

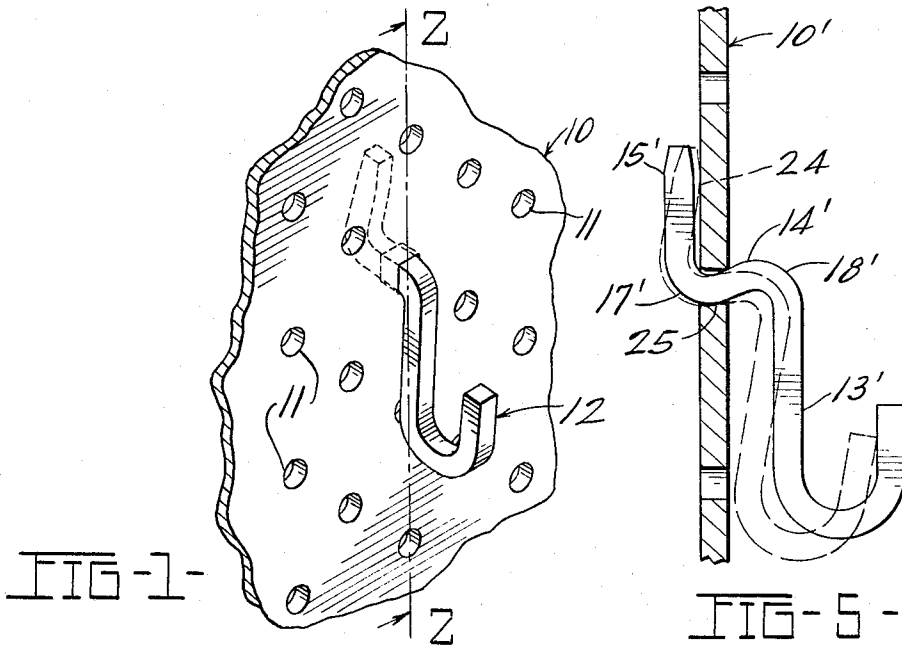
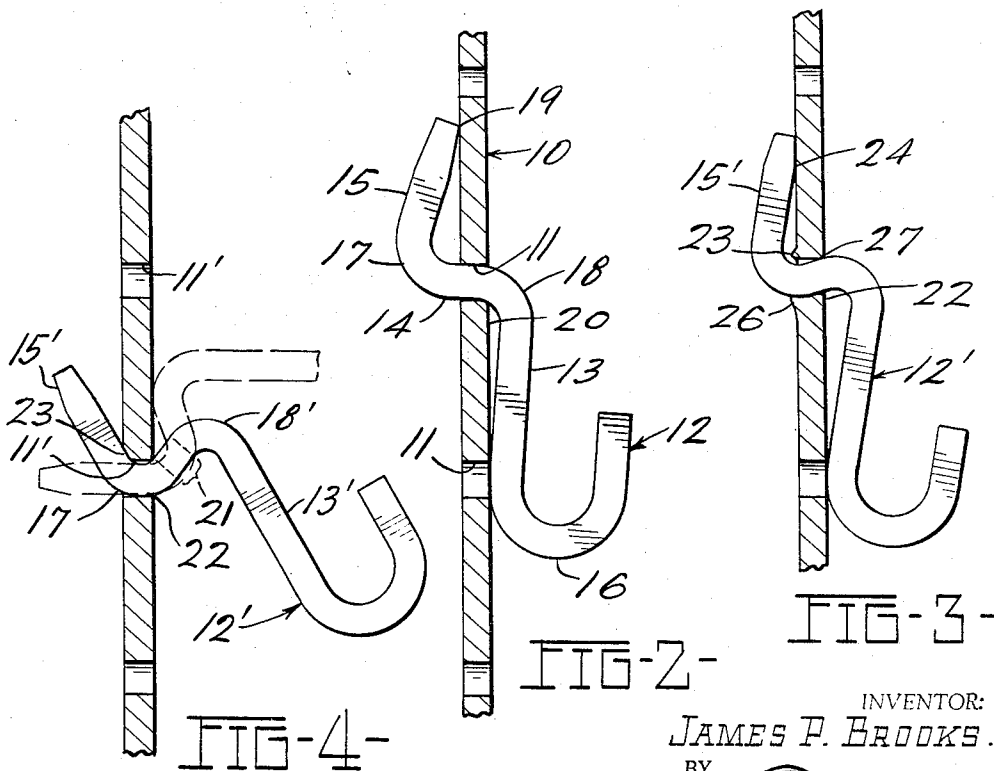
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HOOK STRUCTURE FOR PERFORATED BOARDS

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HOOK STRUCTURE FOR PERFORATED BOARDS
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This application is a continuation-in-part of my co-
pending application Serial No. 359,310, filed April 13,
1964, now abandoned.

