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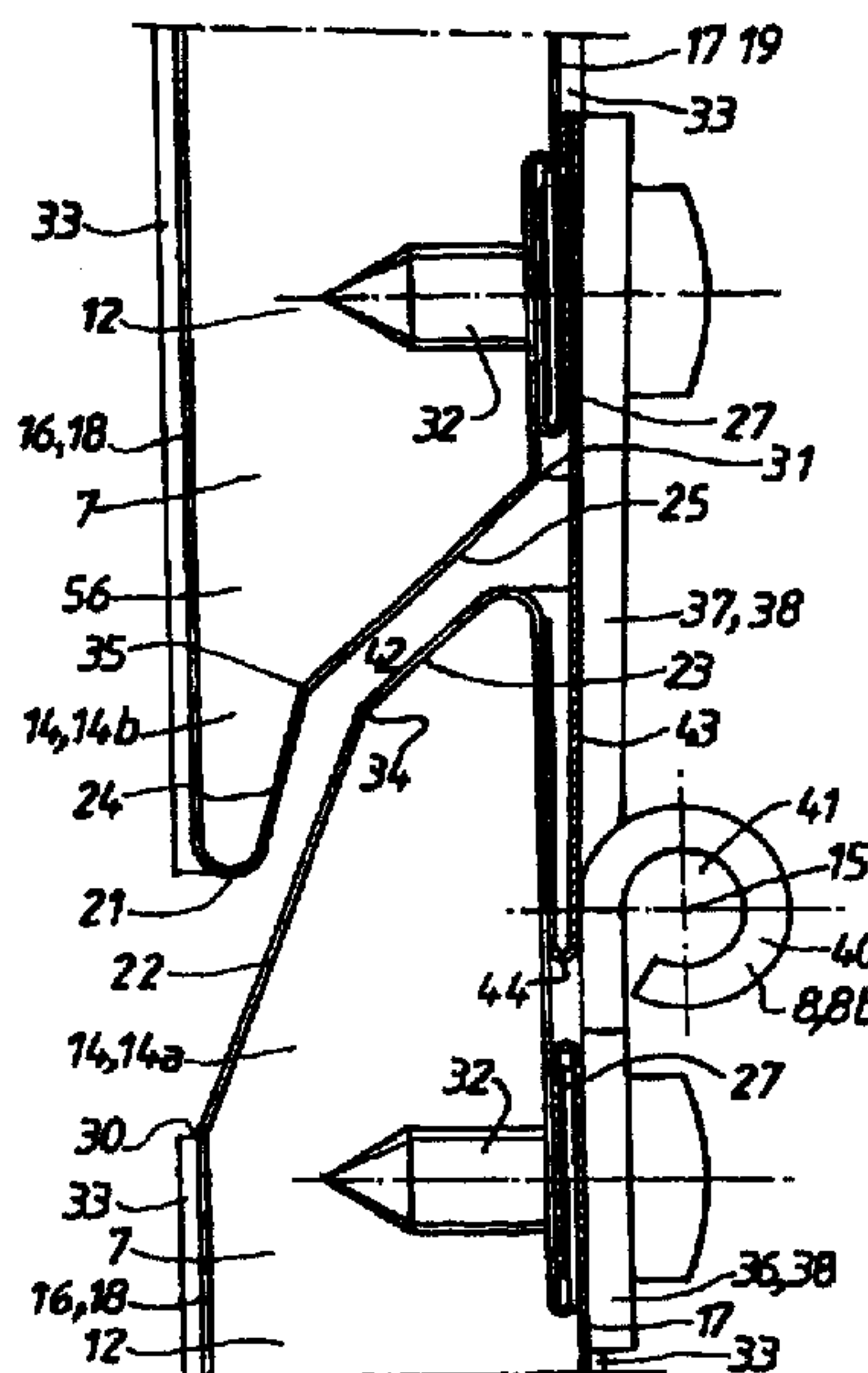
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(54) **PANNEAU DESTINE A UNE PORTE SECTIONNELLE, PORTE
SECTIONNELLE ET CONDITIONNEMENT**

(54) **ROLL-UP DOOR PANEL, ROLL-UP DOOR AND FIXING**



(57) Panneau (7) spécialement destiné à une porte (2) sectionnelle à effacement au plafond et débattement vertical telle que typiquement une porte de garage, ledit panneau étant prévu pour pouvoir être monté sur au moins un autre panneau (7) analogue à pivotement autour d'un axe parallèle à une direction longitudinale normalement horizontale (D) lorsque la porte est montée en situation, le dit panneau comprenant un premier et un second parements (16, 17) définissant ses grandes faces extérieures parallèles (18, 19) solidarisées rigidement l'une à l'autre; au moins un chant longitudinal (14) ayant une épaisseur allant en décroissant, de façon continue, depuis les grandes faces (18, 19) du panneau jusqu'au bord libre longitudinal (21) dudit chant en présentant en section droite transversale un profil de forme générale pseudo triangulaire; l'épaisseur totale du dit panneau allégé étant inférieure à 3 cm.

(57) The invention concerns a panel (7) specially designed for a roll-up door (2) with ceiling retraction and vertical displacement such a typical garage door, said panel being designed so as to be mounted on at least another similar panel (7) pivoting about an axis parallel to the normally horizontal longitudinal direction (D) when the panel is mounted in situ. Said panel comprises first and second sidings (16, 17) defining its parallel large outer surfaces (18, 19) made rigidly integral with each other; at least a longitudinal edge (14) with continuously decreasing thickness from the panel large surfaces (18, 19) up to said edge free longitudinal end (21) having in transverse cross section a generally pseudo-triangular profile, said spandrel panel total thickness being less than 3 cm.

ABSTRACT

5 The invention concerns a panel (7) specially
designed for a roll-up door (2) with ceiling retraction
and vertical displacement such a typical garage door,
said panel being designed so as to be mounted on at least
another similar panel (7) pivoting about an axis parallel
10 to the normally horizontal longitudinal direction (D)
when the panel is mounted in situ. Said panel comprises
first and second sidings (16, 17) defining its parallel
large outer surfaces (18, 19) made rigidly integral with
each other; at least a longitudinal edge (14) with
15 continuously decreasing thickness from the panel large
surfaces (18, 19) up to said edge free longitudinal end
(21) having in transverse cross section a generally
pseudo-triangular profile, said spandrel panel total
thickness being less than 3 cm.

Panel for a sectional door, sectional door and packaging

The invention relates to sectional doors which open against the ceiling with vertical travel such as garage doors.

5 It more particularly relates to a panel intended specially for such a door; an assembly comprising two panels associated together which swivel with respect to each other; a leaf comprising a succession of panels in articulated pairs; a door once manufactured, pre-assembled and pre-
10 adjusted on the one hand, and once installed in the structure for which it is intended on the other hand; a package incorporating a number of pre-assembled doors; a method of assembling for such a door; and finally a structure incorporating an assembled door.

15 Sectional doors which open against the ceiling and with vertical travel such as garage doors are already known.

A known general structure of such doors is described especially in the documents EP-A-666 401, WO-A-96/36 784, EP-A-230 499, US-A-3 311 159, FR-A-2 304 756, FR-A-2 244
20 068, US-A-2 083 467, US-A-3 160 200 and US-A-4 472 910.

Documents EP-A-304 642, EP-A-370 324 and EP-A-370 376 discuss the structure of the longitudinal edges of two adjacent panels.

5 The garage doors under consideration are intended to be installed in a structure which comprises an opening which the door is intended to block. The overall dimensions of the door (horizontal width and vertical height) are for this purpose greater than the dimensions of the opening in question.

10 The structure generally comprises a ceiling and two walls on each side of the opening defining the apron of a lintel and corner pieces of appreciable dimensions to left and right respectively.

15 The apron of the lintel is necessary as the result of the presence at this point of rails, a spindle supporting cable reel drums, and one or more components for retraction of the leaf. As to the corner pieces, they are necessary to house roller spindles, rollers and side rails.

20 The known doors previously considered are stored, delivered and supplied in a number of separate parts. The builder must assemble these pieces on site and provide adjustment. These operations are necessarily long and costly. Furthermore the adjustment can turn out to be less than optimal.

25 The object of the invention is in particular to limit the height of the apron of the lintel and the width of the corner pieces, and the time taken for assembly and adjustment on the construction site.

30 Consequently, for a given opening, it is possible to use a smaller door than previous doors. Or, conversely, for a given door, the opening can be larger. In addition, the storage, delivery, supply and installation (assembly,

mounting, adjustment) are easier, take less time, more compact in volume and less costly.

Another object of the invention is a door which does not have the disadvantages of those now known, which is simple
5 but at the same time strong and easy to make use of.

For this purpose and according to a first aspect, the invention relates to a panel specially intended for a sectional door opening against the ceiling with vertical travel as a typical garage door, the said panel being
10 designed so that it can be mounted on at least another analogous panel swivelling around an axis parallel to a longitudinal direction normally horizontal when the door is mounted in position, the said panel comprising a first and a second facing defining the parallel large outer faces
15 executed in thin sheets of metal or similar, rigidly made solid with one another towards the two longitudinal edges of the panel by folding with interleaving; at least one of the facings including at least one hollow stiffening rib extending in the longitudinal direction; the space closed at
20 the periphery by the two facings being - at least partially - substantially filled with a synthetic material expanded during manufacture; at least one longitudinal edge being essentially defined by a number of substantially flat successive planes on one of the facings, the edge being of a
25 thickness which decreases continuously from the large faces of the panel to the longitudinal free border of the said edge and presenting as a transversal cross section a profile of generally pseudo-triangular shape; the total thickness of the said lightened panel being less than 3 centimetres.

30 In one embodiment, one of the facings includes at least one longitudinal rib, while the other does not, being indeed substantially flat.

A longitudinal rib such as that considered has, in one embodiment, a substantially triangular or rounded profile.

At least a part of this profile has, with respect to the large face of the corresponding facing, an inclination
5 analogous to that of the face of the longitudinal edge adjoining this face.

More generally, the profile of the longitudinal rib is analogous or similar to the profile formed by two adjacent panels in the same plane.

10 For panels of considerable height, a number of spaces longitudinal ribs are provided for in particular at least substantially equidistant.

In particular, the longitudinal rib or ribs is or are situated substantially in the central zone of the panel, at
15 a distance from the longitudinal edges.

In one embodiment, the depth of a longitudinal rib is of an order of size of one third of the total thickness of the panel.

Depending on the embodiment, a longitudinal rib extends
20 between the transverse edges of the panel, or over only a part of the distance between these two edges.

Depending on the embodiment, the panel considered is such that the facings do not include, or on the contrary that at least on facing does include, a substantial stiffening rib,
25 channel or projection, extending in a transverse direction.

In one embodiment, a facing provided with longitudinal ribs is also provided with at least one - and if appropriate several - transverse hollow ribs, especially with a profile analogous or similar to that of a longitudinal rib.

Such a panel is then of the so-called cassette type.

The facings of the panel are executed in one embodiment of thin sheets of steel the thickness of which is of the order of 0.4 mm.

- 5 Such a panel may be without internal reinforcement or insert for substantial stiffening.

The folding with interleaving of facings leaves is flat and substantially on the same plane as that of the large faces of the panel.

- 10 The folding with interleaving is situated on the side of the large face opposite that where the longitudinal ribs are.

- A fold is situated substantially opposite the ridge formed by the first inclined face of the longitudinal edge on the large face opposite; or in the vicinity of the ridge formed
15 by the first inclined face of the longitudinal edge on the same large face.

A fold also provides a functional means of fixing a hinge element for mounting two adjacent panels so that they swivel relative to each other.

- 20 A panel includes two longitudinal edges with a pseudo-triangular profile. One of the two longitudinal edges is protruding, the other is recessed. The edge with a protruding profile shows a general shape with its concave side turned towards the inside of the panel. The edge with a
25 recessed profile shows a general shape with the convex side turned towards the inside of the panel. The profiles of the two longitudinal edges, respectively protruding and recessed substantially, are substantially complementary to each other.

