IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF PENNSYLVANIA

Paschal-Werk G. Maier GmbH, Kreuzbühlstraße 5 77790 Steinach Germany	:	Civil Action No._____
Plaintiff,	:	
v.	:	
Atlas Construction Supply, Inc., 4640 Brinell Street San Diego, CA 92111	:	
Defendant.	:	

COMPLAINT

PARTIES

1. Plaintiff, Paschal-Werk G. Maier GmbH ("Paschal-Werk") is a German corporation, having a place of business at Kreuzbühlstraße 5, 77790 Steinach, Germany.

2. Upon information and belief, Defendant, Atlas Construction Supply, Inc. ("Atlas") is a company organized and existing under the laws of the state of California, having a principal place of business at 4640 Brinell Street, San Diego, CA 92111.

JURISDICTION

3. This action arises out of the patent laws of the United States, Title 35, United States Code, and this Court has jurisdiction under Title 28, United States Code Sections 1331 and 1338(a).

4. Venue is properly laid in this judicial district pursuant to Title 28, United States Code, Sections 1391(b), 1391(c), and 1400(b).

BACKGROUND

5. Plaintiff is a developer and distributor of construction equipment and forms used in casting concrete structures, for which it filed two U.S. patent applications on August 6, 1993 and September 2, 1993.

COUNT I – PATENT INFRINGEMENT

6. On November 29, 1994, U.S. Patent 5,368,272 ("the '272 patent"), was duly and legally issued to Plaintiff for an invention entitled Formwork Panel Having at the Edges Thereof Projecting Edge Webs of Flat Material; and since that date Plaintiff has been its owner. A true and correct copy of the '272 patent is attached hereto as Exhibit A and is incorporated herein by reference.

7. On December 6, 1994, U.S. Patent 5,369,851 ("the '851 patent"), was duly and legally issued to Plaintiff for an invention entitled Clamp for Connecting the Sections at the Edges of Formwork Panels; and since that date Plaintiff has

been its owner. A true and correct copy of the '851 patent is attached hereto as Exhibit B and is incorporated herein by reference.

8. Defendant Atlas is willfully infringing, contributing to, or inducing the infringement of the '272 and '851 patents by making, selling, and/or offering for sale products, including its ACS clamp system modular wall forms and wedge clamps that fall within the scope of the claims of the '272 and '851 patents, and will continue to do so unless enjoined by this Court. True and correct copies of photographs of Atlas' ACS clamp system product are attached hereto as Exhibit C.

9. As a result of Defendant's willful, wanton and deliberate acts, Plaintiff has suffered and will continue to suffer irrevocable damages in its trade and business.

10. As a result of Defendant's willful, wanton and deliberate acts, Plaintiff has suffered monetary damages by reason of Defendant's infringement of the '272 and '851 patents, the amount of which is presently unknown.

11. As a result of Defendant's willful, wanton and deliberate acts, Plaintiff has sustained irreparable harm to its business, and unless Defendant is enjoined and restrained by this court, Defendant will continue in the activities alleged herein and as a result thereof, Plaintiff will continue to sustain irreparable harm to its business.

12. Plaintiff has no adequate remedy at law.

PRAYERS FOR RELIEF

WHEREFORE, Plaintiff respectfully requests the following relief:

A. A permanent injunction against Defendant, its agents, servants, employees, and all persons in active concert or participation with, through, or under it, from doing, abiding, causing, aiding or abetting any of the following:

1. Infringing the '272 and '851 patents pursuant to the provisions of 35 U.S.C. Section 283; and

2. From assisting, aiding or abetting any other person or business entity from engaging in or performing any of the above-described acts.

B. An award of damages and lost profits, to be determined at trial, against the Defendant that is sufficient to compensate Plaintiff for its damage pursuant to the provisions of 35 U.S.C. Section 284.

C. An Order trebling the amount of such damages determined under Paragraph B above pursuant to the provisions of 35 U.S.C. Sections 284 and 285 and awarding attorney's fees.

D. An Order requiring Defendant to take all necessary and appropriate steps to recall for destruction all products infringing the '272 and '851 patents;

E. An Order requiring Defendant to send a written notice acceptable to Plaintiff and to the Court to each of the customers from whom they have received an order for any products infringing the '272 and '851 patents, notifying each customer that the orders have been cancelled;

F. An Order requiring Defendant to provide Plaintiff with a list of all customers that have received, ordered or have received quotes or bids from Defendant for any products infringing the '272 and '851 patents;

G. That the Court award Plaintiff its costs, including attorneys' fees, and an assessment of interest.

H. Such other relief as this Court deems just and equitable.

JURY TRIAL DEMAND

Plaintiff hereby demands trial by jury of all issues property tried to a jury.

Respectfully submitted,

Date: 2/10/12

By: _____

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EXHIBIT A

US005368272A

United States Patent [19]

Badstieber

[11] **Patent Number: 5,368,272**

[45] **Date of Patent: Nov. 29, 1994**

[54] **FORMWORK PANEL HAVING AT THE EDGES THEREOF PROJECTING EDGE WEBS OF FLAT MATERIAL**

[75] Inventor: **Johann Badstieber**, Rutesheim, Germany

[73] Assignee: **Paschall-Werk G. Maier GmbH**, Steinach, Germany

[21] Appl. No.: **98,322**

[22] PCT Filed: **Feb. 6, 1992**

[86] PCT No.: **PCT/DE92/00079**

§ 371 Date: **Aug. 6, 1993**

§ 102(e) Date: **Aug. 6, 1993**

[87] PCT Pub. No.: **WO92/14013**

PCT Pub. Date: **Aug. 20, 1992**

[30] **Foreign Application Priority Data**

Feb. 8, 1991 [DE] Germany 4103775

[51] **Int. Cl.**[5] **E04G 17/04**

[52] **U.S. Cl.** **249/192**; 249/44; 249/47; 249/195; 249/196

[58] **Field of Search** 249/47, 189, 192, 193, 249/194, 195, 196, 219.1, 44

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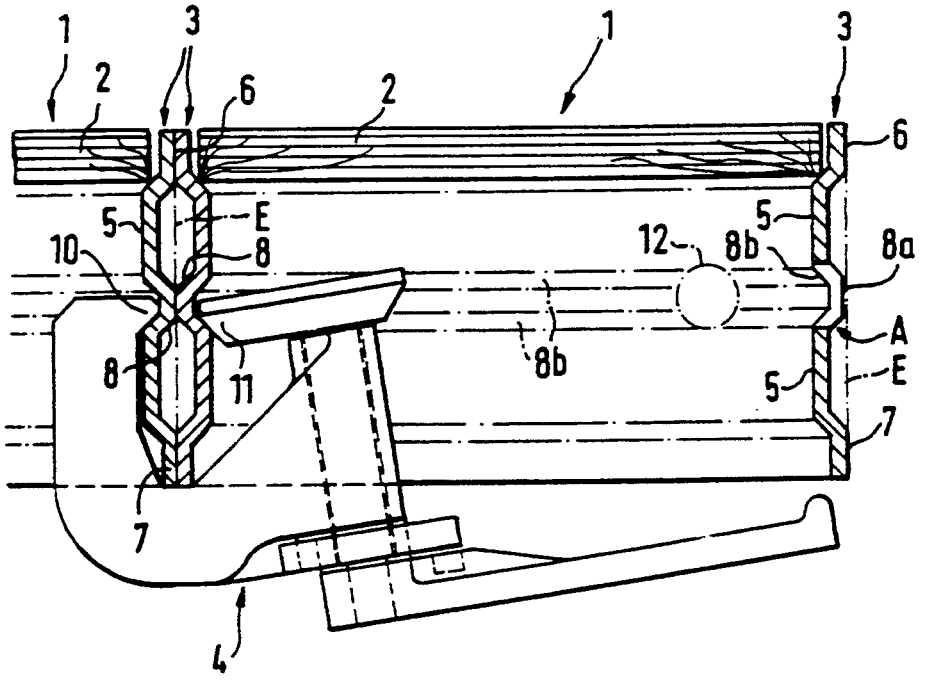
Primary Examiner—Khanh Nguyen
Attorney, Agent, or Firm—Darby & Darby

[57] **ABSTRACT**

A formwork panel has a board and a frame for the board. The frame is made up of strips of sheet material which extend along respective edges of the board and project from the edges at right angles to the board. Each strip has a flat longitudinal marginal portion adjacent to the board and a flat longitudinal marginal portion remote from the board. The marginal portions of a strip are located in a common plane. Each strip further has two protrusions which respectively extend from the marginal portions of the strip towards the opposite strip of the frame and define recesses opening away from the opposite strip. A protuberance is disposed between the two protrusions of a strip. Each protuberance extends from the adjoining protrusions away from the opposite strip and defines a depression opening towards the opposite strip.

16 Claims, 1 Drawing Sheet



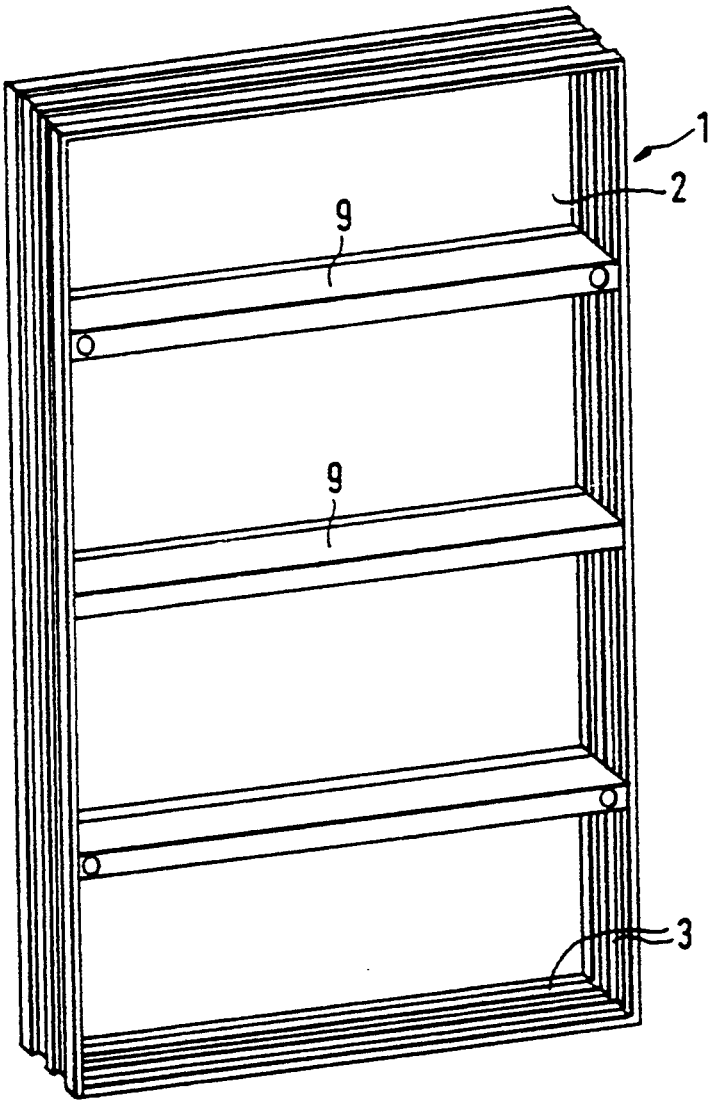


Fig. 1

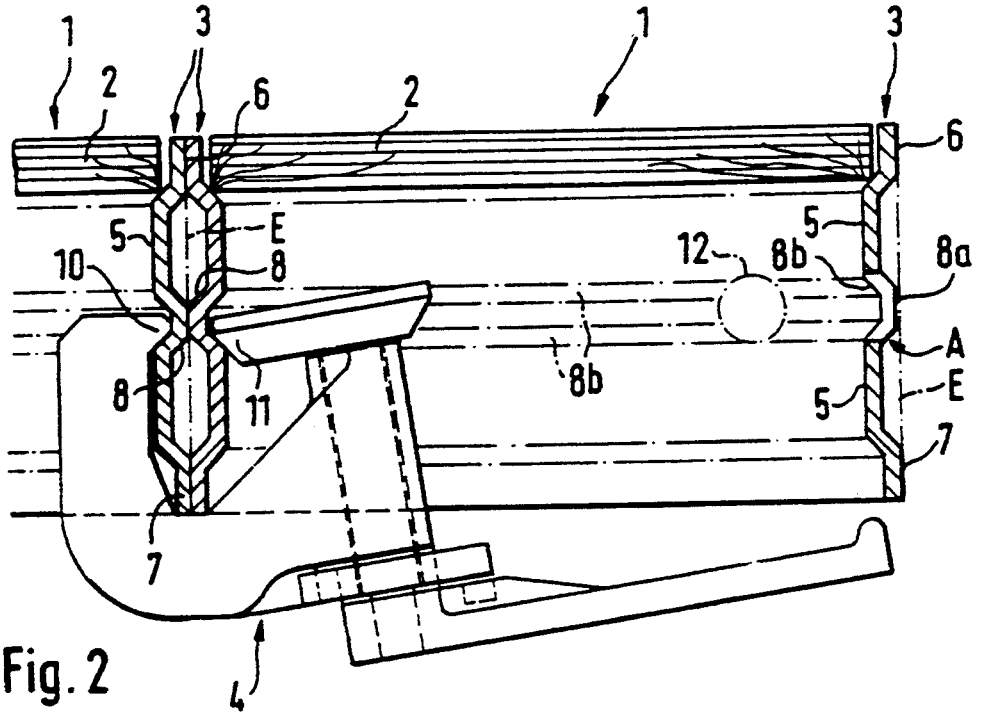


Fig. 2

FORMWORK PANEL HAVING AT THE EDGES THEREOF PROJECTING EDGE WEBS OF FLAT MATERIAL

FIELD OF THE INVENTION

The invention relates to a formwork panel having at the edges thereof edge webs which project at right angles to the forming surface and are made of flat material, the cross section of the edge webs running from the forming surface to a free edge. This cross-sectional course is directed away from the forming surface at least at the free edge and the free edge limits the greatest width of the edge web. In the position of use, the edge webs have lying indirectly or directly thereagainst the edge webs of neighbouring formwork panels and are engaged by connecting means for fastening together the edge webs lying against ore another.

