvist af ekstruderet plastskum eller
b) fuldstændigt eller delvist af sprøjtetstøbt plastskum.

25

18. Emballage ifølge et af kravene 1 til 17, **kendetegnet ved at** båndet eller remmen der anvendes til holde delene (142, 143, 144, 145) af emballagen sammen, ledes i en udsparring i emballagen/kantbeskyttelsen (2, 3, 4, 5, 30, 35,

41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260), hvor tilgængelige riller fortrinsvis på samme tidspunkt tjener som føring for båndet eller remmen.

- 5 **19.** Emballage ifølge et af kravene 1 til 18, **kendetegnet ved at** hulheden i fronten af en yderflade af transportgodset og omgivet af kant-beskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260), er mindst delvist fyldt med yderligere elastisk materiale,

10 a) hvor det yderligere elastiske materiale er dannet af det samme eller lignende elastisk materiale som på kantbeskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260),

b) hvor det yderligere elastiske materiale til det omgivende fladeareal adskiller sig fra det elastiske materiale tilvejebragt udenfor det omgivende område, fortrinsvis af et lag af karton eller pap i det omgivende område,
15 endnu mere fortrinsvis af en bikubeform af karton- eller paplaget.

- 20.** Emballage ifølge et af kravene 1 til 19 **kendetegnet ved** en omhylning af transportgodset og kant-beskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260) i en film og/eller i tekstil, hvor
20 filmen og/eller tekstilet fortrinsvis også omgiver det elastiske materiale tilvejebragt til at fylde hulheden i fronten af overfladearealet af transportgodset.

- 21.** Emballage ifølge krav 20, **kendetegnet ved at**

25 a) filmen eller tekstilet består af et krympbart materiale der efter en varmebehandling krymper og forbliver under belastning, og/eller

b) filmen og/eller tekstilet er bundet til det elastiske materiale, hvor filmen og/eller tekstilet og/eller det elastiske materiale forbliver under belastning, og/eller

30 c) filmen og/eller tekstilet omgiver løst det elastiske materiale og emballagen er udstyret med en sammenspændingsindretning.

22. Emballage ifølge krav 20 eller 21, **kendetegnet ved at**

- a) filmen og/eller tekstilet er delvist støbt eller klæbemiddelbundet til det elastiske materiale eller
- 5 b) tekstilet er indlejret i det elastiske materiale, fortrinsvis et glas-fibertekstiltrådnnet, som tekstilet presses ind i den smeltede flade af det elastiske materiale
- c) strimler af film- og/eller tekstil svejses eller klæbemiddelbindes til det elastiske materiale.

10

23. Emballage ifølge et af kravene 1 til 22 **kendetegnet ved** transportstøtte, fortrinsvis

- a) håndtag og/eller
- b) løkker og/eller
- 15 c) kroge og/eller stifter
- d) sikringsringe og/eller
- e) valser og/eller
- f) fødder og/eller
- g) forbindelsesorganer og/eller
- 20 h) gaffeltruck-fod og/eller
- i) beholdere og/eller
- j) forbindelsesdele til en transportsikringsindretning.

24. Emballage ifølge krav 23, **kendetegnet ved at**

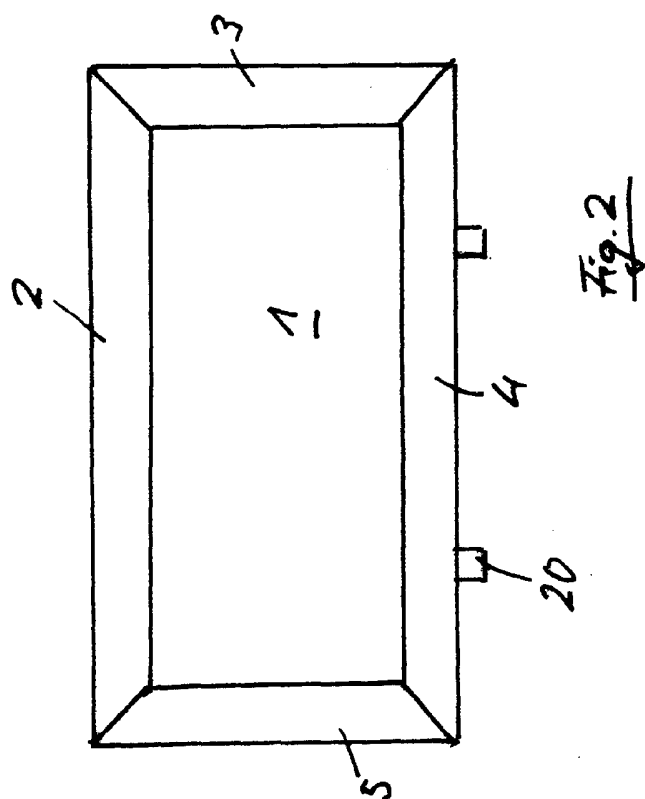
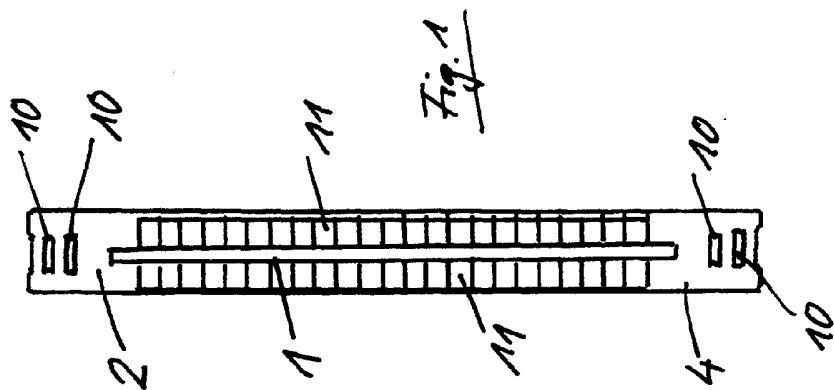
- a) håndtagene er fastgjort permanent eller monteret aftageligt, fortrinsvis med håndtag
- 5 aa) der er tilvejebragt på det elastiske materiale eller på forstærkningsmaterialet (152.1,152.2), fortrinsvis i udsparinger af det elastiske materiale eller forstærkningsmaterialet (152.1,152.2), og/eller
- aaa) som kan forbindes til fastspændingen, på båndspændingen eller spændebåndet,
- b) løkkerne er forbundet permanent eller aftageligt monterbare, fortrinsvis med løkker,
- 10 bb) der er fastgjort på det elastiske materiale eller forstærkningsmaterialet (152.1,152.2), fortrinsvis på wrapningen, på båndspændingen eller spændebåndet,
- 15 c) valserne er anbragt i et separat hus og gennem huset indirekte fastgjort eller aftageligt monterbare på wrapningen, fortrinsvis med valsehuse der er fastgjort permanent eller monteret aftageligt til wrapningen, endnu mere foretrukket med valser der er integreret i emballagedelene (142, 143, 144, 145),
- d) fødderne er permanent fastgjort eller aftageligt monterbare på emballagen,
- 20 e) krogene eller stifterne er permanent fastgjort eller monteret aftageligt på emballagen, fortrinsvis kroge eller stifter der er fastgjort til det elastiske materiale eller forstærkningsmaterialet (152.1, 152.2), fortrinsvis på wrapningen, på båndspændingen eller spændebåndet,
- 25 f) sikringsringe er permanent fastgjort eller monteret aftageligt på emballagen, fortrinsvis med sikringsringe der er fastgjort til det elastiske materiale eller forstærkningsmaterialet (152.1, 152.2), fortrinsvis permanent fastgjort eller aftageligt monteret på wrapningen, på båndspændingen eller spændebåndet eller er dannet af det elastiske materiale eller af wrapningen, båndspændingen eller spændebåndet,

- g) forbindelseselementerne er tilvejebragt til forbindelse af emballage dele (142, 143, 144, 145) som støder på til hinanden og/eller til at forbinde emballage stående side-ved-side og/eller emballage der står bag ved hinanden
- 5 h) gaffeltruckfoden er permanent fastgjort eller monteret aftageligt på emballagen, fortrinsvis med gaffeltruckfod der er fastgjort til det elastiske materiale eller forstærkningsmaterialet (152.1, 152.2), eller permanent fastgjort eller aftageligt monteret på wrapningen, på båndspændingen eller spændebåndet eller er integreret i emballagedelene (142, 143, 144, 145)
- 10 i) beholderne er permanent fastgjort eller aftageligt monteret på wrapningen, fortrinsvis med beholdere der er fastgjort til det elastiske materiale eller forstærkningsmaterialet (152.1, 152.2), eller permanent fastgjort eller aftageligt monteret på wrapningen, på båndspændingen eller spændebåndet eller er integreret i emballagedelene (142, 143, 144, 145)
- 15 j) transportfastgørelsesforbindelserne er permanent fastgjort eller aftageligt monteret på wrapningen, fortrinsvis med forbindelser der er fastgjort til det elastiske materiale eller forstærkningsmaterialet (152.1, 152.2), eller permanent fastgjort eller aftageligt monteret på wrapningen, på båndspændingen eller spændebåndet.
- 20 **25.** Emballage ifølge krav 23 eller 24, **kendetegnet ved at** delene (142, 143, 144, 145) der danner kantbeskyttelsen (2, 3, 4, 5, 30, 35, 41, 45, 55, 60, 107, 124, 130, 140, 151, 230, 235, 240, 245, 260) er profilerede på deres yderflader på en sådan måde at tilbehør- og transportstøtte kan glide på disse profiler, hvor
- 25 profilerne er dannet af opstalter og/eller indrykninger, hvor fortrinsvis en not- og fjerforbindelse er tilvejebragt mellem transport-hjælpen og profilerne, endnu mere foretrukket med fjer- og notforbindelser med en svalehale-tilpasning, mest fortrinsvis med not- og fjerforbindelser der løber i den langsgående retning af indpakning-delene (142, 143, 144, 145), eller på tværs deraf.
- 30 **26.** Emballage ifølge et af kravene 1 til 25, **kendetegnet ved at**

