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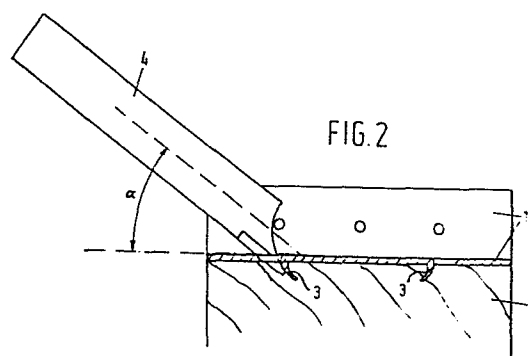
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54 A method of fastening metallic members and a punch for carrying out said method.

57 A method of fastening metallic members to a carrier material. A metallic member is placed with 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, which tongue is bent to form a curved hook-shaped portion by moving the punch further downwards into said carrier material. A punch is described for carrying out this method, which punch is of elongated shape and has a leading end which via a concave curvature terminates in a tip that is flattened at the front.



-1-

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

This invention relates to a method of fastening
metallic members. In fastening metallic members, such as angles
and support plates, to carrier materials such as gypsum board,
wood, chip board and the like, use has hitherto often been made
5 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.

10 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
15 carrier material, so that there is not formed a reliable connection
that can be loaded in various directions.

Netherlands patent application 7807256 describes a
spiked metal plate for attachment to gypsum panels, in which the
spikes are prevented from becoming loosened. This is only avoided,
20 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
25 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
fastening metallic members in which a metallic member is placed
with a planar portion thereof in contact with a carrier material,
30 whereafter by means of a punch at least one tongue is liberated
from the metal surface, which by moving the punch further downwards
into said carrier material is bent to form a curved hook-shaped
portion.

The invention also provides a punch for carrying out
35 the method, which punch is elongated with a rectangular cross-section,

there being provided a bevel on opposite sides of the longitudinal bottom of the punch at one end thereof, so that adjacent the bevels a portion of the bottom surface is maintained, the end face of the punch at said end being provided with a concave curvature extending from the bottom to the longitudinal top of the punch.

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.

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 by means of the method according to the invention, and the punch for carrying out the method according to the invention;

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 according to the invention 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 dimensions of the punch and the required stroke velocity and impact force for various carrier materials and a
5 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 h	= 15 mm
	width b	= 2.5 mm
10	bevel 5,5'	less than 45°
	width flattened portions 6	= 0.8 mm
	radius R	= 13 mm
	distance x between centers of circular arcs 7 and 8	= 4 mm

15 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:

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

25 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
30 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.

C L A I M S
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1. A method of fastening metallic members, characterized in that a metallic member is placed with 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, which by
5 moving the punch further downwards into said carrier material is bent to form a curved hook-shaped portion.
2. A method according to claim 1, characterized in that said tongue has a rectangular body and tapers towards the end to be introduced into the carrier material.
- 10 3. A method according to claim 1 or 2, characterized in that the metallic member is fastened to the carrier material with at least two hook-shaped portions, with the direction of stroke of the punch for forming the first hook-shaped portion making an angle of about 60° - 90° with the direction of stroke for forming the
15 second hook-shaped portion.
4. A method according to any one of claims 1-3, characterized in that the punch is introduced into the metallic member at an angle of about 40° - 60° at a stroke velocity higher than about 3 m/min and a force of impact greater than about 650 kg.
- 20 5. A punch for carrying out the method according to any one of claims 1-4, characterized in that the punch is elongated with a rectangular cross-section, there being provided a bevel on opposite sides of the longitudinal bottom of the punch at one end thereof, so that adjacent the bevels a portion of the bottom surface
25 is maintained, the end face of the punch at said end being provided with a concave curvature extending from the bottom to the longitudinal top of the punch.
6. A punch according to claim 5, characterized in that a dam is formed at the bottom of the leading end of the punch,
30 and that said hollow curvature is composed of two successive curvatures formed as arcs of circles having essentially the same radius, but whose centers are spaced apart.

