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54 **A method of fastening metallic members and a punch for carrying out said method.**

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Description

This invention relates to a method of fastening metallic members wherein a metallic member is placed with the underside of a planar portion thereof in contact with a carrier material, whereafter by means of a punch at least one tongue is liberated from the metal surface, the punch entering said planar portion and the carrier material at an acute angle.

Such a method is known from US—A—2,160,258, which describes a method for fastening nailing strips of for example wood or twisted paper into channellike grooves that are formed on or into metallic members. These metallic members for example can be parts of automobiles or of furniture and the nailing strips can be used to tack upholstery on. Since the nailing strips are placed into grooves the tongues that are liberated from the metal by means of the punch only need to have such a configuration that the nailing strips can not move in a direction parallel to the walls of the groove.

The invention, however, is directed to the fastening of metallic members, such as angles and support plates, to substantially flat carrier materials such as gypsum board, wood, chip board and the like, wherein the metallic member in particular can be loaded in a direction perpendicular to the surface of the carrier material. To this end use has hitherto often been made of metallic members which on the side facing the carrier material to which they have to be fastened are provided with one or more spikes. These spikes can be hammered into the carrier material to effect a connection between the metallic member and the carrier material.

One disadvantage of this method of fastening is that, if a plurality of spikes are provided in the metallic member, these must be forced into the carrier material downwardly in substantially vertical direction. The disadvantage of this is that, when loaded, the spikes of the metallic members become easily loosened from the carrier material, so that there is not formed a reliable connection that can be loaded in various directions.

FR—A—2,297,312 describes an apparatus and a method for making a corner joint between two metal sections. For this purpose a corner piece is positioned in two sections to be connected. Subsequently, the corner joint is clamped in a suitable clamping device, and by means of a punch a tongue is punched from the metal section into the material of the corner piece on opposite sides of the corner, the tongues formed are of rectangular shape. This known connection is suitable to prevent a displacement of the metal section relative to the corner piece in the longitudinal direction of the metal section, which is sufficient for a corner joint in which the corner piece is clamped within the hollow section. When, however, the known method is used, for example, to connect a flat metal member to a flat, for example wooden panel problems occur, because owing to the shape of the tongues, they do not prevent the

metal member from being displaced relatively to the panel in a direction perpendicular to the panel.

NL—A—7807256 describes a spiked metal plate for attachment to gypsum panels, in which the spikes are prevented from becoming loosened. This is only avoided, however, when the metal plate is loaded in one specific direction, while furthermore, a specially shaped metal plate is required with a weakened line, or score line, to produce the desired effect.

It is an object of the present invention to provide a method that does not have the disadvantages outlined above, and by which it is possible to fasten a randomly-shaped metallic member to a carrier material.

For this purpose the invention provides a method of the above mentioned kind wherein the punch is moved downwards in to said carrier material to bend the tongue through an angle of more than 90° to form a curved hook-shaped portion.

By means of the method according to the invention, metallic members can be secured to a carrier material extremely firmly. By adapting the force and velocity of stroke of the punch to the kind of carrier material, metallic members can be secured in a simple manner to both relatively soft material, such as gypsum board, and relatively hard material, such as cement-bonded chip board, with the metal plate being prevented from becoming detached by virtue of the hook-shaped curvature of the part bent from the metal plate. In order to make the attachment of the metallic plate still more secure, successive tongues may be bent from the metallic member into the carrier material in opposite directions, so as to fully exclude the chance of the metallic member becoming loosened in the direction of stroke of the punch, too.

The invention also provides a possible embodiment of a punch for carrying out the method, which punch has a bevel on opposite sides of the punch at the leading edge thereof. Such a punch is also known from US—A—2,160,258. The punch according to the invention differs from this known punch in that the punch is elongated with a rectangular cross-section, in that adjacent the bevels a portion of the longitudinal underside is maintained, in that the end face of the punch at the leading end has a concave curvature extending from the longitudinal underside to the longitudinal topside of the punch and in that a dam is formed at the bottom of the leading end of the punch. Such a punch appeared to be able to form a tongue with a rectangular body which tapers to the free end of the tongue, these tongues are able to sustain a large loading force in a direction perpendicular to the surface of the carrier material.

One embodiment of the invention will be described in more detail hereinafter, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 shows a top plan view of a metallic

member secured to a carrier material and the punch for carrying out the method;

Fig. 2 shows a cross-sectional view, taken on the line II—II of Fig. 1;

Fig. 3 shows the punch for carrying out the method in side-elevational view;

Fig. 4 shows the punch of Fig. 4 in front-elevational view.