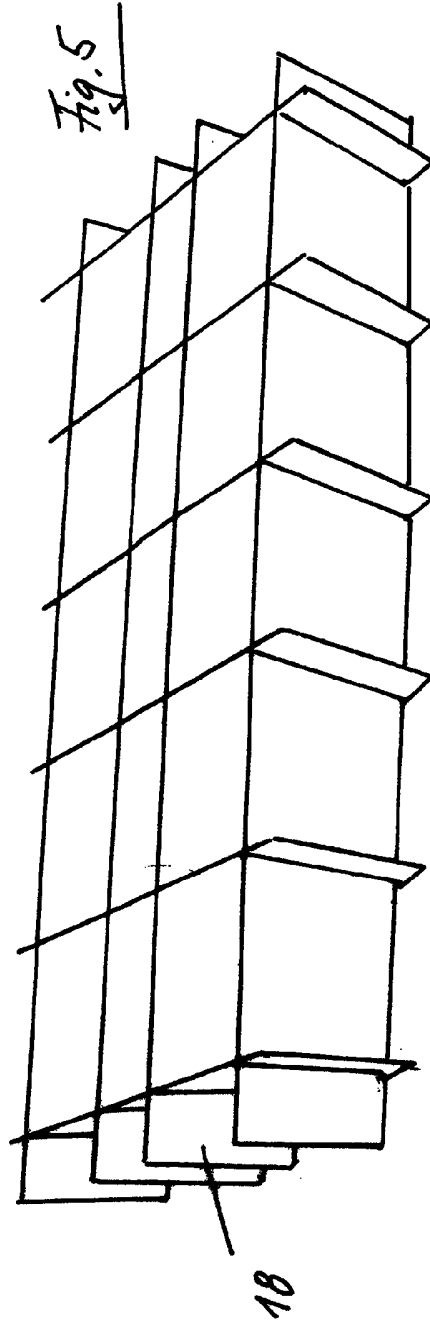
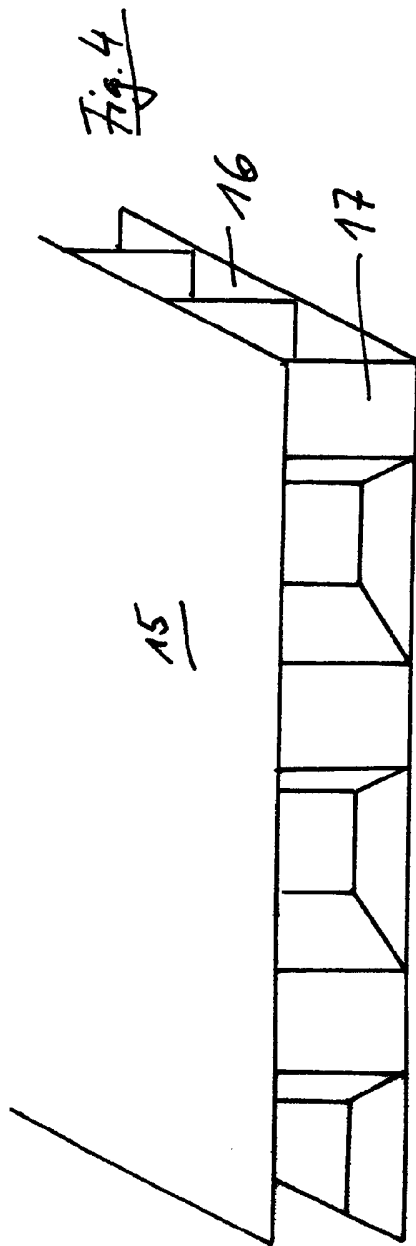
- 5 a) plastskummet der danner det elastiske materiale er tilvejebragt, mindst på hjørnerne og mindst på en side, med en hud som forstærkningen og/eller med en forstærkningsfilm og/eller med et forstærkningstekstil, hvor huden eller forstærkningstekstilet tilvejebringer mindst den samme forstærkning som en ikke-ekspanderet film med en tykkelse på 0,3 mm, fortrinsvis med en tykkelse på 0,6 mm, endnu mere foretrukket med tykkelse på 0,9 mm, fremstillet af det samme plast som plastskummet der danner det elastiske materiale og/eller
- 10 b) en hjørne-beskyttelse, fastgjort permanent eller aftageligt monteret, er tilvejebragt på mindst hjørnerne eller hjørnedelene, fortrinsvis en hjørnebeskyttelse der er fastgjort til eller ligger løst mod hjørnedelene og holdes på plads af fastspændingen.
- 15 **27.** Emballage ifølge et af kravene 23 til 26, **kendetegnet ved at** transportstøtten glidende opretholdes i emballagen, og opretholdes i deres respektive position af selvlåsning eller ved yderligere sammenspænding.
- 20 **28.** Emballage ifølge et af kravene 1 til 27, **kendetegnet ved at** kanterne på det plastskum-elastiske materiale er rundet for at danne en hud, i særdeleshed kanter af udsparinger til ekstruderingshud.
- 29.** Emballage ifølge et af kravene 1 til 28, **kendetegnet ved at**
- a) emballagen er en engangsemballage eller
- 25 b) emballagen er en genanvendelig indpakning, hvor genanvendt, ubeskadigede emballage kan anvendes til nyt transportgods med de samme dimensioner og/eller
- c) ubeskadigede dele (142, 143, 144, 145) af genanvendelig, skadet emballage kan anvendes i kombination med nye dele (142, 143, 144, 145)
- 30 til en ny transportgods og/eller

d) ubeskadigede dele (142, 143, 144, 145) af genanvendelig, ubeskadiget emballage kan anvendes til emballeringen af anden transportgods.

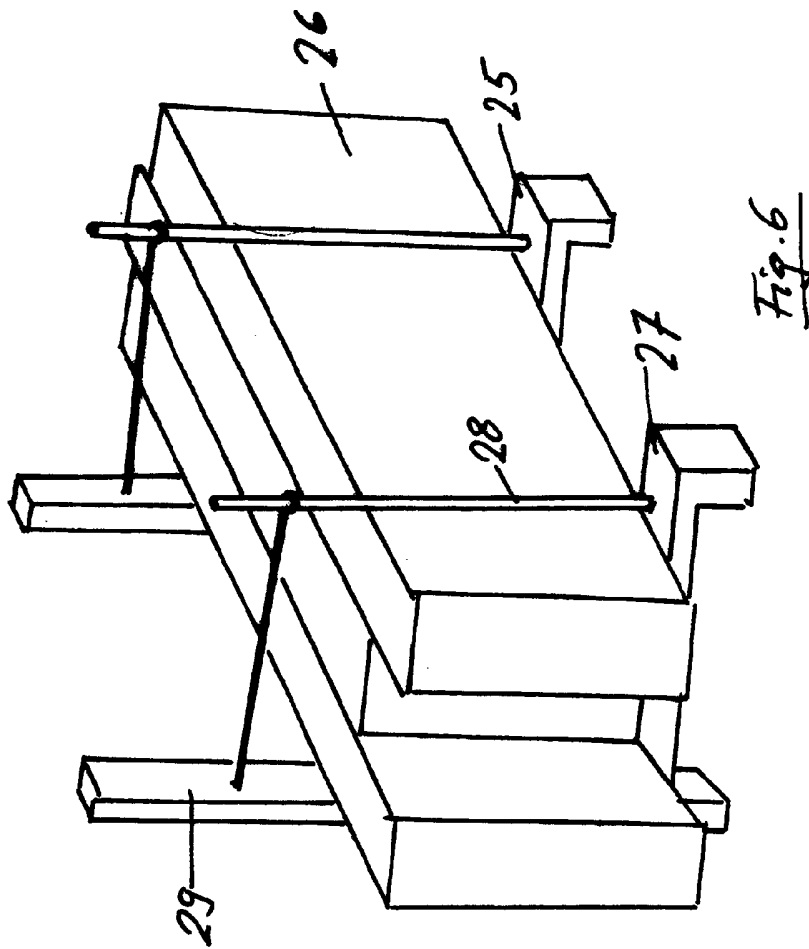
1/26



2/26



3/26



4/26

Fig. 8

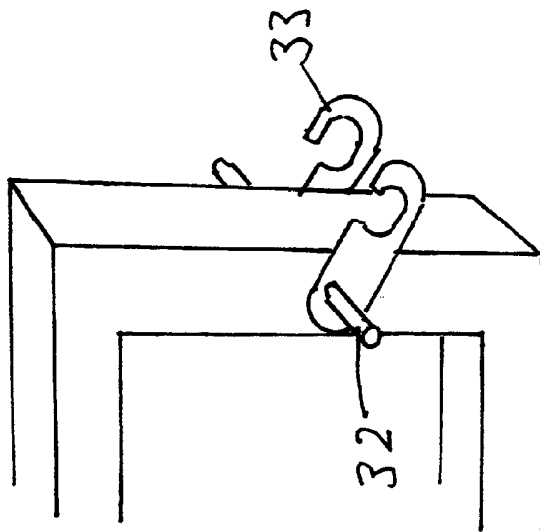
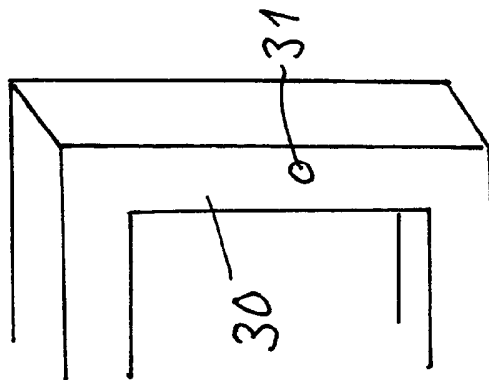