BACKGROUND OF THE INVENTION

Such a formwork panel where the edge webs of aligned and contiguous formwork panels lie directly against one another is known from German Patent Specification No. 21 37 505. Bolts traversing keyhole-like openings in the edge webs serve as the connecting means for fastening together the edge webs lying against one another and have a stop projection and a counter-stop arranged in spaced relationship thereto.

German Patent Specification No. 24 03 325 discloses comparable formwork panels where the edge webs of adjacent formwork panels lie indirectly against one another, that is to say, intermediate parts or spacers are provided between them, while compensating elements may also be provided between such edge webs of aligned, neighbouring formwork panels.

In these known solutions, the edge webs are plane to enable them to lie tightly against one another or to enable intermediate parts to be inserted. However this results in that the stiffness of these edge webs is limited and hence the formwork panels can have only a limited loading capacity.

It is therefore also known, e.g. from German Offenlegungsschrift 27 16 864, to use hollow sections instead of edge webs of flat material. Hollow sections have a greater stiffness, but they also lead to edge webs with large cross sections and correspondingly elaborate connecting means, as well as to considerably higher weights of the formwork panels. In the case of the profiled edge webs according to German Offenlegungsschrift 27 16 864, a C-shape has been selected as the cross section, wherein that free edge of the section which is remote from the forming surface is directed towards the latter and hence does not limit the greatest width of this edge section.

SUMMARY OF THE INVENTION

The object underlying the invention is therefore to provide a formwork panel of the kind mentioned at the outset, in which the edge webs may be of flat material, but one can nevertheless attain a high stiffness accompanied by good sealing of edge webs lying against one another.

This object is accomplished in that between the two aligned longitudinal edges of the edge web which serve as a seating for the edge web of the neighbouring formwork panel is an area receding relative to these longitudinal edges in a direction towards the centre of the formwork panel. In this receding area is at least one

oppositely recessed channel or bead open towards the centre of the formwork panel.

The solution is based on the realization that, as is already known from hollow sections, it is sufficient for sealing abutting edge webs if in each case two edge areas are available as sealing surfaces and seating surfaces. Therefore considerably greater stiffness can be imparted to the edge web consisting of flat material through the described shaping of its crosspiece, as compared with an edge web which is plane throughout. In addition, the further advantage ensues that clamps can have their clamping jaws applied to the beads in the manner as is also known when the edge webs are constituted by hollow sections. Hence these edge webs presenting a stiffened cross-sectional profile but nevertheless consisting of flat material can be engaged by clamps as the connecting means. Clamps have the advantage that they permit of being applied to virtually any locations of the edge webs, and that they allow for a high clamping force and thereby enable good sealing of abutting edge webs or of interposed compensating elements or the like. Nevertheless the total weight of the formwork panel can be kept lower, because the substantially heavier edge sections are replaced by edge webs of flat material which present greater stiffness than plain ones.

It is particularly advantageous if the outer surface of the bead devised for engagement of a clamp is at a distance to a plane contacting the two corresponding outer surfaces of the longitudinal edges of the web. It is sufficient, but at the same time also advantageous, if the distance of the outer surface of the bead from the plane of the longitudinal edges of the web corresponds approximately to or is greater than the elastic deformability of the web when being clamped to a neighbouring web. These measures prevent that when such edge webs lie against one another the outer surfaces of the beads are supported against one another and the sealing surfaces proper fail to be pressed together sufficiently. Rather, one achieves that the entire clamping or connecting force is transferred to the edge webs at their abutting aligned longitudinal edges. The stiffer and thicker the cross sections of the edge webs are, the smaller will be the distance between the outer surface of the bead and the plane of the outer surfaces of the longitudinal edges. The cross-sectional thickness of the edge webs may be, for example, about ½ cm to about ¾ cm and particularly about 6 mm. Given a cross-sectional thickness of about 6 mm, a distance of the outer surface from the plane of the longitudinal edges in the order of about ½ to 1 mm is sufficient in order to achieve on the one hand the desired firm contact pressure of the aligned longitudinal edges and sealing surfaces of the edge webs and on the other hand to allow for elastic deformation under the influence of the clamping force.

It is suitable for the exterior surfaces of the two longitudinal edges of the edge webs to be plane and in alignment and the width at least of the longitudinal edge closer to the forming surface may at least approximate at least the thickness of this forming surface. However, both longitudinal edges may suitably be of the same width in order that a symmetrical cross section ensues and the bead can also be arranged in the centre of the edge webs.

That area of the edge webs which, in relation to the longitudinal edges, recedes towards the centre of the formwork panel may be plane except for the bead. This area is thereby available in order to allow, for example,

further stiffening webs to butt and to be welded to the edge webs. In addition, a sleeve for a tie could in this way be fixed to the inside or inner surface of the edge webs. Further, in this way supports or brackets could be attached to the edge webs.

The bead arranged in the longitudinal direction of the edge web—particularly in the centre thereof—may run uninterrupted and particularly with uniform cross section throughout the length of the edge web. Therefore a clamping device can be applied to virtually any location of the edge web. Further, in this way the edge webs can be made from an originally plane, flat material in a continuous profiling process.

Holes traversing the edge webs, e.g. for attaching connecting bolts or the like, may be provided in the area of the bead. With the use of such connecting bolts, adjacent formwork panels can be fastened together or accessories such as working platforms, shores and the like can be coupled to abutting edge webs of adjacent formwork panels. The arrangement of these coupling holes in the area of the beads has the advantage that the clamping forces applied in the longitudinal direction of the bolts are introduced at the beads provided for them.

The holes provided in the area of the beads may have a circular cross section and their diameter can in particular approximate the greatest width of the bead, so that the walls of the holes also traverse the lateral boundaries of the bead. Therefore, the head of a connecting bolt and also a nut cooperating with a threaded stud can rest against the surface which faces the centre of the formwork and forms part of that area of the edge webs which recedes at the side of the bead.

The transitions from the longitudinal edges to the central area of the edge web and/or the lateral boundaries of the bead may run at a slant relative to the cross-sectional contour of the edge web, for example at an angle of about 45 degrees. This produces not only a good stiffening, but also permits the desired shaping of the cross section of the edge web, without the danger of damage or weakening during the profiling process.

The invention thus provides a formwork panel which is of relatively low weight because its edge webs can consist of flat material. It is nevertheless possible for great forces to be transferred and for clamping devices to be used for connecting neighbouring formwork panels. The advantages of formwork panels with flat edge webs are combined with the advantages displayed by formwork panels with edge webs composed of hollow sections without a considerable increase in weight.

BRIEF DESCRIPTION OF THE DRAWINGS

An exemplary embodiment of the invention is described in more detail below with reference to the drawings in which:

FIG. **1** is a diagrammatic rear view of a formwork panel according to the invention having profiled edge webs of flat material running round the edges and transverse stiffening sections arranged inbetween, and

FIG. **2** is a section through mutually opposed edge webs of the formwork panel with a neighbouring formwork panel fastened thereto, the edge webs in contact being held together by a clamping device.

DESCRIPTION OF PREFERRED EMBODIMENTS

A formwork panel **1** has running round the edges thereof edge webs **3** of flat material which project at right angles to its forming surface **2**. In the position of use, the edge webs have lying indirectly or—according to FIG. **2**—directly thereagainst the corresponding edge webs **3** of neighbouring formwork panels **1** and are connected with the aid of fasteners, in the exemplary embodiment with the aid of a clamping device **4**.

It is clear particularly with reference to FIG. **2** that the cross section of the edge webs **3** runs from the forming surface **2** to a free longitudinal edge **7**, this free edge **7** limiting the greatest width of the edge web **3** and being directed away from the forming surface **2**.

The cross sections of the edge webs **3** in FIG. **2** illustrate that between the two aligned longitudinal edges **6** and **7** of the edge web **3** which serve as a seating for the edge web **3** of the neighbouring formwork panel **1** is an area **5** receding relative to these longitudinal edges **6** and **7** in a direction towards the centre of the formwork panel **1**. In this receding area **5** is an oppositely recessed channel or bead **8** open towards the centre of the formwork panel. FIG. **2** illustrates that a bead **8** of an edge web **3** cooperates with the bead **8** of the edge web **3** of the neighbouring formwork panel **1**, when the clamp **4** engages these beads **8** to connect the formwork panels **1**. Through the clamping force, the confronting outer surfaces **8***a* of the beads **8** are brought closer to one another or are even pressed together. In the starting position, however, where there is no deformation by the clamping force, the outer surfaces are at a distance to a plane contacting the two outer surfaces of the longitudinal edges **6** and **7** of the webs **3**. It is thereby ensured that in the position of use the longitudinal edges **6** and **7** of the webs **3** come into contact with one another and lie tightly against one another, and that there is no premature contact of the outer surfaces **8***a* of the beads **8** which could prevent firm contact between the longitudinal edges **6** and **7**. In addition, due to the resilience of the edge webs **3**, a corresponding pressure force can be generated and transferred in the area of the longitudinal edges **6** and **7**.

It is suitable if the distance A of the outer surface **8***a* of the bead **8** from the plane E of the longitudinal edges **6** and **7** of the web **3** corresponds approximately to or is even greater than the maximum elastic deformability of the edge web **3** when being clamped to a neighbouring web, so that contrary to the representation of FIG. **2** the outer surfaces **8***a* of abutting edge webs **3** do not come into contact.

FIG. **2** illustrates that the exterior surfaces of the two longitudinal edges **6** and **7** of the edge web **3** are plane, namely lie in plane E, and are in alignment. The width at least of the longitudinal edge **6** closer to the forming surface **2** approximates the thickness of this forming surface **2**, so that the receding area **5** can begin directly at the rear of the forming surface **2**, but the forming surface can reach up to the inside of the longitudinal edge **6**, except for a sealing joint. In the exemplary embodiment, both longitudinal edges **6** and **7** are of the same width. An essentially symmetrical configuration of the edge web **3**, which is stiffened by the receding area **5** on the one hand and by the bead **8** on the other hand, is then achieved if—as in the exemplary embodiment—the bead **8**, which extends in the longitudinal direction of the edge web **3** and runs uninterrupted and with uniform cross section throughout the length of the edge web **3**, is arranged in the centre of the cross section of the edge web **3**. The area **5** of the edge webs **3** which, in relation to the longitudinal edges **6** and **7**, recedes towards the centre of the formwork panel **1** is plane except for the bead **8**. Therefore, when butting

against these areas **5**, stiffening sections **9** arranged transversely to the edge webs **3** find a good support and a correspondingly wide area for the provision of a weld seam. Further, in this way a clamp **4** can be pushed over abutting edge webs **3** without excessive movement of its clamping jaws **10** and clamping pieces **11**. The edge webs **3** may be traversed, particularly in the areas of their beads **8**, by holes **12** at which fastening bolts may be arranged instead of or in addition to the clamp **4**. While the clamp **4** permits a fastening at virtually any area of the edge webs **3**, fastening bolts can be provided at preselected locations with the aid of the holes. In addition, accessories such as brackets or supports can be fixed with such fastening bolts.

