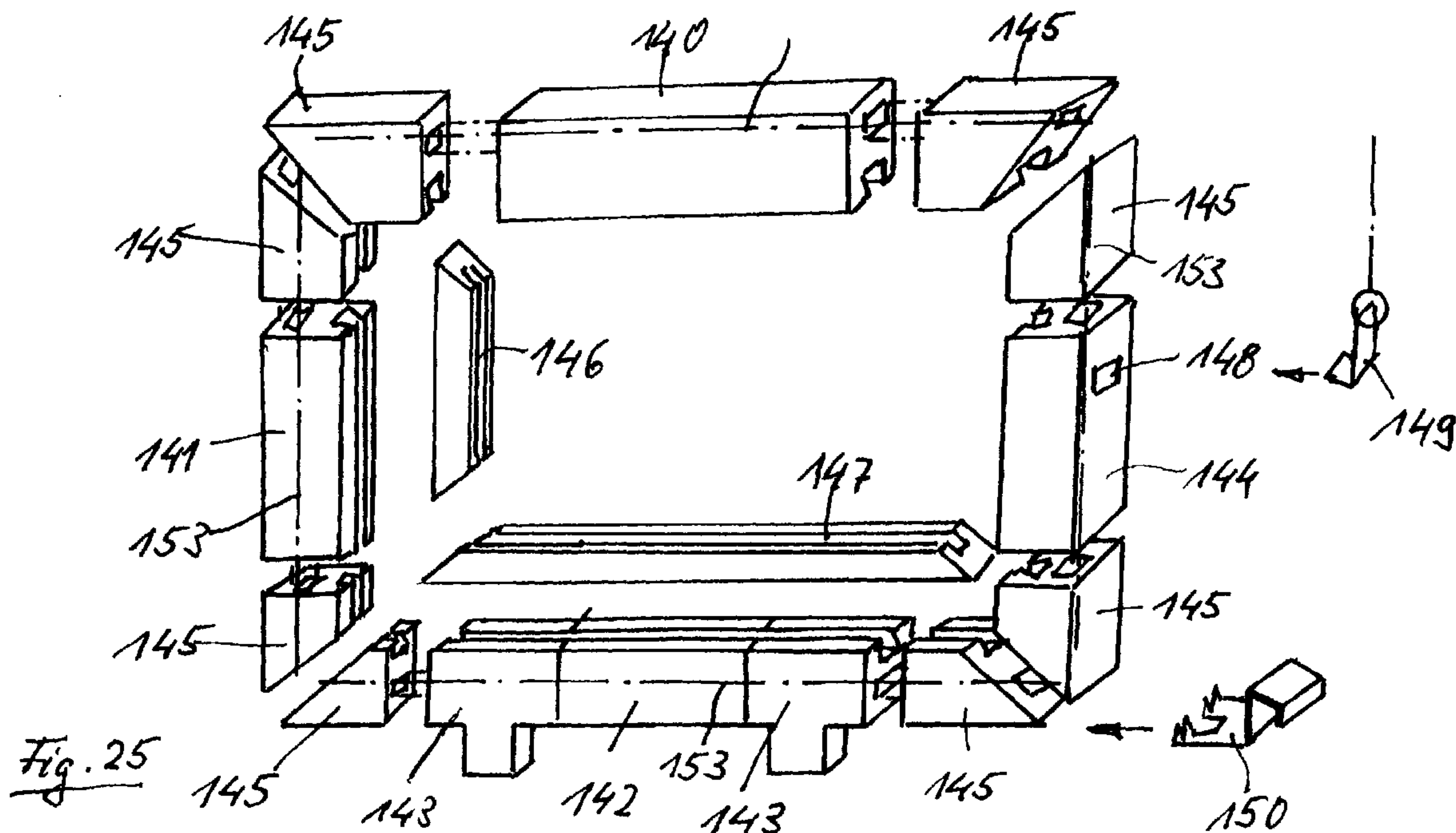




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(71) **Demandeurs/Applicants:**
GILLER, JUTTA REGINA, DE;
CEPVENTURES INTERNATIONAL CORP., GB
(72) **Inventeur/Inventor:**
GILLER, THOMAS, DE
(74) **Agent:** MILLMAN IP INC.

(54) **Titre : EMBALLAGE POUR MARCHANDISE TRANSPORTEE AUX BORDS FRAGILES**
(54) **Title: PACKAGING FOR EDGE-SENSITIVE CARGO**



(57) **Abrégé/Abstract:**

According to the invention, edge-sensitive transported goods are provided with an edge protection that consists of at least one resilient layer and at least one reinforcement layer.



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(71) Anmelder: **GILLER, Jutta, Regina** [DE/DE]; Kölner Str. 27, 57368 Lennestadt (DE). **CEPVENTURES INTERNATIONAL CORP.** [GB/GB]; Caribbean Suite, The Valley, Britisch West Indies, TV11P (GB).

(72) Erfinder: **GILLER, Thomas**; Kölner Str. 27, 57368 Lennestadt (DE).

(74) Anwalt: **KAEWERT, Klaus**; Gänsestr. 4, 40593 Düsseldorf (DE).

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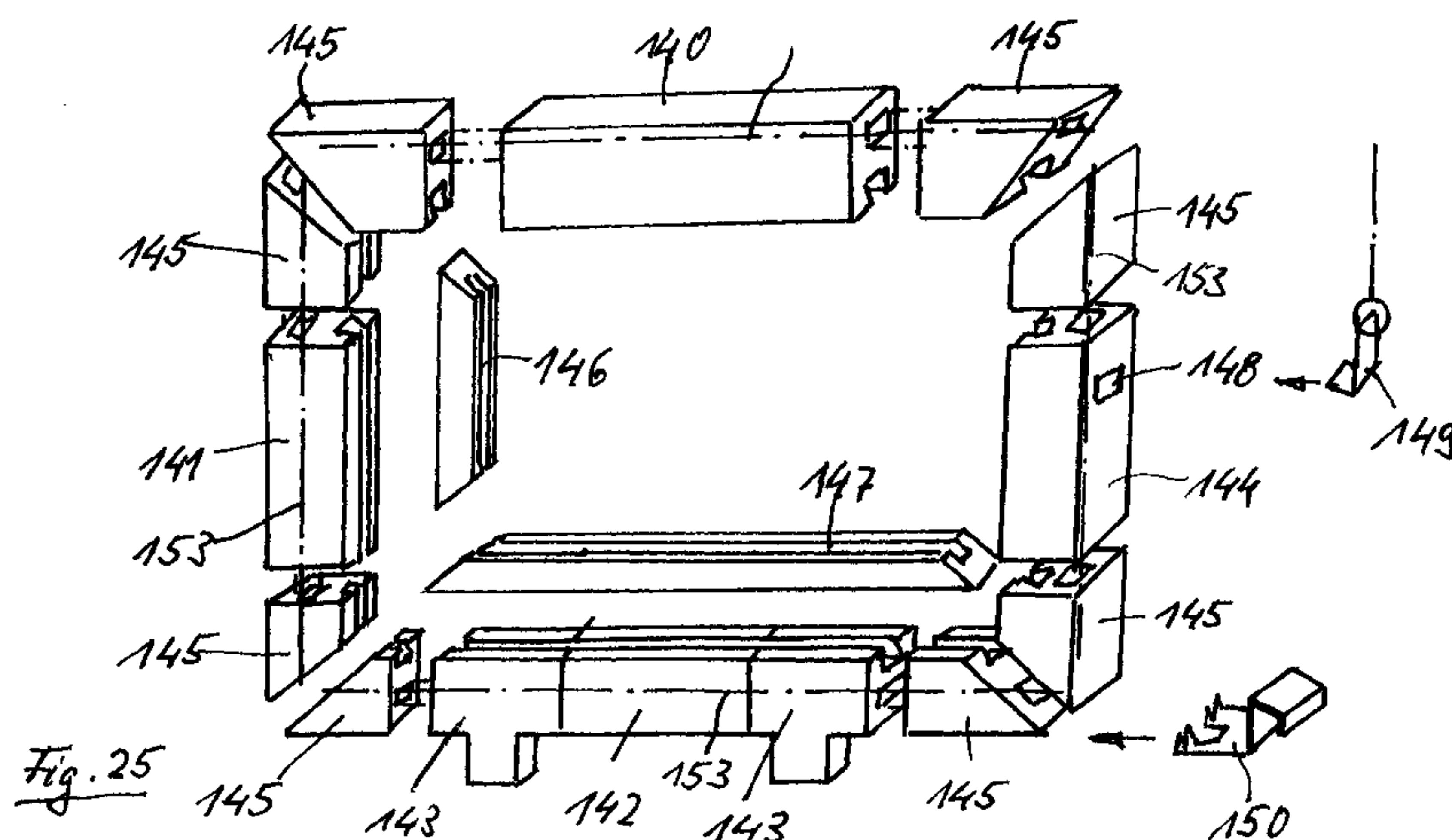
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(54) Title: PACKAGING FOR EDGE-SENSITIVE TRANSPORTED GOODS

(54) Bezeichnung : VERPACKUNG FÜR KANTENEMPFFINDLICHES TRANSPORTGUT



(57) Abstract: According to the invention, edge-sensitive transported goods are provided with an edge protection that consists of at least one resilient layer and at least one reinforcement layer.

(57) Zusammenfassung: Nach der Erfindung wird kantenempfindliches Transportgut mit einem Kantenschutz versehen, der aus mindestens einer Nachgiebigkeitsschicht und mindestens einer Verstärkungsschicht besteht.

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PACKAGING FOR EDGE-SENSITIVE CARGO

The invention relates to the packaging of edge-sensitive cargo. Such cargo includes glass-sheets, especially flat glass-sheets; even more sensitive are natural stone slabs. Even bending-
5 and impact resistant laminated glass-sheets have sensitive areas. These areas are located at the edges.

Flat glass is available in various types, for example as toughened single-pane safety glass, as laminated safety glass, as laminated glass, as multi-pane composite glass, as fire protection glass, as sun protection glass, as thermally or chemically toughened glass, as float glass, as heat
10 protection glass, as wire glass, as window glass, as cast glass, as soundproof glass, as transparent greenhouse glass. The various types of glass are largely standardized. For example, DIN 12150, DIN EN ISO 12543, DIN 1259, DIN 4102, DIN 1863, DIN 11525, DIN 11526 and DIN 52290.

Window glass is nowadays mainly produced using a float glass process, through which it achieves a high surface quality.

15 The float glass process is a continuous production process. Purified / refined molten glass is directed to a bath of molten tin. In comparison to the tin the glass has a lower specific gravity and therefore floats upon the molten tin. This produces very uniform glass with a high surface quality.

Laminated glass typically consists of at least two transparent layers, of which at least one
20 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 foil.

Such foils and the connection of the glass layers are for example described in DE1292811.

Preferably the foils used are highly tear-resistant, tough and elastic, thermoplastic foils. Such foils consist of, for example, ethylene vinyl acetate (EVA), polyacrylate (PA), polymethyl
25 methacrylate (PMMA), polyurethane (PUR), etc. PVB, TPU or similar materials can be used as well.

Instead of foil, other adhesive layers such as liquid resins might be used. Laminated glass also includes glass-sheets that are bonded to other materials, such as a transparent polycarbonate.

Glass, with comparable properties like laminated glass, usually has a substantial thickness.
30 To generate a stress-relieved state, such a glass is preferably produced stress-free or heat-treated after production. In its stress-relieved state, the glass is highly rigid and impact resistant in

comparison to other conventionally produced glass.

If an edge-protection for laminated glass is addressed in the remainder of this document, the expression “laminated glass” also includes one-piece glass with similar properties.

Laminated glass-sheets have found manifold applications. Particularly well known are the applications in construction and in automotive technology. In automotive technology, the laminated glass-sheets are also known as safety glass.

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

Laminated glass can fulfil multiple tasks. Of these, rigidity and impact resistance are only two of the possible tasks. Other possible tasks include fire protection or sound insulation.

When compared to a single-sheet, laminated glass-sheets distinguish themselves through characteristics such as a very high rigidity and a high impact resistance. Rigidity and impact resistance are not defined as absolute values, but rather as values that are sufficient for the particular 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, mirror-glass and other types of glass.

Despite its strength, the edges of glass, including laminated glass, are particularly sensitive.

Therefore it is common, not only with a simple type of glass but also with laminated glass and other types of glass, to protect glass-sheets very well, particularly for transport. Particular in construction, one cannot expect that glass be handled with extreme caution. The harsh modus operandi of the construction business is not set up for such precaution. Up until now, substantial damage to glass is a regular phenomenon in construction. Up to 10% damages is quite common and even 20% is not regarded as exceptional.

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, flexible 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.

The dimensions of glass-sheets designated for use in construction often have much larger dimensions than the glass used for motor vehicles. Therefore, it is common to transport glass-

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5 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 transported in an upright position. There are vehicles with fixed load-carriers, as can be seen from DE 20204181. Frequently, the glass is offloaded from the load-carrier at a construction site. Using a load-carrier has major drawbacks:

A vehicle that is equipped as a load-carrier is not suitable for other transports.

The vehicle must wait at the construction site until all the glass sheets are installed, or a safe interim storage for the glass-sheets must be created on site.

10 The load-carriers are rigid racks that are mountable i.e. lockable on vehicles, in which glass is secured in an upright position. The transport costs for such rack-systems are disproportionately high. In addition it must be taken into account that the racks must not only be transported to the construction site, but also need to be collected from the construction site again. Furthermore it must be taken into account that trucks commonly used for glass transport, when loaded with racks and glass, are filled nowhere near to maximum capacity. It is not uncommon to
15 see offers for glass transport, where the cost of transport is just as high as the cost of the glass itself.

A vehicle with an off loadable load-carrier is of course suitable for other tasks.

20 However, the load-carriers consume a lot of cargo space and are a great hindrance for additional cargo. The load-carrier is offloaded at the construction site. After installing the glass-sheets, the carrier must be collected again. Both issues result in high transport costs. In addition, if a load-carrier is not immediately released, this usually creates significant additional costs. If a delay in the installation of the glass-sheets occurs, a delayed release of the load-carrier is an automatic consequence. In that case, one wants to continue to store the glass on the load-carriers, because any other type of storage contains a much greater risk of damage to the glass.

25 Cargo that is only partially made of glass, encounters the same problems as described for glass sheets above. This is the case for example with photovoltaic elements/solar cells.

30 With natural stone slabs a similar situation as for glass-sheets exists. However, because of their inhomogeneity, natural stone slabs with the same thickness are even more sensitive than glass. Thin Natural stone slabs will break at the slightest bending load. Natural stone slabs are also transported to the customer placed upright in a load-carrier. In construction, natural stone slabs are often used as well, for example as floor panels and windowsills.

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However, also other cargo is easily damaged. These include for example countertops that are otherwise able to withstand considerable loads, but are highly sensitive along their sharp edges.

For much cargo, edge-sensitivity is the most frequent cause of damages.

5 This applies not only to other sheet-like cargo, but also to cuboidal cargo.

The objective of the invention is to simplify the transport of edge-sensitive cargo and/or to reduce its transportation costs, whilst at the same time preserving adequate transport protection.

This is achieved by the invention with the characteristics of the main claim. Preferred versions are the subject of the sub-claims. Essential thereby is:

- 10 a) A protection enveloping the edges
b) Made of yieldable material, in particular a yieldable foam-plastic (yielding material),
and
c) Consisting of a reinforcing material
d) Where the yieldable material is at least partially disposed between the reinforcing
15 material and the edge requiring protection.

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 pressure propagates in the direction of the edge that needs protecting, the reinforcing material causes this pressure to spread wide towards the edges through the yielding material. The pressure acting on
20 the edge requiring protection is thereby reduced to such an extent, that the edge can easily withstand the remaining pressure.

As such, an edge-protection with foam-plastic is known. The cargo is usually completely covered in plastic foam and then cased in cardboard. In this, the cardboard has a much lower resistance than the plastic foam. That is, in the packaging design the foam-plastic is the stronger
25 material/reinforcing material and the cardboard is the more yieldable material / yielding material.

The invented edge-protection is substantially better than a conventional edge-protection. According tot the invention, when compared with the reinforcement layer, the yielding layer is at least 20%, preferably at least 40%, even more preferably at least 60% and most preferably at least 80% more yieldable than the reinforcing material. The yield-ability is to be understood as the
30 measure 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 is measured when an object weighing 1kg is

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dropped with its impacting surface parallel to the impacting surface of the cube from a height of 1 cm.

A multi-layer construction with at least two layers of reinforcing material is advantageous, when a layer of yielding material is not only prevised between the reinforcing material and the edge of the cargo, but also between the two layers of reinforcing material. This positively affects the deformation characteristics of the edge-protection.

The yielding material protrudes laterally over the outer surfaces of the cargo. More preferably, the edge-protection wraps around the edges of the cargo. Most preferably, the reinforcing material protrudes laterally over the exterior surface of the cargo and/or the reinforcing material protrudes into the part of the yielding material covering the cargo.

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

Expanded plastics are preferably used as yielding materials. In the packaging industry, expanded polystyrene and polyethylene plastics are already commonly used.

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 serve as a reinforcing material, which is advantageous. Adding a propellant sets the density. Adding more propellant means a lower density making the foam more yieldable. Adding less propellant means a higher density making the foam less yieldable.

The reinforcing material can also be of an organic or inorganic nature. Organic reinforcing material can be wood. Wooden profiles represent a cost-effective solution, especially if they are straight shaped. A simple profile with a rectangular cross-section can already fulfil the required reinforcement characteristics. As straight profiles, wooden laths, or even roof-battens represent a very cost-effective solution. Inorganic reinforcing materials are for example glass fibres. The glass fibres can enclose the yielding material as a mesh fabric, to create the reinforcing material as described above.

The roof-battens are standardized according to DIN 4047-1. The standardization ensures specific dimensions of 30x50 mm or 40x60 mm. However, most of the commercially available roof battens do not adhere to this norm. These roof-battens usually deviate 1 to 2 mm or more from the norm. The greater accuracy that is provided by the DIN standard is an advantage, because there will be much less play when the reinforcement profile is slid into the yielding

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material; or vice versa, the yielding 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 yielding material consisting of an extruded polystyrene foam, have been performed without causing damage to the glass-sheet. The float glass-sheet used in the tests was 6 mm thick with a surface area of 1 square meter. The polystyrene foam was conventional, closed-cell construction foam, used for exterior insulation of buildings, with a density of 30 kg per cubic meter. Such foam consists of at least 95% closed-cells. The foam properties and in particular the yieldability can be derived from the density.

The polystyrene foam had a thickness of 100 mm. As prevised in the invention, the reinforced polystyrene foam was held in place by a strapping of 10 mm wide and 0.5 mm thick, placed around the edges of the glass-sheet.

The height of 2.5 meters from which the drop-tests were performed, was unrealistically high. Therefor the results of the tests were all the more amazing. The tests had to be stopped after the sixth consecutive drop, only because the strapping had come loose. No damage whatsoever to the glass had occurred until then.

Using the same type of edge protection with a number of straps, repeated tests at a reduced drop-height of 1 meter and using a sandstone slab with a thickness of 20 mm were also successful.

Strapping is preferred on the longitudinal sides.

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, metal profiles cause significantly higher packaging costs, so that a return of the packaging to the supplier is recommended in order to make reuse possible. The packaging costs, using an edge-protection made of particle-foam and roof-battens, are so low that disposing of the packaging can be considered instead of a return.

With curved shapes and/or complicated cross-sections, using plastic reinforcing material, in particular unexpanded plastic might be less expensive. To reduce costs, it is possible to add filling materials to the plastic and/or to use recycled material.

Wood may also be used as filling material. The wood is therefore reduced to a dimension, which makes it suitable for use in the processing equipment of the plastic. In the mix with plastic,

the filling material represents a proportion of at least 50 wt%, even more preferably at least 60%, and most preferably a proportion of at least 70 wt%. As a plastic, a polyolefin such as polyethylene or polystyrene is preferably used.

Extrusion equipment is particularly suitable to process the plastic with filling material.

5 The plastic is mixed, together with the filling material and other additive, in the extrusion equipment. The plastic is melted, so that the other mixture components can be easily mixed 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.

10 The exiting material cools off and retains the desired shape. Alternatively, the melt can be injected into a mould. After the melt in the mould has cooled off, the melt maintains the shape of the mould cavity. One speaks of moulded components or manufacturing by injection moulding.

The yielding material is preferably made of expanded plastic, preferably polyolefin foam such as polystyrene foam. The foam can be a particle foam or extruded foam.

15 The particle foam (also known as bead foam) contains multiple particles (also known as beads). The particles can be produced in an autoclave. Particles are produced by polymerization of monomers, after which they are loaded with a propellant, so that the particles start to foam (expand), directly after being heated and transferred from a pressurized container into a free state. The expanded particles are filled into a mould cavity, which has the intended shape of the yielding material, as prevised for the edge-protection. Usually superheated steam is applied to the
20 particles in the mould cavity, so that the particles melt on their outer surface and start to bond or weld to the adjacent particles. The glued or welded particles then take the shape of the mould cavity. The mouldings can then be removed from the mould cavity.

25 The yielding material can also be manufactured as foam through extrusion. By heating plastic under considerable pressure, the plastic is brought into a molten liquid state. It is then mixed with additives and a propellant and, as explained above, cooled to the exit temperature, after which it is pressed through a die. When exiting the extruder, the melt goes from a high-pressure area into an ambient-pressure area. Due to the pressure drop, the propellant reacts. It expands and, simultaneously with the cooling of the melt, it forms a multitude of cells in the melt. The expansion is limited with a calibrator, which is shaped in the desired cross-sectional
30 dimensions of the foam strand.

The melt containing the propellant, can also be injected into a mould that gives the

forming foam-plastic its desired shape.

Particle foam may also be used for the production of mouldings for the yielding material. Particle foam consists of foam particles. The particles are filled under a certain pressure into a mould, which like the injection mould, has the desired shape of the plastic parts. In the mould,
5 the particles are steamed with superheated steam so that the particles melt on their outer surfaces and bond together under the existing 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 relation to the total number of cells. For yieldability reasons, it may also be advantageous to use
10 foam, which has an open-cell proportion of more than the 5% often found in conventional construction-foam. Preferably, the open-cell proportion is then 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 indicates the proportion of open cells; open cells are the cells through which entrapped gas is able to escape under stress/pressure.

15 A propellant is used to shape the cells. The propellant expands in molten/softened polystyrene, when the ambient pressure is reduced accordingly.

This takes place during extrusion when the melt, loaded with the propellant, exits the extruder in which a many times higher pressure exists than the ambient pressure.

During the production of particle foam this occurs, when the unexpanded or only slightly
20 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 construction foam is generated, or whether an open-celled foam is produced.

In today's conventional carbon dioxide-containing propellants, the proportion of
25 propellant in the mixture for the creation of construction foam is 5-8 wt%. By gradually increasing the propellant proportion, the desired open-cell proportion can be approached. The propellant that is entrapped in the closed cells of the foam does not stay there. It diffuses outwards through the cell walls, whilst ambient air diffuses inwards through the cell walls. The diffusion processes take time. Usually, the utilization of such foam products is postponed, until
30 the diffusion processes are largely completed. The open cells have holes in the cell walls through which the initially present propellant is very quickly replaced by ambient air.

However, the air that is locked-in afterwards is also pushed out of the cells by mechanical deformation of the foam when used as a yieldable layer. This better facilitates the deformation in comparison to closed-cell foam. There, the air remains locked-in and the cell walls must stretch in order to yield to the pressure.

5 Preferably, the open-cell proportion is limited to a maximum of 50%, even more preferably 60%. This means that there are still so many closed cells in the foam, that the foam quickly returns to its original shape when released.

 The yielding material and/or the reinforcing material can also be stacked in several layers. When doing so, the yielding material and/or the reinforcing material can vary from layer to layer,
10 or remain the same.

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

 An open-celled foam layer as described above has these desired damping characteristics.

 By choice, the reinforcing material can cover the yielding material, or vice versa.
20 Alternatively, the reinforcing material can protrude into the yielding material, or vice versa.

 If the packaging is produced in sections it may be advantageous, in the situation of two or more adjacent sections, to have one section hook into or connect to the other. This can also be used to connect the packaging sections in a longitudinal direction. Furthermore, it can be used to connect adjacent packaging units. The connection can be fixed or detachable.

25 The connection can be made using spigots or pins. The spigots or pins may be formed onto 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. Use of multiple pins also prevents the packaging sections from rotating against each other. Eccentric spigots or pins may also prevent rotation of
30 the packaging sections against each other. Moreover, spigots, whose cross-section differs from a circular cross-section (for example, a square cross-section), also prevent the rotation of the

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packaging sections. By creating a rotation-proof connection, the characteristics of the interconnected packing sections resemble the characteristics of a one-piece packaging section with the same length as the interconnected packaging sections.

5 This can be further achieved if the spigots and pins are fixated in the corresponding packaging sections.

This can be achieved by using bulged spigots or pins, resulting in a pressure-fit in the corresponding packaging sections. Optionally, the bulged spigots or pins can engage in the undercuts of the recesses in the corresponding packaging sections.

10 In the above version, it is advantageous if the edge of the cargo that needs to be protected is first covered with yielding 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 yielding material can simultaneously wrap around each other, or interlock with one another. The cross-section of the yielding material is preferably formed as a symmetric profile body, which contains at least one reinforcing profile in an opening. Optionally, two reinforcing profiles fitting in two
15 openings are provided, positioned inside the edge-protection profile within a certain distance of each other.

Advantageously, the reinforcing profiles allow packaging profile sections made from the yielding material to be threaded onto said reinforcing profiles and connect in this manner.

Alternatively, the packaging profile sections may also be arranged behind one another and
20 the reinforcing profiles pushed through the openings in the packaging profile sections.

It is also possible to use foam-plastic for the reinforcing profiles. The required strength for the reinforcing profile is obtained by using foam-plastic that has a higher density, and/or by creating an outer skin or mantel on its surface. A skin or outer mantel is created when the outer surfaces are heated to such an extent that the foam cells closest to the surface collapse. To realize
25 this, rapid heating is an advantage. It is also advantageous for this technique when the foam-plastic has a very low thermal conductivity. After the cooling, the outer skin or mantel results in considerable stiffening of the outer surface. Cooling can be accelerated using the right aiding equipment.

Optionally and instead of creating an outer skin or mantel as above, the foam plastic
30 reinforcing profile can also be stiffened through laminating or coating. Unexpanded foils or textiles are suitable to use as a coating. Foils and textiles made of plastic are favourable for use in

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laminating onto the reinforcing profiles. The invention considers both welding and gluing as a laminating process. However, metallic foils can also be laminated onto foam-plastic profiles. An adhesive may be used to bond the metal with the foam-plastic. For details concerning laminating processes, a reference is made to the following publications:

5 DE602004013008, DE202010008929, DE202010008532, DE20200900339,
 DE20200900692, DE202008017621, DE2020080016r847, DE202008013755,
 DE2020080 12066, DE202008004965, DE2020070 1806r4, DE2020060 17392,
 DE1020111199668, DE102011100025, DE102010053740, DE 102020050874,
 DE102010030310, DE102009046413, DE1020090141574.

10 Plastic foam, with a strong outer layer and the same yieldability as the yielding material, can become a reinforcing material in itself.

Plastic foam, with a strong outer layer and the same yieldability as the yielding material, can become a reinforcing material in itself. The foam-plastic, as prevised for the yielding material, can for example be polystyrene foam with a density of 25 to 40 kg per cubic meter. The
 15 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 could be more than 10%, preferably at least 20% and even more preferably at least 30% open celled, based on the number of cells.

Preferably, the packaging covers the protected edge of the cargo in a U-shape, so that the
 20 invented edge-protection not only absorbs forces that occur in the plane of the disc-shaped cargo (for example glass), but also absorbs forces exerted diagonally thereto.

To withstand the forces that occur diagonally to the plane of the disc shaped cargo, the reinforcing material may have the same or a similar shape as the packaging.

The invention has recognized that adequate protection is already achieved when the
 25 reinforcing material is positioned crosswise to the disc-shaped cargo and extends beyond the cargo, whilst staying connected to the cargo through the yielding material.

In this sense, wooden profiles that have a rectangular cross-section (roof battens with a cross-section of 30 x 50mm or 40 x 60mm) may be sufficient for the invented edge-protection. At the same time, the desired connection between the yielding material/foam and the reinforcing
 30 material/wood is preferably achieved by embedding the wood profiles/reinforcing material in the yielding material. In this, the yielding material can act as the part that encloses the edge that the

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packaging needs to protect.

The reinforcing material may be connected to the yielding material in a fixed manner. As with the above mentioned wooden profile, it, or a reinforcing profile made from an organic or inorganic or a plastic or metal material, can also be seated loosely inside the packaging.

5 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. Preferably, the alternative reinforcement is realized through the already described process of creating an outer skin and/or lamination using foils and/or textiles.

10 The scope of the invention also foresees that reinforcement is realized by wrapping the yielding material in foils or textiles.

Optionally, the yielding material and/or the reinforcing material can be composed of different parts. This has already been described for various materials that can be used to create the reinforcing material. However, the yielding material may be composed of separate parts as well.

15 A design with multiple parts can be used, regardless of the materials used. The design consisting of multiple parts can be used to combine different kind of materials, or in order to gain economies of scale.

With large series, economies of scale will be achieved when the edge protection is manufactured in one piece.

20 With smaller series, economies of scale are realized when, for example, in creating the edge protection, profiles of a different widths/thicknesses/heights are connected together. Preferably the same profiles are used in combination with adapter pieces that fill out the difference in width/thickness/height.

25 Advantageously, the system can be applied using different cross-sections, such as round-, angular-, and rectangular-, square-, and other triangular-, angular, and polygonal cross-sections. Alternatively, the system is also applicable to individual profile-sections. Each profile cross-section can be put together using several profiles. In this case, the profiles of which the ends show a cross-section can be referred to as side-profiles and the profiles forming the fitting pieces between the side-profiles are referred to as centre-profiles.

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

This allows identical or different side-profiles (profiles that in the packaging constitute at

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least one outer side) to be used with identical or different centre-profiles. The centre-profiles can be identical too and still be combined with different side-profiles to create a complete profile.

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

As required, the different profiles are connected together in a permanent or detachable way. Preferably, welding or gluing is used to create the permanent connection. Preferably, pushing the profiles into each other creates the detachable connection.

Applying this technique to foam profiles means that welding or gluing connects the initial starting profiles to form an overall final profile that serves as an edge-protection.

When welding, the welding surfaces must be melted. When melting of foam surfaces takes place, it has to be taken into account that, depending on the duration of the process, more or less cells will collapse at the welded surface and therefore a reduction in thickness must be taken into account.

The reduction in thickness is compensated by using thicker start profiles, so that the resulting overall profiles obtain the desired dimensions. The correct initial dimension can be determined with only a few tries. The necessary heating of the welding-surfaces is 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 surfaces that are positioned awkwardly can be easily reached.

When gluing the start profiles, various adhesives can be used.

With adhesives, including hot melt adhesives, melting of the adhesive/connecting surfaces of the start profiles is prevented, as long as the application temperature of the adhesive remains below the melting temperature of the yielding material.

Particularly large adhesive-strength can 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 materials that are difficult or impossible to weld, can still be joined together.

This is for example the case when plastic needs to be connected with metal. It increases the freedom of design.

Another example concerns the adaption of the edge-protection to accommodate different thicknesses of the disc-shaped cargo (for example glass). Optionally, a recess in the edge-protection is provided for perceivably the largest thicknesses of cargo that requires protection, so

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it can envelop the edge of the cargo that needs to be protected.

Optionally, an insert in the recess for the edge that needs to be protected (for example, the glass edge) is prevised for thinner cargo. The insert fills out the recess in such a way that the edge-protection may be placed tightly over the edge of the disc-shaped cargo, or vice versa, the disc-shaped cargo can be inserted tightly into the recess of the edge-protection.

Optionally, the recess in the edge protection that holds the edge is created in a stepped manner. The opening in the edge-protection tapers, from it's widest, by at least one additional step, so that the recess can at it's widest accommodate, for example, glass-sheets with a thickness of 8 mm, whereas the next step can accommodate a glass-sheet with a thickness of 6 mm.

The reinforcing material may also be made of foam-plastic. In that situation, the foam for the reinforcing material preferably has a greater density than the foam used for the yielding material, preferably greater by at least 20%, even more preferably by at least 40%.

Optionally, the reinforcing material can also be produced by creating an outer skin or mantel on the surface of the foam yielding material as described above.

The foam used as yielding material is melted along at least one side, so that the foam collapses. The resulting outer skin is largely unexpanded and gives the edge-protection its desired strength. When using extruded foam-plastic profiles for the invented edge-protection, it is advantageous 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 yielding material that form the profile strand, may remain untreated. In the finished packaging used for disc-shaped cargo, these should at least comprise the side-surfaces and the outer-surface. On these untreated surfaces, this resulting so-called extrusion skin may already be sufficient as a reinforcement of the yielding 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 a

unexpanded skin layer.

For details on the possibilities of skin extrusion, reference is made to the following publications:

DE19849149, DE19726959, DE19726415, DE19539511, DEDE10315090, DE10251505,
5 DE10245470, DE10151334, DEDE10124061, DE10106341, DEI 0,003,808, DE2032243.

The type and thickness of the extrusion skin can be adjusted with just a few tries to match the desired reinforcement of the flexible layer. During the manufacturing of the foam-plastic, it is not necessary to take into consideration that the side of the foam-plastic profile constituting the flexible layer, has the better yieldability and must therefore be free from extrusion skin. The
10 extrusion skin can easily be removed afterwards. This is common in foam-plastic products. The extrusion skin is regularly milled and the resulting waste recycled. The invention uses or removes the material layer resulting from the extrusion as reinforcement, as required.

As long as the quantities necessary for extrusion of the invented profiles are not achieved, it might be appropriate to produce the profiles from commercially already available products,
15 such as foam-plastic sheets. In that case, a desired reinforcement can be realized by applying a skin to the desired surfaces. To achieve this, the surfaces that need to be reinforced are melted by means of required heating. This creates a reinforcing skin on the desired surfaces. The heating can be done using hot air or hot gas. Heating of the desired surfaces can also be achieved by bringing them into contact with a heated object. Suitable objects for heat transfer are for example
20 heated rollers.

To the extent that the resulting foam-plastic strand, containing grooves as described hereunder, is covered by an extrusion or subsequently applied skin, the skin may be milled in the same way as in the space prevised for holding the cargo. Instead of milling, other mechanical shaping processes to remove the surface tension such as sawing might be considered as well.

25 As an alternative to machining, the calibrator can be prevised in such a way that a groove is shaped including a surface skin, which would contribute to the reinforcement. However, this requires considerable rounding of the cross-section corners of the groove for manufacturing reasons. This rounding however, can be used as an extra advantage in that it increases the tear-resistance of the groove in the foam-plastic strand.

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

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positively contributing to the reinforcement.

Instead of or in addition to the extruded foam-plastic strands as described above, the foam-plastic strands/profiles can also be made of particle foam. Particle foam results when 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 through polymerization of suspended plastic monomers by applying pressure and heat.

Thereby the particles agglomerate. At the same time or later, the particles are loaded with propellant so that the particles, upon exiting the autoclave, foam (expand) into foam-plastic particles. These particles are available in large quantities. One of the major suppliers, BASF, offers the particles in various grades and dimensions, amongst others under the well-known brand Styropor.

In one variation, the finished particles connect together in high-volume moulding machines, to form blocks. This is done through steaming, using superheated steam.

The heated steam causes the particle-surface to melt. Simultaneously applied pressure welds the particles into blocks. If the applied pressure and/or temperature in the welding process is too low, it usually still makes the particles stick to one another. Customarily the resulting blocks are cut into sheets, which are used for insulation purposes in construction. Generally, the blocks 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 the 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, by heating the desired surface areas of the mould. 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 realized 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.

Preferably, cutting of at least the extruded sheets, more preferably also of the particle foam sheets and most preferably also of blocks of foam-plastic, is achieved by using a heating-wire. The heating-wire is preferably electrically heated to a level where the foam-plastic will melt upon contact. This process can be used for cutting foam-plastic.

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For details reference is made to the following publications:

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

This cutting technology can also be used for the cutting of blocks into sheets and/or to cut
5 strands from the sheets as described above. However, the cutting technique is relatively slow
compared to cutting through sawing.

The invention uses this cutting technique for the creation of an outer skin, when the
temperature of the heating-wire is increased and/or a thicker wire is used. A hotter and/or thicker
filament will melt much more material in comparison to a conventional wire-cut, so that within a
10 few tries a skin or outer skin is created, corresponding to the strength described below or
corresponding to the strength of the reference foils.

Optionally, foam-plastic strands made of particle foam, which according to the invention
are to serve as the yielding material, can also be produced in a moulding machine, also with an
outer skin. Relatively simple moulds already suffice for the foam-plastic strands. That is, the
15 moulding machine produces moulded parts that have the same shape as those created by the
above described cutting out of blocks.

For this the moulding machine has a different mould cavity in comparison to the
moulding machines used for the production of blocks of particle foam, as described above.

The cavity will be much smaller, corresponding to the desired volume of the foam-plastic
20 strands. To create an outer skin on the surface of the moulded part, the mould-surfaces are
temperature controlled in those places where the outer skin is required.

To control the temperature, the corresponding walls of the mould have cavities that allow
temperature influencing substances to flow through the walls of the moulding machine so that the
walls may be heated or cooled as required, making it possible to heat the foam particles at the
25 desired spot to such an extent that melting and outer skin formation takes place on the surface of
the moulded part whilst inside the mould.

To accelerate the cool-down of the moulded-part to its exit-temperature once the outer
skin is created, it is effective to cool the walls of the moulding machine. To realize this, coolant
can be directed into the cavities of the walls of the moulding machine.

30 For further details on the creation of outer skins or outer mantels on parts shaped out of
particle foam in moulding machines, reference is made to the following publications:

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DE10247190, DE10247190, DE10226202, DE3022017.

In all the procedures described above, the objective is to create an outer skin or mantel, which preferably results in at least the same reinforcement as with an unexpanded foil of 0.3 mm thickness (reference-foil thickness) that consists of the same plastic as the yielding material. Even
5 more preferred is a reference-foil thickness of at least 0.6 mm and most preferably a thickness is prevised of at least 0.9 mm.

By combining it with an additional foam layer, the reinforcing-skin produced by the outer skin formation can be positioned to be on the inside of the edge-protection.

Again, welding or gluing can be used to create the desired connection. The stability of the edge-
10 protection may require the creation of an outer skin on at least two opposite surfaces of the foam layer. The greater the distance between the two opposite reinforcing-skins, the greater the resistance behaviour against bending.

However, the additional foam layer, arranged to be positioned on the inside of a skin/layer formation, can also be placed loosely against the skin. This is for example the case when the
15 above-described insert (to accommodate different edges that need to be protected) is simultaneously used as such a foam layer. For this, it is advantageous, when a U-shaped foam layer encases the insert.

Alternatively, the foamed-plastic can be given its desired strengthening-skin using a laminated foil or fabric. To laminate the foil or fabric, the proposals for creating an outer skin or
20 mantel as described above apply accordingly. That is, foil or textile laminations are advantageous, preferably on two opposite surfaces. An inner layer, made of a foil or fabric, can also be produced with the help of a further foam layer. The inner layer is formed when a foil or fabric is sandwiched between two foam layers. The foil used can be an unexpanded or expanded foil. Other conditions remaining the same, if they have a higher density, the expanded foils can have
25 greater strength compared to other sections of foam-plastic.

Suitable textiles include all non-woven fabrics, woven fabrics, knitted fabrics and braided fabrics. Preferably fabrics are applied with low elongation in at least one and preferably two directions. Particularly advantageous are mesh fabrics, with threads in the fabric positioned diagonally towards each other and as straight as possible. Further advantages arise when the mesh
30 fabric is put onto the packaging in such a way, that the threads align in the principal stress

directions. The principle stress directions of a disk shaped cargo, packaged in a frame-like packaging, are viewed as being the components extending along an edge of the packaging.

The mesh fabrics are put onto the package or are lead around the package in such a way that the one threads run parallel to the longitudinal edge and the other threads run parallel to the adjacent, diagonal standing edge. Each blow to the packaging causes an indentation in the packaging. In this case, the mesh fabric absorbs a substantial part of the load and distributes the load across a large area of the packaging through the length of the threads; this distributes the impact energy over a large area, preventing a bundled load on the edge that needs to be protected.

Even if the distribution of the impact energy onto the packaging is better with laminated textiles consisting of non-straight threads, than for packaging without laminated textiles, the distribution of the impact energy with straight-threads in the mesh fabric is significantly better again than with non-straight-threaded fabrics.

The invented edge-protection is used as a frame around the disc-shaped cargo that needs to be protected, for example the glass-sheet. It is possible to assemble the circumferential edge-protection in sections. For straight edges, uniform profiles can be used as edge-protection, cut to length from one initial profile as required. The required quantity is obtained from the lengths of the straight edges of the cargo, for example a glass-sheet. If required, the edge-protection sections for straight edges can be combined with edge-protection sections for curved edges.

The curved edge-protection sections can be produced in smaller numbers as special production; with greater numbers it will be worth it to produce the invented edge-protection directly with the integrated appropriate curvature.

The length of the sections of the edge-protection depends on,

a) Whether, for cargo such as a glass sheet, the sections at the corners of the edge-protection directly abut one another, whilst spanning the edge requiring protection from one corner to the other as one single profile, whereby a difference must also be made between corners where the edge-protection is jointed in a blunt manner and corners where the edge-protection is mitre jointed or,

b) Whether the sections at the corners of the edge-protection for the cargo abut against a corner piece, whilst spanning the total length of the edge that needs to be protected between the corners, from corner piece to corner piece as a single profile or

c) Whether the sections in a) and b) are divided into further sections. This may be referred to as a modular concept, in which the modules can be combined with each other in any way and, where appropriate, with adapter pieces.

The length of the sections has a significant influence on the nature and scope of the production. The more production by the piece is required, the more complex the production will be. The invention makes a distinction between the corners and the area between the corners. In the case of a modular composition of the packaging according to the above variant c), the aim is to compose the packaging between two corners/corner-pieces of as many equal sections as possible.

Equal and differing corner pieces can be applied. The corner pieces can enclose a straight angle or any other angle between them. The corner pieces might also have legs of different length. The corner pieces may also form the connection for differently shaped packaging pieces, for example for curved and straight packaging pieces/sections.

Based on a single packaging for a rectangular-shaped disc form, there are two sides of equal width and the two sides of equal length may be composed using the width-sides added to which is an additional fitting piece. The length of the fitting piece will be equal to the difference in length between the width-side and the length-side measurement.

These fitting pieces are different from the fitting pieces that are provided as centre-profiles for a packaging profile cross-section, as described above.

Based on a single packaging, the difference between the modular composition as described above and the special production of single packaging pieces for the length-sides may be small. However, when multiple packagings are considered that differ from each other in their width- and length-side, the advantages of the modular composition become clear. In fact, the higher the number of packagings with different width- and length-sides, the bigger the advantages become. The extent of the advantage created by using identical sections depends on the method of production and the design of the sections.

The invented system is also applicable to packaging with different sides.

According to the invention, when multiple packaging whose wide-side lengths and long-side lengths differ are considered (except for the extreme case), the length-sides as well as the width-sides of a packaging are put together with bluntly abutting sections, allowing for at least one equal section-module to be used for each packaging side. Depending on the length of the

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width- and the length-side, multiple section-modules can be used on each side as well. To the extent that a section on one side remains open, for which another section module is too big, a fitting piece is used instead of another section-module. When very small fitting pieces are required, it may be useful to use a fitting piece, which has the length of a section-module plus the
5 length of the otherwise required very small fitting piece.

These very small fitting pieces have a preferred length that is less than 0.5 times the thickness of the section-module (in the case of different thicknesses the thickness is averaged), even more preferably a length that is less than 0.25 times the (average) thickness of the section-module.

10 The extreme case with large numbers of section-modules and fitting pieces as described above, occurs when the section-module is of the same length as the width-side of a packaging. The above considerations apply to the section-modules and fitting pieces on all sides of the packaging forming the length between the corner-forming sections that need to be mitred-cut at their abutment-point. At the same time it is also possible to use the corner-forming sections
15 simultaneously as fitting pieces.

Because of the special situation during shock impact at a corner, additional fitting pieces are to be preferred so that the corner-forming fitting pieces can remain untouched. The same applies if special corner-pieces are to be used at the corners and the sections abut the corner pieces.

20 For longer width-sides of a packaging, several section-modules per width-side can be used. In that situation, the various sections all have the same length, except for one fitting piece. For the longer length-sides, which are always larger than the width-sides in a rectangular shaped disc, there is even more variation in the number of section-modules used for larger width-sides.

