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⑧ **Improvements in jigs for supporting elongated horizontal workpieces in anodising and like processes.**

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Description

The present invention relates to jigs for the support of elongated workpieces, such as lengths of extruded aluminium, in electrolytic treatment processes, such as anodising and electrolytic colouring which result in the application of a coating of reduced electrical conductivity on the workpieces.

It is already known to support aluminium extrusions on simple jigs, comprising a horizontal support beam (commonly known as a flight bar) and a pair of spaced vertical current-carrying members (commonly referred to as splines), which are suspended from the flight bar. The flight bar is connected to one terminal of the electrical supply, which may be A.C. or D.C., according to the requirements of the process. The flight bar constitutes a support beam which is not immersed in the electrolyte in operation. In one form of such jig a transverse support member is attached to the lower end of each spline. The whole load of work is supported by the two transverse support members (but possibly assisted by intermediate electrically inactive supports, suspended from the flight bar). In anodising, the whole of the anodic current is carried from the work to the splines through these two transverse members. The work is loaded onto the jig outside the treatment tank and is then lifted into the cell by, for example, an overhead travelling crane. In loading the work onto the jig a first layer of aluminium workpieces is placed on the transverse support members. When the first layer (which may consist of no more than two workpieces) is complete, metallic spacer bars are placed immediately above the transverse support members and the procedure is repeated until a complete load of work has been stacked up. The load of work is then clamped together to ensure a good electrical contact through the workpieces of the load to the transverse support members.

In an anodising treatment an anodic oxide coating of reduced conductivity develops on the workpieces and it is necessary in such an arrangement that the metallic spacer bars also develop an electrically resistive coating during the process. Without the growth of such a coating an increasingly large proportion of the cell current would flow to the spacer bars. In consequence in anodising aluminium such spacer bars are normally formed of aluminium. Where the spacer bars and transverse support members are formed from aluminium it is necessary, in the case of a conventionally constructed jig, to strip off the anodically formed oxide coating after each treatment cycle to ensure good electrical contact between such members and the workpieces of the next load. Such stripping is effected by a chemical treatment (usually in sodium hydroxide solution) or by a mechanical treatment, such as grinding.

The spacer bars are relatively short, uncomplicated extruded sections, rarely exceeding 60 cm. in length, and thus they are easy to handle and only require a stripping tank of modest dimen-

sions to strip a large number of spacer bar sections in a single stripping operation. By contrast, the assembly of flight bar, splines and transverse support members require a large stripping tank, if the stripping is to be effected without disassembly. Even where the splines are removed from the flight bar for stripping, a relatively long stripping tank is required and the removal and reconnection of the splines to the flight bar after completion of the stripping operation is time wasting.

Since it is only on the top of the support members that metal-to-metal contact is required in the formation of a load of work, it is only those areas which actually require to be stripped. Stripping of the surfaces of the vertical splines and the remainder of the surfaces of the support members is not only unnecessary, but also deleterious, since each stripping operation and subsequent anodising cycle results in a loss of metal from the splines and reduces their service life.

We have now realised that the necessity for stripping the splines and associated transverse support members can be obviated in a very simple way, which involves employing a separate removable transverse spacer member, which is supported on the transverse support member of the spline and which is mechanically and electrically connected to the transverse support member by an upwardly extending contact pin on the support member fitting into a corresponding recess in the underside of the spacer member, the pin and spacer member having sufficient area of contact for carrying the requisite fraction of the cell current at a level within the recess above that to which liquid can penetrate when the jig assembly is lowered into the electrolytic treatment tank.

