(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 665 406 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **95100394.6**

(51) Int. Cl.[6]: **F21V 11/02**

(22) Date of filing: **13.01.95**

(30) Priority: **31.01.94 SE 9400306**

(43) Date of publication of application:
02.08.95 Bulletin 95/31

(84) Designated Contracting States:
AT CH DE DK FR GB LI NL SE

(71) Applicant: **AB FAGERHULT**

S-566 92 Habo (SE)

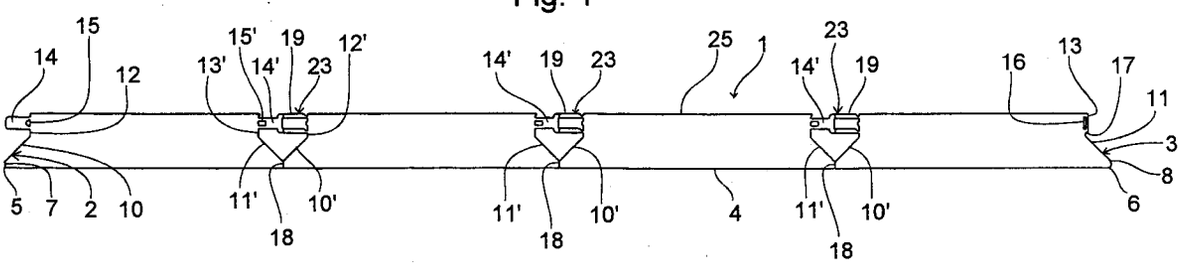
(72) Inventor: **Johansson, Jörgen**
Sjövik 10
S-566 92 Habo (SE)

(74) Representative: **Siebmanns, Hubertus**
Gotapatent AB
Box 154
S-561 22 Huskvarna (SE)

(54) A work piece for a frame structure, a frame structure made of such a work piece and a method of producing such a frame structure.

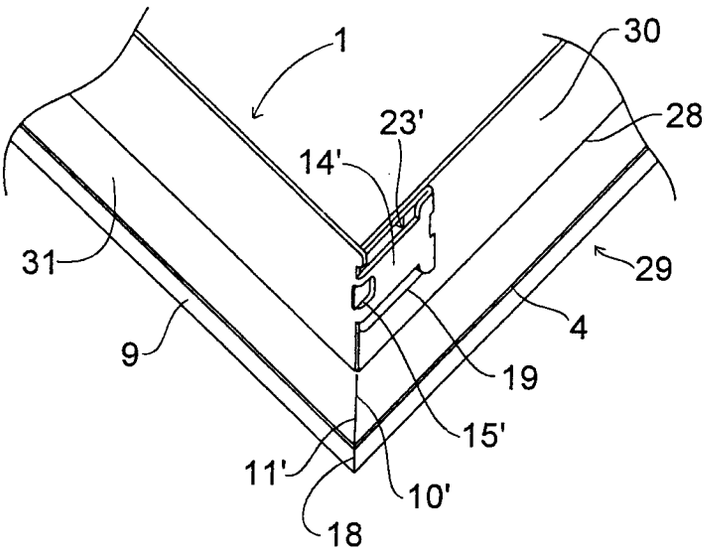
(57) A work piece (1) for a frame structure (29) for en electrical light fitting, designed to be recessed into a ceiling or wall opening, consists of a planar metal strip having mitre cuts (10,11), which are located at the ends of said strip and are mirror-symmetrically disposed in relation fo each other. In accordance with the invention transversal end surfaces (12,13) are located in connection with said mitre cuts at the ends (2,3) of the strip, the one of said end surfaces (12) being provided with an axially porjecting lock tongue (14) and the other of them (13) in close connection with an oblong hole (16), designed to receive the lock tongue. Also, the metal strip according to the invention is along its length provided with mirror-symmetrically disposed mitre cut pairs (10', 11'), in connection with which transversal end surfaces (12',13') are arranged, which are joined to each other by means of bridge portions, which form lock devices (23). Each lock device consists of a tongue (14') and a fork portion (19), which extends from the tongue and which , when the strip is folded about the symmetry plane, which extends through each mitre cut pair, is folded and is brought to abut on the outer side of one of the inner frame sides (30). The invention also relates to a frame structure, manufactured from such a work piece as well as a method to manufacture such a frame structure.