A longitudinal edge is essentially defined by at most four substantially flat faces - and more especially two faces - and a rounding forming the longitudinal free edge. The faces and the rounding are formed by one of the facings folded and rolled for this purpose. In one embodiment this facing is the one which includes the longitudinal rib(s).

In one embodiment, a longitudinal edge includes one face inclined at between 15° and 25° , in particular at about 20° with respect to the large faces; one face inclined at between 40° and 50° , in particular at about 45° with respect to the large faces. Two adjacent faces of a longitudinal edge form between them a ridge and an angle, cant or nook, of between 150° and 160° , in particular of about 155° .

The rounding of the free longitudinal edge has a radius of curvature of the order of or less than one tenth of the total thickness of the panel.

The panel includes, on each of its lateral edges, an added U section.

As a result of the structure given to it, the panel just described is lighter than those of the state of the art and contributes to the objects of the invention.

A panel such as has just been described may have a length of the order of 4 to 5 m and a height (or width) of the order of 0.5 to 0.7 m. Its mass may be of the order of 9 to 10 kg/m², in particular close to 9.5 kg/m², whereas for known doors the mass is close to and even exceeds 11 to 12 kg/m².

According to a second aspect, the invention relates to an assembly of two panels such as have just been described, mounted one on the other so as to swivel with respect to each other by pivoting means. These pivoting means are rigidly associated in the case of one panel to its

protruding longitudinal edge and in the case of the other panel to its recessed longitudinal edge. The pivoting means comprise at least two end hinges towards the lateral edges of the panels and if appropriate one or more intermediate
5 hinges. The two elements of each hinge are fixed to the panels at least on the folds of the corresponding longitudinal edges.

The axis about which the hinges, and therefore the panels, swivel is outside the overall dimensions of the panels, near
10 the second large face and the facing which has the fold of the protruding edge of a first panel. This axis is substantially situated at right angles with the central part of this edge. Finally, it is situated substantially at right angles with the free edge of the recessed longitudinal edge
15 of the second panel when this latter is in continuous line with the first panel on the same plane. The faces defining the recessed longitudinal edge are substantially tangential to the arc of a circle the centre of which is the axis of swivel.

20 The axis of swivel of the hinges is distant from the facing of the first panel by a value of the order of one third, one half or even less of the total thickness of the panel.

The two longitudinal edges opposite the two adjacent panels are separated by a small free space, forming an external
25 guard against pinching of fingers.

The end hinges are fixed on the added sections of the lateral edges.

An internal guard against pinching of fingers is also provided in the form of added plates or sections, fixed flat
30 on the second panel, on the second large face where the fold is. Such a plate or section as guard against pinching of

fingers extends until it is substantially at right angles with the central part of the protruding longitudinal edge of the first panel when the two panels are in a continuous line in the same plane.

- 5 In one embodiment, such a plate or section is folded back to come up against the facing of the first panel when the two panels are in a continuous line in the same plane.

10 In one embodiment, one of the two elements of the end hinge has the form of a bracket having on the one hand a plate for fixing the hinge element to the panels, and on the other hand a lug with an elongated hole which substantially extends perpendicularly to the plane of the panel, in which is fixed, rigidly but so as to be adjustable, a roller support spindle. In the embodiment considered the said
15 spindle has, as a transverse cross section a profile which is not circular but polygonal for the purpose of fixing it in place.

Consequently the panels according to the invention are not only light, flexible but nevertheless rigid, they are also
20 provided with internal and external guards against pinching of fingers.

According to a third aspect, the invention relates to a leaf for a door of the type considered which comprises a succession of panels such as have just been described,
25 similar or identical to one another.

In a conventional application of the door of a garage for personal use, the number of panels used is limited to only a few, of the order of three to ten in the considered embodiment. In a typical embodiment the number of panels is
30 from four to six.

Such an embodiment is possible because the structure of the panels is such that they are notably lighter than the conventional panels known from the state of the art. They are nevertheless sufficiently rigid, especially as regards
5 bending.

According to a fourth aspect, the invention relates to a door opening against the ceiling with vertical travel manufactured, pre-assembled with a view to its installation, able to be thus stored, delivered and supplied on the
10 installation site, comprising on the one hand a first assembly including lateral guide rails; a leaf, the rollers which operate in conjunction with the side rails; a shaft positioned longitudinally towards one end of the side rails; one or two cable reel drums key-mounted on the extreme parts
15 of the shaft towards the outside of the leaf between the latter and the side rails; one or two cables connected on the one hand to the lower end panel, on the other hand wound on to the cable reel drum or drums, thus ensuring that these cables are not subject to unauthorized access; one or more
20 resilient return components mounted on the shaft, such as a spiral spring; manual and/or motorized manoeuvring means, the said first assembly being pre-assembled and pre-adjusted; and on the other hand a second assembly including upper guide rails.

25 The door thus manufactured is presented pre-mounted while remaining compact and manoeuvrable since it is of a suitable weight.

According to another characteristic of the door, the second assembly is placed flat against the leaf of the first
30 assembly, the two together forming one package.

According to a fifth aspect, the invention relates to packaging for such a door which includes a support forming a

pallet and rack capable of housing a number of doors placed side by side.

The support has two side flanks to which are movably fixed the side rails and also two flat iron bars to which are
5 movably fixed the side rails opposite the side flanks.

This packaging can contain up to nine doors, symmetrical two by two.

According to a sixth aspect, the invention relates to a method for positioning in a structure provided with an
10 opening of a door opening against the ceiling and with vertical travel, the said door being manufactured, pre-assembled and pre-adjusted, if appropriate packaged as indicated above, in which the said manufactured, pre-assembled and pre-adjusted door is brought on to the site of
15 the structure where the first and second assemblies are positioned and fixed to the said structure.

According to a seventh aspect, the invention relates to a sectional door opening against the ceiling and with vertical travel, such as typically a garage door, intended to be
20 installed in the opening of a structure, comprising side guide rails and upper guide rails; a leaf, the rollers being intended to operate in conjunction with the side and upper rails in order to guide the leaf in an appropriate way; a shaft positioned longitudinally towards the function of the
25 side rails and the upper rails; one or two cable reel drums mounted on the extreme parts of the shaft towards the outside of the leaf and between it and the side rails; one or two cables attached one or two cables connected on the one hand to the lower end panel, on the other hand wound on
30 to the cable reel drum(s); one or more elastic return components mounted on the shaft, such as a spiral spring; manual and/or motorized manoeuvring means.

Thanks to the smaller weight of the leaf, it is possible to have drums of smaller diameter, e.g. between 65 and 75 mm.

Finally, according to an eighth and last aspect, the invention relates to a structure comprising an opening in which is installed a door such as has just been described.

The structure is such that the apron of the lintel and the corner pieces are of reduced size, possibly less than 10 cm, especially of the order of 8 cm and of the order of 9 cm respectively.

In the structure considered, the upper guide rails and the hinges are situated on the inner side and the longitudinal ribs on the outer side.

The invention will be better understood thanks to the following description with reference to the appended drawings in which:

Figure 1 is a perspective diagrammatic view of the inner side of a structure including a door according to the invention, shown closed;

- Figure 2 is a view in elevation of the leaf of the door of figure 1, on a larger scale, from the inside;

- Figure 3 is a view in elevation of a panel of the leaf of figure 2, on a larger scale, from the outside;

- figure 4 is a diagrammatic sectional view of the panel of figure 3 along the line IV-IV;

- figures 5a and 5b are two diagrammatic sectional views of the two facings, respectively outer and inner, of a panel;

- figures 6a and 6b are two partial diagrammatic views, on a larger scale, of figures 5a and 5b, showing the foldings of the facings;

5 - figure 7 is a partial sectional diagrammatic view, along a vertical plane, on a larger scale, of two panels in the same plane, showing more especially their longitudinal edges; figure 7a is an analogous view of a variant of this embodiment;

10 - figure 8 is a view analogous to that of figure 7, the two panels here being in their extreme relative swivelled position - not in the same plane - corresponding to the open door;

- figures 9 and 10 are two diagrammatic views similar to figures 7 and 8 showing the panels with their end hinges;

15 - figure 11 is a perspective view showing an end hinge with its spindle and roller;

- figure 12 is a front view of door packaging according to the invention;

- figure 13 is a side view of the packaging of figure 12.

20 In the figures is shown a structure having an opening 1 for which the door 2 is intended.

The opening 1 is typically that giving passage to a motor vehicle, the door 2 thus being a garage door.

25 3 designates the floor, 4 designates the apron of the lintel, and 5 designates the corner pieces on each side.

According to the structural measures considered, the apron 4 of the lintel and the corner pieces 5 are of reduced size with respect to those of the state of the art.

For example, in one embodiment, the sizes are less than 10 cm and specifically substantially 8 cm for the apron of the lintel and 9 cm for each corner piece.

5 The door 2 comprises a leaf 6, mobile between a closed position (figure 1) and an open position.

In the closed position, the leaf 6 is positioned vertically or substantially vertically within the opening 1.

10 In the open position, the leaf 6 is positioned horizontally or substantially horizontally towards the ceiling next to the apron 4 of the lintel.

The door 2 considered is thus of the type that opens against the ceiling with a vertical travel. It is further of sectional type, the leaf 6 comprising a series of panels 7 similar or identical to one another. Two adjacent panels are
15 arranged and mounted one on the other in such a way as to be associated together by pivoting means 8.

The door 2 also comprises side guide rails 9 and upper guide rails 10. These rails are respectively positioned vertically or substantially vertically, horizontally or substantially
20 horizontally. They are positioned inside the structure, respectively on each side of and above the opening 1. They are situated near the opening 1. The rails 9 and 10 form two assemblies, one on each side of the opening 1. Each of these two assemblies includes one or two side rails 9 and one or
25 two upper rails 10, the latter being adjacent to the extreme upper parts of the side rails 9. The two assemblies of rails 9 and 10 are positioned in two mutually parallel vertical planes, perpendicular to the plane of the opening 1. The rails 9 are fixed, directly or not, to the wall of the
30 construction in which the opening 1 has been made. The rails 10 are more particularly fixed to the ceiling.

D designates a horizontal direction situated in the plane of the opening 1, perpendicular to the plane of the two assemblies of rails 9 and 10.

5 Rollers with axis D cooperating with the rails 9 and 10 are supported by the panels protruding from their vertical side edges 12. The rollers 11 can slide in the rails 9 and 10 to allow the movement of the leaf 6 between its open and closed positions.

10 The door 2 also comprises, in the embodiment considered a mechanism 13 including a shaft 13a with axis D positioned towards the junction of the rails 9 and 10 - and therefore towards the upper end of the rails 9 -, two cable reel drums 13b key-mounted on the extreme side parts of the shaft 13 towards the outside of the leaf 6 and between the latter and
15 the side rails 9; two cables connected on the one hand to the lower end panel of the leaf 6, on the other hand wound on to the cable reel drums 13b; one or more resilient return components 13c mounted on the shaft 13a, such as a spiral spring; manoeuvring means 13d, in this case manual means,
20 such as a handle controlling a latch cooperating with a catching hole provided in the doorframe 2.

25 The cables are positioned vertically or substantially vertically between the side edges of the leaf 6 and the rails 9. They are positioned in the immediate vicinity of the plane of the opening 1. They run between this plane and the roller supports 11. They are therefore not subject to unauthorized access.

30 The panels 7 comprise a lower end panel 7a, an upper end panel 7b and one or more intermediate panels 7c. In the embodiment of figure 1, the leaf 6 includes in all of four panels 7, which are identical.

The panels 7 in front elevation have a rectangular general outline, the longer side being horizontal in the direction D and the shorter side being vertical (when the door 2 is installed and closed).

- 5 A panel 7 is delimited by the two side edges 12 and the two longitudinal edges 14.

Where appropriate the free longitudinal edges 14 of the panels 7a and 7b have associated with them a sealing gasket, a sensor bar or other appropriate devices.

- 10 The longitudinal edges 14 have in transverse cross section ,a profile of generally pseudo-triangular shape.