In most instances the depth of a tank for electrolytic treatment of horizontally arranged workpieces does not exceed 2 metres. When air is trapped between the contact pin and the walls of the recess into which it fits, the cell liquor can rise through only a small proportion of the depth of the recess under hydrostatic pressure as the jig is lowered vertically into the tank. In consequence the contact area between the contact pin and the transverse spacer member may remain dry and unattacked by the cell liquor. In order to provide mechanical stability coupled with adequate contact area the pin is preferably somewhat rectangular in shape and preferably presents two mutually inclined contact surfaces at its upper end for contact with corresponding faces at the upper end of the recess. The major dimension of the pin is arranged to be transversely in relation to the flight bar. It may be desirable for each support member to be provided with two or even more contact pins. Such contact pins may be disposed on opposite sides of the spline or, in some cases, on the same side of the spline. Particularly where two or more contact pins engage in recesses in a common spacer member, the pins may be cylindrical in shape and have frusto-conical upper ends for engagement in recesses of similar shape.

Where the contact pin is provided with a single frusto-conical contact surface, diametrically oppo-

site portions of such surface may be regarded as separate surfaces of equal and opposite inclination in relation to each other.

It will be appreciated that transverse support members may be provided at more than one level on the spline. Where there are multiple transverse support members, separate clamps (not forming an integral part of the spline) are preferably provided for clamping the work to the transverse support member which carries it.

It will also be understood that the contact pins may have a single horizontal flat contact surface on the upper end thereof for engagement with a single horizontal surface in the recess in the spacer member.

As a result of the arrangement of the invention the only contact surface on the jig assembly (other than on the spacers; are at the upper end on the contact pins on the transverse support members. Since the contact surfaces on the contact pins are protected from the action of electrolyte, it is unnecessary to strip them. In consequence it is unnecessary to strip the jig assembly. The splines and transverse support members, except for the contact surfaces, may be coated with or encased in liquid-resistant plastics material to avoid such attacks as are otherwise inevitable in alkaline etching or other chemical pretreatment stages.

The transverse spacer members, which receive the pins on the support members, are preferably of distinctive appearance as compared with the remaining spacers. It is preferable to strip these special spacer members mechanically by grinding off the anodic oxide film which forms on the top edge. Chemical stripping of such spacers could lead to some erosion of the contact face or faces in the recess and thus result in a progressively less satisfactory electrical contact between the pin and its associated transverse spacer member.

In the accompanying drawings.

Figure 1 is an end view of a spline of a jig in accordance with the invention.

Figure 2 is a horizontal section of the spline of Figure 1 taken at a position close to the bottom end.

Figure 3 is a side view, partly in cross-section of the lower end of the spline, of Figure 1 on a larger scale.

The vertical spline bar 1 has a transverse support member 2 secured to it by welding or in any other way appropriate to produce a secure electrical contact between them. The support member 2 carries a rectangular contact pin 3 at each end and such pin has inclined contact surfaces 4 (Figure 3) at its top end. The support member 2 co-operates with a transverse spacer 5 which has a corresponding recess 6 to receive the contact pins 3 and has contact surfaces 7 to coact with contact surfaces 4. The recesses 6 are dimensioned in such a way that a definite air gap exists between the sides of the pin 3 and the sides of the slot 6, within which liquid can rise to some extent under hydrostatic force, and through

general expansion/contraction of the entrapped air due to thermal effects in the processing but cannot reach the contact surfaces 4 and 7. The existence of the gap between the sides of the pin below the contact surfaces 4 and the sides of the recess allows easy removal and replacement of the spacers 5.

In use a layer of workpieces W are arranged on the support member 2 and a transverse spacer bar 8 is arranged on such workpieces. Further layers of workpieces W, separated by spacer bars 8, complete the stack carried by the jig.

As shown in Figure 1 the spline 1 is preferably connected to its associated flight bar F by a removable pin P.

The spline preferably carries a stirrup 10 near its top end to support a jack screw 11 and clamp member 12 for clamping the assembly of workpieces down onto the support member 2 to ensure good electrical contact between the support member and all the workpieces and transverse spacers.

The spacer members 8 are preferably X-shaped, as shown, or of similar shape so that they are to some extent resiliently compressible under vertical pressure. It will be understood that these spacers are stripped by chemical or mechanical means (as appropriate) after each electrolytic treatment operation.

