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**A Form Panel having Marginal Strips
formed by a Flat Extruded Section**

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The invention relates to a form panel having at its edges marginal strips which project approximately at right angles to the facing sheet and are formed by an extruded section of aluminium, an aluminium alloy or of similar light metal, wherein said marginal strips have stop faces which run at right angles to the facing sheet and in the position of use bear directly or indirectly against stop faces of marginal strips of neighbouring form panels, and fasteners in the form of clamps are applied to said marginal strips at their backs opposed to the stop faces and serve to fasten together the contiguous marginal strips, wherein the extruded sections have cells or similar cavities which extend in the longitudinal direction of the marginal strips and are enclosed all round by walls, and wherein for attaching a facing sheet the one edge of the marginal strip has an angle space and the edge which is parallel thereto and is remote from the facing sheet is embraced by the clamp in the position of use, wherein the point for application of the clamp is a groove or channel which extends at the back of the marginal strip and is arranged approximately midway between the edges of the marginal strip.

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Such a form panel is already known from practice. The marginal strips in the form of an extruded section are relatively thick and therefore correspondingly large clamps have to be applied to them. Further, due to the hollow cross section of the extruded section, an additional strip running parallel to the facing sheet has to be formed for internal stiffening and is situated in the area of the groove or channel. The large cross section entails a corresponding weight and above all correspondingly large clamps of correspondingly heavy weight have to be used for connecting such form panels.

Form panels are also already known from practice in which the marginal strips are made of light metal and the cross section is kept relatively shallow. In order that these marginal strips also known from practice have the required stiffness they are also in the form of an extruded section with cavities. This known extruded section has two back points for application of a clamp, each situated near either edge of this extruded section, namely on the one hand near the edge situated at the facing sheet and on the other hand near the edge remote therefrom.

The points of application overlap the cavities situated in the extruded section and therefore when the clamp exerts a high force there is the danger of indentation of the light metal hollow section of the marginal strip. In order that this danger is minimized, but without being able to eliminate it, the clamp is applied to the marginal strip right up to its area directly at the back of the facing sheet, so that the fixation of the marginal strip has to be located at the end edge of the facing sheet. Therefore care has to be taken that fasteners traversing the marginal strip in the area of the facing sheet do not make the stop face situated there uneven and above all unretentive.



The point, remote from the facing sheet, at which the clamp is applied is conical viewed in cross section, giving rise to a certain centring effect, but at the same time also to a force component transversely of the wall situated there defining one of the cavities of the extruded section. Hence deformation in this area as well cannot be ruled out when high clamping forces are applied. If such deformation of the extruded section in the area of its walls defining the cavities is to be ruled out, the forces emanating from the clamps either have to be limited or the walls of the marginal strip have to be made correspondingly strong, again leading to an increased weight of the form panel.

In the case of the extruded section of relatively wide cross section, a correspondingly wide seating surface for the facing sheet is formed. However the necessity of correspondingly large clamps has to be conceded to. In the case of the extruded section of shallow cross section, only a very small seating surface is formed at the edge of the marginal strip proximate to the facing sheet.

In both instances the fastener therefore has to be introduced into the narrow edge of the facing sheet, or in the case of the wide extruded section the fastener has to be introduced from the side of the facing sheet facing the concrete. This represents either a less stable fixation or harm to the facing sheet facing the concrete.

The object underlying the invention is therefore to provide a form panel of the kind stated at the outset, wherein the clamping forces can be introduced transversely of the marginal strip and outside the walls of the cavities, wherein particularly it is also to be possible for the form panel to be coupled to marginal strips of flat steel material,



particularly to ones having a central bead, wherein the fastening of the marginal strips to the facing sheet is simultaneously improved, but nevertheless relatively small clamps can be used.

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To accomplish this object a form panel of the kind mentioned at the outset is characterized in that the marginal strip is a flat extruded section and in the area of the groove or channel has a solid cross section, that on either side of the channel cavities extend within the marginal strip, that the angle space, which receives the facing sheet and is located at that edge of the marginal strip which is proximate thereto, has bearing against the back of the facing sheet an integral strip extended in cross section, which strip is the continuation of the wall defining the cavity near the facing sheet and serves as the fastening flange for the facing sheet.

Since the marginal strip is a flat extruded section, relatively small clamps are sufficient in order to be able to grip the marginal strips of adjacent form panels. It is also possible to attach form panels having marginal strips of flat steel material, as are described in DE-A-41 03 775.8. Hence a wide spectrum of applications follows. It is advantageous that the clamp is applied to a channel approximately in the centre of the marginal strip in order to be able to press the marginal strips together.

Since a solid cross section is provided in this area and the cavities are located on either side of this area presenting the groove or channel, these cavities and their walls are not acted upon by the clamp in the sense of their being subject to indentation. Even if very high forces are applied by the clamp, no deformation of the walls defining the cavities is to be expected. Since the clamp is applied in spaced



relationship to the facing sheet, there is also sufficient space in the area of the facing sheet for the same to be fastened to the marginal strip, for instance at the back of the facing sheet.

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It is of considerable advantage that the angle space, which receives the facing sheet and is located at that edge of the marginal strip which is proximate thereto, has bearing against the back of the facing sheet an integral strip extended in cross section, which strip is the continuation of the wall defining the cavity near the facing sheet and serves as the fastening flange for the facing sheet. The wall which defines a cavity of the extruded section and extends near and parallel to the facing sheet and to the area for concrete placement therefore does not have to serve as an additional support of the clamp and to take up the clamping forces, because the point for application of the clamp is moved from this area further outwards. Therefore the wall can have the flange-like continuation mentioned, enabling a good seating for the back of the facing sheet and fixation there. Fasteners are then outside the areas where marginal strips of neighbouring form panels contact each other. In addition, the fastener does not have to be introduced into the narrow side of the facing sheet. Rathermore the fastener provided with an appropriate cross section can be applied transversely of the facing sheet. Hence an improved fixation of the facing sheet ensues, without detracting from the potential clamping force when connecting marginal strips of neighbouring form panels.

30 In the area of the free edge of the marginal strip, next to the cavity arranged there, provision may be made for a portion of solid material and a reduction of cross-sectional area and the free edge may serve as a stop for a counter-stop on the clamp. Therefore, particularly when a force component crosswise to the facing sheet arises through the clamping,

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the clamp can serve to align the two connected marginal strips which abut the counter-stop on the clamp and are hence made to assume a uniform and corresponding position relative to the clamp.