It is indicated in FIG. **2** that the holes **12** provided in the area of the beads **8** have a circular cross section and that diameter corresponds approximately to the greatest width of the beads **8**, so that the walls of the holes also traverse the lateral boundaries **8***b* of the beads **8**. Hence the plane zones which form part of the receding areas **5** and are adjacent to the holes **12** are available as a support for a head or a nut or a projection of a fastening bolt.

The transitions from the longitudinal edges **6** and **7** to the central area **5** of the edge web **3** and the lateral boundaries **8***b* of the bead **8** are at a slant relative to the cross-sectional contour of the edge web **3**, in the exemplary embodiment at an angle of about 45 degrees. This has the result that the transitions from abutting edges **6** together form approximately a right angle which constitutes a good compromise from the viewpoint of metal forming on the one hand and from the viewpoint of introducing clamping forces on the other hand.

The formwork panel **1** is of great stiffness. The edge webs **3**, although made of flat material, also display great stiffness by virtue of their cross-sectional shape, while being of relatively low weight. At the same time, a clamp **4** with relatively small jaw displacement is sufficient in order to be able to connect the edge webs. Since the bead **8** enhancing the stiffness allows a clamp **4** to be applied, the holes **12** can be dispensed with. Further, with the aid of a clamp **4**, a connection can be established at virtually any location of the contacting edge webs **3**. Hence the advantages accruing from the relatively low weight of the edge webs **3** consisting of flat material are combined with the possibility of being able to apply clamps at any points of contact, and hence of not being dependent on given hole spacings. Consequently on the one hand the beads **8** have the function of increasing the stiffness of the edge webs **3** and on the other hand they fore a convenient point of engagement for the clamp **4**.

In order to save weight, instead of having hollow sections, the formwork panel **1** has at the edges thereof edge webs **3** which are made of flat material and project at right angles to the forming surface **2**. To increase the stiffness, the edge webs **3** have between their two aligned longitudinal edges **6**, **7** serving as a seating for the edge web **3** of a neighbouring formwork panel **1** an area **5** receding towards the centre of the formwork panel **1**. Within this area **5**, there is an oppositely recessed channel or bead **8** open towards the centre of the formwork panel. In this way, an edge web **3** of flat material and high stiffness is obtained. It is possible for ordinary clamps **4** to be applied to its bead **8** without a need for the high weight of hollow sections. The cross-sectional thickness of the edge webs **3** may be, for example, about ½ cm or 0.6 cm and the distance of the outer surface **8***a* of the bead **8** from the plane E may be between ½ and 1 mm, possibly also somewhat more.

I claim:

1. A formwork panel, comprising a forming element having a forming surface and a pair of opposed edges; and a rim projecting from one of said edges transverse to said surface, said rim having a substantially flat first marginal portion disposed adjacent said element in a predetermined plane, a substantially flat second marginal portion in said predetermined plane at a spacing from said element, a protrusion between said marginal portions extending from said predetermined plane towards the other of said edges and defining a recess which opens away from said other edge, and a protuberance extending from said protrusion away from said other edge and defining a depression which opens towards said other edge, said rim being free of folds wherein said rim has a second protrusion between said marginal portions extending from said predetermined plane towards said other edge and defining a second recess which opens away from the other edge, said protuberance extending from said second protrusion.

2. The formwork of claim **1**, wherein said rim is substantially perpendicular to said surface.

3. The formwork of claim **1**, wherein said second marginal portion has a free end face which faces away from said element.

4. The formwork of claim **1**, wherein each of said marginal portions has a surface which faces away from said other edge, said surfaces of said marginal portions being located in a common plane, and said protuberance having a surface which faces away from said other edge and is spaced from said common plane in a direction towards said other edge.

5. The formwork of claim **4**, wherein said rim has a maximum elastic extensibility and said surface of said protuberance is spaced from said common plane by a distance which is approximately equal to or exceeds said extensibility.

6. The formwork of claim **1**, wherein said element has a predetermined thickness and said first marginal portion has a predetermined width which is at least approximately equal to said predetermined thickness.

7. The formwork of claim **6**, wherein said marginal portions have substantially the same width.

8. The formwork of claim **1**, wherein said protrusion has a substantially flat section spaced from said predetermined plane.

9. The formwork of claim **1**, wherein said rim is elongated along a direction substantially parallel to said surface and has a predetermined length, said protuberance extending longitudinally of said rim along substantially the entire predetermined length of said rim.

10. The formwork of claim **9**, wherein said protuberance has a substantially constant cross section throughout.

11. The formwork of claim **1**, wherein said protuberance is provided with at least one opening.

12. The formwork of claim **11**, wherein said protuberance has a predetermined width and the size of said opening is at least approximately equal to said predetermined width.

13. The formwork of claim **12**, wherein said opening has a substantially circular cross section of diameter at least approximately equal to said predetermined width.

14. The formwork of claim **1**, wherein said protrusion and said protuberance each have a marginal section and at least one of said marginal sections is inclined to said predetermined plane.

15. The formwork of claim **14**, wherein said one marginal section is inclined to said predetermined plane at an angle of about 45 degrees.

16. The formwork of claim **1**, wherein said rim is formed from flat material.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 5,368,272
DATED : November 29, 1994
INVENTOR(S) : Johann BADSTIEBER

It is certified that error appears in the above-indentified patent and that said Letters Patent is hereby corrected as shown below:

On the title page item [73], should read

--Paschal-Werk G. Maier GmbH, Steinach, Germany--.

Signed and Sealed this

Twenty-seventh Day of June, 1995

Attest:

BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks

EXHIBIT B

US005369851A

United States Patent [19]

Merkel

[11] Patent Number: 5,369,851

[45] Date of Patent: Dec. 6, 1994

[54] **CLAMP FOR CONNECTING THE SECTIONS AT THE EDGES OF FORMWORK PANELS**

[75] Inventor: **Josef Merkel**, Welschensteinach, Germany

[73] Assignee: **Paschal-Werk G. Maier GmbH**, Steinach, Germany

[21] Appl. No.: **116,248**

[22] Filed: **Sep. 2, 1993**

[30] **Foreign Application Priority Data**

Oct. 26, 1992 [DE] Germany 4236070

[51] **Int. Cl.**[5] **E04G 17/00**

[52] **U.S. Cl.** ..... **24/136 R**; 24/132 WL; 24/495; 248/231.3

[58] **Field of Search** ..... 24/136 R, 132 WL, 495, 24/483, 514, 525, 535, 492; 248/231.3, 231.5; 269/223, 237, 229, 239

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4,716,811	1/1988	Johnson	24/495

Primary Examiner—Victor N. Sakran
Attorney, Agent, or Firm—Darby & Darby

[57] **ABSTRACT**

A clamp (1) serves for formwork panels (2) arranged in-plane, side by side, to be connected at the webs (3) running round their edges and has for this purpose two clamping jaws (4) which urge these edge webs (3) together and can be swivelled relative to each other and to a mount (8) with the aid of a wedge (7), the mount simultaneously constituting the abutment for the wedge (7). The clamping jaws have for this purpose points (6) of application for the wedge face (7c) averted from face (7b), which points of application (6) are spaced from the swivel bearings (5) of the clamping jaws (4) and are under a lever arm. These points of application (6) are suitably arranged at the inner end of an elongated and guiding slot (10) which is open towards the opposite side and also affords lateral guidance for the wedge as it moves. The direction in which the wedge extends and moves is crosswise to the extent of the swivelling axes of the swivel bearings (5) with which the clamping jaws (4) are swivel-mounted on the common mount (8). (FIG. 2)

16 Claims, 4 Drawing Sheets

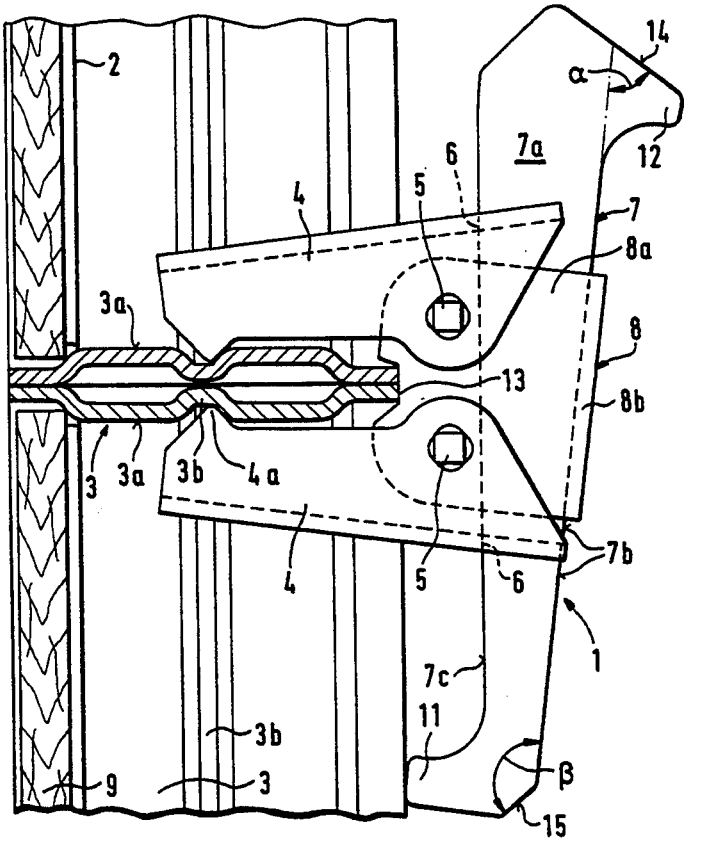
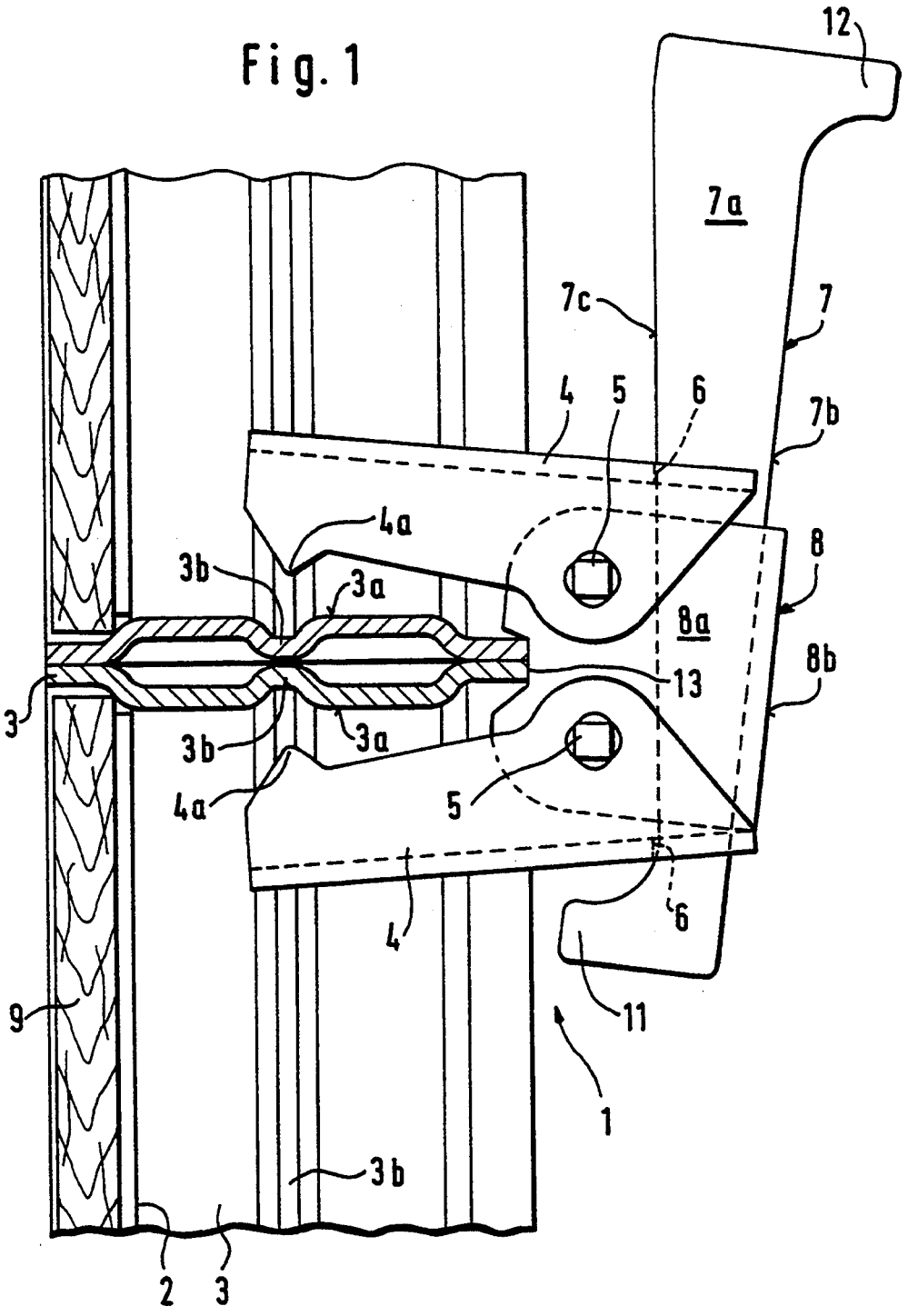
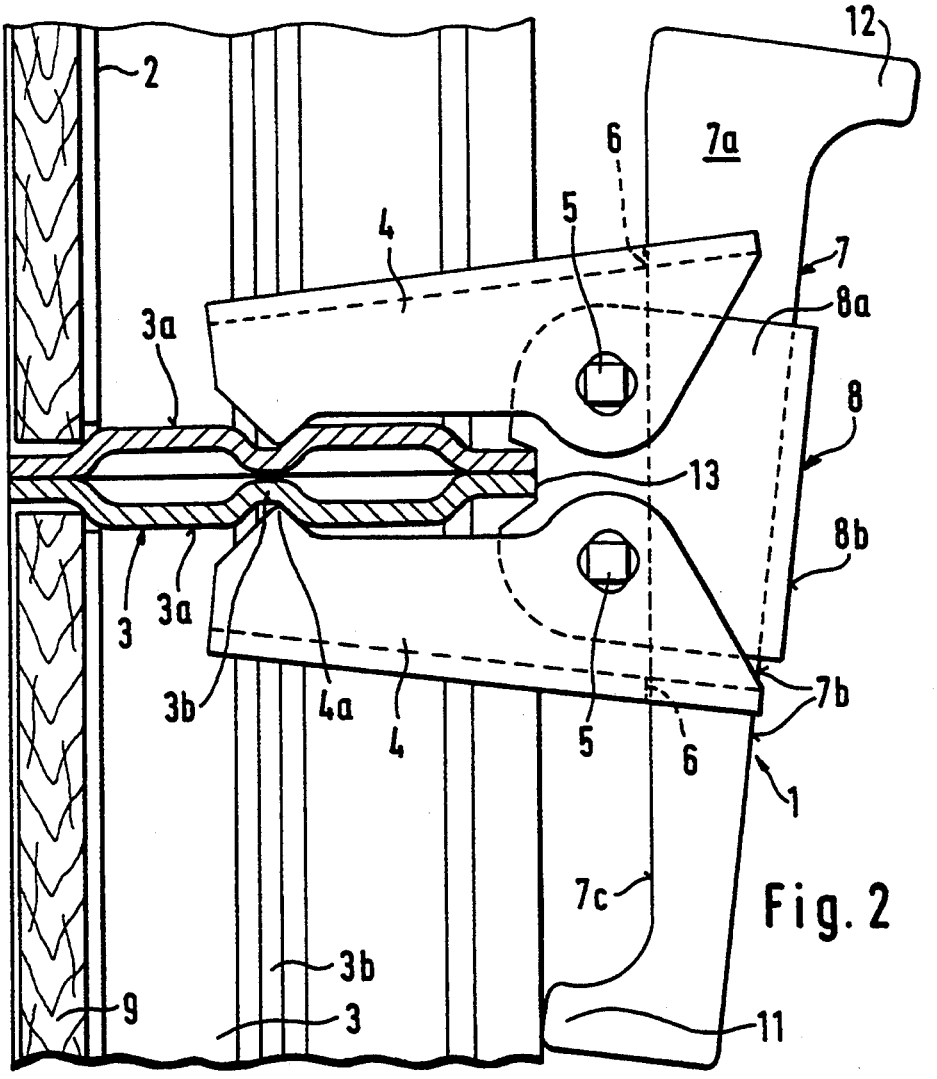