Fig. 7



5/26

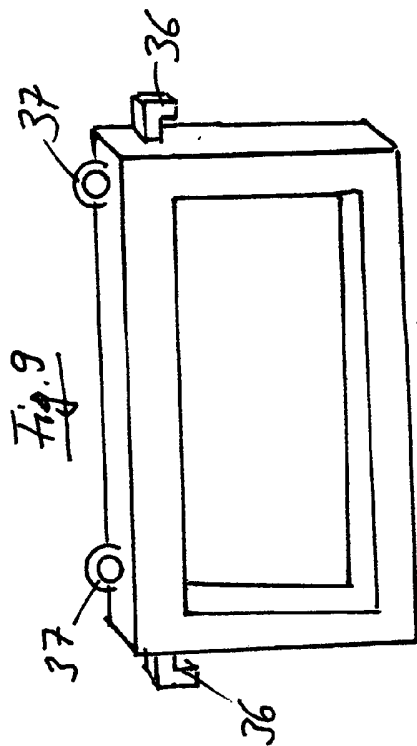
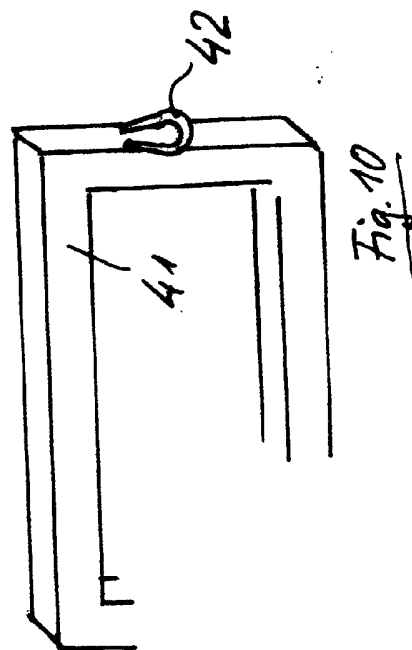
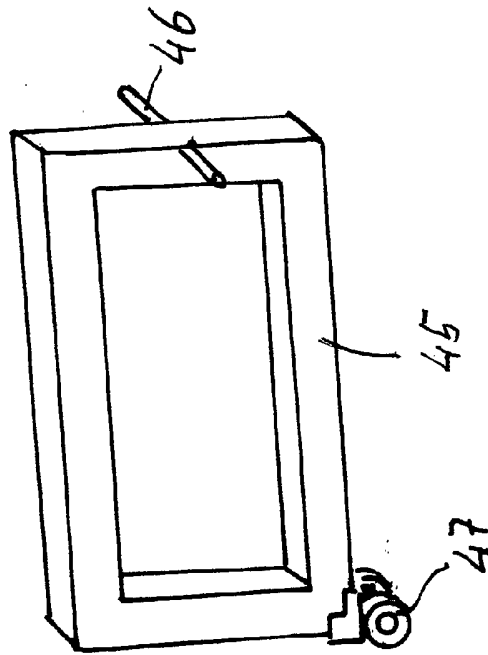
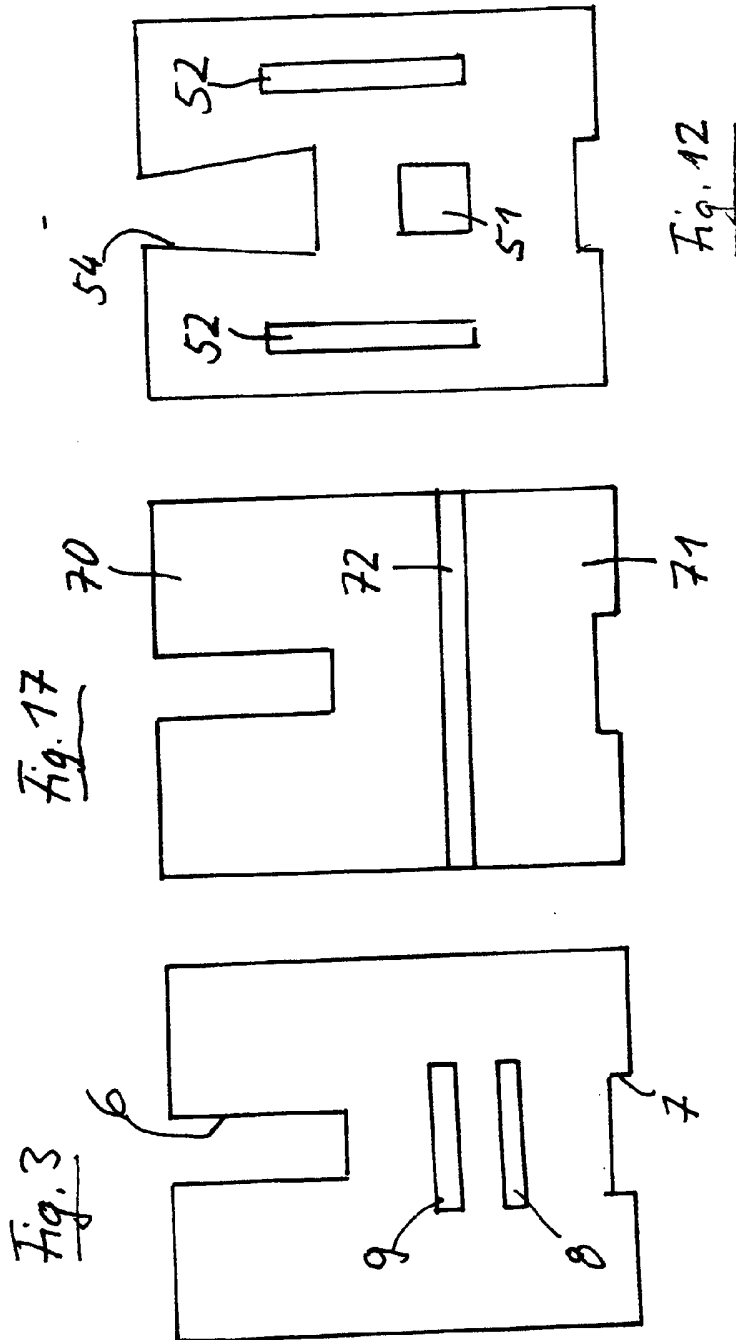


Fig. 11



6/26



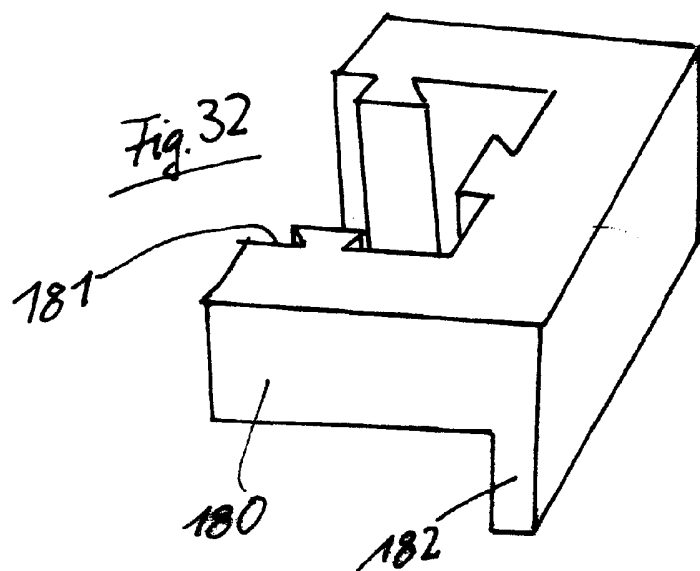
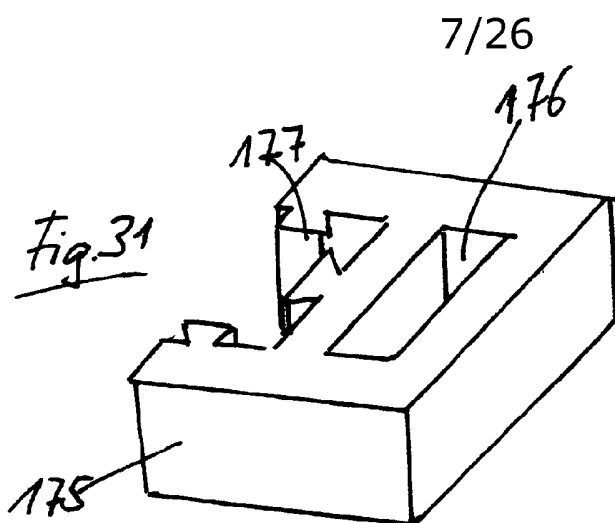


Fig. 39

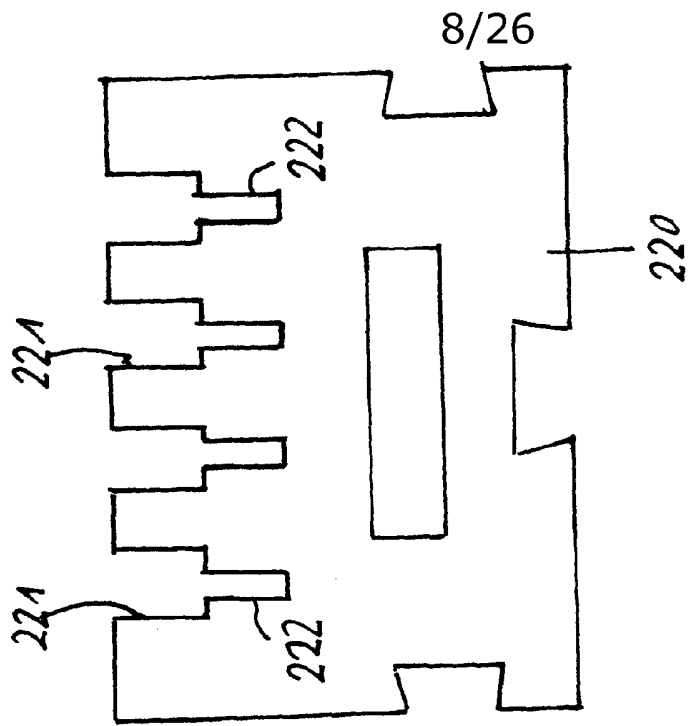
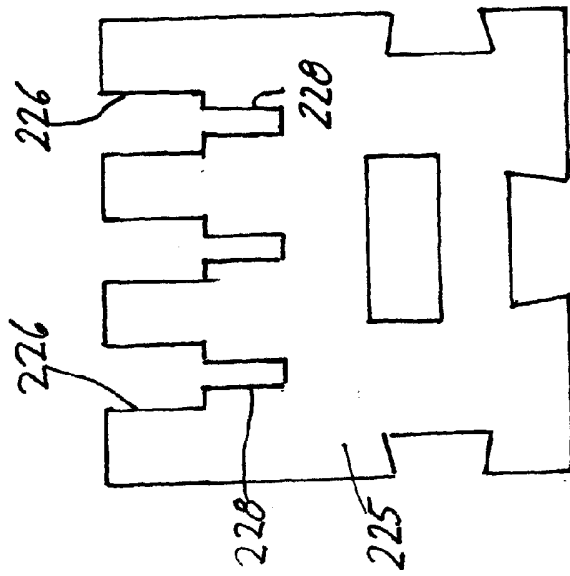
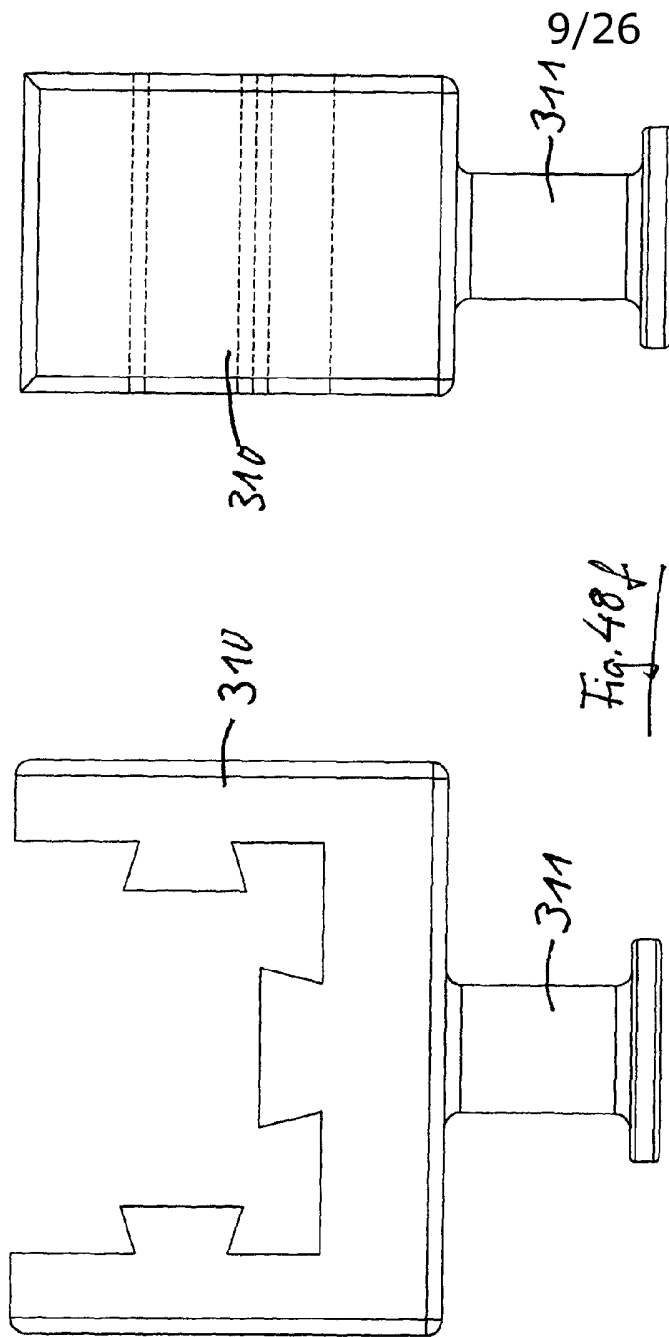