- Two adjacent panels 7 are associated so as to swivel with respect to each other around an axis 15 parallel with the direction D. They have two longitudinal edges which
15 substantially match each other, i.e. a so-called protruding (male) edge 14a and a so-called recessed (female) edge 14b.

- In the embodiment considered, the protruding edges 14a are, when the door is installed and closed, facing upwards and in the upper position. And, conversely, the recessed edges 14b
20 are facing downwards and in the lower position. A panel 7 thus includes, at the top, a protruding edge 14a and at the bottom a recessed edge 14b.

- The protruding edge 14a has a general shape with concavity turned towards the inside of the panel 7. The recessed edge
25 14b has a general shape with the convexity turned towards the inside of the panel 7.

The protruding edge 14a and the recessed edge 14b will be described hereunder with reference to the association of two panels 7 in which these edges are contiguous.

A panel 7 comprises a first and a second facing respectively 16 and 17, defining its large visible outer faces 18 and 19, which are parallel. The facings 16 and 17 are made from thin metallic sheets, rigidly made solid one with another. In particular, the facings 16 and 17 are made from steel sheets of a thickness of the order of 0.4 mm.

The two facings 16 and 17 are, in this embodiment, made from the same type of thin leaf.

Depending on the embodiment, the two facings 16 and 17 are made from different types of sheets. The sheets of facings 16 and 17 may be made from material other than steel, provided that this material is appropriate to the required use and performance.

The first facing 16 is the one situated on the outside of the structure, i.e. towards the visible "show" face 18 of the door 2. The second facing 17 easily seen in figure 1 is situated on the inside of the structure (face 19).

At least one of the facings - in this case the first facing 16 - includes at least one longitudinal hollow stiffening rib 20 extending between the two edges 12. The other facing 17, in this embodiment has no such channel and is substantially flat. In the embodiment illustrated, the longitudinal rib 20 extends across the whole distance between the two edges 12. According to another embodiment the rib 20 extends only across a part of this distance.

The longitudinal rib 20 has, as a transverse cross section, an substantially triangular or rounded profile.

The facing 16 includes, in the embodiment illustrated corresponding to a panel 7 of appreciable width, several longitudinal ribs 20. These are of identical or nearly identical profile. The ribs 20 are essentially situated in

the central zone of the panel 7, distant from the edges 14. They are at least substantially equidistant from one another. In the embodiment considered in which the door 2 comprises 4 panels 7, each of the latter has five
5 longitudinal ribs 20.

The internal space 56 of the panel 7, closed at the periphery by the two facings 16, 17, is filled - at least partially - with a synthetic material which expand during the manufacturing process.

10 In addition, the panel 7 has no internal reinforcement or insert for substantial stiffening

A longitudinal edge 14 is of thickness which decreases continuously from the large faces 18, 19 to its longitudinal free edge 21.

15 The edge 14 is essentially defined by a number of successive substantially flat faces of one of the facings, in this case the outer facing 16 having the longitudinal rib or ribs 20.

More especially, the edge 14 is defined by at most four faces (two faces in the embodiment illustrated) and a
20 rounding forming the longitudinal free edge 21.

For the protruding edge 14a, these two faces are, starting from the first large exterior face and as regards the facing 16, a face 22 having a greater width followed by a face 23 of smaller width, the latter being followed and terminated
25 by the rounding of the edge 21 connected with the second internal large face 19.

For the recessed edge 14b, these two faces are, starting from the first large exterior face 18 and as regards the facing 16, taking into account the rounding of the edge 21,

a face 24 of smaller width and a face 25 of greater width connected with the second internal large face 19.

The facing 16 is folded and rolled to form the faces 22, 23, 24, 25 and the rounded edges 21.

- 5 At least one face 26 of the rib 20 has, with respect to the first outside large face 18 of facing 16, in the embodiment considered, an inclination analogous or close to that of face 22 of the protruding longitudinal edge 14a.

- 10 In addition, in this embodiment, the profile of the rib 20 is analogous or close to the profile formed by the two adjacent longitudinal edges of the two adjacent panels 7 which are associated and in the same plane. This latter profile is in this case formed by part of the face 22 of one of the panels 7 and the rounding 21 opposite the other
15 panel.

A panel 7 has a total thickness less than 3 cm.

The total mass of a panel according to the structure described may be of the order of 9 to 10 kg/m², in particular close to 9.5 kg/m².

- 20 However, despite this lightness, the rigidity of the panel to bending is excellent.

This result can be achieved even when the facings 16 and 17 have no substantially stiffening rib, channel or protrusion extending in a transverse direction.

- 25 However, it would be possible to provide for one or more transverse stiffening ribs, channels or protrusions.

Thus it would be possible for the facing 16 to be provided with longitudinal ribs 20 and also provided with at least one - and if appropriate more than one - transverse hollow

ribs, with a profile analogous or close to that of a longitudinal rib 20, the panel being of the so-called cassette type.

5 In one embodiment, the depth of a longitudinal rib 20 is of an order of magnitude of one third of the total thickness of the panel 7.

The two sheets forming the facings 16 and 17 are rigidly made solid with each other towards each of the edges 14 by a fold with interleaving 27.

10 This fold 27 is flat and substantially in the same plane as one of the large faces of the panel 7, in this case the second internal large face 19, on the side of the facing 17. In this embodiment, the fold 27 is thus situated on the side opposite (i.e. facing) the first large face 18 which has the
15 longitudinal rib(s) 20.

The fold 27 is obtained by means of a fold 28 in one direction of the facing 16 and a fold 29 in the other direction of the facing 17, the two folds 28, 29 being interleaved one in the other like a hook (figures 5a, 5b,
20 6a, 6b).

The fold 27 is situated, as regards the protruding edge 14a substantially opposite the ridge 30 formed by the first inclined face 22 of the edge on the first opposite large face 18. As regards the recessed edge 14b, the fold 27 is
25 situated close to the ridge 31 formed by the first inclined face 25 of the edge on the same second large face 19.

A fold 27 also forms a functional means of fixing a hinge element of the pivoting means 8. Indeed, a fold 27 makes it possible to tighten efficiently one (or more) hinge fixing
30 screws 32.

In the embodiment described, the facing 16 has the general shape of a U-shaped tray, while the facing 17 is substantially flat.

5 The panel 7 also includes, fixed on each of its edges 12, an added U section 33.

10 In the embodiment considered, an edge 14 includes a face 22, 24 inclined between 15° and 25° , in particular at about 20° with respect to the large faces 18, 19. It also includes a face 23, 25 inclined between 40° and 50° , in particular at about 45° on these two large faces 18, 19.

Two adjacent faces of an edge 14, i.e. 22, 23 on the one hand and 24, 25 on the other hand form between them a ridge and a cant or nook respectively 34, 35 of between 150° and 160° , in particular of about 155° .

15 Where the rounding 21 is concerned, it has a radius of curvature of the order of or less than one tenth of the total thickness of the panel 7.

20 Two panels 7 such as have just been described are mounted one on the other so as to swivel with respect to each other by pivoting means 8 rigidly associated in the case of one of the panels 7 near its longitudinal protruding edge 14a and in the case of the other panel 7 near its longitudinal recessed edge 14b. This rigid association is provided by means of screws 32. The pivoting means 8 comprise at least 25 two end hinges 8a towards the side edges 12 and, where appropriate, one or more intermediate hinges 8b. The two elements 36, 37 of each hinge 8 are fixed to the panels 7 at least on the interleaved folds 27. These elements include parts in the form of a plate 38 provided with holes 39 for 30 the shoulder-headed screws 32 and curved parts 40 for housing and fixing a spindle 41 forming the axis 15.

The axis of swivel 15 of the hinges 8, and therefore of the panels 7, is situated outside the outer dimensions of the panels, close to the second large face 19 and to the facing 17 in which is the fold 27, substantially at right angles with the central part of the protruding edge 14a of the first panel 7 and substantially at right angles with the free edge 21 or the recessed edge of the second form when the two panels form a continuous line in the same plane. In figures 7, 8, 9 and 10 the so-called "first" panel 7 is in the lower position and the so-called "second" panel is in the upper position.

More particularly, the axis of swivel 15 is distant from the second large face 19 and from the facing 17 of the first panel 7 by a value of the order of one third, one half or even less of the total thickness of the panel 7.

The two facing longitudinal edges 14a, 14b of the two panels 7 are separated from each other by a small free space 42. The facing longitudinal edges 14 of two adjacent panels are spaced and not interlinked one in the other. This space 42 thus configured and proportioned forms an external guard against pinching of fingers.

The faces 24, 25 of the recessed edge 14b are substantially tangential to an arc of circle with the axis of swivel 15.

The end hinges 8a are fixed on the added sections 33 forming the side edges 12.

In one embodiment the door 2 also comprises an internal guard against pinching of fingers 43 in the form of added plates or sections, fixed flat on the second panel 7, on the second large face 19 where the fold 27 is (facing 17). Such a plate or section extends until it is slightly below the

axis of swivel 15, when the two panels in question form a line in the same plane.

In a variant of this embodiment (figure 7), the plate or section 43 is folded back at 44 to come against the facing 16 of the first panel when the two panels are in line in the same plane.

In another embodiment, the internal guard against pinching of fingers 43 is not an added piece fixed flat on the large face of the second panel 7, but is incorporated in the face 19 of facing 17. The large face 19 then extends until it is slightly offset from the central part of the protruding edge 14a of the first panel 7, when the two panels are in line in the same plane (figure 7a).

The large face 19 is folded back at 44 to come against the facing 16 of the first panel 7 when the two panels are in line in the same plane, and to form the fold for the second panel 7.

One of the two elements of an end hinge 8a, i.e. element 36 for example, has the form of a bracket having on the one hand the plate 38 and on the other hand a lug 45 with an elongated hole 46, extending substantially perpendicularly to the plate in question, in which is fixed rigidly but so as to be adjustable, a spindle 47 supporting the roller 11. The said spindle 47 has, as a transverse cross section a non-circular, indeed polygonal, profile 48, for the purpose of fixing it in place.

The panels 7 thus constituted advantageously have a reduced weight. The same therefore applies to the whole of the leaf 6.

A consequence of this structure is that the cable reel drum can have a reduced diameter, for instance between 65 and 75 mm.

5 The result is that the apron of the lintel and the corner pieces can also be of reduced size, as has already been stated.

10 The shape of the longitudinal edges 14 described makes it possible to use less sheet metal to manufacture them, and the panels are simple to make, by folding. The door is principally aimed at private dwellings.

Once the various constituent parts of the door 2 just described have been produced, in particular the panels 7, the parts are assembled and pre-erected.

15 This pre-erection enables two assemblies to be made. A first assembly includes the side guide rails 9, the leaf 6 being positioned between them, the rollers which cooperate with the rails 9, and finally, the mechanism 13. A second assembly includes the upper guide rails 10, and in some cases a cross-piece 49 the purpose of which is to join them.

20 The first assembly 6, 7, 9, 11, 13 is compact and fits within an envelope with the general shape of a flattened parallelepiped. This is because, as has already been stated, this assembly is laterally limited by the rails 9, since the drums 13b do not protruding out of this assembly because
25 they are positioned between the leaf 6 and the rails 9. As regards the cables, they are incorporated in the ironwork of the door 2, i.e. they do not protrude.

30 The first assembly of the door 2 which has just been described is such that it can be pre-adjusted at the time of manufacture. This pre-adjustment applies the length, the

positioning and the tension of the cables and of the spring or springs 13c.

5 This structural disposition is advantageous since it gives rise to a quality pre-adjustment at the time of manufacture and avoids tedious, time-consuming or delicate operations on the site of final installation of the door.

The second assembly 10, 49 can be placed flat against the leaf 6 of the first assembly on the side of the second large face 19.

10 Thus the two assemblies just described form a package which can fit within an overall thickness of less than 125 mm, whereas in the state of the art the thickness is closer to and even exceeds 155 mm.