Fig. 1



EP 0 665 406 A1

Fig. 7



The present invention relates to a frame structure work piece and a frame structure which is manufactured therefrom as well as a method of manufacturing such a frame structure according to the preamble of main claim 1 and the first patent claims of said category respectively.

Such frame structures are used e.g. in connection with electrical light fittings, which are often designed to be recessed in a ceiling or wall opening.

Frame structure work pieces are already known and also frame structures, in which principally mitre cuts have been provided in the work pieces, which then are folded to the required shape and soldered or welded together in order to obtain a shape permanent frame.

All additional working moments such as welding, soldering, possibly aftertreatment etc. are of course regarded as being a substantial drawback, which prolongs the production time considerably and makes the products more expensive. Also, it may be difficult and expensive to obtain the machines necessary for such additional working moments or at least certain moments may actually have to be carried out manually, which of course is objectionable. It is also objectionable to make products, which comprise several loose parts, the separate handling resulting in additional problems and costs. Finally, the finished product often is not sufficiently precise due to the joining, which cannot be done with the required accuracy.

The object of the present invention is to simplify and improve the above-mentioned already known categories in such a way, that solely one work piece is used and that such a work piece can be produced in only one work operation and that the shaping can be done to obtain a shape permanent frame structure in a simple and reliable way.

This object is attained according to the invention by designing a work piece, of the type described in the introduction, mainly as is set forth in the characterizing clause of patent claim 1 and by constructing said frame structure as is set forth in the first patent claim relating to the frame structure respectively, as well as the first patent claim relating to said method respectively.

Additional characterizing features and advantages of the present invention are set forth in the following description, reference being made to the enclosed drawings, which show a not limiting exemplifying embodiment and in which:

Fig. 1 is a plan view of a work piece for a frame structure according to the invention;

Fig. 2 is a magnification of a detail of the work piece shown in Fig. 1; and

Figs. 3-7 show in successive order a conversion of a work piece portion according to Fig. 2 into a prospective corner area in a finished frame structure according to the invention.

In the enclosed drawings a complete work piece according to the present invention is shown, which is designed to be shaped into a frame structure 29 according to the invention. The term "frame structure" refers in this context not only to a frame in the ordinary sense but also to any box-shaped or case-shaped construction, which can be triangular, rectangular, pentagonal, hexagonal etc. The work piece is made of a metal and/or a plastic material,cardboard or the like. It may be completely surface-finished, before it is converted into a frame structure and/or after such a conversion.

The work piece suitably principally is a flat strip plate, which can be fed from a strip reel and be cut to the required length. Simultaneously with, before or after the cutting-off the work piece is die-cut or punched in the way shown in the drawings or in a similar way. Ends 2 and 3 are thereby formed in their entirety, in the areas, where there, starting from longitudinal edge 4, primarily is a transversal shorter end surface 5 and 6 respectively. End surface 5 suitably is provided with an indent 7, which is open in the axial direction, whereas end surface 6 suitably is provided with a projection 8, which is to dovetail in said indent. In this way the indent and the projection can, when later a frame structure will be formed, be introduced into each other and secure each other against mutual displacements, crosswise in the plane.

Starting at said end surfaces 5 and 6, the length of which corresponds to the width or height of a required rim 9, there are obliquely backwardly directed mitre cuts 10 and 11 respectively, which extend so far across the width of the work piece, as corresponds to the width of a required frame plane side 21. Then terminating transversal end surfaces 12 and 13 respectively are in their turn formed, the width of which corresponds to the width or the height of an interior frame side or interior rim 30. From end surface 12 a lock tongue 14 extends in the axial direction, in the shoulder area of which there suitably is a e.g. triangular opening 15, one side of which is in line with the respective end surface 12 and which is designed to facilitate and secure a precise bending roughly about said end surface with an angle of e.g. 180° or 90°, when the tongue has been introduced through an oblong hole 16, parallel to the other end surface 13, at a distance of e.g. a few millimeters from the last-mentioned end surface on the work piece. The adjacent mitre cut can in this case end somewhat inside the end surface substantially in line with said oblong hole 16 and form a small recess 17, which maybe is an advantage during the following bending together of the work piece to a frame structure.