Fig. 40





10/26

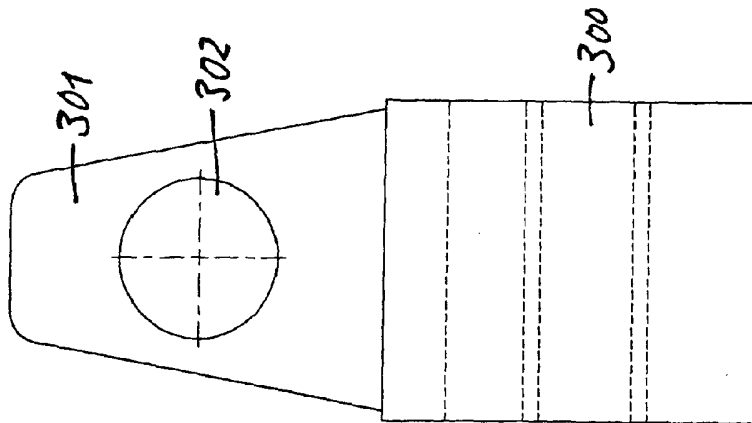
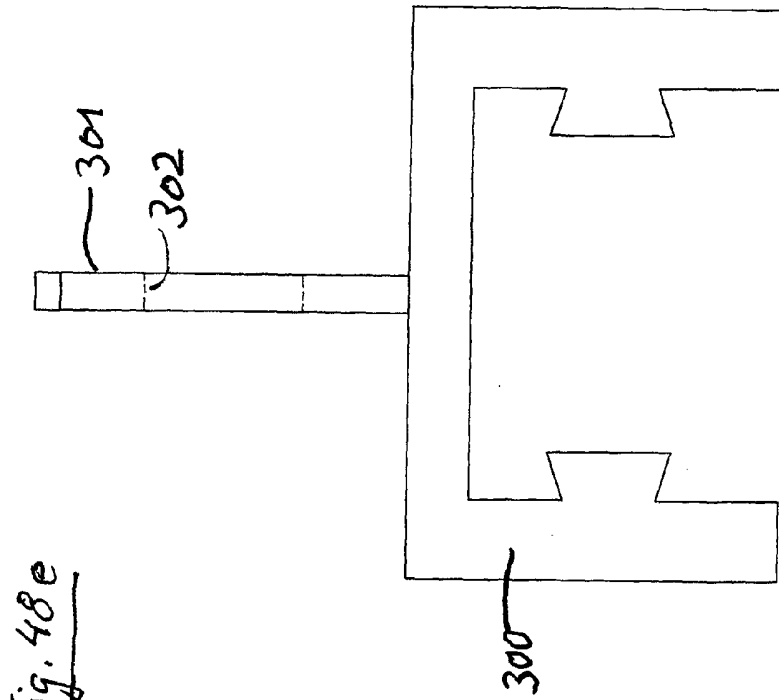
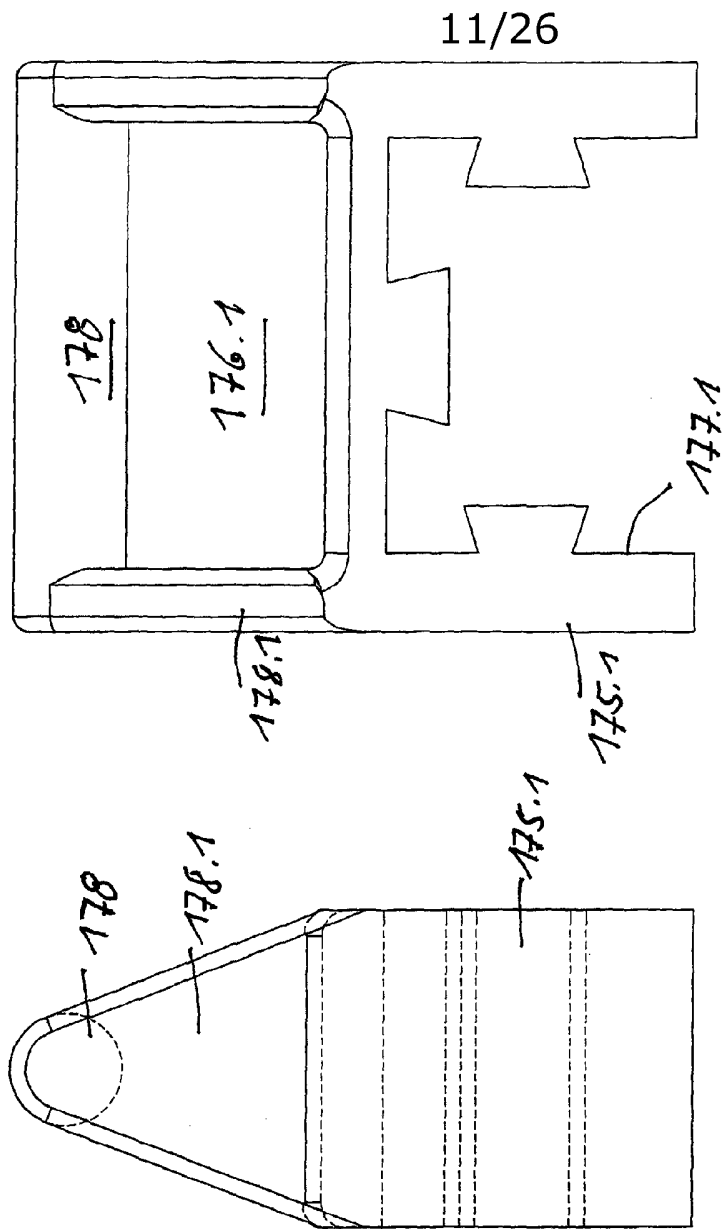
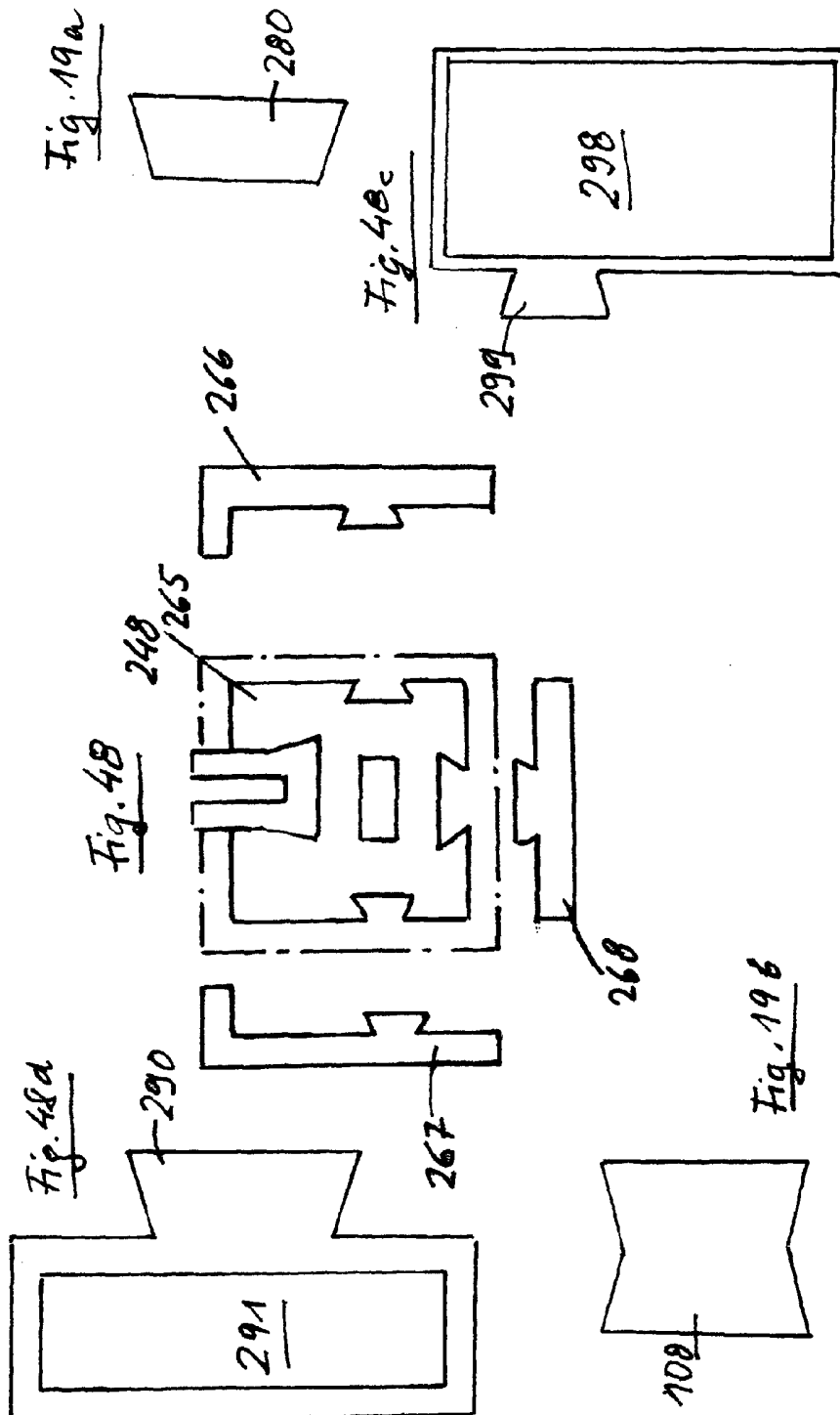