Fig. 1

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2
6
7a
4
5
7
8a
3a
8
13
8b
3
3a
3b
4a
4
5
6
7b
1
7c
3b
9
3
11

Fig. 2

Fig. 3

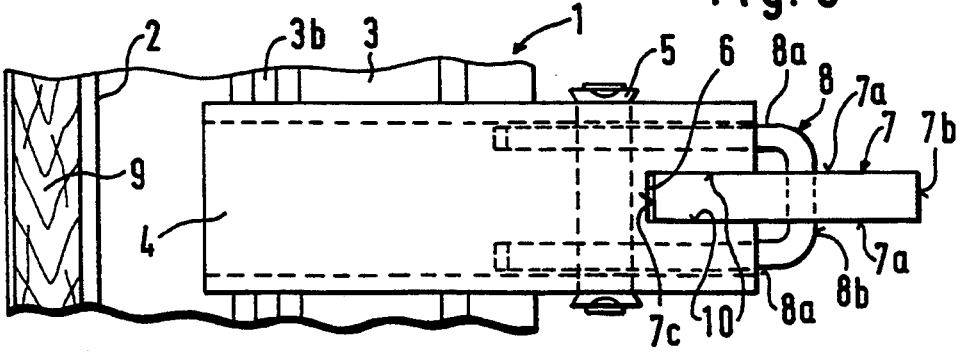
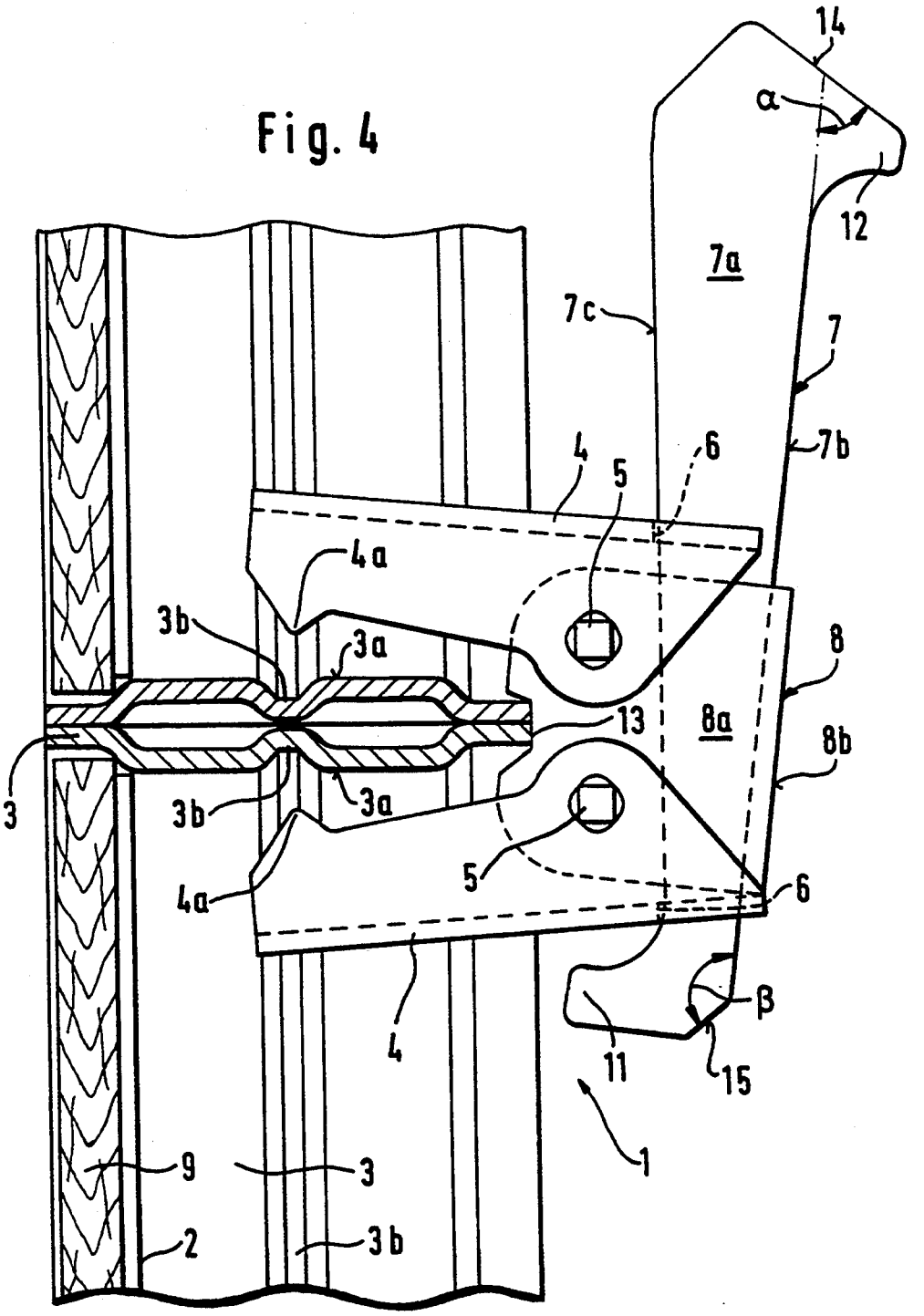