Mitre cuts 10 and 11 exist, but with designations 10' and 11' respectively also within the work piece, provided in an analogous way and distributed along the work piece, where the respective frame edge is to terminate and a new one is to start. However, in these cases the cuts coincide and form jointly a 90° angle, if a rectangular frame is to be made. From the point where the two cuts meet each other, a folding notch suitably extends e.g. in the form of a weak punching line or grooving 18 straight outwards to the adjacent longitudinal edge.

The two end surfaces are also provided in this case as a continuation of the last-mentioned mitre cut and designated 12' and 13'. Tongues 14', which correspond to tongue 14, are provided in this case, but they extend in the opposite direction and can have a rectangular opening 15', the one side of which is in line with the respective end surface. These tongues change then immediately before a projected continuation of folding notch 18 into a lock fork 19, the ends of which, which are turned away from the tongue, end in the work piece material on the opposite side, where however there may be indent-shaped folding notches 20,21, the one side of which coincides with the respective end surfaces. These two notches may be open in a transversal direction away from the folding notches. The end surface section between the two fork ends can be provided with a projection 22, which is directed towards the fork web area and designed to, when the now described lock devices, designated 23 in their entirety, are folded, be introduced into the matching opening 15' and to in this way prevent relative movements of the inner frame sides. The two fork ends can adjacent the two fork webs be provided with folding notches 24 of a type described above. These folding notches are in line with the respective folding notch 18. Finally, that end surface, which supports tongue 14' at the second longitudinal edge 25, can be provided with a nibshaped projection 26, designed to be introduced into the upper indent of said indents 20,21, when the work piece is folded to obtain a frame, and in this way to contribute to a prevention of the relative movements of the inner frame sides.

Fig. 3-7 show several folding processes for the continuous work piece in order to obtain a finished closed frame. Initially an outer rim 9 is folded about a folding notch 27, which possibly can be solely imaginary; i.e. a tool or a machine will entirely accomplish a folding or bending about and along a certain line. The outer rim can project from the planar main frame side in any required angle, but the angle usually is 90°. A line 28, which separates the main frame side from the inner frame side, may also be imiginary or constitute a folding notch. In Fig. 4 it is shown,that the inner frame sides on both sides of a lock device also have been formed, which also can be done simultaneously with the forming of the outer frame rim and before or after respectively. In Fig. 5 the folding of the lock device proceeds up to a lock, all of the described and shown folding notches being used and the lock device being pushed outwards and simultaneously a folding taking place about the outer fork ends, the fork shoulder ends, the tongue shoulder and folding notch 18. It is shown in Fig. 6, that the tongue with the fork web on one of its sides and the fork legs on its other side increasingly are brought together from an angle of 180° to 0°, the tongue however during the phase between Figs. 5 och 6 being swung back to roughly its original position in the same plane as the adjacent inner frame side. When the two lock portions lie close to each other, the projection has been introduced into the opening in the tongue shoulder and simultaneously the rest of the described lockings have been carried out.

It is shown in Fig. 7, that the closed lock then is swung away in order to lie close to the outer side of the inner rim section, which is possible thanks to the fork ends. In this case possibly a welding, a soldering or gluing can be carried out, the lock and said inner frame side thus constituting a compact unit, in case this is required. In the lock, which has been folded back, tongue 14' has been introduced into the space between the fork legs, particularly within the area close to the corner, a less bulky joint in this way being obtained.

The invention is not limited to the exemplifying embodiments described above and shown in the drawing but may be modified and supplemented in an arbitrary fashion within the scope of the inventive idea and the following patent claims. Thus, the inner frame sides may be substantially wider and be provided with a plurality of locks of the type described above. In extreme cases the planar main frame sides and the outer rim or solely the latter respectively may be excluded. Almost arbitrary angle variations are feasible.

