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I, Susan Högerich of Josef-Schmid-Strasse 19, D-7619
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hereby declare that I am conversant with the German and
English languages and that to the best of my knowledge
and belief the attached document is a true and correct
translation made by me of the original text of European
Patent No. 0 369 129 of Josef Maier.

Signed this twentieth day of February 1992

Susan Högerich

The invention relates to a form panel having edge sections running round its edges, stiffening girders which are disposed between the edge sections and serve to stiffen the face sheet, and further having tie points which traverse the form panel for the passage of formwork anchor ties therethrough and which are disposed in spaced relationship to the edge sections, there being provided in the assembly position at each tie point a transverse connection at two spaced stiffening girders.

Such a form panel is known from US-A-4 744 541. Apertures for formwork anchor ties to be inserted are known located in spaced relation to the edge webs, in each case traversing the face sheet between two parallel stiffening girders. Wedge elements are provided at the ends of and are movable transversely to the formwork anchor ties, the wedge elements engaging over the two parallel stiffening girders at the rear sides of the latter averted from the face sheet, thus introducing the forces from the formwork anchor ties to the stiffening girders. This means that to detach the formwork anchor ties when stripping the formwork, the wedge element has to be removed in order to release the form panel. At the same time, the aperture in the face sheet means a weakening of the form panel.

US-A-2 963 763 has disclosed a form panel with peripheral edge webs and transverse stiffening girders. In this form panel, perforation of the face sheet for fitting the formwork anchor tie is avoided by the edge webs having recesses, these being complementary to corresponding recesses in contiguous edge webs of neighbouring form panels to form an opening for receiving a formwork anchor tie. The tie points are hence transferred to the edge webs, through which the latter are weakened or have to be devised to be correspondingly strong. In addition, considerable difficulties are encountered with such form panels in tie-work near to ground.

DE-U-8 107 576 has disclosed a form panel having edge sections running round the edges and stiffening girders disposed between the edge sections, wherein tie points traversing the stiffening girders are provided in spaced relationship to the edge webs. Those stiffening girders featuring the tie points hence have a hole through their surface, thereby weakening the stiffening girder.

Therefore the object underlying the invention is to provide a form panel of the kind mentioned at the outset which in any use, hence also in horizontal use, allows formwork anchor ties to be fitted without difficulty in spaced relationship to the form panel edge then at the bottom, wherein it should be possible for the forces coming from the formwork anchor ties to be introduced into the form panel without impairing and perforating the stiffeners.

To accomplish this object, the form panel mentioned at the outset is characterized in that the transverse connection is arranged as a transverse girder secured between both stiffening girders.

In this manner a form panel ensues in which the tie point - preferably a plurality of tie points - situated at this transverse connection in the form of a transverse girder is/are arranged in spaced relationship to and hence without impairing the outer edge sections, without the stiffening girders being weakened or impaired instead and without a bridging element having to be attached to and detached from two parallel stiffening girders when assembling and stripping formwork. By virtue of the transverse connecting piece, the tie points are even reinforced.

It therefore remains possible for this form panel to be used horizontally within close reach of the ground, without preventing or hindering attachment of the formwork anchor ties there. In addition, jointing strips and the like can be provided in the region of the joints between neighbouring form panels without impeding tie-work there. The forces coming from the formwork anchor ties are nevertheless conducted without difficulty into the form panel, it being possible for the tension coming from the formwork anchor tie to be distributed in an advantageous way over two, preferably parallel, stiffening girders, without having to provide a tie point directly on a stiffening girder.

It is appropriate if the stiffening girders conform in outer, cross-sectional shape and if at least one of the two stiffening girders joined to the transverse connecting piece is reinforced and/or has a larger cross section of material in comparison to the other stiffening girders. This makes it all the more possible for the forces coming from the formwork anchor ties to be transferred without

difficulty. The overall appearance of the form panel as regards the stiffening girders is nevertheless uniform. Therefore any supports, booms and the like engaging these stiffening girders can be attached to all of them using identical fastening means or reducers.

It is appropriate if the stiffening girders running between the edge sections are disposed parallel to one another and to one of the edges of the form panel and in particular if they extend horizontally in the position of use - hence vertically when the form panel is prone - and the transverse connections together with the tie points are disposed approximately at right angles between two parallel stiffening girders. These transverse connections are thereby of minimum length and conduct the tension to the two parallel stiffening girders along a correspondingly short path.