The reinforcing profiles/reinforcing materials on a side of the packaging preferably serve
25 as a guidance and holder for the various section-modules and fitting pieces. The reinforcing material (forming the reinforcing profiles) extends from one corner of the disc-shaped cargo (for example, the glass-sheet) to the other corner of the disc-shaped cargo. Optionally, individual reinforcing profiles can also extend beyond. Preferably, this applies to the reinforcing profile at the lower end of the packaging. The various sections can simply be threaded onto the reinforcing
30 profile, which provides the desired guidance and support.

This has exceptional economical advantages for the production of small series, because

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this can reduce waste: the sections, intended as yielding material for small series, are expected to be cut to length from a commercially available base material.

The base material can consist of commercially available extruded foam-plastic sheets, particle foam-plastic sheets or extruded foam that is cut into material bars. The desired sections
5 or section modules can be cut to length from this material bar. In most cases a rest-material remains, but according to the invention, it is not necessary to dispose of this rest-material as it can be used instead with other rest-materials and/or other sections as yielding material, without causing a substantial loss of functionality. These rest-materials, together with other rest-materials and/or other sections, are threaded onto the profiles that form the reinforcing material.
10 Alternatively, the profiles can be pushed into the sections.

The described rest-materials can also consist of returned packaging components. Depending on the design and value of the packaging, a packaging can be disposable or reusable. With reusable packaging however, some wear and some damage to the packaging is to be expected. The worn and damaged parts of the packaging are preferably separated, whilst the
15 remaining parts are preferably treated as rest-material in the manner described above.

The same applies if there are delivery problems. Returned packaging components can then be used to make up for missing parts of the new packaging.

If the cargo always has the same dimensions, a returned, undamaged packaging can be readily shipped again with new cargo. The invention has recognized however, that a large part of
20 the cargo transported, such as flat glass, has made to order dimensions. Upon the return of such packaging, simply reusing the packaging is then not be possible.

The packaging, made out of packaging sections in accordance with the invention, provides an advantageous solution for reuse, because it allows for the returned packaging to be dismantled. The resulting sections and corner pieces can be reused to construct new packaging
25 for different sized cargo, or combined with new sections to construct new packaging for different sized cargo.

For one-way packaging, problem-free disposability is an important aspect. The disposability depends very much on the plastic used. For example, polyethylene (PE) can be burned without any problems. The same applies to polystyrene (PS). Whereas polyurethane (PU)
30 and polyvinyl chloride (PVC) require an expensive, elaborate type burning, or an elaborate flue gas treatment, or expensive disposal as hazardous waste. At the same time, cost-considerations

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make that only economically favourable commodity-plastics should be considered.

For reusable packaging the situation is different again. Here one can also use a better plastic such as polypropylene (PP), which has better mechanical properties than polyethylene and polystyrene. Even commodity plastics such as PU and PVC are suitable, because their costs are distributed over a multitude of packaging operations. However, the use of relatively complex plastics requires that for a reusable wrapping of the cargo, the wrapping itself can be removed from the cargo after transport in a way that makes reuse possible. Removing the foam-plastic from the cargo can be simplified by an intermediate means of separation, such as a layer of silicon-paper.

Back to one-way 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 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 in a mould together. 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 mould, the weld between the particles may be affected.

By choice sufficient steaming is nevertheless 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 vapour management occurs, the wall can be steamed in sections, with next to each surface-section where heated steam is fed in, a surface-section where the heated steam is sucked out. The sucked out steam has transferred its warmth to the particle foam. The steam is applied in bursts over a predetermined time period. The steam fed to the wall-section stops 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 procedure, every surface-section is preferably equipped with both steam nozzles and suction openings. The, preferably insulated, conduits leading to the steam nozzle, are different 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 steam-bursts and suction-operations on the adjacent surface

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sections are repeated several times in order to ensure that the desired bonding of the particles in the mould is achieved. 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 optimized
 5 through a number 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, using the mould-walls as surface-sections for the supply of heated steam
 10 and/or for the withdrawal of heated steam makes it possible to directly foam-in the cargo with particle foam. 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 steam. As the 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
 15 objects, besides the packaging concerned.

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

After the foam-plastic covered cargo has formed itself, reinforcing the foam-plastic layer can be realized in the manner described above

- 20 a) By creating a skin or outer mantel
- b) By laminating additional layers that cover the full-surface or partial-surface
- c) By welding or gluing foils or tensioned fabrics with the foam-plastic covering the full-surface or a partial surface
- c) By wrapping the full- or partial surface loosely with fabric or foil, tensioned with
 25 strapping, a tensioning-band or a lashing-strap

For details on creating a skin or outer mantel we refer to versions above. The same applies to full-surface or partial-surface laminated layers. It is also explained how welded or glued foil or textile and their tension effectuates a reinforcement of the foam-plastic layer, especially when it concerns holding the sections of the packaging together.

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

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Overlapping foil ends are preferably welded or glued. Depending on the nature of the fabric used, 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 all sorts of fabrics. If the mesh openings of the fabric are too large to glue together, it is advantageous 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, 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 prevised wrapping with shrinking-foil or other foil or textiles, the edge-protection, composed of sections and rest-pieces, in terms of the yielding material, will function as an edge protection extending from one corner of the packaging to the other as one piece.

The connection of an edge-protection section made according to the invention to protect the required edge, can be realized at the ends where the one edge protection section meets the other edge protection section.

The connection may be realized with the reinforcing profiles.

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 likes 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.

It is advantageous if 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.

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

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with a tensioning-band or a tensioning-strap. The same also applies when a foil 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 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 mitred-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 rest-material, which cannot be used afterwards.

When using the particularly economical wooden profiles described above, as a reinforcing material, a method can be used for small series and without the support of auxiliary devices, that leads to a reliable determination of the length of the reinforcing profiles and the yielding material threaded onto or otherwise attached to it. Starting at the corner 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.

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 all the edges that need to be protected

The same method can be used when, instead of the wooden profiles, other materials are used as 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.

The connection of the edge-protection sections at the corners of the packaged good/cargo (for example glass-sheets) 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 other

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adjacent edge that requires protection.

The corners/corner pieces can be of the same nature as the other yielding 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 from a tensioning-band or by a tensioning-strap. The strapping, tensioning-band or the tensioning-strap must be pulled around the corners causing proportional deformation.

This causes an additional strain on the corners/corner pieces. It can damage or deform the edges in a way that the yielding behaviour is no longer guaranteed to be the same as it is in other places of the edge-protection. To avoid this, an edge-protection made of foam-plastic can be provided with a higher density, and/or skin formation, and/or laminated foils, and/or laminated fabrics.

Optionally, a fixed corner-protection at the corners/corner pieces, made of yielding 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 foil or textile wrapping.

The corner-protection also has advantages when the invented edge-protection is used without the above mentioned special corners/corner pieces.

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

Advantageously, the invented edge-protection 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 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. This for example allows packaging of cuboid cargo in accordance with the invention whose thickness is so large that one can no longer refer to it as a disc. When disc-shaped, square cargo is

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considered, using the corners/corner pieces will require four such corners/corner pieces.

With cuboid cargo, which can no longer be referred to as a disc, there are eight corners/corner pieces.

The corners/corner pieces are preferably at least partially provided with ongoing openings
5 for the reinforcement profiles that act as the reinforcing material.

The ongoing openings have the advantage that they are easily fabricated. In addition, adapting the roof battens (and other similar reinforcement profiles) to their required 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
10 by 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 preferable to specify the length of the reinforcing profile in advance.

When implemented as above, the reinforcing profiles can be connected together at their
15 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 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.

20 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 profiles can also be connected together in the corners/corner pieces, or be connected
25 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 guarantee an adequate connection between the edge-protection section and the cargo.

30 Preferably, a strapping, tensioning-band or tensioning-strap tightens all edge-protection sections against the cargo-edge that needs to be protected. Optionally, multiple straps, tensioning-

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bands or tensioning-straps are provided. For disc-shaped cargo, multiple strappings, tensioning-bands and tensioning-straps are arranged side-by-side/parallel to each other. Preferably, the multiple-arrangement is used with very wide edge-protection applications. In addition, for large packaged goods and correspondingly large packaging, centrally arranged additional strapping, tensioning-bands or tensioning-straps may be useful as reinforcement. This is especially true when the frame-shaped packaging is reinforced in the middle. The additional strappings, tensioning-bands and tensioning-straps are then used on the reinforcements and run diagonally to the other strappings, tensioning-bands or tensioning-straps.

With cuboid-shaped cargo that can no longer be referred to as disc-shaped cargo and -as described above- with corners/corner pieces that have three connection-surfaces, one of which is to provide for a diagonal edge-protection-section, the various strappings, tensioning-bands and tensioning-straps can also extend diagonally to one another.

Independent of this, reinforcements and additional strappings, tensioning-bands and tensioning-straps can be useful for larger cuboid-shaped cargo as well.

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 yielding material. The recess provides a 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 specialist can rely on commercially available technology. These include strapping material, tensioning devices, means for 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 series, mass production streets, as well as simple and inexpensive small handheld devices for incidental strapping procedures.

The strapping material is usually a ribbon/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 loosened and tensioned again. For that, tensioning devices/turnbuckles are provided as part of the tensioning-bands. Tensioning-

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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.

5 A strapping can only be destroyed and be replaced by a new strapping. Compared with a tensioning-band or tensioning-strap, a strapping used as one-way packaging generally causes much lower 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 by a so-called easy-lock. The
10 easy-lock consists of 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. To re-tensioning the metal band, it must first be bent back. The same
15 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.

Such straps and bands are available in the market for inexpensive prices. Typically, one
20 end of the band is firmly connected to the tensioning-device. The other strap-end is pulled through the opening split 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 the opening of the tensioning-
25 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 realize a higher tensioning force and a constant tension not susceptible to external influences.

An alternative is a tensioning device consisting of a solid piece of material, with a number
30 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

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strap-end remains in the material-part due to its friction or because of resistance in the material-part, preventing loosening.

Optionally, parts of the tensioning device are connected to a section of the packaging, preferably with a corner piece; alternatively 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 necessary to hold the turnbuckle in position whilst tensioning. With sophisticated turnbuckles, the permanent attachment of the turnbuckle to a section of the package is a complex measure. This is different for the simplest turnbuckles, 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 drawing and punching and provided with recesses. With large series, the use of materials such as plastic, preferably unexpanded plastic is even cheaper, making the use of injection moulds required for production, economically viable.

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

The above versions 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.

If the ends of the edge-protection sections are mitred-cut, the mitred angle is preferably 45 degrees for perpendicularly jointed edge-protection sections. For edge-protection sections that are joined under a different angle, the mitred-angle is preferably equal to half the angle of that which the edge-protection sections enclose between them. For the above versions, the forces that act on the edge-protection during the strapping are greatest at the corners of the edge-protection and may therefore require additional corner reinforcement. Besides the corner load, the corner reinforcement may have other reasons as well: for example, an additional function such as a transport-aid.

The transport-aids can add to the invented edge-protection in a very advantageous way. They improve handling and thereby reduce the risk of damage to the packaging and the packaged good/cargo. However, the transport-aids are also advantageous for other types of packaging, unrelated to the invented edge-protection.

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The transport-aid can be a handle, a sling, an eyelet, or a hook. The eyelets can serve different purposes. Eyelets are suitable for attaching tensioning means for load securing during transport. The eyelets are also suitable for attaching handles. Advantageously, the eyelets can form, together with a simple accessory, a handle as well. This can be realized with two eyelets placed at a distance and a rod, for example a wooden rod. The rod can connect the eyelets placed at a distance together, so 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. A roller is suited as a transport-aid as well. The same applies for forklift-feet, containers, fasteners or connectors for transport securing. The containers are of considerable advantage for various applications of the packaging.

This is especially true if fasteners/assembly aids/assembly instructions/accompanying documents are to be transported with for example one sheet or a number of sheets of glass. This is especially the case when glass parts for showers or building-kits for showers are transported. For the various applications, different sized containers can be made available. The transport-aids can also be made of foam-plastic. The transport-aids can also be made of other materials, and they can be made of a composite of foam-plastic and other materials.

Preferably, a container is made of unexpanded/minimum expanded plastic, as long as damping of an impact-like load is not required. It is advantageous to manufacture such containers of the same plastic as the foam-plastic used for the packaging itself and to connect them with foam-plastic components, with which the container engages in the grooves that are provided in the packaging. In that case, the foam-plastic components simulate the cross-sectional shape of the grooves. The foam-plastic can be properly connected to the containers by gluing. Hot glue is a well-known, suitable glue for this type of gluing. The connection can also be welded, provided the container itself and the parts that engage in the grooves have a sufficient match in texture for the welding process.

Engineering the container in various parts is an advantage for small series, because common parts can then be kept for all sizes. Such common moulded parts will at least consist of those parts that are used to engage the container into the grooves of the packaging. In addition, it may be advantageous to develop containers with different volumes. This is realized by using tubular containers, which are sealed at both ends by lids and which are selected by choosing the

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right length to achieve the desired volume. The tubular containers preferably have a rectangular or square cross-section in order to facilitate the connection with the moulded parts, which engage into the grooves of the packaging.

5 The transport-aids do not have to be directly attached to the packaging, instead it is sufficient if the packaging has a connection for the transport-aids or allows the mounting of transport-aids. Attaching a transport-aid to the yielding material, and/or to the reinforcing material, and/or to the strapping, the tensioning-band, or tensioning-strap thus becomes possible.

10 The transport-aids can be mounted permanently or detachable. Such a detachable connection can be formed for example by an exterior and/or interior connection-surface and/or by 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.

15 The various transport-aids may also be integrated into a packaging section. This is especially the case for forklift-feet and rollers. For the hooks it can be an advantage if they are formed forklike, making it possible to grab the packaging on both sides of the strapping, tensioning-band or tensioning-strap.

Preferably, grooves are provided in the packaging, especially in the yielding material, in which the transport-aid can be inserted or pressed into with a corresponding tongue.

20 For the tongue and groove connection, a dovetail shape, or a shape derived thereof, is advantageous. Such connections are very stable, however with limited clearance they can be difficult to handle. Easier to implement are tongue and groove connections where the tongue has a rounded shape, so that the tongue can be pushed into the groove, transverse to the longitudinal direction, and can be pulled out again in reverse. 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.

25 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 the dimension of the opening width of the groove, which allows the tongue to be pressed into the groove by hand within reasonable efforts, whilst at the same time providing sufficient grip in the groove.

30 The grooves can be machined into the foam-plastic. Suitable methods are, for example, milling and/or sawing. However, the grooves may be pre-formed in the foam-plastic as well. This

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is realized during production of the foam-plastic.

It is done for example by means of a suitably shaped extrusion-die and a correspondingly shaped calibrator.

Preferably rounded corners (both inside corners as well as outside corners) are created in the groove and matching corresponding round corners are realized in the transport-aids that grip into 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 deformation and obtain their final shape by milling or sawing. The invented grooves 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. In this way, the transport-aids can be inserted into the grooves as desired/required. The rollers are inserted into the bottom, the handles into the side of the packaging at a comfortable height for its user. Forklift-feet or other feet are also inserted into 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/transport. The 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, often requires special angles, rails, seals, screws, dowels, etc. These accessories must at least be supplied when the cargo is 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 for example used to connect multiple packagings together. Preferably, a connection is made between all the packaging parts, which contain opposite grooves.

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

When strapped, a band is placed around the edge-protected-cargo, for example the glass-sheet, after which the band is tensioned with a tensioning device. The tension presses the edge-

protection against the edges that need to be protected. After tensioning, the band is secured in tensioned position. This can be done by means of brackets, bushings and 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.

5 The band can be made of plastic or steel. Plastic band made from different materials such as polyester, PP, PET are known, which can be used for strapping. At all times must the band be able to withstand the force of the tension. Fabric bands made of plastic, such as threadlike structured band, woven band and composite band are the most suitable for this.

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

15 Brackets, clips and seals press the band-ends permanently against each other. This might already be sufficient for the locking of the band-ends. Furthermore it is well known, how to give steel bands additional grip by making an incision before and after the clips, brackets, and seals and to bend them outwards at these positions.

20 Alternatively, corrugated brackets and clips can be placed at the ends of the band, with the corrugation transverse to the longitudinal direction of the band.

 The corrugation increases the grip of the brackets and clips pressed around the ends of the band.

 Welding is a joining-technique, which is preferably used when plastic bands are applied.

25 Optionally, the transport-aids, even in the situation where rollers are used, are formed of at least two parts, where 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, it is favourable if the sleeve or seal is slit laterally and can be pushed onto the strapping band sideways after it is positioned and before it is tensioned. The
30 sleeve or seal is preferably pressed onto the strapping band, causing it to stay fixed on the strapping band. In addition, it would be favourable if the slit of the sleeve or seal is provided with

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a funnel-shaped guidance and when the sleeve, after sliding it on, engages the strapping band immediately. The funnel-shape makes sliding on easier. Engaging behind prevents it from falling of. If in addition, the sleeve clamps the strapping band, it will stay in its selected position and slipping of is impossible.

- 5 Optionally sleeves or seals for the transport aids can be mounted on the strapping band in their desired position during its production. This makes the bringing along of tools for later attachment of sleeves and seals unnecessary.

 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
10 advantageous. Optionally, claws on the sleeves and seals can be provided.

 Providing for Grips and flaps, a distance from the top of the lateral edge-protection can be of advantage as well.

 Optionally, a handle or eyelet can be clamped onto the strapping band, the clamping strength of which increases when the weight of the cargo requiring protection, such as a glass
15 sheet (and its packaging), increases. Such clamping is for example created when handles/eyelets are used, which simultaneously form a lever arm of a double-armed lever, in which the other lever arm presses against the strapping band. These levers are self-clamping based upon the explained mechanism. This mechanism 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
20 made of plastic and/or of foam-plastic, is so large that the tongue jams into the groove. Another version is where the connectors or sleeves are glued, or welded, or connected with the strapping band in the same manner as with the connection of the band-ends of a strapping-band.

 Even without the above described sleeves and connections, the handles/eyelets can form a transport-aid if the strapping band can be held at its desired location with two fingers/jaws, in a
25 way that an upward pivotal movement of the handle/sleeve leads to a twisting of the strapping band as well as to a clamping of the handle/eyelet onto the strapping band.

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

 The invented edge-protection can also be designed in a way that multiple disc-shaped

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cargos (for example glass-sheets) can be simultaneously transported next to one another. For this purpose, the edge-protection can optionally be provided with multiple recesses that run parallel to one another as, for example, described in DE 1953181.

Preferably it is provided for each individual packaging to be connected to a multitude of other packagings, making space-savings for transport possible. The connection can for example be realized with tongue and groove as described above.

Using recesses with a dovetail cross-section is thereby an advantage. Preferably, recesses are provided in each packaging, so that the connection can be made with appropriate tongues, which engage with one side in one recess and with the other side in the other recess. Advantageously, the recesses can also be used for other tasks, such as connecting with other profiles to thicken the yielding material.

It is advantageous if the invented edge-protection solely forms the packaging for glass and other goods requiring packaging.

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

To prevent scratching of the outer surfaces of transported goods such as glass, the space, which is enclosed by the proposed edge-protection, might for instance be wholly or partially filled with carton or cardboard.

Especially corrugated cardboard in substantial thicknesses is widely available on the market, so 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 should even protrude over the edge-protection, the use of a honeycomb insert made of cardboard or cardboard/corrugated board is preferred.

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 cargo alike.

If the carton/cardboard cannot meet the requirements of the cargo, a flexible layer, made out of foam-plastic, can be used between the carton/cardboard and the cargo. The foam-plastic may have the same characteristics as the material that is provided as edge-protection.

The cardboard can fill the space of the glass-sheet enclosed by the invented edge-

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protection either by itself or in combination with other protection material. Air cushions can be seen as other protection materials as well. Air cushions can be used alone and/or with cardboard, or in combination with other protection materials, to fill the space of the packaged good enclosed by the invented edge-protection.

5 Optionally, the filled space on both sides of the packaged good is covered with a protective plate. The protective plates can overlap the packaging itself, or fit into the space enclosed by the packaging. The protective plates create stiffening, which can replace the reinforcing bars, as suggested elsewhere, or can be used in addition to the reinforcing bars. Attaching the protective plates can be done in any manner.

10 A detachable type of fastening is preferred, which will not hinder the reusability of the packaging. 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, the claws or hooks may clasp the protective plate on all four sides, thereby ensuring that with
15 common transport loads, the protective plates do not detach from the packaging.

 For the attachment of the protection plates, the claws or hooks are pushed into the grooves and slid over the protective plates at the same time. To detach, the claws or hooks are pulled out of the grooves. Optionally, the entire cargo is wrapped in foam-plastic. For small series, the wrapping is assembled using different parts in order to avoid the cost of moulds, which would
20 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 cargo is placed in the open mould, which is then closed and filled with particles ensuring that the cargo is surrounded by particles on
25 all sides.

 Subsequently, heated steam is injected into the mould, so that the particle's outer surface softens and becomes doughy and they weld together. After sufficient cooling, the mould is opened and the wrapped cargo is removed.

 Preferably the foam-plastic is then strengthened near the edges of the cargo, for example
30 the glass, in the manner as described above.

 Preferably, the cargo together with its packaging, is wrapped with shrink-foil.

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These are foils that shrink greatly under the influence of heat. Shrink-foils are usually composed of a mixture of polyethylene and polypropylene. The foils are often wrapped around the packaged product. The foils can also be shaped as bags or tubes and slipped over the packaged product. The heat required to shrink the foil can come from hot air or hot gas.

5 Series products are preferably led into a tunnelled-oven and heated while going through.

The earlier-mentioned transport-aids (or their connections) are preferably cut out from the shrinking-foil. This might already be done while wrapping the foil. Cut outs for transport-aids can be provided in the foil-tubes and foil-bags for the transport-aids and/or their connections. It is also possible to provide cut outs in the foil only when the connections must be accessible for
10 transport-aids.

The cargo, packaged with the invented packaging, such as a type of glass used in construction, must be moveable on a construction site. It is important to distinguish between smaller size glass-sheets with corresponding lower weight, which can be off-loaded and moved around on location by one or more builders by hand, and larger size glass-sheets with
15 corresponding weight that need to be moved mechanically.

In any case, using transport-aids attached to the edge protection such as handles and/or loops and/or eyelets and/or hooks and/or fasteners and/or feet, can simplify handling of the glass-sheets. The transport-aids can be attached to the edge-protection permanently or only for the duration of the transport. If the transport-aids are permanently attached, an appropriate
20 attachment method to the edge-protection can be used. Detachable attachments are provided for temporary attachment.

For the edge-protection (together with the transport-aids) to be mainly exposed to pull forces, and less exposed to bending forces is thereby an advantage. This is achieved when the transport-aids attach to the side of the edge-protection.

25 Furthermore it is advantageous to provide the bottom edge-protection with forklift-feet. Forklift-feet attached to pallets are well known. Pallets have forklift-feet in the form of wooden bars at the bottom. The forklift-feet guide a forklift that puts its forks under the pallet to lift it up, transport it to another location and then put the pallet back down again.

The same is true for pallet-trucks, which are equipped with the same fork as a forklift, and
30 which are intended for moving pallets. However, the pallet-trucks only serve for short transport distances and are not suitable for stacking. The pallet-truck only lifts to provide the necessary

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ground-clearance to move the packaged cargo. The pallet-trucks are usually moved by hand. To the extent that forklifts are further mentioned, it includes pallet-trucks.

The forklift-feet ensure a central gripping of the cargo by the forklift and prevent the pallet from slipping sideways, which may otherwise occur during movement of the forklift. This is especially important when the forklift is turning corners.

Compared to normal pallets, the forklift-feet may be smaller. However, this is only possible to the extent that the forks of the forklift/pallet-truck still fit between the forklift-feet. The forklift-feet have a thickness that ensures that the forklift can drive its forks under the edge-protection, allowing it to lift the cargo together with its packaging. The forklift-feet can also be seen as transport-aids. They can be attached to the fastening strap using sleeves and seals, as is prevised in the previously described transport-aids. Optionally, the forklift-feet are integrated in the protective packaging, even more preferred, they are integrated in a packaging section.

Other transport-aids are handles, loops, hooks, spigots, rings, rollers, fasteners, 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 different packages to one another. Containers facilitate the carrying of cargo-accessories and of accompanying documents.

Transport-aids can be attached to different places of the packaging in a fixed or detachable manner. As a permanent arrangement, combined individual packaging sections can form the desired transport-aids, or be permanently connected to the transport-aids. Packaging sections at the bottom may have protrusions serving as feet or forklift-feet. 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. Preferably, the transport-aids are mounted in a detachable manner in order to reduce the number of transport-aids required for all 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 hook into the

recesses.

Preferably grooves are provided in the packaging and the transport-aids will engage with a so-called tongue into the grooves. There are no special requirements for the grooves, if they are on opposite sides from one another. Small depressions as grooves and small elevations building the tongues will already be sufficient. In principle, the depressions (grooves) may also be provided in the transport-aids and the elevations (tongues) may be provided in the packaging. The effort required for this is however higher the other way around. In addition, the packaging can damage more easily at the elevations than in the depressions.

More needs to be considered when using grooves and tongues when the transport-aids need to engage into one groove only. The transport-aids should then be secured against falling out of and against tilting and unforeseen sliding in the grooves.

A cross-sectional shape of both the groove and tongue can largely achieve this. A cross-sectional shape such as a dovetail fitting is thereby advantageous. Undercuts in the grooves and tongues characterize such cross-sectional shapes, making it possible for the tongue of the protruding cross-sectional parts to engage in the undercuts of the grooves. Using such grooves and tongues prevents falling out as well as tilting.

The stability of the tongues and grooves will depend on the foam-plastic. If desired, reinforcing the grooves/springs and/or the surrounding area can alter stability.

Using a different plastic for the packaging in order to increase strengthening is only possible within the limits of the prescribed yieldability of the packaging. However, simple measures such as the rounding of corners/edges on the tongues and in the grooves lead to substantial strengthening. In addition, providing a mantle and/or coating as described above can also create strengthening. A material for the transport-aids that can withstand all stress types can easily be selected as well. Transport-aids with low weight, for example when made out of aluminium, are preferred. Clamping prevents the transport-aids from slipping in the grooves.

Clamping devices are provided for such situations. Simple clamping devices are for example wedges. More elaborate clamping devices might also be used. The transport-aids themselves can also be formed as clamping devices.

The amount of friction between tongue and groove, the amount of play between tongue and groove, and the lever ratios, all resulting from the forces exerted by the transport-aids and their distance from the tongue and groove connection to the packaging, greatly influence the

strength of the clamping.

Transport-aids that can self-lock in the grooves and on the tongues are of economic value.

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

Such transport-aids wedge if a load is not exactly centrally positioned opposite the central axis of the grooves. This can be achieved easily by choosing an appropriate distance within which loads are directed towards the transport-aids.

Wedges might 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 further be moved 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 especially linked to the risk of damage. With current transports, cargo corners are bumped and the cargo placed on the floor too hard only too often. On the other hand, with the invented packaging, 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 invented packaging will also survive the usual bumping and being placed hard on the floor without damage. Advantageously, 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 colour-coded impact causes the liquid to spill over the detector and colours it.

In the drawings, a number of examples of the invention are shown.

Figures 1 and 2 show a laminated glass-sheet 1, which is covered around its edges by the edge-protection profiles 2, 3, 4 and 5. In the example of this version all profiles 2, 3, 4 and 5 are

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made of XPS foam ((extruded polystyrene foam) (in other version-examples of other foam)), with a density of 25 kg per cubic meter. All profiles 2, 3, 4 and 5 have the same cross-section. In addition, profiles 2 and 4 have the same length. The same applies to the profiles 3 and 5. The cross-section of the profiles 2, 3, 4 and 5 can be seen in figure 1 and 3.

5 Profiles 2, 3, 4 and 5 are mitred cut at the ends.

 The cross-section of the profile is shown in figure 3. The profile cross-section is basically rectangular with dimensions of 130 mm x 200 mm. On the one narrow side a recess 6 with a width of 23 mm and a depth of 50 mm is provided, in which the laminated glass-sheet 1 is placed. On the opposite narrow side a recess 7 with a width of 60 mm and a depth of 5 mm is provided;
 10 this recess is provided for a strapping band. In the inside of the profile two recesses 8 and 9 with cross-sectional dimensions of 25 mm x 50 mm are provided, which are to accommodate wooden slats 10.

 In the example of this version, the XPS foam of the profile functions as yielding material. The wooden slats form a reinforcing material for the yielding material. Using multiple wooden
 15 slats, with foam separating the individual wooden slats from each other, creates a remarkable resistance of the edge-protection against the particularly dreaded impact- and shock loads that occur with glass transportation.

 In the example of this version, the profile is composed of three parts (not shown).

 When the three parts are not connected, two parting joints extend through the openings 8
 20 and 9, parallel to the narrow sides.

 The three parts are cut out of standard XPS foam panels and they are composed on the surface in such a way that the recesses 6 and 7 and further recesses are created, which become visible as recesses 8 and 9 when all the parts are put together.

 The cutting is done by sawing.

25 The recesses are milled into the version example.

 During assembly the parts are glued together at high temperatures. The hot glue is applied with suitable glue-guns.

 In other versions the individual parts are welded together. During the welding process, the welding surfaces are heated and the parts are then pressed together. A hot air blower can be used
 30 to apply the required heat (in other versions, the heat is applied by contact with a heating blade or by means of another object that has a corresponding heated surface, with which the welding

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surfaces are brought into contact).

After bringing the invented edge-protection onto the market, the desired quantities of profiles can be produced by (in relation to the cross-section) one-piece extrusion, or by injection moulding, or particle foam mouldings. Extruders with extrusion-dies are required for extruding, which are designed with the required profile cross-section and guide the foam into a shaping calibrator.

With the extrusion of a profile, containing all the cross-sectional dimensions of the desired profile, the processes as described above become (at least partially) unnecessary

The shown profiles 2, 3, 4 and 5 are pressed onto the edge of the glass sheet 1 with a strapping band not shown here (in other versions with a tensioning-band or a tensioning-strap). In the version shown, the strapping band is made of plastic. A strapping-machine pulls the strapping-band from a roll and then guides it around the outside of the profiles 2, 3, 4 and 5. This process is initially done by hand. For larger quantities, a strapping-machine is prevised, equipped with an automatic band feeder and automated guidance respectively, guiding the strap around the profiles 2, 3, 4, 5.

The strapping-machine comes in various versions. Initially a simple hand-operated device can be used for tensioning the band. When larger quantities of packaging need to be strapped, an electric strapping-machine with automatic control can be used instead of a hand-operated device. In this version the two ends of the plastic strapping band are welded together after tensioning the band. For this, a heated blade is shortly inserted between the two ends of the band. The heating blade shortly melts the surfaces of both ends of the band in such a way that, with sufficient pressure, a weld is created without causing a notable weakening of the strapping itself. Immediate cooling of the weld ensures it is given sufficient strength.

The strapping holds profiles 2, 3, 4 and 5 together in the form shown, without further action being required.

In another version, a reinforcement/corner-protection is provided for the corners. The reinforcement/corner-protection is achieved by caps that are placed over the corners before the profiles are being strapped together. Such caps are commercially available and offered as plastic or metal corners. Automated equipment places the caps automatically. The functionality of such equipment depends on whether the caps that are used, meet the requirements of the equipment.

As long as there are no high volume production series that justify automatic strapping

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machinery, manual strapping is recommended. When strapping is done manually, the positioning of the caps is a problem when the caps are not held in place by the strapping itself. It is advisable for the caps to be brought/held in position with a double-sided self-adhesive strip, for as long as the strapping itself does not do this.

5 According to figure 49, the caps 321 can also be positioned on the strapping 320.

To achieve this, the caps may be provided with slits, through which the strapping is guided as shown.

For strapping-by-hand several tools are available, varying from very simple designs to upscale versions.

10 A simple design is shown in figure 50. It shows a band of material 325 with a row of cutouts 326, whose openings and the distances between them are adapted to the dimensions of the strapping-band. The material used in the version example is a sheet-metal. Other rigid materials are used in other version examples. The strapping-band is fastened with one end to the end of band 325. The strapping-band is guided around the package and its other end is threaded to and
15 from through the openings 326. After tensioning the band, it remains tensioned due to the frictional resistance in the sheet-metal strip.

The profiles 2, 3, 4 and 5 create an edge-protection measuring approximately 53,5 mm in height perpendicular to the glass-sheet. In the resulting enclosed space a layer of cardboard 11 with a thickness of 50 mm is provided on each side. In addition, soft foam-plastic, made of
20 polyethylene not shown in the example with a thickness of 1,5 mm, is placed between the cardboard 11 and the glass-sheet 1.

Figures 4 and 5 show corrugated cardboard with different structures.

According to figure 4, each cardboard layer has a honeycomb core 16, which is connected on either side with a paperboard layer 15 or 17. The honeycombs are formed through cardboard
25 strips that are bent and glued together in a way that creates a honeycomb-like structure. The cardboard in figure 5 shows a differently structured core. 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 four-cornered structure as opposed to the 6-cornered honeycomb structure.

The glass-sheet, combined together with its edge-protection and the cardboard layers on
30 the side, is wrapped in a shrinking-foil after it has been strapped. The shrinking-foil leaves the underside partially uncovered, so that forklift-feet 20 can be attached. The forklift-feet serve as

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transportation-aid in order to position the forks of a forklift used for loading and/or offloading.

Figure 6 shows skids as transport-aid for the glass-sheets 26 with their edge-protection and shrinking-foil. The skids are made of struts 29 with feet 25. The feet 25 have different openings 27 at the top. The openings 27 take rods 28 that can be tensioned with the load against the struts 29. With the skids, the load can be easily stored and transported with vehicles.

Figure 7 and 8 show an edge-protection 30 made of various profile sections with a hole 31. The hole 31 serves as a transport-aid for the attachment of a hook 33. With the hook, every glass-sheet including its edge-protection and possible other packaging can be loaded/offloaded.

Figure 9 shows an edge-protection made of various profile sections with side hooks 36 and eyelets 37 as transport-aids.

Figure 21 and 22 show another version of the packaging where a grip 121 is used. The grip 121 has been cut out of a plate 120 and folded. In addition, the plate is toothed 120, which allows the plate 120 to be pressed into the yielding material. This is done as required. The strapping-band 125 that is placed around the packaging/edge-protection 124 is then lifted slightly in order to push the plate with the grip 121 into its desired position under the strap 125, and to push the teeth into the yielding material. The strapping-band 125 holds the plate 120 in the desired position.

Figure 10 shows an edge-protection made of various profile sections 41 with lateral loops 42 as transport-aids.

Figure 11 shows an edge-protection made of various profile sections 45 with a roller 47 at one of the lower corners as transport-aid. The roller makes the glass-sheet easy to move. In addition a grip 46 is an advantage.

Figure 20 shows another version of a roller (111) used as a transport-aid. The roller (111) is seated in a housing (112), which is designed at the same time as a hood/cap for enclosing a corner of the edge-protection. In this version example the hood/cap (112) is made of tin-plating, in other versions it is made of plastic. The hood/cap 112 has a number of teeth 113, with which it presses into the yielding material. The hood/cap can be placed as required once the packaging is finished, and can be reused when the glass-transport has been completed.

The hood/cap 112 can also be placed whilst strapping. If so, the strapping should preferably be guided through between the roller and the hood/cap 112 in order to mount the hood/cap in a fixed manner. The hood/cap then acts as a corner reinforcement/corner-protection

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for the packaging itself as well. The version example shows a roller, which is seated rotatable at both ends in the hood/cap 112. To facilitate placing the strapping-band between the roller and hood/cap, the roller can be seated in the hood/cap one-sided (floating) in other version examples.

Figure 12 shows another cross-section of an edge-protection 50. The three grooves 51 and 52 are for reinforcing profiles and make cross-section 50 differ from the cross-section as shown in figure 3. Furthermore, a groove 54 is provided for inserts 60.

Out 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 should result in improved shock-resistance, impacting the plane of the glass edge-protection at a right-angle. The recesses 51 and 52 are formed in the same way as the recesses/openings of the edge-protection in figure 3.

Recess/groove 54 has a dovetail shape. The dovetail-shape ensures that the respective insert 60 is firmly held in the edge-protection. The cross-section of the insert 60 is provided with a corresponding recess/groove.

In the version example of figure 14, the insert (60) has an opening (61), in which the glass-sheet is placed. In the version example the insert 60 is made of an elastomer. There are natural and artificial elastomers. Rubber is one of the natural elastomers. The elastomers are capable (within certain limits) to hold different thicknesses of glass-sheets. In the version example the insert 60 is intended for glass-sheets with a thickness of 5 to 10 mm. Other inserts are provided for thicknesses that range from 10 to 20 mm and from 20 to 35 mm.

Figure 14a shows another version example of an insert 60.1, providing an incremental recess. One part of the recess has an opening width for glass-sheets with a thickness of 12 mm 61.1. The deeper part of the recess has a width for glass-sheets with a thickness of 8 mm.

Figure 14b shows an insert with a recess conically tapering to its deepest end 61.3. The taper enables a continuous adjustment to any glass thickness ranging between 12 and 8 mm.

Figure 14c corresponds to the principle of continuous adjustment as shown in figure 14b. However, for insert 60.3 three different ranges 61.4, 61.5, 61.6 are provided that allow for a continuous adjustment to any glass thickness, provided the glass thickness falls within one of the three ranges.

Figure 14d corresponds to the principle shown in figure 14a. However, the example shows an insert 60.4 providing a three-staged incremental recess 61.7, 61.8 and 61.9 for three

different glass thicknesses.

The version example in figure 14f differs from the version example in figure 14a in that instead of one single glass sheet, two sheets of glass can be placed side-by-side.

5 The version example in figure 14e differs from the version example in figure 14a in that instead of one single glass sheet, three sheets of glass can be placed side-by-side.

Figure 23 shows an edge-protection 130 with an insert 131, which differs from the insert 60 in figure 14 in a way that it holds the glass sheet 133 within an inlay 132. In the version example the insert 132 is made of cardboard. Its task is to prevent damage to the insert caused by the edges of sharp glass.

10 The version example in figure 13 shows a cross-section of an edge-protection 55 and differs from the edge-protection 50 in figure 12, in that only one recess 57 centred below recess 56 is provided for inserts 60.

15 The edge-protector 107 in figure 19 consists of polystyrene foam with a density of 30 kg per cubic meter and differs from the edge-protector in figure 13 in that different dimensions are used. The cross-section width is 130 mm, the height 160 mm and a centred opening 100 of 24 x 48mm is provided in the middle. The opening allows insertion of a roof batten as reinforcement. Furthermore, four grooves 101, 102, 103 and 104 are provided on the outside. The four grooves have a dovetail shaped cross-section. Groove 101 differs from groove 56 in figure 13 in that different dimensions are used, that is 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 hold an insert, similar to the one shown and described in figure 14. On its opposite side, a recess 102 is provided, just as in the edge-protector of figure 13. In the edge-protector as shown in figure 13 the groove/recess 13 only serves to guide and secure a strapping-band.

25 In the version example, the groove/recess 102 has a depth of 20 mm, a width of 50 mm at its deepest point and a width of 40 mm at its opening. According to figure 19, the groove/recess 102 has additional functions. A housing can be inserted in the groove, in which a rotatable roller is held. Additionally or alternatively, two forklift-feet can be inserted in the groove 102, which are placed at a distance of each other in accordance with the distance between the forks of a forklift, centred under the glass-sheet in its packaging, in order to facilitate the transport of the glass-sheet by forklift, for example during loading or offloading a vehicle.

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Additionally, the groove/recess 102 can be used to attach a flat profile shown in a dash-dotted manner 105, made of the same foam-plastic as the profile. A similar flat profile may also be attached to the grooves/recesses 103 and 104 on the other two sides. Attaching flat profiles creates more yielding material, which proportionally increases the damping behaviour, in line
5 with the use for heavier glass sheets.

The grooves/recesses 103 and 104 have a depth of 15 mm, with a width of 40 mm at their deepest point and of 30 mm at the opening.

An important further functionality of the grooves/recesses 103 and 104 is to create a connection with other packaging/edge-protection, shown as dash-dotted packaging detail 106.

10 The packaging/edge-protection 106 has the same groove/recess as the packaging/edge-protection/yielding profile 107. The connection can be achieved with the help of a so-called tongue (108). The tongue (108) is formed by a profile-rod, which has two sides/ends in cross-section, corresponding to the grooves/recesses 106 and 107 in the packaging/edge-protection in such a way that a firm connection is created.

15 With the use of the tongue 108 as connecting technique, multiple packages and their enclosed packaging goods can be connected to each other to form one block, which positively influences transport costs. The block can be made in a wide range of desired widths, allowing for transport surfaces to be used to their maximum available width. In addition, the blocks can be made in a wide range of desired heights, allowing for transport volumes to be used to their
20 maximum available height.

For that, instead of the flat profile 105, a different packaging is placed on top, and connected using the tongue 108.

Finally, the block can be made in a wide range of desired lengths. The packagings with their enclosed cargo, arranged one behind the other, are connected together with the tongue 108.
25 For container or truck transport respectively as well as other similar types of transport, utilizing the transport volume in this way brings considerable advantages.

Packagings of different sizes can also be connected together. If the grooves in the various packagings are exactly opposite one another, this can be realized with the tongue 108. If the grooves are not exactly opposite one another, a connection can still be made with the grooves 108.
30 For this an adapter-piece is provided. For the adapter-piece, grooves of corresponding height and/or distance are provided, so that the tongues 108 can connect the one packaging from one

side and the other packaging from the other side to the adapter piece.

Alternatively, adapter-pieces can be provided which are adapted to the different sizes of the packagings to be connected. These adapter-pieces correspond to the previously described adapter-pieces with tongues provided on both sides, only now the tongues are integrated in the adapter-piece itself.

The tongue 108 is shown in cross-section view in figure 19b. Figure 19a shows another tongue 280, which can fill-out unused grooves in the invented packaging.

Figures 19c and 19d show variations of the invented edge-protection profile made from yielding material. In contrast to the profile according to figure 19, figure 19c shows a round opening 276 in the profile 275. This allows for the use of a reinforcing material with a round cross-section. The round opening is more easily machine-manufactured than an angular opening.

Figure 19d differs from the version example in figure 19c in that it shows two round openings 279 in cross-section instead of one round opening 276 in cross-section, provided for round reinforcing material.

Figure 19e shows a profile 277, which, in contrast to the profile shown in figure 19 to 19c, has no openings other than for the recess for an insert.

As a further alternative to the version example in figure 19, figure 19f shows the possibility to connect two side-by-side packagings. In figure 19 this is done with a separate tongue. The version example in figure 19 shows only one connection at the bottom of the packaging enclosing the glass-sheet. Usually this is sufficient, because the packagings are handled individually after offloading from a vehicle. Therefore, the advantages of this type of connection are particularly true with transport of several side-by-side packagings in one vehicle. This makes securing the load much easier. Securing the cargo can for example be limited to only lashing to top of the packagings together.

In other version examples requiring better securing, this can be realised by also connecting the side-by-side packagings at the top using the same type of connection. This connection will result in a very stable/robust overall packaging.

Such a need arises if the transport does not take place by trucks but with transporter-vans with a maximum allowed gross vehicle weight of less than 7,5 ton. Such transporter-vans are generally used for all transports with which handling takes place by hand (without lifting means), because the transporter-vans are much faster than freight trucks. Experience has shown that

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proper load securing, despite transport/traffic regulations, is severely lacking in such transporter-vans. For such transports, use of an additional connection at the top of the side-by-side packagings, is advantageous.

If there is the need to further connect the side-by-side packagings, a connection between
 5 both sides connecting the top and bottom of the packaging is also provided.

Figure 19b shows a variation of the profile as used in combination with the yielding material in figure 19. In addition profiles 280 and 281 have arisen, which show a groove 282 on one side as shown in figure 19, whereas on the opposite side it shows a tongue 283 instead of a groove 282.

10 When connecting two side-by-side packagings, the separate tongues 108 become dispensable. This may apply if the simultaneous connection of side-by-side packagings on the sides connecting the top and bottom of the packagings is not required.

Figure 27 shows an edge-protection 151 with a profile cross-section that differs from the cross-section of figure 19, in that there is no recess/groove provided on the outer side 160 of the
 15 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 yielding material.

Figure 28 shows the schematic application of the profile cross-sections 161 as packaging for a glass-sheet 162. In the version example, the packaging is covered on both sides with a foam
 20 layer 163, which although also made of polystyrene, has a density that is 30% lower. This is synonymous for being more yieldable.

In the version example 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 disc.

Figure 15 shows a cross-section of the edge-protection 60 that differs from the edge-
 25 protection of figure 3 in that recess 63, intended to accommodate the glass-sheet, is provided with an insert 62, which may be replaced by other inserts, when other glass-sheets need to be accommodated. Additionally, recess 64, which is centred below recess 63, is provided for not just one reinforcing profile 61, but for multiple reinforcing profiles.