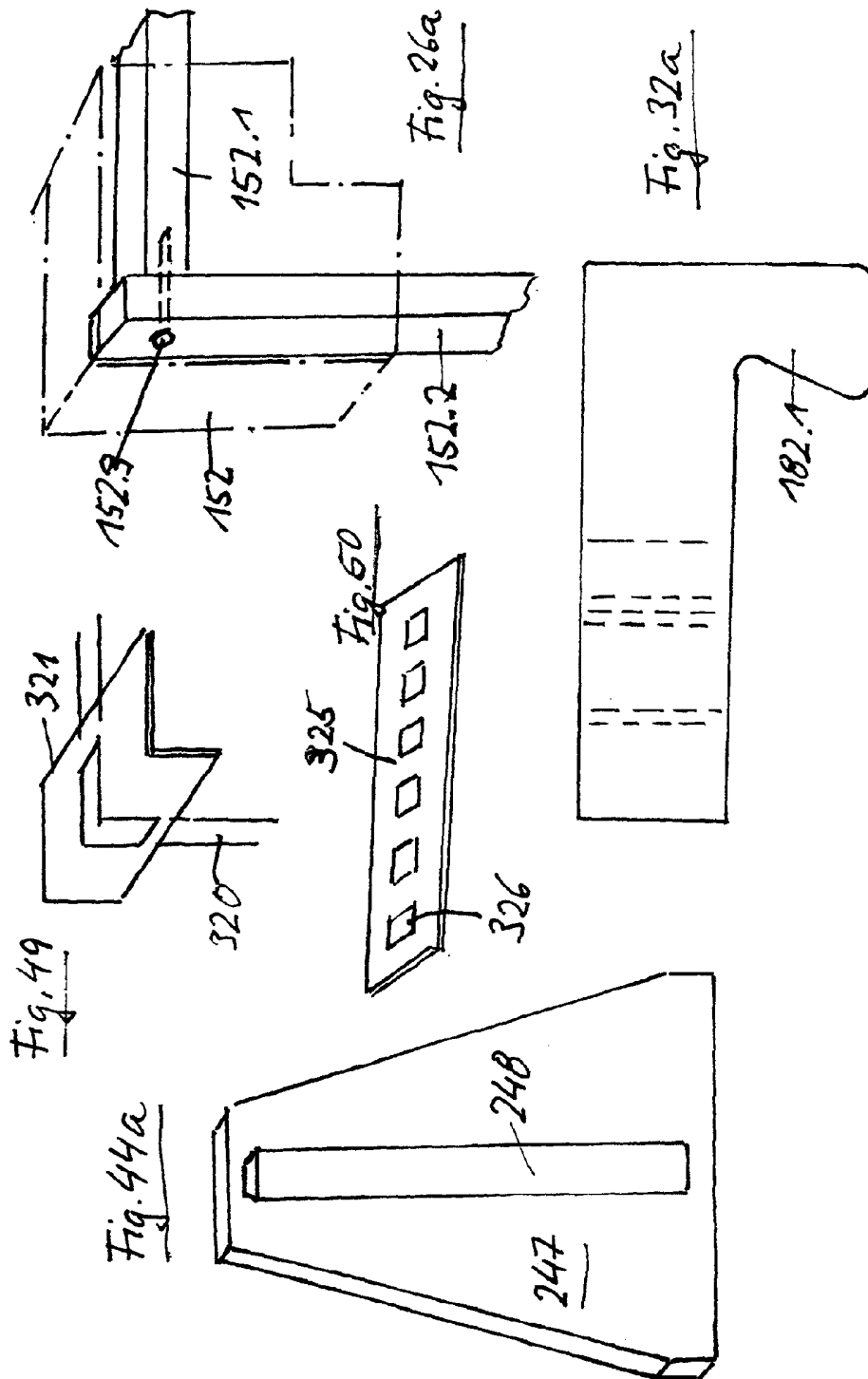
Fig. 31a



12/26



13/26



14/26

Fig. 48B

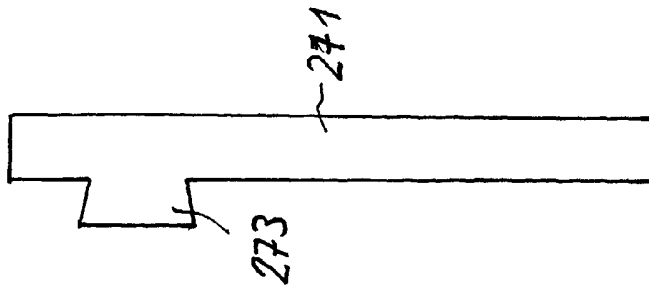


Fig. 48a

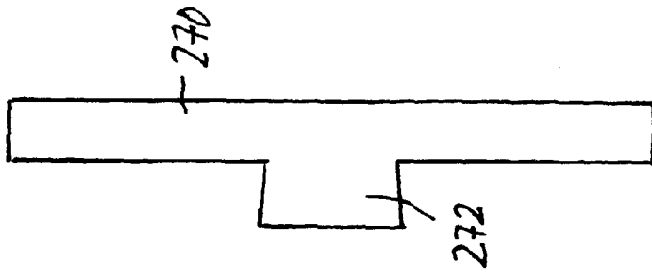
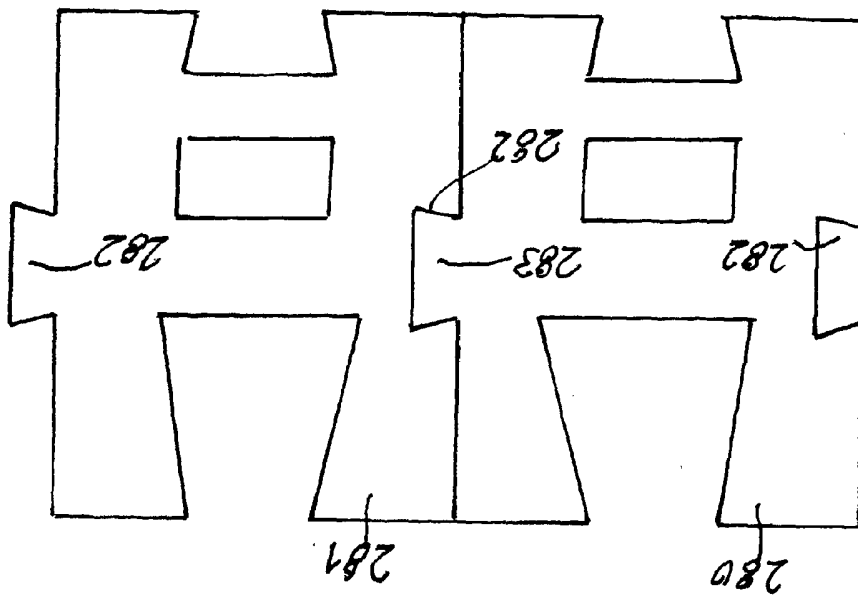