2
3b
3
1
5
6
8a
8
7a
7
7b
9
4
7a
8b
8a
7c
10

Fig. 4



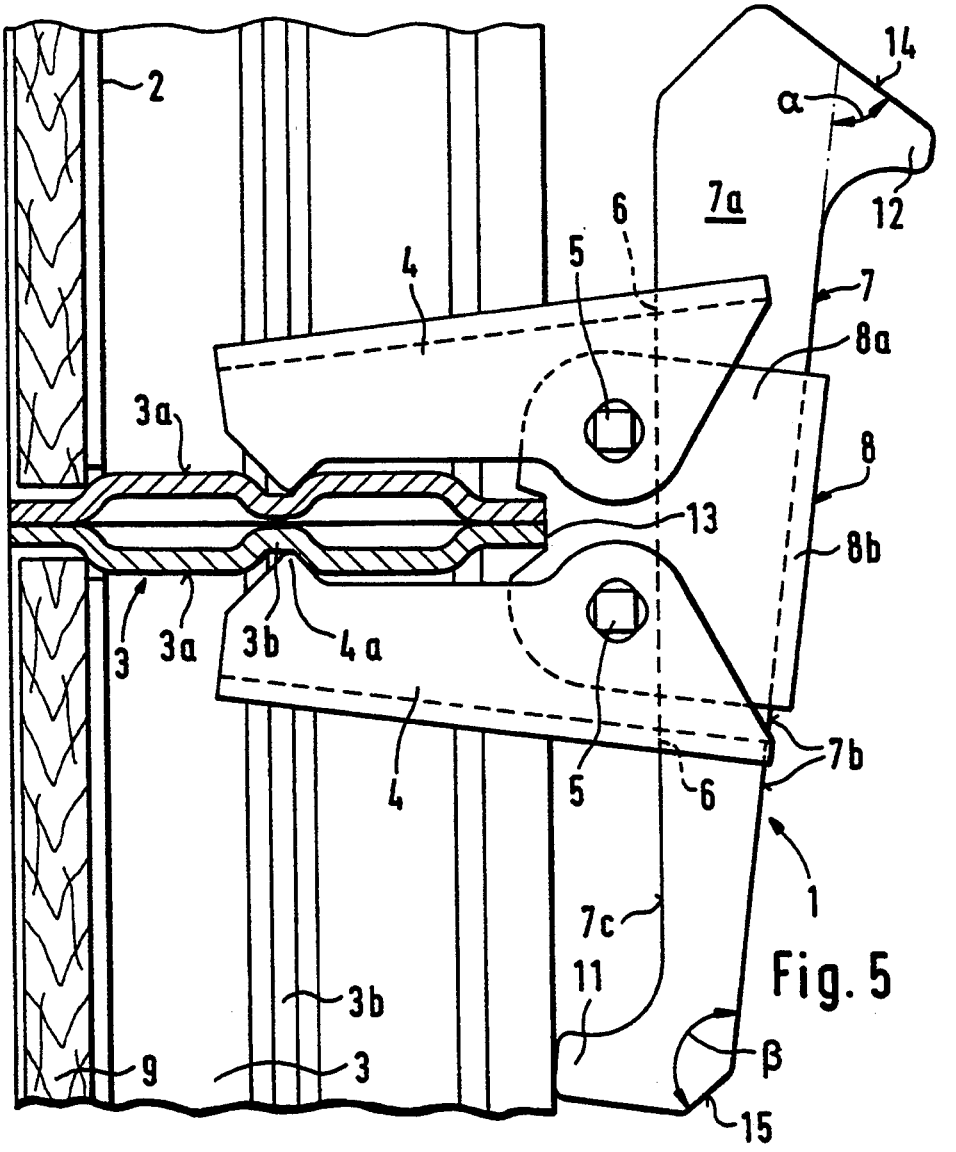

2
14
α
12
7a
6
5
4
7
8a
3a
8
13
8b
3
3a
3b
4a
4
5
6
7b
1
7c
11
3b
9
3
β
15

Fig. 5

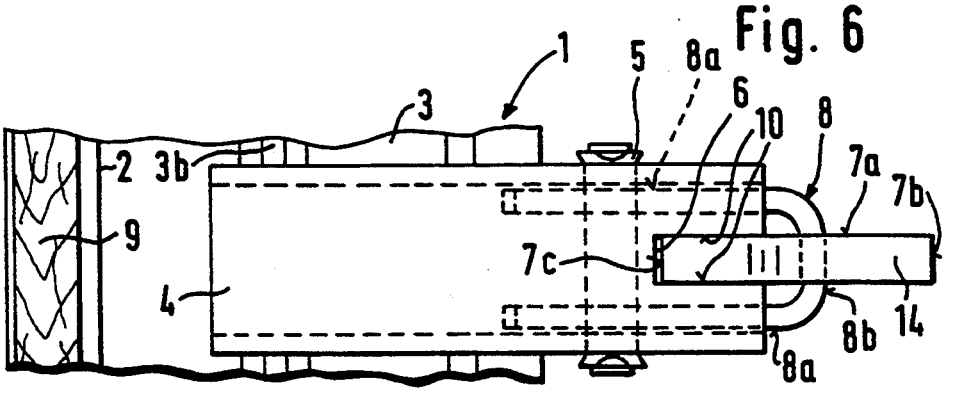

1
5
8a
3
6
10
8
2
3b
7a
7b
9
7c
4
8b
14
8a

Fig. 6

CLAMP FOR CONNECTING THE SECTIONS AT THE EDGES OF FORMWORK PANELS

The invention relates to a clamp for connecting formwork panels which are arranged in-plane, side by side, and have webs or sections running round their edges, the clamp including two clamping jaws which are adapted to be swivelled towards and urge together the longitudinal faces averted from each other of the abutting edge webs or the like, and further including an actuating element for swivelling these clamping jaws, the two clamping jaws each having located at their end averted from their clamping point and arranged in spaced relationship to their swivel bearing a point of application for the actuating element, and the actuating element being supported on a mount belonging to the clamp, on which the two clamping jaws are swivel-mounted.

Such a clamp is known from German Utility Model No. 88 14 208 and has proved to be useful particularly for edge sections in the form of hollow ones of relatively large cross section. It is then necessary, however, that the two clamping jaws are approximately L-shaped and have adjusting arms directed towards and overlapping each other, in order that in the region where the two adjusting arms overlap both can be jointly engaged by an eccentric whose pivot or swivel bearing also has to be movable perpendicular to the forming surface. It is true that this provides for simple manipulability, because a turn of the eccentric effects the bracing wanted. However, particularly the requirement that both clamping jaws overlap each other at their adjusting arms entails a need for corresponding space or restricts the potentially selectable cross sections of material, particularly in the loaded area.

In a clamp of a different kind, according to DE-27 59 966 C2, the clamping jaws or arms are not swivel-mounted on a support, but are movable relative to each other with the aid of overlapping adjusting arms, the latter being jointly traversed by a wedge, so that by driving in the wedge the two adjusting arms and thereby also the clamping arms can be drawn together and braced. The wedge has to be arranged with its breadth approximately parallel to the forming surface, while its working wedge faces opposite and at an angle to each other are at approximately right angles to the forming surface, and the moving direction of the wedge is again directed parallel to the forming surface. This has the result that, as the wedge is driven in, the adjusting arms are not only moved relative to each other but at the same time may also be pressed one against the other, so that the frictional force encountered is liable to be increased in such a way that at least part of the clamping force may thereby be used up.

A clamping device for edge sections of adjacent formwork panels is known from DE-35 17 307 A1, in which swivel-mounted on a support having a fixed clamping jaw as a stop there is a second clamping jaw, whereby the swivelling can be effected with the aid of a threaded piece movable approximately at right angles to the forming surface and can be transferred by way of an L-limb. Therefore different movements result at the mutually opposed clamping jaws and the selected transmission to a swivel member with the aid of a screw spindle performing rectilinear movements requires additional measures.

Therefore the object underlying the invention is to provide a clamp of the kind mentioned at the outset, wherein the advantages of two clamping jaws adapted to swivel relative to each other and to a mount are maintained, but nevertheless a simple actuating element needing no pivot bearings can be used.

This object is accomplished in that the actuating element is a wedge which is arranged with its large face in the swivelling plane and is supported with the one small face against the mount side facing the forming surface and is supported with the other wedge face against the points of application of the clamping jaws, the former being arranged in spaced relationship to the swivel bearings, that the points of application of the two clamping jaws are in each case arranged on sides averted from each other, and in both end positions of the wedge the latter projects beyond both clamping jaws at their points of application.

Hence a very simple actuating element proven in formwork is provided, namely a wedge, but it is avoided that the wedge traverses overlapping parts, so that the parts to be moved towards each other are pressed one against the other through the component oriented in the direction in which the wedge is driven in. Rathermore, the wedge faces can act directly on the points of application, without the parts thereby to be swivelled contacting each other and rubbing against each other. It follows that the wedge is arranged with its breadth in a plane approximately at right angles to the forming surface, as a rule a horizontal one, while the two working wedge faces at an angle to each other are in vertical planes, one of which may run parallel to the forming surface, while the other is at the wedge angle thereto. Very simple handling results, because the wedge can be driven in the one direction and by this means both clamping jaws are swivelled relative to their mount, while they are loosened and released by an opposite movement of the wedge.

It is particularly advantageous if the mount is a hollow section and has at least one limb which is arranged parallel to the swivelling plane and serves to accommodate the swivel bearing of the clamping jaws, as well as a crossbar which is spaced away from the forming surface and serves as an abutment for the wedge. It is particularly advantageous if the support is of angular or even U-shaped configuration and the one angle side or the crossbar of the U forms the abutment of the wedge. The other angle side or U-limbs can point with their free edges to the forming surface in the position of use, so that the actuating wedge is then situated between the swivel bearings and the abutment, the actuating points of the clamping jaws also projecting into that interspace.

The points at which the wedge is applied to the clamping jaws are hence closer to the abutment than the swivel bearings are.

The clamping jaws may for their part have an angular or approximately U-shaped cross section and lap over the mount in the region of their swivel bearing, particularly externally, or may be externally embraced by the mount of U-shaped cross section. This produces a compact and stable design in which the forces arising can be introduced largely symmetrically.

Good introduction of force accompanied by simple guidance of the wedge can be attained if in the region of the points of application of the wedge the clamping jaws extend lengthwise so as to pass beyond their swivel bearings, and preferably have open-ended, elongated

slots partly embracing the wedge and small side thereof engaging the slots. Hence the cross section of the wedge can engage with these elongated slots and project from them so far that contact to the abutment is established, but in this way the wedge is engaged not only at its small faces but also over part of its breadth and is guided correspondingly well.

It is suitable if the elongated slots embracing the wedge have a width slightly exceeding the thickness of the wedge and form a lateral guide of the wedge, engaging both large faces of the wedge.

The guide slot may be of the same length at both clamping jaws and the clamping jaws may be arranged at different angles relative to a cross-sectional plane disposed at right angles to the mount and its crossbar, or the crossbar of the mount may be situated relative to the forming surface at the angle at about which the two tapering, working faces of the wedge are arranged to each other. In this way one can allow for the fact that, due to its wedge shape, the wedge simultaneously engaging both clamping jaws is applied to the one clamping jaw with a narrower area than to the other clamping jaw. On the other hand, it would also be conceivable for the length of the slots to be adapted to these different widths of the wedge.

The wedge may have at least at its tapering, narrower end a projection which protrudes beyond the wedge face and serves as a stop preventing the wedge from being removed from the clamp. In this way the wedge becomes captive and furthermore in this way its narrow end also becomes widened for improved application of a tool, for example a hammer, to move the wedge into its release position.

Arranged at the wider end of the wedge there may also be a projection jutting out transversely of the direction in which the wedge extends, particularly a projection averted from the forming surface. This also facilitates and improves driving in of the wedge. Furthermore, a striking tool or the like can be applied to this projection for releasing the wedge, if the narrower end of the wedge is inaccessible, e.g. due to it being too close to stiffening webs or the like.

A development of the invention of great advantage, enabling the forces exerted on the wedge to be introduced more effectively for closing the clamp, may consist in that the small wedge face—which is located at the wider wedge end and is arranged crosswise to the longitudinal expanse of the wedge and crosswise to the direction in which the wedge moves as the clamp is braced—runs slantwise in such a way that an acute angle is formed between said small face and the one small wedge face averted from the swivel bearings. The inclination of the small face and angle thereof to the one small face of the wedge may be selected in such a way that a perpendicular through this slope intersects the space between the two clamping jaws, namely as far as possible in the release position, as the wedge is being driven in and/or also in the closed position of the clamp. As driving in of the wedge progresses, so of course this perpendicular line travels from the outer opening of the interspace towards the rear limit.

Through the slope mentioned, the striking forces applied as the wedge is driven in are introduced into the clamp in a more effective and better way through the wedge. The slanting striking surface at the wider end of the wedge leads to a greater force component approximately in the direction in which the clamping jaws extend, so that the respective clamping jaw spaced from its swivel bearing can be swivelled about its swivelling axis in the closing direction all the quicker and with increased force. This takes place concurrently at both clamping jaws.

Therefore no longer is only the increasing widening of the wedge used for swivelling the clamping jaws more and more, but part of the striking force is directly translated into a swivel movement of the clamping jaws. The other force component in the longitudinal direction of the wedge simultaneously effects the necessary and wanted driving in movement of the wedge. Tests have shown that such an arrangement enables the wedge to be driven in a considerably smoother and vibration-free fashion and allows the clamping jaws to be braced correspondingly effectively, without the striking forces leading to undesired elastic deformations of the formwork panels at the edge webs to be clamped.

It is suitable if the slanting small face continues to the end of the projection provided at the wider end of the wedge. The user is provided with a correspondingly large striking surface inclined relative to the driving in direction, forming a good target to hit.

A further development of the invention, potentially facilitating release of the clamp, may consist in that at the narrower end of the wedge, the wedge has a small face which is arranged at least in part at an obtuse angle to the one small face averted from the swivel bearings of the clamp and serves as an impact surface for a striking tool during release. Hence the shorter end face of the wedge may also be arranged slantwise in an opposite way to the longer end face, in order again to attain an enhanced distribution of the force components as this face is struck. Therefore release of the wedge can also be simplified because a considerable share of the striking force expended is translated into a direct swivel movement of the clamping jaws.

The angle of inclination of the narrower end face of the wedge may be selected in such a way that when the clamp is closed a perpendicular on this slanting face is directly approximately to the clamping zone of the clamping jaws. This measure, which finds its equivalent at the wider end face of the wedge through a corresponding angle of inclination, has proved to be a good compromise for on the one hand swivelling the clamping jaws as directly as possible, but on the other hand for wedging or freeing the wedge without causing vibrations through the reaction forces—also at the edge webs to be clamped of the formwork panels. It has proved that even a short blow may be sufficient on the one hand to fasten the wedge and on the other hand to release it, because the clamp arrangement has no inherent resilience.

Altogether a clamp ensues, all the component parts of which are captivated, so that handling and also storage are very simple. Through the approximately horizontal arrangement of the wedge in the position of use, it is also possible for the clamp embodying the invention to be fitted very close to the upper or lower edge of formwork, without it contacting surfaces proud of the formwork, such as the ground at the lower edge of the formwork.

Two embodiments of the invention with principal features of the same will be described in further detail below with reference to the drawings in which, partly in schematized form.