15 Doors 2 as they have just been described are packed by means of the packaging 50.

The packaging 50 includes a support 51 forming a pallet as to its part 52 and a rack as to its part 53.

The rack 53 is able to house a plurality of doors such as just described, placed side by side.

20 The support 51 includes, as regards the part forming the rack 53, two side flanks 54. In addition the packaging 50 also includes, in the embodiment considered, two side flat iron bars 55.

25 Such a packaging can house up to nine doors each in the form of the package previously described. These doors are placed symmetrically two by two in such a way that the first two large faces 18 or the second two large faces 19 face each other.

When the doors are so arranged, they can be fixed removably by their side rails 9 to the flanks 54 by means of screws.

As to the flat iron bars 55, they are fixed in the same way at the other end of the flanks 54.

- 5 The support 51 is placed at the bottom, forming a pallet. The flat iron bars are placed at the top.

The overall dimensions of such a packaging comprising nine doors and fitting within a parallelepiped is for example 1.15 m x 3.20 m by 2.60 m in height, or less.

- 10 Once manufactured the doors are packaged as just described. This packaging can easily be transported given the limited weight of the panels 7. The packaging 50 makes it possible to store the doors awaiting installation in a structure.

- 15 For this installation, a door is taken from the packaging 50, carried to the site of the structure, the first assembly 6, 7, 9, 11, 13 and the second assembly 10, 49 are positioned and fixed.

Since the door has been pre-mounted during manufacture and pre-adjusted, the installation can be quick.

CLAIMS

1. A panel (7) specially intended for a door (2) opening
against the ceiling and with vertical travel such as
5 typically a garage door, the said panel being to be mounted
on at least another analogous panel (7) swivelling around an
axis parallel to a longitudinal direction normally
horizontal (D) when the door is mounted in place, the said
panel comprising a first and a second facing (16, 17)
10 defining its parallel large outer faces (18, 19), made from
thin sheets of metal or analogous material, rigidly made
solid with one another towards the two longitudinal edges
(14a, 14b) of the panel (7) by a fold with interleaving
(27); one at least of the facings including at least one
15 hollow stiffening rib (20) extending in a longitudinal
direction; the space (56) enclosed at the periphery by the
two facings (16, 17) being - at least partially -
substantially filled with a synthetic material expanded
during manufacture; at least one longitudinal edge (14)
20 being essentially defined by a number of successive
substantially flat faces one of the facings; characterized
in that the said longitudinal edge (14) is of a thickness
which decreases continuously from the large faces (18, 19)
of the panel to the longitudinal free border of the said
25 edge and presenting, as a transverse cross section, a
profile of generally pseudo-triangular shape; the total
thickness of the said lightened panel being less than 3 cm.

2. A panel according to claim 1, characterized in that one
30 of the facings (16, 17) includes at least one longitudinal
rib (20), while the other has none, being indeed
substantially flat.

3. A panel according to claim 1 or 2, characterized in that a horizontal rib (20) has an substantially triangular or rounded profile.

5 4. A panel according to claim 3, characterized in that at least a part of the profile of the longitudinal rib (20) has, with respect to the large face of the corresponding facing, an inclination analogous or close to that of the face of the longitudinal edge adjoining this large face.

10

5. A panel according to claim 3 or 4, characterized in that the profile of the longitudinal rib (20) is analogous or close to the profile formed by two adjacent panels (17) associated and in the same plane.

15

6. A panel according to any of claims 1 to 5, characterized in that one facing includes a number of longitudinal ribs distant one from another, in particular at least substantially equidistant.

20

7. A panel according to any of claims 1 to 6, characterized in that the longitudinal ribs (20) are essentially situated in the central zone of the panel, at a distance from the longitudinal edges (14).

25

8. A panel according to any of claims 1 to 7, characterized in that the depth of a longitudinal rib (20) is of the order of magnitude of one third of the total thickness of the panel.

30

9. A panel according to any of claims 1 to 8, characterized in that a longitudinal rib extends over the whole distance between the two transverse edges (12) of the panel.

10. A panel according to any of claims 1 to 8, characterized in that a longitudinal rib (20) extends over only a part of the distance between the two transverse edges (12) of the panel.

5

11. A panel according to any of claims 1 to 10, characterized in that the facings (16, 17) have no substantially stiffening rib, channel or protrusion extending in a transverse direction.

10

12. A panel according to any of claims 1 to 10, characterized in that at least one facing (16, 17) is provided with a substantially stiffening rib, channel or projection extending in a transverse direction.

15

13. A panel according to claim 12, characterised in that one facing provided with longitudinal ribs (20) is also provided with at least one - and where appropriate a number of - hollow transverse ribs, in particular having a profile analogous or close to that of a longitudinal rib.

20

14. A panel according to any of claims 1 to 13, characterized in that the facings (16, 17) are made from thin sheets of steel with a thickness of the order of 0.4 mm.

25

15. A panel according to any of claims 1 to 14, characterized in that it has no internal reinforcement or insert for substantial stiffening.

30

16. A panel according to any of claims 1 to 15, characterized in that the fold with interleaving (27) of the sheets of the facings is flat and substantially in the same plane as the large faces (18, 19) of the panel (7).

17. A panel according to any of claims 1 to 16, characterized in that the fold with interleaving (27) is situated on the side of the large face opposite the one where the longitudinal ribs (20) is/are.

5

18. A panel according to any of claims 1 to 17, characterized in that a fold (27) is situated substantially opposite the ridge (30) formed by the first inclined face (22) of the longitudinal edge (14a) with the opposite large face (18); or close to the ridge (31) formed by the first inclined face of the longitudinal edge (14b) with the same large face (19).

19. A panel according to any of claims 1 to 18, characterized in that a fold (27) also forms a functional means of fixing a hinge element for mounting two adjacent panels so that they swivel with respect to each other.

20. A panel according to one of claims 1 to 19, characterized in that that it includes two longitudinal edges (14) having a pseudo-triangular profile, respectively protruding and recessed, the edge with a protruding profile (14a) having a general shape with its concave side turned towards the inside of the panel, the edge with a recessed profile having a general shape with the convex side turned towards the inside of the panel.

21. A panel according to claim 20, characterized in that the profiles of the two respectively protruding (14 a) and recessed (14b) longitudinal edges are substantially complementary to each other.

22. A panel according to any of claims 1 to 21, characterized in that a longitudinal edge (14) is

essentially defined by at most four substantially flat faces (22, 23; 24, 25) - more especially two faces - and a rounding (21) forming the longitudinal free border, the faces and the rounding being formed by one of the facings folded and rolled for this purpose.

23. A panel according to claim 22, characterized in that one longitudinal edge (14) includes a face (22, 24) inclined at between 15° and 20°, in particular at about 20° with respect to the large faces (18, 14); a face (23, 25) inclined at between 40° and 50°, in particular at about 45° with respect to the large faces.

24. A panel according to claim 22 or 23, characterized in that two adjacent faces (22, 23; 24, 25) of a longitudinal edge form a ridge (24; 35) between them.

25. A panel according to any of claims 22 to 24, characterized in that two adjacent faces (22, 23; 24, 25) of a longitudinal edge form between them, a cant or nook (34 ;35), of between 150° and 160°, in particular of about 155°.

26. A panel according to one of claims 22 to 25, characterized in that the rounding (21) of the longitudinal free border has a radius of curvature of the order of or less than one tenth of the total thickness of the panel.

27. A panel according to any of claims 1 to 27, characterized in that it includes on each of its two transverse edges (12) an added U section.

28. A panel according to any of claims 1 to 27, characterized in that it has a mass of the order of 9 to 10 kg/m², in particular close to 9.5 kg/m².

29. An assembly of two panels according to any of claims 1 to 28, the two panels mounted one on the other so as to swivel with respect to each other by pivoting means (8), rigidly associated in the case of one panel (7) towards its protruding longitudinal edge (14a) and in the case of the other panel to its recessed longitudinal edge (14b), the pivoting means comprising at least two end hinges (8a) towards the lateral edges and, if appropriate, one or more intermediate hinges (8b), the two elements (36, 37) of each hinge being fixed to the panels at least on the folds (27) of the corresponding longitudinal edges.

30. An assembly of two panels according to claim 29, characterized in that the axis of swivel (15) of the hinges (8), and therefore of the panels, is situated outside the outer dimensions of the panels, close to the second large face (19) and to the facing (17) in which is the fold (27) of the protruding edge (14a) of a first panel (7), substantially at right angles with the central part of this edge (14a) and substantially at right angles with the free border (21) of the recessed edge (14b) of the second panel when the two panels are in line in the same plane, the faces defining the recessed longitudinal edge being substantially tangential with an arc of a circle the centre of which is the axis of swivel (15).

31. An assembly of two panels according to claim 30, characterized in that the axis of swivel (15) of the hinges (8) is distant from the facing of the first panel by a value of the order of one third, one half or even less of the total thickness of the panel.

32. An assembly of two panels according to any of claims 29 to 31, characterized in that the two facing longitudinal

edges (14a, 14b) of the two panels are separated by a small free space (42), forming an external guard against pinching of fingers.

5 33. An assembly of two panels according to any of claims 29 to 32, characterized in that the end hinges (8a) are fixed on the added sections of the side edges.

10 34. An assembly of two panels according to any of claims 29 to 33, characterized in that it also includes an internal guard against pinching of fingers (43) in the form of added plates or sections, fixed flat on the second panel, on the second large face (19) where the fold (27) is, such a plate or section extending until it is substantially at right
15 angles with the central part of the longitudinal edge of the first panel, when the two panels form a line in the same plane.

20 35. An assembly of two panels according to claim 34, characterized in that the plate or section of the guard against pinching of fingers (43) is folded back to come against the facing (16) of the first panel when the two panels form a line in the same plane.

25 36. An assembly of two panels according to any of claims 29 to 35, characterized in that one of the two elements of end hinge (8a) has the shape of a bracket having on the one hand a plate (38) for fixing the hinge element to the panel and on the other hand a lug (45) with an elongated hole (46),
30 extending substantially perpendicularly to the plane of the panel, in which is fixed rigidly, but so as to be adjustable in position, a spindle (47) supporting the roller, the said spindle having, as a transverse cross section a non-

circular, indeed polygonal, profile (48), for the purpose of fixing it in place.

5 37. A leaf (6) for a sectional door opening against the ceiling and with vertical travel such as typically a garage door, comprising a series of panels (7), similar to or identical to one another, so that from three to ten panels, more especially between four and six, each according to any of claims 1 to 28, two adjacent panels forming an assembly
10 according to any of claims 29 to 36.

38. A sectional door (2) opening against the ceiling and with vertical travel, such as a typical garage door, manufactured, pre-assembled with a view to its installation,
15 suitable for being thus stored, delivered and supplied on the installation site, comprising on the one hand a first assembly (6, 7, 9, 11, 13) including side guide rails (9); a leaf (6) according to claim 37, the rollers (11) operating in conjunction with the side rails; a shaft (13a) positioned
20 longitudinally towards one end of the side rails; one or two cable reel drums (13b) key-mounted on the extreme parts of the shaft towards the outside of the leaf and between the latter and the side rails; one or two cables connected on the one hand to the leaf of the lower end panel, on the
25 other hand wound on to the cable reel drum(s), the cables thus assembled not being subject to unauthorized access; one or more resilient return components (13c) mounted on the shaft, such as a spiral spring; manual and/or motorized manoeuvring means (13d), the said first assembly being pre-
30 assembled and pre-adjusted; and on the other hand a second assembly (10, 49) including upper guide rails (10).

39. A door according to claim 38, characterized in that the second assembly (10, 49) is positioned flat against the leaf of the first assembly, the two together forming a package.

5 40. A packaging (50) for a sectional door opening against the ceiling and with vertical travel according to claim 39, characterized in that it includes a support (51) forming a pallet and a rack (53) capable of housing a plurality of doors placed side by side.

10

41. A packaging according to claim 40, characterized in that that the support has two side flanks (54) to which are removably fixed the side rails, and in that it also includes where appropriate two flat iron bars (55) to which are
15 removably fixed the side rails at the other end of the flanks.