The present invention relates to adjustable supports of
the type wherein a hook structure is adapted to be rigidly
retained when inserted horizontally through an opening
in a perforated board and then rotated downwardly against
the board, and more particularly to an improved hook
structure for use in such an application.

An object of the invention is the provision of a new
and improved supporting structure comprising a board
having a hole therethrough and a hook structure which is
inserted horizontally through the hole and then rotated
downwardly against the board, the hook structure and
opening being of non-circular cross section and the hook
structure having a tight fit in the opening so as to resist
swinging motion of the hook structure relative to the
board.

Another object of the invention is the provision of a
new and improved structure of the immediately above
described type in which the hook structure is made from
material having a generally square cross section.

Another object of the invention is the provision of a
new and improved structure of the above-mentioned type
in which the hook structure comprises a vertical portion,
a rearwardly extending portion at the top of said vertical
portion for extending through an opening in the board,
and an upwardly extending portion at the rear of said
rearwardly extending portion, the upwardly extending por-
tion being bent at an acute angle relative to said rear-
wardly extending portion and the angle between said rear-
wardly extending portion and said vertical portion is no
more than ninety degrees, and being arranged so that the
top edge of the upwardly extending section abuts the
back of the board when the bottom of the vertical portion
abuts the front face of the board.

A further object of the invention is the provision of a
support structure of the immediately above-mentioned
type wherein the angle between the vertical portion and
the backwardly extending portion is an acute angle and
the angle between the backwardly extending portion and
the upwardly extending portion is also an acute angle, the
backwardly extending portion having a straight section
of a length substantially equal to the thickness of the
board and being connected to the vertical portion and the
upwardly extending portion by rounded sections; so that
when the hook structure is installed in the board, the top
of the upwardly extending portion engages the back of
the board and the bottom of the vertical portion engages
the front face of the board with the backwardly extending
portion being inclined downwardly and backwardly and
being wedged against the top front edge and the bottom
rear edge of the opening through the board.

Another object of the invention is the provision of a
hook structure of the above-mentioned type which is bent
from a length of material of square cross section, for in-
sertion through an opening of circular cross section having
a diameter less than a diagonal of said square cross sec-
tion so that the hook structure deforms the sidewalls of
the opening when the hook structure is inserted in the
opening.

A still further object of the invention is the provision
of a hook structure of the immediately above-mentioned
type whose upwardly extending portion has a tapered end

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to assist in the deformation of the sidewalls of the open-
ing in the perforated board.

Further objects and advantages will become apparent
to those skilled in the art to which the invention relates
from the following description of the preferred embodi-
ment described with reference to the accompanying draw-
ings forming a part of this specification, and in which:

FIG. 1 is a fragmentary front perspective view of a per-
forated board having a hook structure embodying prin-
ciples of the present invention locked in one of the open-
ings through the board;

FIG. 2 is a sectional view taken approximately on the
line 2-2 of FIG. 1;

FIG. 3 is a sectional view similar to FIG. 2 but showing
another embodiment of the invention;

FIG. 4 is a fragmentary sectional view showing the
first stage of the deformation of the walls of the opening
through the board by the hook during installation of the
hook; and

FIG. 5 is a fragmentary sectional view similar to FIG. 4
showing a second stage of deformation of the sidewalls
of the opening in the board and which takes place during
the final rearward movement of the hook relative to the
board.

The preferred embodiment of support structure shown
in the drawing comprises a perforated board 10 of con-
ventional construction having a plurality of openings 11
therethrough spaced apart at regular intervals. Although
the openings 11 may have cross sections of various shapes
that include square, they are preferably round because of
the ease with which round holes can be made, and the
board 10 is preferably made of tempered wood fiber board
or similar material which is rigid and yet can be deformed
without exerting undue force. The board 10 is of a
thickness which is preferably no less than approximately
1/8 of an inch and preferably no greater than approxi-
mately 1/4 of an inch, although other thicknesses can be
used.

The support structure also includes a hook structure 12
having a vertical portion 13, a backwardly extending por-
tion 14 at the upper end of the vertical portion 13, and an
upwardly extending portion 15 at the back end of the
backwardly extending portion 14. The backwardly extend-
ing portion 14 extends through an opening 11 in the
board 10 when the hook structure is locked into position
on the board, and any type of forwardly, or forwardly and
upwardly extending leg portion 16 is carried by the lower
end of the vertical portion 13 to provide a hook or sup-
port on which tools, implements or other objects can be
hung or supported.