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The marginal strip may be of approximately the same thickness in the area of its parallel cavities on either side of the groove, and the cavities and the walls defining them may preferably also be of approximately the same thickness. This then results in a marginal strip of largely uniform thickness, interrupted only at the back by the groove or channel which corresponds to the bead in a marginal strip according to DE-41 03 775 and may also have its shape and effect. It is suitable if this groove has inclined boundaries, whereby the angle of inclination may be for example 45° in order to be able to co-operate with a correspondingly inclined projection of a clamp. This leads to the alignment already mentioned at the counter-stop of the clamp.

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The breadth of the cavities transversely of the plane formed by the facing sheet may also be approximately the same. Then cavities on either side of the groove for application of the clamp are produced which are of approximately the same thickness and breadth and have approximately the same bending strength. Consequently the force of the clamp can also be uniformly distributed on either side of the point for application of the clamp.

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The contact face of the marginal strip may have at least one shallow recess between the two edges of said marginal strip, so that when two marginal strips are in contiguity a clear space remains in this central area. Under the action of the clamping force of the clamp, a possible, slight elastic deformation is therefore permitted, leading to the contact

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faces proper being pressed firmly together and thereby to good tightness. Any small amounts of dirt can be held by the recess or space.

5 Connection to a marginal strip of flat steel material having an inwrought bead according to German laid open print No. 41 03 775 is rendered possible in that the groove-like channel or the like for application of a clamp is arranged at that distance to the facing sheet and to the free edge of the
10 marginal strip at which a bead for the application of the clamp is located in a marginal strip formed of flat steel material, and that in particular the breadth of the marginal strip consisting of flat material is the same as the breadth of the marginal strip formed by an extruded section.
15 Therefore the stop faces can serve for such marginal strips composed of different materials to be aligned to one another. The form panel hence has a high loading capacity, accompanied by favourable, low weight and can be connected without any difficulty to the frames of known form panels having flat,
20 steel marginal strips. In an advantageous way identical clamps can be used, i.e. an owner of formwork with form panels having marginal strips of flat, steel material can replace or complement them by a form panel having the marginal strip embodied by the invention formed by an
25 extruded section and he can use the latter together with the other form panels. The owner of an older formwork system therefore also has the possibility of gradually changing it over to the new form panels, without no longer being able to use the older ones.

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An exemplary embodiment of the invention will be described in further detail below with reference to the drawings in which, partly in schematic form,

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Fig. 1 is a side view, partly in section, of an edge area of a form panel, showing at the upper edge of the form panel the marginal strip in cross section embodied by the invention formed by an extruded section,

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Fig. 2 is a cross section through two contiguous marginal strips according to the invention which are pressed together by a clamp applied to their central, grooved area where they have a solid cross section, the facing sheet being omitted for the sake of simplicity,

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Fig. 3 is a view corresponding to that of Fig. 2, wherein a marginal strip embodied by the invention formed by an extruded section is pressed together with a marginal strip of flat steel material having a groove-like bead by the clamp, again for the sake of simplicity showing only the marginal strips and not the complete form panels.

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A form panel, generally designated 1, has at its edges marginal strips, generally designated 3, which project approximately at right angles to its facing sheet 2 and are formed by a flat extruded section of aluminium, an aluminium alloy or of another light metal. In addition the facing sheet may be stiffened by further hollow sections 4 or the like between these marginal strips 3.

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The marginal strips 3 are provided with stop faces 5 which run at right angles to the facing sheet 2 and in the position of use bear - as a rule directly - against complementary stop faces 5 of marginal strips 3 of neighbouring form panels, as is shown particularly in Fig. 2.

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According to Figs. 2 and 3 fasteners in the form of clamps 7 are applied to the backs 6 opposed to the stop faces 5 and serve to fasten together the contiguous marginal strips 3, so that the marginal strips 3 and thereby the form panels 1 are frictionally interconnected. According to the exemplary embodiments the extruded sections composing the marginal strips 3 have cells or cavities 8 which extend in the longitudinal direction of the marginal strips and are enclosed all round by walls 9. This leads to reduction in weight, nevertheless accompanied by good stiffness.

The marginal strip 3 has at its one edge 10 located in the area of the facing sheet 2 an angle space 11 for attachment of the latter, the one angle leg engaging over the end face of the facing sheet 2, while the other angle leg 12 is applied to the facing sheet 2 at the back thereof facing away from the surface for concrete placement.

The marginal strip 3 has its edge 13 parallel thereto and remote from the facing sheet 2 embraced by the clamp 7 in the position of use, as is shown in Figs. 2 and 3.

The point for application of the clamp 7 is a groove 14 or channel which extends at the back 6 of the marginal strip 3 and is arranged approximately midway between the edges 10 and 13 of the marginal strip 3, so that the clamp 7 does not have to come right up to the facing sheet 2. The marginal strip 3 has a solid cross section in the area of this groove 14, so that the forces emanating from the clamp 7 do not lead to a deformation of the cavities 8. These cavities 8 extend within the marginal strip 3 on either side of the channel 14 and hence on either side of the area having the solid cross section. This arrangement is shown clearly in Fig. 1, but also in Figs. 2 and 3.



The angle space 11, which receives the facing sheet 2 and is located at that edge 10 of the marginal strip 3 which is proximate thereto, has bearing against the back of the facing sheet 2 an integral strip 15 or flange extended in cross section, which strip or flange is the continuation of the wall 16 which defines the cavity 8 near the facing sheet and runs parallel to the facing sheet 2 and to the surface for concrete placement. This strip 15 may serve as the fastening flange for the facing sheet 2, as is indicated by the dot-dash line 17 signifying a screw. There is consequently sufficient room for a fastener of almost any cross section, so that considerably improved fixation is possible than if it had to be effected through that leg of the angle space which engages over the end face 18 of the lining skin and is applied to a seal 19 there. In addition the entire marginal strip 3 is stiffened further by this strip 15.

In the area of the free edge 13 of the marginal strip 3, next to the cavity 8 arranged there, a portion 20 of solid material and a reduction of cross-sectional area 21 are to be seen. The reduction of cross-sectional area can be engaged by a complementary counter-stop 22 of the clamp 7 and hence serves as a stop when aligning two interconnected marginal strips 3, as is apparent in Fig. 2. According to Figs. 1 and 2 the stop face or contact face 5 of the marginal strip 3 has a shallow recess 23 between the two edges 10 and 13, so that when two marginal strips 3 are in contiguity a clear space remains in the central area. This space or recess 23 covers the areas of the cavities 8, so that the actual contact and transfer of force takes place at the sides of the cavities 8. Pressure forces of commensurate magnitude can be transferred and sustained in this area.