In place of the illustrated jack screw and clamp member, clamping of the workpieces may be effected by means of stepped wedges inserted between a transverse member secured to the vertical spline member or members and the top spacer member 8. This achieves good electrical connection between all the workpieces and the support member 2, carrying the contact pins 3. The necessary clamping pressure may be generated by means of a cranked lever, inserted between the transverse member and the top spacer, and maintained by the insertion of stepped wedges.

In the illustrated jig a single vertical spline member 1 is shown. This may be supplemented by a second vertical member inserted at the location shown in Figure 2. This is particularly suitable where clamping of workpieces is effected by leverage and insertion of stepped wedges.

The construction of the invention may also be employed with equal advantage in a jig structure, in which one or more support members are arranged to extend transversely between two or even more vertical current-carrying members arranged at the ends of the jig, for example at the positions indicated in chain lines at 11 in Figure 2 to replace the vertical member or members 1. Similarly the flight bar can be replaced by another form of overhead support where appropriate. Additionally longitudinal structural members may be included to extend between the lower ends of the current-carrying members at opposite ends of the jig.

Claims

1. A jig for supporting elongated, horizontal

workpieces in an electrolytic treatment bath comprising an overhead support structure (F), carrying at least two vertical current-carrying members (1) longitudinally spaced from each other, such vertical members (1) each supporting at least one transversely extending load support member (2) electrically connected with such vertical member (1) characterised in that each support member (2) is provided with at least one upwardly extending contact pin (3), each such contact pin having one or more contact surfaces (4) towards the upper end thereof, said contact surface or surfaces (4) contacting a corresponding surface or surfaces (7) in a recess (6) in a spacer member (5) arranged over said support member (2), said recess (6) being dimensioned to be of such depth that electrolyte cannot rise in the recess (6) to the level of the contact surface or surfaces (7) under the hydrostatic forces encountered in the electrolytic treatment bath.

2. A jig according to claim 1 further characterised in that each contact pin (3) is provided with contact surfaces (4) which are inclined to the vertical and inclined in relation to each other.

3. A jig according to claim 1 or 2 further characterised in that each contact pin (3) is longer in the lengthwise direction of its support member (2) than in the widthwise direction of such support member.

4. A jig according to claim 1, 2 or 3 further characterised in that each support member (2) carries at least two contact pins (3).

5. A jig according to any preceding claim further characterised in that each contact pin (3) and corresponding recess (6) are dimensioned to allow lateral clearance between the sides of the pin (3) below the contact surfaces (4) and the facing sides of the recess (6).

6. A jig according to any preceding claim in which each vertical member (1) and support member (2) is coated with or encased in liquid-resistant plastic.

Patentansprüche

1. Haltevorrichtung zur Halterung länglicher horizontaler Werkstücke in einem elektrolytischen Behandlungsbad, die eine Überkopf-Halterung (F) umfasst, die mindestens zwei vertikale stromführende Elemente (1) aufweist, die in Längsrichtung im Abstand voneinander liegen, wobei diese vertikalen Elemente (1) jeweils mindestens ein sich in Querrichtung erstreckendes Lastträger-element (2) halten, das elektrisch mit dem vertikalen Element (1) verbunden ist, dadurch gekennzeichnet, dass jedes Lastträger-element (2) mit mindestens einem sich nach oben erstreckenden Kontaktstift (3) versehen ist, dass jeder Kontaktstift eine oder mehrere Kontaktflächen (4) im Bereich des oberen Endes desselben aufweist, dass diese Kontaktfläche oder Kontaktflächen (4) in Anlage an einer entsprechenden Fläche oder entsprechenden Flächen (7) in einer Ausnehmung (6) in einem Abstandselement (5) stehen, das über dem Lastträger-element (2) liegt, und dass die Ausneh-

mung (6) mit solcher Tiefe bemessen ist, dass der Elektrolyt bei den im elektrolytischen Behandlungsbad auftretenden hydrostatischen Kräften nicht bis zum Niveau der Kontaktfläche oder den Kontaktflächen (7) ansteigen kann.

2. Haltevorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass jeder Kontaktstift (3) mit Kontaktflächen (4) versehen ist, die gegenüber der Vertikalen und gegenüber einander geneigt sind.

3. Haltevorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass jeder Kontaktstift (3) in Längsrichtung seines Lastträger-elementes (2) länger ist als in Richtung der Breite dieses Lastträger-elementes.

4. Haltevorrichtung nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, dass jedes Lastträger-element (2) mindestens zwei Kontaktstifte (3) trägt.

5. Haltevorrichtung nach einem der vorausgehenden Ansprüche, dadurch gekennzeichnet, dass jeder Kontaktstift (3) und die entsprechende Ausnehmung (6) derart bemessen sind, um ein zeitliches Spiel zwischen den Seiten des Kontaktstiftes (3) unterhalb der Kontaktflächen (4) und den anliegenden Seiten der Ausnehmung (6) zuzulassen.

6. Haltevorrichtung nach einem der vorausgehenden Ansprüche, dadurch gekennzeichnet, dass jedes vertikale Element (1) und jedes Lastträger-element (2) mit einem flüssigkeitsbeständigen Kunststoff beschichtet oder in einen solchen eingebettet ist.

Revendications

1. Un montage pour supporter des pièces horizontales allongées dans un bain de traitement électrolytique, comprenant une structure portante supérieure (F), portant au moins deux éléments verticaux (1) conducteurs de courant, espacés longitudinalement l'un de l'autre, lesdits éléments verticaux (1) supportant chacun au moins un élément porteur de charge (2) s'étendant transversalement et relié électriquement audit élément vertical (1), caractérisé en ce que chaque élément porteur (2) est pourvu d'au moins une broche de contact (3) s'étendant vers le haut, chacune desdites broches de contact comportant une ou plusieurs surfaces de contact (4) vers son extrémité supérieure, la ou lesdites surfaces de contact (4) venant toucher une ou des surfaces correspondantes (7) placées dans un évidement (6) d'un élément d'espacement (5) disposé au-dessus dudit élément porteur (2), ledit évidement (6) étant dimensionné de façon à avoir une profondeur telle que l'électrolyte ne puisse pas monter dans l'évidement (6) jusqu'au niveau de la ou des surfaces de contact (7) sous l'effet des forces hydrostatiques engendrées dans le bain de traitement électrolytique.

2. Un montage selon la revendication 1, caractérisé en outre en ce que chaque broche de contact (3) est pourvue de surfaces de contact (4) qui sont inclinées par rapport à la verticale et qui sont inclinées l'une par rapport à l'autre.

3. Un montage selon la revendication 1 ou 2,

caractérisé en outre en ce que chaque broche de contact (3) est plus longue dans la direction longitudinale de son élément porteur (2) que dans la direction transversale dudit élément porteur.

4. Un montage selon la revendication 1, 2 ou 3, caractérisé en outre en ce que chaque élément porteur (2) porte au moins deux broches de contact (3).

5. Un montage selon une quelconque des revendications précédentes, caractérisé en outre en

ce que chaque broche de contact (3) et l'évidement correspondant (6) sont dimensionnés pour établir un jeu latéral entre les côtés de la broche (3) situés en dessous des surfaces de contact (4) et les côtés correspondants de l'évidement (6).

6. Un montage selon une quelconque des revendications précédentes, dans lequel chaque élément vertical (1) et chaque élément porteur (2) sont recouverts ou enveloppés d'une matière plastique résistant aux liquides.