Fig. 19f



15/26

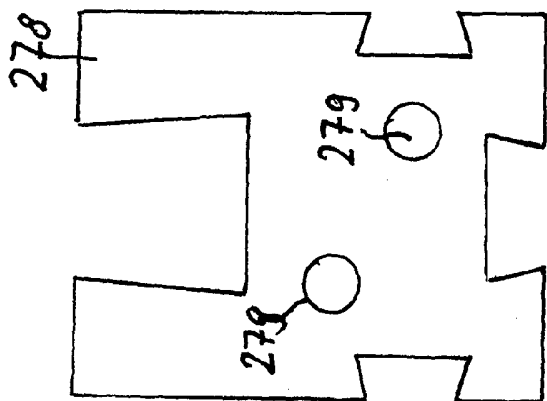


Fig. 19d

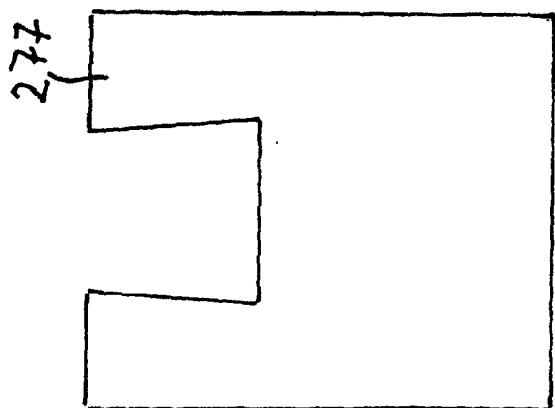


Fig. 19e

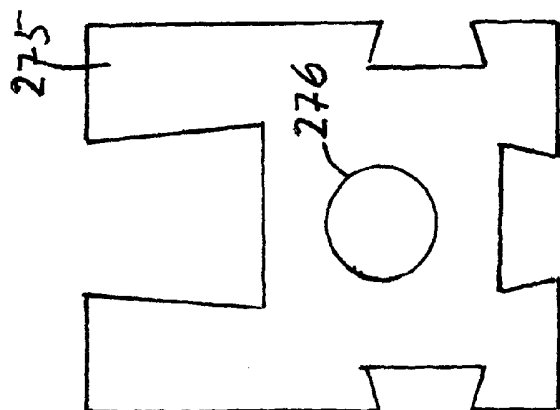
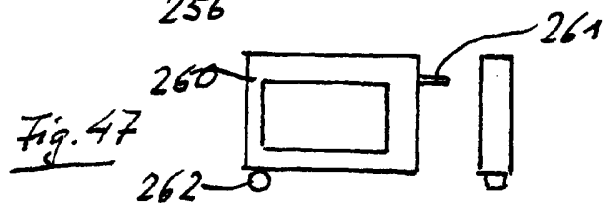
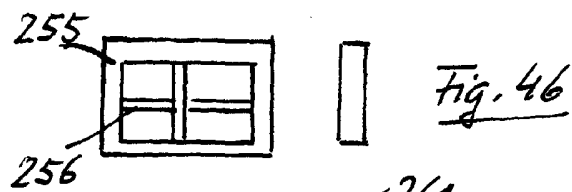
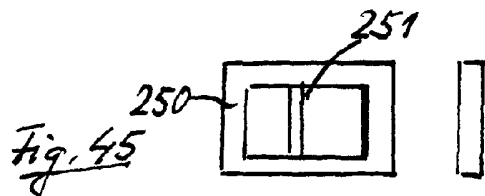
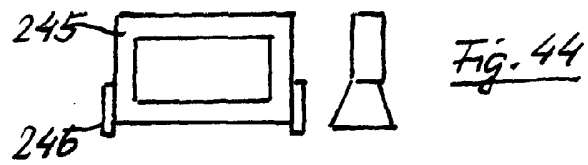
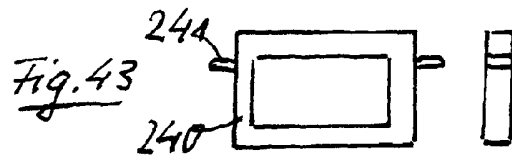
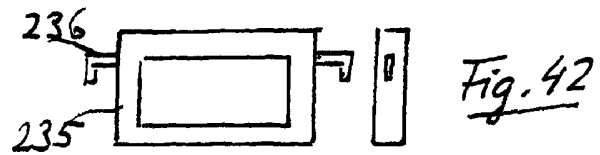
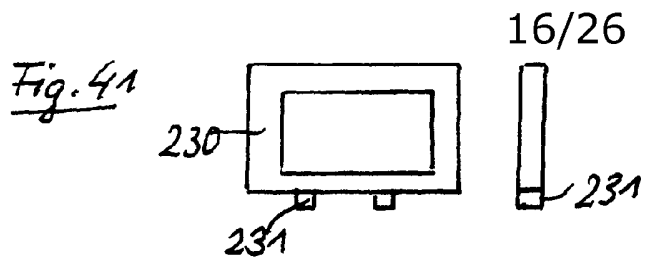


Fig. 19c



17/26

Fig. 37

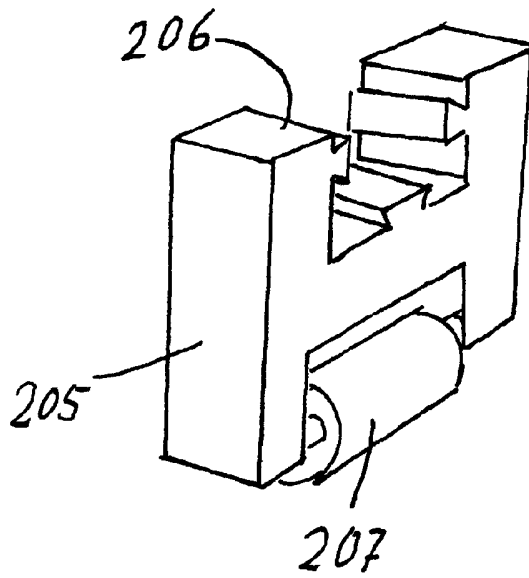
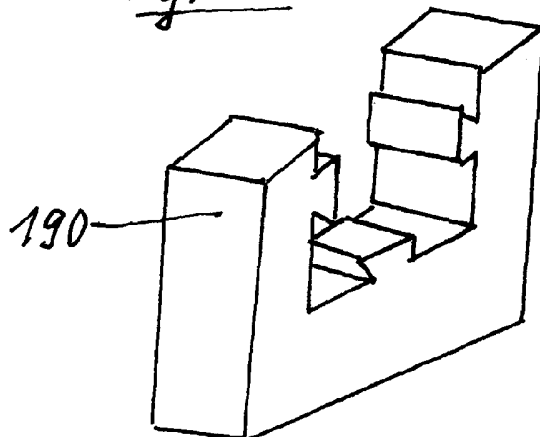
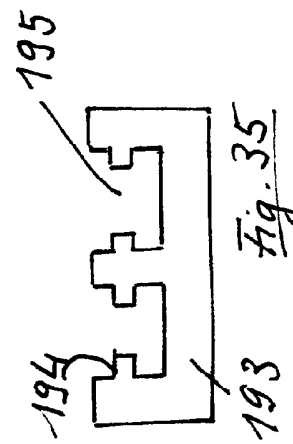
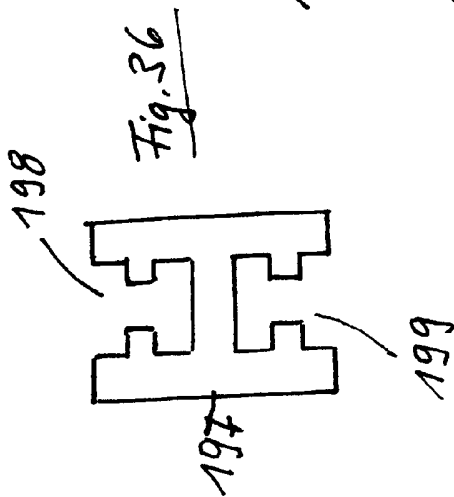
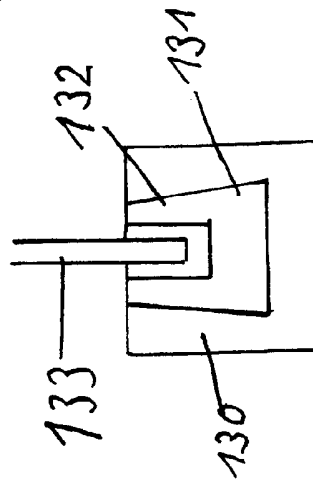
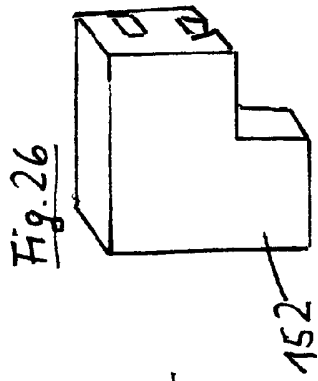
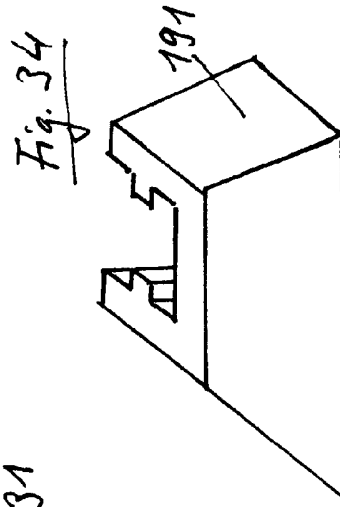
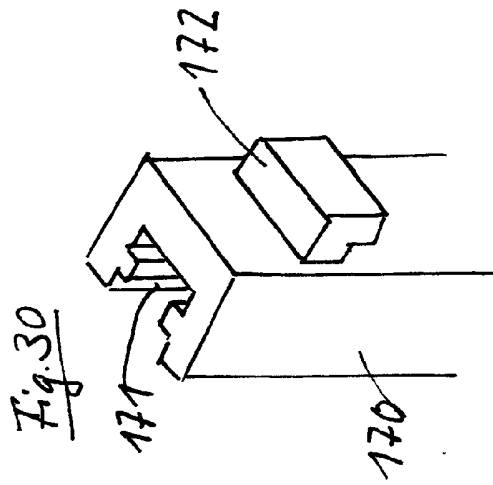