The marginal strip 3 is of approximately the same thickness in the area of its parallel cavities 8 on either side of



groove 14, and the cavities 8 and walls defining them are also of approximately the same thickness, resulting in largely conforming dimensions throughout the breadth of the marginal strips 3 and thereby the same compressive and flexural strengths everywhere. The breadth of the cavities 8 transversely of the plane formed by the facing sheet 2 are also approximately the same.

According to Figs. 1 and 2, the boundary 24 of the groove 14 is inclined and runs at an angle of approximately 45° - viewed in cross section - to the stop face 5 of the marginal strip 3. A correspondingly shaped projection 25 of the clamp 7 can therefore be applied to the boundary 24 and bring about a certain force component also in the direction of the counter-stop 22 on the clamp 7. Mention is made in this connection that the clamp 7 acts upon the marginal strips 3 only with its projections 25 within the groove 14 and even in the clamped position of Fig. 2 a minimal space can remain between the clamping jaws 26 and the back of the marginal strips 3. However even if clamping forces are applied and transferred here as well, the intermediate cavities 8 cannot be indented, because a solid cross section on either side of this cavity 8 between the clamping jaws 26 provides for sufficient support.

A clamp of any kind; for instance according to DE-A-41 03 775 or - as illustrated in the exemplary embodiment - according to DE-42 36 070, can be applied to the groove 14 or channel. It is contemplated that the groove-like channel 14 for application of this clamp 7 is arranged at that distance to the facing sheet 2 and to the free edge 13 of the marginal strip 3 at which a bead 14a for the application of the clamp 7 is located in a marginal strip 3a according to Fig. 3 formed of flat steel material. The breadth of the marginal strip 3a consisting of flat material is the same as the breadth of the marginal strip 3 formed by an extruded



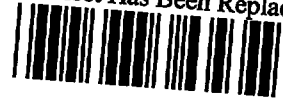
section, so that the two different marginal strips 3 and 3a of Fig. 3 can be fastened together without any difficulty by the clamp 7. Therefore form panels having such different marginal strips can be combined in a simple manner. Hence the invention has succeeded in providing a marginal strip formed by an extruded light metal, allowing good application of force of a clamp 7 at a location at which the cavities 8 are not endangered by this pressure force of the clamp 7, also enabling optimal fixation of the facing sheet 2 and nevertheless permitting of being combined with an already known and existing marginal strip in such a way that the same clamp 7 can fix together both different marginal strips 3 and 3a. Therefore form panels according to the exemplary embodiment can be combined with ones having marginal strips 3a.

The form panel 1 has marginal strips 3 formed by a flat extruded section of aluminium, an aluminium alloy or of another light metal and therefore has a low weight, nevertheless accompanied by good stiffness. The points for application of clamps 7 for fixing together such marginal strips 3 of adjacent form panels 1 are in spaced relationship to the facing sheet 2 at a location where the marginal strips 3 have a solid cross section and the cavities 8 situated on either side of this point of application are not in danger of being deformed by the pressure force of the clamp 7. A groove 14 or channel is provided for application of the clamp in order that this point of application really is used. Therefore the same clamp 7 can be employed as may also serve for flat marginal strips provided with a central bead and therefore form panels having such marginal strips of different materials can also be combined.

Claims

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C l a i m s

1. A form panel (1) having at its edges marginal strips (3) which project approximately at right angles to the facing sheet and are formed by an extruded section of aluminium, an aluminium alloy or of similar light metal, wherein said marginal strips (3) have stop faces (5) which run at right angles to the facing sheet (2) and in the position of use bear directly or indirectly against stop faces (5) of marginal strips (3) of neighbouring form panels, and fasteners in the form of clamps (7) are applied to said marginal strips at their backs (6) opposed to the stop faces (5) and serve to fasten together the contiguous marginal strips (3), wherein the extruded sections have cells or similar cavities (8) which extend in the longitudinal direction of the marginal strips and are enclosed all round by walls (9), and wherein for attaching a facing sheet (2) the one edge (10) of the marginal strip (3) has an angle space (11) and the edge (13) which is parallel thereto and is remote from the facing sheet (2) is embraced by the clamp (7) in the position of use, wherein the point for application of the clamp (7) is a groove (14) or channel which extends at the back (6) of the marginal strip (3) and is arranged approximately midway between the edges (10, 13) of the marginal strip (3), characterized in that the marginal strip (3) is a flat extruded section and in the area of the groove (14) or channel has a solid cross section, that on either side of the channel (14) cavities (8) extend within the marginal strip (3) and that the angle space (11), which receives the facing sheet (2) and is located at that edge (10) of the marginal strip (3) which is proximate thereto, has bearing against the back of the facing sheet (2) an integral strip (15)





extended in cross section, which strip (15) is the continuation of the wall (16) defining the cavity (8) near the facing sheet and serves as the fastening flange for the facing sheet (2).

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2. A form panel as claimed in claim 1, characterized in that in the area of the free edge (13) of the marginal strip (3), next to the cavity (8) arranged there, provision is made for a portion (20) of solid material and a reduction of cross-sectional area (21) and the free edge serves as a stop for a counter-stop (22) on the clamp (7).

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3. A form panel as claimed in claim 1 or claim 2, characterized in that the marginal strip (3) is of approximately the same thickness in the area of its parallel cavities (8) on either side of the groove (14), and the cavities (8) and the walls defining them are also preferably of approximately the same thickness.

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4. A form panel as claimed in any one of claims 1 to 3, characterized in that the breadth of the cavities (8) transversely of the plane formed by the facing sheet (2) is approximately the same.

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5. A form panel as claimed in any one of claims 1 to 4, characterized in that the stop face or contact face (5) of the marginal strip (3) has at least one shallow recess (23) between the two edges (10, 13) of said marginal strip, so that when two marginal strips (3) are in contiguity a clear space remains in said central area.

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6. A form panel as claimed in any one of claims 1 to 5, characterized in that the groove-like channel (14) or the like for application of the clamp (7) is arranged at that distance to the facing sheet (2) and to the free edge (13) of the marginal strip (3) at which a bead (14a) for the application of the clamp (7) is located in a marginal strip (3a) formed of flat steel material, and that in particular the breadth of the marginal strip (3a) consisting of flat material is the same as the breadth of the marginal strip (3) formed by an extruded section.
7. A form panel as claimed in any one of claims 1 to 6, characterized in that the boundary (24) of the groove (14) is inclined, in particular runs at an angle of approximately 45° to the stop face (5) or back (6) of the marginal strip (3).