FIG. 1 is a top view of a clamp according to the invention, the clamp being in an open position and applied to two abutting edge webs of adjacent formwork

panels, wherein the free edges of the webs are supported against or are up against the mount of the clamp,

FIG. 2 is a top view corresponding to FIG. 1 of the clamp in the closed position,

FIG. 3 is a side view of the clamp according to the invention in the position of use,

FIG. 4 is a top view corresponding to FIG. 1 of an opened clamp with a wedge, in contradistinction to the first embodiment the end striking surfaces of the wedge being arranged at a slant,

FIG. 5 is a top view corresponding to FIG. 4 of the clamp in the closed position and

FIG. 6 is a side view of the clamp according to FIGS. 4 and 5 in the position of use.

A clamp, generally designated by the reference numeral 1, serves for connecting formwork panels 2 which are arranged in-plane, side by side, and have running round their edges webs 3 or sections to which, in the position of use, the clamp 1 according to FIGS. 2 and 3 is applied for urging together these contacting edge webs 3.

The clamp has for this purpose two gripping or clamping jaws 4 adapted to swivel towards and urge together the longitudinal faces 3*a* averted from each other and grooves 3*b* provided there of the abutting edge sections 3, and further has an actuating element, yet to be described, for this swivelling and bracing of these clamping jaws 4.

The exemplified embodiment shows that the two clamping jaws 4 each have a point of application 6 for the actuating element, in the exemplified embodiment the latter being a wedge 7, said point of application 6 being located at their end averted from their clamping point or clamping projection 4*a* engageable with the groove 3*b* and being arranged in spaced relationship to their swivel bearing 5. This actuating element, hence wedge 7, is supported on a mount 8 belonging to the clamp 1, support being provided in such a way as to permit clamping force to be applied, transferred and maintained thereby.

As already mentioned, the actuating element for this purpose is a wedge 7 which is arranged with its large face 7*a* in the swivelling plane, hence at right angles to the swivelling axes 5, and is supported with the one small face 7*b* against the mount 8 side facing the forming surface 9 of the formwork panels 2 and is supported with the other wedge face 7*c* against the points of application 6 of the clamping jaws 4, the former being arranged in spaced relationship to the swivel bearings 5. The points of application 6 of the two clamping jaws 4 are in each case arranged on sides of the swivel bearings 5 averted from each other, with a lever arm sufficient to lead to the clamping points 4*a* on the clamping jaws 4 swivelling towards each other as the wedge is moved from the position illustrated in FIG. 1 into the position shown in FIG. 2. In both end positions the wedge 7 projects beyond both clamping jaws 4 at their points of application 6, so that both clamping jaws 4 do not fail to be swivelled relative to the mount 8 through the movement of the wedge 7.

Particularly FIG. 3 shows that the mount 8 is a hollow section and has at least one limb 8*a* which is arranged parallel to the swivelling plane and serves to accommodate the swivel bearing 5 of the clamping jaws 4, as well as a crossbar 8*b* which is spaced away from the forming surface 9 and serves as an abutment for the wedge 7 and wedge face 7*b* thereof. The mount could be angular, but in the embodiment is particularly suitably of U-shaped configuration and the crossbar 8*b* of the U forms the abutment already mentioned for the wedge, while the two other limbs 8*a* are traversed by the swivelling axis 5 in the form of a pin or bolt. Since the conceived line connecting the points of application 6 is closer to the abutment, hence crossbar 8*b*, than a line connecting the swivel bearings 5 of the clamping jaws 4 is, and the points of application 6 have a different spacing, in the embodiment a greater one, than the two swivel bearings 5, inserting the wedge 7 from its position illustrated in FIG. 1 into the position of FIG. 2 leads to the clamping jaws 4 swivelling relative to the mount 8 and to each other.

It further follows from FIGS. 1 and 2 on the one hand and FIG. 3 on the other hand that the clamping jaws 4 for their part have an approximately U-shaped cross section and externally lap over the mount 8 in the region of their swivel bearing 5. Conversely it would also be possible though that the clamping jaws 4 are externally embraced by the mount 8 of U-shaped cross section.

In the region of the points of application 6 of the wedge 7 the clamping jaws 4 extend lengthwise so as to pass beyond their swivel bearings 5 and, according to FIG. 1, in the open position one of the clamping jaws can even project beyond the mount 8. According to FIG. 3, the clamping jaws 4 each have in this area an open-ended, elongated slot 10 embracing the wedge 7 and the small face 7*c* thereof engaging the slot. It is apparent in the light of FIG. 3 that by this means the wedge partly comes to rest in, and is guided by, this elongated slot 10, particularly at its large face 7*a*. This is promoted in that the elongated slots 10 embracing the wedge 7 have a width slightly exceeding the thickness of the wedge and therefore form the lateral guide mentioned of the wedge 7 at two spaced locations, therefore guiding and locating the wedge well. On the other hand, by this means the clamping jaws 4 are also fixed better relative to the wedge and locked with the mount 8.

In the exemplified embodiment the guide slot or elongated slot 10 is of the same length at both clamping jaws 4—despite the wedge differing in breadth in the region of each slot—and the clamping jaws 4 are therefore arranged at different angles relative to a cross-sectional plane disposed at right angles to the mount 8 and its crossbar 8*b*—and at an acute angle relative to the large faces of the edge webs 3—or in the position of use the crossbar 8*b* of the mount 8 is situated relative to the forming surface 9 at the angle at about which the two tapering, working faces of the wedge 7 are arranged to each other. It becomes clear particularly in the light of FIG. 2 that given an approximately symmetrical application of the two clamping jaws 4 to the edge webs 3 in the position of use, the mount 8 with its crossbar 8*b* runs slightly at a slant and thereby allows for the wedge taper.

The wedge 7 has at its tapering, narrower end a projection which protrudes beyond the wedge face 7*c* and serves as a stop 11 preventing the wedge from being removed from the clamp 1. In addition, this signifies that the end of the wedge is widened, making it easy for this location to be hammered for release.

The exemplified embodiment also shows that arranged at the wider end of the wedge 7 there is also a projection 12 jutting out transversely of the direction in which the wedge extends, in the embodiment the projection being oriented towards the side averted from the

forming surface **9**, whereas the stop **11** points in an opposite direction towards the forming surface **9**. This projection **12** provides the wedge with an enlargement of its end face, upon which hammer blows can be exerted to increase the gripping power. In addition, this arrangement of the projection **12** allows its opposite side to be acted upon or hammered to release the wedge.

Altogether, for vertical edge webs, the wedge **7** and its large faces *7a* are arranged horizontally, enabling the clamp also to be fixed very close to obstacles running at right angles to the edge webs to be connected, e.g. near the ground the ground itself or brackets or the like attached to the formwork, without the wedge as such and its actuation and movement being inconvenient. Even if the clamp **1** is arranged directly above the base of formwork, the wedge can be driven in without any difficulty, this not being possible at such a location if, for bracing, the wedge were one having to be driven in vertically.

FIGS. **1** and **2** also show that, between the swivel bearings **5**, the mount **8** has at its side facing the forming surface **9** an abutment and locating face **13**, which can also be termed as a stop face and in the position of use lies against the edges of the edge webs **3** or sections gripped by the clamp **1**. The dimensions are selected in such a way that in the clamped position a pulling force towards this locating face **13** is produced by the clamping projections **4***a* through grooves **3***b*, so that any slight, initial displacements of the edge webs **3** can be levelled out by bracing.

Altogether a clamp **1** ensues which is simple to handle, is nevertheless efficient and consists of a few simple component parts which, however, are interconnected in such a way as to be captive and hence do not have to be assembled for bracing edge webs **3**.

The above-mentioned advantages are also realized in the exemplified embodiment according to FIGS. **4** to **6**, there being tallying parts to which therefore the same reference numerals have been assigned.

Unlike the first embodiment, however, in the present embodiment of FIGS. **4** to **6** it contemplated that the small face **14**—which is located at the wider wedge end presenting projection **12** and is arranged crosswise to the longitudinal expanse of the wedge and crosswise to the direction in which the wedge **7** moves as the clamp **1** is braced—runs slantwise in part, namely in an area averted from the formwork panel **2**, in such a way that an acute angle α is formed between said small face and the one small wedge face *7b* averted from the swivel bearings **5**. An imaginary extension of small face *7b* up to the point of intersection with the slanting small face **14** is entered into FIG. **4** to illustrate this angle α.

This angle α and the inclination of small face **14** is selected in such a way that a perpendicular on this slope **14**, and extension of the perpendicular through the slope, intersects the space between the two clamping jaws **4**, whereby in the starting position such a perpendicular about midway on the slant is directed approximately into the region of the clamping projections **4***a*, whereas in the braced position (FIG. **5**) although such a line also intersects the space between the two clamping jaws **4**, it does so closer to their swivel bearings **5**.

For good manipulability the slanting small face **14** continues to the end of the projection **12**.

At the end of this slanting small face **14** opposed to the projection **12** there is a slant running in an opposite direction provided in order to somewhat reduce the overall length of the wedge and to ensure that the user delivers the blow is an area of the wedge where it can be transferred well to the clamping jaws **4** via the wedge itself.

At the narrower end of the wedge **7**, the wedge **7** also has a small face **15** which is arranged at least in part at an obtuse angle β to the one small face *7b* averted from the swivel bearing **5** of the clamp **1** and serves as an impact surface for a striking tool in releasing the clamp **1**. The angle of the inclination β of the narrower end face of the wedge **7** is selected in such a way that when the clamp **1** is closed a perpendicular on this slanting face is directed approximately to the clamping zone of the clamping jaws **4**, so that a good transfer of force for swivelling the clamping jaws **4** is also attained during release. By virtue of the inclination particularly of small face **14**, but also of the opposite small face **15**, the resolution of force of an applied blow is so good that a single blow may suffice for bracing of for releasing the clamp **1**, the striking force being converted into swivelling movement of the clamping jaws **4** considerably more effectively than in the embodiment of FIGS. **1** to **3**. This is due to the fact that at the points **6** at which the wedge **7** is applied to the clamp jaws **4**, a force component in the direction in which these clamping jaws **4** extend arises which is of substantially greater magnitude than if only the widening of the wedge leads to displacement of this point of application **6**. The force component running in the direction of the clamping jaw can swivel the clamping jaw directly under the lever arm relative to the swivel bearing **5**. Therefore reaction forces causing vibrations can be prevented to a very large extent.

The clamp **1** serves for formwork panels arranged in-plane, side by side, to be connected at the webs **3** running round their edges and has for this purpose two clamping jaws **4** which urge these edge webs **3** together and can be swivelled relative to each other and to a mount **8** with the aid of a wedge **7**, the mount simultaneously constituting the abutment for the wedge **7**. The clamping jaws have for this purpose points **6** of application for the wedge face *7c* averted from face *7b*, which points of application are spaced from the swivel bearings **5** of the clamping jaws and are under a lever arm. These points of application **6** are suitably arranged at the inner end of an elongated and guiding slot **10** which is open towards the opposite side and also affords lateral guidance for the wedge as it moves. The direction in which the wedge extends and moves is crosswise to the extent of the swivelling axes of the swivel bearings **5** with which the clamping jaws **4** are swivel-mounted on the common mount **8**.

I claim:

1. A claim for connecting formwork panels (**2**) which are arranged-in-plane, side by side, and have webs (**3**) or sections running around their edges, the clamp including two clamping jaws (**4**) which are adapted to be swivelled towards and urge together the longitudinal faces (*3a*) averted from each other of the abutting edge sections or the like, and further including an actuating element for swivelling said clamping jaws (**4**), the two clamping jaws (**4**) each having located at their end averted from their clamping point and arranged in spaced relationship to their swivel bearing (**5**), a point of application (**6**) for the actuating element, and the actuating element being supported on a mount (**8**) belonging to the clamp (**1**), on which the two clamping jaws (**4**) are swivel-mounted, wherein the actuating element is a wedge (**7**) which is arranged with its large face (*7a*) in

the swivelling plane and is supported with a small face (7*b*) against the mount (8) side facing the forming surface (9) and is supported with the other wedge face (7*c*) against the points of application (6) of the clamping jaws (4), the former being arranged in spaced relationship to the swivel bearings (5), that the points of application (6) of the two clamping jaws (4) are in each case arranged on sides of the swivel bearings (5) averted from each other, and in both end positions of the wedge (7) the latter projects beyond both clamping jaws (4) at their points of application (6).

2. A clamp as claimed in claim 1, wherein the mount (8) is a hollow section and has at least one limb (8*a*) which is arranged parallel to the swivelling plane and serves to accommodate the swivel bearing (5) of the clamping jaws (4), as well as a crossbar (8*b*) which is spaced away from the forming surface (9) and serves as an abutment for the wedge (7).