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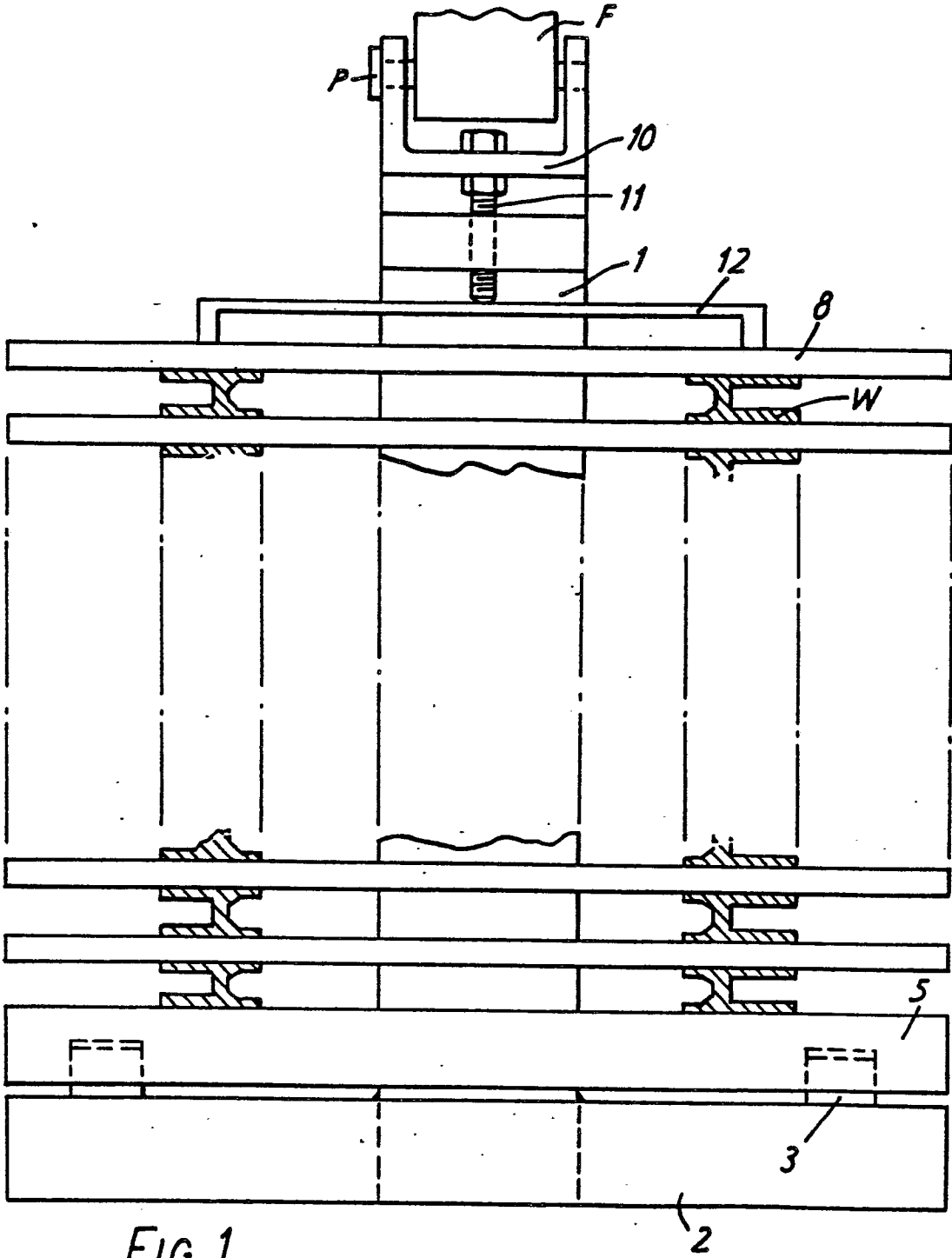