FIG.1

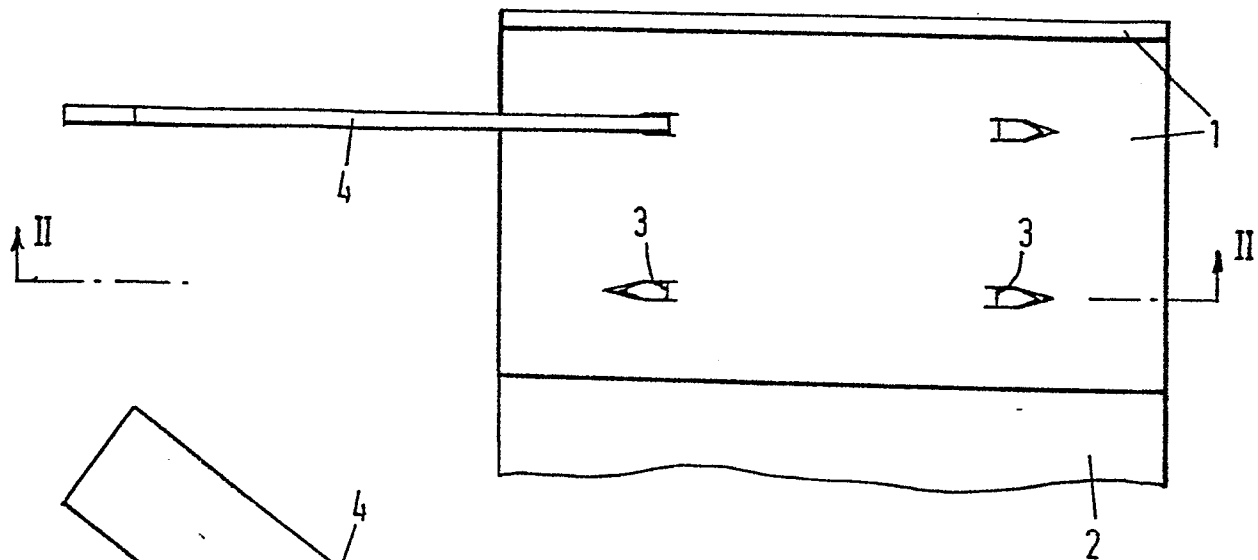


FIG.2

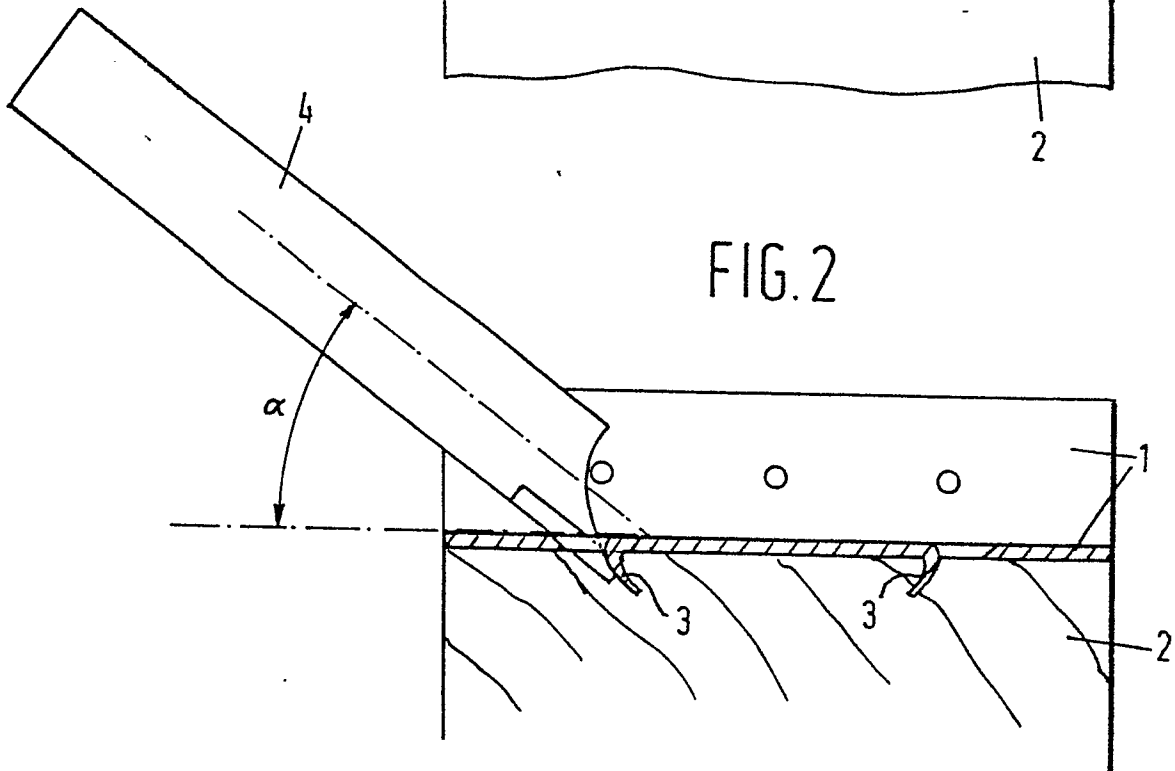


FIG.3

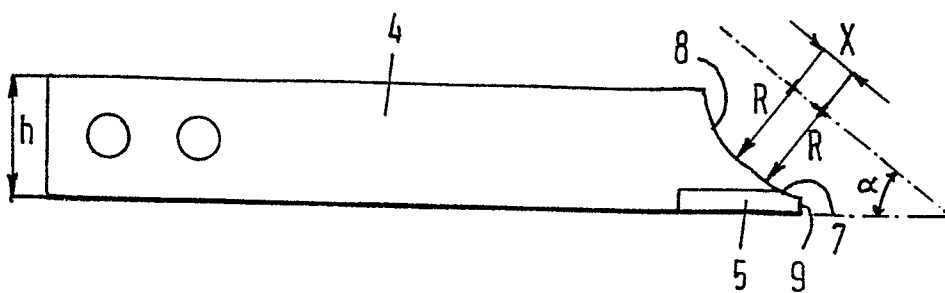


FIG.4