3. A clamp as claimed in claim 1 wherein the mount is of angular or U-shaped configuration and the one angle side or the crossbar (8*b*) of the U forms the abutment of the wedge.

4. A clamp as claimed in claim 1, wherein the points of application (6) are closer to the abutment (8*b*) than the swivel bearings (5) of the clamping jaws (4).

5. A clamp as claimed in claim 1, wherein the clamping jaws (4) have an angular or approximately U-shaped cross section and externally lap over the mount (8) in the region of their swivel bearing (5) or are externally embraced by the mount (8) of the U-shaped cross section.

6. A clamp as claimed in claim 1, wherein the region of the points of application (6) of the wedge (7) and the clamping jaws (4) extend lengthwise so as to pass beyond their swivel bearings, and have open-ended, elongated slots (10) partly embracing the wedge (7) and small face (7*c*) thereof engaging said slots.

7. A clamp as claimed claim 6, wherein the elongated slots (10) embracing the wedge (7) have a width slightly exceeding the thickness of the wedge and form a lateral guide of the wedge (7), engaging both large faces of said wedge.

8. A clamp as claimed claim 1, wherein the guide slot (10) is of the same length at both clamping jaws (4), and the clamping jaws (4) are arranged at different angles relative to a cross-sectional plane disposed at right angles to the mount and its crossbar, or the crossbar (8*b*) of the mount (8) is situated relative to the forming surface (9) at the angle at which the two tapering, working faces of the wedge (7) are arranged to each other.

9. A clamp as claimed in claim 1, wherein the wedge (7) has at its tapering, narrower end a projection which protrudes beyond the wedge face 7(*c*) and serves as a stop (11) preventing the wedge from being removed from the clamp (1).

10. A clamp as claimed in claim 1, wherein arranged at the wider end of the wedge (7) there is also a projection (12) jutting out transversely of the direction in which the wedge extends, said projection being averted from the forming surface (9).

11. A clamp as claimed claim 1, wherein between the swivel bearings (5), the mount (8) has at its side facing the forming surface (9) an abutment and locating face (13) or stop face for the edges of the edge webs (3) or sections gripped by the clamp (1).

12. A clamp as claimed in claim 1, wherein the small face (14), which is located at the wider wedge end and is arranged crosswise to the longitudinal expanse of the wedge and crosswise to the direction in which the wedge (7) moves as the clamp (1) is braced, runs slantwise in such a way that an acute angle (2) is formed between said small face and the small wedge face (7*b*) averted from the swivel bearings.

13. A clamp as claimed in claim 12, wherein the inclination of the small face (14) and the angle thereof to the small face (7*b*) of the wedge (7) is selected in such a way that a perpendicular through said slope (14) intersects the space between the two clamping jaws (4).

14. A clamp as claimed in claim 13, wherein the slanting small face (14) continues to the end of the projection (12) provided at the wider end of the wedge (7).

15. A clamp as claimed in claim 1, wherein at the narrower end of the wedge (7), the wedge (7) has a small face (15) which is arranged at least in part at an obtuse angle (B) to the small face (7*b*) averted from the swivel bearings (5) of the clamp (1) and serves as an impact surface for a striking tool during release.

16. A clamp as claimed in claim 1, wherein the angle of the inclination (B) of the narrower end face of the wedge (7) is selected in such a way that when the clamp (1) is closed a perpendicular on said slanting face is directed approximately to the clamping zone of the clamping jaws (4).

* * * * *

EXHIBIT C

Atlas ACS

Atlas Clamp System

The new *ACS* (Atlas Clamp System) heavy-duty modular ganged wallform offers an allowable 1,650 psf pour pressure, and weighs only 11 lbs per sq.ft.

ATLAS CONSTRUCTION SUPPLY, INC.

Atlas ACS Features

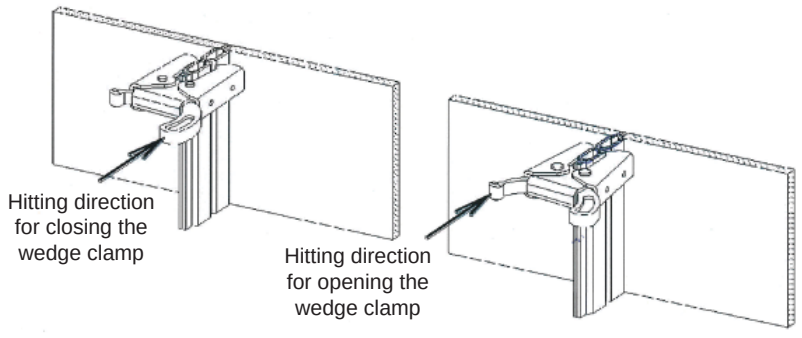
- Maximum safe working pressure of 1,650 psf with a 7/8" (20mm) thru-rod or 1-1/4" to 1" taper tie.
- Maximum safe working pressure of 1,250 psf with a 5/8" (15mm) thru-rod.
- Imperial Dimensions; Large panel is 8' x 10'
- Dulen-X® Composite Form Face
- Rail profile allows for easy clamping, long form life and is easier to repair than hollow frame panels.
- Tie holes in large size panels are designed for high capacity ties.
- Conical shaped Tie holes for increased tolerances, easier cleaning and Facilitates battered walls.
- For bulkhead forming, spacer channels allow for wall thicknesses of 6" to 20" with adjustment increments of 1".

ATLAS ACS Wedge Clamp

Round Wedge Clamp

The round wedge clamp provides an easy & fast method of connection between panels. The clamp works with any panel or filler size and allows for strong connections with minimal hardware. This one-piece clamp weighs only 3.5 lbs and has an allowable axial tension of 1,575 lb.

Typical Panel Clamp Use:
10' height - 4 clamps
8' Height - 3 clamps
4' Height - 2 clamps



ATLAS ACS Components

ACS Spacer Channel

The ACS spacer channel has Ten openings that allow for an adjustment to wall thicknesses from 6" to 20" in increments of 1". spacer channels connected to wall panels also replace the ties normally placed bulkheads.

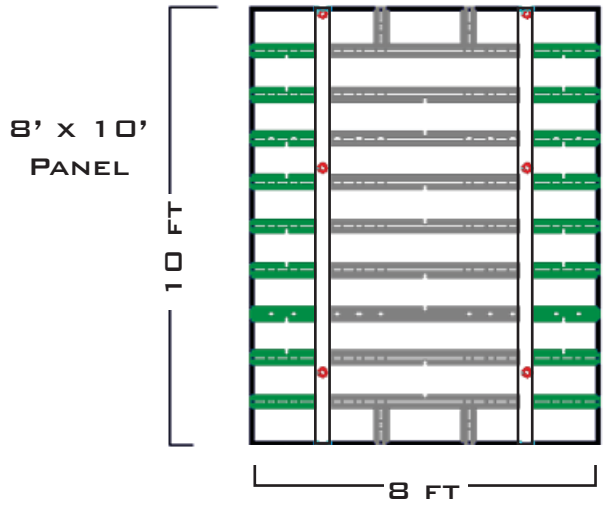
ACS Brace System

The ACS brace system consists of a brace assembly, a pipe brace and a shoe. The brace assembly connects to the wall panels with no additional hardware. The bracing system allows the ACS wallform system to withstand wind loads prior to the concrete pour.

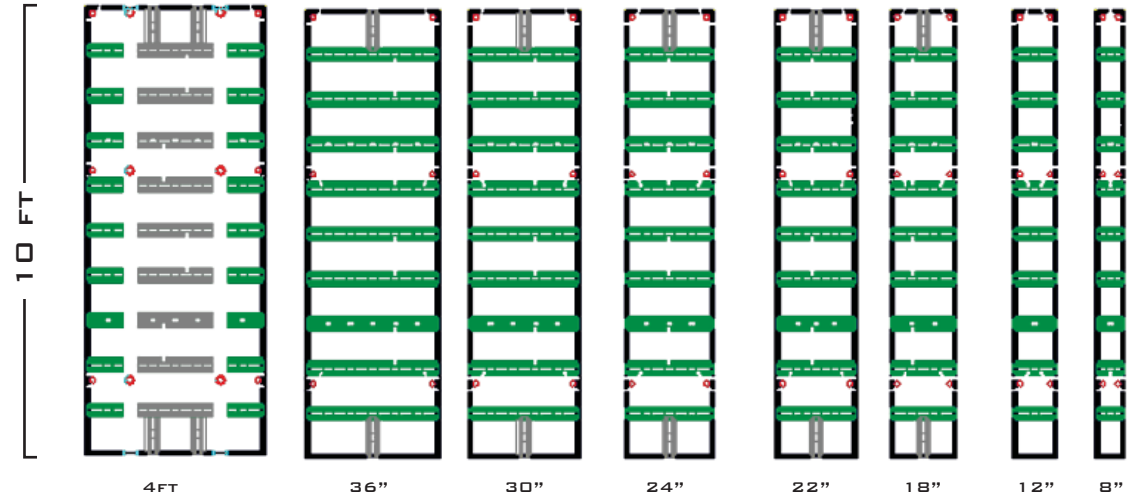
ACS Crane Clamp

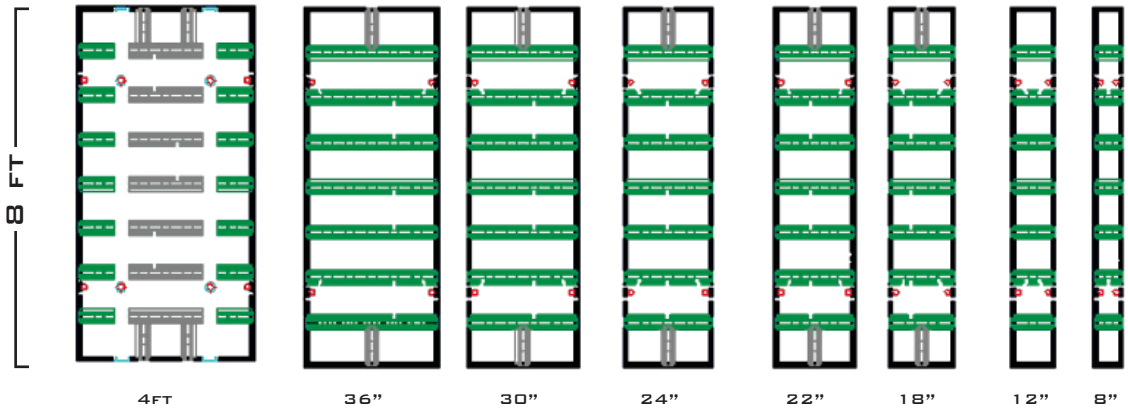
The ACS Crane clamp easily fits onto every panel and filler and will work whether the panel is vertically or horizontally aligned. The clamp attaches to panels without any additional hardware and allows the assembled wallform to be quickly set into place.