Figure 16 differs from the one-piece cross-section of figure 3 in that it shows two-halves
 30 65 and 66, which are brought together at their cross-section, as shown in figure 3. In the version example the contact-surfaces 67 and 68 of the two halves are positioned on the centre line when

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assembled. The halves are made of the same foam-plastic as in the version example in figure 3. To connect the two-halves 65 and 66, the contact surfaces are melted and pressed against each other, creating a weld.

Figure 17 shows the cross-section of another edge-protector. This edge-protector has the same recess for the glass-sheet as shown in figure 3 and the same recess for the strapping-band as shown in figure 3. In difference from the version example in figure 3, the cross-section shown in figure 17 consists of the three parts 70, 71 and 72. The parts 70 and 71 consist of the same foam-plastic as provided in figure 3. The parts 70 and 71 thus form the yielding material. At the same time, part 70 forms the recess, in which the glass-sheet is placed, while part 71 functions as the recess for the strapping-band.

A reinforcing layer 72 of a expanded plastic is provided between the two parts. Like parts 70 and 71, this plastic is also made of polystyrene, making it possible to weld all parts together. For other version examples, other materials are provided. If materials are provided that cannot be welded, gluing can be used.

Figure 18 shows a version example with a cross-section 75, which has a similar recess 76 as used in the cross-section shown in figure 3. It also has the same recess for the strapping-band. In contrast to figure 3, two recesses 77 and 78 are provided for placing two parallel-arranged, spaced apart glass-sheets.

Figure 24 shows another version example that differs from other versions in that in the hollow on both sides of the glass-sheet enclosed by the edge-protection 140, a cross 141 made of foam-plastic is provided to further secure the glass-sheet. The struts from the cross forms a brace. In the current version example, the cross is made of the same foam as the yielding material. In other version examples, one or more struts are provided instead of the cross.

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

According to figure 25, the profiles shown in figure 24 are divided into different sections. The sections are labelled 140, 141, 142, 143, 144 and 145. All the sections 140, 141, 142, 143, 144 and 145 have a profile with a cross-section corresponding to the cross-section shown in figure 13. The sections 140, 141, 142, 143, 144 and 145 were created by cutting the right length

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from profile bars/rods. In addition, the sections 145 are mitred. Finally, sections 143 are also provided with forklift-feet.

Each section 140, 141, 144, 142 and 143 is placed with two mitred-cut sections 145 on wooden profiles, whose cross-section is shown and in the remaining's of this document show as dashed and dash-dotted centre lines 153. In this example, the inserts 146 and 147 are pushed into the corresponding grooves. In this way parts are created corresponding to the profiles/sides/side profiles as described in figure 24. The wooden profiles give the profiles/sides/side-profiles composed of individual sections already considerable support, allowing the edge-protection to be placed around the glass-sheet. The required additional cohesion with the glass-sheet is realized by the strapping. In sections 140, 141, 144, 141, 143 and 145 corresponding recesses for the wooden profiles are provided. Due to the strapping tension of the strapping-band, it is not necessary to connect the ends of the wooden profiles. This makes for easier installing of the packaging.

In other version examples, all sections 140, 141, 144, 142 and 143, with the exception of one for each section of the profile/side/side-profile, have the same profile length. This one profile section has a customized length and can therefore be referred to as a fitting section. Using the same length for all the other sections streamlines production. Especially 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, which is only worthwhile when quantities are large enough, even when particle-foam is cheaper than extruded foam.

According to figure 26, instead of the sections 145 providing the corners as shown in figure 25, corner pieces out of one piece 152 are provided. The corner pieces 152 may contribute to an efficient production, because they make mitre-cuts unnecessary, which otherwise cause significant waste/scrap.

In the corner-pieces, the wooden-profiles may abut one another bluntly, or abut one another with a mitre-cut, or a small distance may even remain in between.

Figure 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 figure 26 is shown in dash-dotted lines.

In other version examples, instead of the wooden profiles loosely abutting each other, a connection of the wood-profiles is provided. The connection can be used as an assembly aid, or it can provide cohesion for the packaging if so required, either alone or in combination with the strapping of the packaging. As a connection, a screw 152.3 is provided. The screw can be easily

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

5 In the version example according to figure 25, more transport-aids besides the forklift-feet are provided, shown as the hooks 149 and handles 150.

In the version example, the hooks combine with the openings 148 provided in the side-profiles 144. The hooks 149 can be hooked in the openings 148, making it possible to transport the glass-sheets in their packaging in a suspended manner.

10 This has significant advantages on construction sites, especially because cranes or other lifting equipment are often used on site. With these provisions, transporting a glass-sheet by hand becomes partly unnecessary.

If however a glass-sheet transport by hand is required, a handle 150 attached to the packaging can be very helpful. The handle 150 differs from the version example in figure 21 and
15 figure 22 in that it is made of S-shaped, or meandering bent sheet metal, or it consists 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.

20 Figure 29 shows a further application of the invented edge-protection profile shown in figure 27. Here, the edge-protection is composed of sections 165 and corner pieces 166. As already shown in figure 27, grooves/recesses are provided on the sides of the sections 165 with dove-tail-shaped cross-sections. These grooves continue in the corner pieces 166, up to the ends of the corner pieces 166, so that it is possible to slide accessories on at the corner pieces. The
25 accessories grip into the grooves/recesses with, in cross-section, dove-tail-shaped tongues/protrusions.

An accessory is shown in figure 30. It concerns a U-shaped sleeve 170, which can be slid onto the outside of the edge-protection as shown in figure 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
30 the width of the edge-protection plus the necessary freedom of movement to allow the sleeve 170 to be slid on. Moreover, as with other accessories, tongues/protrusions with dove-tail-shaped

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cross-sections are provided, which connect with sufficient freedom of movement 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 is equipped with 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 version example, blocking by inserting a small wedge (not shown) between sleeve and edge-protection is provided. In the version example, when the cargo/packaged-good is to be carried by the sleeves, it is inserted from above. This has the advantage that the wedges cannot fall out from the gap between the sleeve and the packaging.

The shorter the sleeve 170 becomes and especially if the sleeve length is shortened to such an extent that one can speak of a bracket, the more a situation occurs where the sleeve will self-lock onto the packaging. The force engaging on the handle forces a tilting of the sleeve 170 towards the packaging. A small tilting is already sufficient when both the packaging and the sleeve are made of foam-plastic, which is cut at the contact surface. The self-locking does not interfere with the ability to move the sleeve 170 on the packaging if the sleeve 170 is made to hold in the area of the dove-tail-shaped grooves/recesses and tongues/protrusions, so that the sliding forces are exerted there.

The handle 172 can also be used as a hook for suspended transport of the glass-sheet and its packaging.

Figure 31 and 32 show further version examples of handles. In both cases, the handles are shaped like a bracket, created by shortening the sleeve, resulting in a self-locking attachment/transport-aid as shown in figure 30.

Figure 31 shows a bracket 175 that has an opening 177, which has the same cross-section as the sleeve 170. As a result, the bracket 175 can be slid onto the edge-protection just like the sleeve 170. Advantageously, tilting blocks the bracket inside the recesses/grooves when a corresponding pull is applied to the bracket. For that, a handle opening 176 is provided in the bracket. Using a hook that hooks into the handle's opening or through which a means to pull is guided and secured, a suspended transport becomes possible.

Figure 31a builds on the version example of a handle that can slide onto the packaging as in figure 31. Figure 31a provides the same recess as in figure 31, but referred to as 177.1. The material that covers the packaging material is the same as in figure 31 and referred to as 175.1.

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However, an ergonomically enhanced shape is selected on the opposite side of the recess 175.1. The handle 178 has no sharp edges, but is rounded and therefore more pleasant to use. The handle bar 178 is held between two sides, which taper from the enclosing material 175.1 to the handle bar 178.

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

Figure 32 also shows a bracket-like accessory/transport-aid 180 that differs from the accessory shown in figure 31 in that it is shaped like a hook, attached to the opposite side of the
10 recess 181. The hook-shaped end 182 can be used as a handle or can be used for a hitch like type of traction device.

Figure 32a shows another handle 182.1 as a transport-aid, which differs from the handle of figure 32 in having a better ergonomic shape. When using this transport-aid as a hook, it will provide more security against the possibility of cables or similar type lifting means slipping off.

15 The accessories/transport-aids shown in figure 31 and figure 32 can also be used as forklift-feet, by pushing them from the outside onto the bottom edge-protection. According to figure 33, a special part 190 is optionally provided as an accessory/transport-aid that differs from the accessories shown in figure 31 and figure 32 in that it has neither a handle opening nor a hooked-end.

20 Advantageously, when used as forklift-feet, the accessories shown in figures 31 to 33 improve to the stability of the glass-sheet and its packaging, because they create a wider contact area.

Figure 34 shows a special foot 191 as an accessory, which creates an even wider contact area in comparison to the accessories shown in figures 31 to 33. The foot 191 is slid onto the
25 packaging at the bottom corners.

Figure 35 shows another accessory 193 for the invented packaging. The accessory 193 has two openings 194 and 195, both of which are able to slide over the invented packaging/edge-protection. This allows for the packaging of two sheets of glass to be joined. Advantageously, the glass packaging and the glass-sheets will then support each other.

30 Figure 36 also shows an accessory/transport-aid for a connection between two glass-sheets and their packaging. In this situation however, a connection profile 197 is provided to

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connect glass-sheets and their packaging standing one behind the other. To achieve this, the connection profile has a H-shape with consecutive openings 198 and 199, which allows the connecting profile to be slid over the invented packaging/edge-protection.

Figure 37 also shows an H-shaped transport-aid 205, where the upper opening 206 is intended to grip the lower edge of the invented packaging/edge-protection with the opening facing upwards, with a roller 207 positioned in the lower opening so that the glass-sheet, together with its packaging, can be moved, with the aid of the transport-aid.

Figure 38 builds on the profile for the edge-protection of figure 19, which forms the yielding material for the invented edge-protection. The profile shown in figure 19 shows a single recess 101 for placing an insert to hold the glass-sheet. The insert is exchangeable and by changing the selected thickness, it can be adjusted to suit the thickness of the glass-sheet.

This way, a variety of glass thicknesses can be placed into the inserts: for example, 5 or 10 or more different glass-sheets can be held, depending on the dimensions of the inserts. Profile 215 in figure 38 differs in that two side-by-side recesses are provided. In this version example the two recesses are designed to hold the glass-sheets directly, without the use of an insert (as shown figure 14 to 14f).

Other version examples are also intended to hold the glass-sheets without the use of inserts and show to the same recesses as the inserts of figure 14 to 14f.

The recesses in the exemplary version of figure 38 are stepped. On the top side, the recesses are made to hold glass-sheets with a thickness of 8 mm. towards the deepest side of each recess 216, a narrowing 217 is provided to hold glass-sheets with a thickness of 6 mm.

Therefore the profile in figure 38 can accommodate 2 glass-sheet thicknesses.

Figure 39 and figure 40 show other profiles for the invented edge-protection, which are also intended to hold the glass-sheets directly.

The profile 220 in figure 39 has four recesses 221 with narrowings 222 towards their deepest side. In the version example, the recesses 221 and 222 are provided for other glass-sheet thicknesses than with the profile in figure 38.

Figure 40 shows a profile 225 with recesses 226 and narrowings 228 at their deepest. The profile 225 is intended for further glass-sheet thicknesses.

Figures 40 to 47 show various packaging for glass-sheets in comparison to one-another. All packages enclose the glass-sheet in a frame-shape. Figure 41 shows a packaging 23 that is

permanently provided with forklift-feet 231.

Figure 42 shows a frame 235 with permanently provided band-hooks 241. These are hooks allowing the frame, hanging on bands, to be transported in a suspended manner. Figure 43 shows a frame 240 with permanently provided handles 241, which allows the frame to be carried
5 by the handles.

Figure 44 shows a frame 245 with feet 246 attached to it. The feet serve to position the frame 245 with the glass-sheet firmly on the ground in an upright position. Fig. 44a shows the feet in detail. It shows that the feet consist of a triangular plate 247 and a tongue 248.

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

Both plate and tongue can be made of foam-plastic, so that both parts can be manufactured as one-piece. Using a plate-shape saves space. On the other hand, a thin plate is easily damaged. To reduce the risk of damage, strengthening the foam-plastic plate will be advantageous. To achieve this, the plate can be given a mantle or coat, or be reinforced in the
15 same way as described elsewhere for the profiles, which form the packaging for the glass-sheets.

In other version examples, the plate and the tongue are made of different materials. The connection can be made by gluing, or in a conventional mechanical manner.

The feet can be mounted flush to the packaging and they can create distance between the packaging and the ground. In this case it is advantageous to create a small plinth to the feet that
20 grips the packaging. The plinth creates a corresponding distance of the packaging to the contact area.

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

Figure 46 shows a frame 255 with multiple struts 256, connected in the form of a cross, to stiffen the frame.

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

Figure 48 builds on figure 19 and shows a profile 265 with further profiles 266, 267 and 268. Profiles 266, 267 and 268 are made of the same foam-plastic as profile 265 and serve to thicken profile 265. The additional profiles 266, 267 and 268 grip into the grooves of profile 265.

30 The details of the grooves are described in figure 19.

These grooves correspond with tongues in the profiles 266, 267 and 268. The tongues are

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part of a so-called tongue & groove connection. The tongues are formed by protrusions/bulges on the profiles 266, 267 and 268, which match the grooves cross-sectional, so that the profiles can be slid into the grooves with the tongues.

5 In another version example, profiles 266, 267 and 268 consist of open-cell foam-plastic with an open-cell percentage 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.

10 The open-cell structure causes a damping characteristic of the profiles 266, 267 and 268; during deformation the air can escape from the open cells, allowing a slow reset/recovery of the profiles after release. This prevents the cargo from vibrating after being bumped into or bumping against an object. For sensitive glass like float glass, this has considerable advantages.

In other version examples, profiles 266, 267 and 268 may have a different cross-sectional shape, for example with curvatures or nubs on the surface.

15 Figures 48a and 48b show variations of the thickening profiles 266, 267 and 268 as shown in figure 48. The figures show thickened profiles 270 and 271, whose tongues 272 and 273 respectively are in a different position. It means that, in modification of the version example in figure 48, the lengths, thicknesses, and arrangement of the tongues on the thickening profiles 266 to 268 can vary over a wide range.

20 Figures 48c and 48d show containers as two additional transport-aids for the invented packaging, with which accessories and/or transport documents and/or assembly instructions can be sent. The container according to figure 48d is small; the container according to figure 48c in comparison large. Both containers have a tongue 290 or 299 that allows them to be inserted into the available grooves of the packaging. In both figures the containers 291 and 298 show a tubular shape. After filling the containers they are sealed with lids (not shown).

25 Figure 48e shows an eyelet as yet another transport-aid for the invented packaging. This transport-aid consists of a part 300, which is identical to part 175.1 of figure 31a that encompasses the packaging, but is now equipped with a ridge 301.

30 Like the other transport-aids, the eyelet is made of plastic. However, the plastic is reinforced by providing it with a coat or mantle, in the same way as described elsewhere for the reinforcement of foam-plastic.

The eyelets are suitable both for attaching lifting means, such as hooks and cables, as well

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as for transport securing.

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

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

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

Figure 48f shows a transport-aid with a pin. The transport-aid serves to attach lifting means such as cables and hooks. But it can also be used to allow for carrying by hand. This
10 additional transport-aid consists of a part 310 that is identical to the part that covers the packaging 175.1 in figure 31a, but in which a pin 311 has now been integrated. Like the other transport-aids, this transport-aid is made of plastic. However, the plastic is reinforced through formation of an outer coat or mantle, in the same way as described elsewhere for the reinforcement of foam-plastic. The spigots are pushed onto the sides that connect the top and
15 bottom of the packaging.

Figure 51 shows two profile-halves 340 and 341, which have a 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 profile has a recess 343 for an insert, which, in this version example, both holds the glass-sheet and protects the edge.

20 In addition, profile-half 341 has a groove for a tongue from a tongue & groove connection.

The profile-half 340 has a tongue 345 for a groove from a tongue & groove connection. The tongue & groove connection is dovetail shaped. Using two profile-halves and welding them together has manufacturing-advantages for smaller quantities. It then becomes economical to cut the profile-halves out of foam boards.

25 The profile in figure 52 differs from the profile in figure 51 in that it uses different profile-halves 351 and 352 as an edge-protection. The two profile-halves of figure 52 differ from the profile-halves of figure 51 in that they are held together by a tongue & 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
30 advantageous, for example in the situation where damage has occurred to only one of the profile-halves, which can then simply be replaced with an undamaged profile half. Furthermore, the

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

If multiple sheets are to be packed simultaneously side-by-side and only small quantities per type of sheet are required, it may be advantageous to select the profile halves 350 and 352 as
5 side-profiles and to space them by means of centre-profiles 353 and 354, in order to enlarge the space for inserting the glass-sheets.

Figure 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 with an insert 360 that can hold three glass-sheets.

10 Figure 54 shows a profile with two centre-profiles 353 and 354 between the side-profiles 350 and 351. These centre-profiles can be connected to both the side-profiles and an insert 361, made to hold 6 glass-sheets.

Patent claims

1. Packaging for cargo, in particular disc-shaped cargo, in which an edge-protection is provided for at least one outer edge, in which the edge-protection consists at least partially of yielding material and a reinforcing material, in which the yielding material is at least partially disposed between the edge of the cargo and the reinforcing material, in which the yielding material has a yieldability at least 20% greater than the yieldability of the reinforcing material, preferably at least 40%, even more preferably at least 60% and most preferably at least 80% greater than the yieldability of the reinforcing material.
2. Packaging for cargo, in particular disc-shaped cargo, in which an edge-protection is provided for at least one outer edge, in which the edge-protection consists at least partially of yielding material and a reinforcing material, in which the yielding material is at least partially provided on the outside with a reinforcing material, in which the yielding material has a yieldability which is at least 20% greater than the yieldability of the reinforcing material, preferably at least 40%, even more preferably at least 60% and most preferably at least 80% greater than the yieldability of the reinforcing material.
3. Packaging for cargo, in particular disc-shaped cargo, in which an edge-protection is provided for at least one outer edge, in which the edge-protection consists of a yielding material and a reinforcing material according to claim 1 or 2, and is characterized by the fact that the yielding material at least partially encloses the reinforcing material and/or the reinforcing material at least partially encloses the yielding material, in which the yielding material and/or the reinforcing material is either a one-piece section or consists of multiple sections and/or has a one-piece cross-section or multiple-piece cross-section.
4. Packaging according to claim 3, characterized by,
 - a) Sections made of yielding material and connected together by the reinforcing material and/or further packaging parts, in which the further packaging parts are preferably formed by unexpanded materials, which enclose the packaging including the cargo at least partly,

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b) or the sections are made of reinforcing material and are connected together by the yielding material and/or further packaging parts, in which the further packaging parts are preferably formed by unexpanded materials, which enclose the packaging including the cargo at least partially

c) The one-piece packaging consists of yielding material, which is surrounded with the reinforcing material and/or other parts of the packaging and/or the sections in cross-profile consist of multiple profiles, preferably side-profiles, combined with at least one middle-profile.

5. Packaging according to claim 4, characterized by,

a) A multitude of sections that are held together by external strapping or by an external band, and/or by an external strap, and/or by an external foil, and/or by an external fabric, and/or an external profile, in which the foil and/or the fabric and/or the profile are pressed or tensioned against the sections.

b) A multitude of sections held together by an inner lying strapping and/or by an inner lying strapping band and/or inner lying profiles.

c) Packaging sections made of one-piece or composed of sections, reinforced by a foil and/or fabric, which encloses the outside of the packaging at least partially and

cc) preferably being at least partially laminated onto the packaging, even more preferably whilst put under tension or

ccc) preferably being embedded into the surface of the yielding material.

d) Packaging sections made in one-piece or composed of sections, which are at least partially enclosed on the outside by a fabric, wherein the fabric is a mesh-fabric.

Packaging sections made in one-piece or composed of sections which is at least partially provided with a coat or mantle as reinforcement

6. Packaging according to claim 5, characterized by section made from yielding material,

a) In which profiles provided as a reinforcing material can be slid onto and/or

b) In which profiles provided as a reinforcing material can be inserted into the yielding material and/or

c) In which from two adjacent sections one section engages with a protrusion into a recess of the other section and/or

d) In which from two adjacent sections one section connects with or into the other section by a connecting means and/or

e) In which one or more sections are externally reinforced with a foil and/or a fabric, preferably with a foil and/or fabric that covers at least two sections made of yieldable material and positioned side-by-side or behind one-another in the packaging, in which even more preferably, the foil or the fabric is laminated onto the yielding material and/or

d) In which the mantle or coat is an extrusion skin, or a skin of a filament cut, or a skin that is the result of heat treatment

7. Packaging according to one of claims 1 to 6, characterized by the fact that the yielding material is a foam-plastic with at least 95% closed cells, preferably a foam-plastic with at least 10% open cells, even more preferably with at least 20% open cells and most preferably with at least 30% open cells.

8. Packaging according to one of claims 1 to 7, characterized by the fact that the reinforcing material is of a metallic, an organic or an inorganic nature, or that it is made of plastic, or that it is made of a mixture of at least two different materials, and even more preferably is produced on a layer-by-layer basis.

9. Packaging according to one of claims 1 to 8, characterized by the fact that sections used for a packaging are at least also partially useable for a packaging with other dimensions.

10. Packaging according to one of claims 1 to 9, characterized by the fact that the reinforcing material, in particular for glass-sheets, is a wooden profile, preferably a roof batten and even more preferably a roof batten made according to DIN 4074-1.

11. Packaging according to one of claims 1 to 9, characterized by the fact that the reinforcing material, in particular for natural stone plates, is a metal profile, preferably a hollow aluminium profile or a hollow steel profile.

12. Packaging according to one of claims 1 to 11, characterized by at least two layers of

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reinforcing material, positioned at different distances from the edge of the cargo needing protection, in which yielding material is not only provided between the edge requiring protection and the next layer of reinforcing material, but also in between both layers of reinforcing material and is preferably also placed on the outside of the layer with reinforcement material, positioned furthest away from the edge requiring protection.

13. Packaging according to one of claims 1 to 12, characterized by the fact that the yielding material, as used on the outer surface of the cargo, protrudes beyond the cargo, preferably encloses the edge that needs to be protected.

14. Packaging according to claim 13, characterized by the fact that the reinforcing material extends into the region of the yielding material, which stands at a right angle to the outer surface of the cargo with respect to the cargo and preferably extends into the region with which the yielding material encloses the edge that needs to be protected.

15. Packaging according to one of claims 1 to 14, characterized by the fact that the yielding material or the reinforcing material is composed of one piece or multiple pieces when viewed as a cross-section.

16. Packaging according to claim 15, characterized by the fact that the yielding material, together with the reinforcing material, forms a composite material.

17. Packaging according to one of claims 1 to 16, characterized by the fact that the yielding material and/or the reinforcing material form a profile, made of several parts when viewed as a cross-section, in which at least one dividing-joint runs in the profile's longitudinal direction, in which the dividing-joint running in the profile's longitudinal direction preferably runs through the opening provided for the reinforcing-profile.

18. Packaging according to claim 17, characterized by the fact that the various parts of the profile are glued together and/or welded together and/or mechanically held together.

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19. Packaging according to one of claims 1 to 18, in which a circumferential edge-protection of the cargo is provided and in which the edge-protection is composed of individual sections, held together by at least one strapping, or at least one tensioning-band, or at least one tensioning-strap, and/or at least a tensioned foil enveloping the cargo, and/or at least a tensioned fabric enveloping the cargo, preferably using corner-protection in order to reduce the corner load and/or to improve the slip effect on the packaging corners for the strapping, the strap, the strapping band, the foil or the fabric.
20. Packaging according to claim 14, characterized by the fact that,
- a) At least two profile-sections of the edge-protection abut one another bluntly at a corner of the cargo or
 - b) At least two profile-sections of the edge-protection abut one another mitred at a corner of the cargo, or
 - c) At least two profile-sections of the edge-protection abut a corner-section; especially bluntly abut a corner-section.
21. Packaging according to claim 15, characterized by the fact that
- a) For a disc-shaped cargo four corner-profiles are provided, in which each corner-section connects with two profile-sections and
 - b) For a cuboid-shaped cargo eight corner-profiles are provided, in which each corner-section connects with three profile-sections.
22. Packaging according to claim 20 or 21, characterized by the fact that
- a) One single profile-section is provided between two adjacent corners of the cargo or
 - b) Several profile-sections are provided between two adjacent corners of the cargo, in particular when at least one of the profile-sections serves as a section-module of the same length for different packagings, and where another profile-section serves as a fitting piece, which together with one or more section-modules, creates the required profile length between two adjacent corners
23. Packaging according to one of claims 1 to 122, characterized by an interchangeable use as

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edge-protection ,

- a) That can hold and adjust to different thicknesses of the disc-shaped cargo and/or
- b) That can hold a number of side-by-side positioned cargos and/or
- c) That can adapt to different lengths and/or widths of the packaged product.

24. Packaging according to one of claims 1 to 13, characterized by

- a) Stepped recesses in the edge-protection to accommodate inserts with different thicknesses and/or different thicknesses of cargo and/or
- b) Stepped recesses in the inserts used in the edge-protection, to hold different thicknesses of cargo.

25. Packaging according to one of claims 1 to 24, characterized by a permanently or detachably affixed thickening to the edge-protection, in which

- a) The permanent thickening is preferably laminated and/or
- b) The detachable thickening is preferably provided with a tongue and groove connection between the edge-protection and the thickening.

26. Packaging according to one or more of claims 1 to 25, characterized by the fact that several packagings can be connected with one another, preferably with a tongue and groove connection in which the tongue is undercut and the groove grips around the tongue, even more preferred by a dovetail-fitting between tongue and groove.

27. Packaging according to one of claims 1 to 26, characterized by the fact that the yielding material,

- a) Is made completely or partially of particle foam-plastic or
- b) Is made completely or partially of extruded foam-plastic or
- c) Is made completely or partially of injected foam-plastic.

28. Packaging according to claim 27, characterized by the fact that

- a) For smaller quantities, the sections of the packaging are composed of various parts, in which

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aa) The individual pieces are assembled to form a closed cavity when viewed as a cross-section and/or an open cavity when viewed as a cross-section, so that a machined deformation is at least partially expendable

b) For smaller quantities, the sections of the packaging are machine deformed to create open and/or closed cavities.

c) Foam-plastic strands are at least used in part for the sections of the packaging with smaller quantities, which are cut from a sheet-type base-material, preferably from a plate-shaped extruded material or a plate-shaped material made of particles.

d) For larger quantities, the use of extruded foam-plastic strands, and/or the use of moulded parts made of particle foam and/or the use of injection mouldings.

29. Packaging according to one of claims 1 to 28, characterized by the fact that the band or strap used to hold the sections of the packaging together, is guided through a recess in the packaging/edge-protection, in which at the same time, available grooves preferably serve as guidance for the band or strap.

30. Packaging according to one of claims 1 to 29, characterized by the fact that the hollow over the outer surface area of the cargo and enclosed by the edge-protection, is at least partially covered with further yielding material

a) In which the additional yielding material is made of the same or similar yielding material as the edge-protection,

b) In which the additional yielding material for the enclosed surface area differs from the provided yielding material used outside of the enclosed area, preferably with a layer of cardboard or paperboard in the enclosed area, even more preferably with a honeycomb structure in the cardboard or paperboard layer.

31. Packaging according to one of claims 1 to 30, characterized by a wrapping of the cargo and its edge-protection in a foil and/or a fabric, in which the foil and/or the fabric preferably encloses the provided yielding material filling the hollow over the outer surface area of the cargo as well.

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32. Packaging according to claim 31, characterized by the fact that
- a) The foil or the fabric is made of a shrink-material that tensions due to shrinking with heat treatment and/or
 - b) The foil and/or the fabric is connected to the yielding material, in which the foil and/or fabric and/or the yielding material are under tension and/or
 - c) The foil and/or the fabric surrounds the yielding material loosely and the packaging is provided with a tensioning device.
33. A package according to claim 31 or 32, characterized by the fact that,
- a) The foil and/or the fabric is at least partially welded or glued to the yielding material or
 - b) That the fabric is embedded in the yielding material, preferably a glass-fibre grid fabric is imprinted in the molten surface of the yielding material
 - c) That strips of foil and/or fabric are welded or glued to the yielding material.
34. Packaging for cargo, in particular disc-shaped cargo, with an edge-protection for at least one outer edge, in which the edge-protection at least partially consists of yielding material, preferably according to one of claims 1 to 33, characterized by transport-aids, preferably,
- a) Handles and/or
 - b) Loops and/or
 - c) Hooks and/or pins
 - d) Eyelets, and/or
 - e) Rollers and/or
 - f) Feet and/or
 - g) Fasteners and/or
 - h) Forklift feet and/or
 - i) Containers and/or
 - j) Connections for transport-securing
35. Packaging according to claim 34, characterized by the fact that
- a) The handles are attached permanently or detachably, preferably with handles

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- aa) That are provided to attach to the yielding material or the reinforcing material, preferably in recesses provided in the yielding material or the reinforcing material, and/or
- aaa) Are attachable to the tensioning band or tensioning strap used for strapping
- b) The loops are attached permanently or detachably, preferably with loops,
 - bb) Which are attached to the yielding material or the reinforcing material, preferably attached to the band or strap used for strapping
- c) Rollers are housed in a separate casing and through the casing indirectly or detachably attached to the packaging, preferably with roller casings, which are attached permanently or detachably to the packaging, even more preferably with rollers which are integrated into packaging sections,
- d) The feet are attached permanently or detachably to the packaging,
- e) Hooks or spigots are attached permanently or detachably to the packaging, preferably with hooks or spigots that can be attached to the yielding material or to the reinforcing material, preferably to the band or strap used for strapping,
- f) Eyelets are attached permanently or detachably to the packaging, preferably eyelets that are attached permanently or detachably to the yielding material or to the reinforcing material, preferably attached permanently or detachably to the strapping, to the band or to the strap or that eyelets are formed by the reinforcing material, the strapping, the band or the strap itself.
- g) Connecting elements are provided that serve as a connection for abutting packaging sections and/or as a connection of packagings standing side-by-side and/or packagings that stand behind one another other.
- h) Forklift feet are attached permanently or detachably to the packaging, preferably forklift feet that are attached permanently or detachably to the yielding material, to the reinforcing material, to the strapping, to the band, to the strap or integrated into the packaging sections.
- i) Containers are attached permanently or detachably to the packaging, preferably containers that are attached permanently or detachably to the yielding material, to the reinforcing material, to the strapping, to the band, to the strap or integrated into the packaging sections.
- j) Transport-securing connections are attached permanently or detachably to the packaging, preferably transport-securing connections that are attached to the yielding material, to

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the reinforcing material, to the strapping, to the band, to the strap or integrated into the packaging sections.

36. Packaging according to claim 35, characterized by the fact that the sections that form the edge-protection are profiled on their outer surfaces in a way that accessories and transport aids can be slid onto these profiles, in which the profiles are formed by elevations and/or indentations, in which preferably a tongue/groove connection is provided between the transport-aids and the profiles, even more preferably with tongue/groove connections with a dovetail-fitting, and most preferably with a tongue/groove connection that run in the longitudinal direction of the packaging-sections, or at right angles thereto.

37. Packaging according to one of claims 1 to 36, characterized by the fact that

a) The plastic foam that forms the yielding material is, at least at the corners and on one side, provided with a mantle or coat as a reinforcement, and/or is provided with a reinforcement foil and/or with a reinforcement fabric, where the mantle or coat or the reinforcing fabric provides at least the same reinforcement as a unexpanded foil with a thickness of 0.3 mm, preferably with a thickness of 0.6 mm, even more preferably with a thickness of 0.9 mm, made of the same plastic as the foam-plastic composing the yielding material, and/or

b) A corner-protection, attached permanently or detachably, is provided on at least the corners or the corner-parts, preferably a corner-protection which is attached to or lies loosely against the corner-sections, held in place by the strapping

38. Packaging according to one of claims 35 to 37, characterized by the fact that the transport-aids are held by the packaging in a moveable way, and that they are held in the respective position by self-locking or by additional clamping.

39. Packaging according to one of claims 1 to 38, characterized by the fact that the edges of the yielding foam-plastic material, are rounded for creating a coat or mantle, in particular the edges of the recesses in the case of an extrusion coat or mantle.

40. Packaging for cargo, in particular disc-shaped cargo, with an edge-protection for at least

one outer edge, in which the edge-protection consists at least partially of yielding material, preferably according to one of claims 1 to 39, characterized by the fact that

- a) The packaging is a one-way packaging or
- b) The packaging is reusable packaging, from which the undamaged returned packaging can be used for the packaging of new cargo with the same dimensions and/or
- c) Undamaged sections of returned packaging that is damaged can be used in combination with new sections for the packaging of new cargo and/or
- d) Undamaged sections of returned, undamaged packaging can be used for the packaging of new cargo.

41. Packaging for cargo, in particular disc-shaped cargo, with an edge-protection for at least one outer edge, in which the edge-protection consists at least partially of yielding material, preferably according to one of claims 1 to 40, characterized by a complete enveloping of the cargo with yielding material, in which

- a) The covering consists of multiple pieces or
- b) The covering consists of one piece and is made of particle foam.

42. Packaging according to one of claims 1 to 41, characterized by being applied to

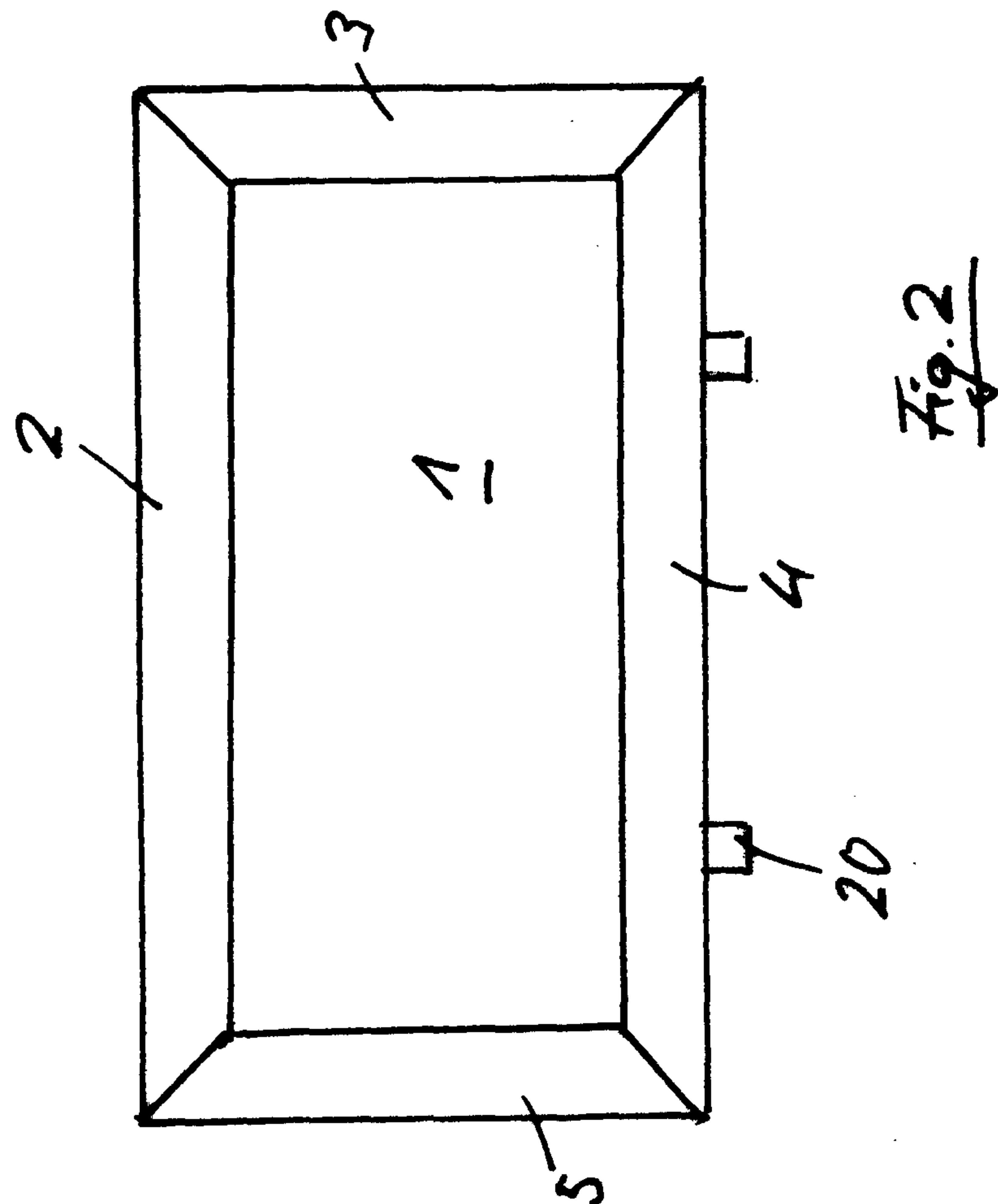
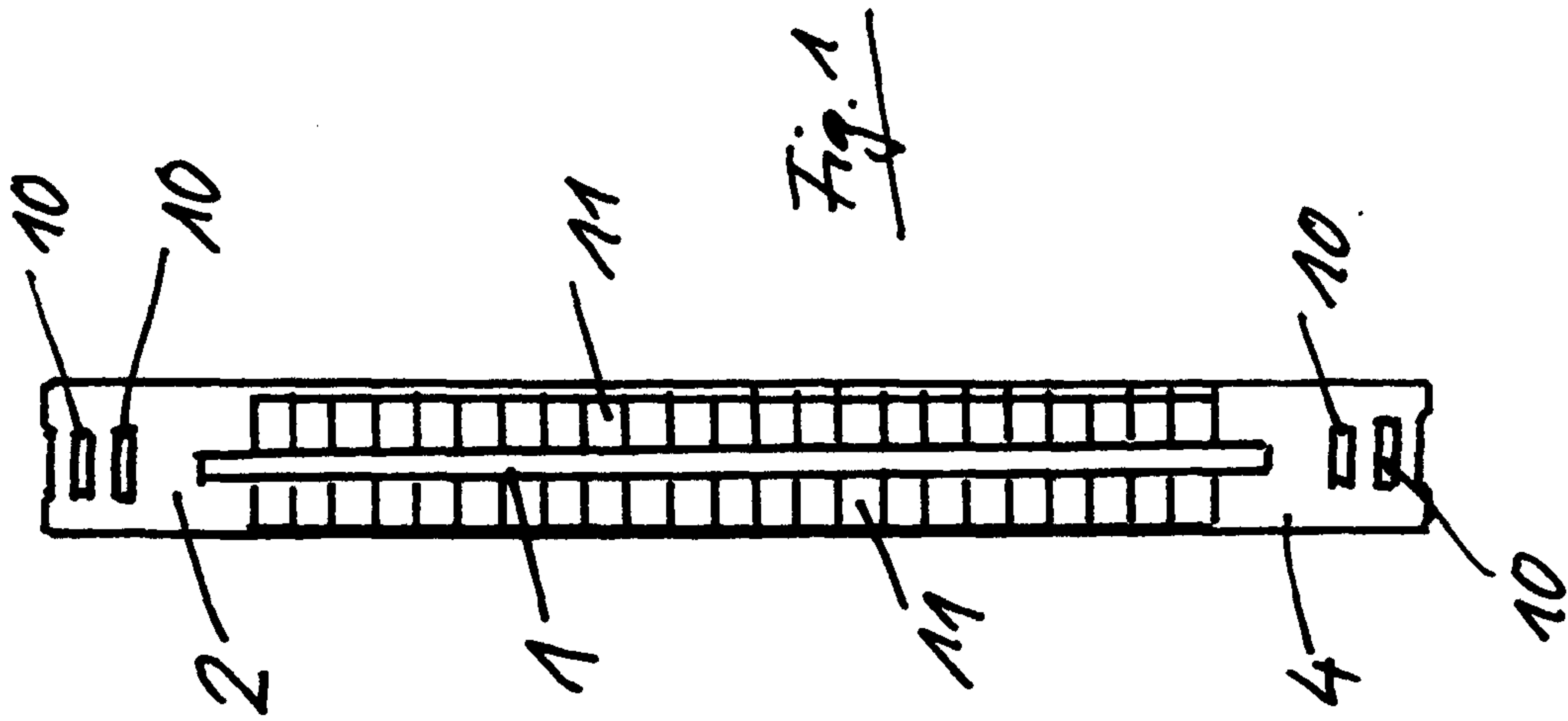
- a) Glass, preferably flat glass, especially for buildings or vehicles and/or
- b) Natural stone slabs and/or
- c) Counter tops and/or
- d) Photovoltaic panels/solar cells

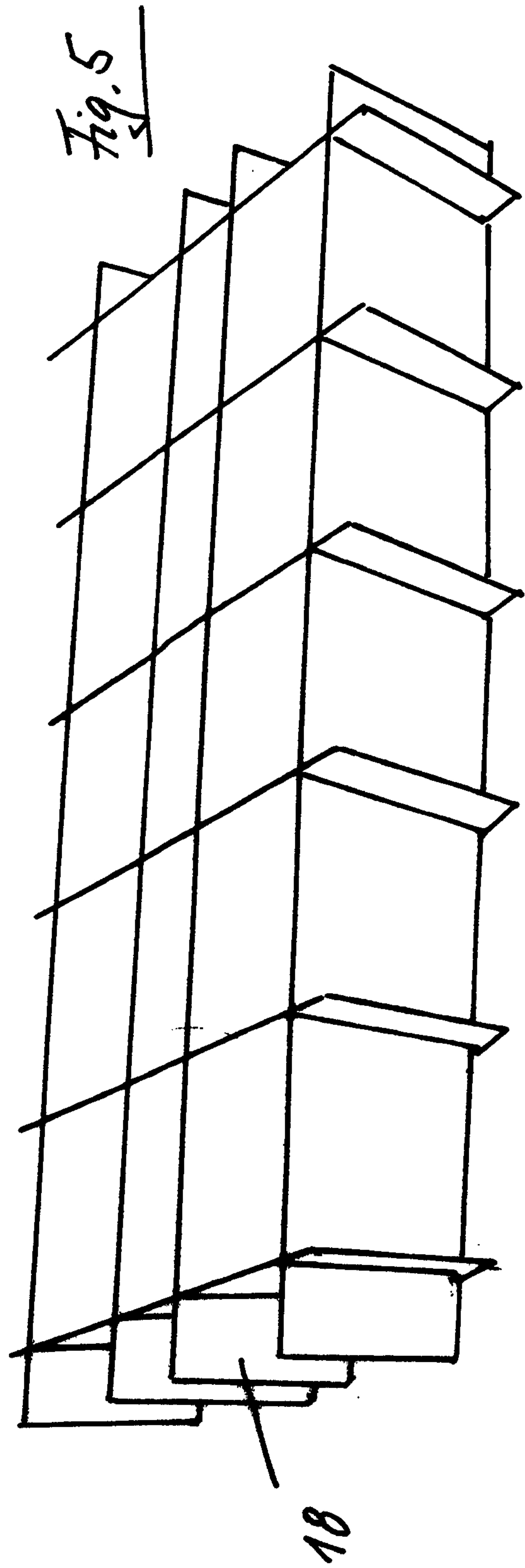
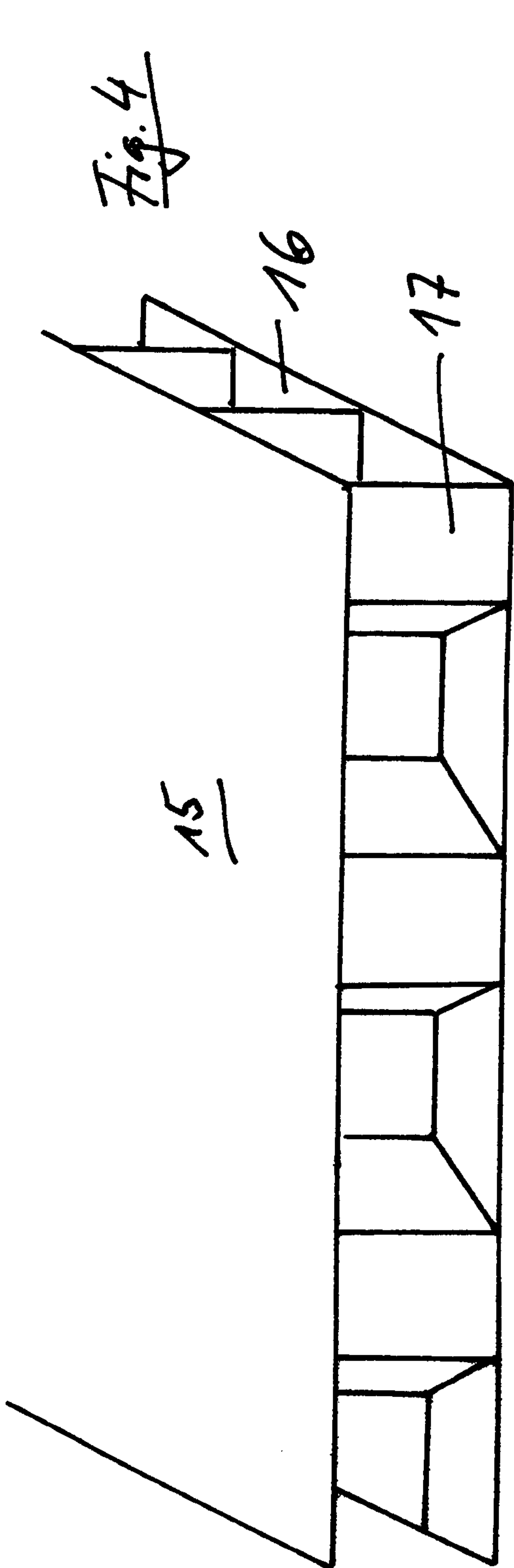
43. Packaging according to claim 42, characterized by the fact that flat glass, which has a tendency to show hairline cracks and even micro-fine hairline cracks during its manufacturing, is honed/sanded at least at the edges.