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A FORM PANEL HAVING MARGINAL STRIPS FORMED BY A FLAT
EXTRUDED SECTION

Abstract

A form panel (1) has marginal strips (3) formed by a flat extruded section of aluminium, an aluminium alloy or of another light metal and therefore has a low weight, nevertheless accompanied by good stiffness. The points for application of clamps (7) for fixing together such marginal strips (3) of adjacent form panels (1) are in spaced relationship to the facing sheet (2) at a location where the marginal strips (3) have a solid cross section and the cavities (8) situated on either side of this point of application are not in danger of being deformed by the pressure force of the clamp (7). A groove (14) or channel is provided for application of the clamp in order that this point of application really is used. Therefore the same clamp (7) can be employed as also may serve for flat marginal strips provided with a central bead and therefore form panels having such marginal strips of different materials can also be combined. (Fig. 3)

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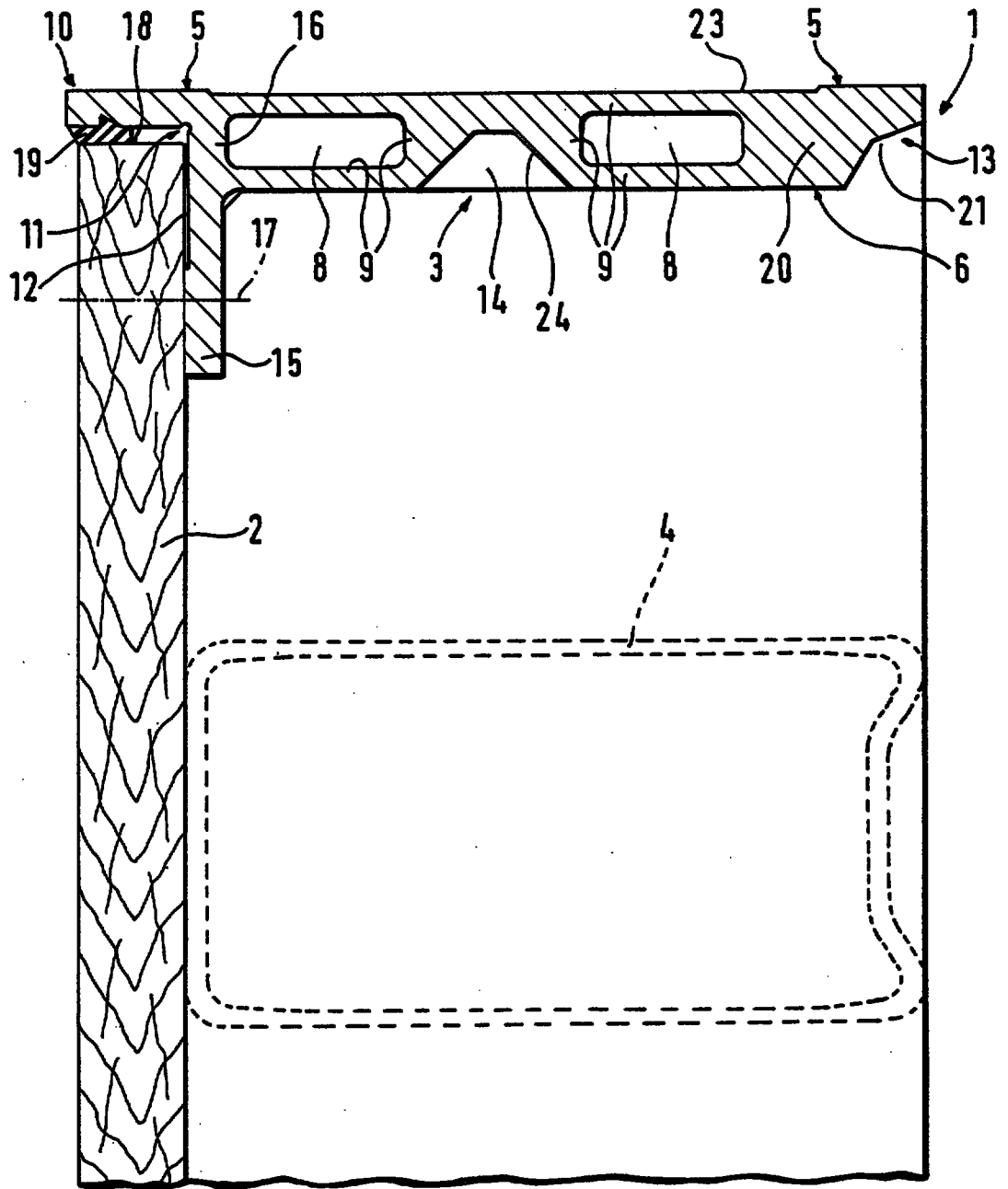