The stiffening girders may have an approximately U-shaped or trapezoidal cross section, the opening of this cross section being closed by the face sheet, this altogether leading in a known manner to the form panel being stiffened well. These stiffening girders may have their cross webs averted from the face sheet provided with holes for accessory parts to be fitted. Since all the stiffening girders substantially conform in their outer contour and hence even the reinforced stiffening girders do not vary in their outer contour, these accessory parts and particularly the means connecting them to these stiffening girders do not have to be of different form.

A particularly simple realization of the invention may contemplate that for the purpose of reinforcing the U-shaped or trapezoidal stiffening girders in the region of the tie point they be formed of thicker metal sheeting than the other stiffening girders.

Another or possibly an additional measure for reinforcing the stiffening girder(s) proximate to the tie points may consist in that stiffening webs, stiffening plates or the like are fitted, particularly welded, into the hollow section of these girders. If this measure on its own is sufficient to reinforce the stiffening girder, the latter may in an advantageous way be produced from the same metal sheeting or the same rolled section as the remaining - not reinforced - stiffening girders of the form panel.

An increase in the external dimensions of the form panel may be enabled by girders running approximately centrally parallel to the preferably vertical edge sections, the stiffening girders meeting the former girders from either side and in particular being butt-welded onto them. It is of advantage that the tie points are not provided in the sections running round the edge but are moved inwardly, this advantage obtaining above all for such a form panel having enlarged external dimensions in such a way that the outer frame is not sufficient, but so to say two frames are provided, between each of which the stiffening girders extend. Otherwise, the distance between two tie points might become too large or there would be too many tie points if, between two tie points situated on the edge sections, there were also a third one on the sections in the middle of this enlarged form panel. Moving the tie points away from the edges of the form panel also permits in each case only two tie points to be arranged side by side on a level in such an enlarged form panel, the forces coming from the formwork anchor ties then being conducted into the reinforced stiffening girders.

Since the edge sections are not weakened by tie points, they may be intended for clamps or suchlike connecting members to be applied and additionally have transverse holes for connecting

bolts, slings for cranes or haulage or the like. These transverse holes, through which e.g. two form panels arranged side by side in a plane can be connected, may be provided at any position because the presence of tie points does not have to be considered.

A further or additional measure for reinforcing stiffening girders can also be put to advantageous effect for stiffening girders not in the direct vicinity of tie points, but primarily contributes towards being able to absorb the tension well at the stiffening girders proximate to the tie points. This measure may consist in that the cross web which is provided on the stiffening girders of U-shaped or trapezoidal cross section and is averted from the face sheet has a bead or suchlike deformation, in particular a channel-like cross-sectional shape, whilst in particular this channel may be concave viewed from the outside. This concept means in practice that reinforcement brought about by this shaping for the stiffening girder proximate to the tie point can also be implemented for the other stiffening girders in order to retain the outer contour. This, however, is also of benefit for the other stiffening girders if and when they are used for the fitting of accessory parts such as brackets, shoring, booms or the like.

A very rigid form panel - in which the tie points can be placed so conveniently that rectangular form panels can also be used horizontally without the formwork anchor ties coming too close to the ground or into the region of jointing plates or the like, but in which the tension can still be absorbed well - results above all from the features and steps described above being combined singly or severally. The stiffening girders neverthe-

less conform in outer shape, so that accessory parts can be attached without any difficulty and with the use of identical fasteners to any stiffening girders, even to the reinforced ones.

The invention with its leading features is described more closely below with the aid of the drawings, in which

Fig. 1 shows in schematic form two form panels standing opposite each other, these being enlarged in their external dimensions and nevertheless having in their lower region as well as in their upper region in each case only two tie points on a level and

Fig. 2 is a partial cross section through a form panel according to the invention in the region of a tie point, with a cross section through the stiffening girders and an edge section.

A form panel 1 has edge sections 2 (cf. particularly Fig. 2) which run round its edges and are hollow in cross section, and stiffening girders 4 and 5 which are arranged between the edge sections and serve to stiffen the face sheet 3. Furthermore, the form panel 1 is provided with tie points 6 traversing it for the passage of formwork anchor ties, the tie points taking the form of holes and sleeves 7.