42. A packaging according to claim 41, characterized in that it can house up to nine doors, symmetrical two by two.

20

43. A method of installation in a structure provided with an opening of a door opening against the ceiling and with vertical travel, the said door being manufactured, pre-assembled and pre-adjusted according to either of claims 38 and 39, if appropriate packaged according to any of claims
25 40 to 42, characterised in that the manufactured, pre-assembled and pre-adjusted door is taken to the site of the structure where the first and second assemblies are positioned and fixed to the said structure.

30

44. A sectional door opening against the ceiling and with vertical travel, such as typically a garage door, intended to be installed in the opening of a structure, comprising side guide rails (9) and upper guide rails (10); a leaf (6)

according to claim 37, the rollers (11) being intended to operate in conjunction with the side rails (9) and upper rails (10) in order to guide the leaf correctly; a shaft (13a) positioned longitudinally towards the junction of the side and upper rails; one or two cable reel drums (13b) mounted on the extreme parts of the shaft towards the outside of the leaf and at right angles with the side rails; one or two cables connected on the one hand to the leaf of the lower end panel, on the other hand rolled on the drum(s); one or more resilient return components (13c) mounted on the shaft, such as a spiral spring; manual and/or motorized manoeuvring means.

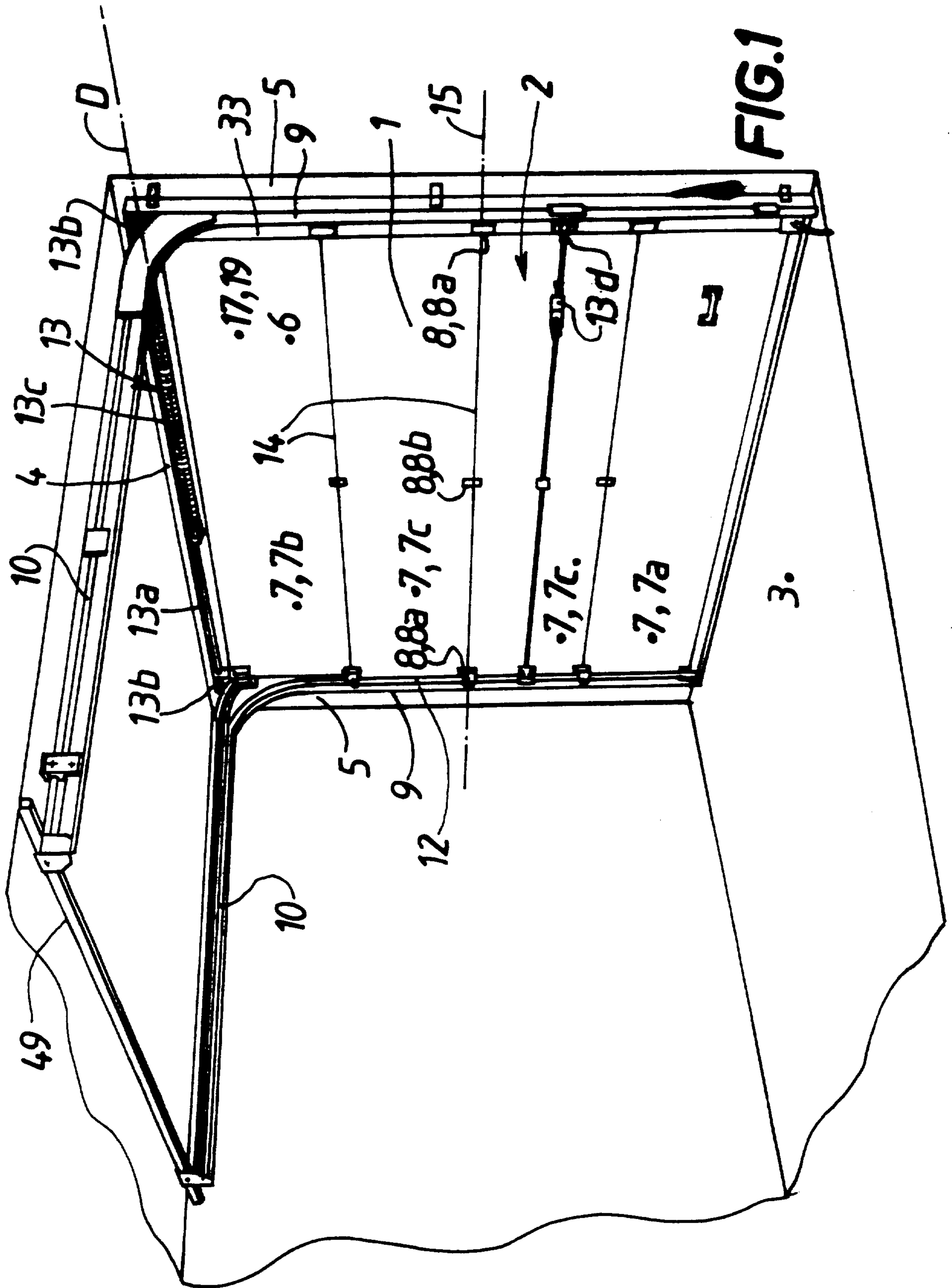
45. A door according to claim 44, characterized by one or more cable reel drums of reduced diameter, such as between 65 and 75 mm.

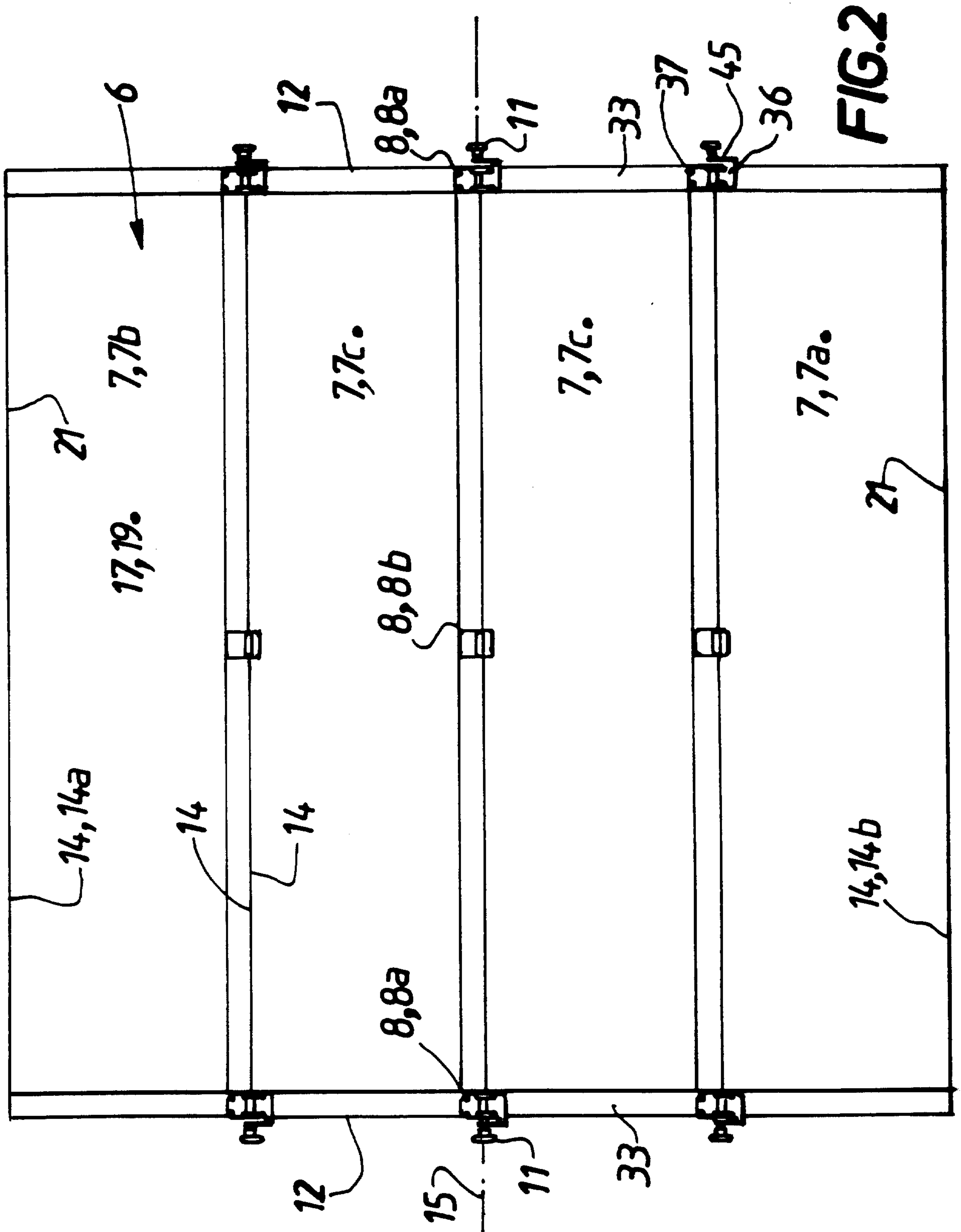
46. A construction comprising an opening in which is installed a sectional door opening against the ceiling and with vertical travel according to claim 44 or 45.

47. A construction according to claim 46, characterized by a lintel apron and two corner pieces of reduced size, possibly less than 10 cm, in particular of the order of 8 cm and 9 cm respectively.

48. A construction according to either of claims 46 or 47, characterized in that the upper guide rails and the hinges are situated on the inside and the longitudinal ribs on the outside.