Fig. 1

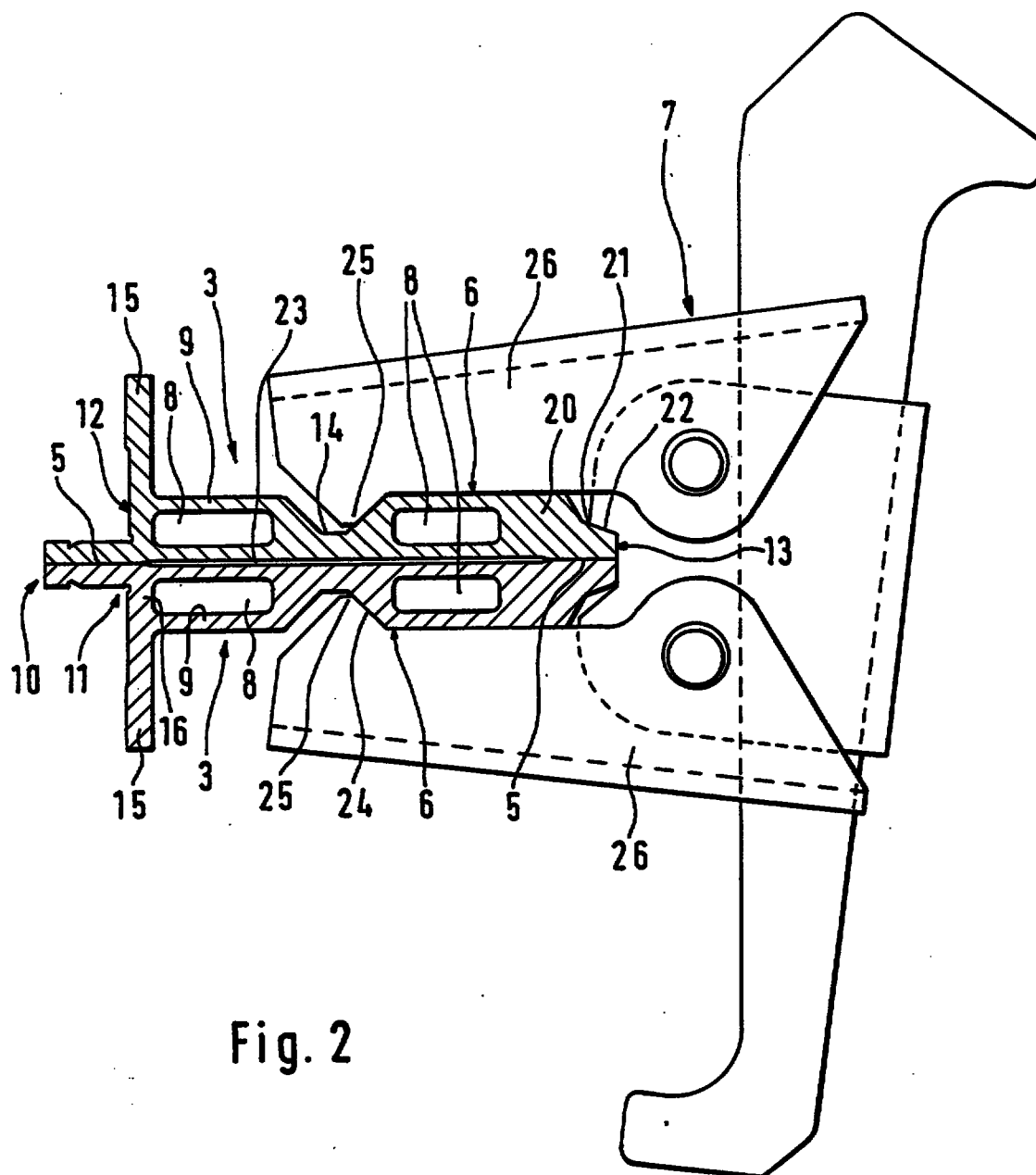
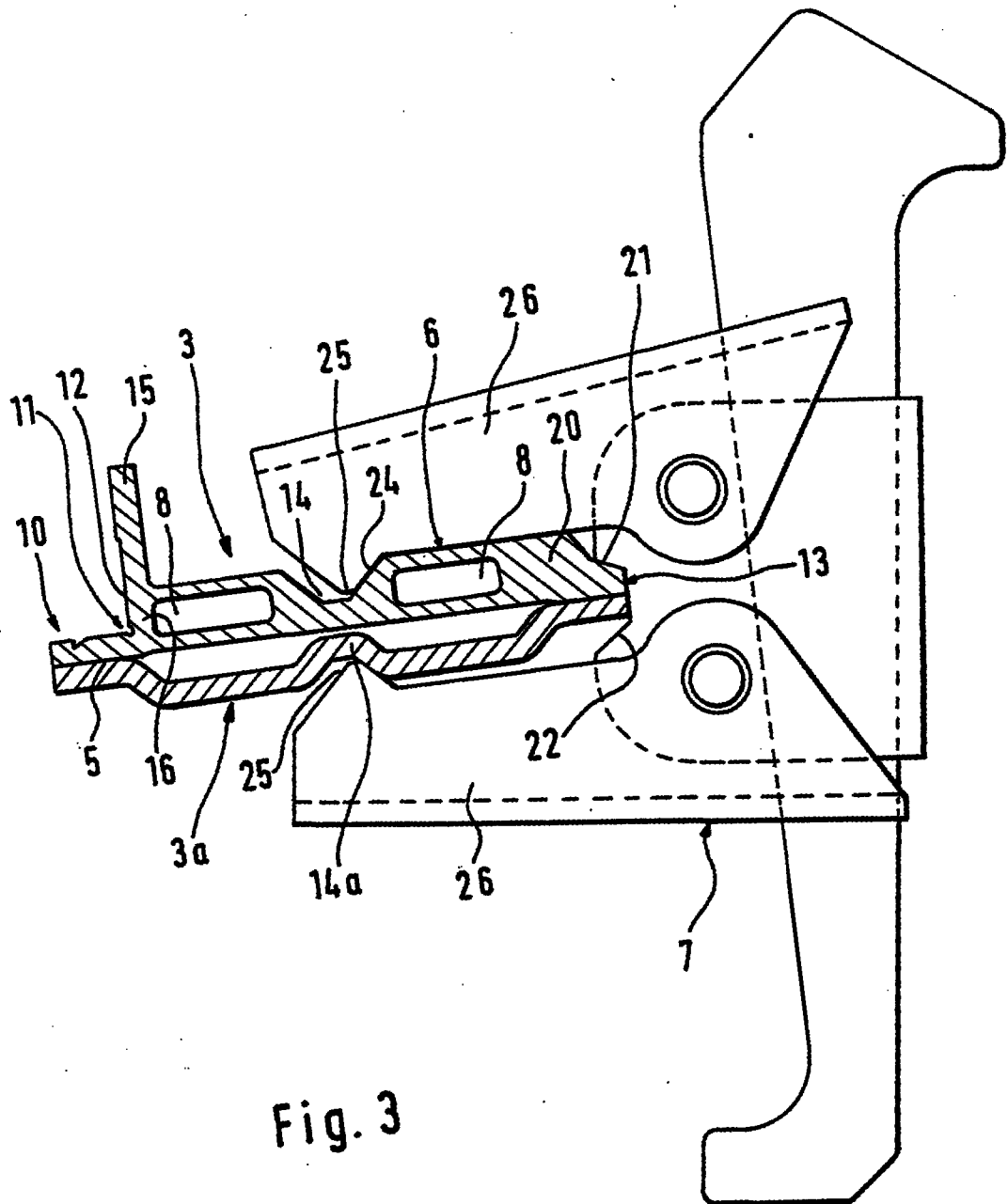


Fig. 2



**A SHUTTERING PANEL HAVING EDGE STRUTS FORMED BY A FLAT
EXTRUDED SECTION**

The invention relates to a shuttering panel having at its edges struts which project approximately at right angles to the shuttering lining and are formed by an extruded section of aluminium, an aluminium alloy or of similar light metal, wherein said edge struts have stop faces which run at right angles to the shuttering lining and in the position of use bear directly or indirectly against stop faces of edge struts of neighbouring shuttering panels, and fasteners in the form of clamps are applied to said edge struts at their backs opposed to the stop faces and serve to fasten together the contiguous edge struts, wherein the extruded sections have cells or similar cavities which extend in the longitudinal direction of the edge struts and are enclosed all round by walls, and wherein for attaching a shuttering lining the one edge of the edge strut has an angle space and the edge which is parallel thereto and is remote from the shuttering lining is embraced by the clamp in the position of use, wherein the point for application of the clamp is a groove or channel which extends at the back of the edge strut and is arranged approximately midway between the edges of the edge strut.