It is evident in Fig. 1 that the tie points 6 are disposed in spaced relationship to the edge sections 2, at or next to a stiffening girder 4, Fig. 2 illustrating that while the stiffening girders 4 and 5 conform in outer cross-sectional shape, the stiffening girder(s) 4 in the region of each tie point 6 are

reinforced and/or have a large cross section of material. Weight is thereby saved and it is nevertheless achieved that identical reducers, couplings and the like for accessory parts can be fastened to all the stiffening girders 4 or 5.

It is contemplated in the exemplified embodiment that a transverse connection 8 be welded between two spaced, parallel stiffening girders 4, the transverse connection featuring the tie point 6, and that at least one of the two stiffening girders 4 joined to the transverse connection 8 is reinforced compared to the other stiffening girders 5. Consequently the tension is transferred to the reinforced stiffening girder(s) 4 by way of this transverse connection 8. In the exemplified embodiment, the transverse connection 8 is a hollow section, appropriately even a totally closed hollow section and the tie point 6 is formed by the sleeve 7 already mentioned traversing this hollow section. In an appropriate manner, the outer surface 8a of the transverse connection 8 is on a level with the outer webs 4a of the stiffening girders 4. Therefore the tension exerted, for example, by a clamp nut onto the transverse connection 8 is conducted into the stiffening girders 4 over the entire height.

The stiffening girders 4 and 5 extending between the edge sections 2 are disposed parallel to one another and to one of the edges of the form panel 1 and as a rule they extend horizontally in the position of use, as shown in Fig. 1. As opposed to this, the transverse connections 8 together with the tie points 6 are disposed approximately at right angles between two parallel stiffening girders 4. However it is also possible for a form

panel 1 to be used turned through 90° in a horizontal position because in an advantageous way the tie points 6 are in spaced relationship to all the edges of the form panel 1.

The stiffening girders 4 and 5 have an approximately U-shaped cross section or - as shown in Fig. 2 - a trapezoidal cross section, the opening of this cross section being closed by the face sheet 3. These sections forming the stiffening girders 4 and 5 have holes 9 provided on their outer webs 4a and 5a averted from the face sheet 3, these holes serving for accessory parts such as supports, booms or brackets or the like to be fitted.

As already mentioned, for the purpose of reinforcing the U-shaped or trapezoidal stiffening girders 4 in the region of the tie point 6 they may be formed of thicker metal sheeting than the other stiffening girders 5. Figure 2 shows, however, that additionally or alternatively, in order to reinforce the stiffening girder(s) 4 proximate to the tie points 6, stiffening webs 10 or stiffening plates or the like may be fitted, particularly welded, into the hollow section of these girders. This would also enable stiffening girders 4 produced from the same thickness of plate as the stiffening girders 5 to be reinforced.

Further reinforcement of the stiffening girders 4 is the result of the cross web 4a averted from the face sheet 3 having a bead or suchlike deformation, in the exemplified embodiment it having an approximately channel-like cross-sectional shape, this channel being concave viewed from the outside. In order that all the stiffening girders 4 and 5 conform in outer cross-sectional shape as desired, the

stiffening girders 5 also have this bead on the cross web 5a.

Fig. 1 shows a form panel 1 of particularly large dimensions, for which the invention and particularly the arrangement of tie points in spaced relationship to the edges is of especial advantage. For, in spite of the form panel 1 being of virtually double width, it is sufficient if at the two levels at which tie points 6 are provided there are in each case only two such tie points. The distance of these tie points from one another as well as from tie points of neighbouring formwork panels is nevertheless not too large, as would have to be feared if the tie points were provided directly on the edge sections 2. In the case of this enlarged form panel 1, girders 11 run approximately centrally, parallel to the vertical edge sections 2, the stiffening girders 4 and 5 meeting the girders 11 from either side and in particular being butt-welded onto them. It is also conceivable that such an enlarged form panel be made by two form panels having edge sections 2 running round them being welded together on one longitudinal side. This girder 11 running in the middle is then doubled, as is also to be seen in the exemplified embodiment.

In accordance with Fig. 2, the edge sections 2 are intended to be engaged by clamps or suchlike connecting members and have a channel-like depression 12 for engagement of a clamp. In addition, they have transverse holes reinforced by sleeves 13 for connecting bolts, slings for cranes or haulage. These can readily be tolerated on the edge webs 2 because the latter are not weakened through having tie points passing through them.