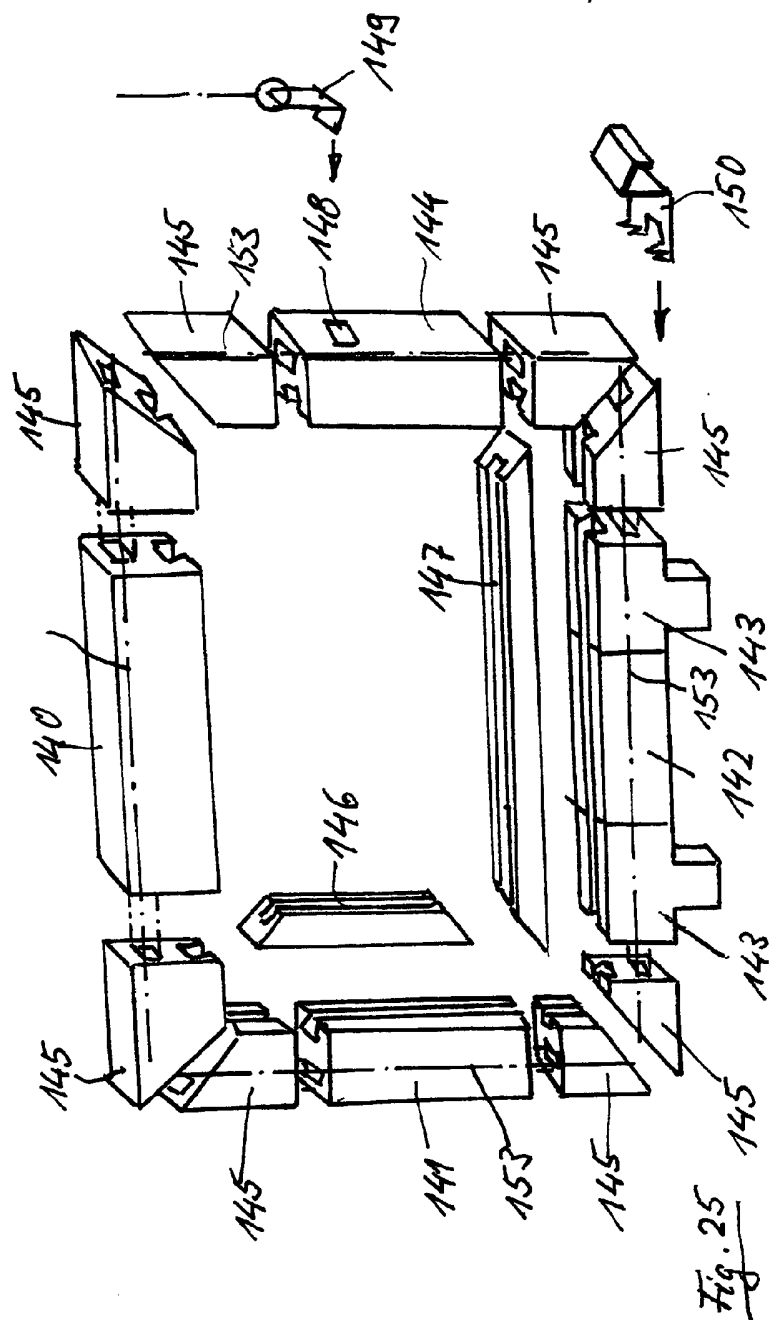
Fig. 33



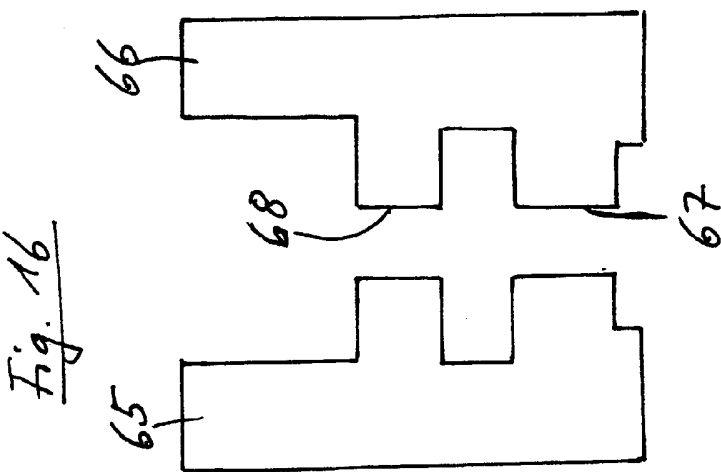
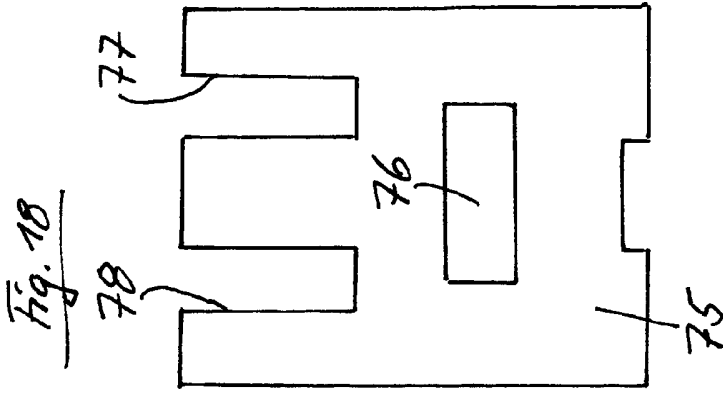
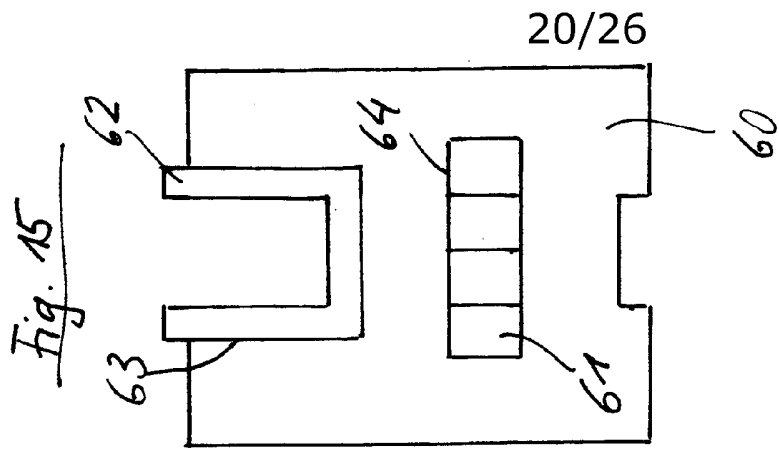
18/26



19/26



20/26



21/26

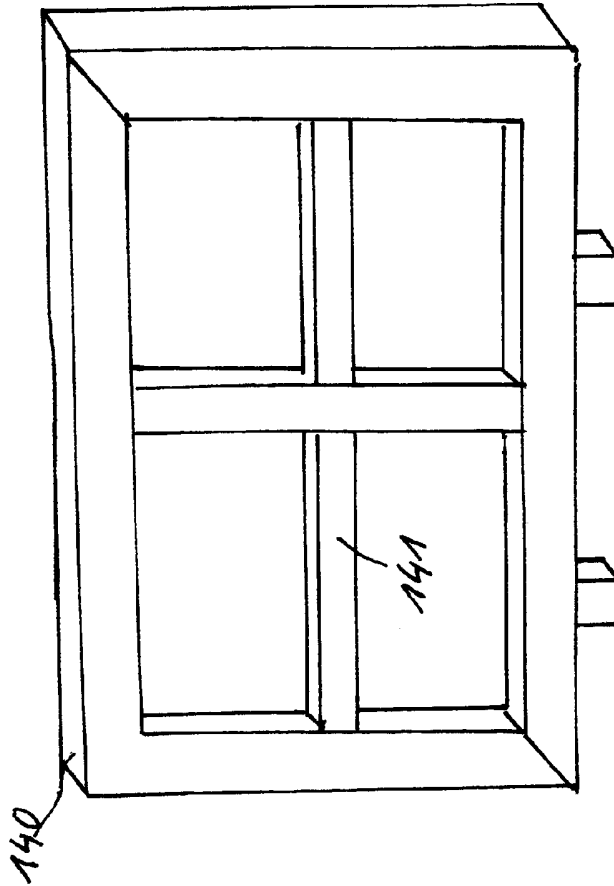


Fig. 24

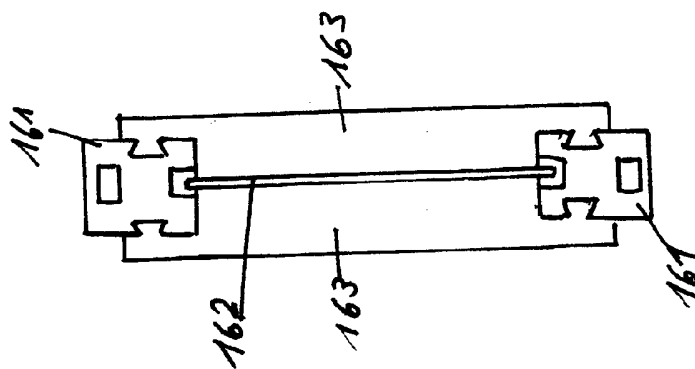
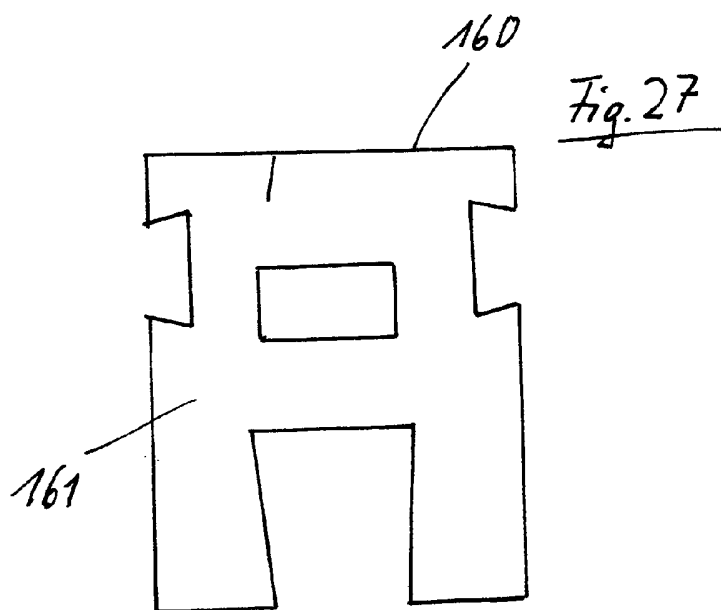
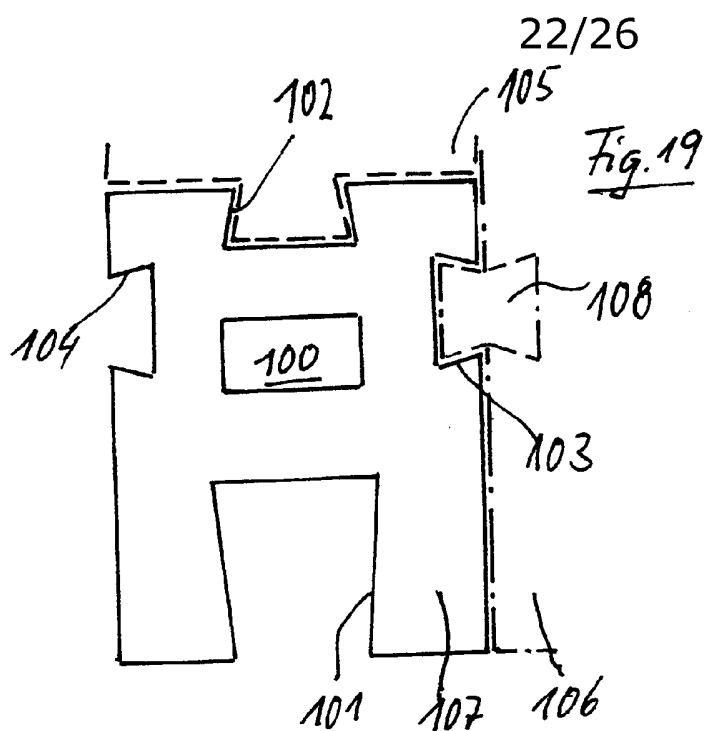
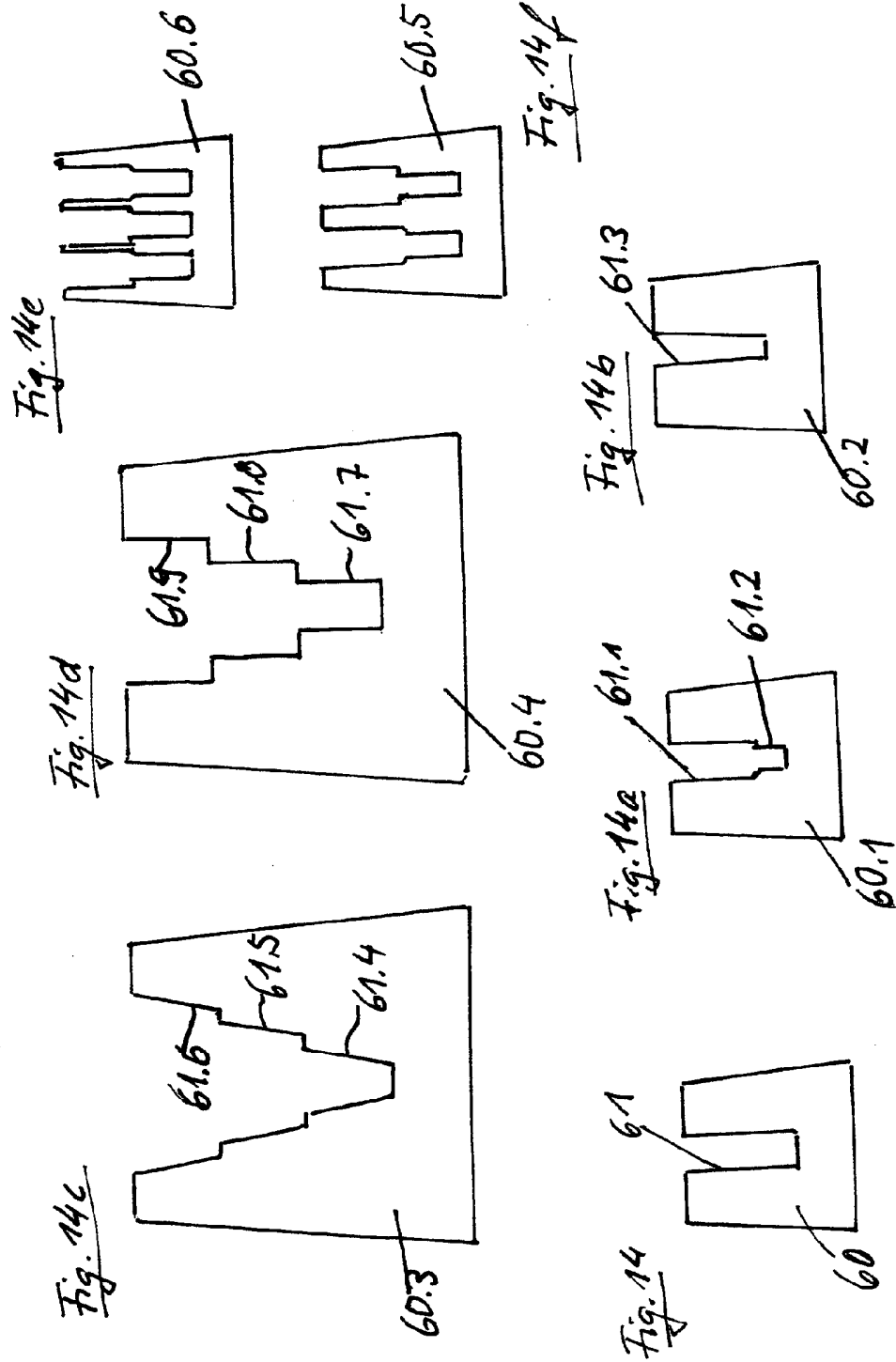
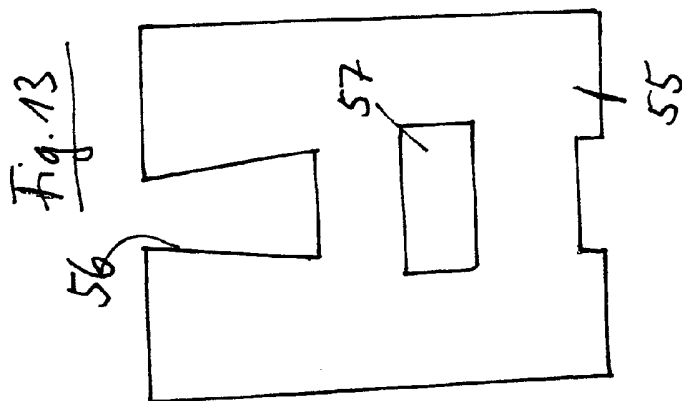
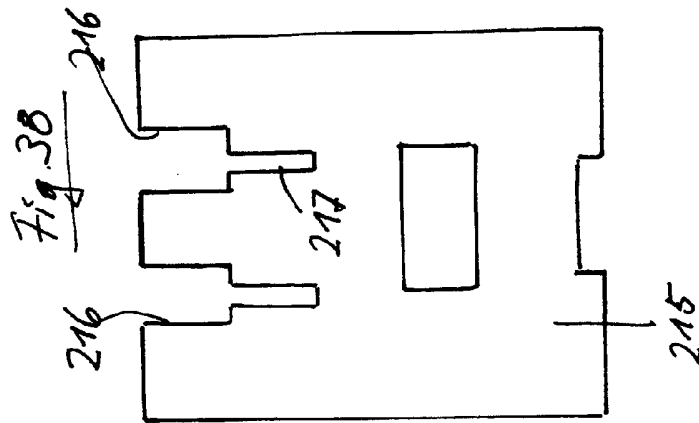
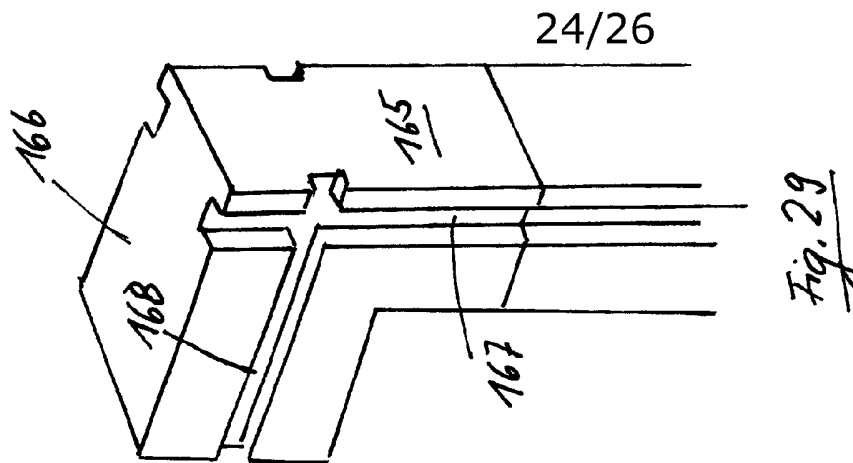