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Such a shuttering panel is already known from practice. The edge struts in the form of an extruded section are relatively thick and therefore correspondingly large clamps have to be applied to them. Further, due to the hollow cross section of the extruded section, an additional strip running parallel to the shuttering lining has to be formed for internal stiffening and is situated in the area of the groove or channel. The large cross section entails a corresponding weight and above all correspondingly large clamps of correspondingly heavy weight have to be used for connecting such shuttering panels.

Shuttering panels are also already known from practice in which the edge struts are made of light metal and the cross section is kept relatively shallow. In order that these edge struts also known from practice have the required stiffness they are also in the form of an extruded section with cavities. This known extruded section has two back points for application of a clamp, each situated near either edge of this extruded section, namely on the one hand near the edge situated at the shuttering lining and on the other hand near the edge remote therefrom.

The points of application overlap the cavities situated in the extruded section and therefore when the clamp exerts a high force there is the danger of indentation of the light metal hollow section of the edge strut. In order that this danger is minimized, but without being able to eliminate it, the clamp is applied to the edge strut right up to its area directly at the back of the shuttering lining, so that the fixation of the edge strut has to be located at the end edge of the shuttering lining. Therefore care has to be taken that fasteners traversing the edge strut in the area of the shuttering lining do not make the stop face situated there uneven and above all unretentive.

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The point, remote from the shuttering lining, at which the clamp is applied is conical viewed in cross section, giving rise to a certain centring effect, but at the same time also to a force component transversely of the wall situated there defining one of the cavities of the extruded section. Hence deformation in this area as well cannot be ruled out when high clamping forces are applied. If such deformation of the extruded section in the area of its walls defining the cavities is to be ruled out, the forces emanating from the clamps either have to be limited or the walls of the edge strut have to be made correspondingly strong, again leading to an increased weight of the shuttering panel.

In the case of the extruded section of relatively wide cross section, a correspondingly wide seating surface for the shuttering lining is formed. However the necessity of correspondingly large clamps has to be conceded to. In the case of the extruded section of shallow cross section, only a very small seating surface is formed at the edge of the edge strut proximate to the shuttering lining.

In both instances the fastener therefore has to be introduced into the narrow edge of the shuttering lining, or in the case of the wide extruded section the fastener has to be introduced from the side of the shuttering lining facing the concrete. This represents either a less stable fixation or harm to the shuttering lining facing the concrete.

The object underlying the invention is therefore to provide a shuttering panel of the kind stated at the outset, wherein the clamping forces can be introduced transversely of the edge strut and outside the walls of the cavities, wherein particularly it is also to be possible for the shuttering panel to be coupled to edge struts of flat steel material,

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particularly to ones having a central bead, wherein the fastening of the edge struts to the shuttering lining is simultaneously improved, but nevertheless relatively small clamps can be used.

To accomplish this object a shuttering panel of the kind mentioned at the outset is characterized in that the edge strut is a flat extruded section and in the area of the groove or channel has a solid cross section, that on either side of the channel cavities extend within the edge strut, that the angle space, which receives the shuttering lining and is located at that edge of the edge strut which is proximate thereto, has bearing against the back of the shuttering lining an integral strip extended in cross section, which strip is the continuation of the wall defining the cavity near the shuttering lining and serves as the fastening flange for the shuttering lining.

Since the edge strut is a flat extruded section, relatively small clamps are sufficient in order to be able to grip the edge struts of adjacent shuttering panels. It is also possible to attach shuttering panels having edge struts of flat steel material, as are described in DE-A-41 03 775.8. Hence a wide spectrum of applications follows. It is advantageous that the clamp is applied to a channel approximately in the centre of the edge strut in order to be able to press the edge struts together.

Since a solid cross section is provided in this area and the cavities are located on either side of this area presenting the groove or channel, these cavities and their walls are not acted upon by the clamp in the sense of their being subject to indentation. Even if very high forces are applied by the clamp, no deformation of the walls defining the cavities is to be expected. Since the clamp is applied in spaced

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relationship to the shuttering lining there is also sufficient space in the area of the shuttering lining for the same to be fastened to the edge strut, for instance at the back of the shuttering lining.

It is of considerable advantage that the angle space, which receives the shuttering lining and is located at that edge of the edge strut which is proximate thereto, has bearing against the back of the shuttering lining an integral strip extended in cross section, which strip is the continuation of the wall defining the cavity near the shuttering lining and serves as the fastening flange for the shuttering lining. The wall which defines a cavity of the extruded section and extends near and parallel to the shuttering lining and to the area for concrete placement therefore does not have to serve as an additional support of the clamp and to take up the clamping forces, because the point for application of the clamp is moved from this area further outwards. Therefore the wall can have the flange-like continuation mentioned, enabling a good seating for the back of the shuttering lining and fixation there. Fasteners are then outside the areas where edge struts of neighbouring shuttering panels contact each other. In addition, the fastener does not have to be introduced into the narrow side of the shuttering lining. Rathermore the fastener provided with an appropriate cross section can be applied transversely of the shuttering lining. Hence an improved fixation of the shuttering lining ensues, without detracting from the potential clamping force when connecting edge struts of neighbouring shuttering panels.

In the area of the free edge of the edge strut next to the cavity arranged there, provision may be made for a portion of solid material and a reduction of cross-sectional area and the free edge may serve as a stop for a counter-stop on the clamp. Therefore, particularly when a force component crosswise to the shuttering lining arises through the clamping,

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the clamp can serve to align the two connected edge struts which abut the counter-stop on the clamp and are hence made to assume a uniform and corresponding position relative to the clamp.

The edge strut may be of approximately the same thickness in the area of its parallel cavities on either side of the groove, and the cavities and the walls defining them may preferably also be of approximately the same thickness. This then results in an edge strut of largely uniform thickness, interrupted only at the back by the groove or channel which corresponds to the bead in an edge strut according to DE-41 03 775 and may also have its shape and effect. It is suitable if this groove has inclined boundaries, whereby the angle of inclination may be for example 45° in order to be able to co-operate with a correspondingly inclined projection of a clamp. This leads to the alignment already mentioned at the counter-stop of the clamp.

The breadth of the cavities transversely of the plane formed by the shuttering lining may also be approximately the same. Then cavities on either side of the groove for application of the clamp are produced which are of approximately the same thickness and breadth and have approximately the same bending strength. Consequently the force of the clamp can also be uniformly distributed on either side of the point for application of the clamp.