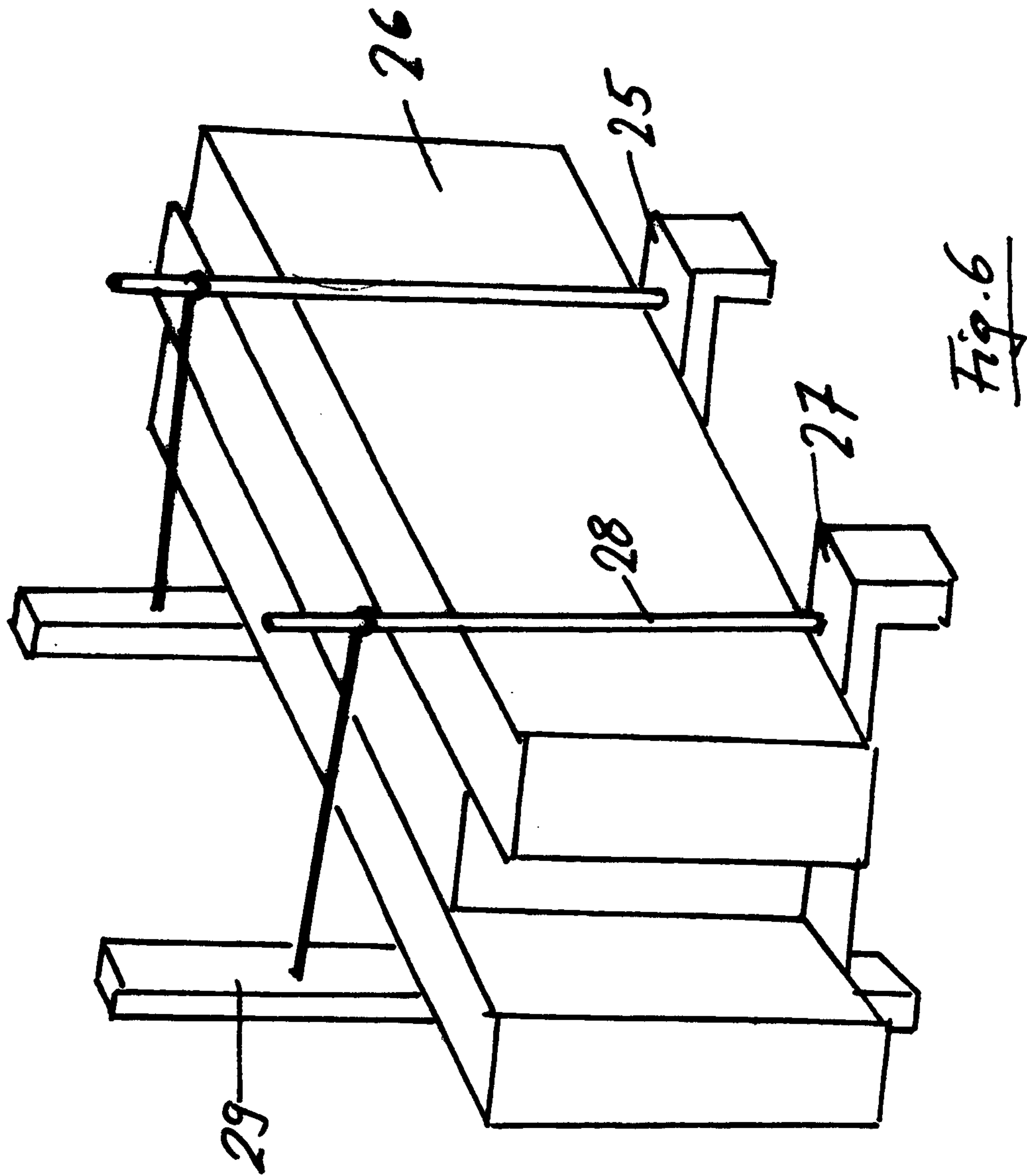
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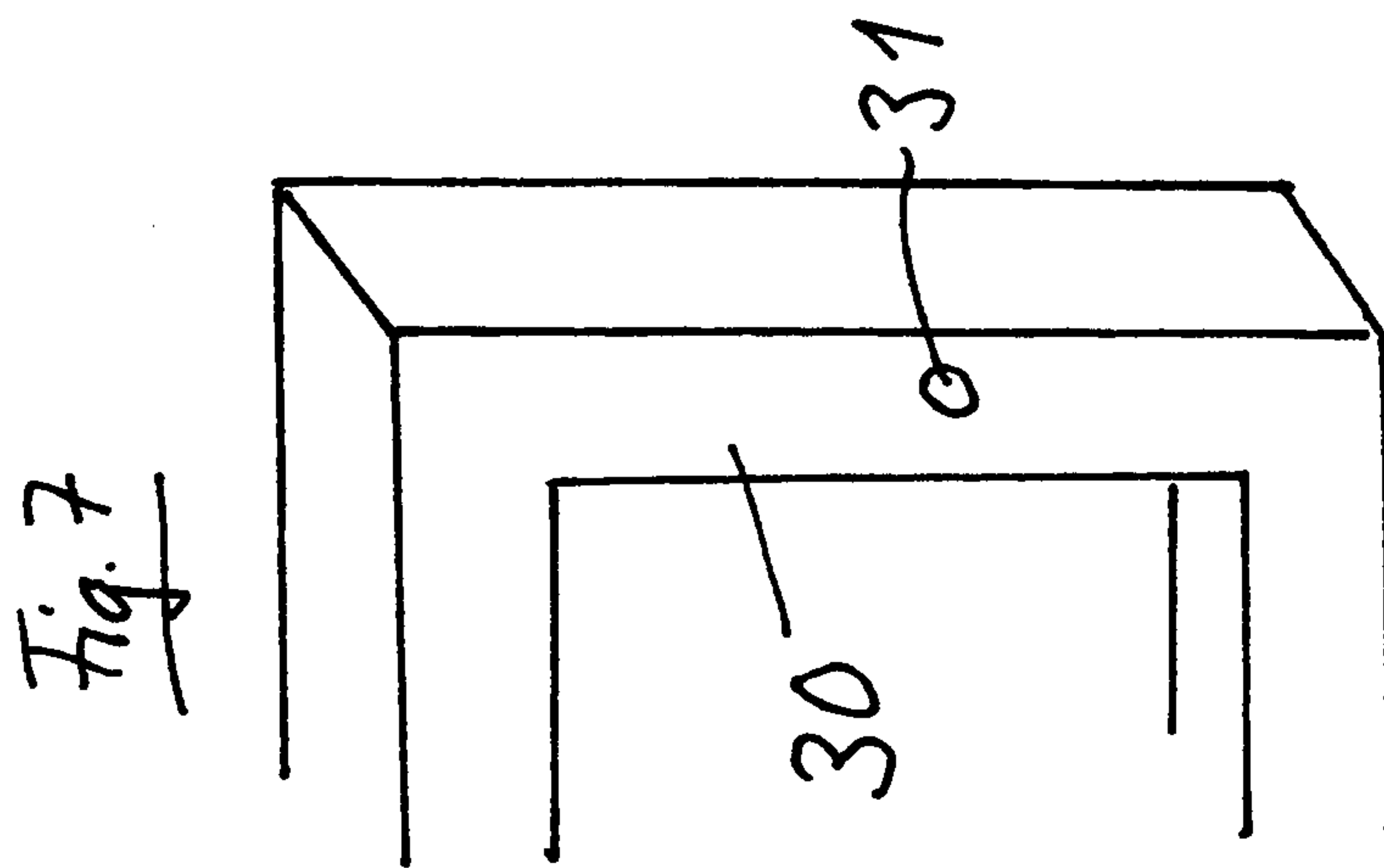
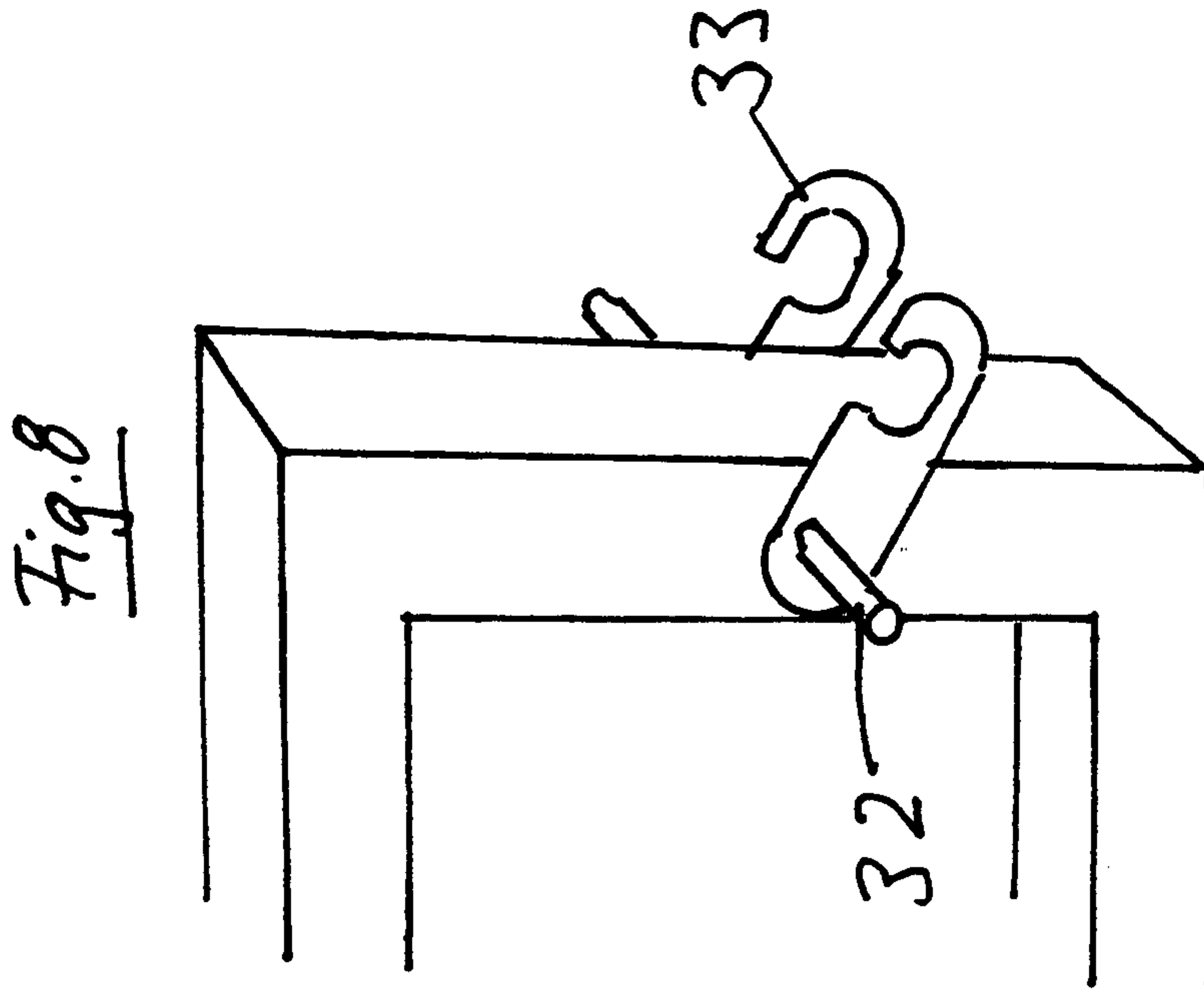
Summary

According to the invention, edge-sensitive cargoes are provided with an edge-protection that
5 consists of at least one yieldable layer and at least one reinforcing layer.









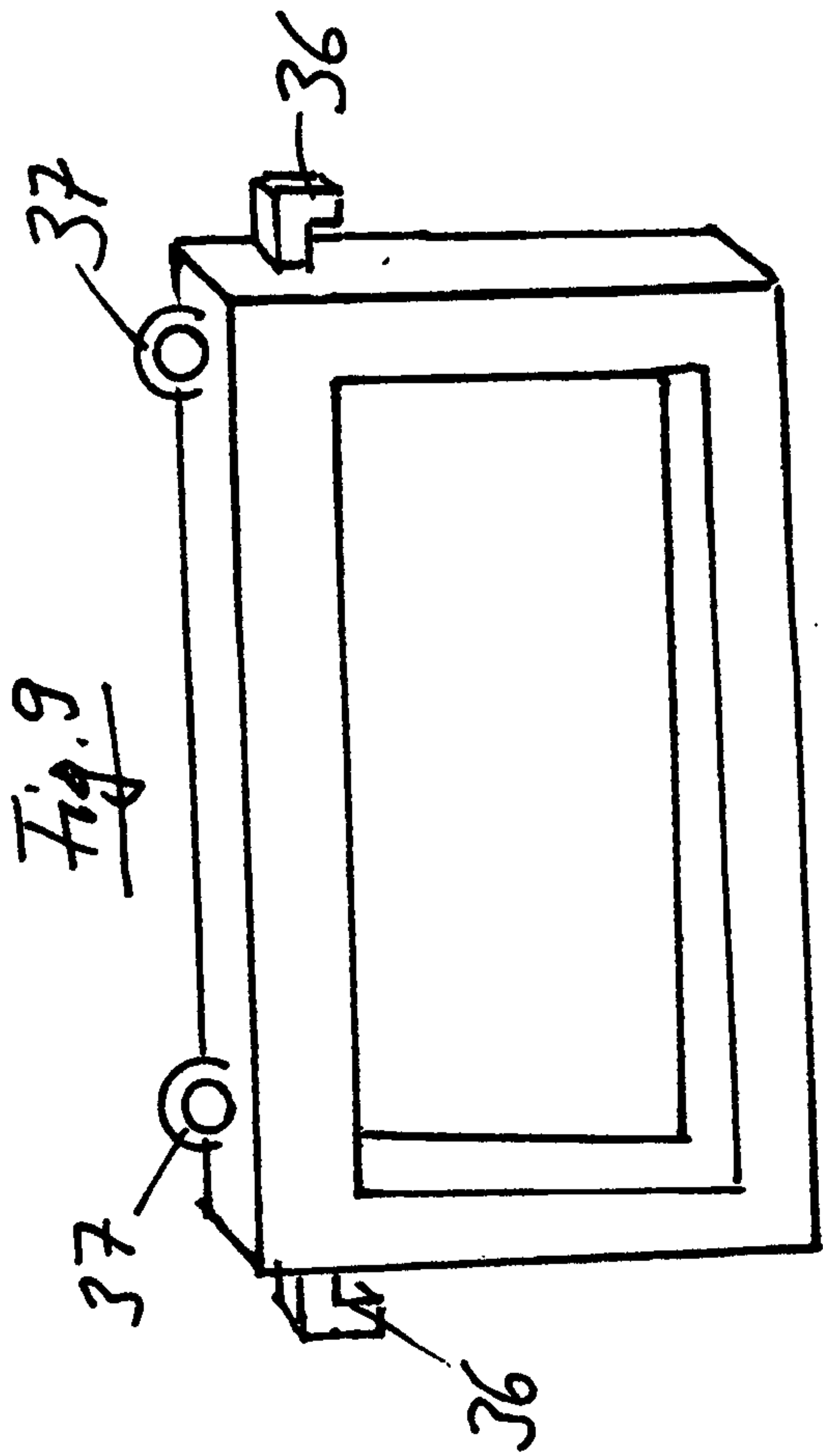


Fig. 11

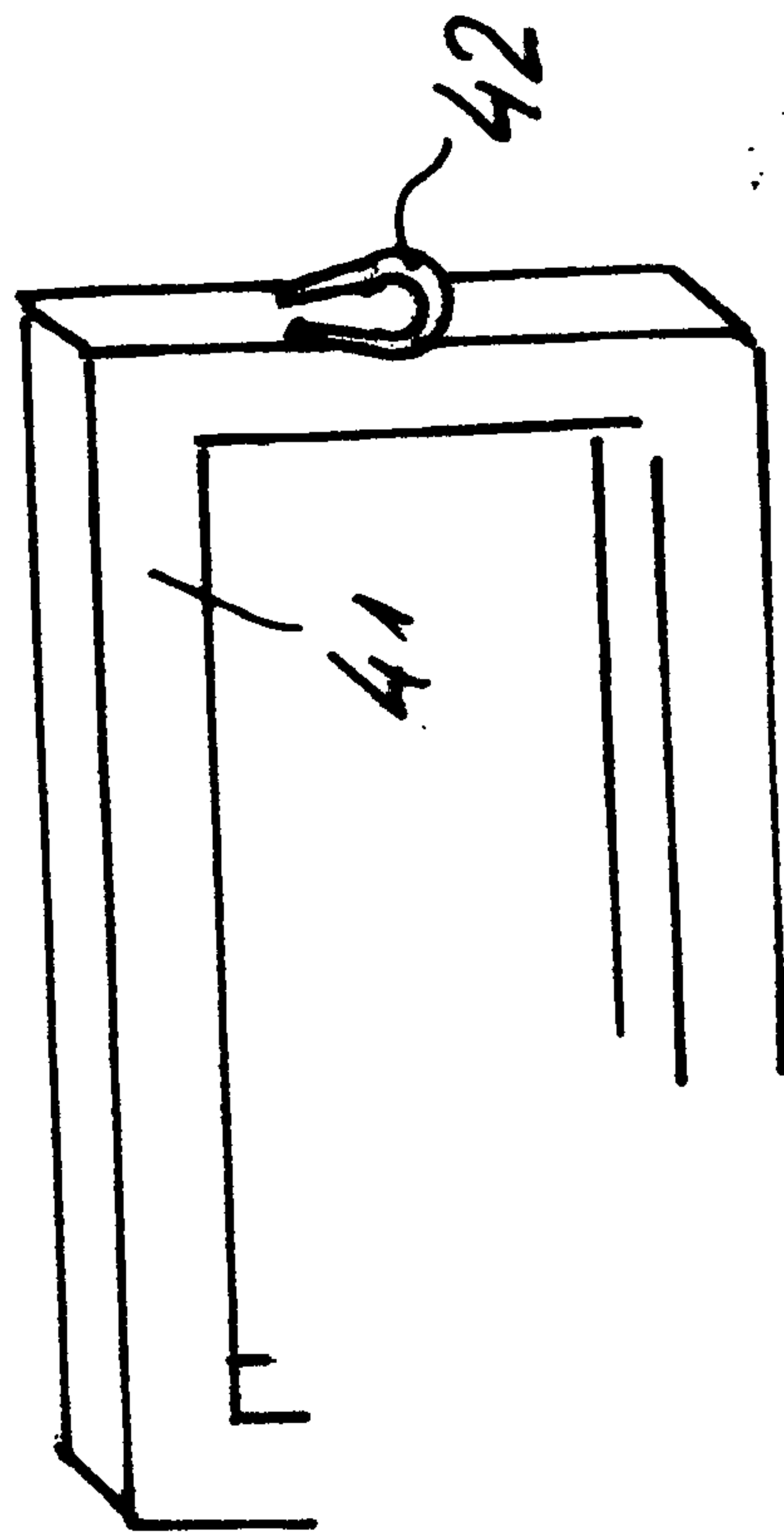
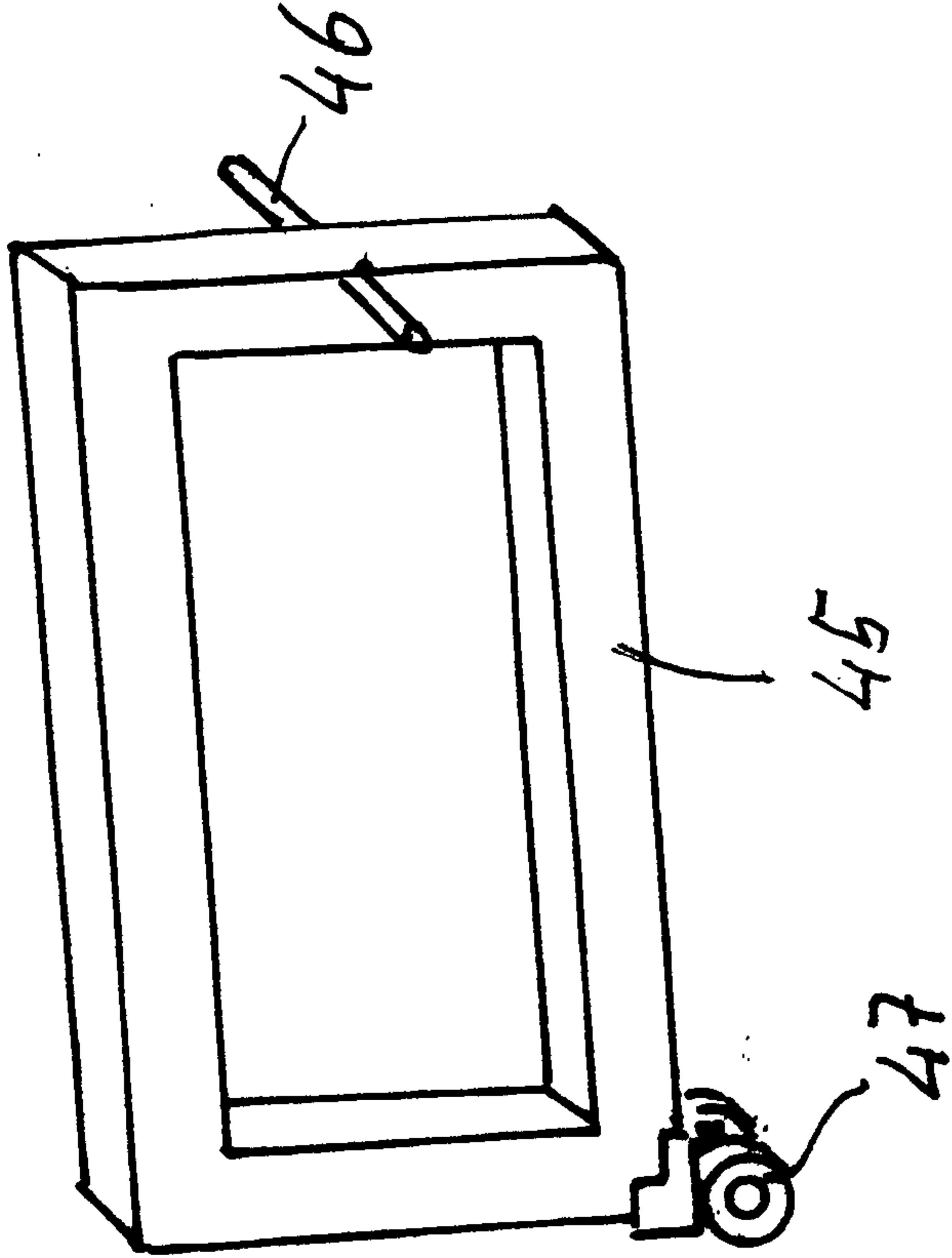


Fig. 10

Fig. 3

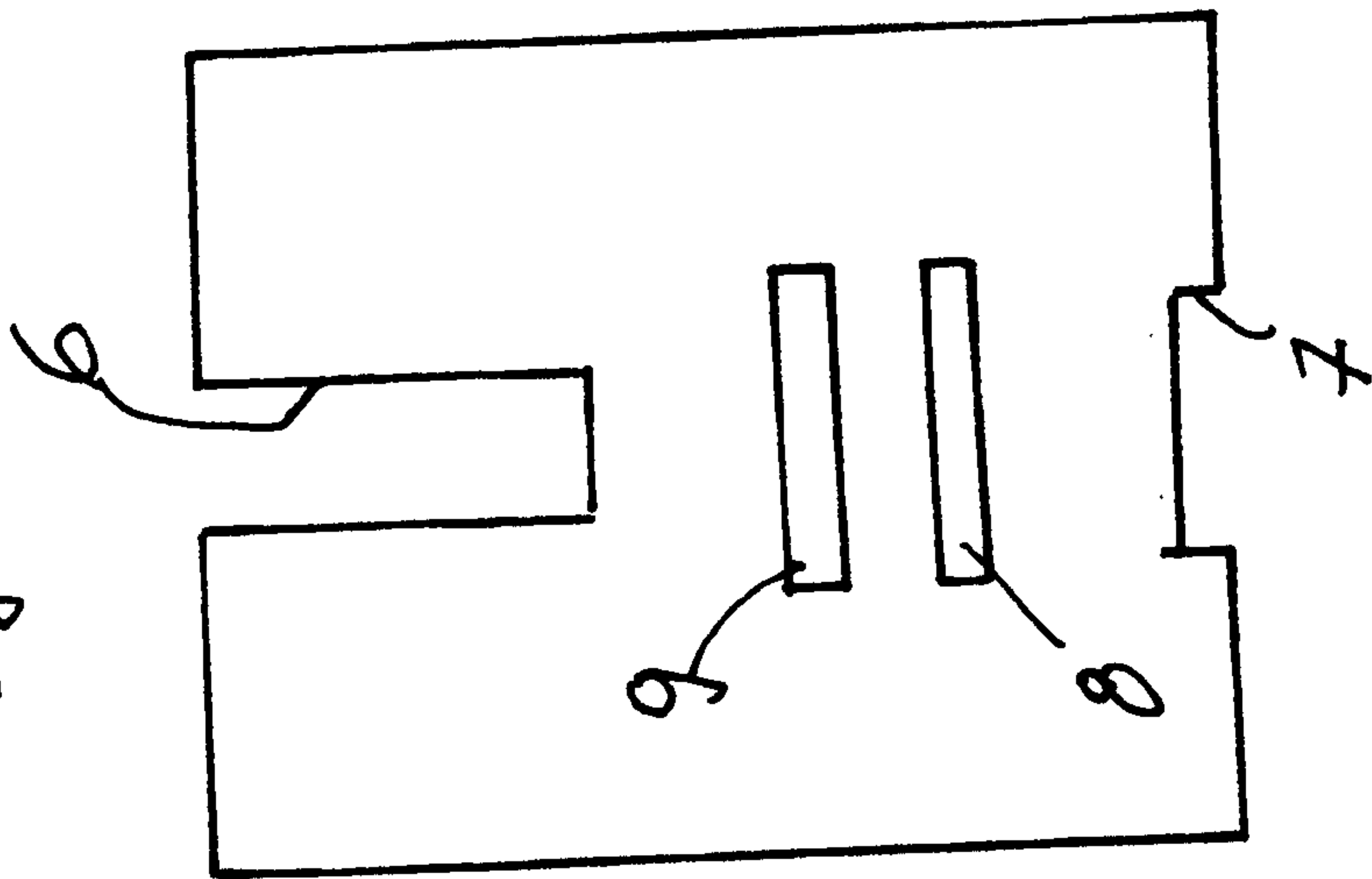


Fig. 17

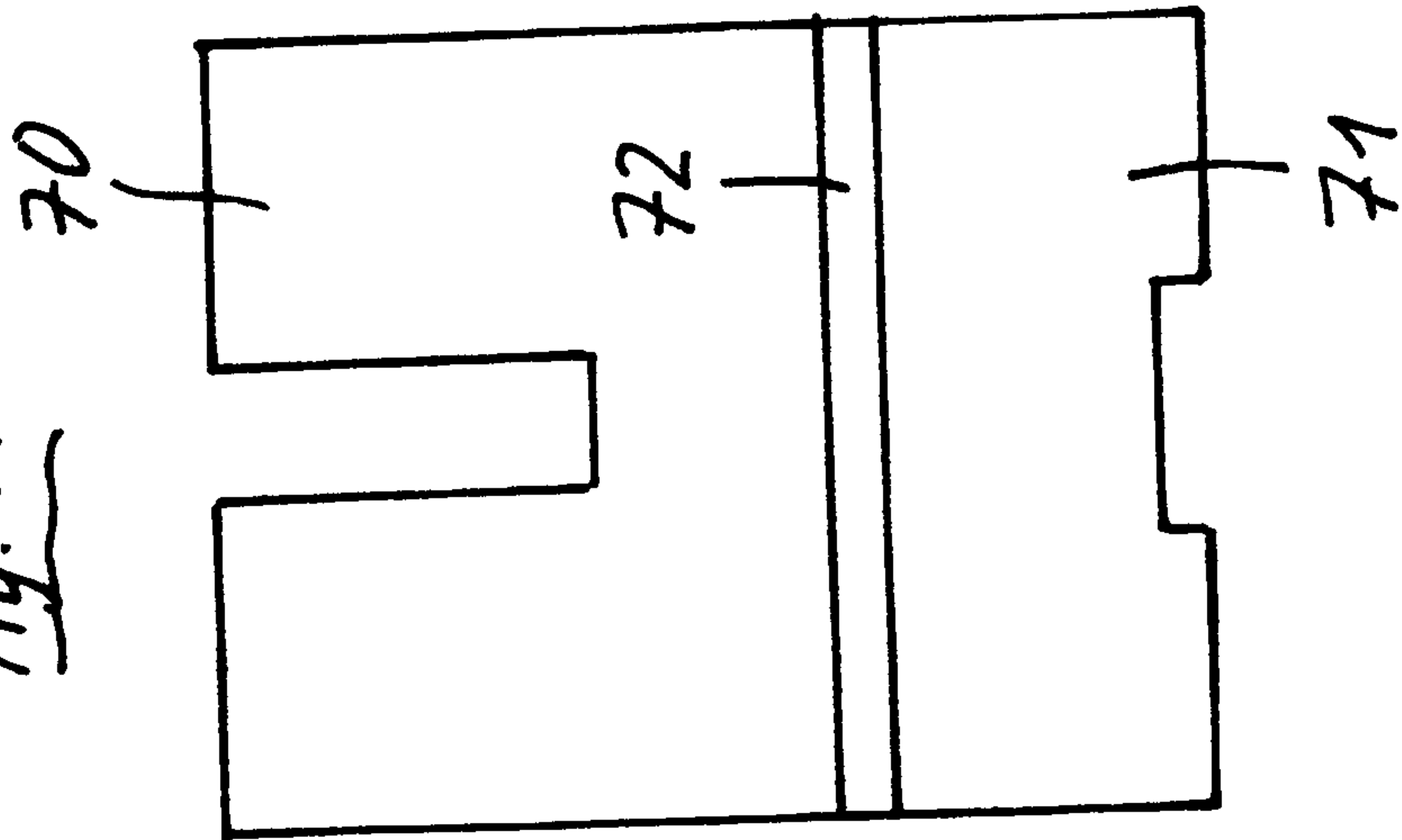
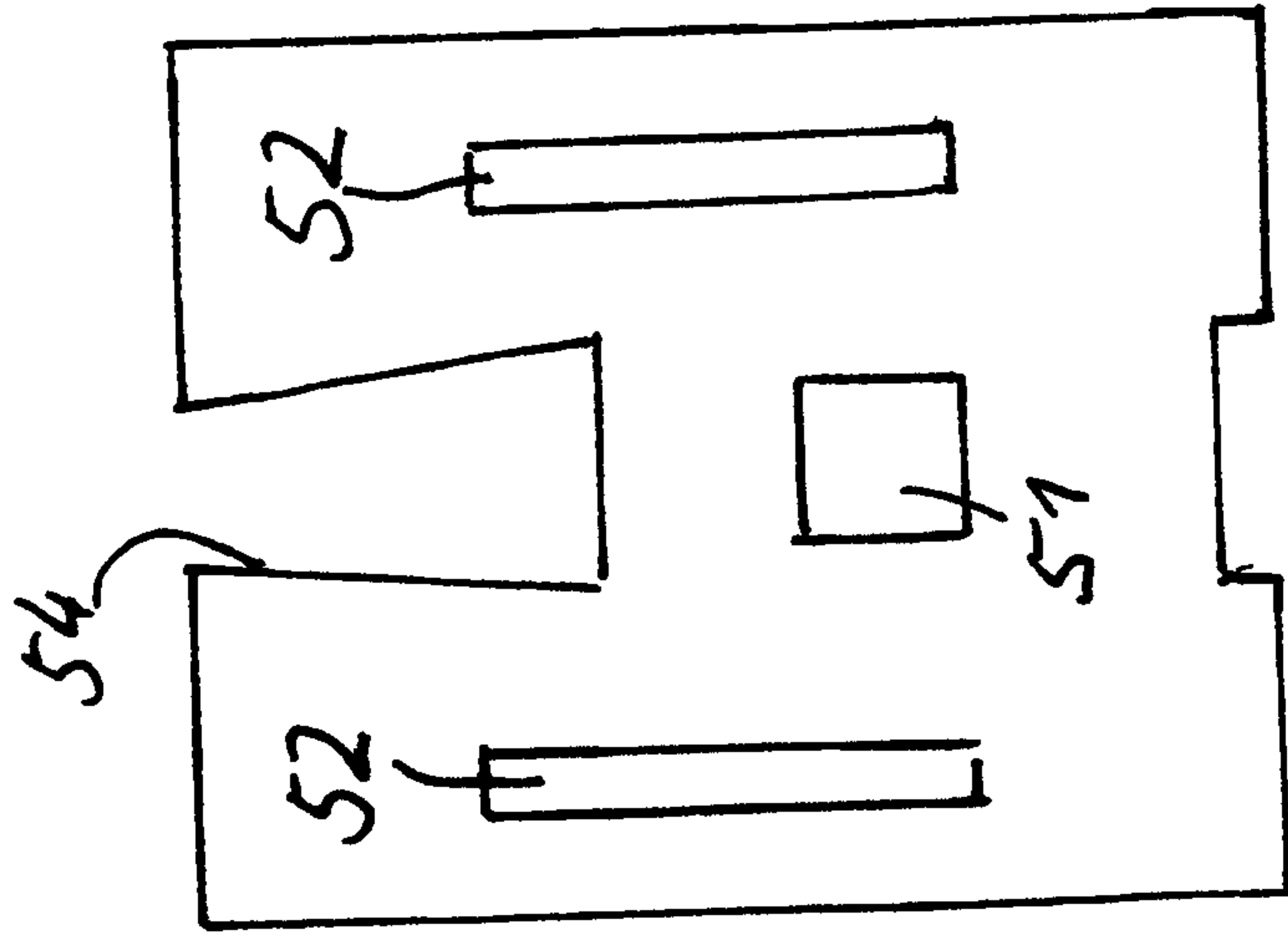