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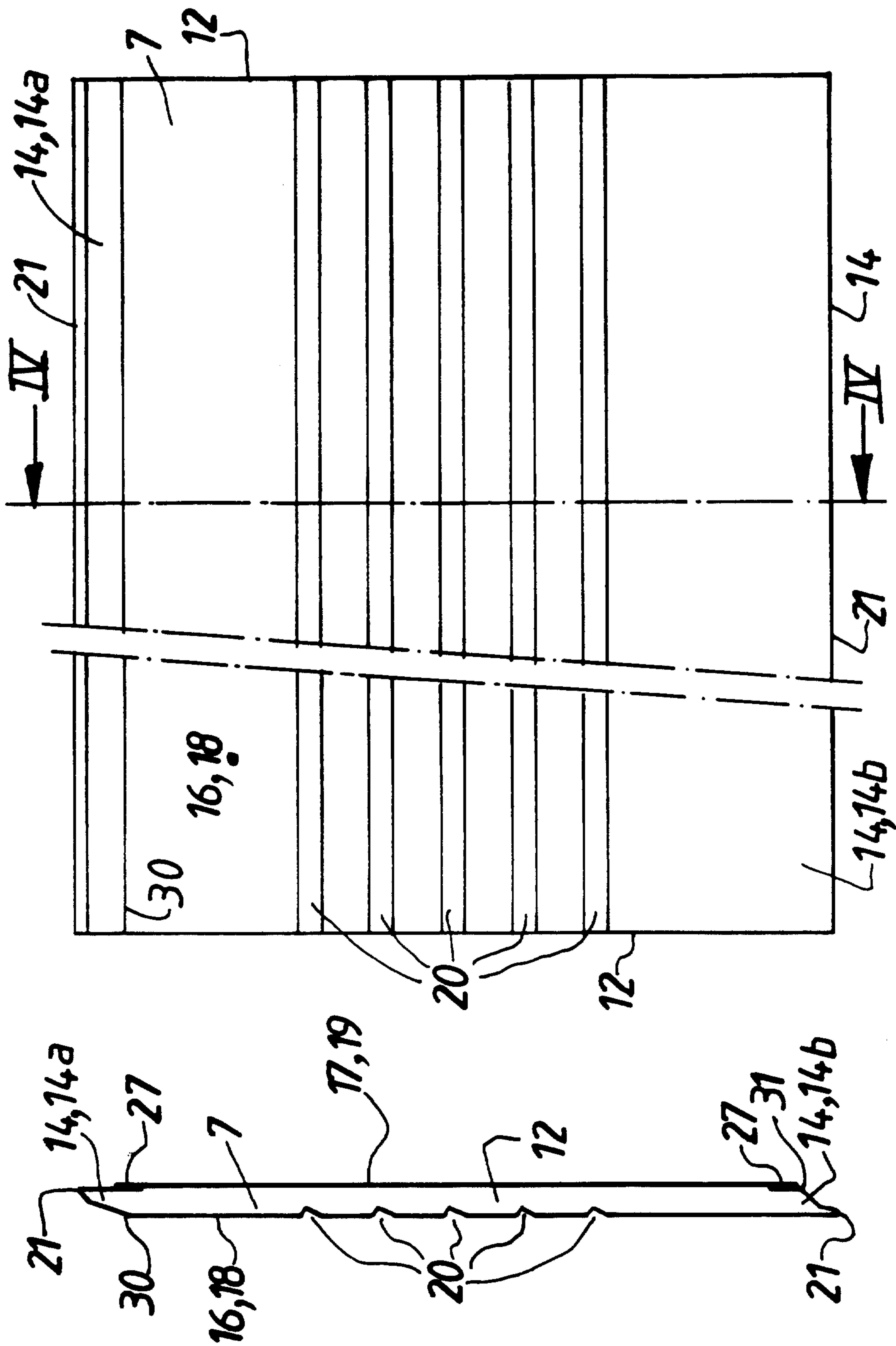
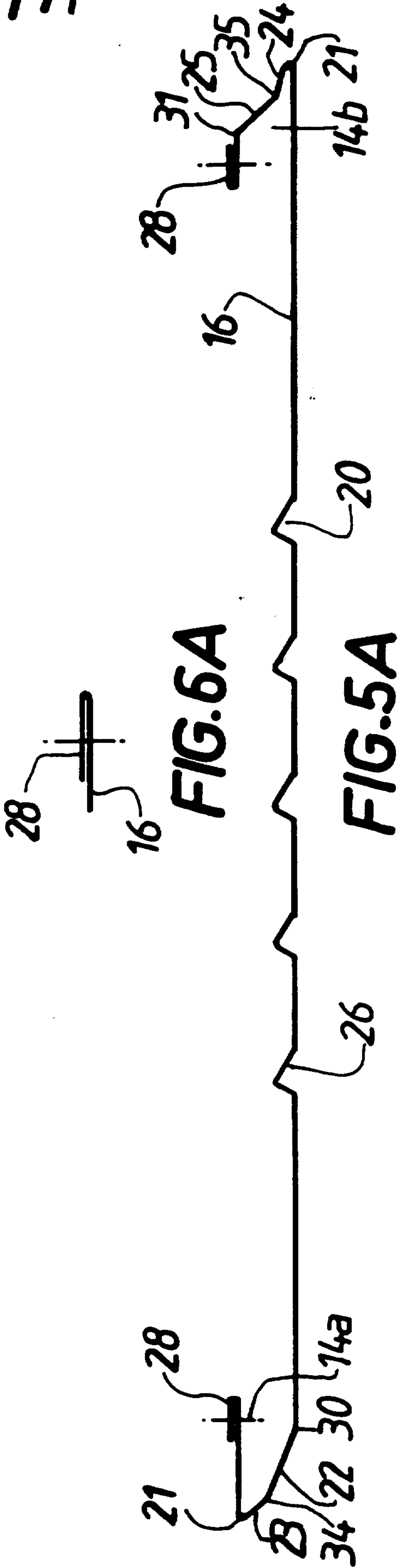
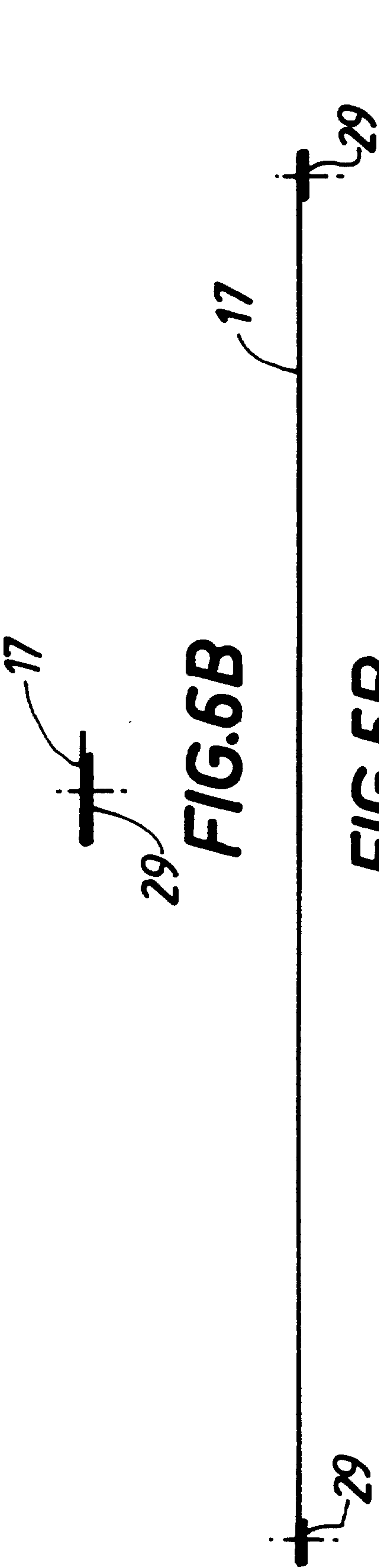


FIG. 3

FIG. 4

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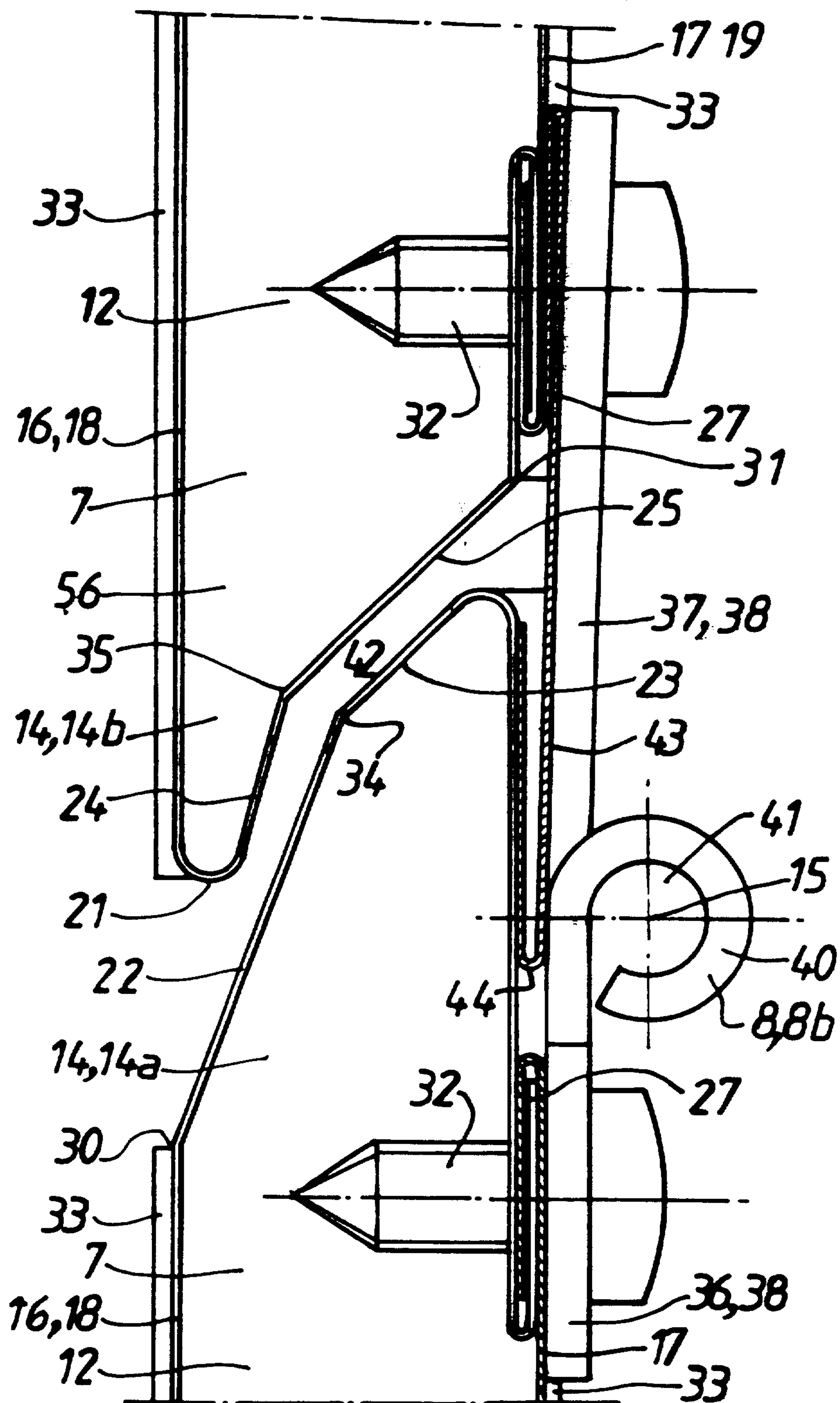