The contact face of the edge strut may have at least one shallow recess between the two edges of edge strut so that when two edge struts are in contiguity a clear space remains in this central area. Under the action of the clamping force of the clamp, a possible, slight elastic deformation is therefore permitted, leading to the contact

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faces proper being pressed firmly together and thereby to good tightness. Any small amounts of dirt can be held by the recess or space.

Connection to an edge strut of flat steel material having an inwrought bead according to German laid open print No. 41 03 775 is rendered possible in that the groove-like channel or the like for application of a clamp is arranged at that distance to the shuttering lining and to the free edge of the edge strut at which a bead for the application of the clamp is located in an edge strut formed of flat steel material, and that in particular the breadth of the edge strut consisting of flat material is the same as the breadth of the edge strut formed by an extruded section. Therefore the stop faces can serve for such edge struts composed of different materials to be aligned to one another. The shuttering panel hence has a high loading capacity, accompanied by favourable, low weight and can be connected without any difficulty to the frames of known shuttering panels having flat, steel edge struts. In an advantageous way identical clamps can be used, i.e. an owner of formwork with shuttering panels having edge struts of flat, steel material can replace or complement them by a shuttering panel having the edge strut embodied by the invention formed by an extruded section and he can use the latter together with the other shuttering panels. The owner of an older formwork system therefore also has the possibility of gradually changing it over to the new shuttering panels, without no longer being able to use the older ones.

An exemplary embodiment of the invention will be described in further detail below with reference to the drawings in which, partly in schematic form,

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Fig. 1 is a side view, partly in section, of an edge area of a shuttering panel, showing at the upper edge of the shuttering panel the edge strut in cross section embodied by the invention formed by an extruded section,

Fig. 2 is a cross section through two contiguous edge struts according to the invention which are pressed together by a clamp applied to their central, grooved area where they have a solid cross section, the shuttering lining being omitted for the sake of simplicity,

Fig. 3 is a view corresponding to that of Fig. 2, wherein an edge strut embodied by the invention formed by an extruded section is pressed together with an edge strut of flat steel material having a groove-like bead by the clamp, again for the sake of simplicity showing only the edge struts and not the complete shuttering panels.

A shuttering panel designated 1, has at its edges struts, generally designated 3, which project approximately at right angles to its shuttering lining 2 and are formed by a flat extruded section of aluminium, an aluminium alloy or of another light metal. In addition the shuttering lining may be stiffened by further hollow sections 4 or the like between these edge struts 3.

The edge struts 3 are provided with stop faces 5 which run at right angles to the shuttering lining 2 and in the position of use bear - as a rule directly - against complementary stop faces 5 of edge struts 3 of neighbouring shuttering panels, as is shown particularly in Fig. 2.

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According to Figs. 2 and 3 fasteners in the form of clamps 7 are applied to the backs 6 opposed to the stop faces 5 and serve to fasten together the contiguous edge struts 3, so that the edge struts 3 and thereby the shuttering panels 1 are frictionally interconnected. According to the exemplary embodiments the extruded sections composing the edge struts 3 have cells or cavities 8 which extend in the longitudinal direction of the edge struts and are enclosed all round by walls 9. This leads to reduction in weight, nevertheless accompanied by good stiffness.

The edge strut 3 has at its one edge 10 located in the area of the shuttering lining 2 an angle space 11 for attachment of the latter, the one angle leg engaging over the end face of the shuttering lining 2, while the other angle leg 12 is applied to the shuttering lining 2 at the back thereof facing away from the surface for concrete placement.

The edge strut 3 has its edge 13 parallel thereto and remote from the shuttering lining 2 embraced by the clamp 7 in the position of use, as is shown in Figs. 2 and 3.

The point for application of the clamp 7 is a groove 14 or channel which extends at the back 6 of the edge strut 3 and is arranged approximately midway between the edges 10 and 13 of the edge strut 3, so that the clamp 7 does not have to come right up to the shuttering lining 2. The edge strut 3 has a solid cross section in the area of this groove 14, so that the forces emanating from the clamp 7 do not lead to a deformation of the cavities 8. These cavities 8 extend within the edge strut 3 on either side of the channel 14 and hence on either side of the area having the solid cross section. This arrangement is shown clearly in Fig. 1, but also in Figs. 2 and 3.

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The angle space 11, which receives the shuttering lining 2 and is located at that edge 10 of the edge strut 3 which is proximate thereto, has bearing against the back of the shuttering lining 2 an integral strip 15 or flange extended in cross section, which strip or flange is the continuation of the wall 16 which defines the cavity 8 near the shuttering lining and runs parallel to the shuttering lining 2 and to the surface for concrete placement. This strip 15 may serve as the fastening flange for the shuttering lining 2, as is indicated by the dot-dash line 17 signifying a screw. There is consequently sufficient room for a fastener of almost any cross section, so that considerably improved fixation is possible than if it had to be effected through that leg of the angle space which engages over the end face 18 of the lining skin and is applied to a seal 19 there. In addition the entire edge strut 3 is stiffened further by this strip 15.

In the area of the free edge 13 of the edge strut 3, next to the cavity 8 arranged there, a portion 20 of solid material and a reduction of cross-sectional area 21 are to be seen. The reduction of cross-sectional area can be engaged by a complementary counter-stop 22 of the clamp 7 and hence serves as a stop when aligning two interconnected edge struts 3, as is apparent in Fig. 2. According to Figs. 1 and 2 the stop face or contact face 5 of the edge strut 3 has a shallow recess 23 between the two edges 10 and 13, so that when two edge struts 3 are in contiguity a clear space remains in the central area. This space or recess 23 covers the areas of the cavities 8, so that the actual contact and transfer of force takes place at the sides of the cavities 8. Pressure forces of commensurate magnitude can be transferred and sustained in this area.

The edge strut 3 is of approximately the same thickness in the area of its parallel cavities 8 on either side of

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groove 14, and the cavities 8 and walls defining them are also of approximately the same thickness, resulting in largely conforming dimensions throughout the breadth of the edge struts 3 and thereby the same compressive and flexural strengths everywhere. The breadth of the cavities 8 transversely of the plane formed by the shuttering lining 2 are also approximately the same.