Fig. 12



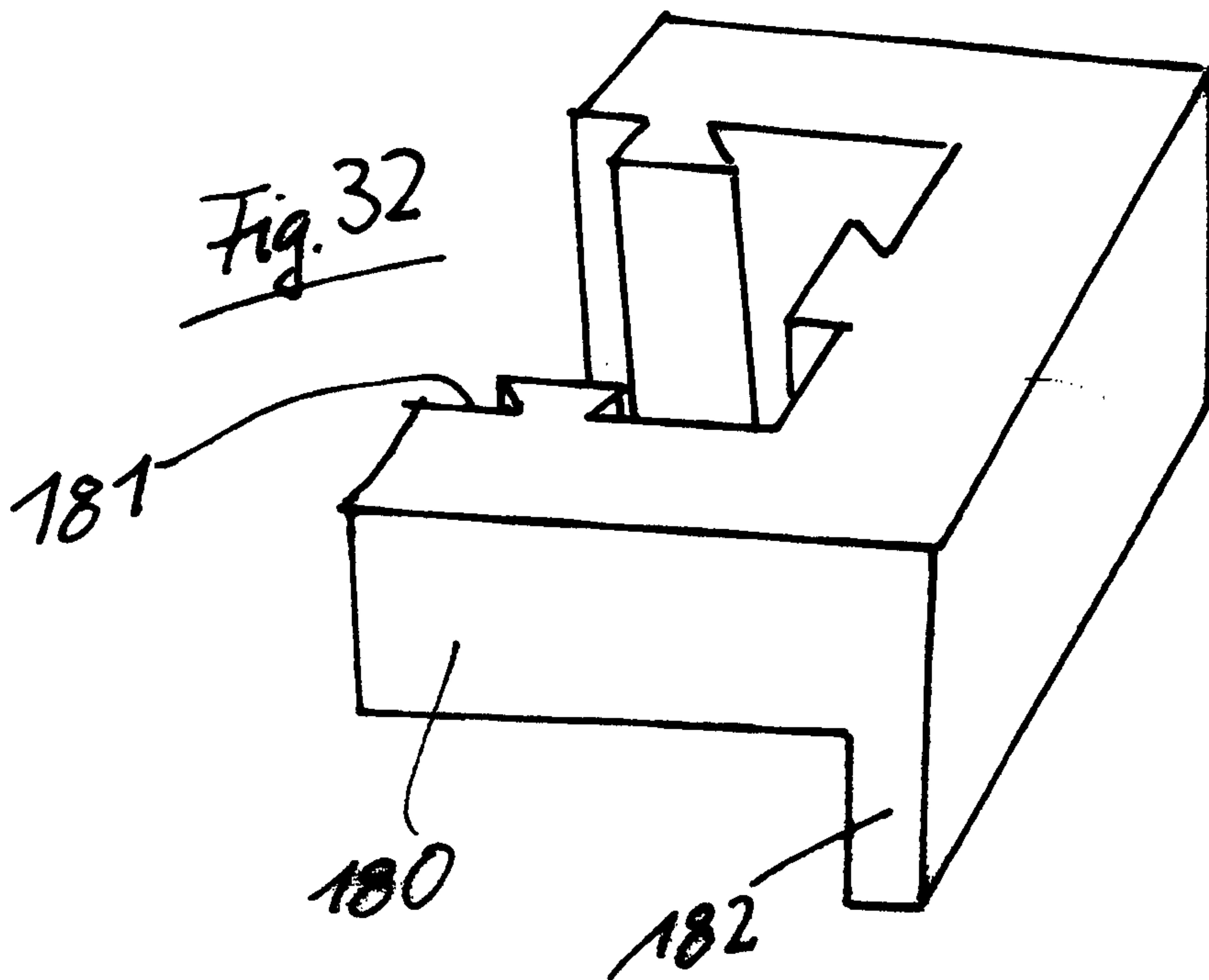
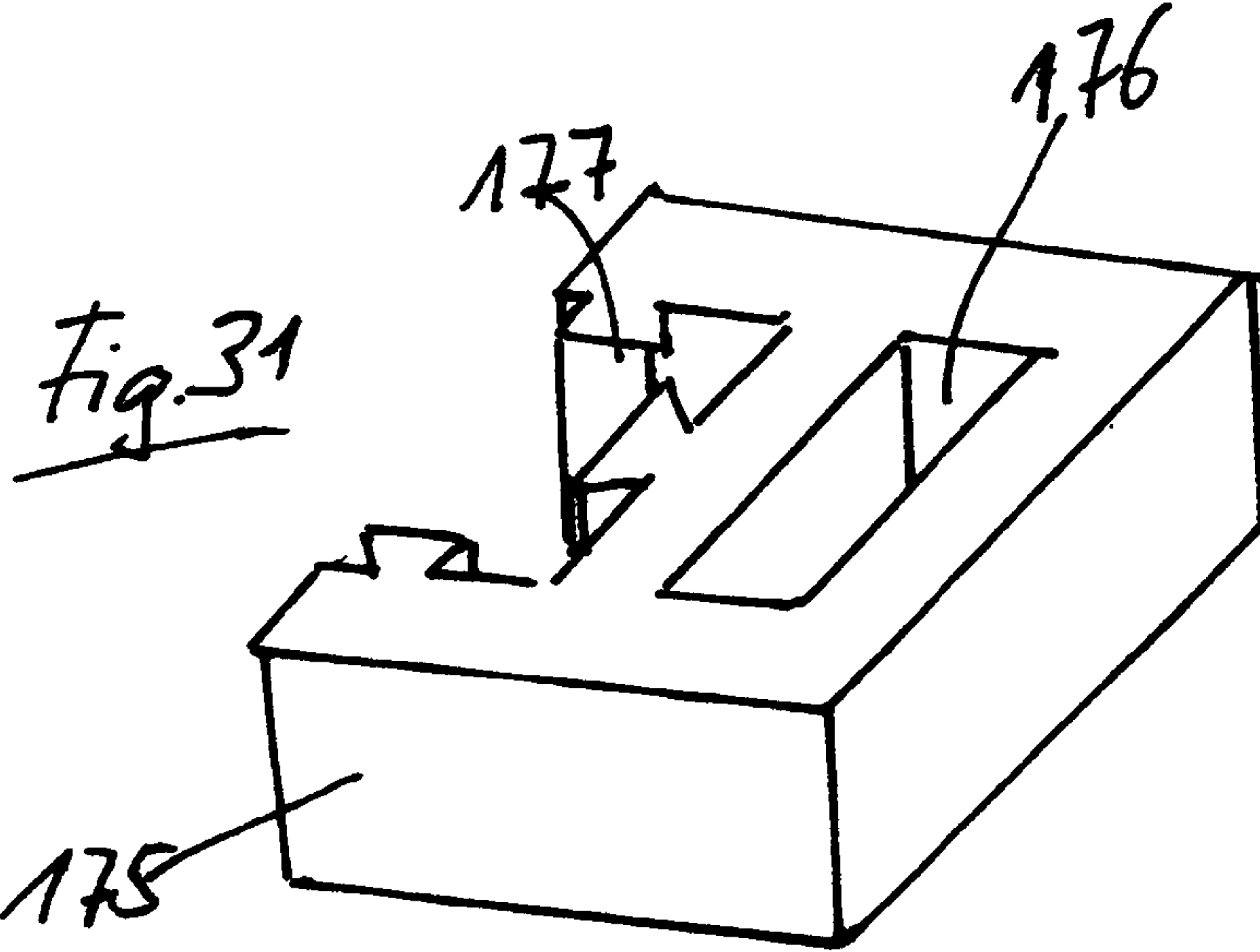
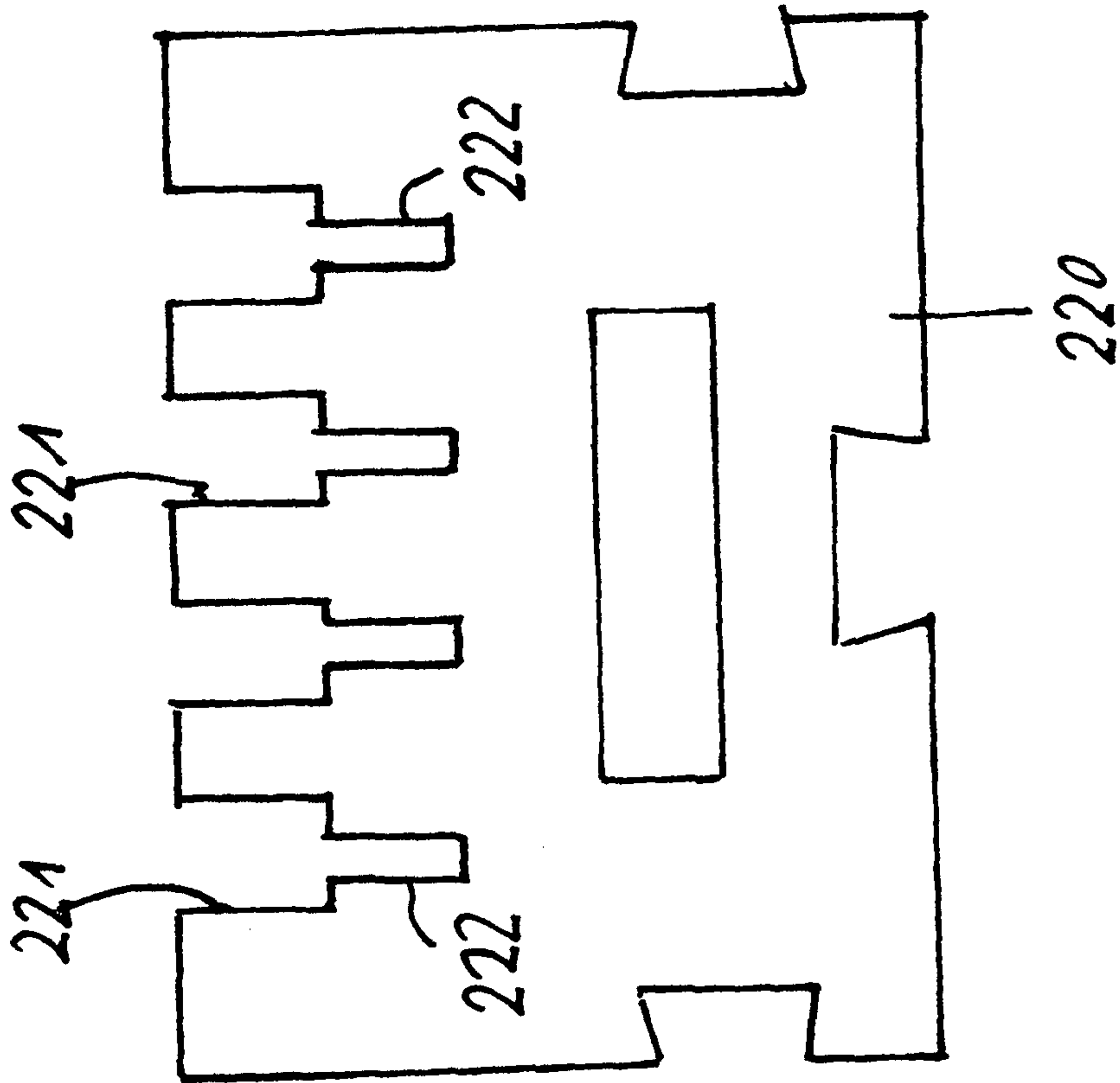
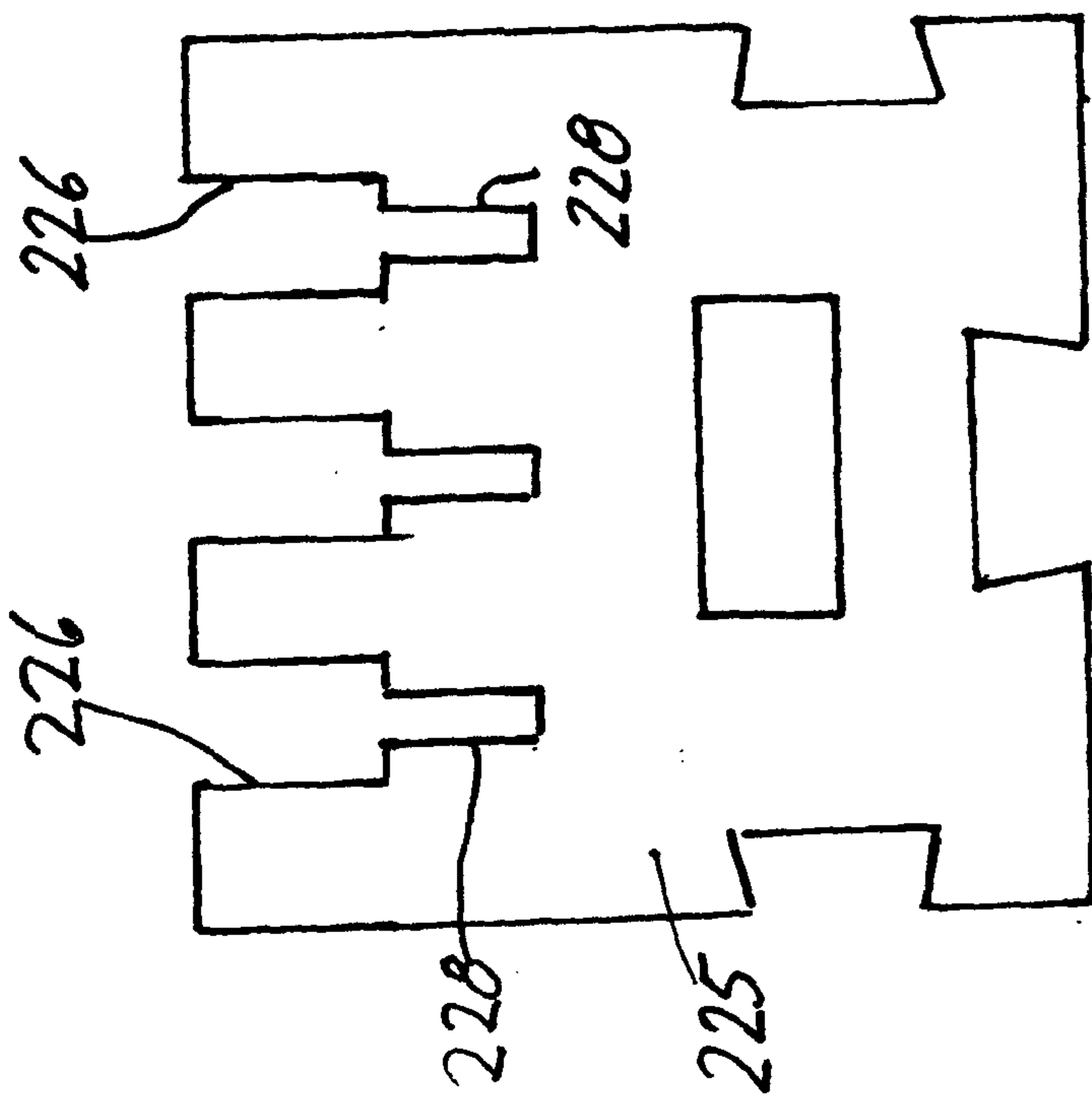
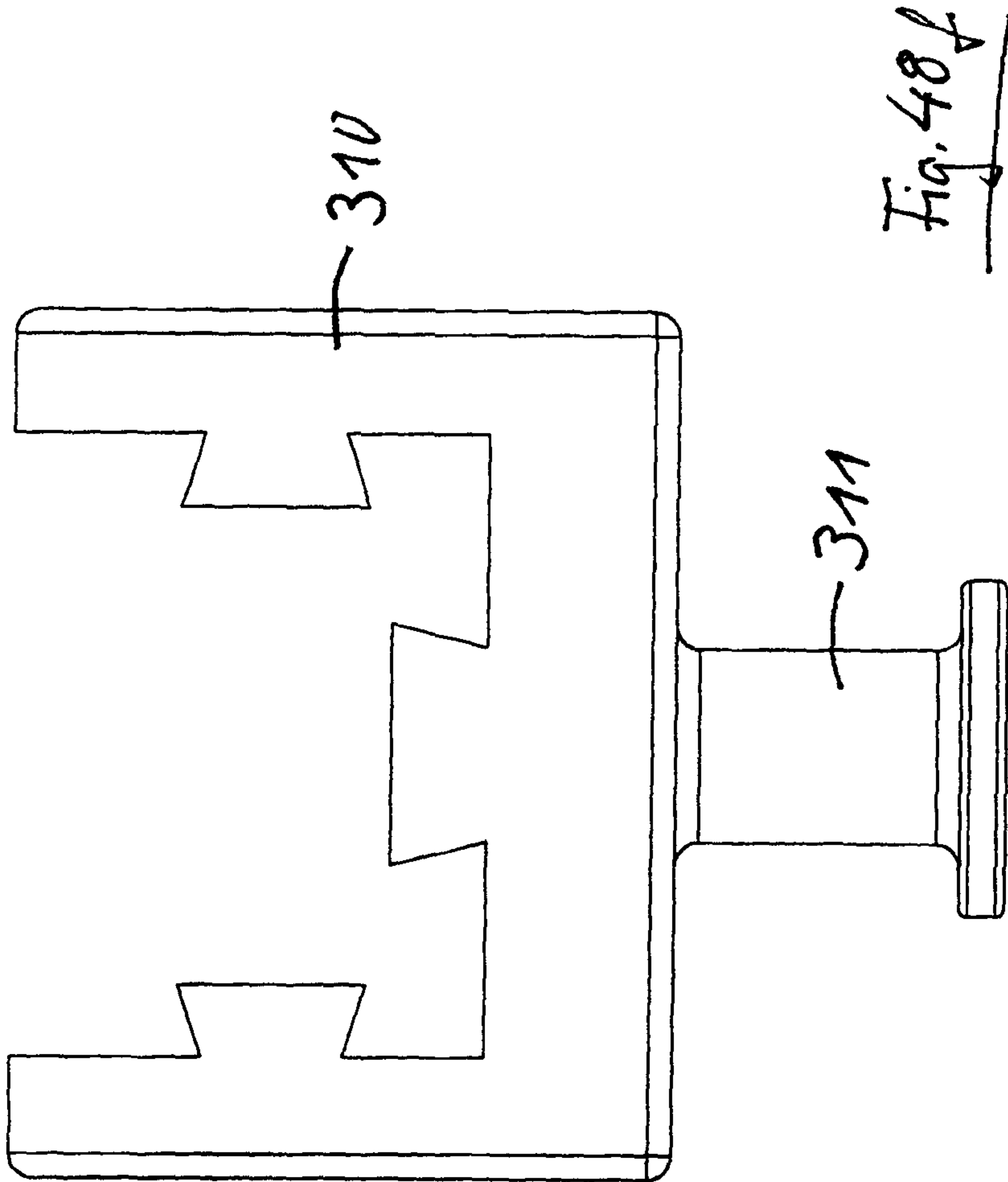
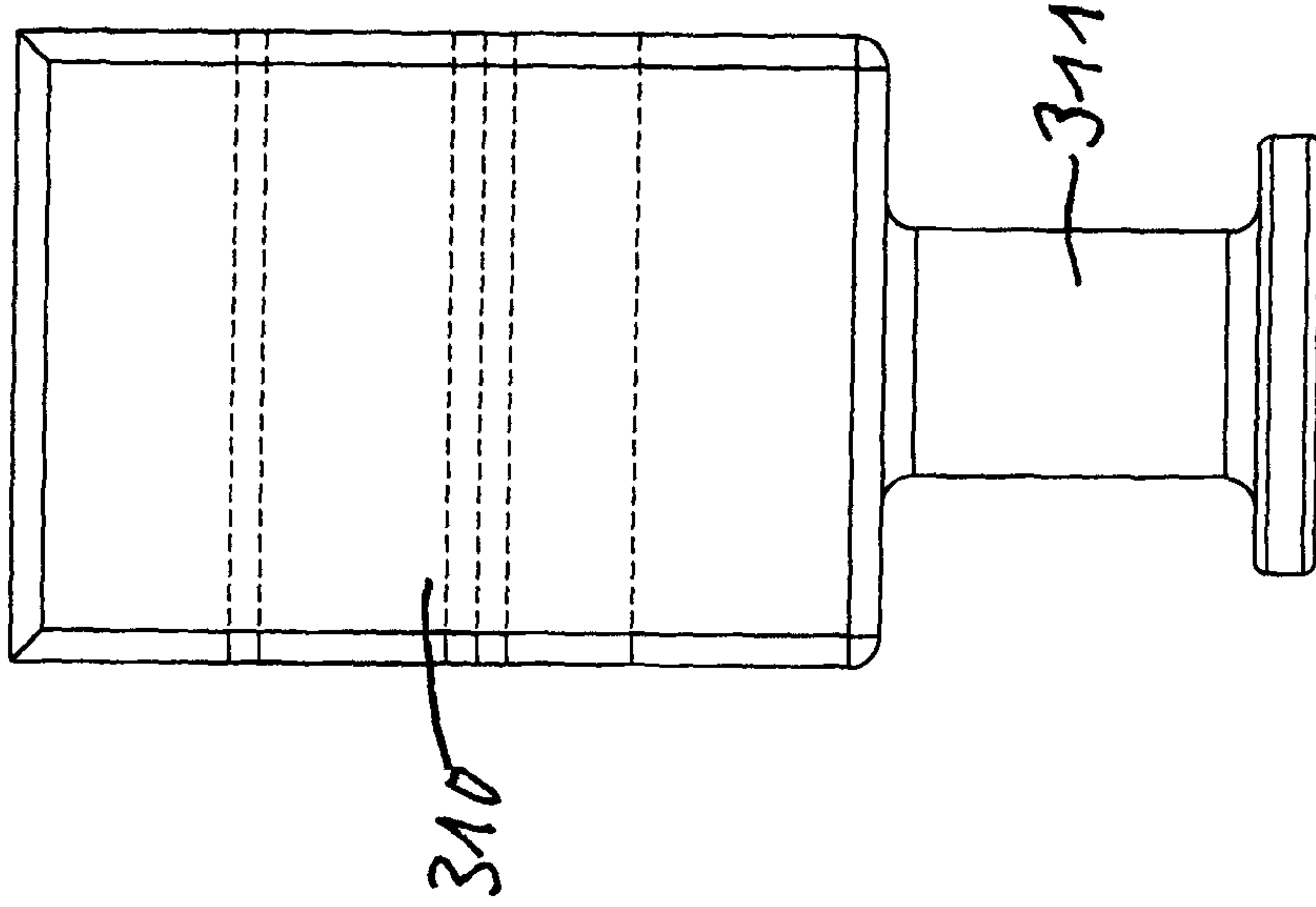


Fig. 39Fig. 40



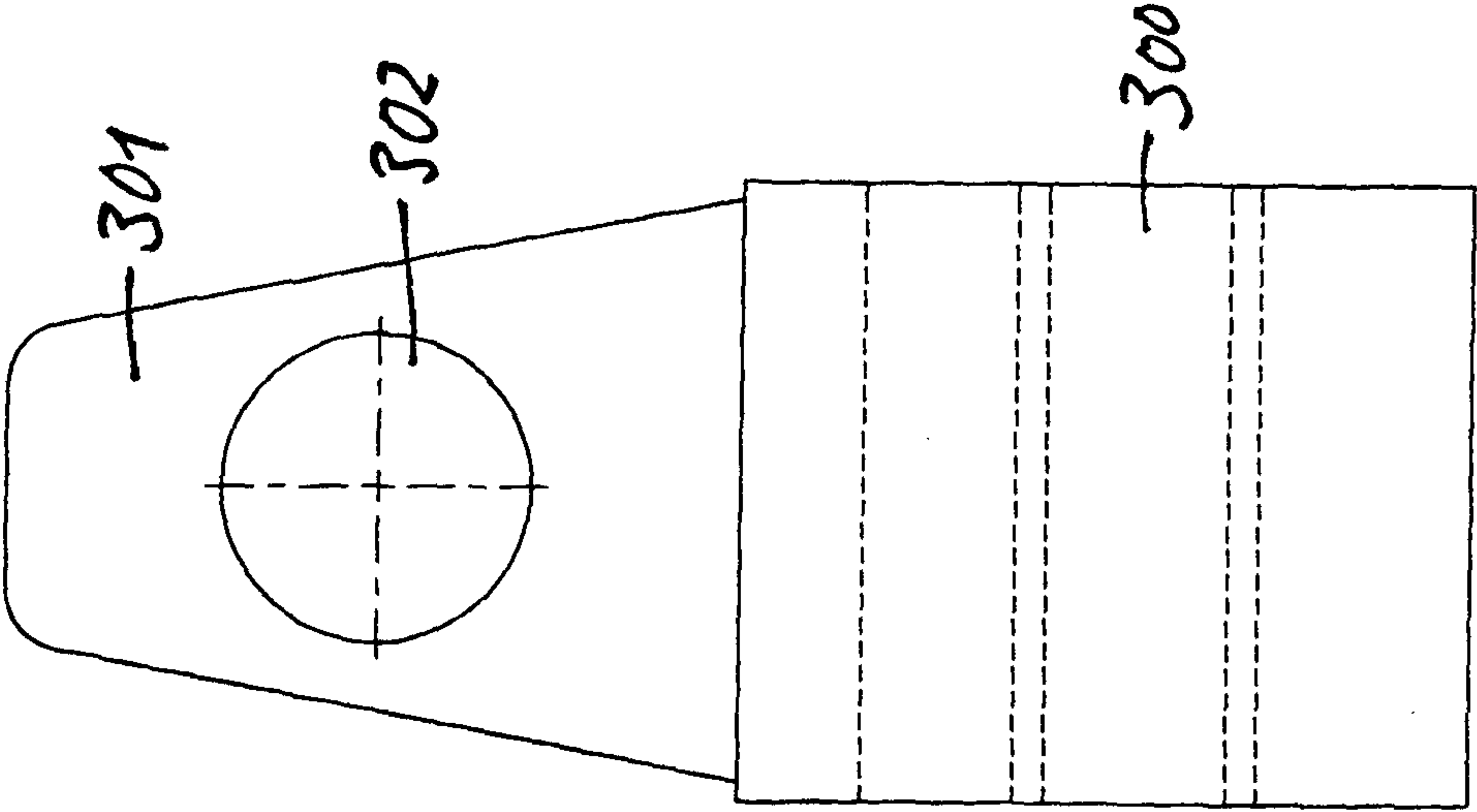
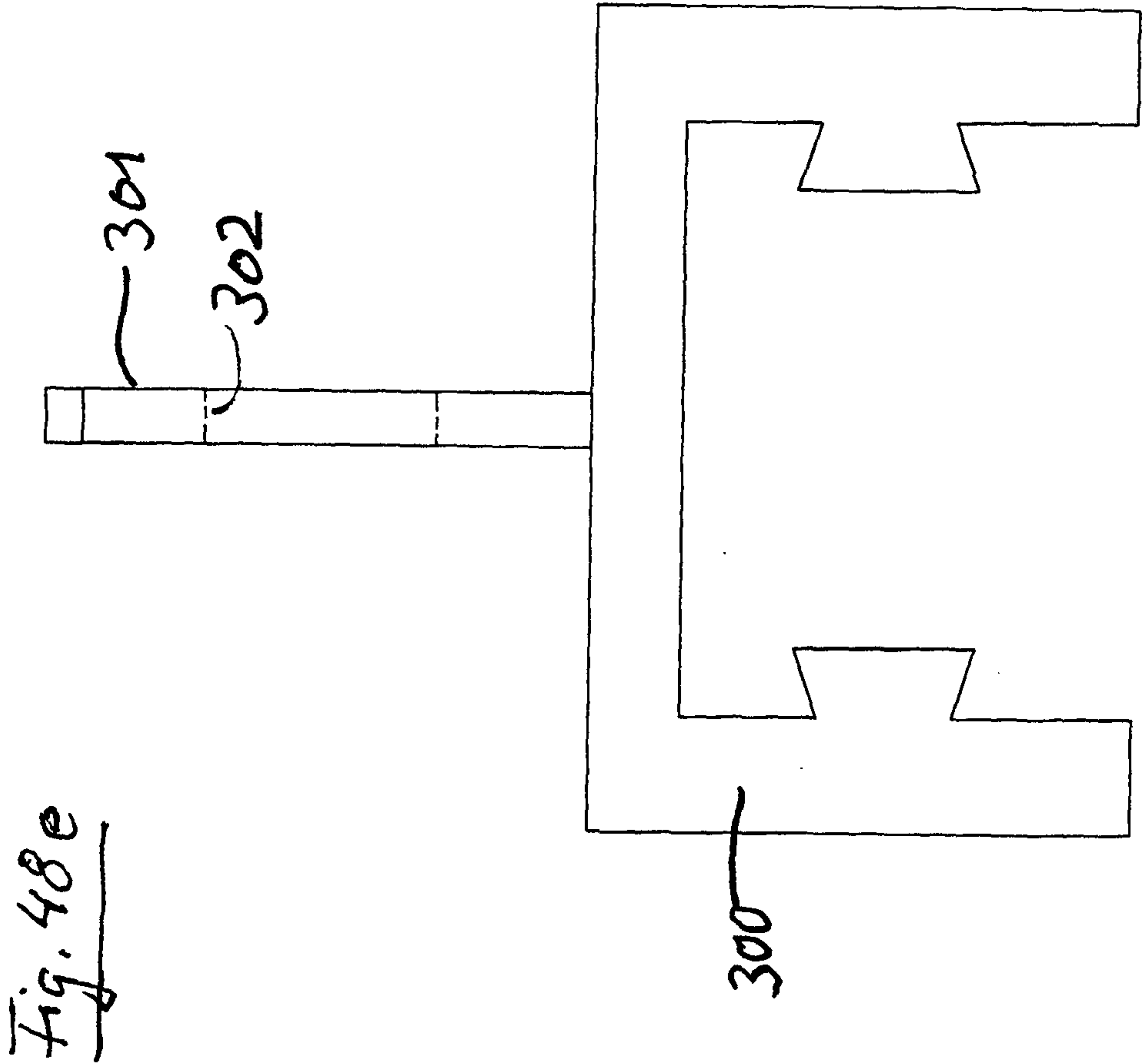
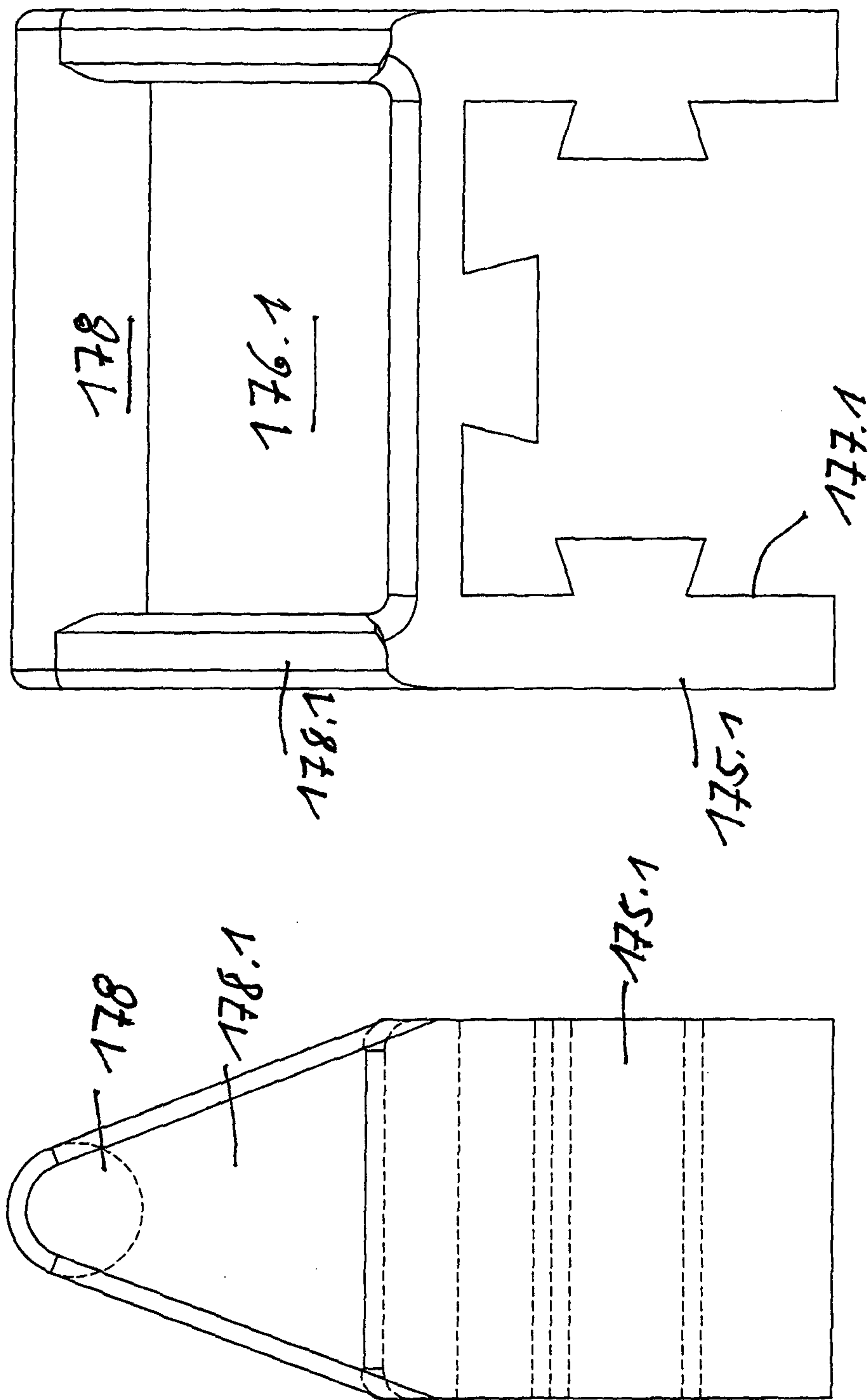
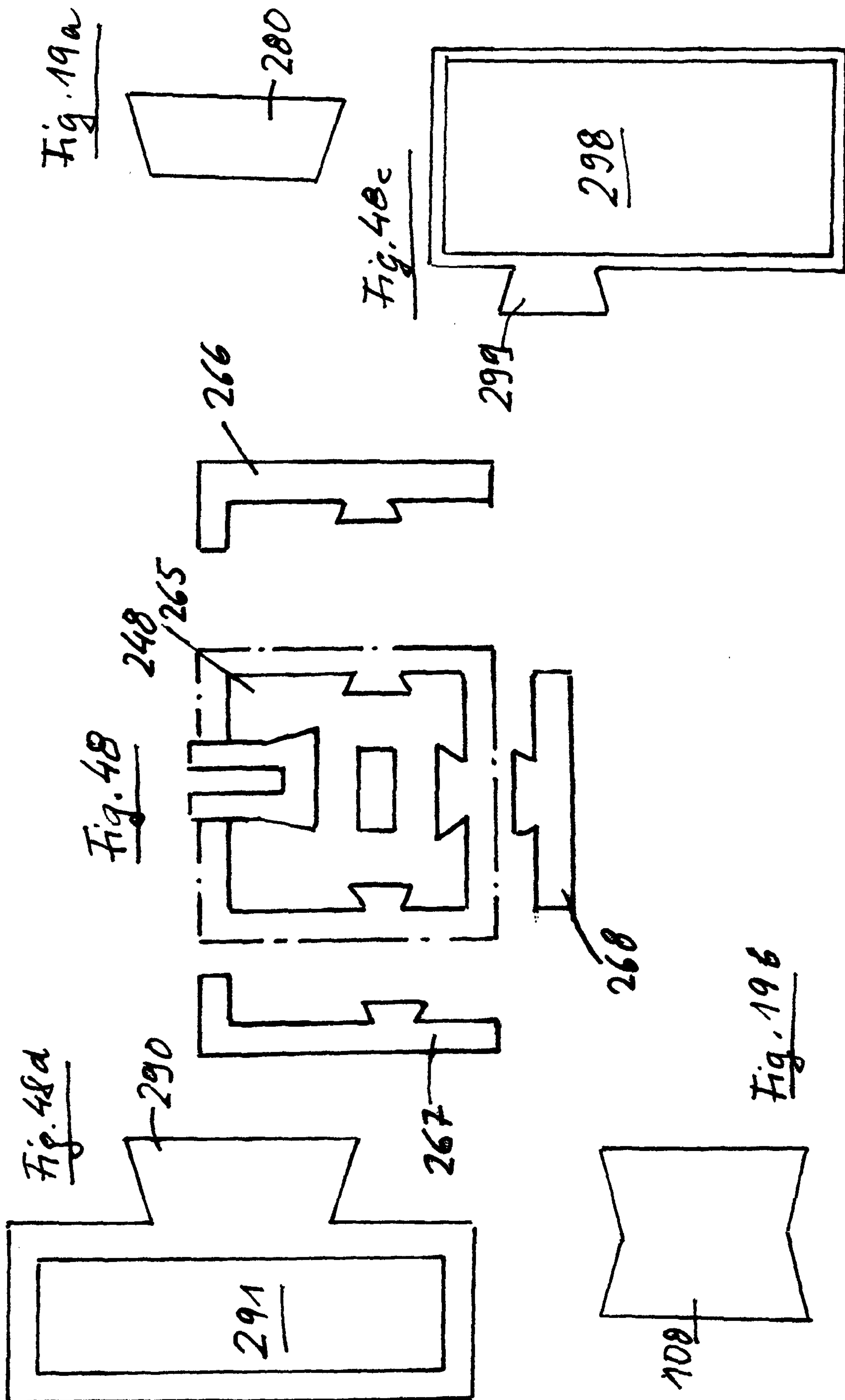
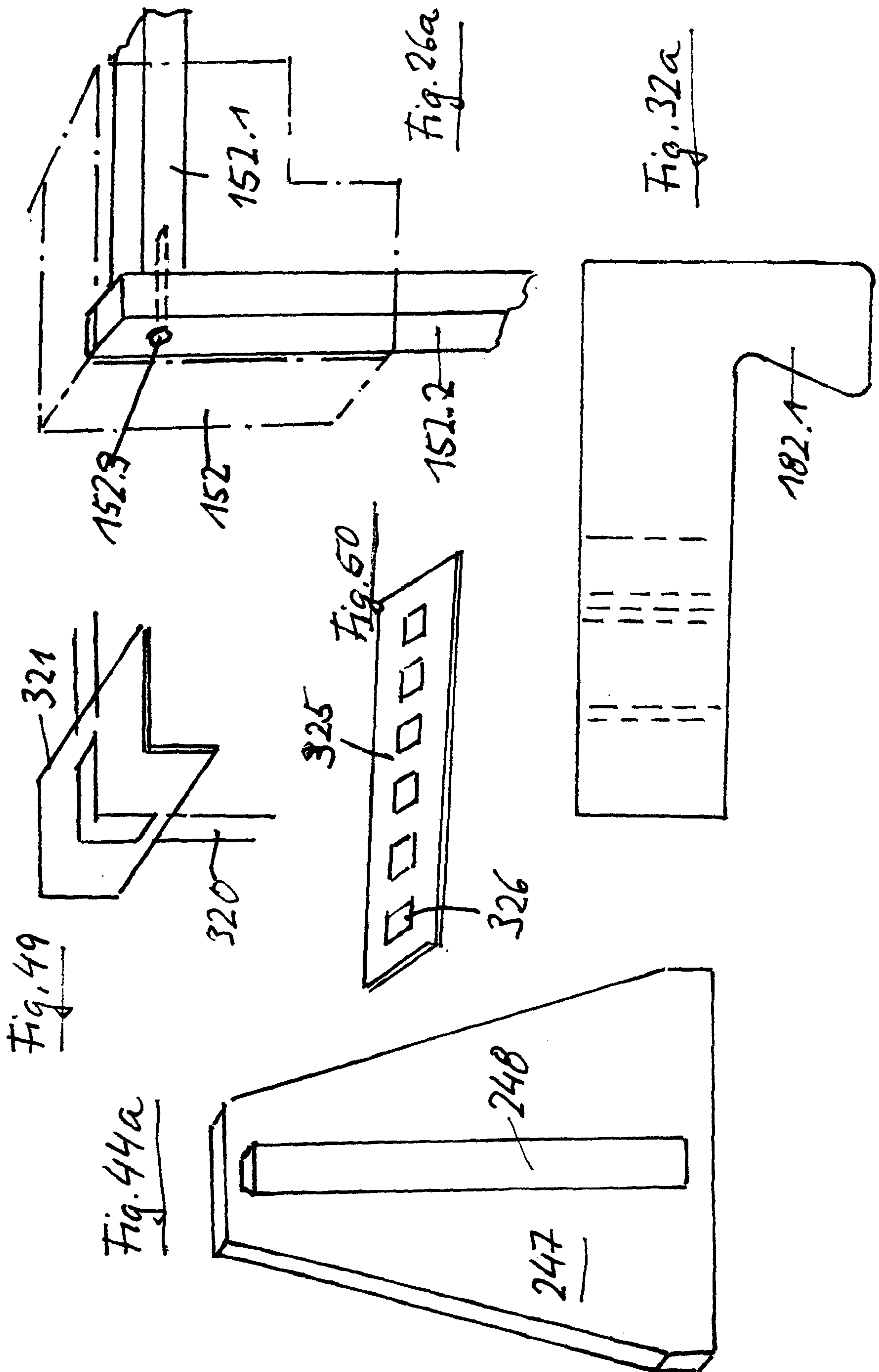
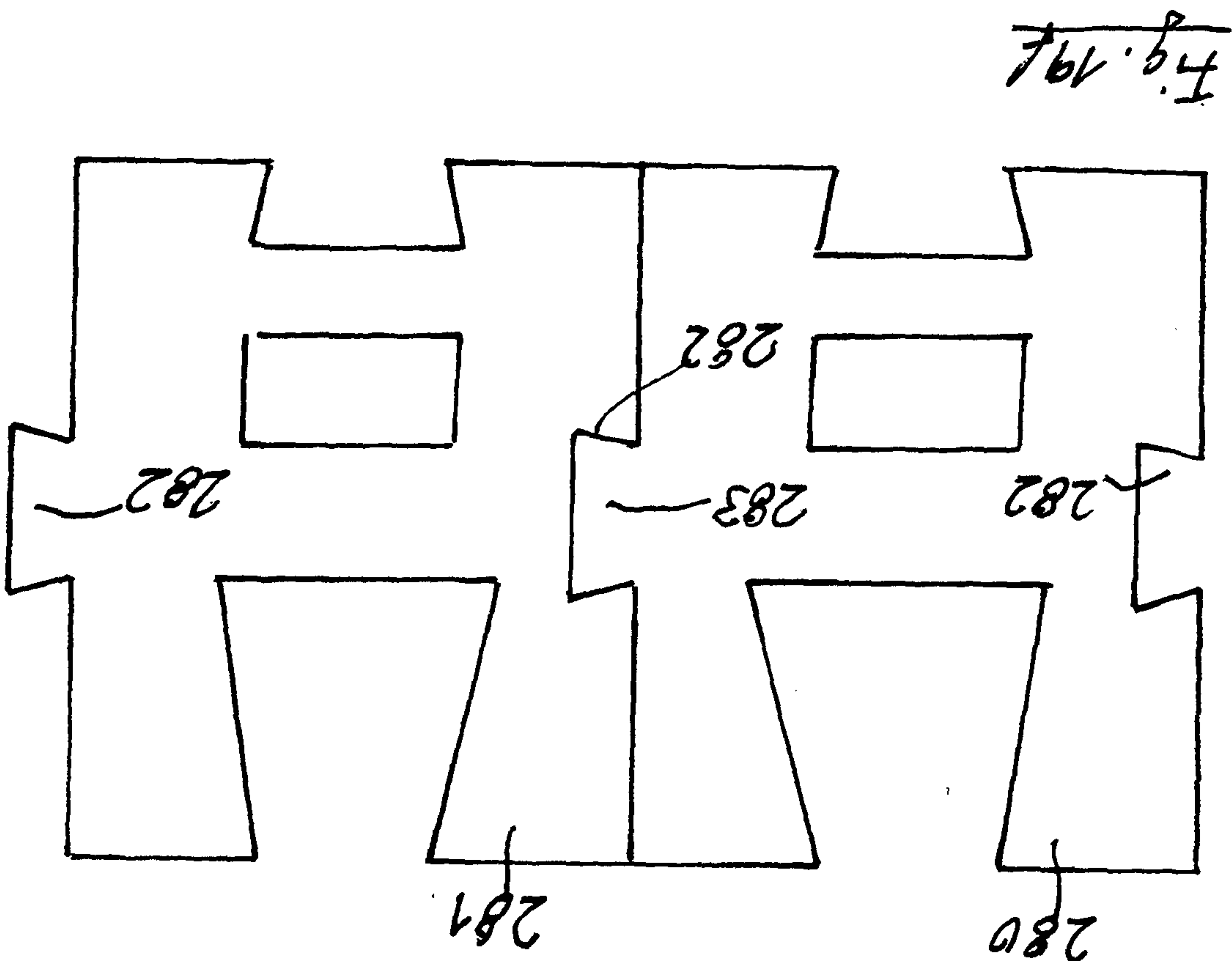
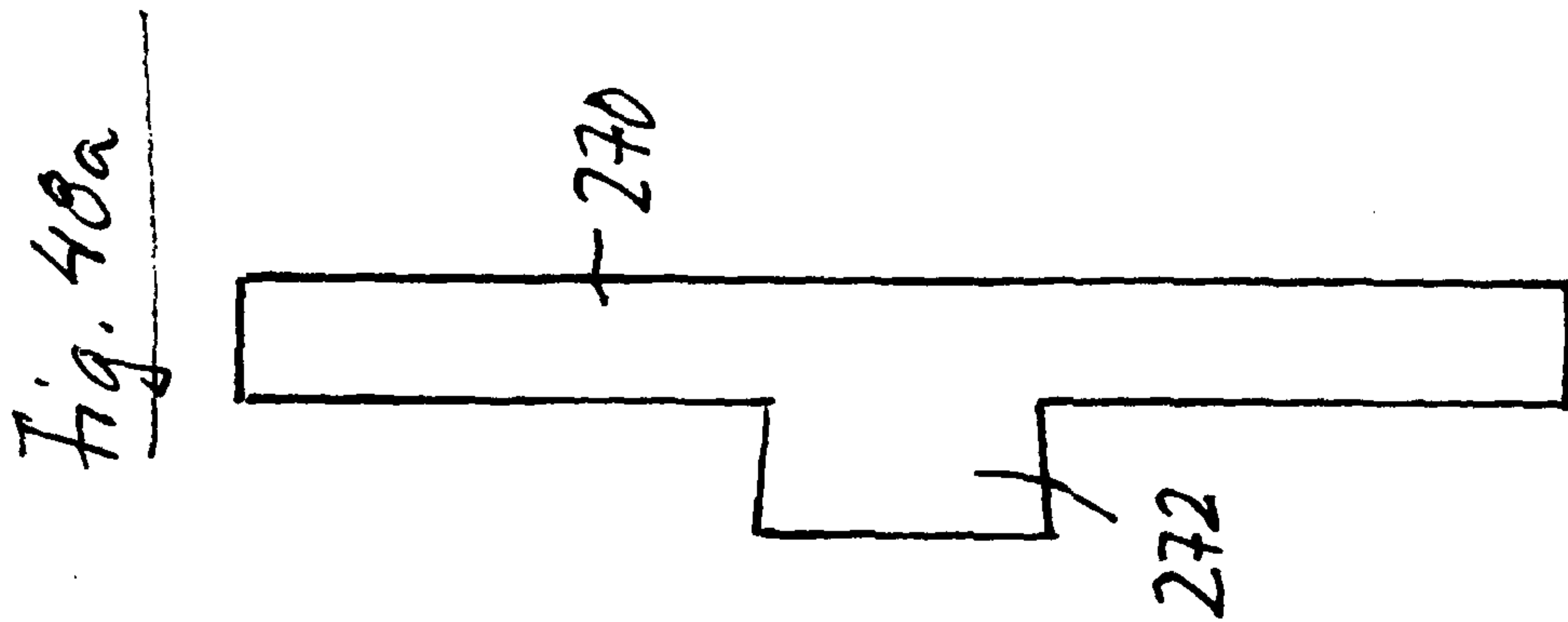
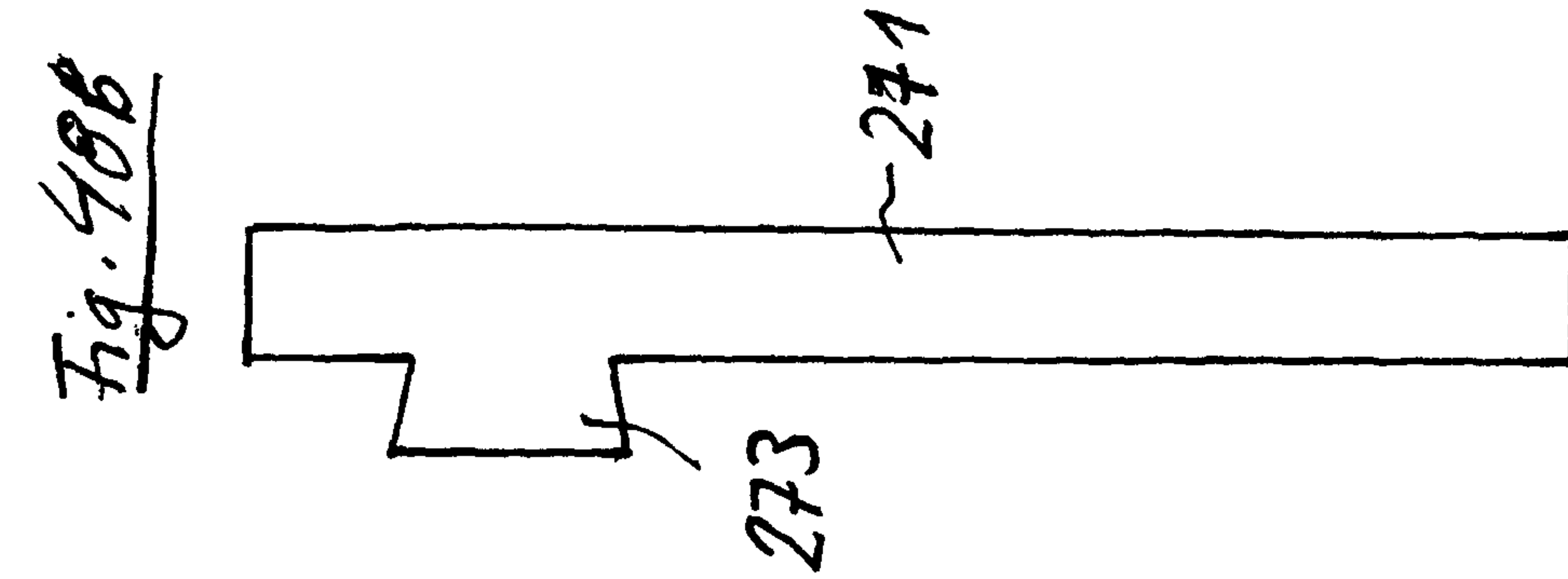