FIG. 1

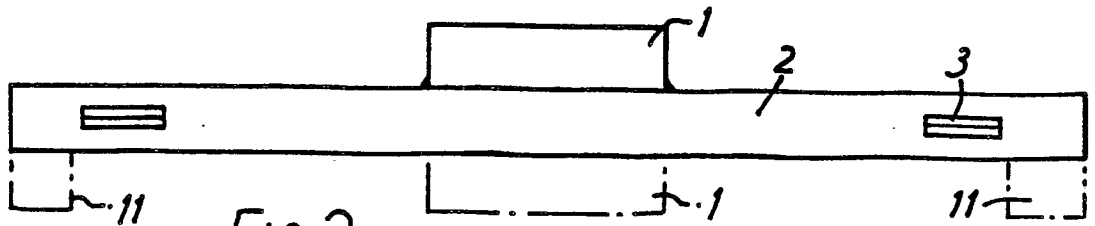


FIG. 2

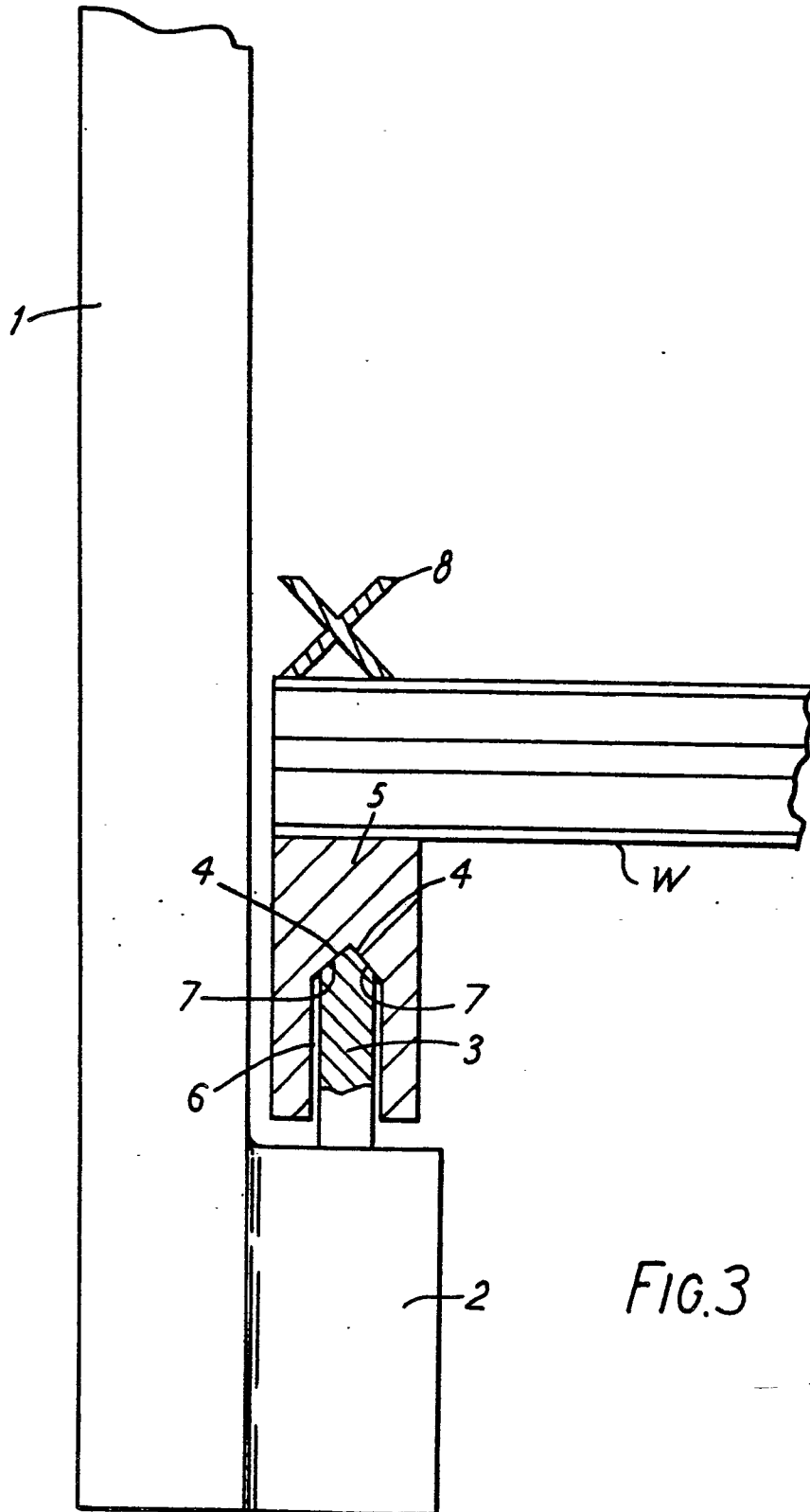


FIG. 3