According to Figs. 1 and 2, the boundary 24 of the groove 14 is inclined and runs at an angle of approximately 45° - viewed in cross section - to the stop face 5 of the edge strut 3. A correspondingly shaped projection 25 of the clamp 7 can therefore be applied to the boundary 24 and bring about a certain force component also in the direction of the counter-stop 22 on the clamp 7. Mention is made in this connection that the clamp 7 acts upon the edge struts 3 only with its projections 25 within the groove 14 and even in the clamped position of Fig. 2 a minimal space can remain between the clamping jaws 26 and the back of the edge struts 3. However even if clamping forces are applied and transferred here as well, the intermediate cavities 8 cannot be indented, because a solid cross section on either side of this cavity 8 between the clamping jaws 26 provides for sufficient support.

A clamp of any kind, for instance according to DE-A-41 03 775 or - as illustrated in the exemplary embodiment - according to DE-42 36 070, can be applied to the groove 14 or channel. It is contemplated that the groove-like channel 14 for application of this clamp 7 is arranged at that distance to the shuttering lining 2 and to the free edge 13 of the edge strut 3 at which a bead 14a for the application of the clamp 7 is located in an edge strut 3a according to Fig. 3 formed of flat steel material. The breadth of the edge strut 3a consisting of flat material is the same as the breadth of the edge strut 3 formed by an extruded

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section, so that the two different edge struts 3 and 3a of Fig. 3 can be fastened together without any difficulty by the clamp 7. Therefore shuttering panels having such different edge struts be combined in a simple manner. Hence the invention has succeeded in providing an edge strut formed by an extruded light metal, allowing good application of force of a clamp 7 at a location at which the cavities 8 are not endangered by this pressure force of the clamp 7, also enabling optimal fixation of the shuttering lining 2 and nevertheless permitting of being combined with an already known and existing edge strut in such a way that the same clamp 7 can fix together both different edge struts 3 and 3a. Therefore shuttering panels according to the exemplary embodiment can be combined with ones having edge struts 3a.

The shuttering panel 1 has edge struts 3 formed by a flat extruded section of aluminium, an aluminium alloy or of another light metal and therefore has a low weight, nevertheless accompanied by good stiffness. The points for application of clamps 7 for fixing together such edge struts 3 of adjacent shuttering panels 1 are in spaced relationship to the shuttering lining 2 at a location where the edge struts 3 have a solid cross section and the cavities 8 situated on either side of this point of application are not in danger of being deformed by the pressure force of the clamp 7. A groove 14 or channel is provided for application of the clamp in order that this point of application really is used. Therefore the same clamp 7 can be employed as may also serve for flat edge struts provided with a central bead and therefore shuttering panels having such edge struts of different materials can also be combined.

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P a t e n t C l a i m s

1. A shuttering panel (1) having at its edges struts (3) which project approximately at right angles to the shuttering lining and are formed by a flat extruded section of aluminium, an aluminium alloy or of similar light metal, wherein said edge struts (3) have stop faces (5) which run at right angles to the shuttering lining (2) and in the position of use bear directly or indirectly against stop faces (5) of edge struts (3) of neighbouring shuttering panels, and fasteners in the form of clamps (7) are applied to said edge struts at their backs (6) opposed to the stop faces (5) and serve to fasten together the contiguous edge struts (3), wherein the extruded sections have cells or similar cavities (8) which extend in the longitudinal direction of the edge struts and are enclosed all round by walls (9), and wherein for attaching a shuttering lining (2) the one edge (10) of the edge strut (3) has an angle space (11) and the edge (13) which is parallel thereto and is remote from the shuttering lining (2) is embraced by the clamp (7) in the position of use, wherein the point for application of the clamp (7) is a groove (14) or channel which extends at the back (6) of the edge strut (3) and is arranged approximately midway between the edges (10, 13) of the edge strut (3), characterized in that the edge strut (3) has a solid cross section in the entire area of the groove (14) or channel, that on either side of the channel (14) cavities (8) extend within the edge strut (3) and that the angle space (11), which receives the shuttering

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lining (2) and is located at that edge (10) of the edge strut (3) which is proximate thereto, has bearing against the back of the shuttering lining (2) an integral strip (15) extended in cross section, which strip (15) is the continuation of the wall (16) defining the cavity (8) near the shuttering lining and serves as the fastening flange for the shuttering lining (2).

2. A shuttering panel as claimed in claim 1, characterized in that in the area of the free edge (13) of the edge strut (3), next to the cavity (8) arranged there, provision is made for a portion (20) of solid material and a reduction of cross-sectional area (21) and the free edge serves as a stop for a counter-stop (22) on the clamp (7).
3. A shuttering panel as claimed in claim 1 or claim 2, characterized in that the edge strut (3) is of approximately the same thickness in the area of its parallel cavities (8) on either side of the groove (14), and the cavities (8) and the walls defining them are also preferably of approximately the same thickness.
4. A shuttering panel as claimed in any one of claims 1 to 3, characterized in that the breadth of the cavities (8) transversely of the plane formed by the shuttering lining (2) is approximately the same.
5. A shuttering panel as claimed in any one of claims 1 to 4, characterized in that the stop face or contact face (5) of the edge strut (3) has at least one shallow recess (23) between the two edges (10, 13) of said edge

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strut, so that when two edge struts (3) are in contiguity a clear space remains in said central area.

6. A shuttering panel as claimed in any one of claims 1 to 5, characterized in that the groove-like channel (14) or the like for application of the clamp (7) is arranged at that distance to the shuttering lining (2) and to the free edge (13) of the edge strut (3) at which a bead (14a) for the application of the clamp (7) is located in an edge strut (3a) formed of flat steel material, and that in particular the breadth of the edge strut (3a) consisting of flat material is the same as the breadth of the edge strut (3) formed by an extruded section.
7. A shuttering panel as claimed in any one of claims 1 to 6, characterized in that the boundary (24) of the groove (14) is inclined, in particular runs at an angle of approximately 45° to the stop face (5) or back (6) of the edge strut (3).

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**A SHUTTERING PANEL HAVING EDGE STRUTS FORMED BY A FLAT
EXTRUDED SECTION**

Abstract

A shuttering panel (1) has edge struts (3) formed by a flat extruded section of aluminium, an aluminium alloy or of another light metal and therefore has a low weight, nevertheless accompanied by good stiffness. The points for application of clamps (7) for fixing together such edge struts (3) of adjacent shuttering panels (1) are in spaced relationship to the shuttering lining (2) at a location where the edge struts (3) have a solid cross section and the cavities (8) situated on either side of this point of application are not in danger of being deformed by the pressure force of the clamp (7). A groove (14) or channel is provided for application of the clamp in order that this point of application really is used. Therefore the same clamp (7) can be employed as also may serve for flat edge struts provided with a central bead and therefore shuttering panels having such edge struts of different materials can also be combined. (Fig. 3)

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