Fig. 31a









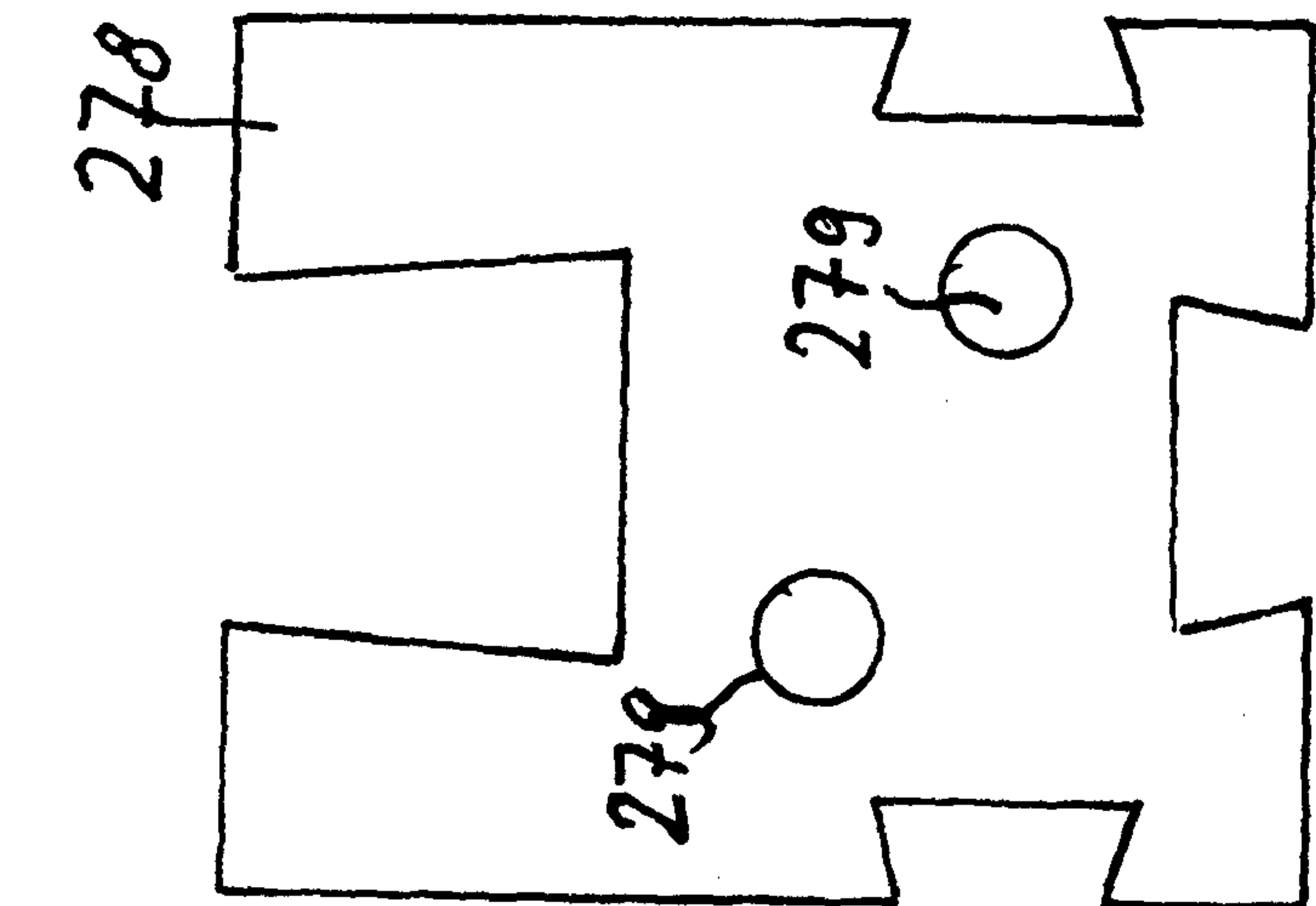


Fig. 19c

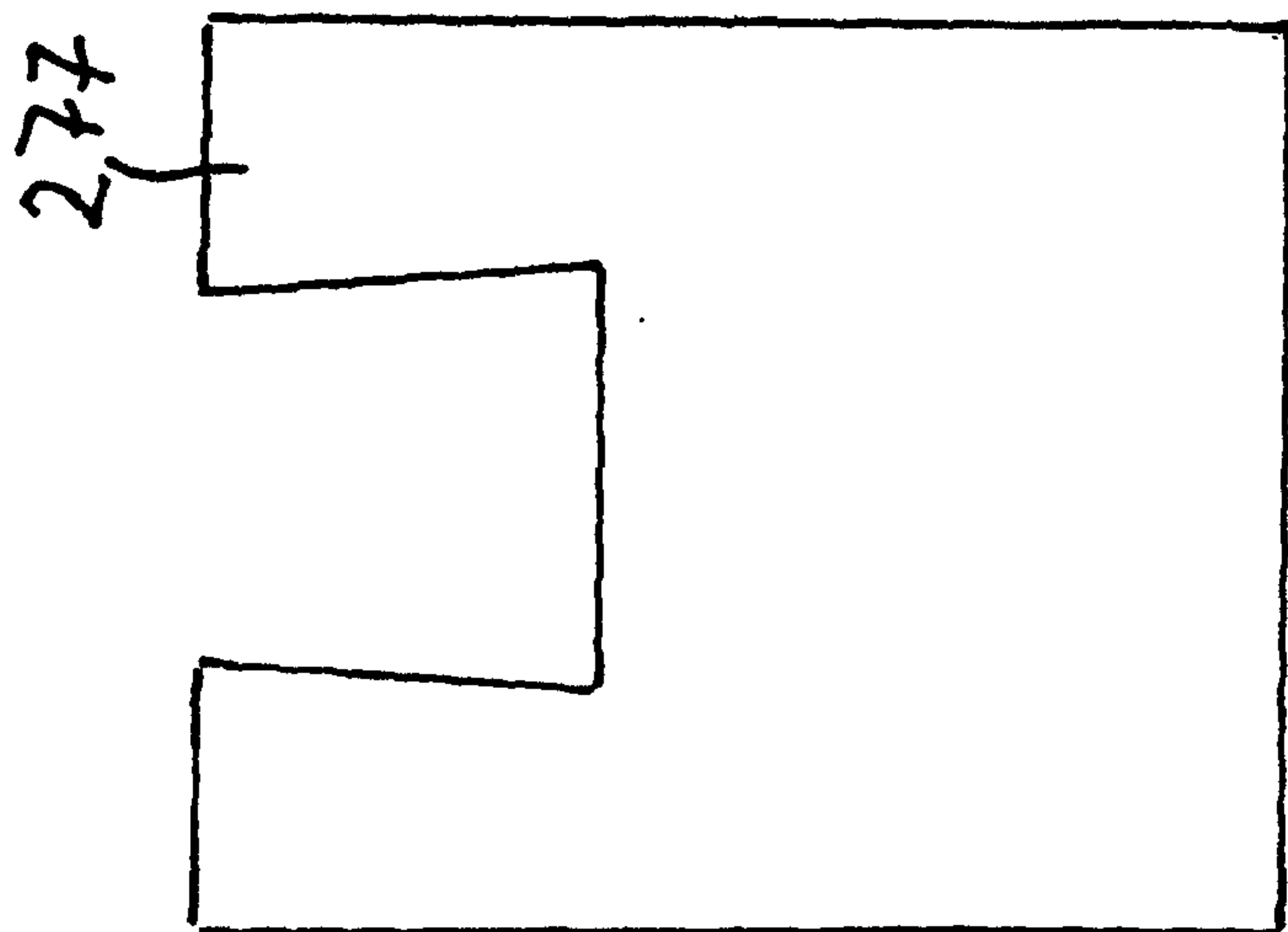


Fig. 19d

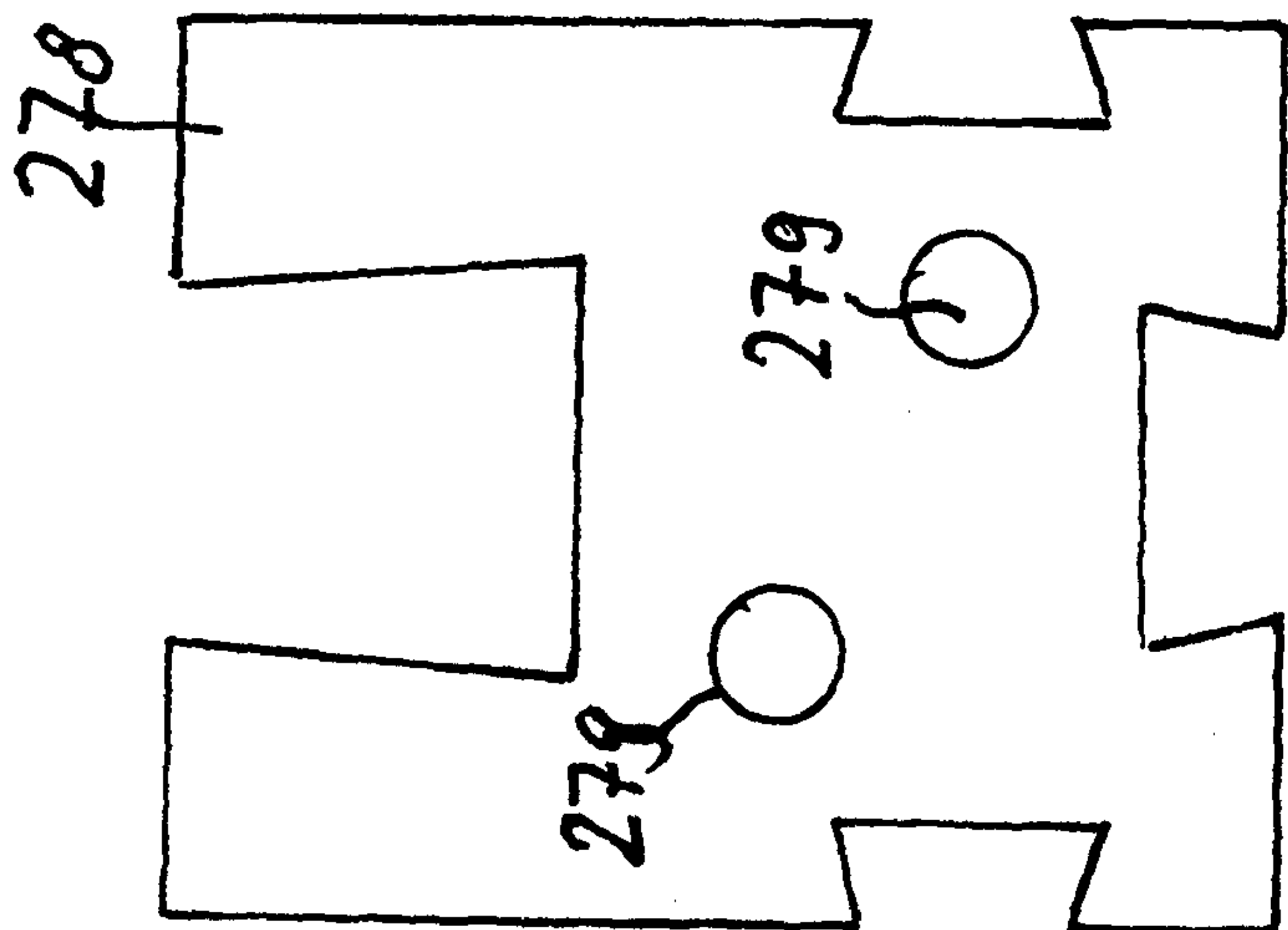


Fig. 19e

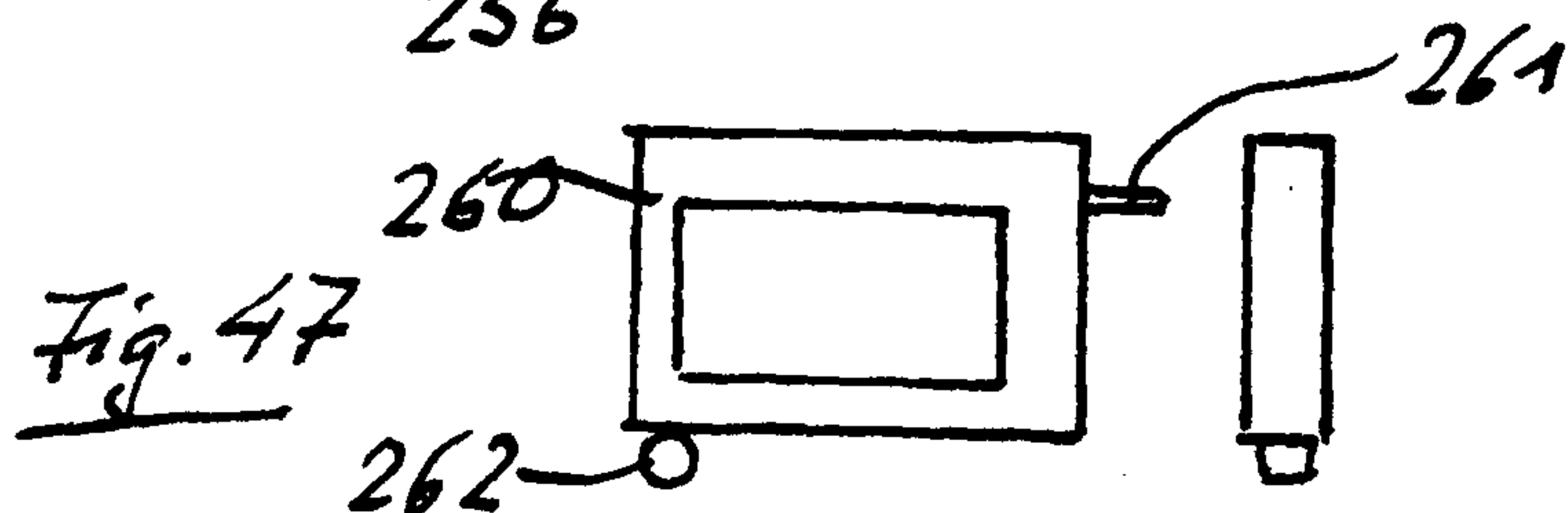
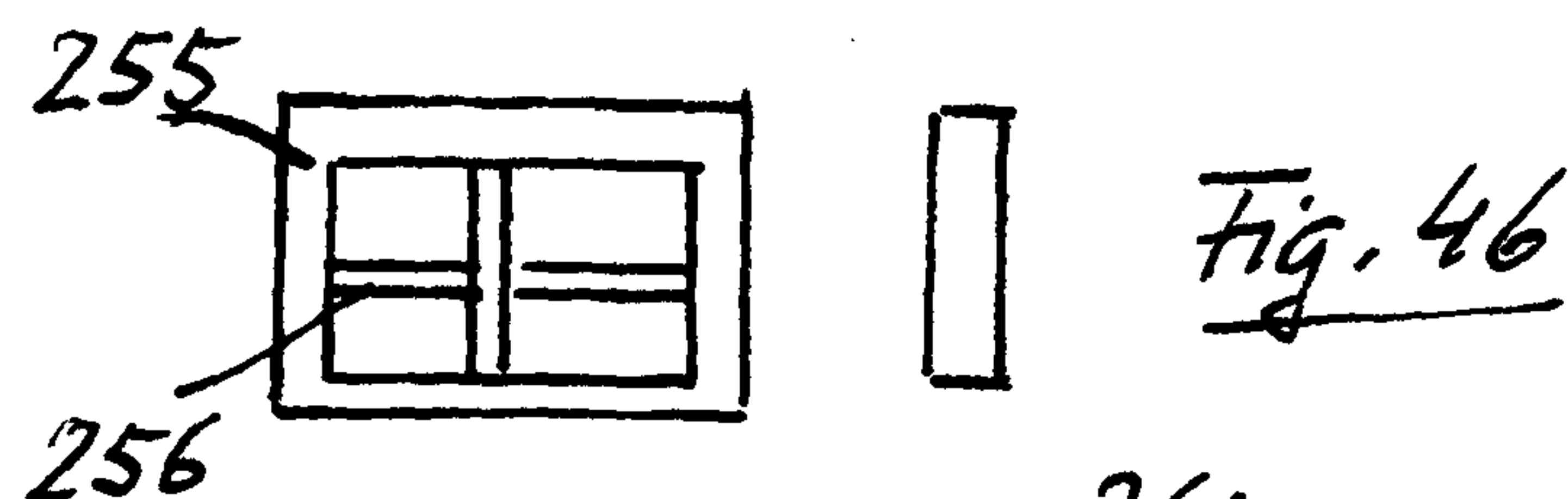
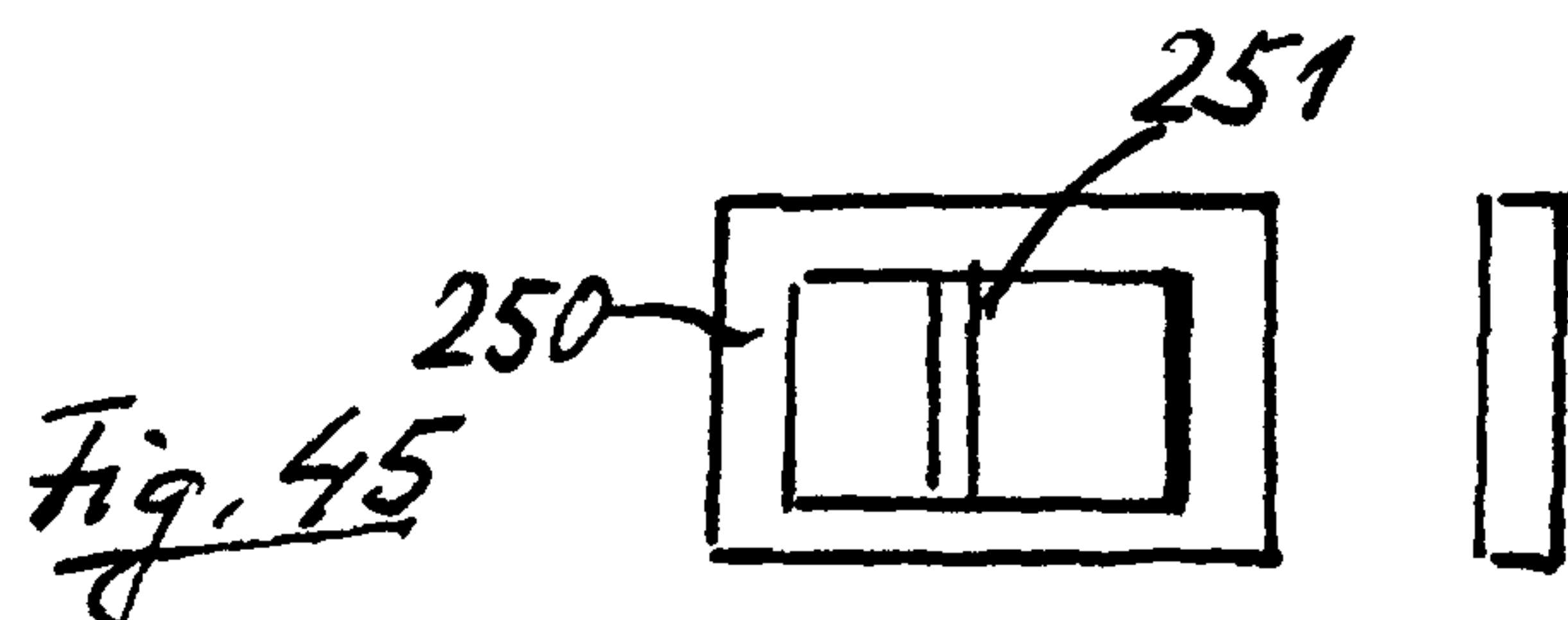
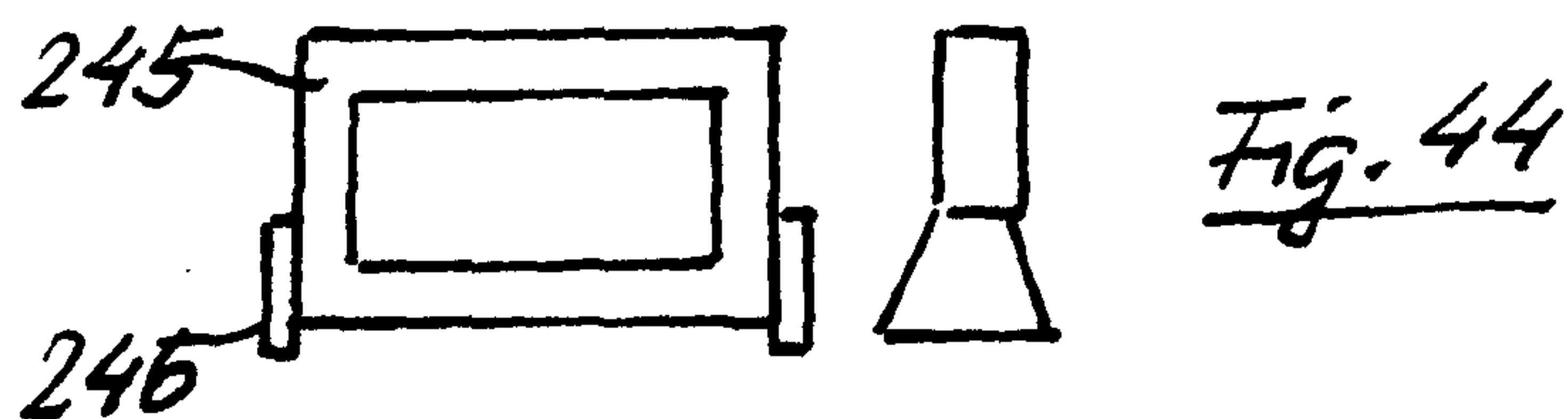
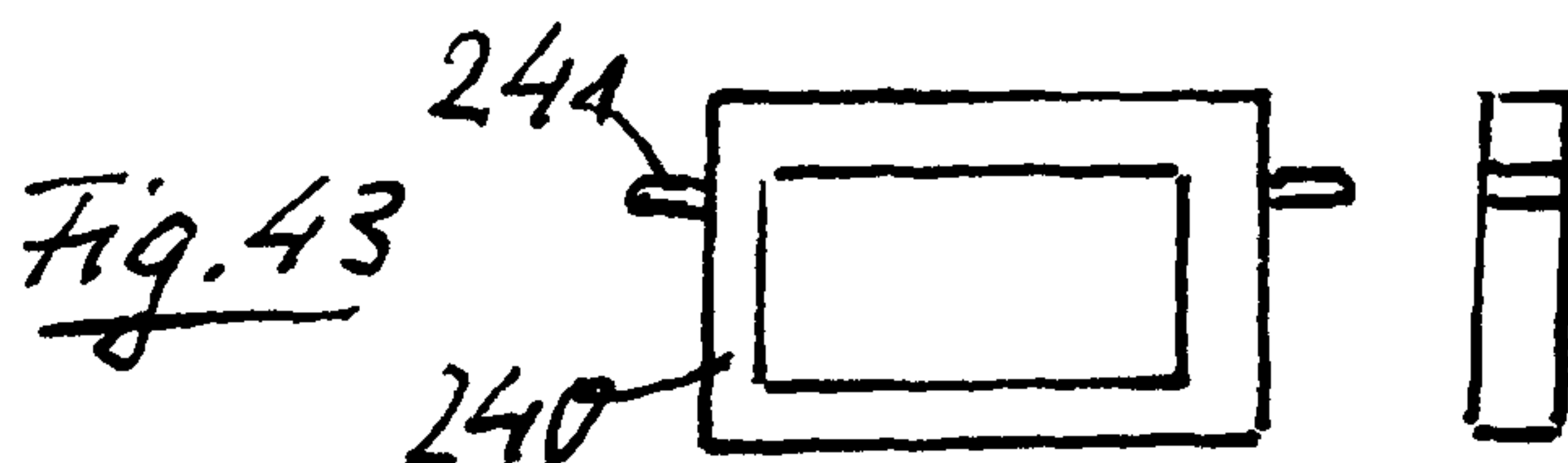
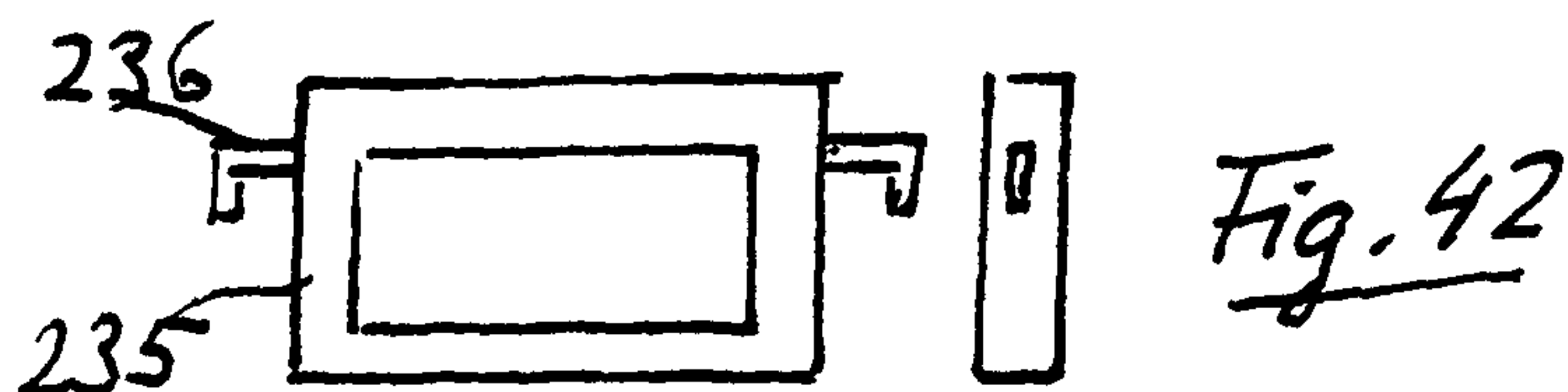
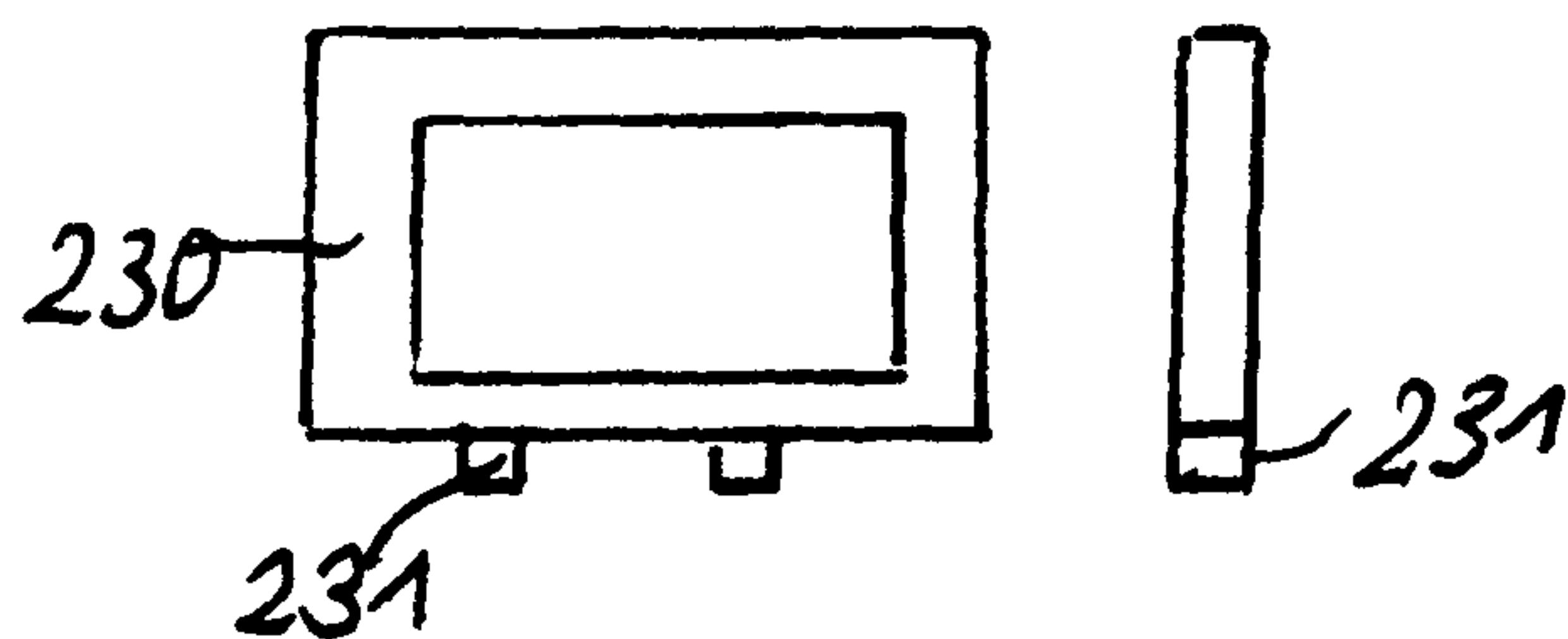
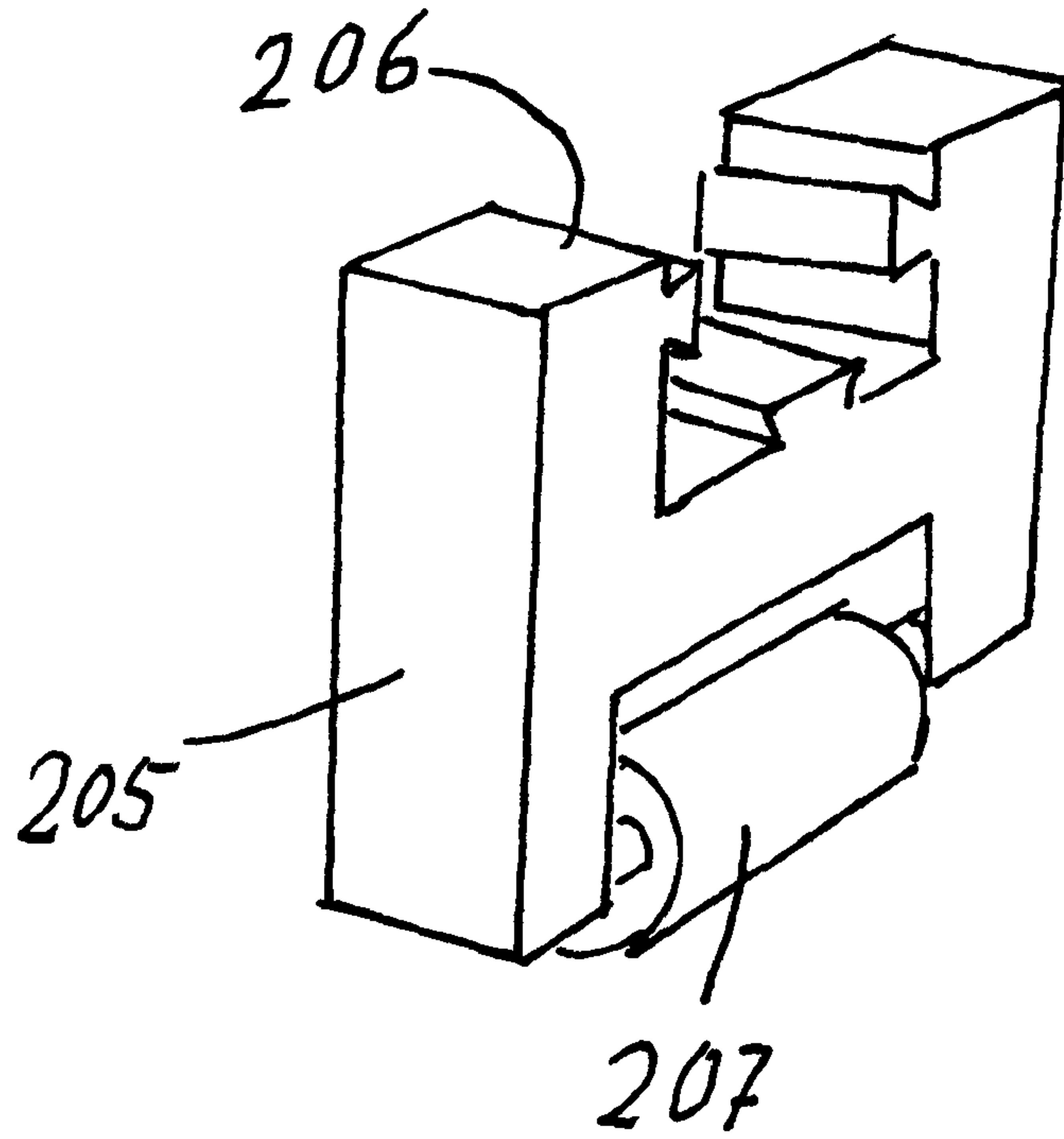
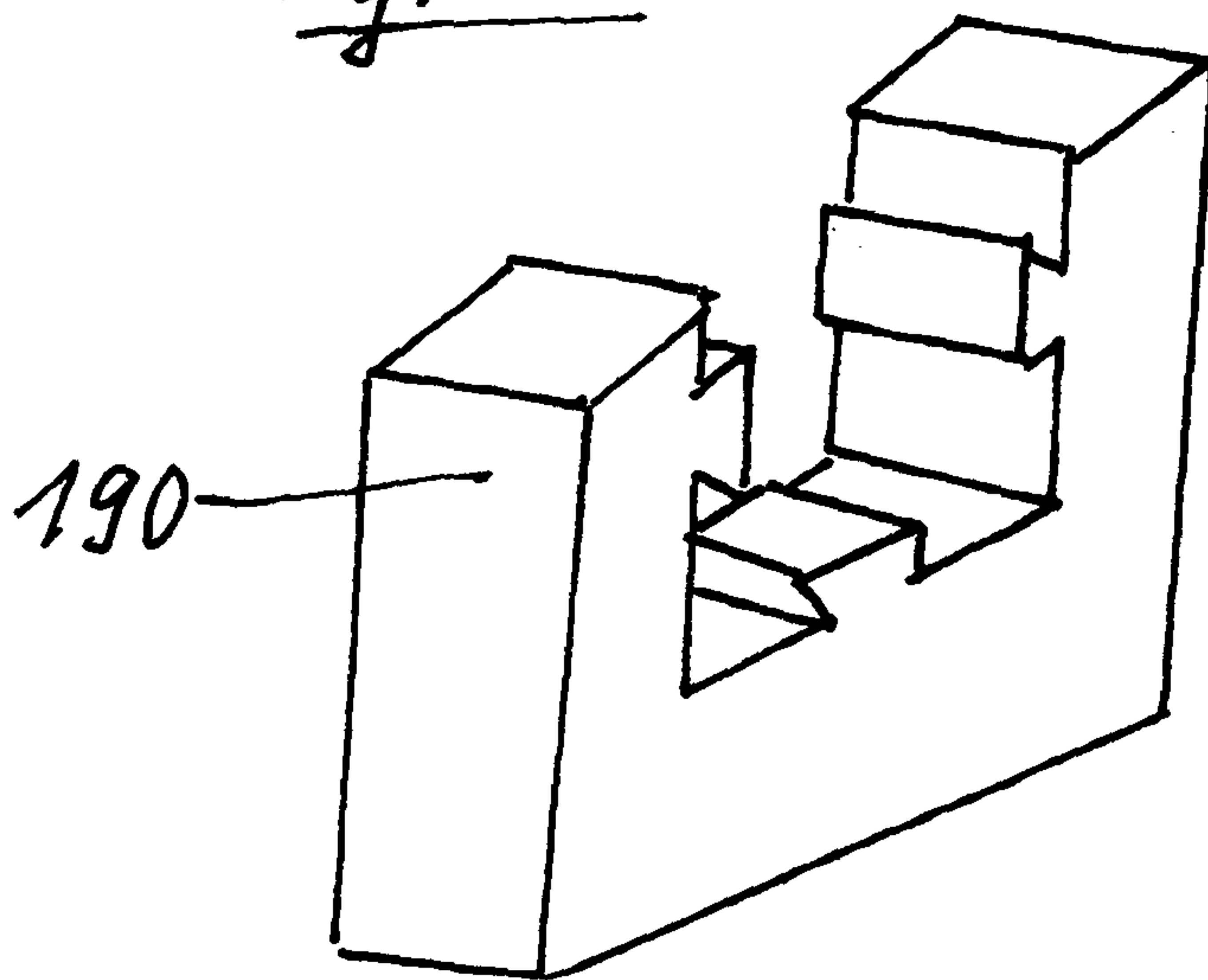
Fig. 41