Claims

1. A work piece (1) for a frame structure (29), particularly for an electrical light fitting to be inserted into an opening in a ceiling or wall, which work piece consists of a planar strip, preferably made of metal and provided with punchings, is designed to be folded to a durably shaped frame, is continuous and is provided with mitre cuts (10, 11) at its ends and with mitre cuts (10', 11') disposed thereinbetween in a mirror-symmetrical fashion along the length of the work piece and at a distance from each other, which corresponds to the length of a frame side, which mitre cuts are

adjacent to end surfaces (12',13'), which are connectable to each other via locking means (23) comprising a tongue (14'), which emanates from the one end surface (13') and is designed to be folded aside in locking position into abutment to a frame side (30), **characterized in that** even said locking means is designed continuous to form a bridge with said tongue (14') merging into the other end surface (12') in the shape of a fork (19), the transition into which fork shape suitably commences slightly before the plane of symmetry of said internal mitre cuts (10',11'), said tongue (14') being provided to engage, in the said locking position, between the legs of said fork (19), particularly in the region of a frame corner, to render a less bulky joint.

2. A work piece according to claim 1, **characterized in that** the work piece (1) is provided with ends (2,3) comprising transversal short end surfaces (5 and 6, respectively) emanating from the one longitudinal edge (4) of the strip, one of which short end surfaces (5) being provided with an indent (7), which is open in an axial direction, whereas the other of which end surfaces (6) being provided with a projection (8), which fits into said indent and is designed, when the frame structure is formed later on, to be introduced into said indent and to secure the so obtained joining within this region against relative displacements in transversal directions within the plane of the frame side in question.

3. A work piece according to claim 2, **characterized in that,** emanating from said end surfaces (5,6), the length of which corresponds to the width or height of an outer rim (9), there are provided obliquely backwardly directed mitre cuts (10 and 11, respectively), which extend so far across the width of the work piece, which corresponds to the width of a frame plane side (31) which is to be formed, and which cuts connect to transversal end surfaces (12 and 13, respectively), the width of which latter corresponds to the width or height of an inner frame side or inner rim (30), from one of said end surfaces (12) a lock tongue (14) extends in axial direction, in the base region of which tongue there is suitably a triangular opening (15), one side of which is in line with the respective end surface (12), which opening is designed to facilitate and secure a precise folding roughly about said end surface with e.g. 180° or 90° after said tongue having been pushed through an oblong hole (16), which extends in parallel with the other end surface (13) at a distance of e.g. a few millimeters from the last-mentioned end surface of the work piece, and in that the adjacent mitre cut (11) suitably ends somewhat inside the respective end surface (13), roughly in line with said oblong hole (16) and forms a minor recess (17).

4. A work piece according to any of claims 1 - 3, **characterized in that** the base region of said interior tongues (14') comprises a suitably rectangular opening (15'), one side of which extends in line with said one end surface (13').

5. A work piece according to any of claims 1 - 4, **characterized** in that the leg ends of said fork (19) which are turned away from said tongue (14') within the region of transition into the strip material on the other side (12') are laterally limited by indent-shaped folding indications (20,21), one side of which coincides with the respective end surface (12').

6. A work piece according to claim 5, **characterized in that** said folding indications suitably are open in lateral direction away from said mitre cuts (10',11'), that the part of the end surfaces (12',13') between a pair of fork legs preferably is provided with a projection (22) facing the fork web and intended, when folding said locking means (23) to an effective lock, to enter into an associated tongue opening (15') to prevent relative movements of the inner sides of the frame, and that the fork leg ends adjacent the fork web preferably are provided with folding indications (24), which are in line with one possible folding indication (18) in said symmetry plane, and that the end surface (13'), which supports the tongue (14'), at the other longitudinal edge (25) of the work piece suitably is provided with a nib-like projection (26) designed to be introduced into the upper one of said indents (20, 21), when the work piece is folded to a frame, in order to prevent relative movements between the inner frame sides.