Fig. 28

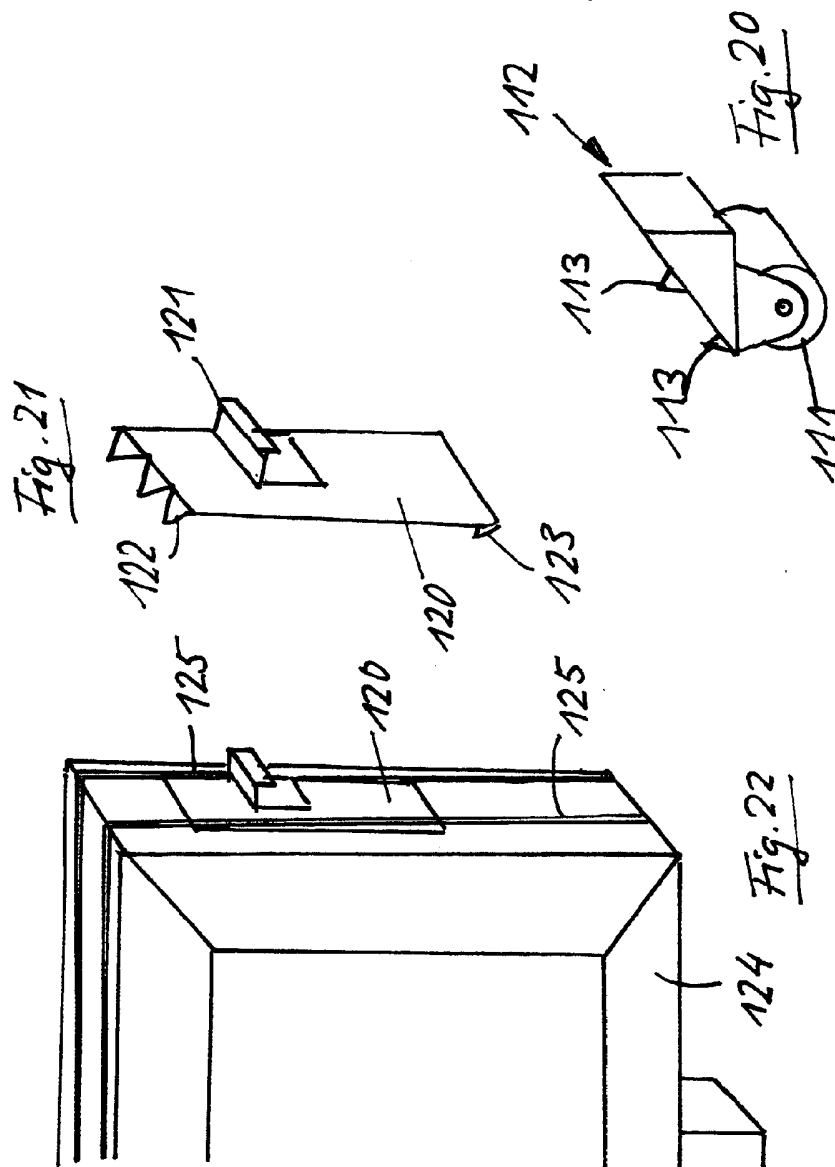


23/26





25/26



26/26

Fig. 53

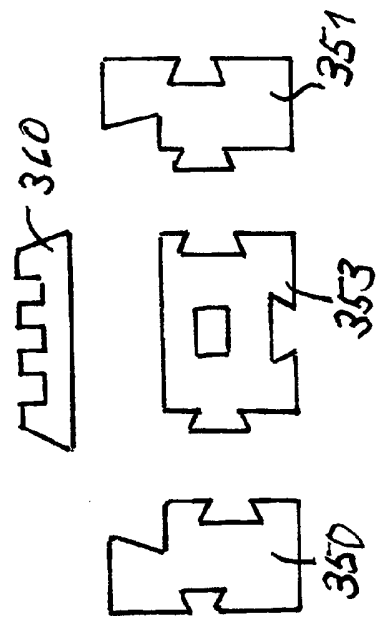


Fig. 54

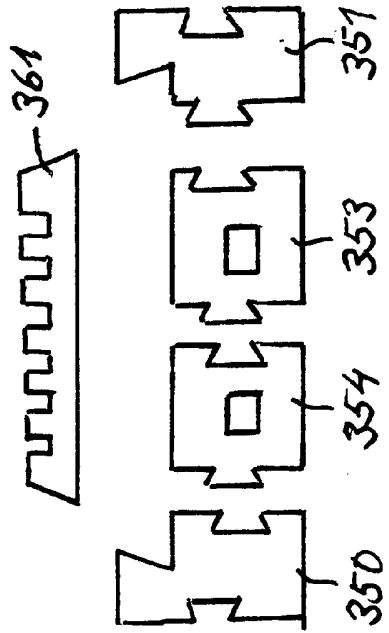


Fig. 52

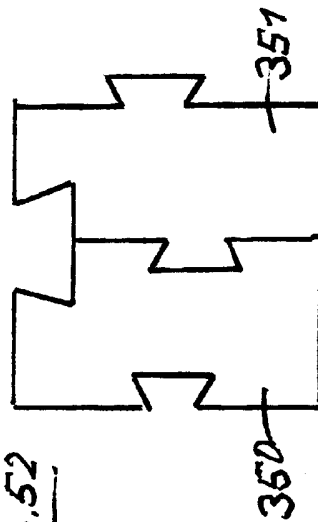


Fig. 51