The hook structure 12 is made from a piece of mate-
rial that has a non-circular cross section, preferably
square, and the openings 11 when the hook 12 is inserted
in the opening will be deformed to a non-circular shape
which closely fits the backwardly extending portion 14
of the hook 12 to resist rotation of the hook 12 relative
to the board. The hook 12 is installed in the position
shown in FIG. 2 by holding the hook 12 horizontally and
forcing the end of the upwardly extending portion 15
through the opening 11 until the corner 17 between the
upwardly extending portion 15 and rearwardly extending
portion 14 reaches the front face of the board. There-
after the vertical portion 14 is moved downwardly and the
hook 12 is pushed backwardly to rotate the corner 17
through the opening 11 and bring the bottom end of the
vertical portion 13 against the front face of the board 10.
As previously stated, the openings 11 preferably have a
round cross section and the material from which the hook
is made, preferably has a square cross section. The di-
agonal of the square cross section of the hook is pref-
erably greater than the diameter of the openings 11 so

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that the board 10 must be deformed slightly when the upwardly extending portion is forced through the opening 11 to provide an interference fit therebetween. In order that this tight interference fit will not be disturbed unduly when the hook is rotated downwardly and backwardly to bring the vertical portion 13 against the front face of the board 10, the corner 17 is appropriately rounded. In order that the rounded corner 17 will not deform the back portion of the opening 11 unduly when the vertical portion is rotated downwardly against the front face of the board 10, the backwardly extending portion 14 has a straight section which is approximately equal to the thickness of the board 10. The hook structure is preferably formed so that the straight section of the backwardly extending portion 14 is positioned in and tightly engaged by the opening 11 to resist a vertical rocking action of the hook structure when it is installed in the opening 11.

To further resist rotation of the hook 12 when it is installed in an opening 11, the upwardly extending portion 15 is bent at an acute angle (preferably approximately 70 degrees) relative to the backwardly extending portion 14. The corner 18 between the vertical portion 13 and backwardly extending portion 14 is rounded as is the corner 17, and the upwardly extending portion 15 is of such a length that the top end 19 of the portion 15 engages and "digs" into the back of the board 10 to cause the bottom surface 20 of the rounded corner 18 to further slightly deform the lower front edge of the opening 11 when the bottom of the vertical portion 13 abuts the front face of the board 10. The tight non-circular fit of the backwardly extending portion 14 in the opening 11 (which is straight for substantially the full length of the opening), the "digging" in of the top edge 19 into the back of the board 10, and the further "digging" into the board of the bottom surface 20, individually and collectively help to resist rotation of the hook structure in the opening 11. In addition, the tight interference fit of the hook structure in the opening 11 resists upward and forward movement of the hook 12 when objects are lifted from the hook structure.

Another embodiment of the invention is shown in FIGS. 3 through 5. Those portions of the embodiment shown in FIGS. 3 through 5 which correspond to similar portions of the embodiment shown in FIGS. 1 and 2 are designated by a like reference numeral characterized further in that a prime mark is affixed thereto.

In the embodiment shown in FIGS. 3 through 5, the backwardly extending portion 14 has a straight section 21 of a length approximately equal to the thickness of the board. Each of the corners 17' and 18' are bent more than 90 degrees, so that the backwardly extending portion 14' forms acute angles both with the vertical portion 13' and the upwardly extending portion 15'. In the most preferred arrangement the acute angles between the backwardly extending portion 21 and both the vertical portion 13' and upwardly extending portion 15' are approximately 70 degrees. The hook structure 13' is, of course, made of square rod as is the embodiment shown in FIGS. 1 and 2, so that the portions 15', 17' and 21 are all of square cross section. The holes 11' in the board 10', shown in the drawing, are round. These holes could also be square, providing they have a close fit with the hook, and providing they are of such a size that the hook is wedged against the front and rear edge portions of the opening when the hook is rotated into its locked position shown in FIG. 3.

The hook 12' is installed in the opening 11' in what can be considered to be two stages. The first stage is depicted in FIG. 4. The hook 12' is installed in the opening 11' by inserting the tapered end 15' through the opening 11' (as shown by dashed lines) until the portion of the hook located at the region of juncture between corner 18' and backwardly extending portion 21 engages the front surface of the board. Thereafter the vertical portion 13' is rotated downwardly through the position

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shown by solid lines in FIG. 4 to the position shown in FIG. 5 by a downward force on the outer end of the hook. During the initial movement of this rotation from the dotted position in FIG. 4 to the position shown in solid lines in FIG. 4, the front lower edge 22 of the opening 11' is deformed slightly as is the top rear edge 23 of the opening 11'. As previously stated the board is made of a deformable material such as pressed wood. The edges 22 and 23 are, therefore, deformed into a rounded condition as is clearly shown in FIG. 3, which rounded condition permits the corner 17' to pass through the opening 11' and assume the position shown generally in FIG. 5. The rotation of the vertical portion 13' downwardly proceeds smoothly until it reaches the position shown in FIG. 5 after which downwardly applied force will no longer rotate the hook. In this position, the portion 15' engages the back of the board.