Figures 1 and 2 respectively show, in top plan view and in side-elevational view, a metallic member 1 secured to a carrier material 2. As shown, the metallic member is a corner-iron, but it is emphatically pointed out that the shape of the metallic member is completely irrelevant, so long as it has a planar portion to be secured to the carrier material. The metallic member 1 is secured to the carrier material by means of hook-shaped portions 3. The hook-shaped portions 3 have been formed by punching tongues from the material of the metallic member 1 by means of a punch 4, which tongues consist of tapered rectangular pieces.

By selecting a suitable shape of the punch 4, a suitable angle α relative to the carrier material, and a correct impact velocity and impact force for the specific carrier material, the tongue members can be bent into hook-shaped members in the carrier material in the manner as shown, whereby an extremely firm connection is produced. The connection is extremely strong when, as shown in the drawing, the hook-shaped portions are forced into the carrier material in opposite directions, so that loosening of the metallic members in the direction of stroke of the punch is not possible either. Depending on the size of the metallic member to be secured and the desired strength of the attachment to the carrier material, more or fewer hook-shaped portions can be struck into the carrier material.

Figures 3 and 4 show a preferred embodiment of the punch in side and front elevational view, respectively. Punch 4 is provided at its bottom, for a portion of its length, adjacent to its leading end, with a double bevel 5, 5', terminating at the bottom in a flattened portion 6 and at the front forming a dam 9. The leading end is also provided with a curvature 7, 8, extending rearwardly from dam 9. Accordingly, in front view, dam 9 has the shape of a trapezium with the short side of the trapezium being formed by the flattened portion 6. The curvature 7, 8 has been formed from two circular arcs of circles having essentially the same radius R but with centers located at different levels. The distance between the centers is indicated by x in Fig. 3. This shape of the punch has turned out to be highly favourable to produce an optimal shape and curvature of the hook-shaped portions 3.

The punch is secured in a punching device known to those skilled in the art, and in which the stroke velocity and the impact force of the punch can be adjusted, while during the performance of the punch movement the metallic member is held down on to the carrier material. By way of example, some numerical values for the dimen-

sions of the punch and the required stroke velocity and impact force for various carrier materials and a metallic member of steel sheet having a thickness of 1 mm to be fastened will be specified hereinafter by way of example.

The punch has the following dimensions:

	height	= 15 mm
10	width b	= 2.5 mm
	bevel 5, 5'	less than 45°
15	width flattened portions 6	= 0.8 mm
	radius R	= 13 mm
20	distance x between centres of circular arcs 7 and 8	= 4 mm

The punch was introduced at an angle $\alpha = 45^\circ$ relative to the top surface of the metallic member, but an angle α of up to 60° has proved to be possible.

Minimum stroke velocity:

30	deal	-3 m/min
	gypsum board	-4.5 m/min
	chip board	-4 m/min
35	cement-bonded chip board	-6 m/min
	650 kg \leq impact force \leq 900 kg	

It should be noted that the above values for the dimensions of the punch and the magnitudes of stroke velocity and impact force are given by way of example only and that the desired fastening of the metallic member to the carrier material can also be accomplished using punches having different dimensions and other kinds of metals, possibly with other thicknesses, and kinds of carrier material, using different stroke velocities and impact forces, and possibly using a different angle of stroke.

Claims

1. A method of fastening metallic members, wherein a metallic member (1) is placed with the underside of a planar portion thereof in contact with a carrier material (2), whereafter by means of a punch (4) at least one tongue (3) is liberated from the metal surface, the punch (4) entering said planar portion and the carrier material (2) at an acute angle, characterized in that the punch (4) is moved downwards into said carrier material (2) to bend the tongue (3) through an angle of more than 90° to form a curved hook-shaped portion.

2. A method according to claim 1, characterized

in that said tongue (3) has a rectangular body and tapers towards the free end that is to be introduced into the carrier material (2).

3. A method according to claim 1 or 2, characterized in that the metallic member (1) is fastened to the carrier material (2) with at least two hook-shaped portions (3), with the direction of stroke of the punch (4) for forming the first hook-shaped portion making an angle of about 60—90° with the direction of stroke for forming the second hook-shaped portion.

4. A punch for carrying out the method according to any one of claims 1—3, which punch has a bevel (5, 5') on opposite sides of the underside of the punch at the leading end thereof, characterized in that the punch (4) is elongated with a rectangular cross-section, in that adjacent the bevels (5, 5') a portion (6) of the longitudinal underside is maintained; in that the end face of the punch at the leading end has a concave curvature (7, 8) extending from the longitudinal underside to the longitudinal top side of the punch, and in that a dam (9) is formed at the bottom of the leading end of the punch.

5. A punch according to claim 4, characterized in that said concave curvature consists of two successive curves (7, 8) consisting of circular arcs of circles having essentially the same radius (R), but whose centres are spaced apart (X).