Fig. 37Fig. 33

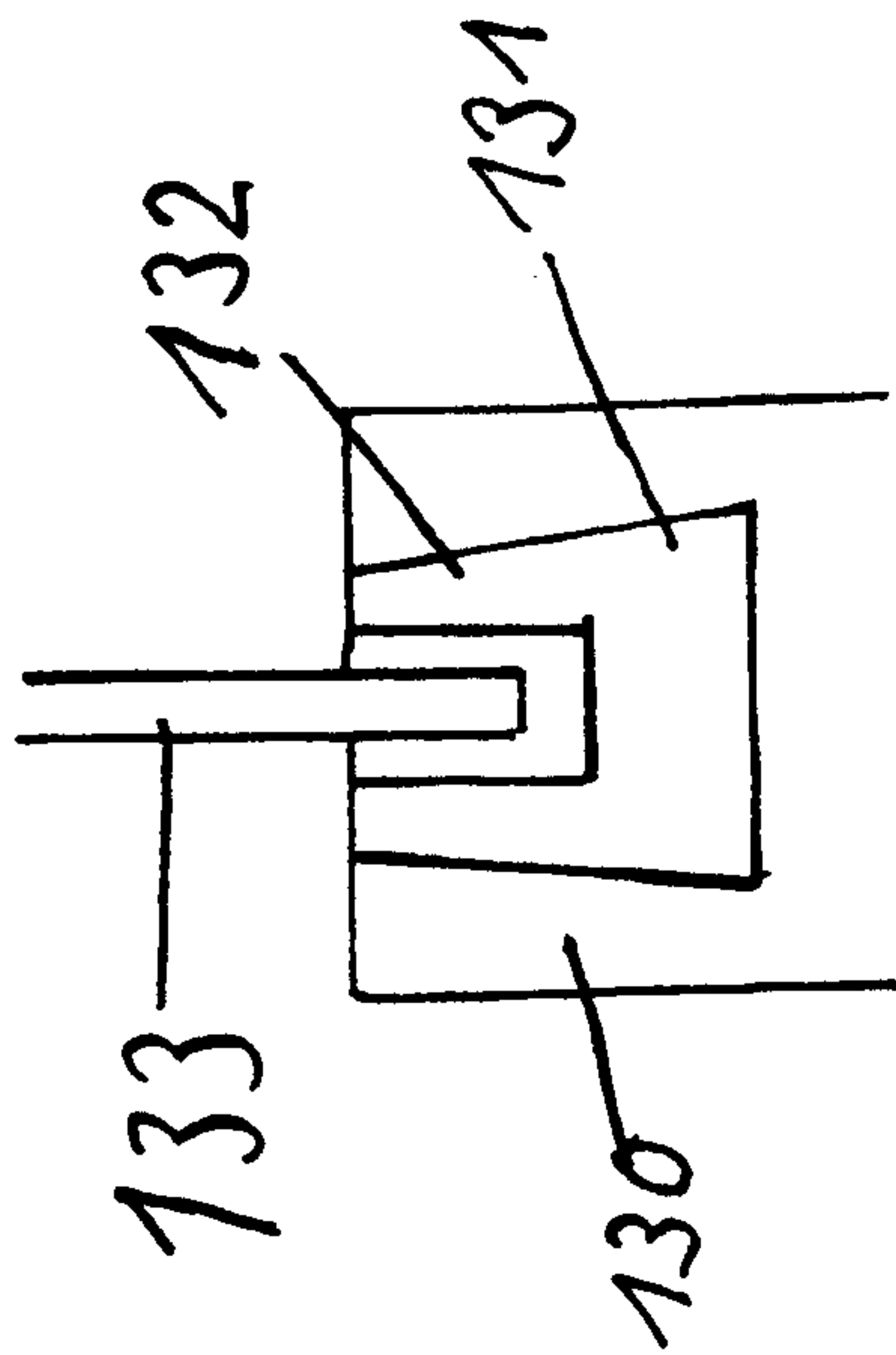
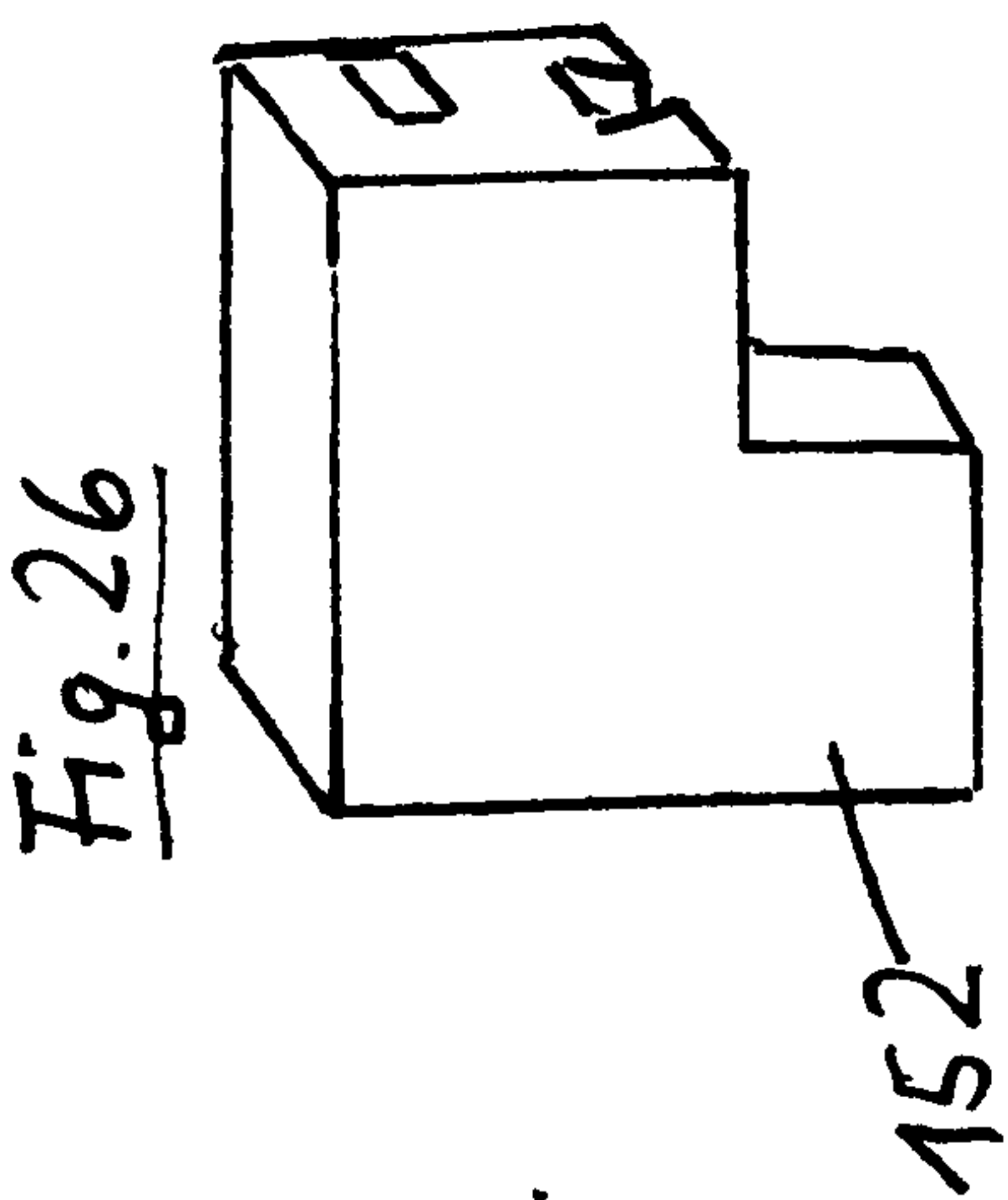
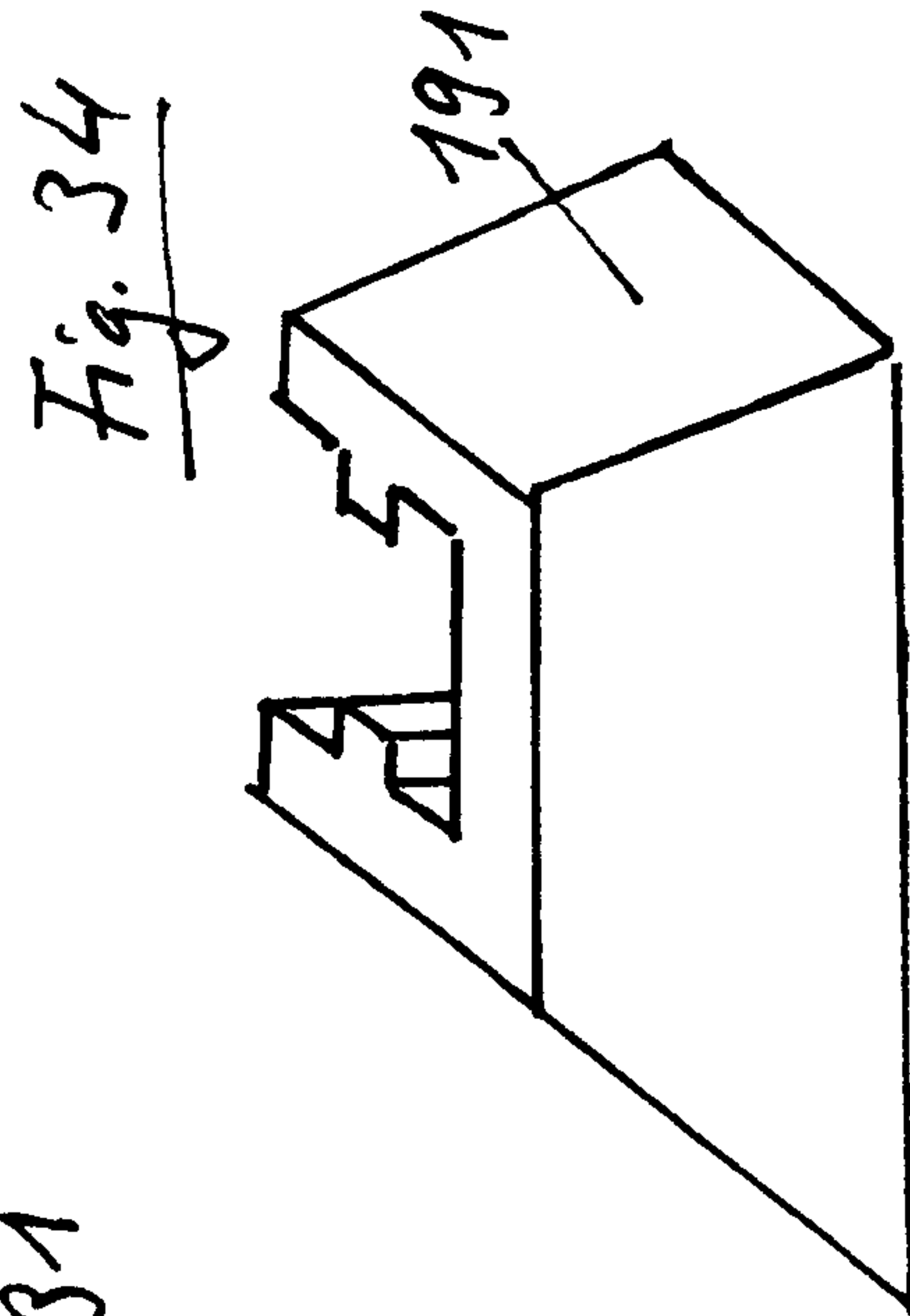
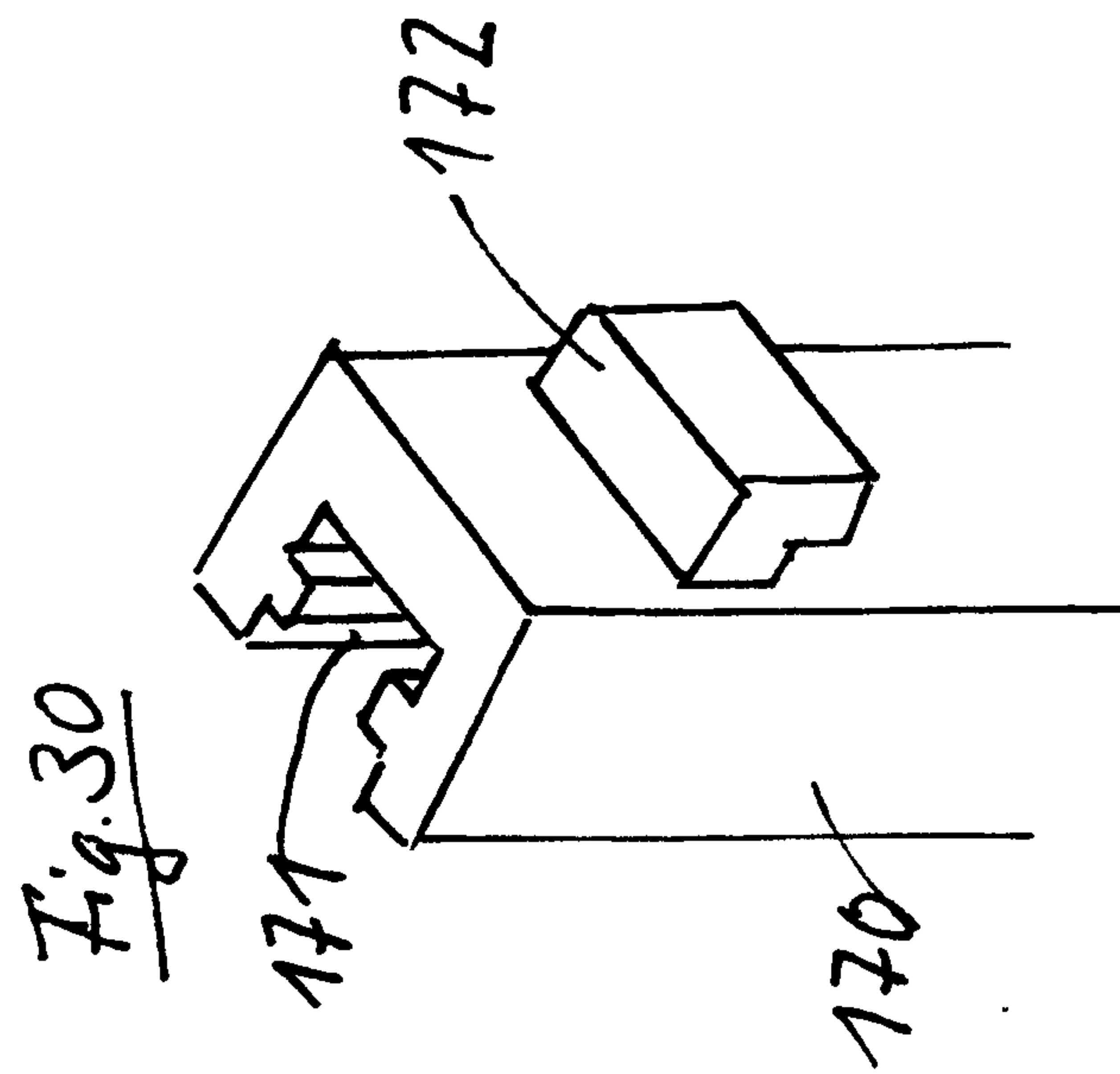
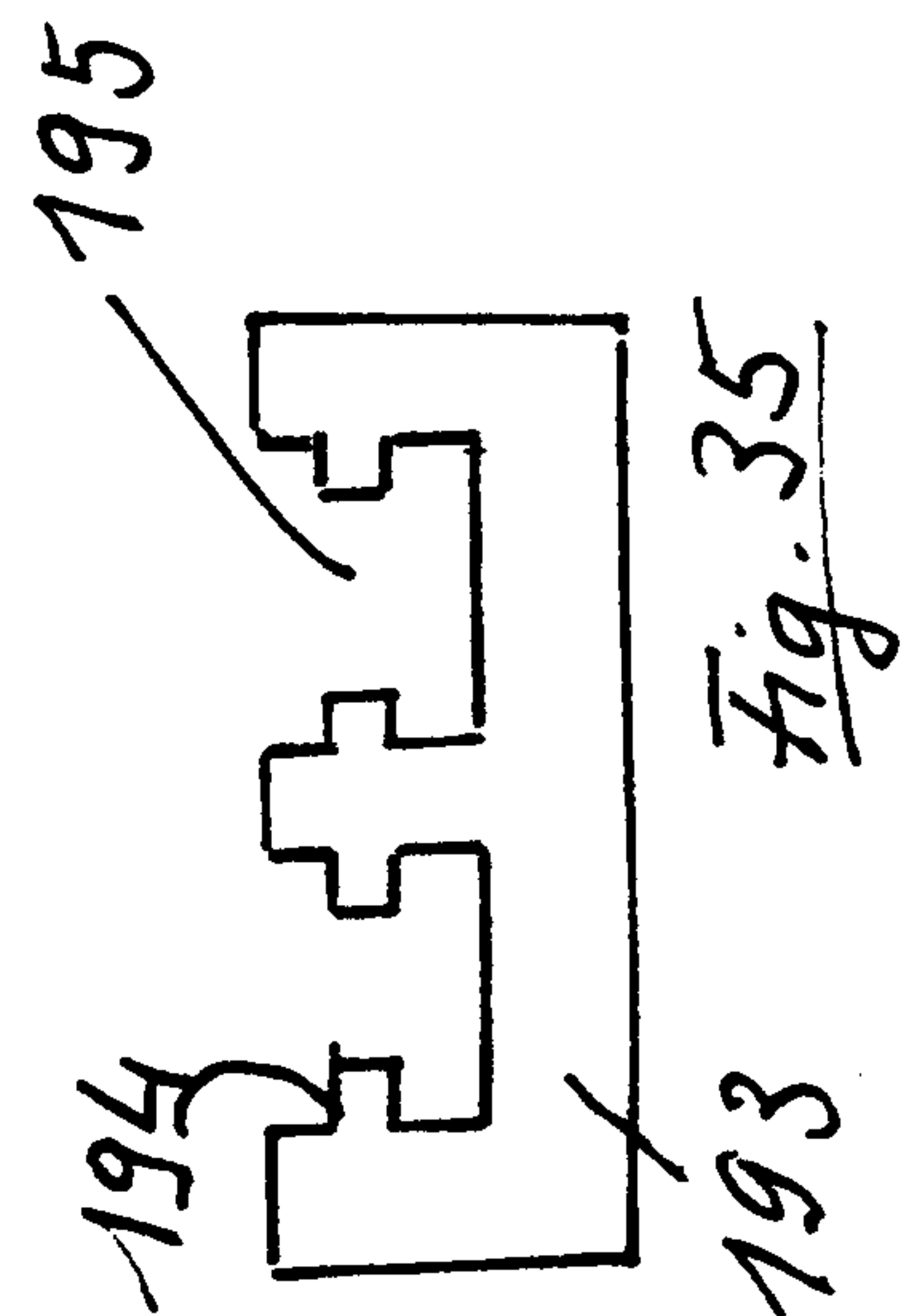
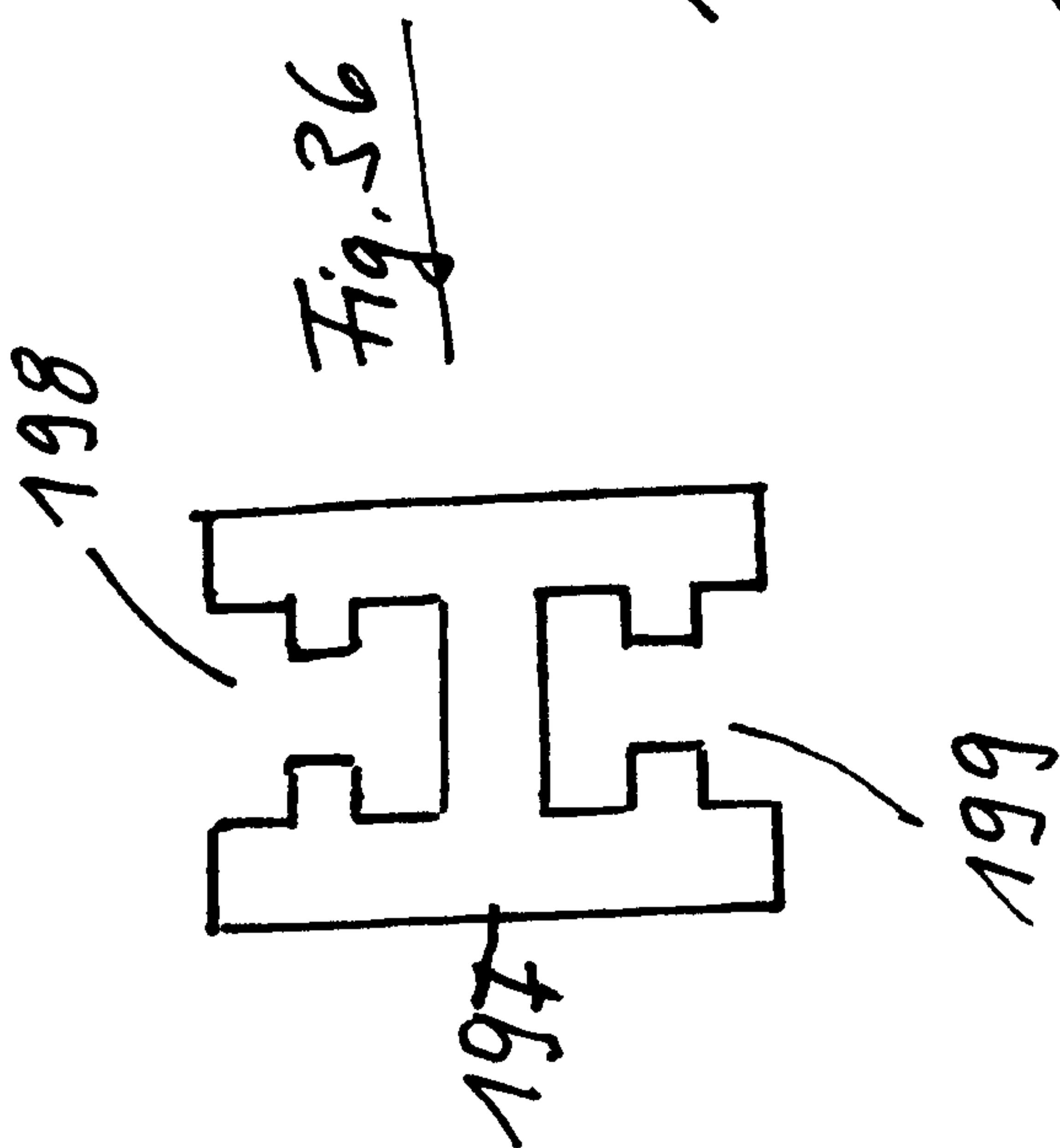
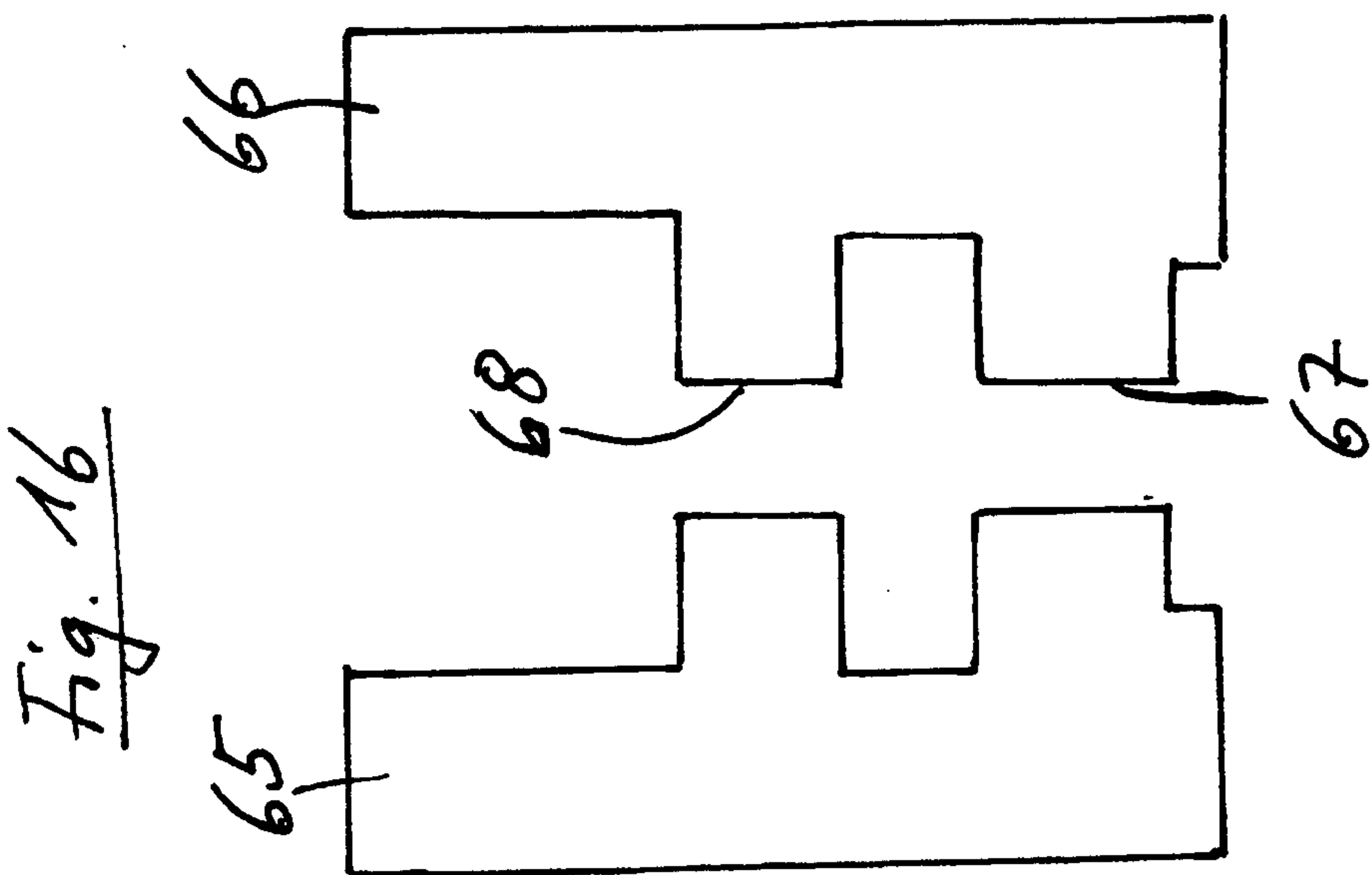
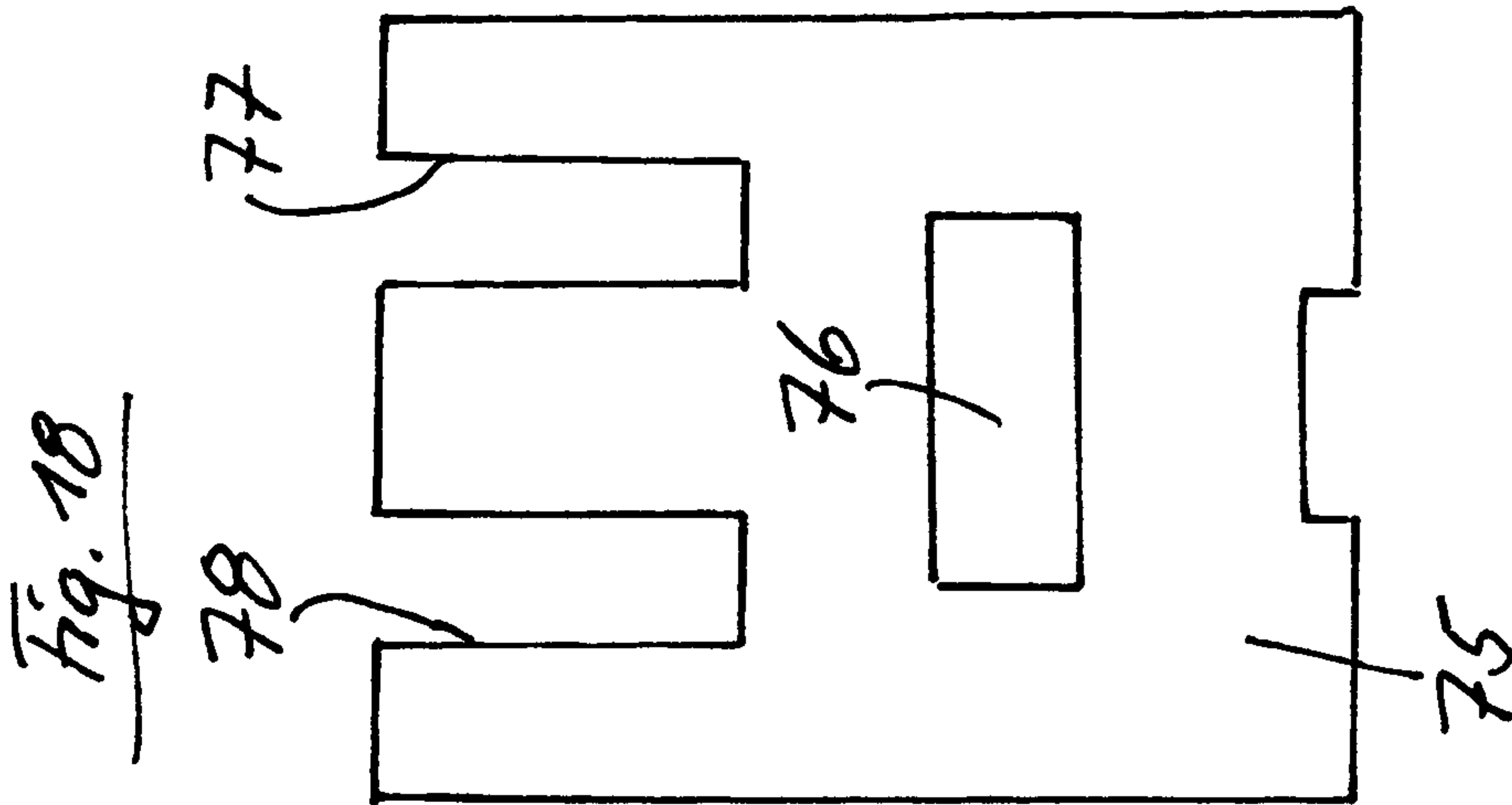
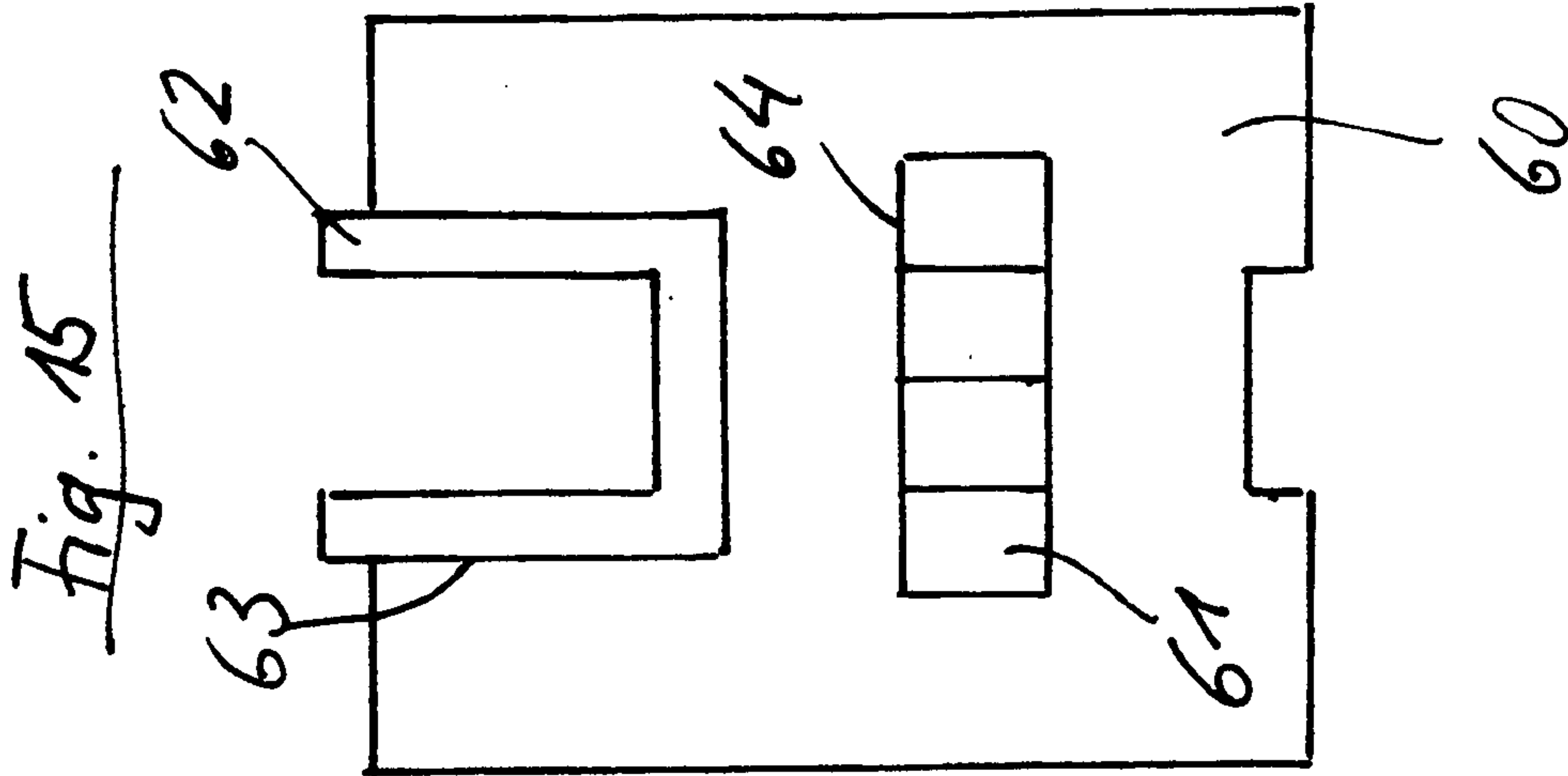
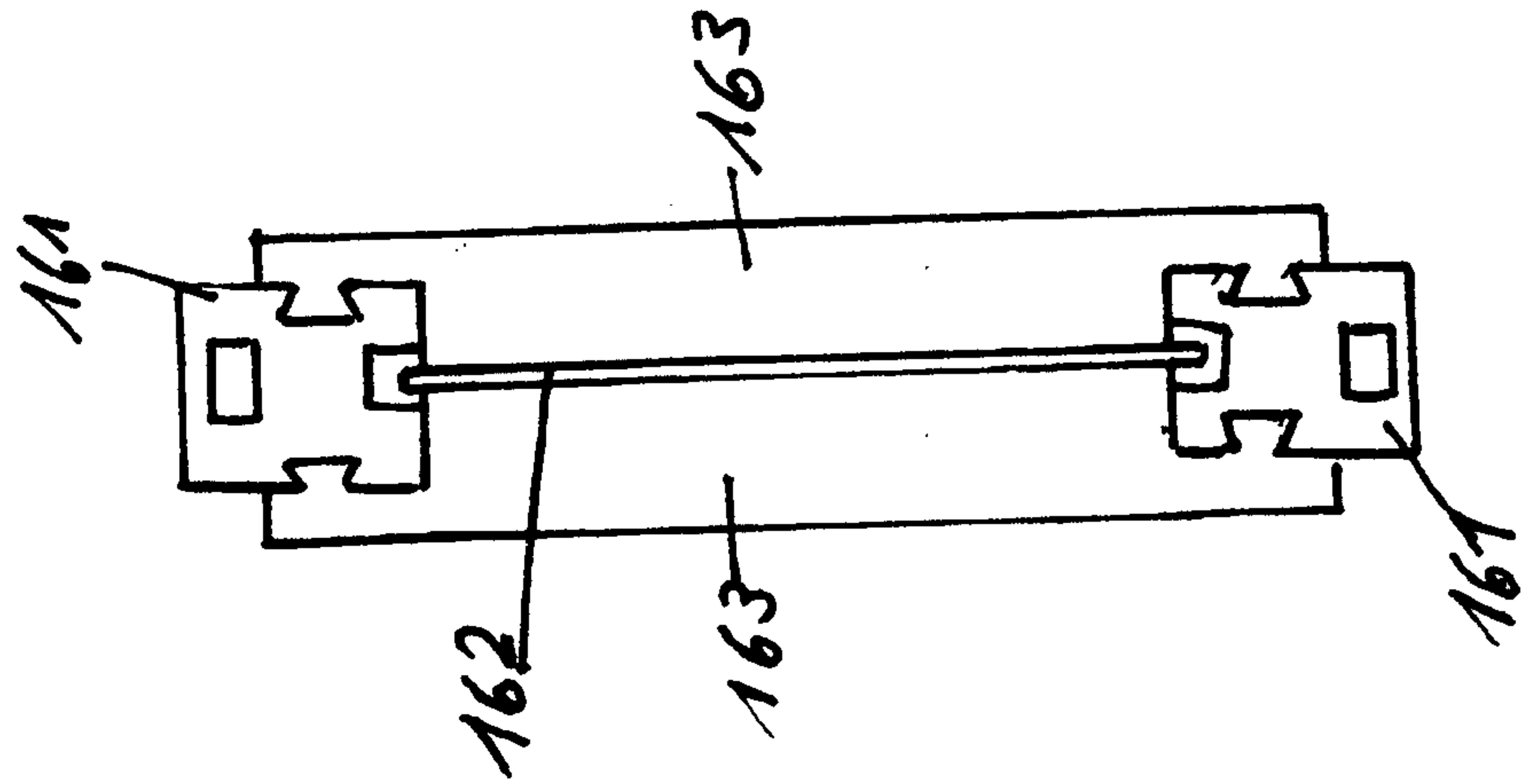
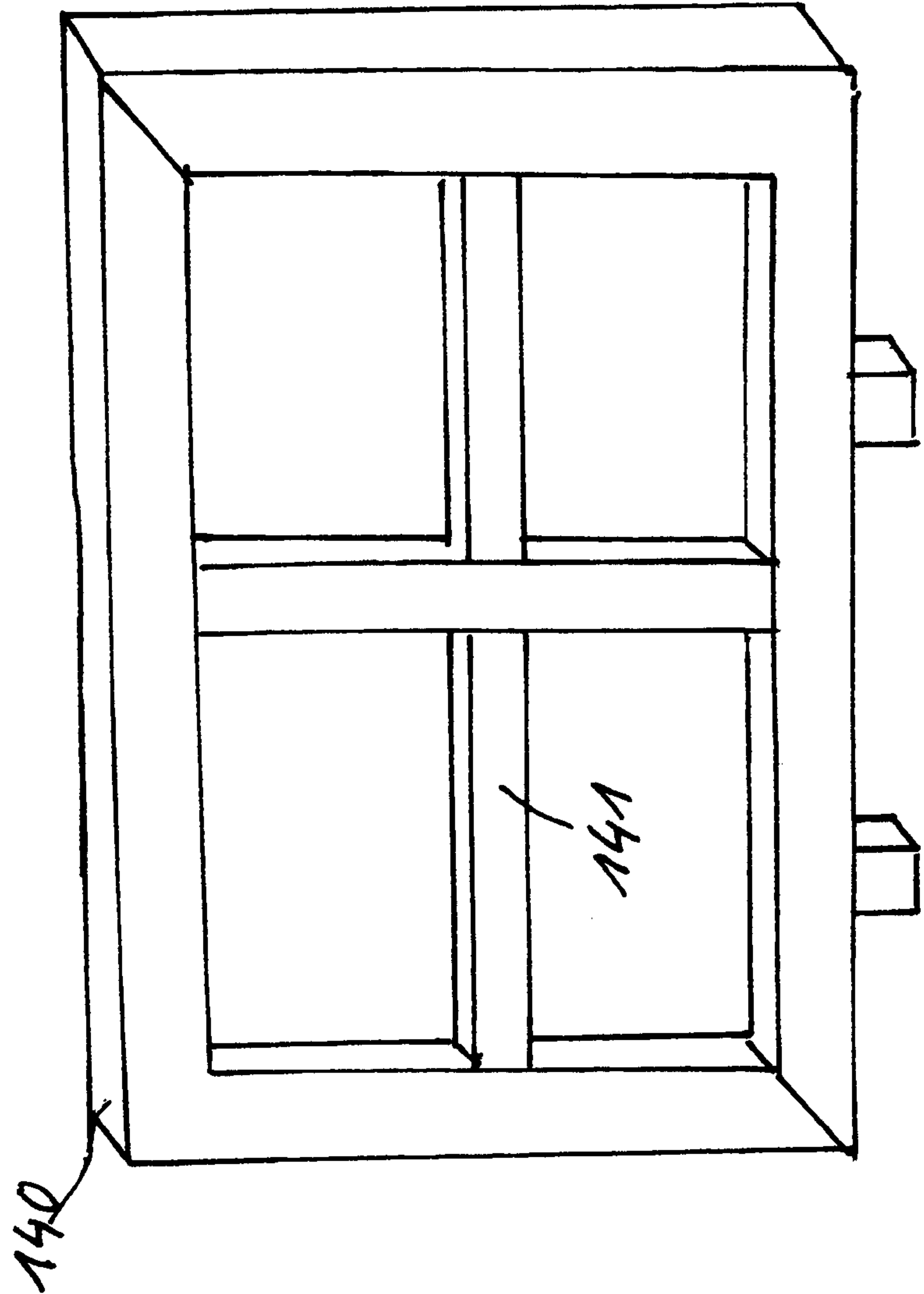
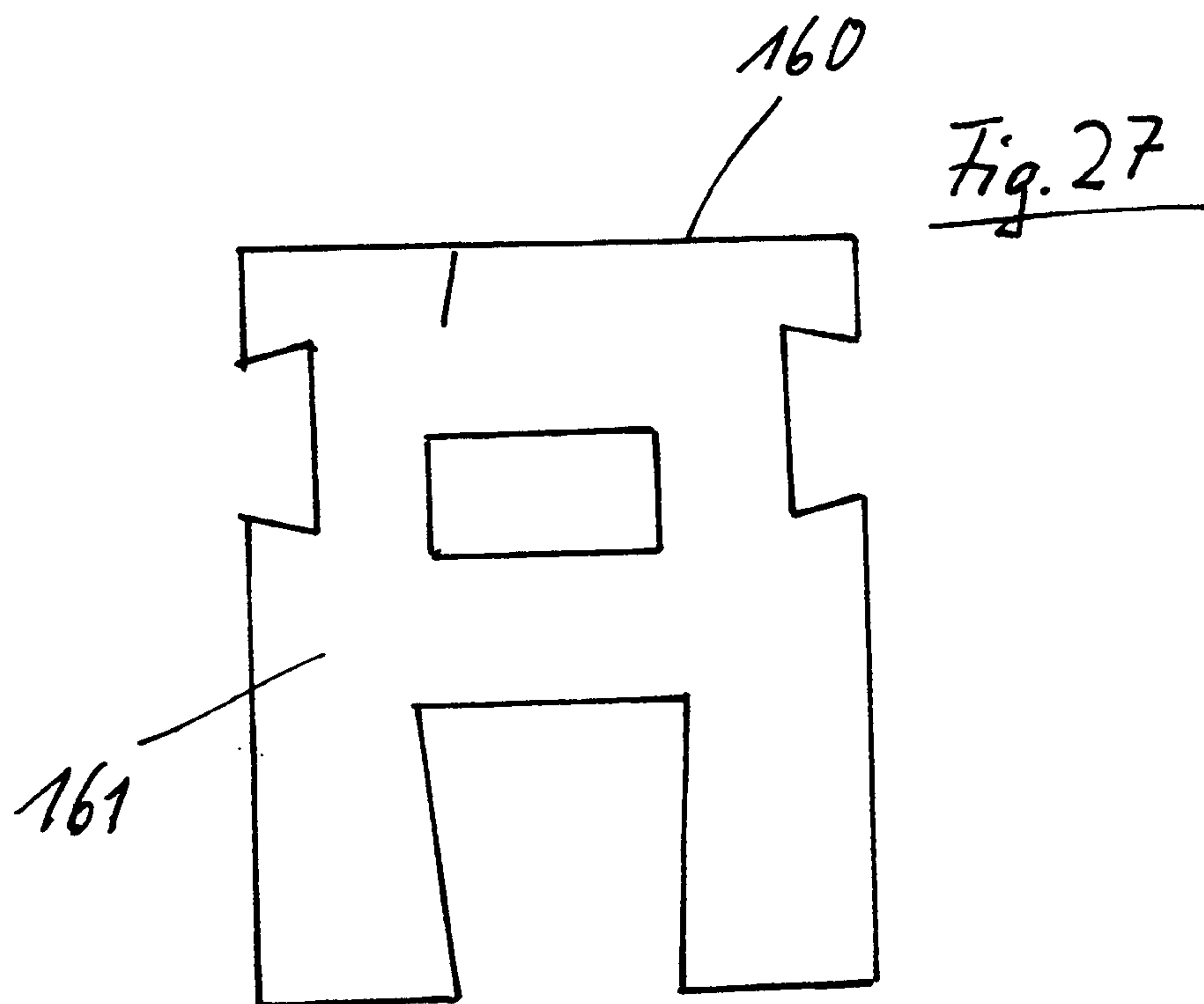
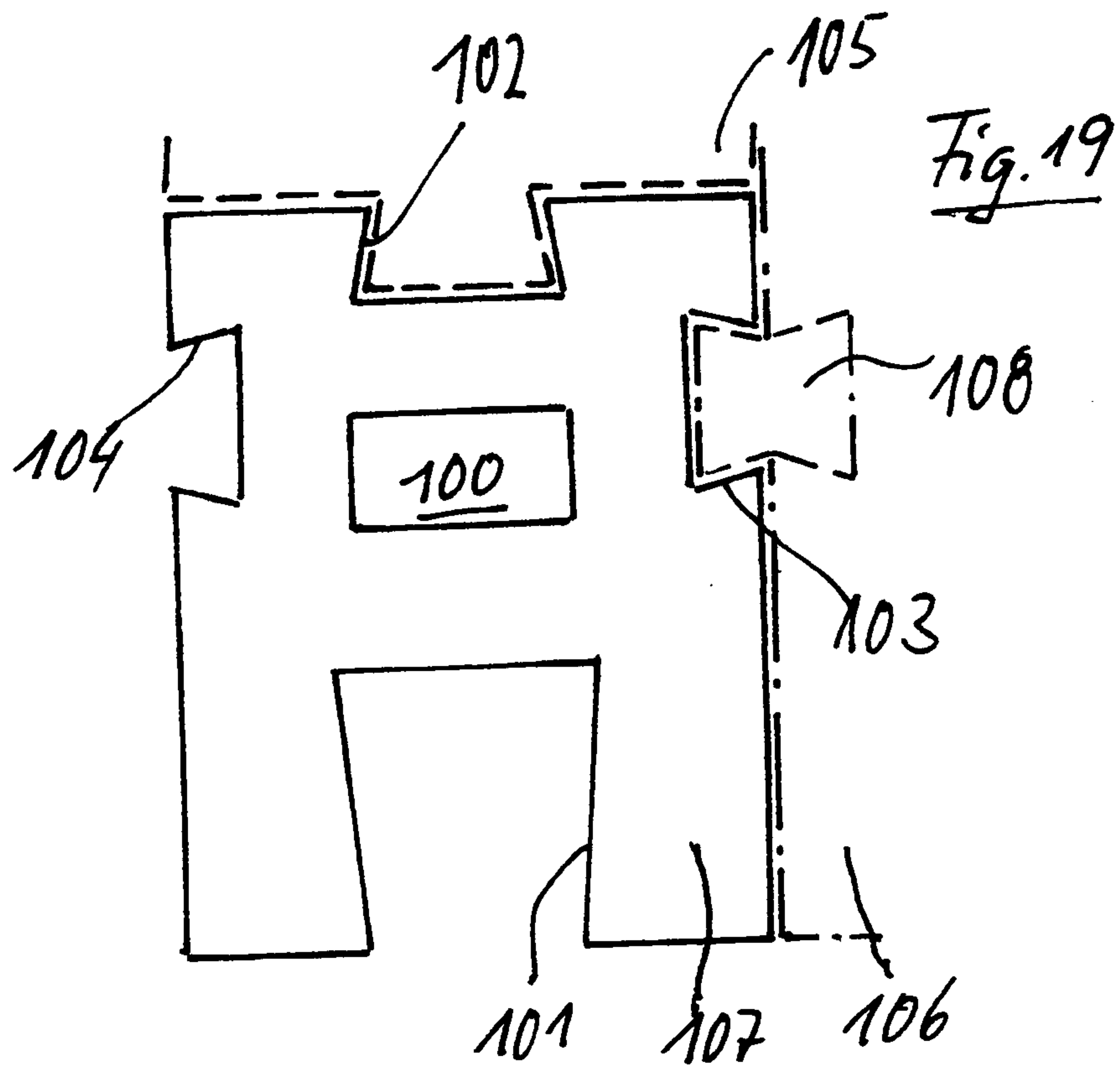