The rotation of the hook above described is produced generally by a downward force on the lower portion of the hook, and as previously stated stops when the hook reaches the approximate position shown by full lines in FIG. 5. Thereafter the insertion of the hook is finished by a second action produced by pushing backwardly on the bottom end of the hook. During this second stage, the top end of the upwardly extending portion 15 engages the back surface of the board and acts as a pivot point 24. In the position of the hook shown by full lines in FIG. 5, the lowermost portion 25 of the backwardly extending portion 14' is positioned against the bottom surface of the opening 11' approximately midway between the front and rear surfaces of the board. Force is supplied to the bottom of the hook in a rearward direction causes the hook to pivot about the point 24 to swing the lowermost portion 25 downwardly and rearwardly to deform the bottom rear edge 26 of the opening 11' in a downward and rearward direction as shown in FIG. 3. At the same time the rotation about the point 24 causes the front top edge of the backwardly extending portion 14' to move rearwardly into tight engagement with the front top edge 27 of the opening 11'. This occurs because the backwardly extending portion 14' is formed at an acute angle relative to the upwardly extending portion 15'. The top surface of the front portion of the backwardly extending portion 14' is positioned above the top edge of the opening 11', and the rotation about the point 24 draws this upwardly sloping portion into tight engagement with the front top edge 27. The amount of deformation of the front top edge 27 depends upon the angle between the backwardly extending portion 14' and the upwardly extending portion 15', and should be such that the rotation occurring during the second stage of insertion brings the top edge of the rearwardly extending portion 14' into tight engagement with the edge 27. Where the upwardly extending portion 15' forms an angle of 70 degrees with respect to the backwardly extending portion 14', pivotal movement about the point 24 causes a slight deformation of the upper front edge 27.

It will now be seen that the hook structure shown in FIGS. 3 to 5 deforms the lower front edge 22 and the back upper edge 23 of an opening which has an interference fit relative to the backwardly extending portion 21 during the initial stage of its installation. During this stage, the upper front edge 27 and the lower rear edge 26 remain in a substantially non-deformed condition. During the second stage of the installation the hook structure shown automatically forces the bottom rear portion 25 of the backwardly extending portion 21, and the top front portion of the backwardly extending portion 21 into tight engagement with the lower rear edge 26 and the front upper edge 27 of the opening, respectively. In the preferred embodiment, the hook structure is so formed that it deforms the bottom rear edge 26 and the top edge 27 as it moves into its final position against the board. During the final movement of the installation of the hook, the bottom rear edge 26 is deformed outwardly, following

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which the bottom surface 25 of the backwardly extending portion slides over the deformed edge 26, and the bottom end of the hook snaps into engagement with the front surface of the board. In the installed condition shown in FIG. 3, the hook is locked or wedged between the surfaces 26 and 27, and the deformed edges 26 and 27 are caused to be contoured to the precise configuration of the hook when in its finished, installed condition in the board.

It will be apparent that the objects heretofore enumerated as well as others have been accomplished and that there has been provided a hook structure for insertion into openings through boards, which hook structure strongly resists rotation relative to the board, as well as upward and forward movement of the hook when an object supported by the hook structure is removed therefrom.

While the invention has been described in considerable detail, I do not wish to be limited to the particular objects and advantages above described, and it is my intention hereby to cover all novel adaptations, modifications, and arrangements thereof which come within the practice of those skilled in the art to which the invention relates.

What I claim is:

1. An adjustable support structure comprising: a board of uniform predetermined thickness having a hole of predetermined size extending between its front and back surfaces, a hook structure having a vertical portion a lower end portion of which bears against the front face of said board, a backwardly turned portion on the upper end of said vertical portion and extending through said opening in said board, and an upwardly turned portion on the back end of said backwardly turned portion, at least said backwardly turned portion of said hook structure being of a substantially square cross section, said hole being deformed by said substantially square cross section to provide an interference fit with the hole of said board.

2. The support structure of claim 1 wherein the angle between said backwardly and upwardly turned portion is approximately 70 degrees, and the portion between said vertical portion and said backwardly turned portion is

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formed on a radius which is embedded into said board.

3. The support structure of claim 1 wherein the top of said upwardly turned portion abuts the back of said board, and said backwardly turned portion slopes backwardly and downwardly from said vertical portion, said backwardly turned portion fitting into a deformed upper front portion and a deformed lower back portion of the sidewalls of said hole.

4. The support structure of claim 3 wherein said backwardly turned portion forms angles of approximately 70 degrees with said vertical portion and said upwardly turned portion.

5. The support structure of claim 4 wherein said backwardly turned portion has a straight section in said hole and curved portions forwardly and rearwardly of said board connecting it to said vertical portion and said upwardly turned portion respectively.

6. The hook structure of claim 4 wherein the upper end of said upwardly turned portion is tapered to provide a truncated section of a square pyramid.

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