Patentansprüche

1. Verfahren zum Befestigen von metallischen Teilen, wobei ein Metallteil (1) mit der Unterseite eines ebenen Teiles sich in Kontakt mit einem Trägermaterial (2) befindet, wonach mit Hilfe eines Stößels (4) mindestens eine Zunge (3) aus der ebenen Metallfläche gestanzt wird, wobei der Stößel (4) unter einem spitzen Winkel in die Metallfläche und das Trägermaterial (2) eindringt, dadurch gekennzeichnet, daß der Stößel (4) nach unten in das Trägermaterial (2) bewegt wird, um die Zunge (3) um einen Winkel von mehr als 90° zu biegen und dadurch ein gebogenes, hakenförmiges Teil zu erzeugen.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Zunge (3) einen rechtwinkligen Körper hat und sich zum freien Ende hin verjüngt, das in das Trägermaterial (2) eingeführt wird.

3. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das Metallteil (1) an dem Trägermaterial (2) mit mindestens zwei hakenförmigen Zungen (3) befestigt wird, wobei die Stoßrichtung des Stößels (4) zum Formen der ersten Zunge (3) in einem Winkel von etwa 60 bis 90° zur Stoßrichtung beim Formen der zweiten Zunge (3) steht.

4. Stößel zur Durchführung der Verfahren nach einem der Ansprüche 1 bis 3, wobei der Stößel (4) eine Abschrägung (5, 5') an den gegenüberliegenden Seiten seines vorderen Endes hat, dadurch gekennzeichnet, daß der Stößel (4) mit einem rechteckigen Querschnitt verlängert ist, wobei

anschließend an Abschrägungen (5, 5') in Längsrichtung der Unterseite ein flach gedrücktes Teil (6) erzielt wird, daß der Stößel (4) am vorderen Ende eine konkave Kurve (7, 8) hat, die sich von der Längs-Unterseite zur Längs-Oberseite des Stößels (4) erstreckt, so daß an der Unterseite des vorderen Endes des Stößels eine Schräge (9) gebildet wird.

5. Stößel nach Anspruch 4, dadurch gekennzeichnet, daß die Kurve (7, 8) aus zwei aufeinanderfolgenden Kreisabschnitten mit im wesentlichen dem gleichen Radius (R) besteht, deren Mittelpunkte jedoch einen Abstand (X) haben.

Revendications

1. Procédé de fixation d'éléments métalliques, dans lequel on place un élément métallique (1) en disposant la face inférieure d'une partie plane de cet élément en contact avec une matière support (2), après quoi, au moyen d'un poinçon (4), on détache au moins une languette (3) de la surface métallique, la poinçon (4) pénétrant dans ladite surface plane et dans la matière support (2) dans une direction formant un angle aigu, caractérisé en ce que l'on enfonce le poinçon (4) de haut en bas dans la matière support (2) pour replier la languette (3) d'un angle de plus de 90° pour former une partie recourbée en forme de crochet.

2. Procédé selon la revendication 1, caractérisé en ce que ladite languette (3) possède un corps annulaire et s'amincit vers son extrémité libre qui doit être introduite dans la matière support (2).

3. Procédé selon la revendication 1 ou 2, caractérisé en ce que l'élément métallique (1) est fixé à la matière support (2) par au moins deux parties (3) en forme de crochet, la direction de la course du poinçon (4) qui sert à former la première partie en forme de crochet formant un angle d'environ 60 à 90° avec la direction de la course qui sert à former la deuxième partie en forme de crochet.

4. Poinçon pour la mise en oeuvre du procédé selon l'une des revendications 1 à 3, lequel poinçon possède un biseau (5, 5') sur les deux côtés de la face inférieure du poinçon, à l'extrémité avant de ce poinçon, caractérisé en ce que le poinçon (4) est de forme allongée, avec une section rectangulaire, en ce qu'une partie (6) de la face inférieure longitudinale reste conservée le long des biseaux (5, 5'), en ce que la face terminale de l'extrémité avant du poinçon présente un courbure concave (7, 8) s'étendant de la face inférieure longitudinale à la face supérieure longitudinale du poinçon et en ce qu'un méplat (9) est formé au bas de l'extrémité avant du poinçon.

5. Poinçon selon la revendication 4, caractérisé en ce que ladite courbure concave est composée deux courbes successives (7, 8) constituées par des arcs de cercles circulaires ayant sensiblement le même rayon (R) mais dont les centres sont espacés (X).