FIG. 7

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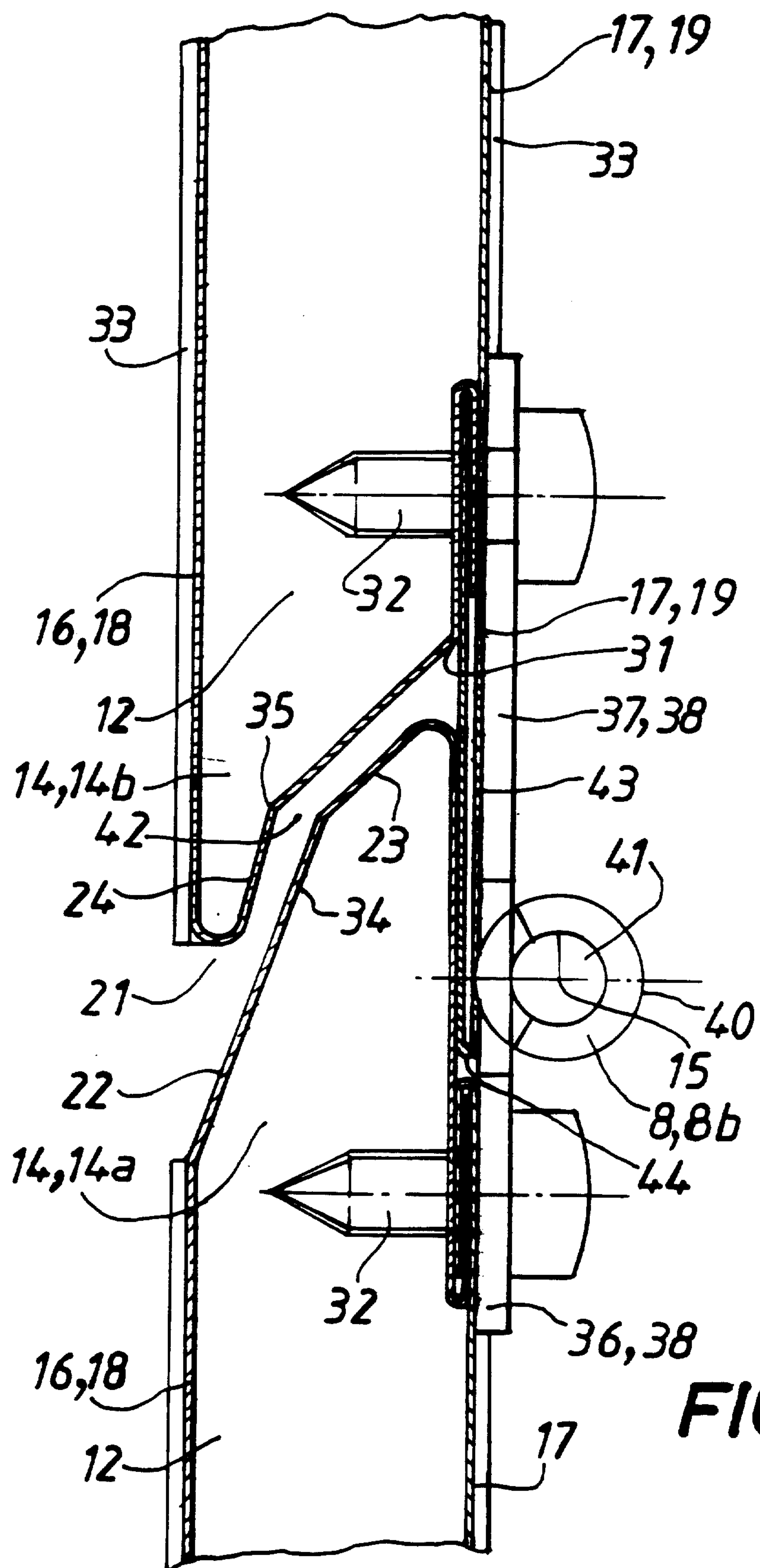
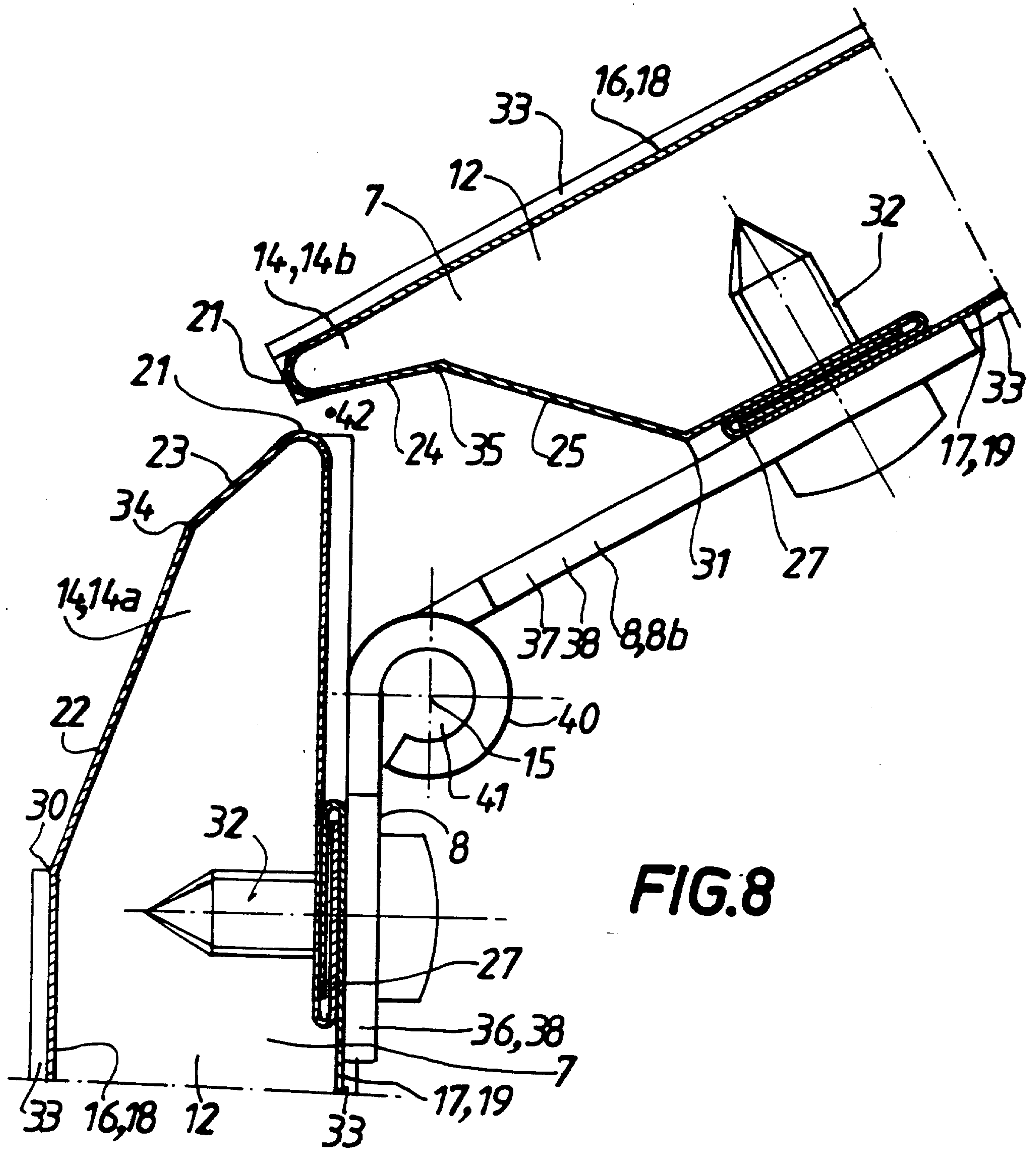


FIG. 7a

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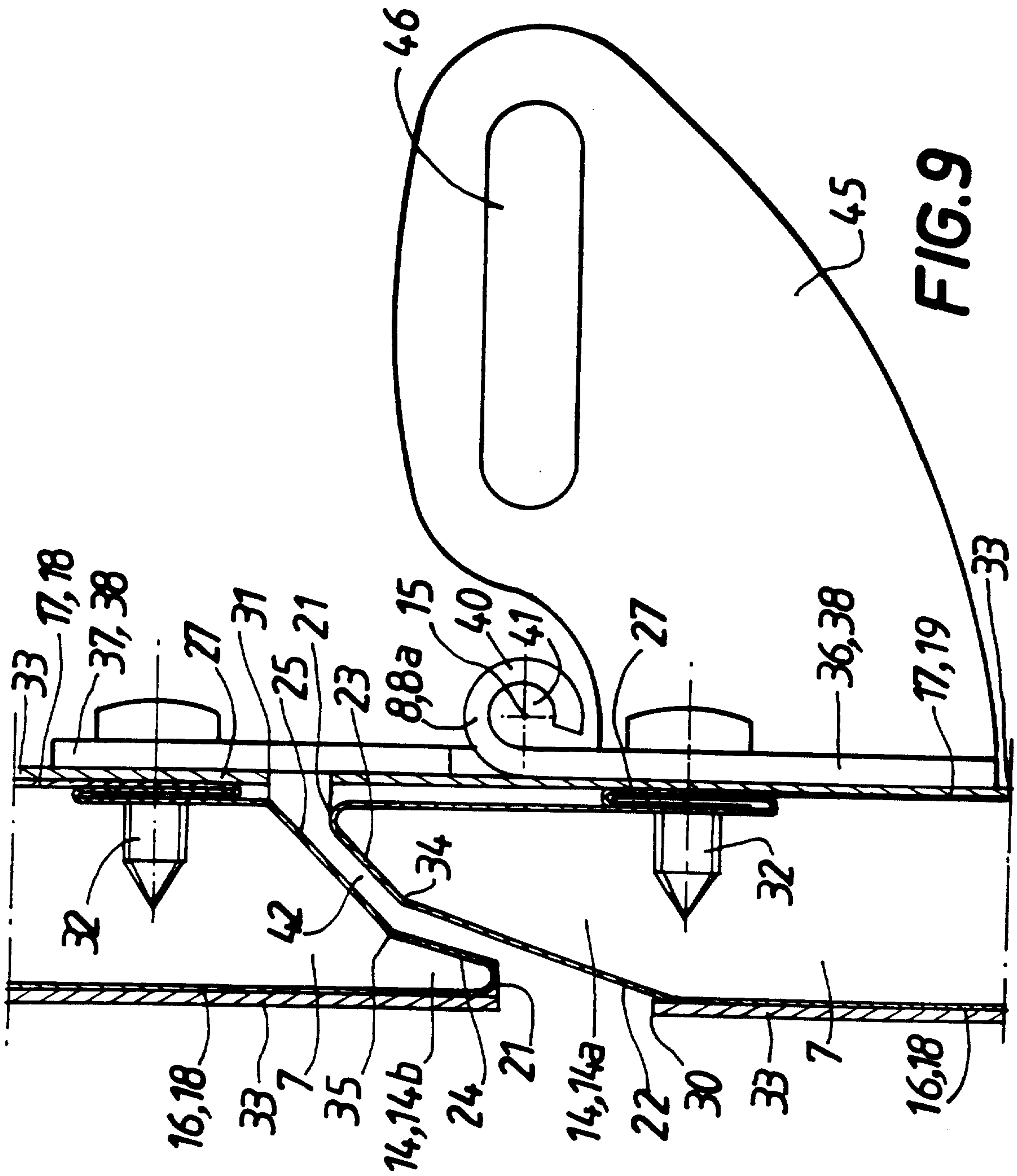
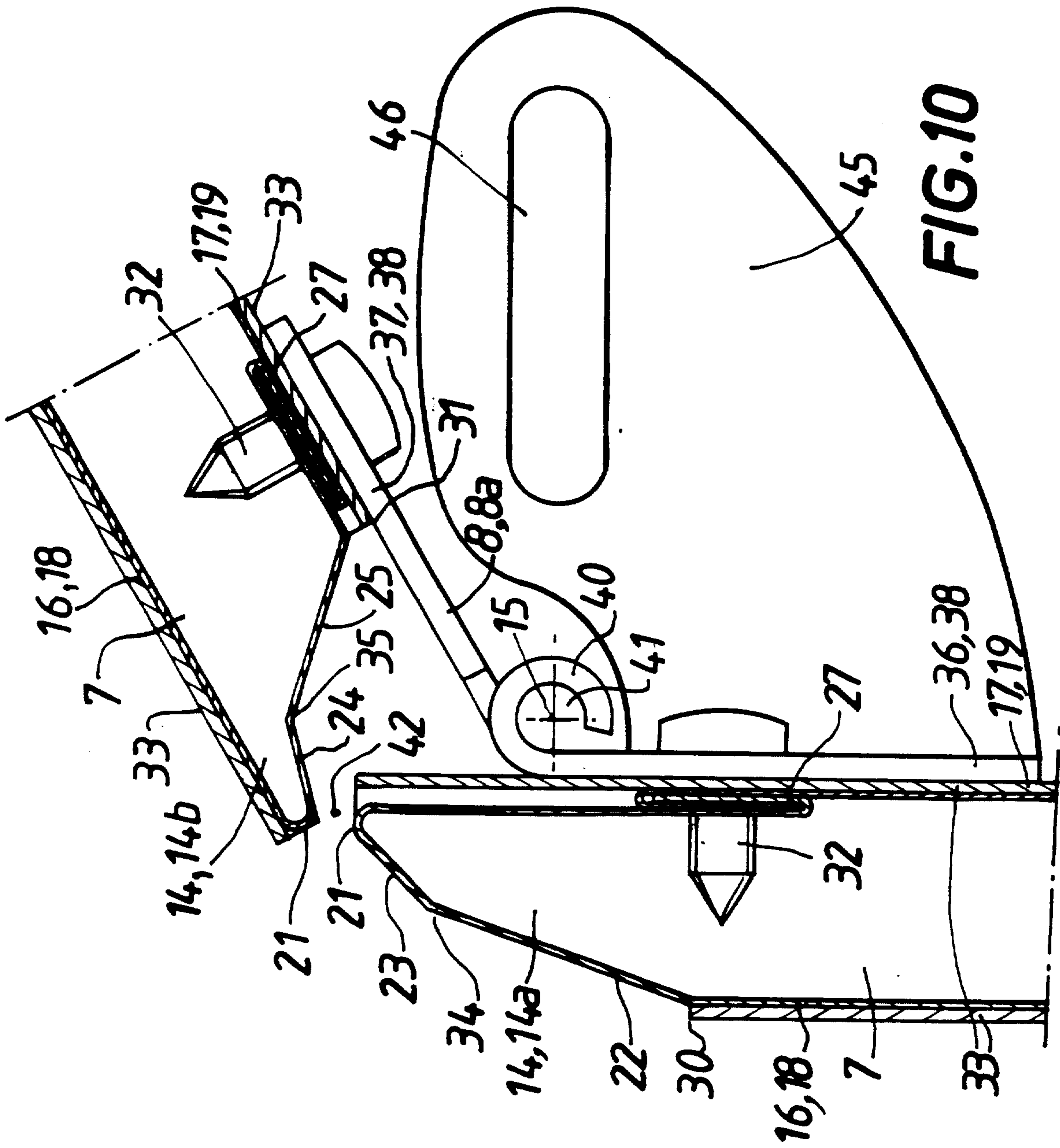
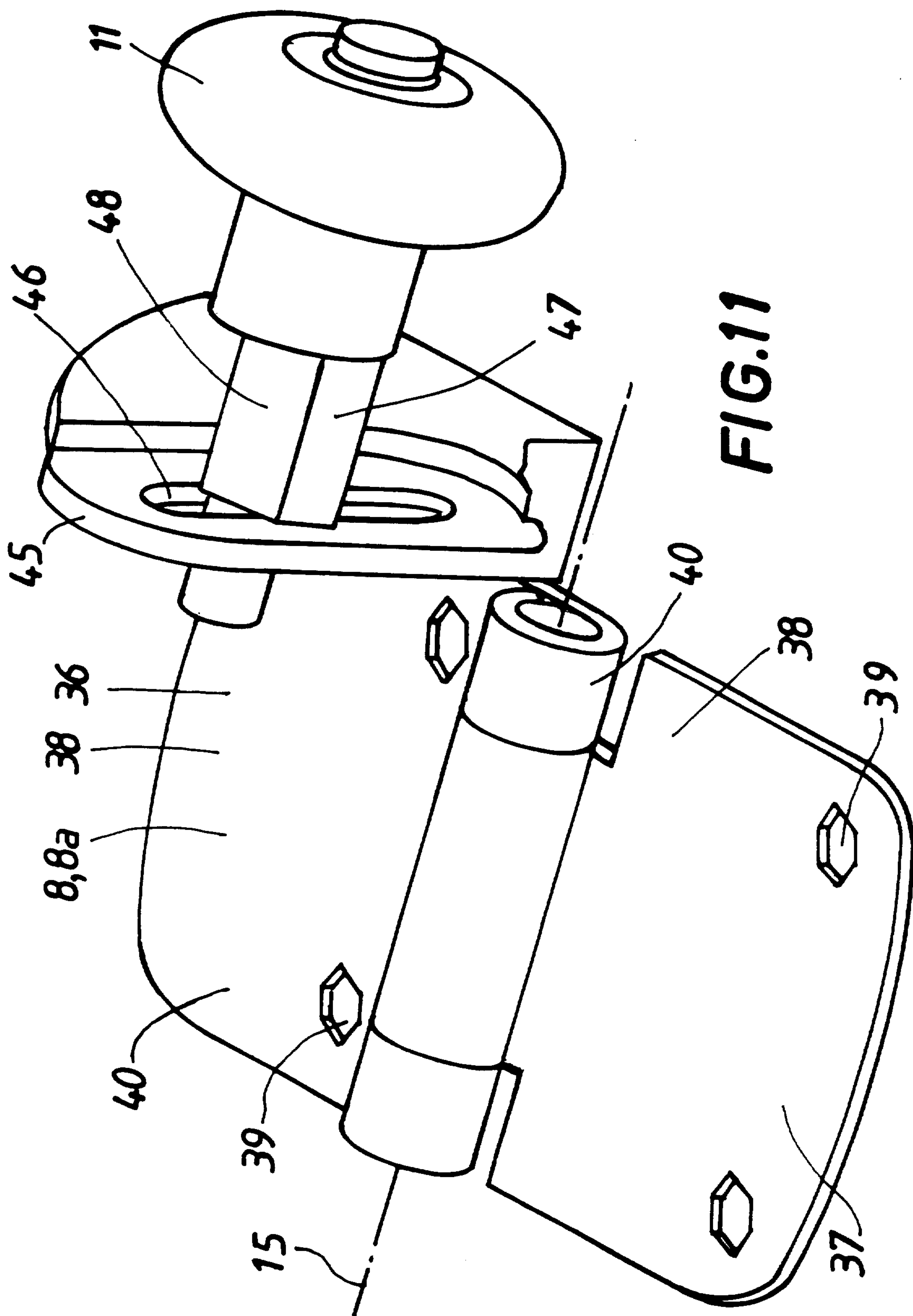