7. A frame structure (29) made of a work piece (1) according to any of claims 1 - 6, which frame structure particularly is intended for an electrical light fitting to be inserted into an opening in a ceiling or wall, said work piece comprising at its ends mitre cuts (10,11) and consisting of a continuous planar strip preferably made of metal and provided with punchings and folded to a durably shaped frame and furthermore with mitre cuts (10',11') between said ends in a mirror-symmetrical fash-

ion along the length of the work piece at distances corresponding to the length of a frame side, which mitre cuts (10',11') are adjacent to end surfaces (12',13'), which are connected to each other via locking means (23) comprising a tongue (14'), which emanates from the one end surface (13') and is folded aside into abutment to a frame side (30), **characterized in that** even said locking means (23) is designed continuous to form a bridge with said tongue (14') merging into the other end surface (12') in the shape of a fork (19), the transition into which fork shape suitably commences slightly before the plane of symmetry of said internal mitre cuts (10',11'), said tongue (14') engaging, in the folded-aside locking position, between the legs of said fork (19), particularly in the region of a frame corner, to render a less bulky joint.

8. A method of producing a frame structure (29) according to claim 7 by means of a work piece (1) according to any of claims 1 - 6, as work piece being used a continuous planar strip, preferably made of metal, which strip is provided with punchings, i.a. mitre cuts (10,11) at its ends and mitre cuts (10',11') disposed thereinbetween in a mirror-symmetrical fashion along the length of the work piece and at distances from each other corresponding to the length of a frame side, which latter mitre cuts are adjacent to end surfaces (12',13'), which are connected to each other via a tongue (14'), which emanates from the one end surface (13') and is folded aside in locking position into abutment to a frame side (30), while the work piece is folded to a durably shaped frame, **characterized in that** said punchings are carried out leaving said locking means (23) continuous in longitudinal direction of said strip to form a bridge with said tongue (14') merging into the other end surface (12') in the shape of a fork (19), the transition into which fork shape suitably commences slightly before the plane of symmetry of said internal mitre cuts (10',11'), that said work piece initially is folded to form an outer rim (9) about a folding indication (27), which possibly may be solely imaginary, in case such an outer rim is to be formed, possibly simultaneously with, before or after the folding of an inner frame side or inner rim (30), which is connected to the main frame side (31), about a separation line (28), which may be imaginary or existing as a folding indication, that subsequently the locking means (23) is folded to a lock with use of possibly existing folding indications, and the lockind means is pushed outwards with simultaneous folding about the outer fork ends, the fork shoulder ends, the tongue base and a transversal line (18) in a possible outer rim work piece portion, the tongue with its fork web on the one side and the fork legs on the other side being increasingly brought together from an angle of 180° to 0° and the tongue during a later phase being swung back to roughly its original extension in the same plane as an adjacent inner frame side, and, when the two so formed locking means portions abut each other, a projection (22) being introduced into an opening (15') in the tongue base and simultaneously also possibly additional lockings being performed, subsequent to which the closed locking means is swung aside to abut the outer side of the inner rim section, which is coherent with the fork ends, while the tongue (14') is caused to enter into the space between the fork legs, particularly within the region of a frame corner, whereupon any possible welding, soldering or gluing is carried out.