FIG.1

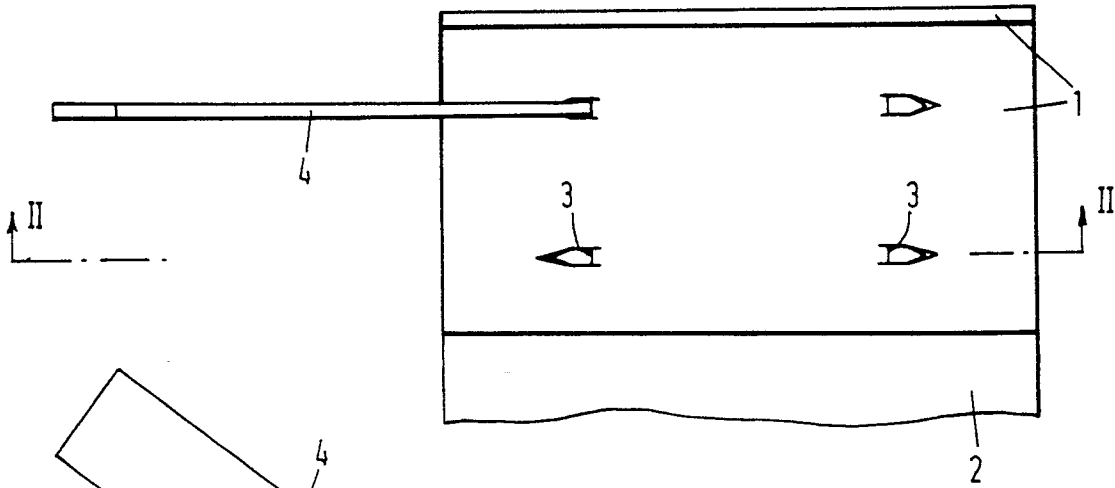


FIG.2

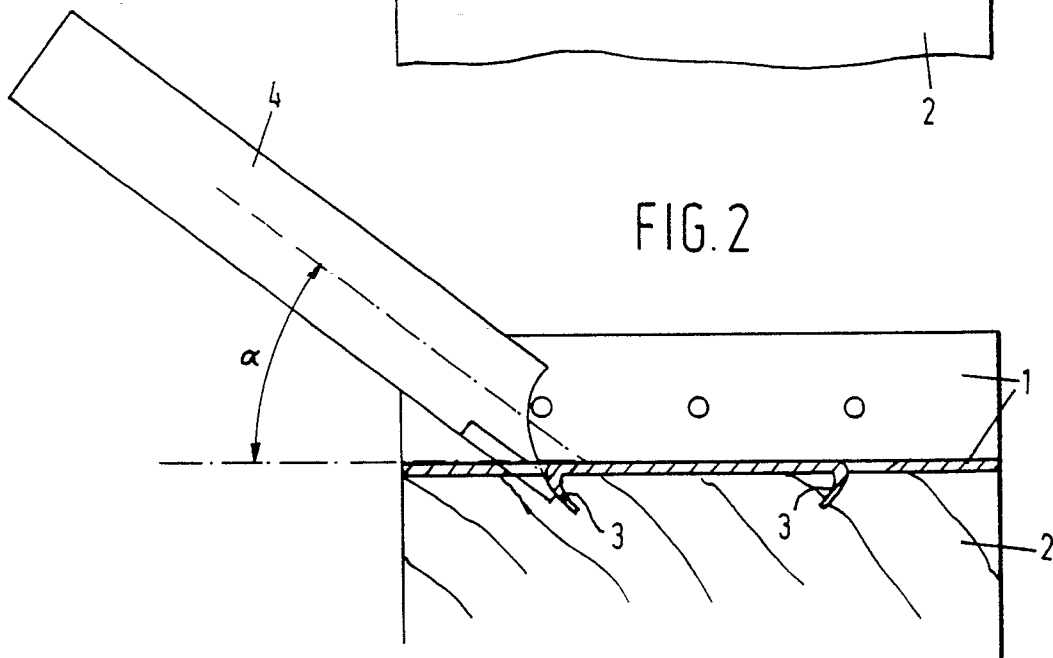


FIG.3

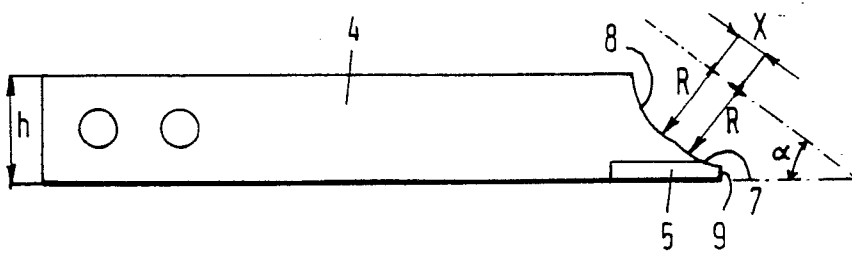


FIG.4