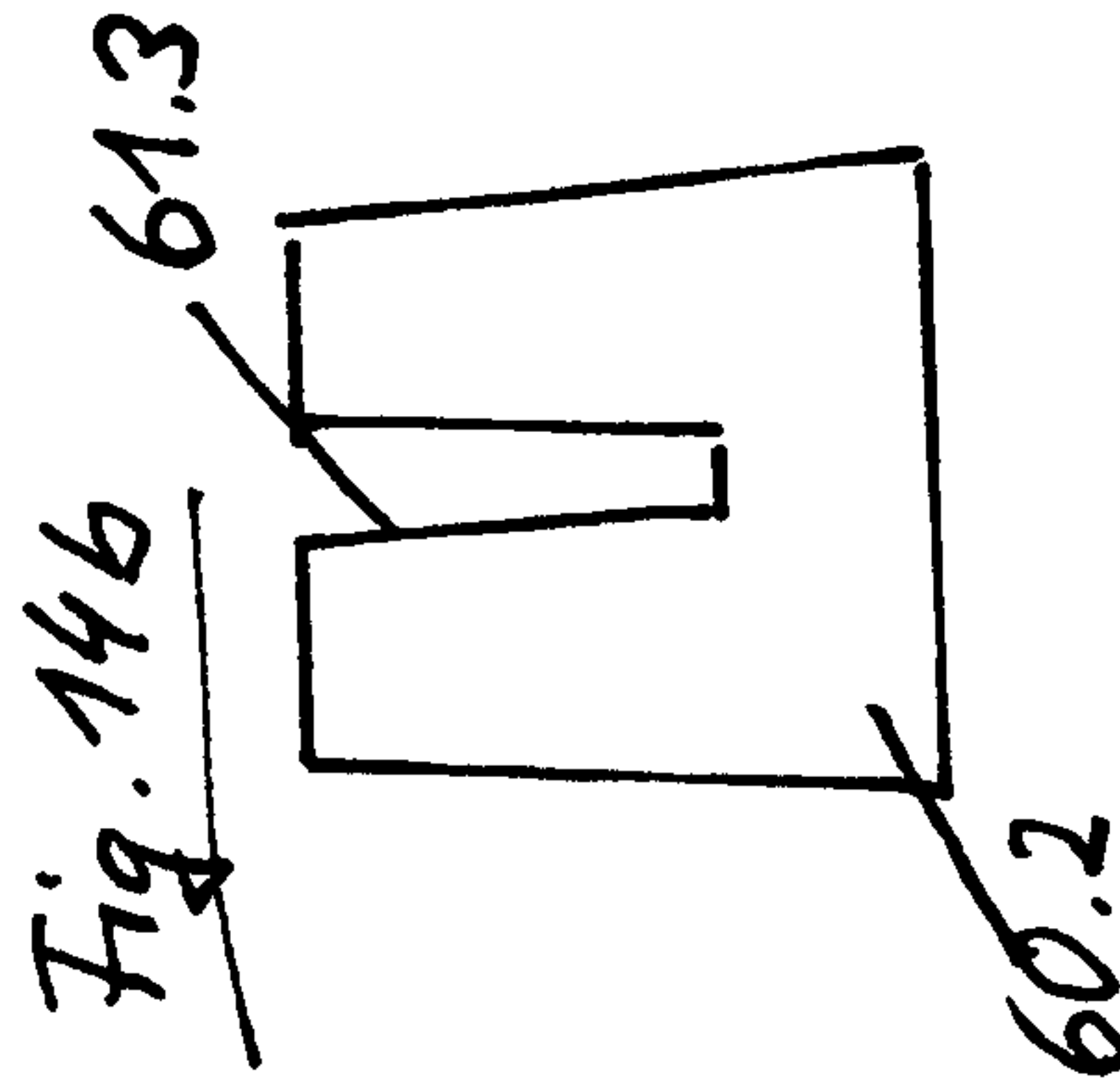
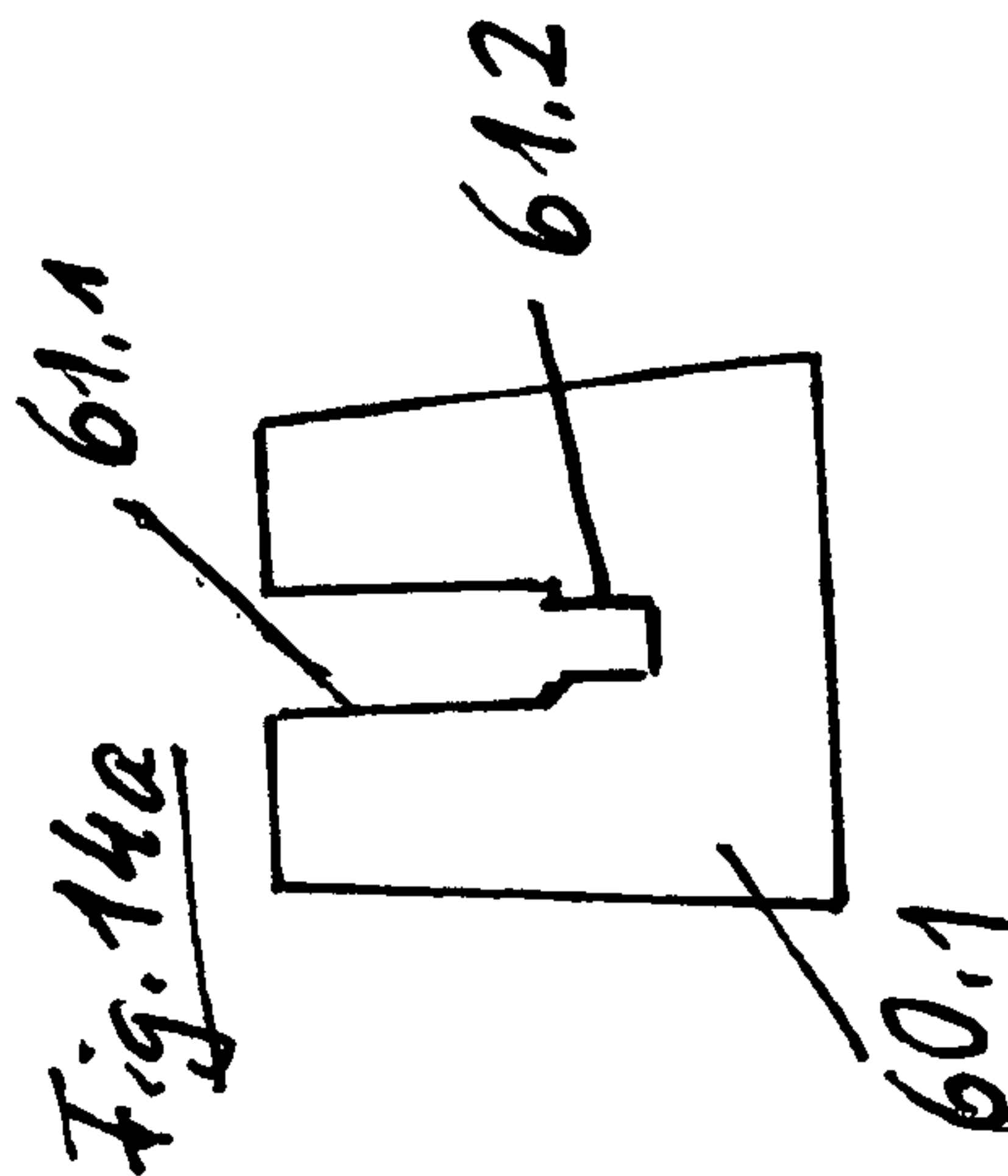
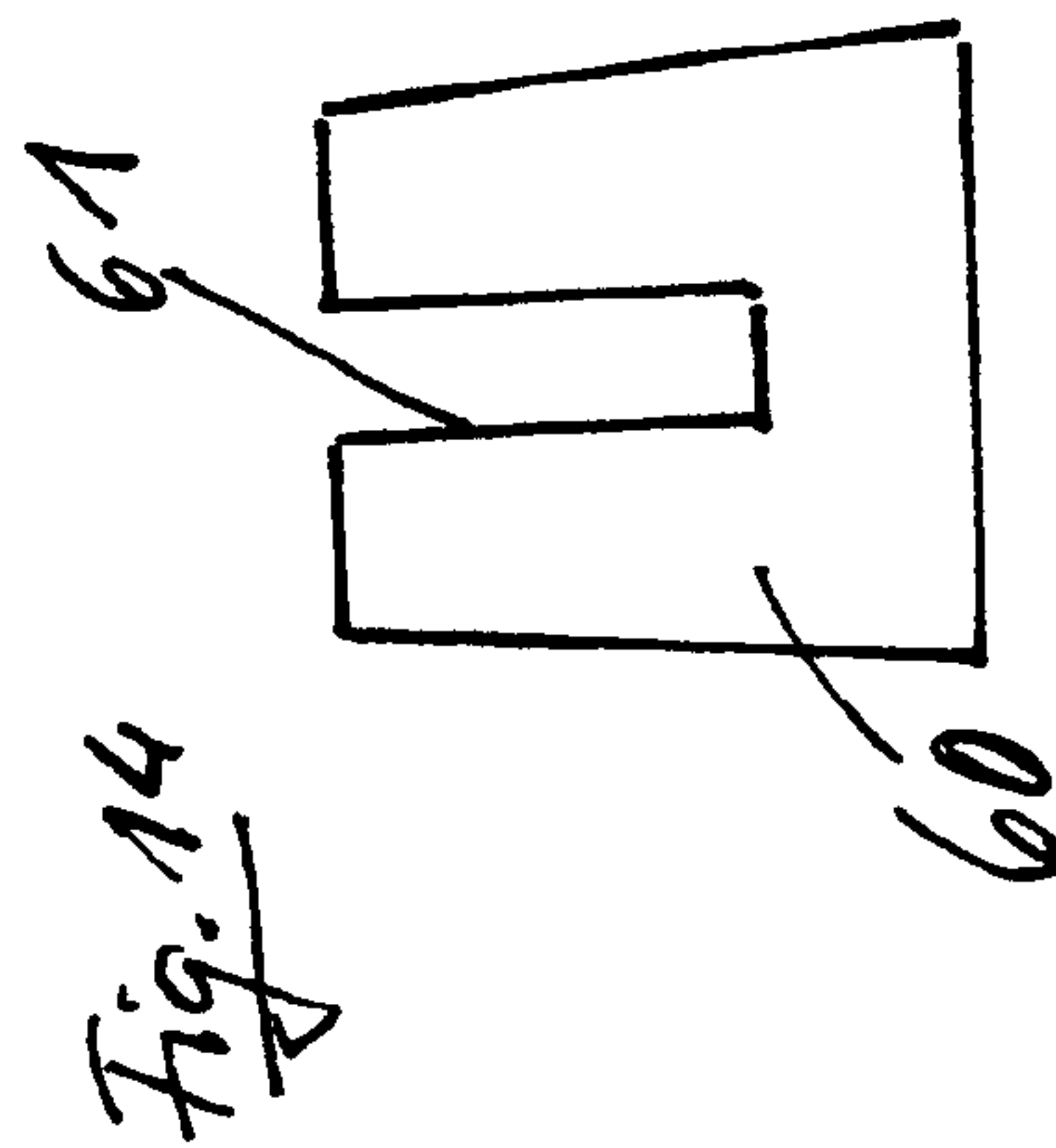
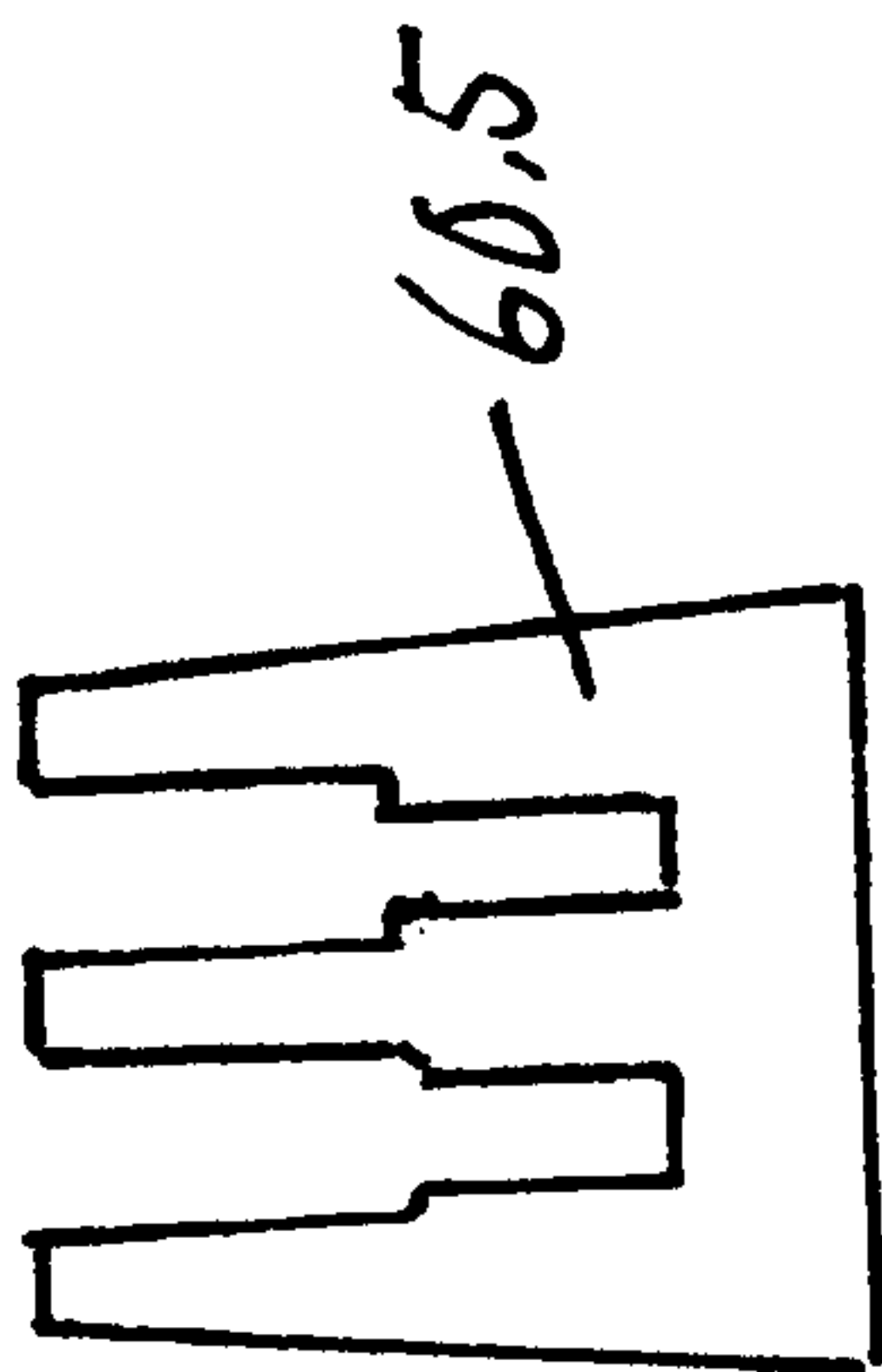
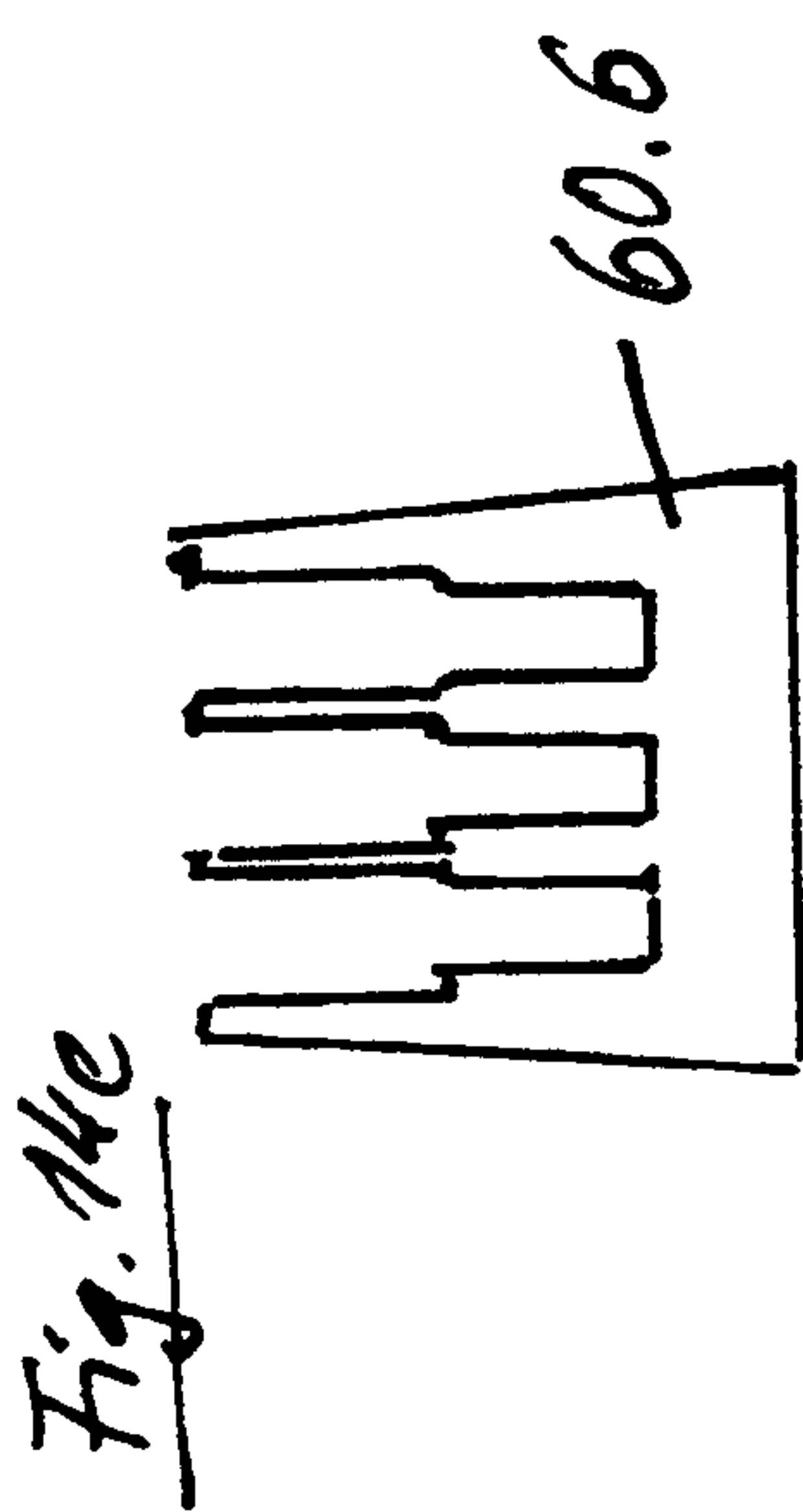
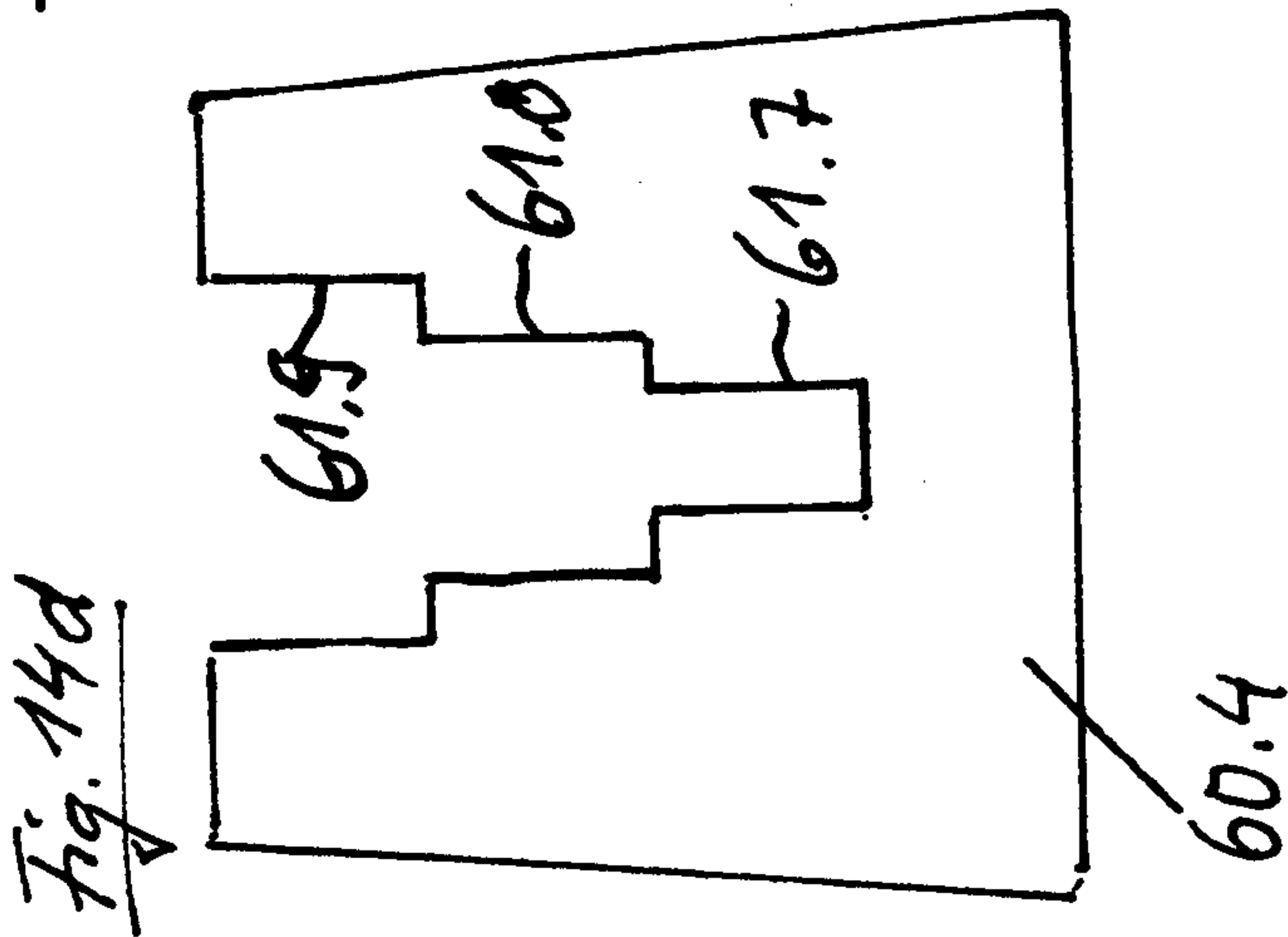
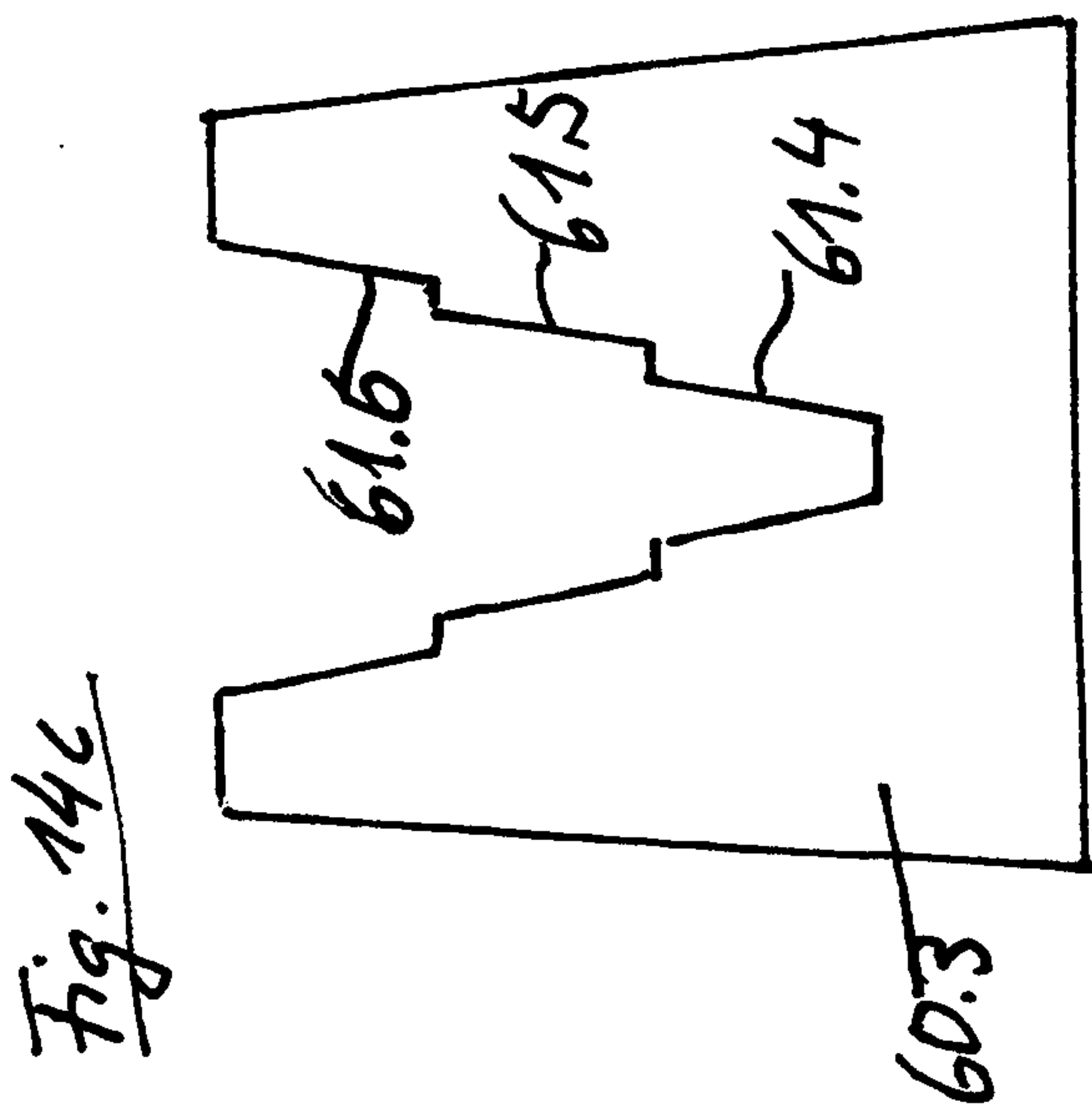
Fig. 23

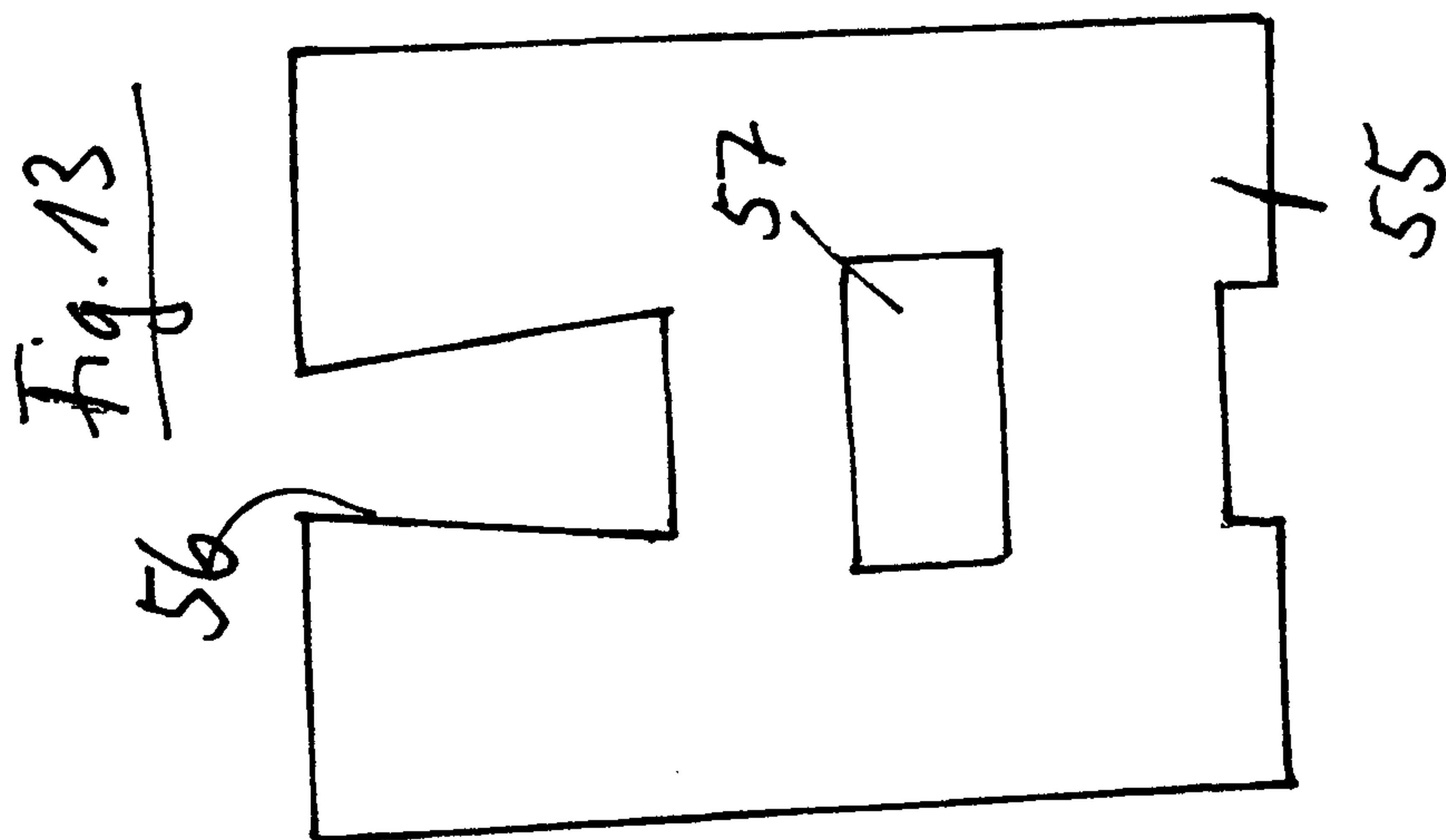
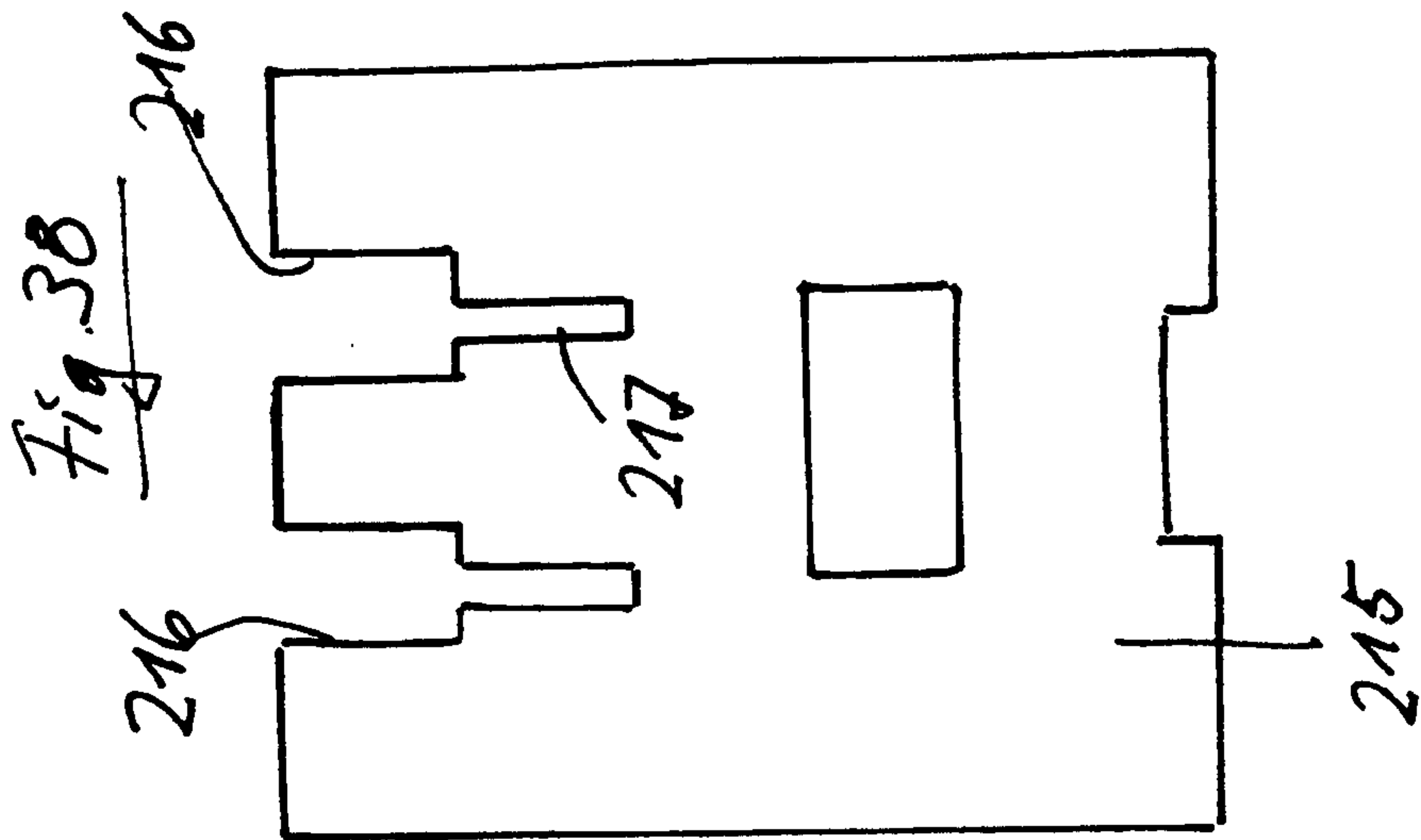
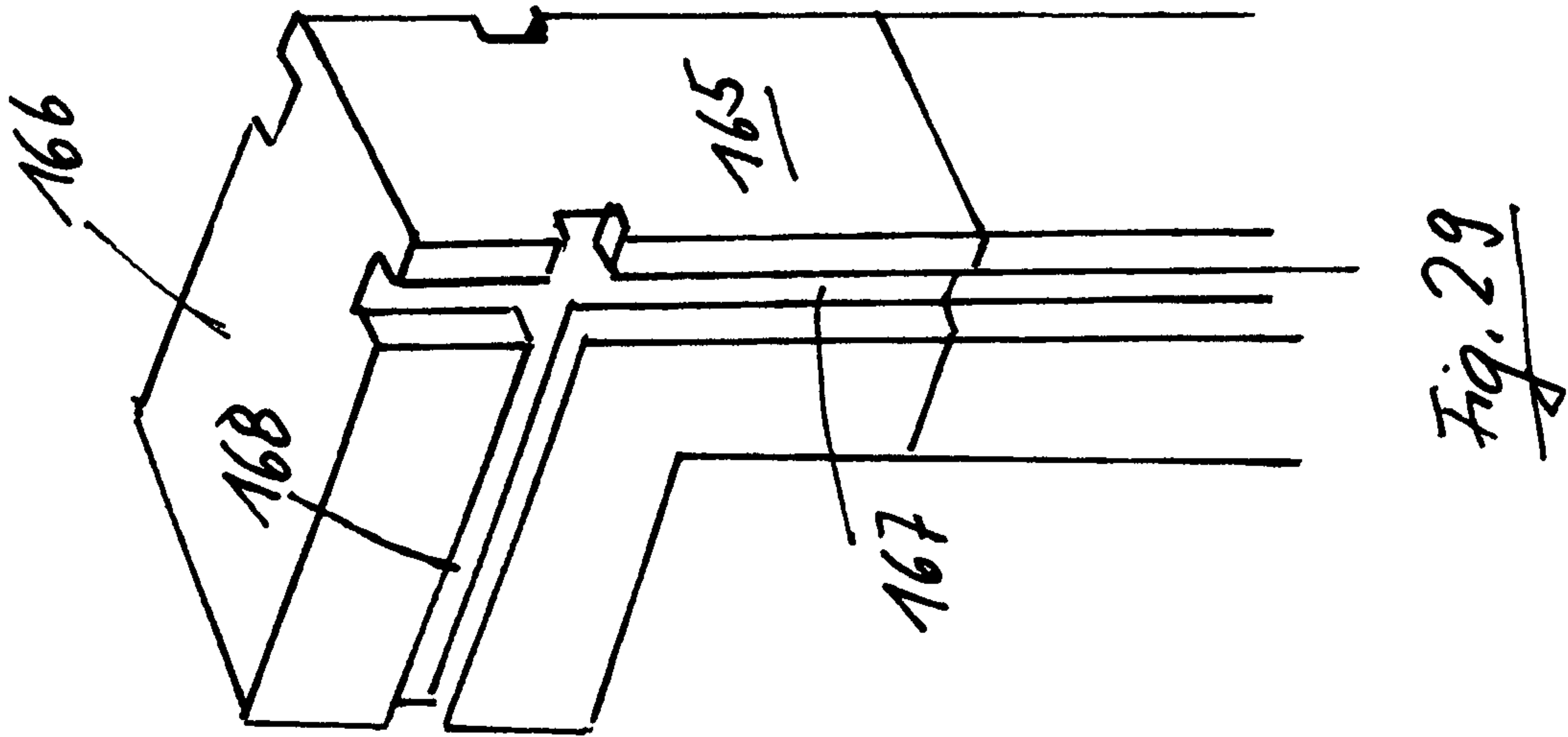












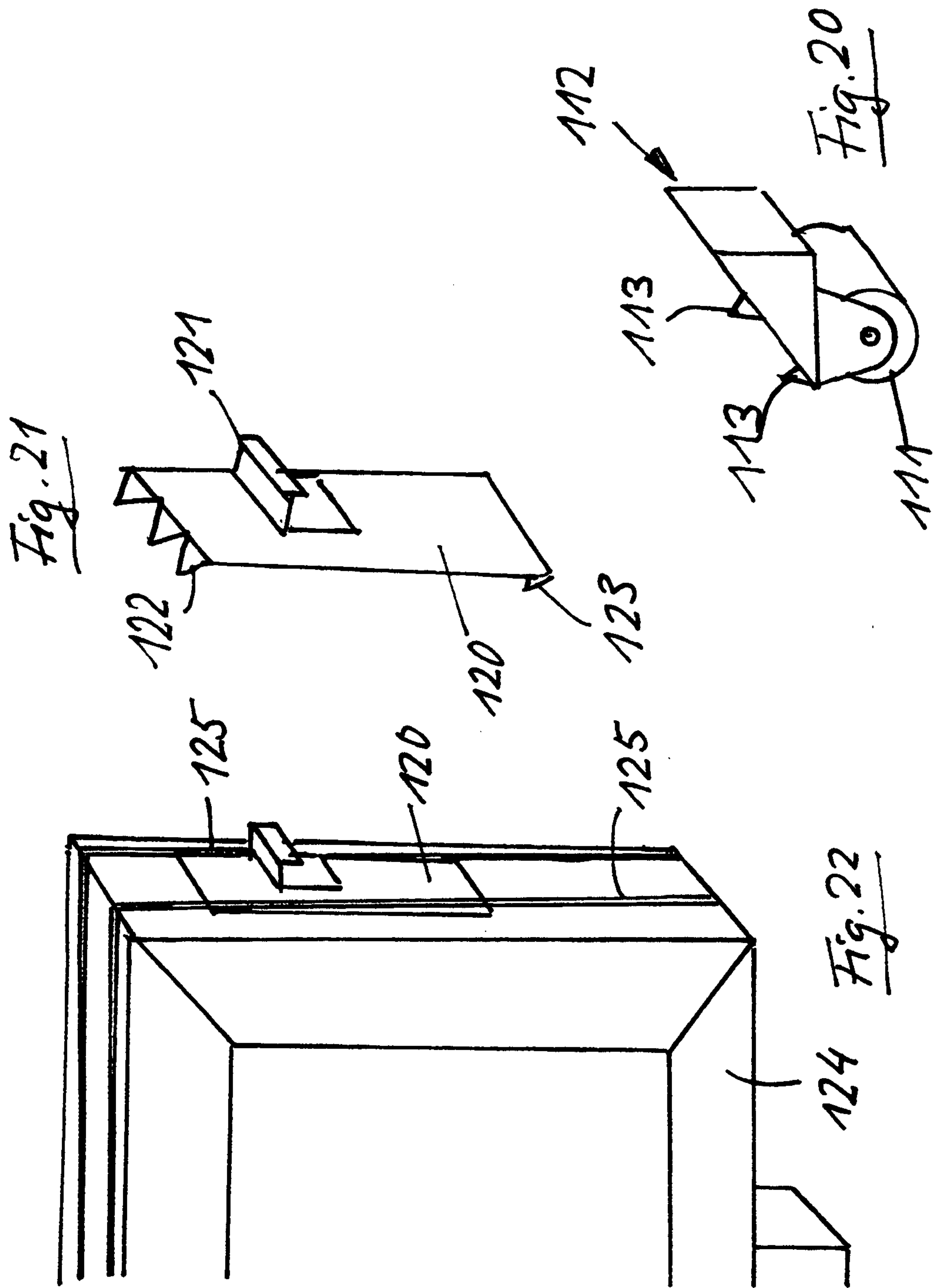


Fig. 53

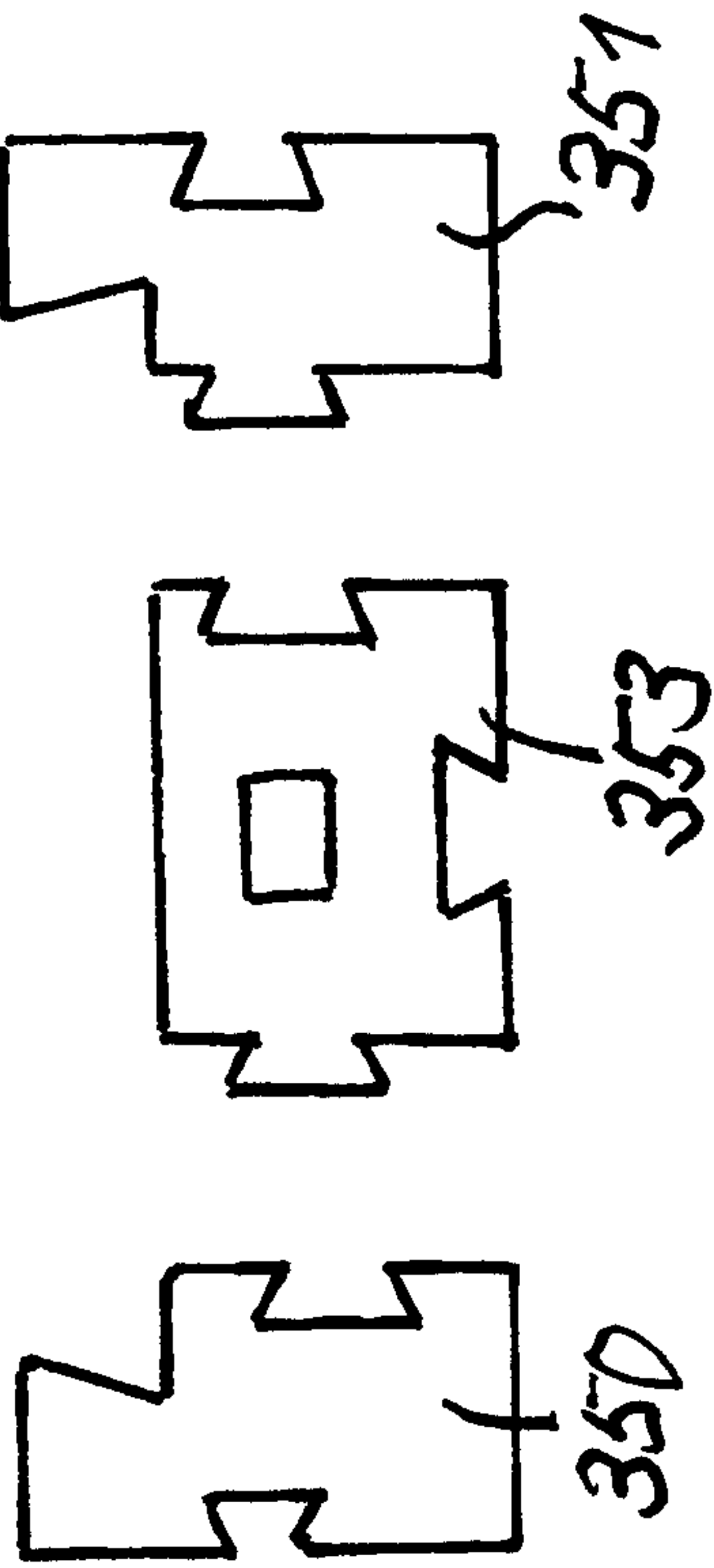


Fig. 54

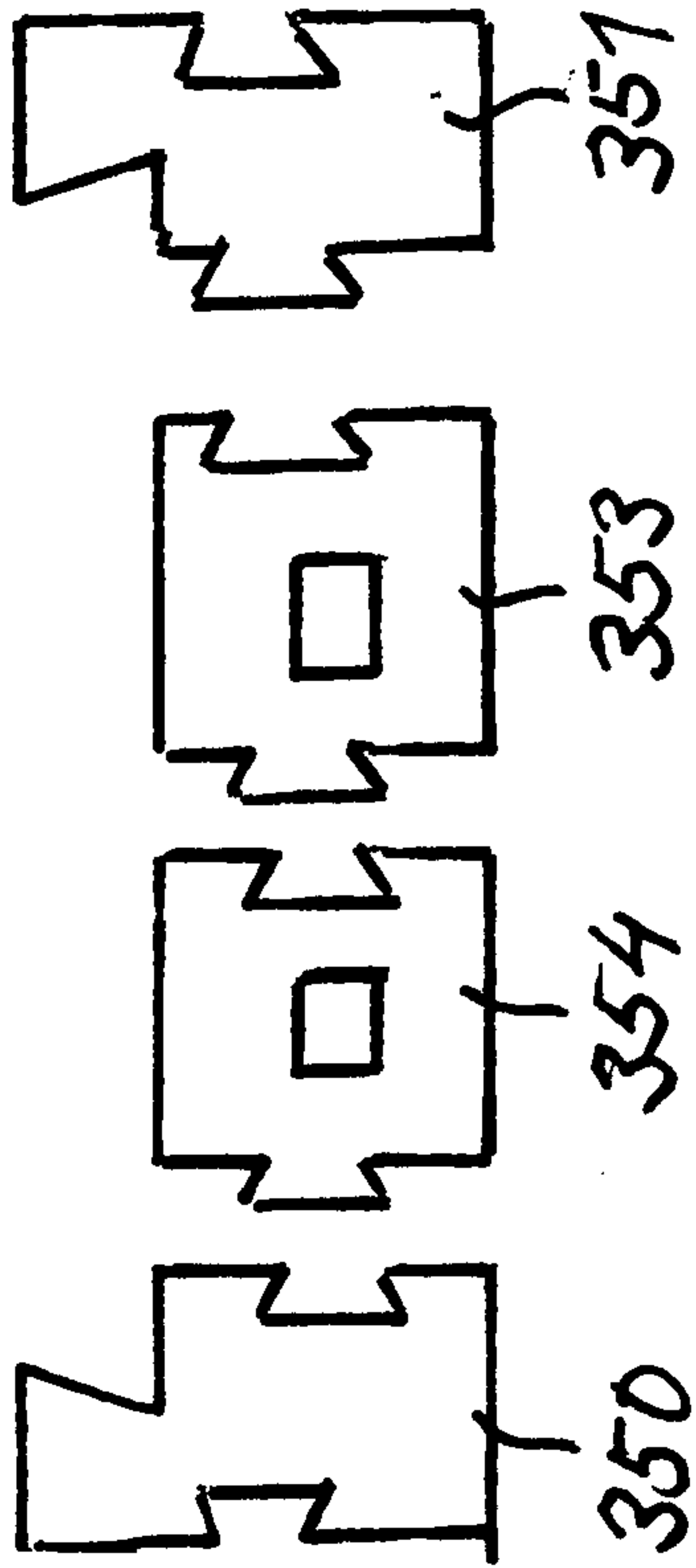


Fig. 52

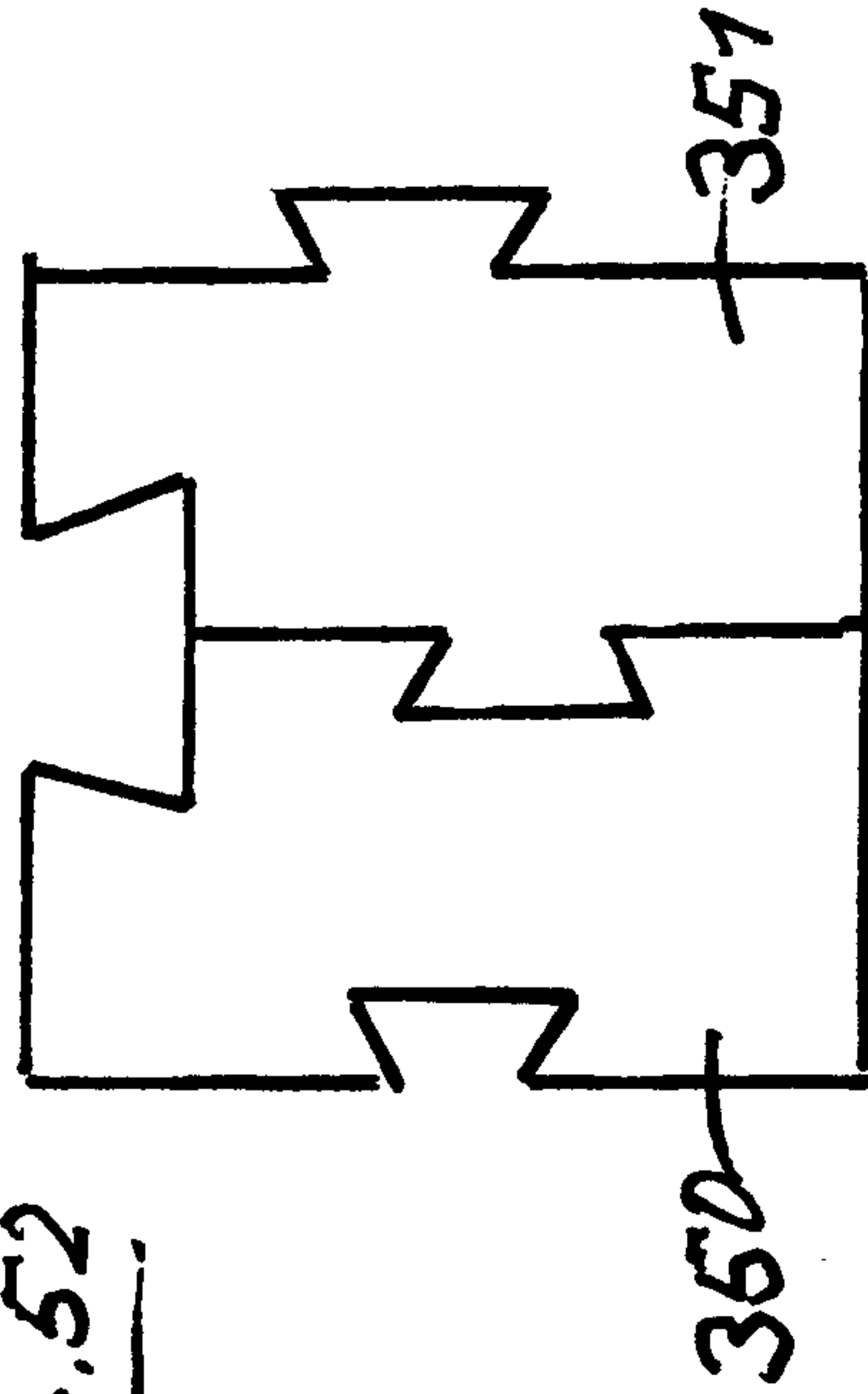


Fig. 51