Figure 2 also shows that the tie point 6 is arranged so as to be off the centre of the transverse connecting piece 8, namely, closer towards the middle of the form panel 1 and hence also closer to a stiffening girder 4 more remote from the edge section 2. The desired distance of the tie point from the corresponding edge of the form panel is thereby increased somewhat more. Therefore jointing plates or the like can be provided without difficulty without obstructing the attachment of the formwork anchor tie and without the formwork anchor tie limiting the size of such a jointing plate or the like.

This altogether leads to a form panel 1 which is simple to produce and which, through the tie points 6 being moved more towards the middle of the form panel, has advantages in handling and also in the configuration of the edge sections 2, because the latter are not weakened by tie points. The accompanying reinforcement of the stiffening girders 4 proximate to the tie points 6 can be readily accommodated.



Patent Claims

1. A form panel (1) having edge sections (2) running round its edges, stiffening girders (4,5) which are disposed between the edge sections and serve to stiffen the face sheet (3), and further having tie points (6) which traverse the form panel (1) for the passage of formwork anchor ties therethrough and which are disposed in spaced relationship to the edge sections (2), there being provided in the assembly position at each tie point (6) a transverse connection at two spaced stiffening girders (4), characterised in that the transverse connection (8) is arranged as a transverse girder secured between both stiffening girders (4).

2. A form panel as claimed in claim 1, characterised in that the stiffening girders (4,5) conform in outer, cross-sectional shape and that at least one of the two stiffening girders (4) joined to the transverse connection (8) is reinforced and/or has a larger cross section of material in comparison to the other stiffening girders (5).

3. A form panel as claimed in claim 1 or claim 2, characterised in that the transverse connection (8) is a hollow section, preferably a totally closed hollow section which in particular meets the side faces of the stiffening girders (4) in a butting manner and is preferably welded, and that the tie point (6) is formed by a sleeve (7) traversing the hollow section.

4. A form panel as claimed in any one of claims 1 to 3, characterised in that the outer surface (8a) of the hollow section forming the transverse connection (8) is on a level with the outer webs (4a) of the stiffening girders (4).



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5. A form panel as claimed in any one of claims 1 to 4, characterised in that the stiffening girders (4,5) extending between the edge sections (2) are disposed parallel to one another and to one of the edges of the form panel (1) and in particular they extend horizontally in the position of use, and that the transverse connections (8) with the tie points (6) are disposed approximately at right angles between two parallel stiffening girders (4).

6. A form panel as claimed in any one of claims 1 to 5, characterised in that the stiffening girders (4,5) have an approximately U-shaped or trapezoidal cross section, the opening of said cross section being closed by the face sheet (3), and that said section have holes (9) provided on their outer webs (4a,5a) averted from the face sheet (3), said holes serving for accessory parts to be fitted.

7. A form panel as claimed in any one of claims 1 to 6, characterised in that for the purpose of reinforcing the U-shaped or trapezoidal stiffening girders (4) in the region of the tie point (6), said stiffening girders (4) in the region of the tie point (6) are formed of thicker metal sheeting than the other stiffening girders (5).



8. A form panel as claimed in any one of claims 1 to 7, characterized in that girders (11) extend approximately centrally, parallel to the preferably vertical edge sections (2), the stiffening girders (4,5) meeting said girders (11) from either side and in particular being butt-welded onto them.
9. A form panel as claimed in any one of claims 1 to 8, characterized in that the edge sections (2) are intended to be engaged by clamps, clips or suchlike connecting members and have additional transverse holes for connecting bolts, slings for cranes or haulage or the like.
10. A form panel as claimed in any one of claims 1 to 9, characterized in that in order to reinforce the stiffening girder(s) (4) proximate to the tie points(6), stiffening webs (10), stiffening plates or the like are fitted, particularly welded, into the hollow section of said girders.
11. A form panel as claimed in any one of claims 1 to 10, characterized in that the cross web (4a, 5a) which is provided on the stiffening girders (4,5) of U-shaped or trapezoidal cross section and is averted from the face sheet (3) has at least one bead or deformation running in the longitudinal direction of the girders, in particular has an approximately channel-like cross-sectional shape, said channel in particular being concave viewed from the outside.



12. A form panel as claimed in any one of the preceding claims, characterized in that the tie point (6) is arranged so as to be off the centre of the transverse connecting piece (8), preferably closer to the middle of the form panel (1) and a stiffening girder (4) situated there.