FIG. 9

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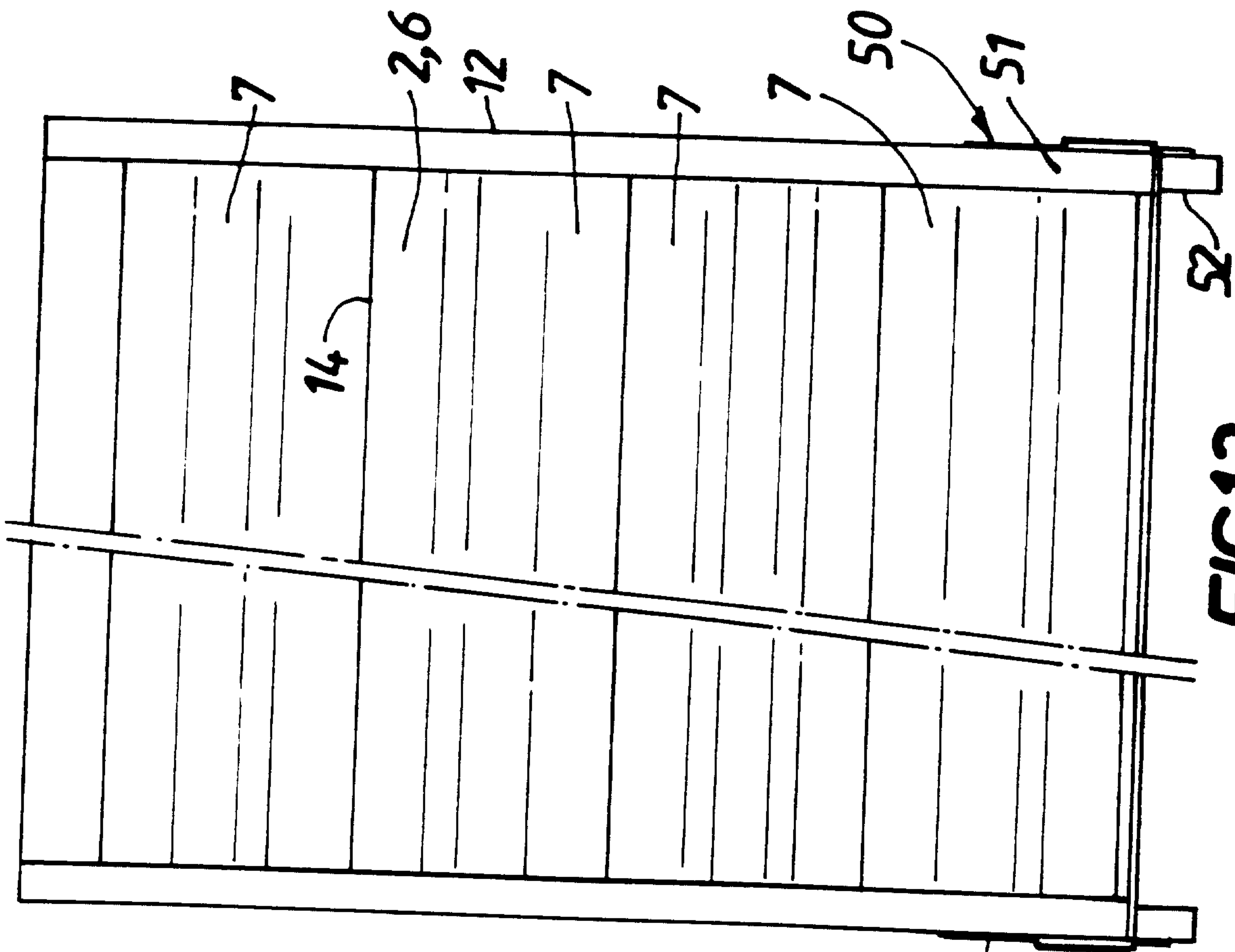


FIG.12

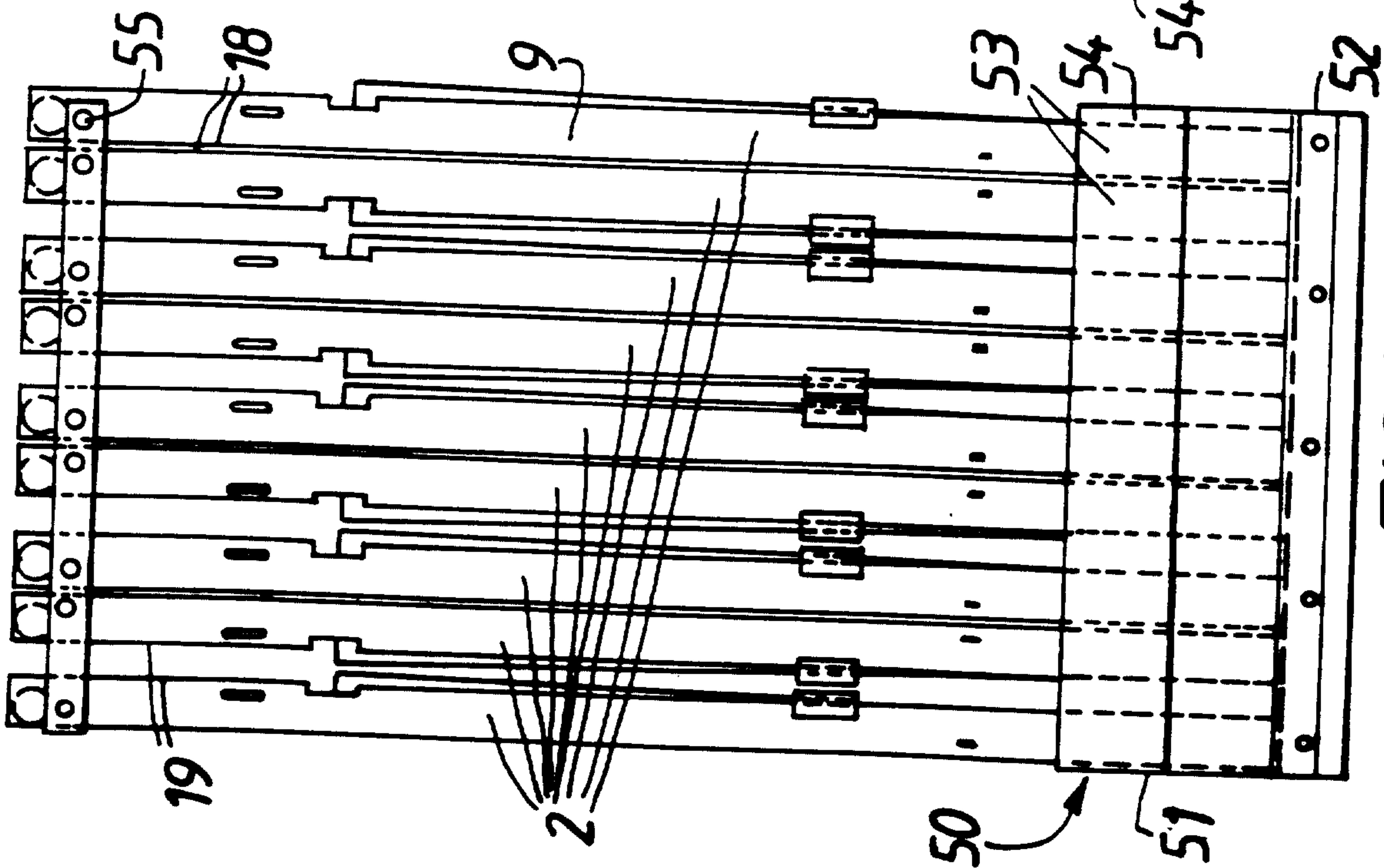


FIG.13