Fig. 1

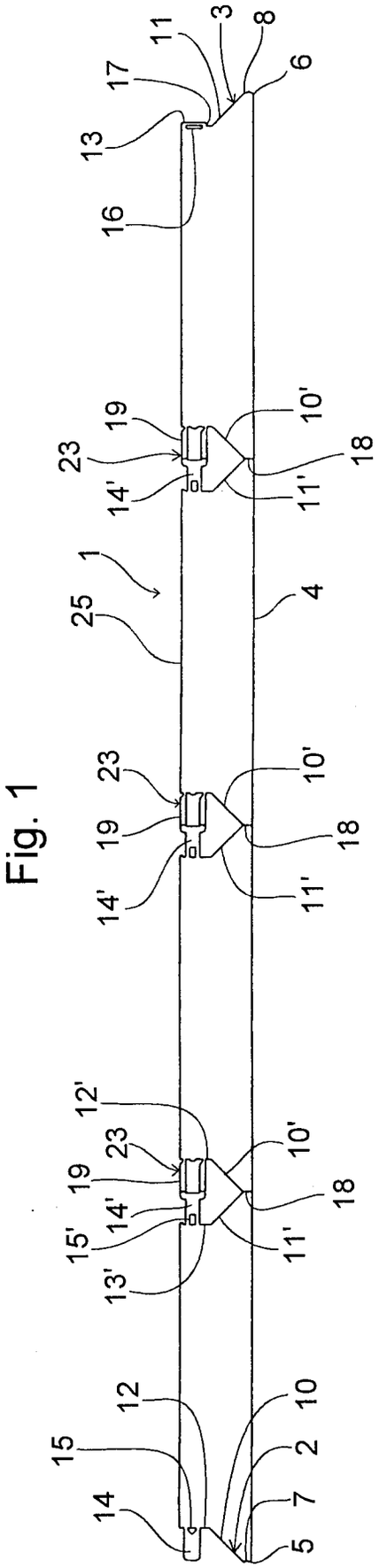


Fig. 3

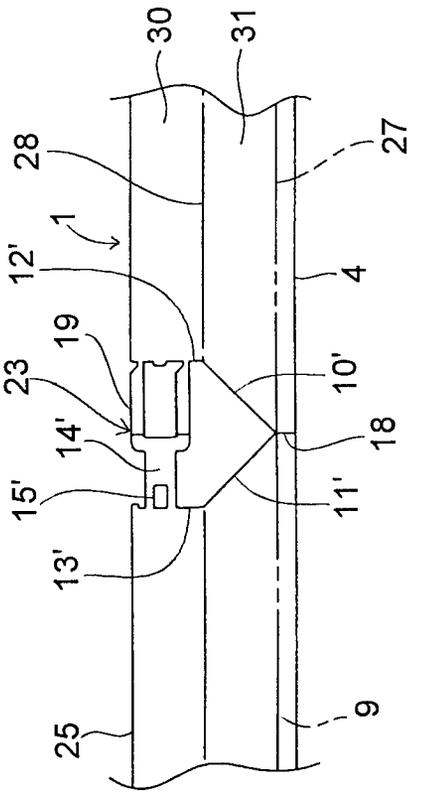


Fig. 2

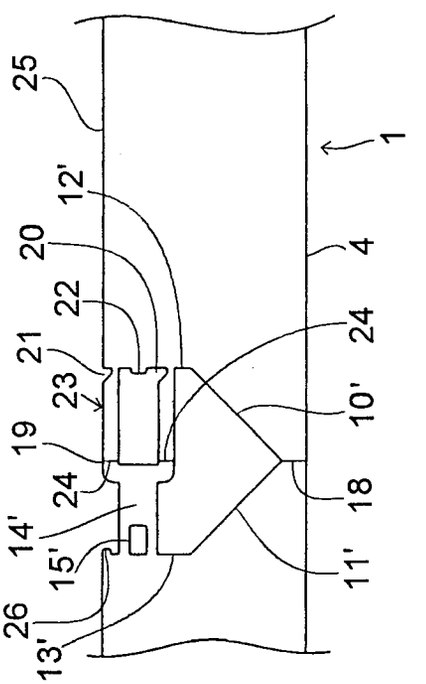


Fig. 5

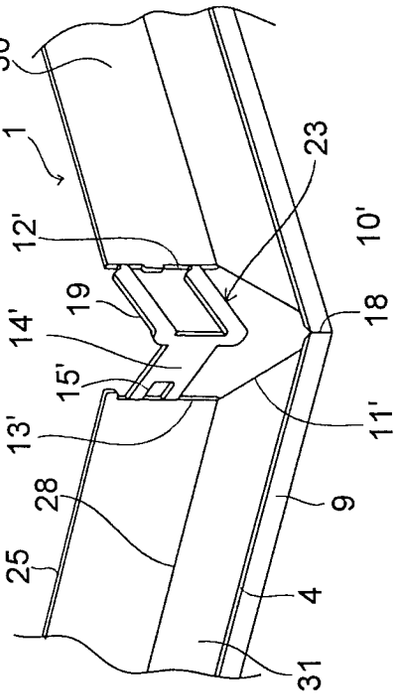


Fig. 7

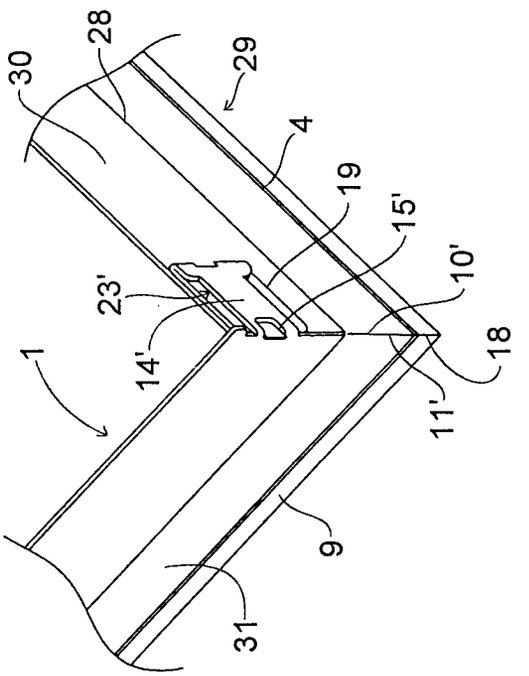


Fig. 4

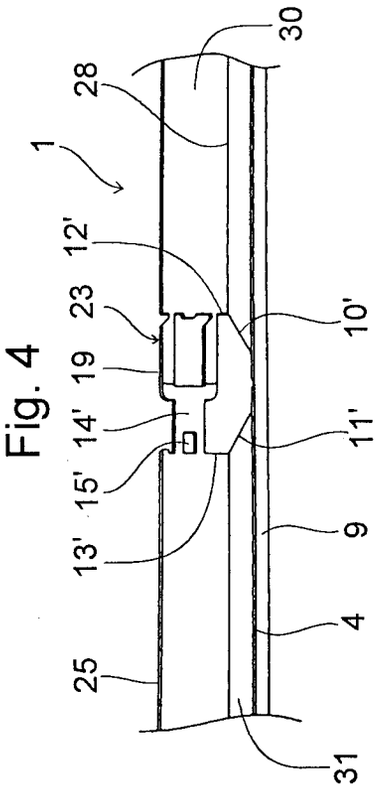
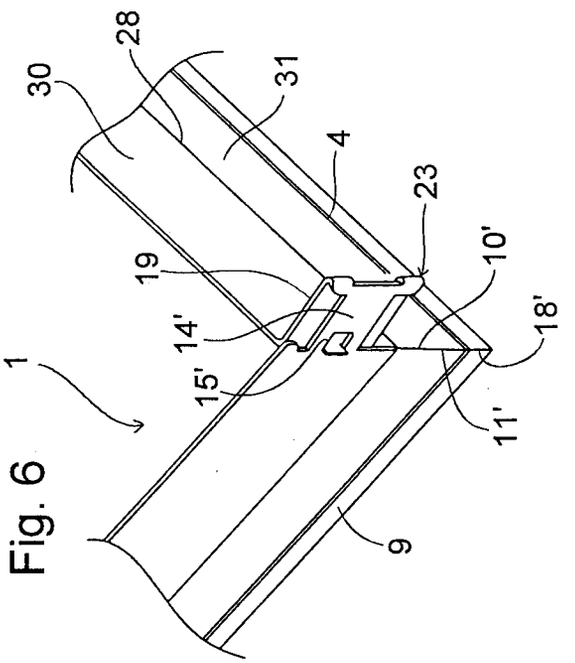


Fig. 6



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 10 0394

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE-A-29 16 331 (KORSCH) * page 12, line 20 - page 14, line 18; claim 1; figure 10 *	1,3,8	F21V11/02
A	EP-A-0 522 480 (FAGERHULT) * figures 1,3 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F21V
B21D
F16L
E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	31 March 1995	Schaeffler, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)