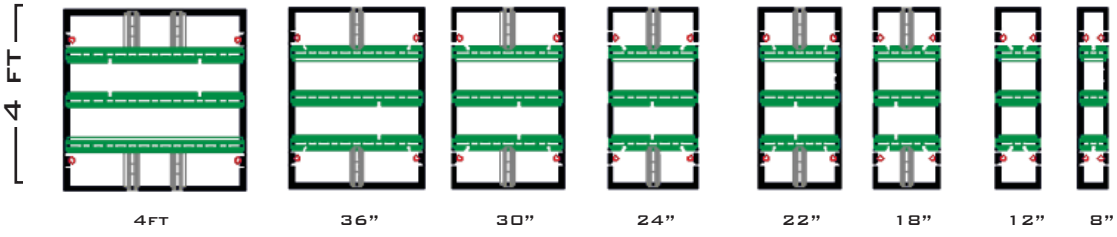
ATLAS ACS PANEL SIZES



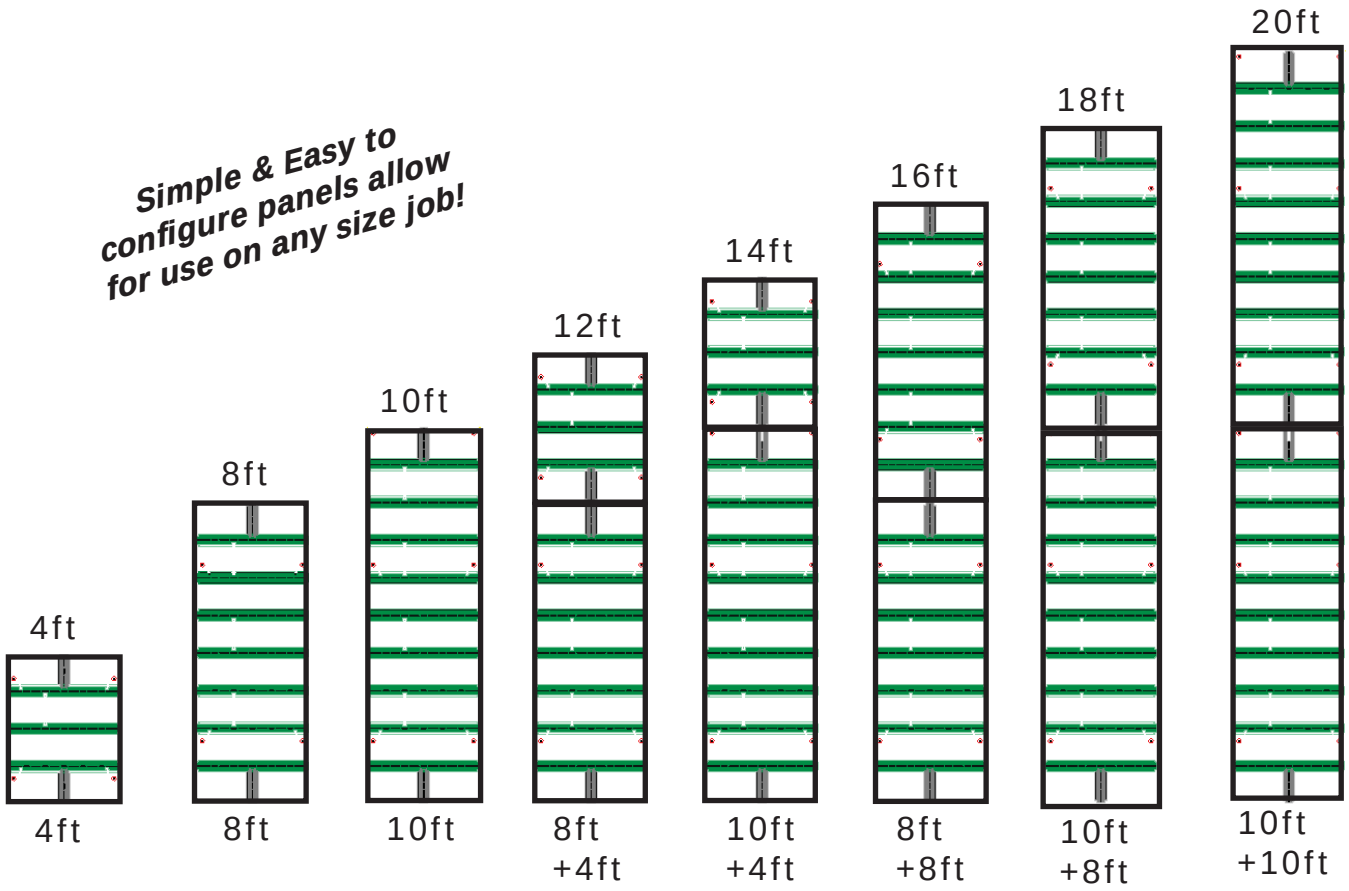
For wall heights up to 10', only 4 ties are needed per panel!







ATLAS ACS TYPICAL LAYOUT HEIGHTS



*Aligning members where required not shown for clarity.

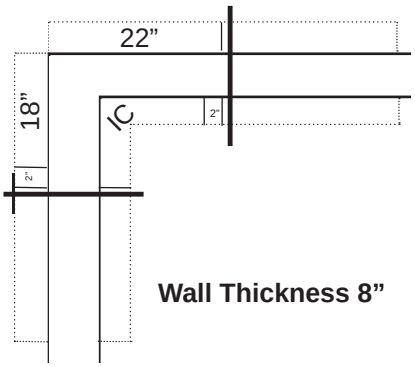
Available Panel Sizes

10 Feet	8 Feet	4Feet
8' x 10'		
4' x 10'	4' x 8'	4' x 4'
3' x 10' Multi	3' x 8' Multi	3' x 4' Multi
3' x 10'	3' x 8'	3' x 4'
30" x 10'	30" x 8'	30" x 4'
24" x 10'	24" x 8'	24" x 4'
22" x 10'	22" x 8'	22" x 4'
18" x 10'	18" x 8'	18" x 4'
12" x 10'	12" x 8'	12" x 4'
8" x 10'	8" x 8'	8" x 4'
2" x 10'	2" x 8'	2" x 4'
1" x 10'	1" x 8'	1" x 4'
IC; OC; IHC; OHC	IC; OC; IHC; OHC	IC; OC; IHC; OHC
Stripping IC	Stripping IC	Stripping IC

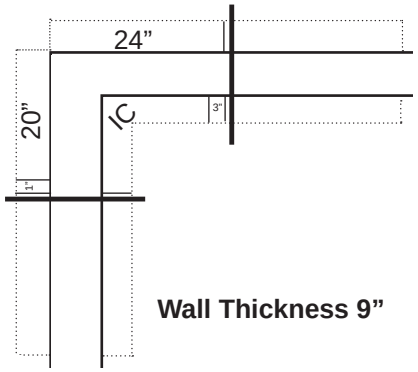
ATLAS ACS CORNER SOLUTIONS

ATLAS ACS IS VERSATILE AND ALLOWS FOR A VARIETY OF CORNER LAYOUTS BASED ON WHICH PANELS YOU HAVE ON THE JOB SITE. A WIDE RANGE OF WALL THICKNESSES CAN ALSO BE ACCOMODATED!

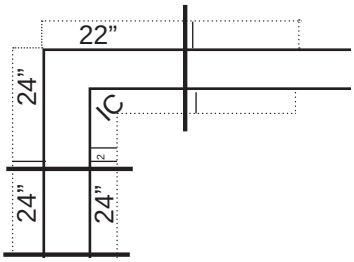
I.C. = 12" x 12"



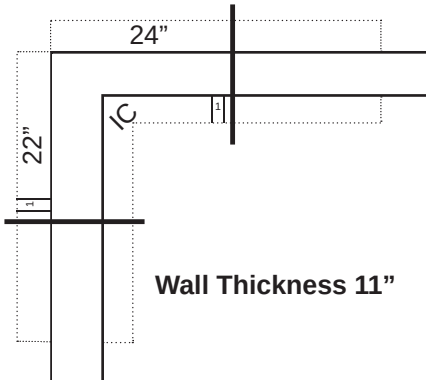
Wall Thickness 8"



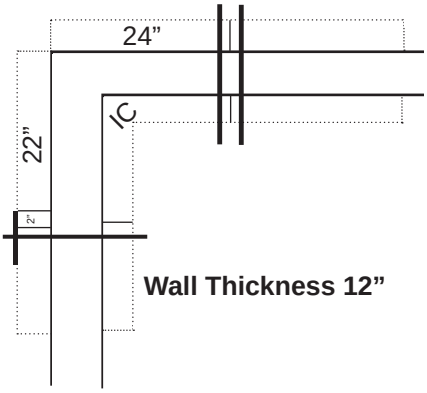
Wall Thickness 9"



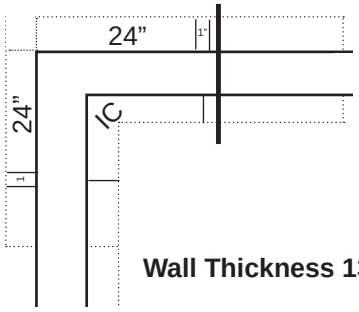
Wall Thickness 10"



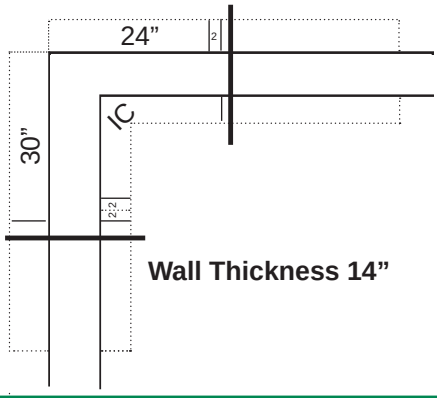
Wall Thickness 11"



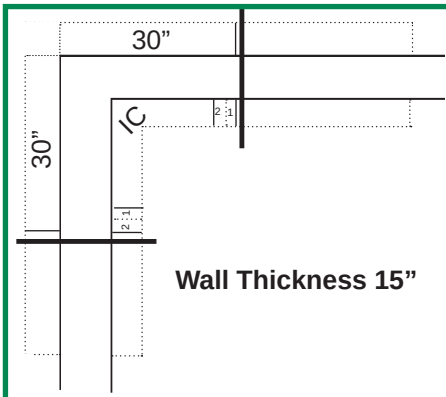
Wall Thickness 12"



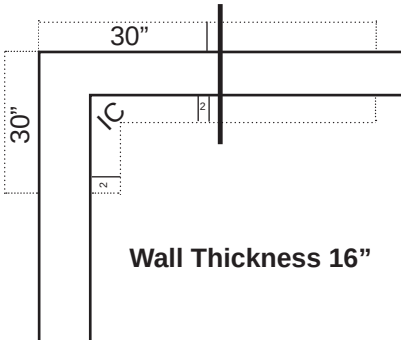
Wall Thickness 13"



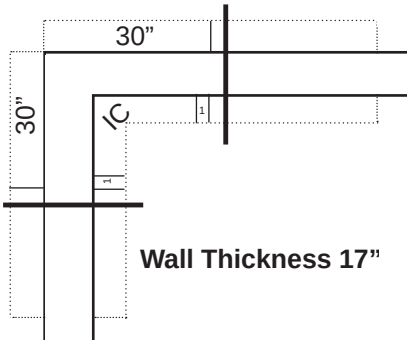
Wall Thickness 14"



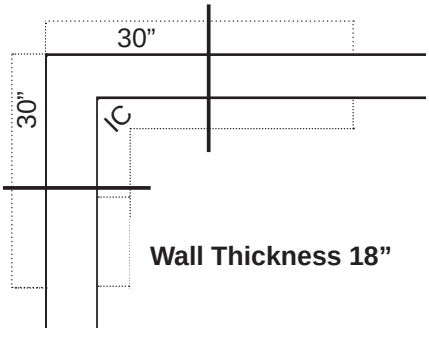
Wall Thickness 15"



Wall Thickness 16"



Wall Thickness 17"



Wall Thickness 18"

Atlas Inside & Outside Corners

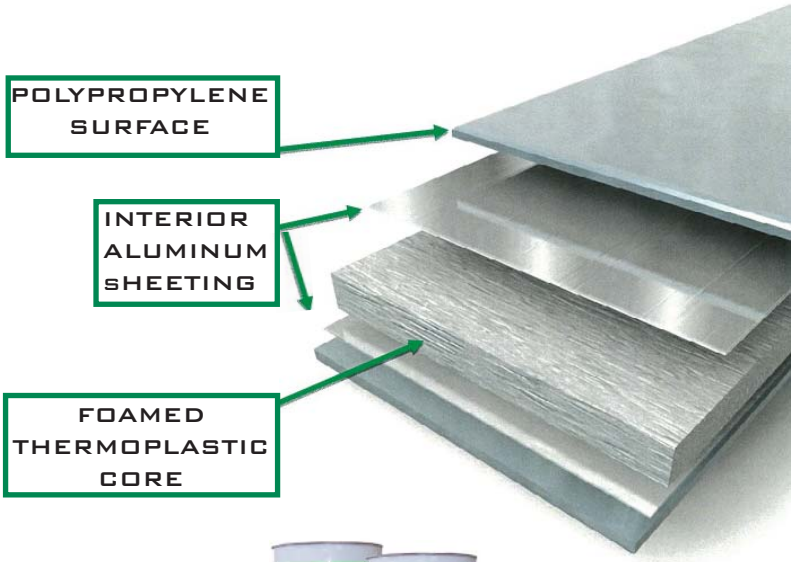
Atlas ACS corners

ACS Corner panels offer a quick transition between panels. They are easily connected to ACS panels using the ACS Wedge Clamp. Inside corners are 12" x 12".

Dulen-X® Features & Benefits

- High Use Capability of **1,000 pours! ***
- 18mm (.71") Poly-Propylene Composite Panels
- Durability - Constant rigidity throughout lifetime
- No swelling, shrinking or delamination
- Workable like wood- nailing & sawing
- Same attachment to panel frame as plywood
- Repairability
- Less form release agent required
- Easy to clean forms
- Produces a dense & smooth concrete surface

Dulen-X® Panel Composition



Atlas Release is compatible with Dulen-X® and will prolong the life of your forms!

*1000 reuse potential based on proper care and maintenance. Manufacturer requires the use of form release between each pour.

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